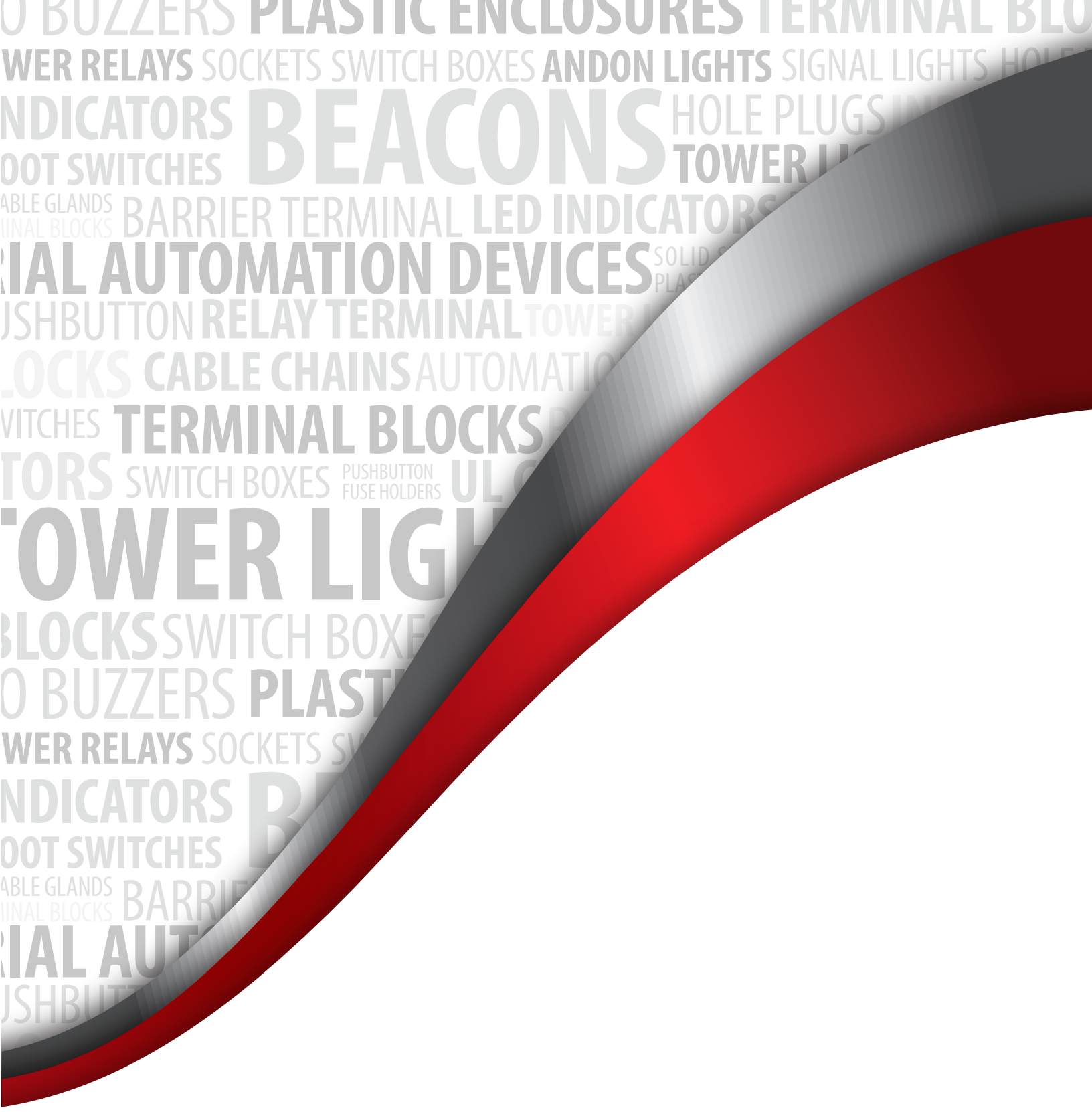


AmeriMation

CONTROLLERS

Color LCD Graphic Panel

GP-A Series

PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Features

- Equipped with TFT LCD for realizing True color
- Horizontal/Vertical installation according to environment
- Available to monitor device of the connected controllers even without user screen data
- Using user screen drawing program 'atDesigner'
  : More variety functions, objects and library image
  : Intuitive user interface
  : Multilingual table function: switching language of user screen by touching a button
- Various communication interface: RS232C, RS422, Ethernet, CAN

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

01. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
    Failure to follow this instruction may result in personal injury, economic loss or fire.
02. **Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
    Failure to follow this instruction may result in explosion or fire.
03. **Use the unit within the rated specifications.**
    Failure to follow this instruction may result in fire or shortening the life cycle of the product.
04. **Do not connect, repair, or inspect the unit while connected to a power source.**
    Failure to follow this instruction may result in fire.
05. **Check 'Power Wiring' and 'Serial Interface' before wiring.**
    Failure to follow this instruction may result in fire.
06. **In preparation for product damage, communication error, or malfunction, install external limit switch, emergency stop switch, or other protection circuit.**
    Failure to follow this instruction may result in personal injury, economic loss or fire.
07. **Since Lithium battery is embedded in the product, do not disassemble or burn the unit.**
    Failure to follow this instruction may result in fire.
08. **Do not disassemble or modify the unit.**
    Failure to follow this instruction may result in fire.
09. **Please contact us for battery replacement.**
    Using an unauthentic battery may result in fire or product damage.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. **Use dry cloth to clean the unit, and do not use water or organic solvent.**
    Failure to follow this instruction may result in electric shock or fire.
02. **When connecting the power input, use AWG 23 cable or over and tighten the terminal screw with a tightening torque of 0.5 to 0.8N·m.**
    Failure to follow this instruction may result in fire or malfunction due to contact failure.
03. **Keep the product away from metal chip, dust, and wire residue which flow into the unit.**
    Failure to follow this instruction may result in fire or product damage.
04. **Do not touch the front LCD screen over 2 points at the same time.**
    Failure to follow this instruction may result in malfunction.
05. **Do not put any heavy object on the front screen.**
    Failure to follow this instruction may result in malfunction due to deformation of LCD and touch panel.

CE KC

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Operate the product after supplying power to the product, input/output equipment, and load. If operate product before supplying power, it may result in output error or malfunction.
- Use a USB cable within 2 m.
- Keep away from high voltage lines or power lines to prevent inductive noise. Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Make a required space around the unit for radiation of heat, and do not block ventilation openings.
- Do not push the touch panel with a hard and sharp object or push the panel with excessive force. It may result in fire or malfunction.
- When skin is smeared with liquid crystal from the broken LCD, rinse with running water for over 15 minutes. If it gets into the eyes, rinse eyes with running water for over 15 minutes and contact a doctor.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000m
  - Pollution degree 2
  - Installation category II

Cautions during Wiring

- For power supply, use the wire of which cross section is at least 0.75mm² and use the wire of which cross section is at least 1.25mm² for grounding.
- Use ring crimp terminal with at least 3mm of internal diameter and less than 6mm of external diameter.
- Do not apply power before power line connection.
- Check power polarity.
- Tighten the terminal screw with 0.5 to 0.6N.m torque.
- Ground resistance should be less than 100Ω and ground it separately.

Product Components

- Graphic panel + built in battery
- 4.6 / 5.7 / 7.0 inch: 4 fixing brackets
- 10.4 inch: 6 fixing brackets, CAN connector
- Sold separately: communication cable

Manual

For the detailed information and instructions, please refer to the manuals, and be sure to follow cautions written in the technical descriptions.
Visit Autonics web site to download manuals.

- GP-A Series user manual
  It describes general information about installation and system of GP-A Series.
- atDesigner user manual
  It describes how to design user screen and how to use HMI function.
- GP/LP user manual for communication
  It describes how to connect with external devices such as PLC.

Ordering Information

This is only for reference.
For selecting the specific model, follow the Autonics web site.

GP	-	A	❶	-	T	❷	D	❸

❶ Screen size
046: 4.6 inch
057: 5.7 inch
070: 7.0 inch
104: 10.4 inch

❷ Display color
8: 262,144 color
9: 16,777,216 color

❸ Interface

Model	❸	RS232C	RS422	CAN	Micro SD	USB Host	USB Device	Ethernet
GP-A 046/057/070	6	1	1	-	-	1	1	1
	7	2	-	-	-			
GP-A104	8	1	1	1	1			
	9	2	-	1	1			

Specifications

	GP-A046	GP-A057	GP-A070	GP-A104
Screen size	4.6 inch	5.7 inch	7.0 inch	10.4 inch
LCD type	TFT Color LCD			
Resolution	800×320 pixel	640×480 pixel	800×480 pixel	800×600 pixel
Display area	108×43.2 mm	115.2×86.4 mm	154.4×93.44 mm	211.2×158.4 mm
Display color	16,777,216 color	262,144 color	16,777,216 color	16,777,216 color
LCD view angle (top/bottom/left/right)	Within 75°/70° /80°/80° of each	Within 70°/70° /80°/80° of each	Within 50°/60° /65°/65° of each	Within 60°/70° /80°/70° of each
Backlight	White LED			
Luminance adjustment	Adjustable by software			
Touch	Resistive type (4-wire)			
Approval	CE KC			
Unit weight (packaged)	≈ 272 g (≈ 382 g)	≈ 489 g (≈ 644 g)	≈ 520 g (≈ 706 g)	≈ 1.07 kg (≈ 1.62 kg)

Serial interface	RS232C, RS422
USB interface	USB Host, USB Device(USB2.0)
Ethernet interface	IEEE802.3(U), 10/100Base-T
CAN interface	24V CAN transceiver
External storage	Micro SD up to 32GB (FAT16/32)
Real-time controller	RTC embedded
Battery life cycle	3 years at 25°C

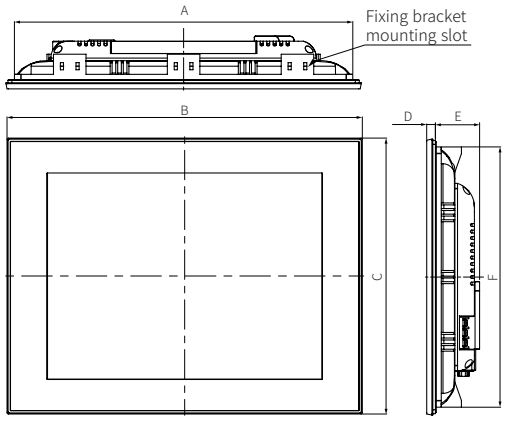
Supportive interface can be different up to model. For the detailed information, please refer to 'Ordering Information'.

Language	Korean, English
Text	Bitmap and vector font
Memory for user screen	64MB
Number of user screen	100 pages

Power supply	24 VDC⎓
Allowable voltage range	90 to 110% of power supply
Power consumption	4.6 inch : ≤ 4.8 W, 5.7 / 7.0 inch : ≤ 7.2 W, 10.4 inch : ≤ 8.0 W
Insulated resistance	≥ 100 MΩ (500 VDC⎓ megger) (between all terminals and case)
Ground	3rd grounding (≤ 100 Ω)
Noise immunity	The square wave noise (pulse width: 1μs) by the noise simulator ± 0.5 kV
Dielectric strength	500 VAC~ 50/60 Hz for 1 minute (between all terminals and case)
Vibration	0.75 double amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 1 hour
Vibration (malfunction)	0.5 double amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 10 minutes
Shock	147 m/s² (approx. 15 G) in each X, Y, Z direction for 3 times
Shock (malfunction)	100 m/s² (approx. 10 G) in each X, Y, Z direction for 3 times
Ambient temperature	0 to 50°C, storage: -20 to 60°C (a non freezing or condensation environment)
Ambient humidity	35 to 85%RH, storage : 35 to 85%RH (a non freezing or condensation environment)
Protection structure	IP65 (front panel, IEC standard)

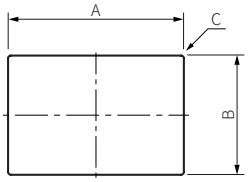
Dimensions

• Unit: mm, For the detailed dimensions of the product, follow the Autonics web site.



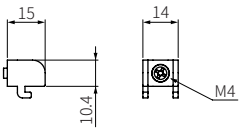
	A	B	C	D	E	F
4.6 inch	135	143.5	75.5	6.5	36	67
5.7 inch	160	168.5	128.5	6.5	36	120
7.0 inch	185	194	134	6.5	28.5	125
10.4 inch	260	273	212	7.2	34	200

• Panel cut-out



	A	B	C
4.6 inch	$135.5^{+1.1}_{0}$	$67.5^{+1.1}_{0}$	≤ 4-R3
5.7 inch	$160.5^{+1.0}_{0}$	$120.5^{+1.0}_{0}$	≤ 4-R3
7.0 inch	$186^{+1.1}_{0}$	$126^{+1.0}_{0}$	≤ 4-R3
10.4 inch	$260.5^{+1.1}_{0}$	$200.5^{+1.0}_{0}$	≤ 4-R3

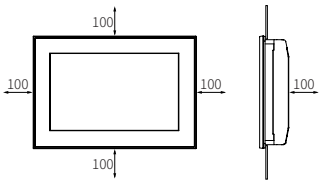
• Fixing bracket



Installation

1. Set the product in panel. (panel thickness: ≤ 4mm)
   When installing GP-A104 on panel, make 100mm of space from upper, lower, right, left side of the product on the panel and back side of panel. It is for preventing effect of electromagnetic waves and heat from other controllers. [Image 1]
2. Set fixing brackets in the fixing bracket mounting slots. [Image 2]
3. Tighten the fixing bracket with M4 Screw driver and tightening torque is 0.5 to 0.6N·m.

[Image 1]



[Image 2]

Software

Visit Autonics web site to download software.

• atDesigner
atDesigner is for editing project file.
Recommended computer specification for atDesigner is as below.

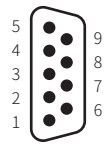
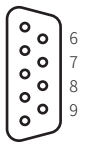
Item	Recommended spec
Operating system	Windows 7/10
CPU	Intel Core i5-2nd gen. 2500
Memory	8GB
Hard disk	8GB free space
Resolution	1920×1080

• Firmware
Please refer to 'GP-A Series user manual' for firmware upgrade.

Interface

Interface is different up to the model.
For the detailed information about each interface, refer to the GP-A Series user manual and GP/LP user manual for communication.

■ Serial port (RS232C/RS422)

RS232C			**RS422**		
Port	Pin function		Port	Pin function	
	1	N/A		1	TXD+
	2	RXD		2	RXD+
	3	TXD		3	N/A
	4	DTR		4	N/A
	5	SG		5	SG
	6	DSR		6	TXD-
	7	N/A		7	RXD-
	8	N/A		8	N/A
D-sub 9 Pin Male	9	N/A	D-sub 9 Pin Female	9	N/A

■ USB port

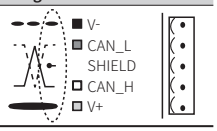
Type	**Port**	**Function**
USB Host		• Coping data between storage and GP • Firmware upgrade • Connecting external device (bar-code reader, printer, etc.) • External memory: max. 32GB (supported file system: FAT16, FAT32)
USB Device		• atDesigner project upload/download

Use a USB cable within 2 m.

■ Ethernet port

It is available to upload/download project file by connecting PC and atDesigner, and monitor PLC which supports Ethernet communication protocol.

■ CAN port

Number	**Color**	**Function**	**Configuration**
1	Black	24VDC⎓(-)	
2	Blue	CAN_L	
3	None	SHIELD	
4	White	CAN_H	
5	Red	24VDC⎓(+)	

■ Micro SD

External memory: max. 32GB (supported file system: FAT16, FAT32)

18, Bansong-ro 513Beon-gil, Haeundae-gu, Busan, Republic of Korea, 48002
www.autonics.com | +82-51-519-3232 | sales@autonics.com

Autonics

Color LCD Logic Panel

LP-A Series

PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.
The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Features

- Equipped with TFT LCD for realizing True color
- Easier system configuration and use with PLC, HMI, I/O all-in-one design
- Horizontal/Vertical installation according to environment
- Available to monitor device of the connected controllers even without user screen data
- Using user screen drawing program 'atDesigner'
  : More variety functions, objects and library image
  : Intuitive user interface
  : Multilingual table function: switching language of user screen by touching a button
- Various communication interface: RS232C, RS422, Ethernet, CAN

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

01. **Fail-safe device must be installed when using the unit with machinery that may cause serious injuryor substantial economic loss.(e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
    Failure to follow this instruction may result in personal injury, economic loss or fire.
02. **Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact or salinity may be present.**
    Failure to follow this instruction may result in explosion or fire.
03. **Use the unit within the rated specifications.**
    Failure to follow this instruction may result in fire or shortening the life cycle of the product.
04. **Do not connect, repair, or inspect the unit while connected to a power source.**
    Failure to follow this instruction may result in fire.
05. **Check 'Cautions during Power Wiring' and 'I/O Wiring' before wiring.**
    Failure to follow this instruction may result in fire.
06. **In preparation for product damage, communication error, or malfunction, install external emergency stop circuit, forward/reverse interlock circuit, limit switch, emergency stop switch, or other protection circuit.**
    Failure to follow this instruction may result in personal injury, economic loss or fire.
07. **Since Lithium battery is embedded in the product, do not disassemble or burn the unit.**
    Failure to follow this instruction may result in fire.
08. **Do not disassemble or modify the unit.**
    Failure to follow this instruction may result in fire.
09. **Please contact to us for battery replacement.**
    Using an unauthentic battery may result in fire or product damage.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. **Use a dry cloth to clean the unit, and do not use water or organic solvent.**
    Failure to follow this instruction may result in fire.
02. **When connecting the power input, use AWG 23 cable or over, and tighten the terminal screw with a tightening torque of 0.5 to 0.6 N·m.**
    Failure to follow this instruction may result in fire or malfunction due to contact failure.
03. **Keep the product away from metal chip, dust, and wire residue which flow into the unit.**
    Failure to follow this instruction may result in fire or product damage.
04. **Do not touch the front LCD screen over 2 points at the same time.**
    Failure to follow this instruction may result in malfunction.
05. **Do not put any heavy object on the front screen.**
    Failure to follow this instruction may result in malfunction due to deformation of LCD and touch panel.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- Power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Operate the product after supplying power to the product, input/output equipment, and load. If operate product before supplying power, it may result in output error or malfunction.
- Use a USB cable within 2 m.
- Keep away from high voltage lines or power lines to prevent inductive noise. Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Make a required space around the unit for radiation of heat, and do not block ventilation openings.
- Do not push the touch panel with a hard and sharp object or push the panel with excessive force. It may result in fire or malfunction.
- When skin is smeared with liquid crystal from the broken LCD, rinse with running water for over 15 minutes. If it gets into the eyes, rinse eyes with running water for over 15 minutes and contact a doctor.
- When changing the battery, contact Autonics service center to change it. Using unauthentic battery may result in fire or product damage.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000m
  - Pollution degree 2
  - Installation category II

Cautions during Power Wiring

- Do not apply power before power line connection.
- Check power polarity.
- For power supply, use the wire of which cross section is at least 0.75 mm² and use the wire of which cross section is at least 1.25 mm² for grounding.
- Use ring crimp terminal with at least 3 mm of internal diameter and less than 6mm of external diameter.
- Tighten the terminal screw with 0.5 to 0.6 N·m torque.
- Ground resistance should be less than 100 Ω and ground it separately.

Product Components

- Logic panel + built in battery
- 7.0 inch: 4 fixing brackets
- 10.4 inch: 6 fixing brackets, CAN connector
- Sold separately: communication cable

Manual

For the detailed information and instructions, please refer to the manuals, and be sure to follow cautions written in the technical descriptions.
Visit Autonics web site to download manuals.

- LP-A Series user manual
  It describes general information about installation and system of LP-A Series.
- atDesigner user manual
  It describes how to design user screen and how to use HMI function.
- atLogic user manual, atLogic programming manual
  It describes how to install and use atLogic, how to program, and commands for LP Series.
- GP/LP user manual for communication
  It describes how to connect with external devices such as PLC.

Ordering Information

This is only for reference.
For selecting the specified model, follow the Autonics webstie.

LP - A ❶ - T 9 D ❷ - C ❸ ❹

❶ Screen size
070: 7.0 inch
104: 10.4 inch

❷ Interface

Series	❷	RS232C	RS422	CAN	Micro SD	USB HOST	USB Device	Ethernet
LP-A070	6	1	1	-	-	1	1	1
	7	2	-	-	-			
LP-A104	8	1	1	1	1			
	9	2	-	1	1			

❸ I/O configuration
5: 7.0 inch - input 16-point, output 16-point
6: 10.4 inch - input 32-point, output 32-point

❹ I/O connector type
R: Ribbon cable connector
T: Terminal block connector

Specifications

	LP-A070-T9D□-C5□	LP-A104-T9D□-C6□
Screen size	7.0 inch	10.4 inch
LCD type	TFT Color LCD	
Resolution	800×480 pixel	800×600 pixel
Display area	154.4×93.44 mm	211.2×158.4 mm
Display color	16,777,216 color	
LCD view angle (top/bottom/left/right)	Within 50°/60°/65°/65° of each	Within 60°/70°/80°/70° of each
Backlight	White LED	
Luminance adjustment	Adjustable by software	
Touch	Resistive type (4-wire)	
Input	16-point	32-point
Insulation method	Photo coupler insulation	
Rated input voltage	24 VDC⎓	
Rated input current	X0 to X8: ≈ 10 mA, X9 to XF: ≈ 4 mA	X0 to X8: ≈ 10 mA, X9 to X1F: ≈ 4 mA
Voltage range	19.2-28.8 VDC⎓	
Input resistance	X0 to X8: 3.3 kΩ, X9 to XF: 5.6 kΩ	X0 to X8: 3.3 kΩ, X9 to X1F: 5.6 kΩ
Response time	0.5 ms	
Common method	16-point/1COM	16-point/1COM, 16-point/1COM
Applicable wire	Stranded wire 0.3 to 0.7 mm²	
Output	16-point	32-point
Power supply	24 VDC⎓	
Insulation method	Photo coupler insulation	
Rated load voltage	24 VDC⎓	
Load voltage range	19.2-28.8 VDC⎓	
Max. load current	0.1 A/1-point, 1.6 A/1COM	
Max. voltage falling when ON	≤ 0.2 VDC⎓	
Common method	16-point/1COM	16-point/1COM, 16-point/1COM
Applicable wire	Stranded wire 0.3 to 0.7 mm²	
Approval	CE	
Unit weight (package)	≈ 540 g (≈ 742 g)	≈ 1.10 kg (≈ 1.66 kg)

Command	Basic command: 28, application command: 236
Program capacity	8 K step
Processing speed	Average: approx. 1μs/basic command, application command
I/O control method	Batch processing
Computer control method	Repeated-doubling method, interrupt processing
Device range	Refer to 'LP-A Series user manual'
Special function	Positioning function, motion coltroller, high speed counter

Serial interface	RS232C, RS422
USB interface	USB Host, USB Device (USB2.0)
Ethernet interface	IEEE802.3(U), 10/100Base-T
CAN interface	24V CAN transceiver
External storage	Micro SD up to 32 GB (FAT16/32)
Real-time controller	RTC embedded
Battery life cycle	3 years at 25°C

Supportive interface can be different up to model. Please refer to 'Ordering Information' for the supportive interface per model and 'LP-A Series user manual' and 'GP/LP user manual for communication' for the detailed information about each interface.

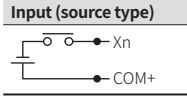
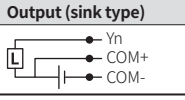
Language	Korean, English
Text	Bitmap and vector font
Memory for user screen	64 MB
Number of user screen	100 pages

Power supply	24 VDC⎓
Allowable voltage range	90 to 110% of power supply
Power consumption	7.0 inch : ≤ 7.2 W, 10.4 inch : ≤ 8.0 W
Insulated resistance	≥ 100 MΩ (500 VDC⎓ megger) (between all terminals and case)
Ground	3rd grounding (≤ 100 Ω)
Noise immunity	The square wave noise (pulse width: 1 μs) by the noise simulator ± 0.5 kV
Dielectric strength	500 VAC~ 50/60 Hz for 1 minute (between all terminals and case)
Vibration	0.75 double amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 1 hour
Vibration (malfunction)	0.5 double amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 10 minutes
Shock	147 m/s² (approx. 15 G) in each X, Y, Z direction for 3 times
Shock (malfunction)	100 m/s² (approx. 10 G) in each X, Y, Z direction for 3 times
Ambient temperature	0 to 50 °C, storage: -20 to 60 °C (a non freezing or condensation environment)
Ambient humidity	35 to 85 %RH, storage : 35 to 85 %RH (a non freezing or condensation environment)
Protection structure	IP65 (front panel, IEC standard)

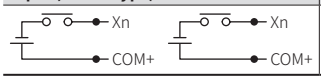
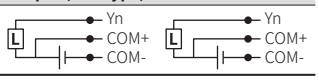
I/O Connection Diagram

For the detailed information about pin number and others, please refer to 'LP-A user manual'.

■ 7.0 inch

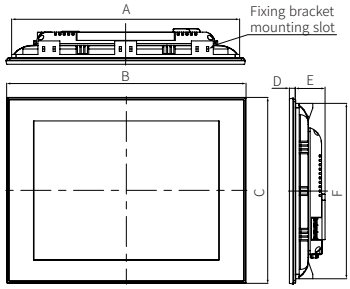
Input (source type)	Output (sink type)
	

■ 10.4 inch

Input (source type)	Output (sink type)
	

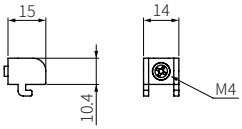
Dimensions

• Unit: mm, For the detailed drawings, follow the Autonics website.

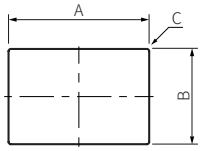


	A	B	C	D	E	F
7.0 inch	185	194	134	6.5	28.5	125
10.4 inch	260	273	212	7.2	34	200

• Fixing bracket

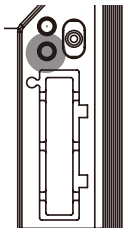


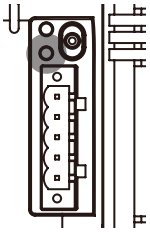
• Panel cut-out



	A	B	C
7.0 inch	186^{+1}_{0}	126^{+1}_{0}	≤ 4-R3
10.4 inch	260.5^{+1}_{0}	200.5^{+1}_{0}	≤ 4-R3

Program Status Indicator


< 7.0 inch >

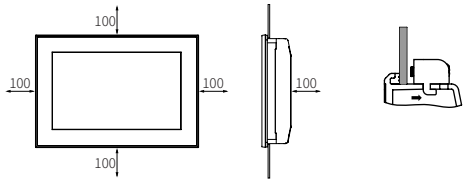

< 10.4 inch >

Indicator		Program status
Color	**Status**	
Green	ON	Run
Green	Flashing	Pause
Red	Flashing	Error
7.0 inch: orange 10.4 inch: red	ON	atLogic debugging

Installation

1. Set the product in panel. (panel thickness: ≤ 4mm)
   When installing the product on panel, make 100 mm of space from upper, lower, right, left side of the product, on panel and back side of panel. It is for preventing effect of electromagnetic waves and heat from other controllers. [Image 1]
2. Set fixing brackets in the fixing bracket mounting slots. [Image 2]
3. Tighten the fixing bracket with M4 Screw driver and tightening torque is 0.5 to 0.6N · m.

[Image 1] [Image 2]



Software

Visit Autonics web site to download software.

• atDesigner
  atDesigner is for editing project file.
• atLogic
  atLogic is for writing and debugging program.
• Recommended computer specification

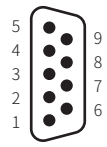
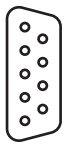
Item	Recommended spec for atDesigner	Recommended spec for atLogic
Operating system	Windows XP/Vista/7/8/10	Windows 7/8/10
CPU	Over Intel Core i5-2nd gen. 2500	Over Pentium Dual Core
Memory	Over 8 GB	Over 1 GB
Hard disk	Over 8 GB free space	Over 5 GB free space
Resolution	1920×1080	1280×1024

• Firmware
  Please refer to 'LP-A Series user manual' for firmware upgrade.

Interface

Interface is different up to the model.
For the detailed information about each interface, refer to the 'LP-A Series user manual' and 'GP/LP user manual for communication'.

■ Serial port (RS232C/RS422)

RS232C			RS422		
Port	Pin function		Port	Pin function	
	1	-		1	TXD+
	2	RXD		2	RXD+
	3	TXD		3	-
	4	DTR		4	-
	5	SG		5	SG
	6	DSR		6	TXD-
	7	-		7	RXD-
	8	-		8	-
D-sub 9 Pin Male	9	-	D-sub 9 Pin Female	9	-

■ USB port

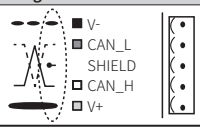
Type	Port	Function
USB Host		• Coping data between storage and LP • Firmware upgrade • Connecting external device (bar-code reader, printer, etc.) • External memory: max. 32GB (supported file system: FAT16/32)
USB Device		• atDesigner project upload/download

Use a USB cable within 2 m.

■ Ethernet port

It is available to upload/download project file by connecting PC and atDesigner, and monitor PLC which supports Ethernet communication protocol.

■ CAN port

Number	Color	Function	Configuration
1	Black	24VDC⎓(-)	
2	Blue	CAN_L	
3	None	SHIELD	
4	White	CAN_H	
5	Red	24VDC⎓(+)	

■ Micro SD

External memory: max. 32 GB (supported file system: FAT16/32)

Touch Screen

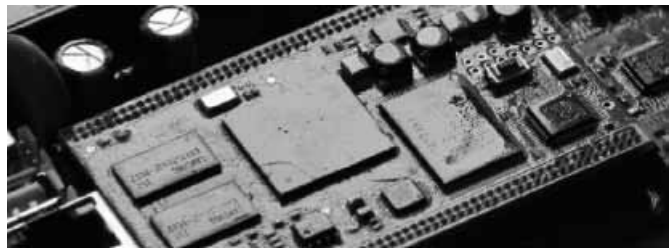
KTS Series

Wide Temperature range

- Can work efficiently under -30~70°C temperature.

Anti-corrosion Coating

- Anti-Corrosion material, applicable to harsh environment.



Full metal Frame

- Metal exterior, solid and strong anti-interference.

Multi-touch Capacitive HMI

- Nimble Touch, high light transmittance, no drift, Reinforced glass surface, anti-scratching and easily for washing.

Isolated Power

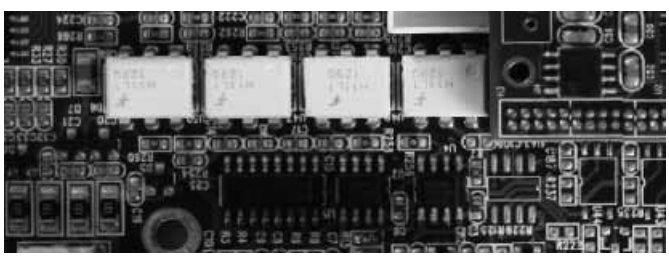
- Protect from over 4,000V group pulse and lightning sure. Can work under harsh industrial environment.

IPS Full LCD

- Full view, clear and light brightness, the screen can be seen clearly under sunshine.

Photoelectric Isolated Serial Ports

- Over voltage, to maintain stable communication state lightning to or static electricity.



Interface port

- All interface ports are placed in the bottom of the product, which enables the efficient use of space (KTS11 series).

Touch Screen

KTS Series

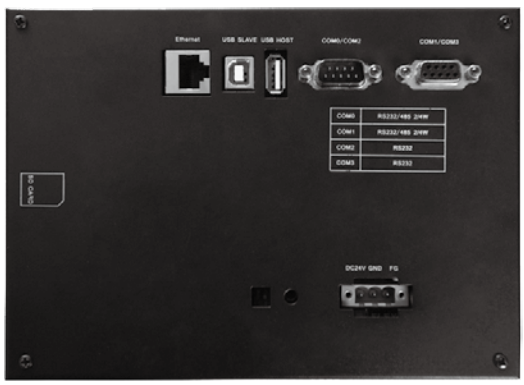
AV terminal (exclusively for KTS92070V)

- The AV terminal can be used to connect to a CCTV to use the realtime screen.

Two AV terminals for up to two screens

Diverse interfaces

- Diverse interface devices widen the compatibility of the product



1. ETHERNET PORT
   10M/100M base
2. USB SLAVE
   Program download/upload for cable
3. USB HOST
   Program download/upload for USB memory
4. COM0, COM2
   RS232/RS485/RS422
5. COM1, COM3
   RS232/RS485/RS422
6. SD card
7. 24VDC POWE

KTS 11 Series

7"
16:9

KTS113070H

- 1024×600
- 65536 colors
- 600 cd/m² Brightness
- capacitive touch screen
- 600MHz ARM Cortex A8
- 256M Flash + 256M
- aluminum, steel
- DC 24V Input

9.7"
4:3

KTS113097X

- 1024×768
- 65536 colors
- 420 cd/m² Brightness
- capacitive touch screen
- 600MHz ARM Cortex A8
- 256M Flash + 256M
- aluminum, steel
- DC 24V Input

KTS 9 Series

4.3"

KTS92043W

- 480×272
- 65536 Colors TFT
- 300 cd/m² Brightness
- capacitive touch screen
- 32 Bit 400MHz RISC ARM926EJ CPU
- 128M Flash + 64M
- aluminum, steel
- DC 24V Input

KTS 9 Series

7"

KTS92070

- 800×480
- 65536 Colors TFT
- 450 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC ARM926EJ CPU
- 128M Flash + 64M
- aluminum, steel
- DC 24V Input

7"

KTS92070E

- 800×480
- 65536 Colors TFT
- 450 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC ARM926EJ CPU
- 128M Flash + 64M
- aluminum, steel
- DC 24V Input

7"

KTS92070V

- 800×480
- 65536 Colors TFT
- 450 cd/m² Brightness
- resistive touch screen
- 32 Bit 600MHz RISC CORTEX A8 CPU
- 128M Flash + 64M
- aluminum, steel
- DC 24V Input

8"
4:3

KTS92080S

- 800×600
- 65536 Colors TFT
- 300 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC ARM926EJ CPU
- 128M Flash + 64M
- aluminum, steel
- DC 24V Input

9.7"
4:3

KTS92097X

- 1024×768
- 65536 Colors TFT
- 420 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC ARM926EJ CPU
- 128M Flash + 64M
- aluminum, steel
- DC 24V Input

10.4"
4:3

KTS92104S

- 800×600
- 65536 Colors TFT
- 300 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC ARM926EJ CPU
- 128M Flash + 64M
- aluminum, steel
- DC 24V Input

12.1"
4:3

KTS92121X

- 1024×768
- 65536 Colors TFT
- 500 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC ARM926EJ CPU
- 128M Flash + 64M
- aluminum, steel
- DC 24V Input

15"
4:3

KTS92150X

- 1024×768
- 65536 Colors TFT
- 400 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC ARM926EJ CPU
- 128M Flash + 64M
- aluminum, steel
- DC 24V Input

Touch Screen

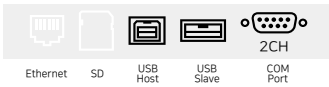
KTS Series

KTS 7 Series

4.3"

KTS72043C

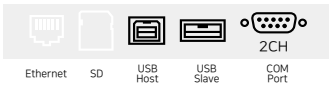
- 480×272
- 65536 Colors
- 300 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC
- 128M Flash + 64M
- ABS+PC
- DC 24V Input



7"

KTS72070C

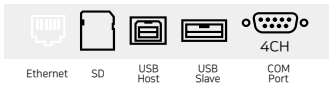
- 800×480
- 65536 Colors
- 450 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC
- 128M Flash + 64M
- ABS+PC
- DC 24V Input



7"

KTS72070i

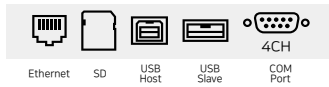
- 800×480
- 65536 Colors
- 450 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC
- 128M Flash + 64M
- ABS+PC
- DC 24V Input



7"

KTS72070iE

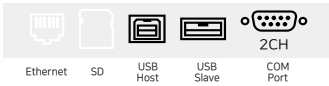
- 800×480
- 65536 Colors
- 450 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC
- 128M Flash + 64M
- ABS+PC
- DC 24V Input



9.7"

KTS72097C

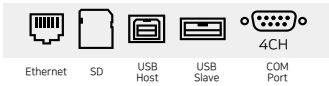
- 1024x768
- 65536 Colors
- 350 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC
- 128M Flash + 64M
- ABS+PC
- DC 24V Input



9.7"

KTS72097iE

- 1024x768
- 65536 Colors
- 350 cd/m² Brightness
- resistive touch screen
- 32 Bit 400MHz RISC
- 128M Flash + 64M
- ABS+PC
- DC 24V Input

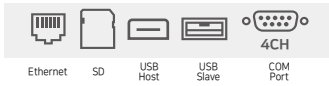


K series (economy type)

7"

K007

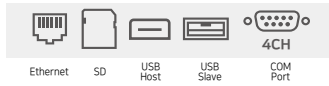
- 1024*600
- 24 bit color
- Capacitive touch screen
- 600MHz ARM Cortex-A8
- 128MB Flash + 128MB DDR3
- ABS+PC
- DC 24V Input



9.7"

K010

- 1024*678
- 24 bit color
- Capacitive touch screen
- 600MHz ARM Cortex-A8
- 128MB Flash + 128MB DDR3
- ABS+PC
- DC 24V Input



KTS Guide to Selection

Series	KTS 11		KTS 9									KTS 7						K	
Size	7"	9.7"	4.3"	7"			8"	9.7"	10.4"	12.1"	15"	4.3"	7"			9.7"		7"	9.7"
Model	3070H	3097X	2043W	2070	2070E	2070V	2080S	2097X	2104S	2121X	2150X	2043C	2070C	2070i	2070iE	2097C	2097iE	K007	K010
USB	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
SD card	●	●		●	●	●		●		●	●		●		●		●	●	●
Ethernet	●	●			●	●	●	●	●	●	●				●		●	●	●
Video						●													

KTS11 Series

- Capacitive
- Aluminum, Steel enclosure
- IPS Full LCD
- Capacitance sensitive

KTS9 Series

- **Video Support**
- **Aluminum, Steel enclosure**

KTS7 Series

- **Economic**
- **PC+ABS Enclosure**

K Series

- **Capacitive**
- **Economic type**
- **Easy installation without separate bracket**

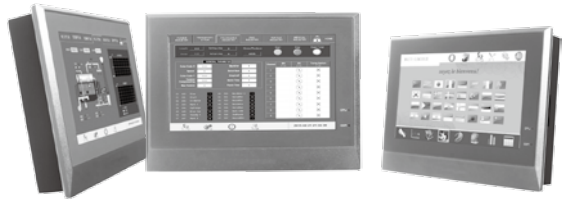
Touch Screen

KTS11 Series

Model	KTS113070H	KTS113097X
Display Type	7" 16:9 TFT LCD. Full view	9.7" TFT LCD. Full view
Resolution (W x H)	1024 × 800	1024 × 768
Colors	65536	
Brightness	600 cd/㎡	420 cd/㎡
Backlight	LED	
Backlight Life Cycle	50000 Hours	
Touch Panel	Glass + Glass projective multi-touch capacitive HMI	
CPU	600MHz ARM Cortex 8	
Memory	256M Flash + 256M DDR2 DRAM	
RTC	Built in	
Ethernet	10M/100M Base	
SD Card	Included	
USB Port	USB Host 2.0" X 1EA , USB Device 1.0" X 1EA	
Program Download	USB Host / USB Device	
COM Port	COM0/COM1 : RS232C/RS485/RS422, COM2 : RS232, COM3 : RS232	
Power Consumption	Max. 10W	
Input Voltage	24VDC, Input Range : 9~30VDC	24VDC, Input Range : 18~30VDC
Power Protection	Protected from thunder strike and surging	Isolated power supply, Protected from thunder strike and surging
Power Down Allowed	Max. 5mS	
Certification	EN61000-6-2:2005, EN61000-6-4:2007, ROHS / Surge Immunity : ±4KV, EFT : ±4KV, ESD : 4KV, Air : 8KV	
Operation Temperature	-20 ~ 70°C	
Storage Temperature	-30 ~ 85°C	
Operation Humidity	10~90% RH (with no icing)	
Vibration Endurance	10 ~ 25 Hz (X/Y/Z 2G/30 Minute)	
Cooling	Natural air cooling	
Degree of Protection	Front : IP65, Rear : IP20	
Material of Body	Front Cover : Aluminum, and the surface with hard oxide treatment Rear Cover : Steel and the surface with baking finish treatment	
Panel cut-out	185 X 123mm	230 × 180mm
Dimension	204 × 145 × 38mm	247 × 197 × 31mm
Weight	Approx. 1000g	Approx. 1100g

Touch Screen

KTS9 Series



Model	KTS92043W	KTS92070	KTS92070E	KTS92070V
Display Type	4.3'' TFT LCD	7'' TFT LCD		
Resolution (W x H)	480 × 272	800 × 480		
Colors	65536			
Brightness	300 cd/㎡	450 cd/㎡		
Backlight	LED			
Backlight Life Cycle	50000 Hours			
Touch Panel	4 wires resistive Touch Screen			
CPU	32 Bit 400Mhz RISC	32 Bit 400Mhz RISC ARM926EJ		32 Bit 600Mhz RISC CORTEX A8
Memory	128M Flash + 64M DDR2 DRAM			256M Flash + 256M DDR2 DRAM
RTC	Built in			
Ethernet	NA	NA	10M/100M Base	
SD Card	NA	Built in	Built in	
USB Port	USB Host 2.0'' X 1EA , USB Device 1.0'' X 1EA			
Program Download	USB Host / USB Device			
COM Port	COM0 : RS232C/RS485/RS422, COM1 : RS485	COM0/COM1 : RS232C/RS485/RS422, COM2 : RS232, COM3 : RS232		
Power Consumption	Max. 5W	Max. 8W		
Input Voltage	24VDC Input Range : 9~32VDC	24VDC Input Range : 18~32VDC		
Power Protection	Protected from thunder strike and surging	Isolated power supply, Protected from thunder strike and surging		
Power Down Allowed	Max. 5mS			
Certification	EN61000-6-2:2005, EN61000-6-4:2007, ROHS / Surge Immunity : ±4KV, EFT : ±4KV, ESD : 4KV, Air : 8KV			
Operation Temperature	-20~ 70°C			
Storage Temperature	-30~ 80°C			
Operation Humidity	10~90% RH (with no icing)			
Vibration Endurance	10 ~ 25 Hz (X/Y/Z 2G/30 Minute)			
Cooling	Natural air cooling			
Degree of Protection	Front : IP65, Rear : IP20			
Material of Body	Front Cover : Aluminum, and the surface with hard oxide treatment, Rear Cover : Steel and the surface with baking finish treatment			
Panel cut-out	120 × 93mm	192 × 138mm		
Dimension	128 × 102 × 32mm	200 × 146 × 40mm		
Weight	Approx. 500g	Approx. 800g		

Touch Screen

KTS9 Series

Model	KTS92080S	KTS92097X	KTS92104S	KTS92121X	KTS92150X
Display Type	8" 4:3 TFT LCD	9.7" 4:3 IPS LCD	10.4" 4:3 TFT LCD	12.1" 4:3 TFT LCD	15" 4.3 TFT LCD
Resolution (W x H)	800 × 600	1024 ×768	800 × 600	1024 × 768	1024 × 768
Colors	65536				
Brightness	300 cd/㎡	420 cd/㎡	300 cd/㎡	500 cd/㎡	400 cd/㎡
Backlight	LED				
Backlight Life Cycle	50000 Hours				
Touch Panel	4 wires resistive Touch Screen				
CPU	32 Bit 400Mhz RISC ARM926EJ / 32 BIT 600MHz RISC CORTEX A8				
Memory	128M Flash + 64M DDR2 DRAM / 256M Flash + 256M DDR2 DRAM				
RTC	Built in				
Ethernet	10M/100M Base	10M/100M Base	10M/100M Base	10M/100M Base	10M/100M Base
SD Card	Built in	Built in	NA	NA	NA
USB Port	USB Host 2.0" X 1EA , USB Device 1.0" X 1EA				
Program Download	USB Host / USB Device				
COM Port	COM0/COM1 : RS232C/RS485/RS422, COM2 : RS232, COM3 : RS232				
Power Consumption	Max. 10W	Max. 10W	Max .15W		
Input Voltage	24VDC Input Range : 18~32VDC				
Power Protection	Isolated power supply, Protected from thunder strike and surging				
Power Down Allowed	Max. 5mS				
Certification	EN61000-6-2:2005, EN61000-6-4:2007, ROHS / Surge Immunity : ±4KV, EFT : ±4KV, ESD : 4KV, Air : 8KV				
Operation Temperature	-10~ 60℃				
Storage Temperature	-20~ 70℃				
Operation Humidity	10~90% RH (with no icing)				
Vibration Endurance	10 ~ 25 Hz (X/Y/Z 2G/30 Minute)				
Cooling	Natural air cooling				
Degree of Protection	Front : IP65, Rear : IP20				
Material of Body	Front Cover : Aluminum, and the surface with hard oxide treatment, Rear Cover : Steel and the surface with baking finish treatment				
Panel cut-out	224 × 162mm	232 × 182mm	260 × 202mm	291 × 219mm	360 × 272mm
Dimension	235 × 171.6 × 38.2mm	245 × 190 × 31mm	275 × 215 × 39.6mm	310 × 240 × 48.5mm	394 × 297 × 48.3mm
Weight	Approx. 1000g	Approx. 1100g	Approx. 1500g	Approx. 2200g	Approx. 2500g

Touch Screen

KTS7 Series

Model	KTS72043C	KTS72070C	KTS72070i	KTS72070iE	KTS72097C	KTS72097iE
Display Type	4.3'' TFT LCD	7'' TFT LCD			9.7 TFT LCD	
Resolution (W x H)	480 × 272	800 × 480			1024 ×768	
Colors	65536					
Brightness	300 cd/㎡	450 cd/㎡			350 cd/㎡	
Backlight	LED					
Backlight Life Cycle	50000 Hours					
Touch Panel	4 wires resistive Touch Screen					
CPU	32 Bit 400Mhz RISC					
Memory	128M Flash + 64M DDR2 DRAM					
RTC	Built in					
Ethernet	NA	NA	NA	10M/100M Base	NA	10M/100M Base
SD Card	NA	NA	Built in	Built in	NA	Built in
USB Port	USB Host 2.0 X 1 , USB Device 1.0 X 1					
Program Download	USB Host / USB Device			USB Host / USB Device Ethernet	USB Host / USB Device	USB Host / USB Device Ethernet
COM Port	COM0 : RS232/RS485/RS422 COM1 : RS485		COM0/COM1 : RS232C/RS485/RS422 COM2 : RS232 COM3 : RS232		COM0 : RS232/RS485/RS422 COM1 : RS485	COM0/COM1 : RS232C/RS485/ RS422 COM2 : RS232 COM3 : RS232
Power Consumption	Max. 5W	Max. 8W			Max. 10W	
Input Voltage	24VDC Input Range : 9~30VDC		24VDC Input Range : 18~30VDC		24VDC Input Range : 9~30VDC	
Power Protection	Isolated power supply, Protected from thunder strike and surging		Isolated power supply, Protected from thunder strike and surging		Isolated power supply, Protected from thunder strike and surging	
Power Down Allowed	Max. 5mS					
Certification	EN61000-6-2:2005, EN61000-6-4:2007, ROHS Surge Immunity : ±4KV, EFT : ±4KV, ESD : 4KV, Air : 8KV					
Operation Temperature	0~ 50°C					
Storage Temperature	-20~ 60°C					
Operation Humidity	10~90% RH (with no icing)					
Vibration Endurance	10 ~ 25 Hz (X/Y/Z 2G/30 Minute)					
Cooling	Natural air cooling					
Degree of Protection	Front : IP65, Rear : IP20					
Material of Body	ABS + PC					
Panel cut-out	120 × 93mm	192 × 138mm			259 × 201mm	
Dimension	128 × 102 × 32mm	204 × 145 × 44.5mm			276 × 213 × 39mm	
Weight	Approx. 500g	Approx. 650g			Approx. 1000g	

Touch Screen

K Series

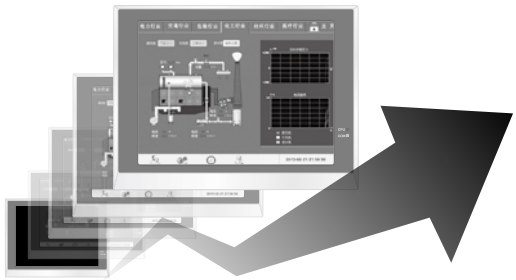
Model	K007	K010
Display Type	7″16:9 TFT LCD	9.7″4:3 TFT LCD
Resolution (W x H)	1024 × 600	1024 × 768
Colors	24 bit color	
Brightness	450 cd/㎡	350 cd/㎡
Backlight	LED	
Backlight Life Cycle	50000 Hours	
Touch Panel	Glass + Glass projective multi-touch capacitive HMI	
CPU	600MHz ARM Cortex-A8	
Memory	128MB Flash + 128MB DDR3	
RTC	Built in	
Ethernet	10M/100M Ethernet	
SD Card	Built in	
USB Port	USB Host 2.0 x 1 , USB Device 2.0 x 1	
Program Download	USB Host / USB Device / SD Card / Ethernet	
COM Port	COM1 : RS232/RS485/RS422 COM2/COM4 : RS485 COM3 : RS232	
Power Consumption	Max. 5W	Max. 7W
Input Voltage	24VDC Input Range : 9~28VDC	
Power Protection	Isolated power supply, Protected from thunder strike and surging	
Power Down Allowed	Max. 2mS	
Certification	EN61000-6-2:2005, EN61000-6-4:2007, ROHS Surge Immunity : ±1KV, EFT : ±2KV, ESD : 4KV, Air : 8KV	
Operation Temperature	-20~60℃	0~50C
Storage Temperature	-20~70℃	-20~60℃
Operation Humidity	10~90% RH (with no icing)	
Vibration Endurance	10 ~ 25 Hz (X/Y/Z 2G/30 Minute)	
Cooling	Natural air cooling	
Degree of Protection	Front : IP65, Rear : IP20	
Material of Body	ABS + PC	
Panel cut-out	178 × 125mm	232 × 180mm
Dimension	185.1 x 131.1 x 30mm	247 × 197 × 31.5mm
Weight	Approx. 650g	Approx. 1000g

Touch Screen

KTS Series

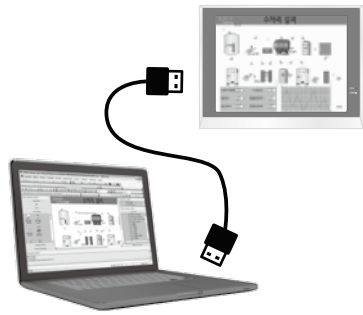
Faster booting speed

- 600MHz ARM Cortex 8 processor ensures faster booting speed.



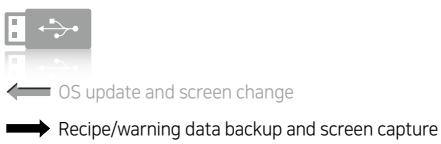
Drawing data transfer

- Fast and easy data transfer via the USB cable port.



Use of USB flash drives

- Simple drawing data upload/download and operating system update do not require a PC
  ① Drawing file ② OS file ③ Font file ④ Recipe/logging data

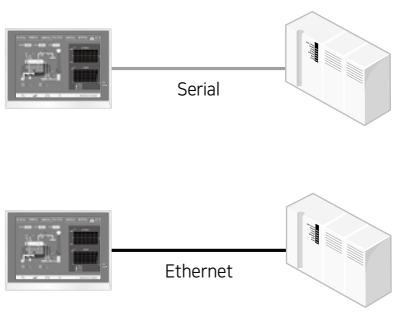


Example of System Configuration

- Diverse interface functions can be used to extend the range of applicable devices.

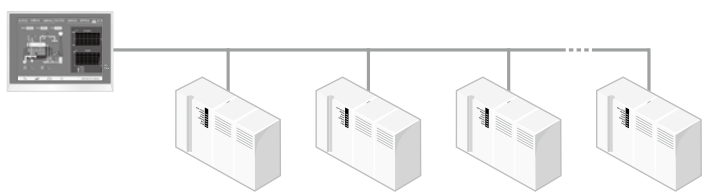
1:1 Serial / Ethernet Communication

single KTS and single PLC.



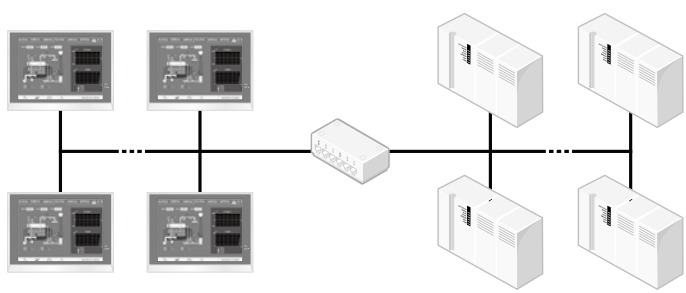
1:N Serial Communication

single KTS and multiple PLC.



N:M Ethernet Communication

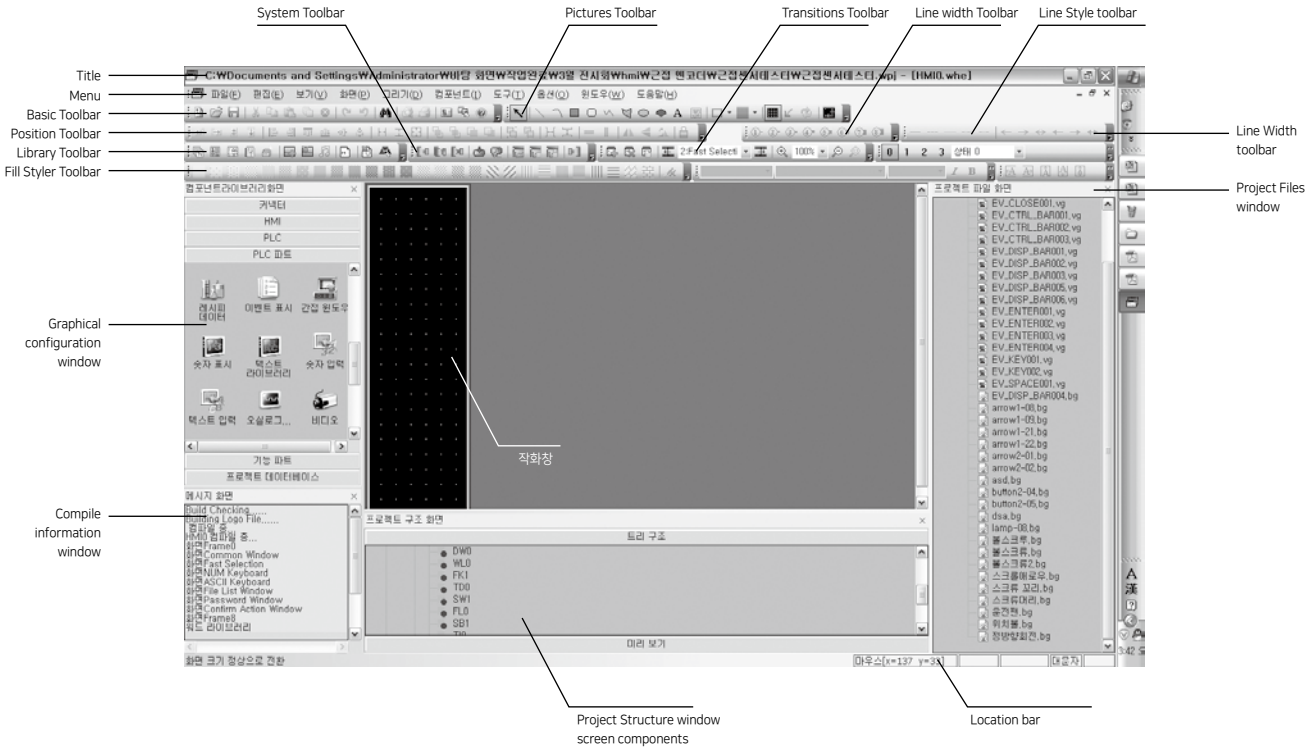
multiple KTS and multiple PLC.



Touch Screen

KTS Series

User Interface



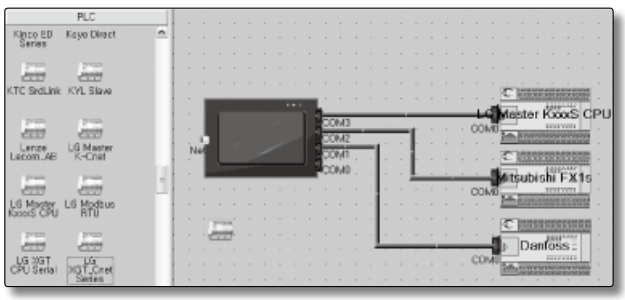
This free drawing program to quickly and easily express

Bitmap

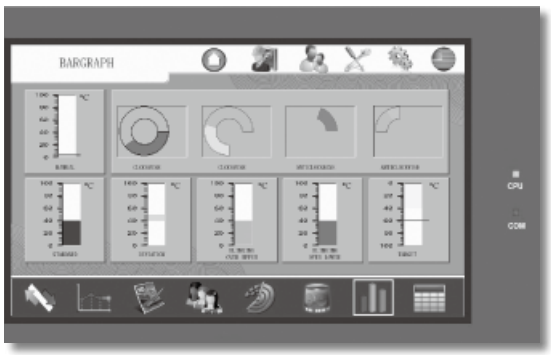
Diverse and clean 3D graphics

Simple drawing

- HMI and PLC settings, and all the graphical, just drag device, add, delete, and can be easily executed.



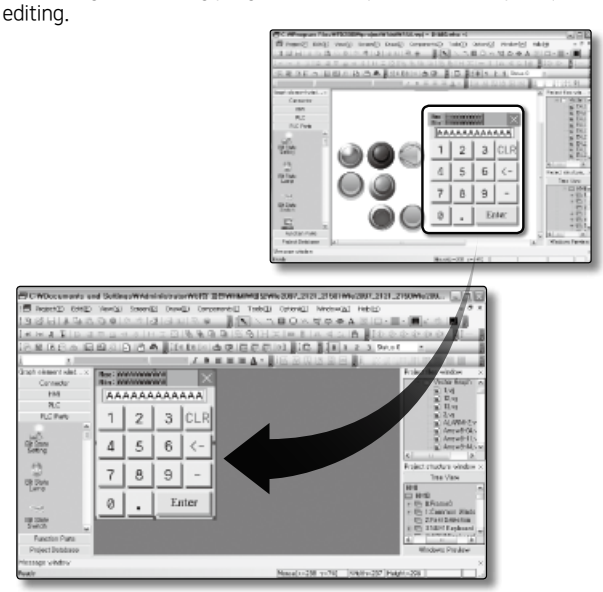
- Online and off-line simulation has fix errors capabilities in advance, running on a computer screen and that can run program on computer.



- Various switches and meta-groups moved by dragging the drawing screen and set the parameters and characteristics.

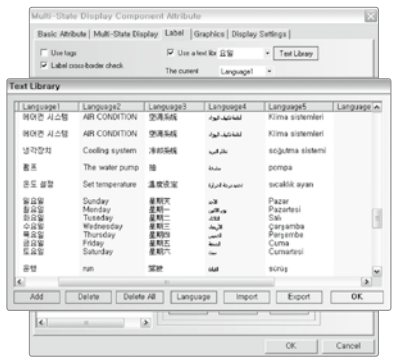
Majority of the program window

- Able to open the window at the same time a large number of programs. so Utilizing the existing programs, it can proceed more quickly and easier editing.



Convert multiple languages

- multiple languages using the language table can be expressed freely.



Touch Screen

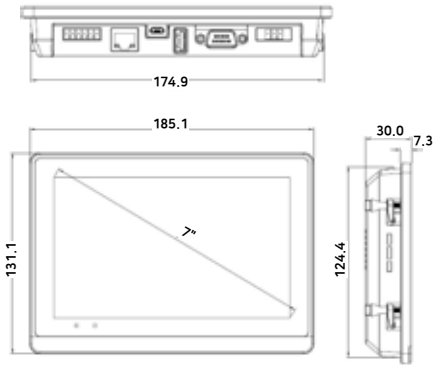
KTS Series

Dimension

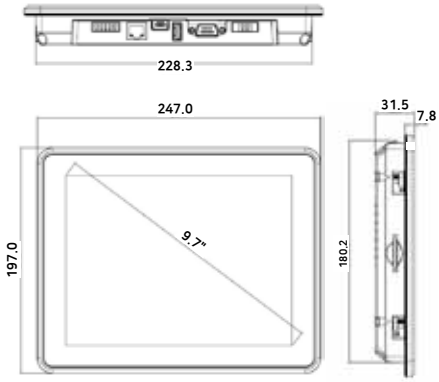
unit : mm

K Series

K007

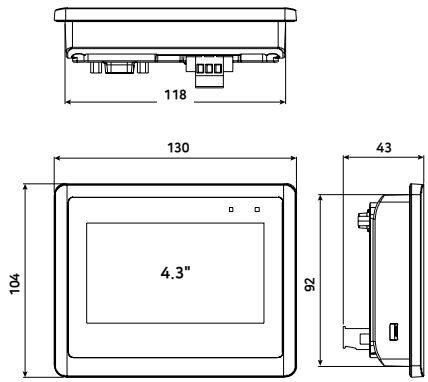


K010

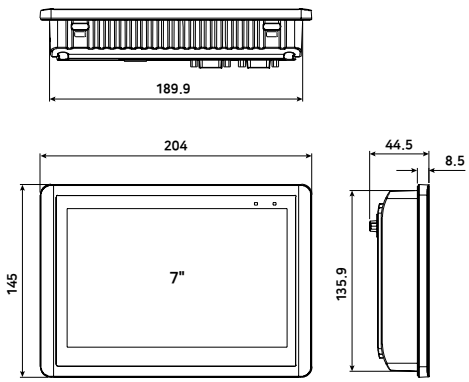


KTS 7 Series

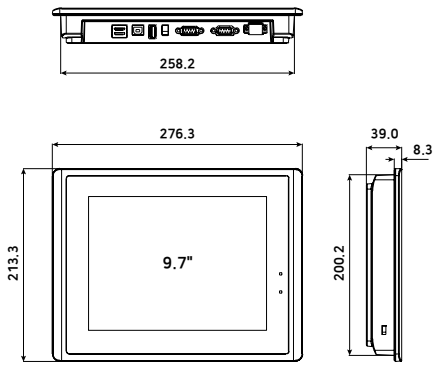
KTS72043C



KTS72070C, KTS72070i, KTS72070iE



KTS72097C,KTS72097iE

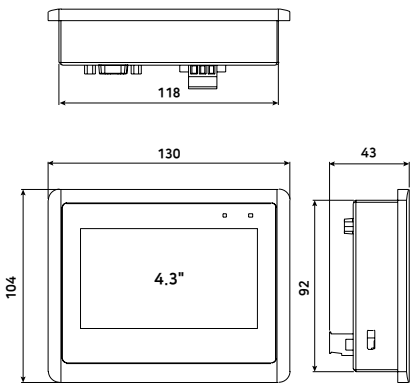


Dimension

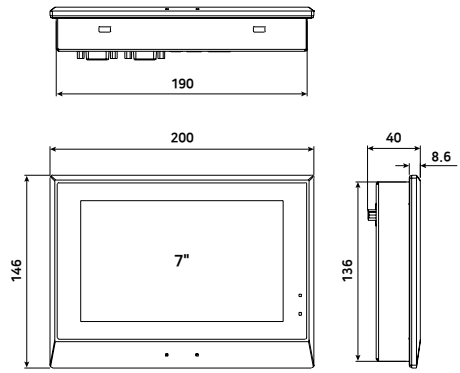
unit : mm

KTS 9 Series

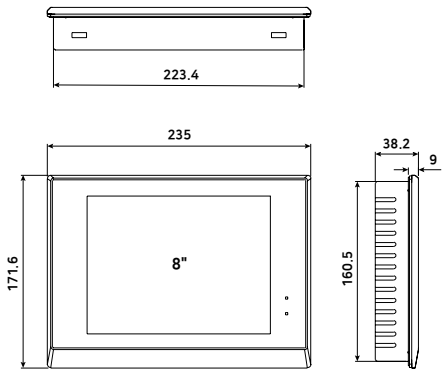
KTS9043W



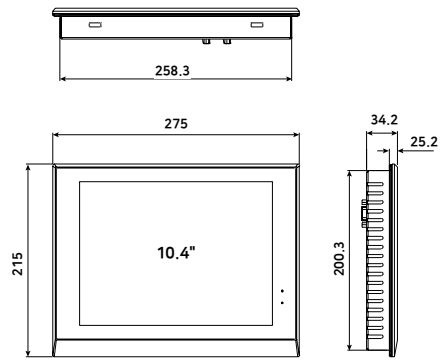
KTS9070 / KTS9070E / KTS9070V



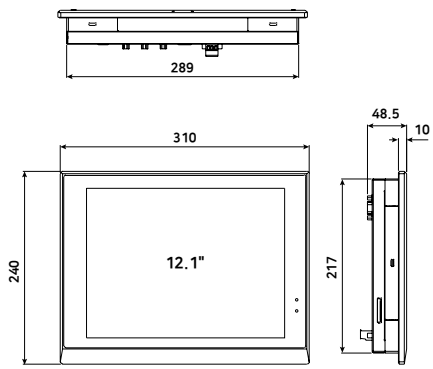
KTS9080S



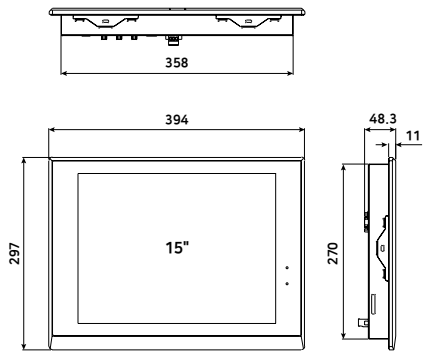
KTS9104S



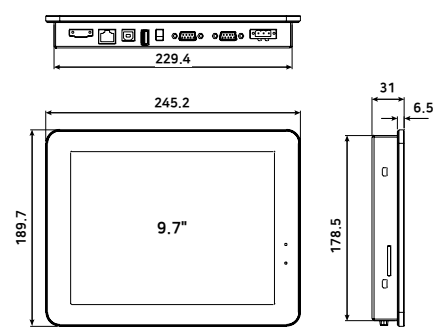
KTS9121X



KTS9150X



KTS92097X



Touch Screen

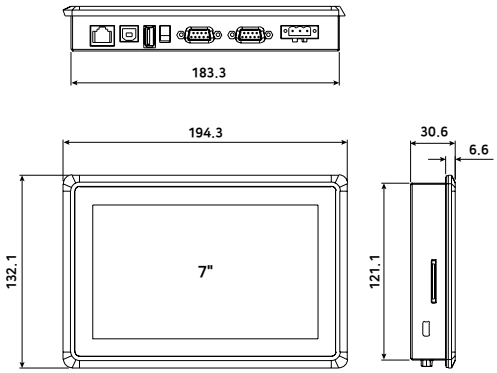
KTS Series

Dimension

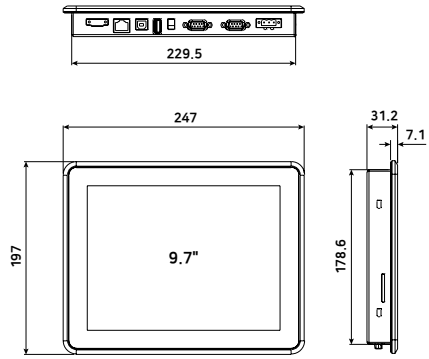
unit : mm

KTS 11 Series

KTS113070H



KTS113097X



Connection Device

Allen-Bradley	ABB	BOSCH	DELTA		KEYENCE
CompactLogic/ ControlLogix DF1 EtherNet/IP Slave	AC31 Modbus RTU AC500	Rexroth Rexroth Ethernet Rexroth KVFC+	DVP DTA/DTB/DTC	Fanuc Series SNP SNP-X	KV-1000 KV-16DT KV-3000 KV-3000 EnhancedVer KV-5000 EtherNet Slave
LS	Matsushita	OMRON	Schneider Electric	SIEMENS	EMERSON
Master K-Cnet Master KxxxS CPU Modbus RTU XGT CPU Serial XGT Cnet Series	FP	C Series Host Link CJ Series Ethernet Slave CJ/CS Series Host link CP Series Host Link CPM1AH_CPM2AH E5EZ-R3	Modicon Uni-Telway Twido Modbus RTU	S7-1200 Ethernet (TPC Slave) S7- 200 S7- 200 Network Slve S7- 300 Network Slve S7- 300/400 (PC Adapter)	EC10 EC20
Koyo	OEMAX CONTROLS	Modbus	Parker	MITSUBISHI ELECTRIC	
Direct	NX7	ASCII LS Inverter RTU RTU Extend RTU MT500 compatible RTU Slave TPC Slave UDP Slave	ACR9000 Serial Compax3 SLVD Series	FX0N/1N/2N FX1s FX2N-10GM/20GM FX3u FX-485ADP/422BD (Multi-station)	Melsec Q Q Series (CPU Port) Q_QnA (Link Port) Q00J (CPU Port) Q06H QJ71E71 Ethernet slave
YASKAWA	Facon	Fuji Electric	HITACHI	Kinco	Panasonic
AH Modbus RTU MP 2300 SGDM UDP Slave	FB	SPB	SJ300	ED Series	AFPX-COM5 Ethernet Slave
RKC	Saia	SHIMADEN	YOKOGAWA		
CH402	Sbus	FP23	FA-M3 FA-M3 Ethernet Slave		
Free Protocol	Lenze	PHARMA	Vigor	CAN	CANOpen

DIN W96×H48mm 12-segment, LCD Display Multi Panel Meter

▣ Features

- Improved visibility with LCD display
- Isolated input and power modules allows powering of multiple units using a single power supply
- Mounting space saving with compact design
  : downsized back length by 78%, compared to another model in same DIN size (length of panel back: 20mm)
- Various input options (by model)
  - Input options: DC voltage, DC current, AC voltage, AC current
- Max. measuring inputs: 500VDC, 500VAC, DC5A, AC5A
- Display range: -9999 to 9999
- High/Low scale function
- AC frequency measurement (measuring range: 0.100 to 1200Hz)
- Preset output: OUT1, OUT2 (NPN/PNP open collector output)
- Power factor display and output
  : displays input of 1-5V, 4-20mA, etc as -0.50 to 1.00 to 0.50
- Various functions
  : monitoring function for max. and min. display value, display cycle delay function, zero-point adjustment function, high display correction function, etc
- Power supply: 24-240VAC 50/60Hz, 24-240VDC universal

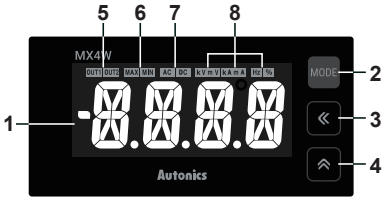
⚠ Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

MX 4 W – V – F N

Output	**N**	Indicator
	1	NPN open collector output
	2	PNP open collector output
Power supply	**F**	24-240VAC 50/60Hz, 24-240VDC
Measurement Input	**V**	DC/AC voltage
	A	DC/AC current
Size	**W**	DIN W96×H48mm
Digit	**4**	9999 (4-digit)
Item	**MX**	Multi Meter

▣ Unit Description



1. Measurement value display part
2. MODE key
: Press the key to enter parameter groups, return RUN mode, move parameters, or save the setting values.
3. « key
: Press the key to move digits, enter parameters, or move parameter setting values.
4. » key
: Press the key to change digit value, enter or change parameters, or change the parameter setting value.
5. Control output (OUT1/OUT2) indicator (red, indicator model: white)
6. MAX/MIN indicator (green, indicator model: white)
: When input is over/below the range, HHHH or LLLL appears.
7. AC/DC indicator (green, indicator model: white)
8. Unit (V/mV/A/mA/Hz/%) indicator (yellow, indicator model: white)

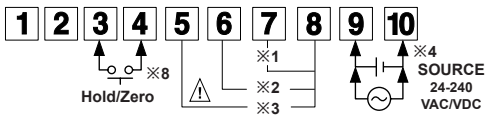
■ Specifications

Model		MX4W-V-F□	MX4W-A-F□
Measurement input		DC/AC voltage	DC/AC current
Max. allowable input		• DC input: approx. -110 to 110% of each measurement input range (when not using minus input: -10 to 110%) • AC input: approx. 110% of each measurement input range	
Power supply		24-240VAC~ 50/60Hz, 24-240VDC⎓	
Allowable voltage range		90 to 110% of the rated voltage	
Power supply		Max. 5VA (24-240VAC~ 50/60Hz), max. 3W (24-240VDC⎓)	
Display method※1		12-segment (measurement value display part: white, character height: 19mm), other display parts (red, green, yellow, indicator model: white) LCD method	
Display accuracy		23℃±5℃ - DC input: ±0.1% F.S. ±2-digit, AC input: ±0.3% F.S. ±3-digit ※The terminal for 5A of current input, ±0.3% F.S. ±3-digit 0℃ to 50℃ - DC/AC input: ±0.5% F.S. ±3-digit ※The terminal for 5A of current input, ±1% F.S. ±3-digit	
Display cycle		0.2 to 5.0 sec (select per 0.1 sec)	
A/D conversion method		Sigma-Delta (∑-△) analog-to-digital converter	
Sampling cycle		DC input: 50ms (resolution 1/20,000), AC input: 16.6ms (resolution 1/20,000)	
Max. display range		-9999 to 9999 (4-digit)	
Preset output※2		NPN/PNP open collector output • Load voltage: max. 30VDC⎓ • Load current: max. 100mA • Residual voltage: max. 1VDC⎓ (NPN), max. 2VDC (PNP)	
AC measurement※3		Select RMS value/AVG value measurement methods	
Frequency measurement※3		Measurement range: 0.100 to 1200Hz (varies depending on the decimal point)	
Insulation resistance		Over 100MΩ (at 500VDC megger)	
Dielectric strength		3,000VAC 50/60Hz for 1 min (between all terminals and case)	
Noise immunity		±2kV the square wave noise (pulse width: 1μs) by the noise simulator	
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min	
Shock	Mechanical	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times	
	Malfunction	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times	
Environment	Ambient temp.	-10 to 50℃, storage: -20 to 60℃	
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH	
Insulation type		Double insulation or reinforced insulation (mark: ⧈, dielectric strength between the measurement input part and the power part: 1kV)	
Approval		CE, cULus	
Weight※4		Approx. 100g (approx. 77g)	

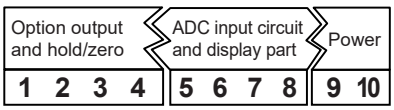
※1: When using the unit at low temperature (below 0℃), display cycle is slow due to characteristics of LCD. Control output operates normally.
※2: Indicator model (MX4W-□-FN) does not have the function.
※3: AC, frequency measurement are available when input type is AC.
※4: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

■ Connections and Insulated Block Diagram

• MX4W-V-F□

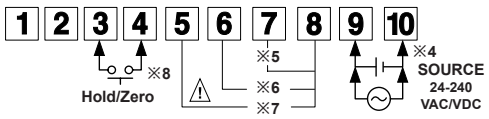


※1: DC±500mV/±200mV/±50mV, AC0-500mV/0-200mV/0-50mV
※2: DC±20V/±5V/1-5V/±2V, AC0-20V/0-5V/0-2V
※3: DC±500V/±200V/±50V, AC0-500V/0-200V/0-110V/0-50V
※4: For using DC power, connect wires regardless of polarity.



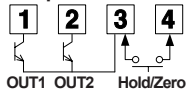
※Input and output are insulated from the power.

• MX4W-A-F□

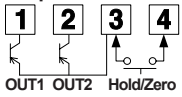


※5: DC±20mA/4-20mA/±5mA/±2mA, AC0-20mA/0-5mA/0-2mA
※6: DC±500mA/±200mA/±50mA, AC0-500mA/0-200mA/0-50mA
※7: DC±5A/±2A, AC0-5A/0-2A
※8: Indicator model does not have the hold/zero terminal.

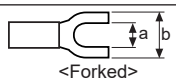
• NPN open collector output



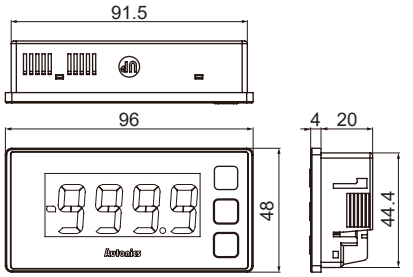
• PNP open collector output



※Use terminals of size specified below.

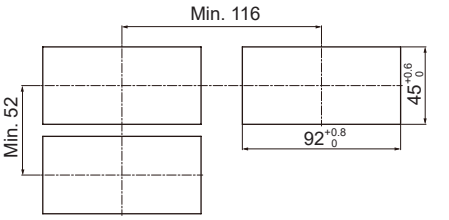
	a	b
 <Forked>	Min. 3.0mm	Max. 6.0mm

▣ Dimensions

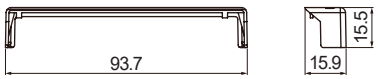


● **Panel cut-out**

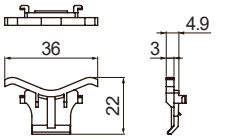
(unit: mm)



● **Terminal cover**



● **Bracket**



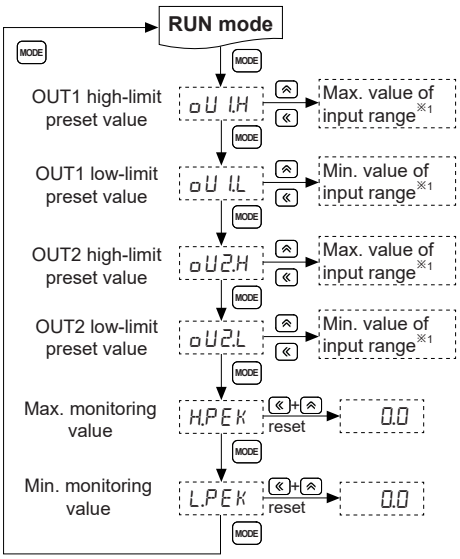
▣ Parameter Group

◎ Parameter (0 to 2 group) setting

1. Each parameter and corresponding setting value will flash alternately every 0.5 sec.
2. Press the [MODE] key to save the setting value and move to the next parameter.
3. If there is no key input for 60 sec, the unit will return to RUN mode.
4. Hold the [MODE] key for 3 sec to return to RUN mode.
5. Press the [«], [»] keys to change the set value. ([«]: moves digits, [»]: changes setting value)

※ [ ]: Dotted parameters may not appear by model type or other parameter settings.
※1: Refer to '▣ Measurement Input.'

◎ Parameter 0 group



Does not appear when OUT1 preset output operation mode [oU1t] of parameter 2 group is set as oFF/LoW.
Setting range: -9999 to 9999

Does not appear when OUT1 preset output operation mode [oU1t] of parameter 2 group is set as oFF/HIGH.
Setting range: -9999 to 9999

Does not appear when OUT2 preset output operation mode [oU2t] of parameter 2 group is set as oFF/LoW.
Setting range: -9999 to 9999

Does not appear when OUT2 preset output operation mode [oU2t] of parameter 2 group is set as oFF/HIGH.
Setting range: -9999 to 9999

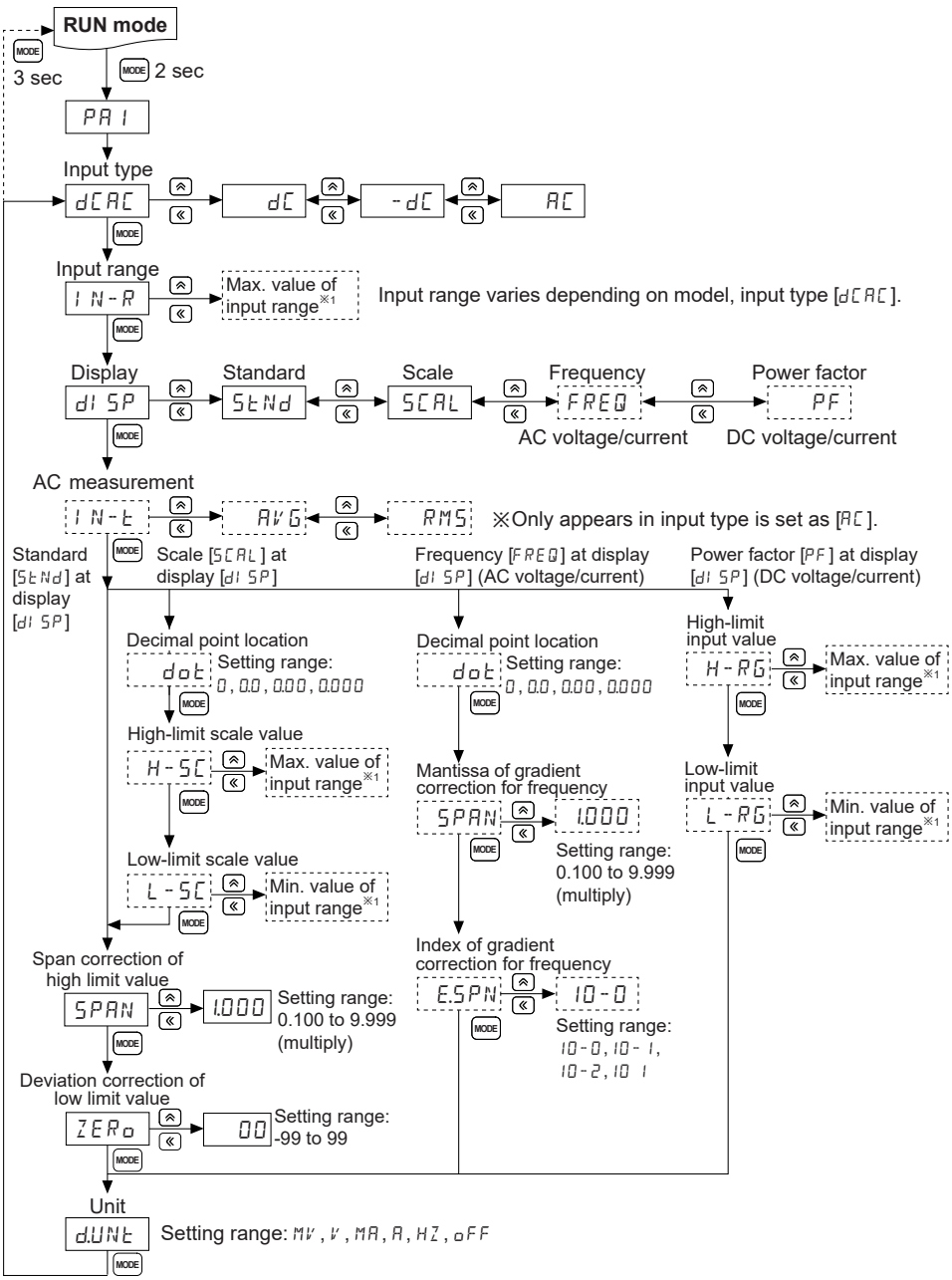
Do not appear when monitoring delay time [PEAK] of parameter 2 group is set as 00 sec [00 S]. Hold the [«]+[»] for over 1 sec, to reset the parameter.

◎ Factory defaults

Parameter	MX4W-V (DC)	MX4W-V (±DC)	MX4W-V (AC)	MX4W-A (DC)	MX4W-A (±DC)	MX4W-A (AC)
oU1H※1	500.0	500.0	500.0	5.000	5.000	5.000
oU1L※1	000.0	-500.0	000.0	0.000	-5.000	0.000
oU2H※1	500.0	500.0	500.0	5.000	5.000	5.000
oU2L※1	000.0	-500.0	000.0	0.000	-5.000	0.000
H.PEK	0.0	0.0	0.0	0.0	0.0	0.0
L.PEK	0.0	0.0	0.0	0.0	0.0	0.0

※1: Does not appear in indicator models.

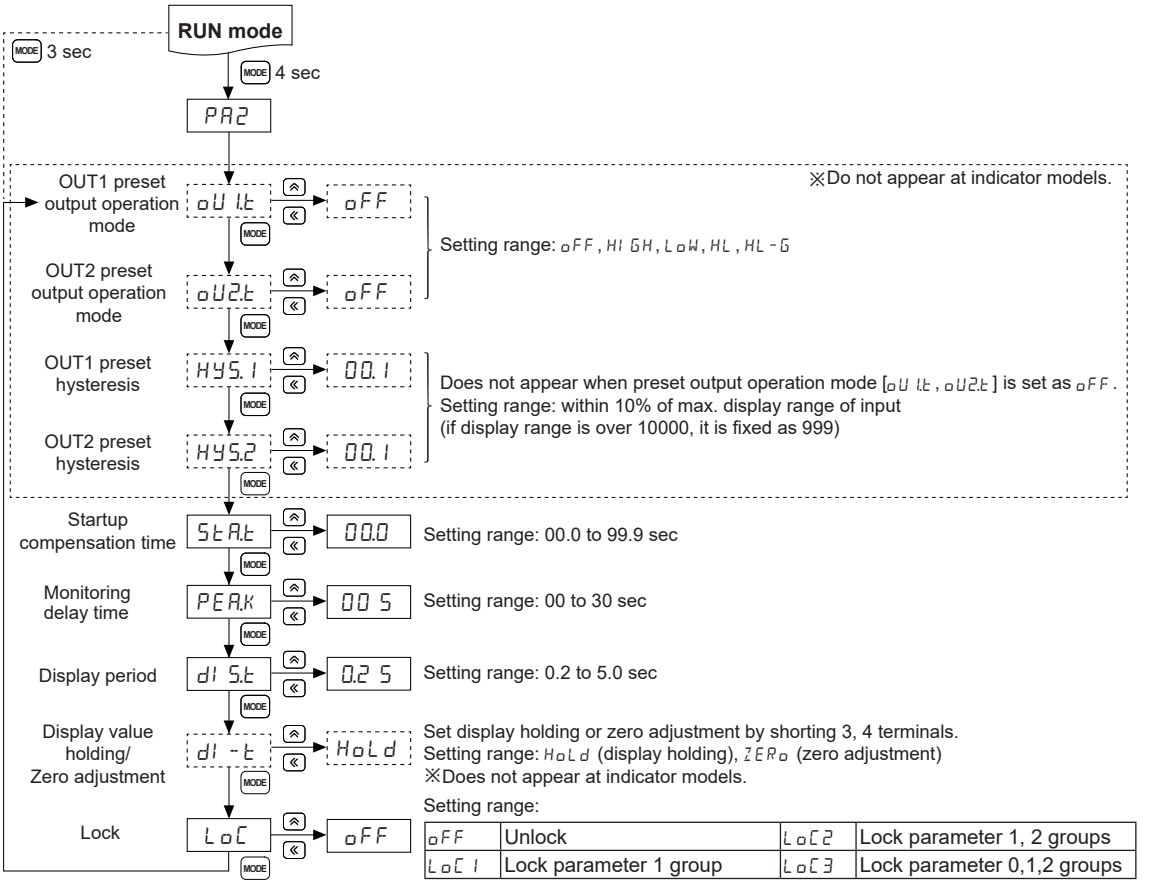
◎ Parameter 1 group



◎ Factory defaults

Parameter	MX4W-V (DC)	MX4W-V (±DC)	MX4W-V (AC)	MX4W-A (DC)	MX4W-A (±DC)	MX4W-A (AC)
dCAC	dC	-dC	AC	dC	-dC	AC
IN-R	500.0	-500.0	500.0	5.000	-5.000	5.000
diSP	StNd	StNd	StNd	StNd	StNd	StNd
IN-t	—	—	AVG	—	—	AVG
dot	000.0	000.0	000.0	0.000	0.000	0.000
H-SC	500.0	500.0	500.0	5.000	5.000	5.000
L-SC	000.0	-500.0	000.0	0.000	-5.000	0.000
SPAN	1.000	1.000	1.000	1.000	1.000	1.000
ZERo	00	00	00	00	00	00
E.SPN	—	—	10-0	—	—	10-0
H-RG	500.0	500.0	—	5.000	5.000	—
L-RG	000.0	-500.0	—	0.000	-5.000	—
d.UNt	V	V	V	A	A	A

◎ Parameter 2 group



◎ Factory defaults

Parameter	MX4W-V (DC)	MX4W-V (±DC)	MX4W-V (AC)	MX4W-A (DC)	MX4W-A (±DC)	MX4W-A (AC)
oUt1 ※1	oFF	oFF	oFF	oFF	oFF	oFF
oUt2 ※1	oFF	oFF	oFF	oFF	oFF	oFF
HYS.1 ※1,2	00.1	00.1	00.1	0.001	0.001	0.001
HYS.2 ※1,2	00.1	00.1	00.1	0.001	0.001	0.001
STAt	00.0	00.0	00.0	00.0	00.0	00.0
PEAK	005	005	005	005	005	005
dISt	0.25	0.25	0.25	0.25	0.25	0.25
dI-t	Hold	Hold	Hold	Hold	Hold	Hold
LoC	oFF	oFF	oFF	oFF	oFF	oFF

※1: Does not appear in indicator models.
※2: It will vary depending on input range [IN-R] setting.

▣ Measurement Input

DC voltage				DC current			
Measurement input range	Display	Input impedance	Display range [SEnd]	Measurement input range	Display	Input impedance	Display range [SEnd]
0.0-500.0V	500.0	4.062MΩ	0.0 to 500.0	0.000-5.000A	5.000	0.02Ω	0.000 to 5.000
0-500V	500		0 to 500	0.00-5.00A	5.00		0.00 to 5.00
0.0-200.0V	200.0		0.0 to 200.0	0.000-2.000A	2.000		0.000 to 2.000
0-200V	200		0 to 200	0.00-2.00A	2.00		0.00 to 2.00
0.00-50.00V	50.00		0.00 to 50.00	0.0-500.0mA	500.0	0.87Ω	0.0 to 500.0
0.0-50.0V	50.0		0.0 to 50.0	0-500mA	500		0 to 500
0.00-20.00V	20.00	162kΩ	0.00 to 20.00	0.0-200.0mA	200.0		0.0 to 200.0
0.0-20.0V	20.0		0.0 to 20.0	0-200mA	200		0 to 200
0.000-5.000V	5.000		0.000 to 5.000	0.00-50.00mA	50.00		0.00 to 50.00
0.00-5.00V	5.00		0.00 to 5.00	0.0-50.0mA	50.0		0.0 to 50.0
1.000-5.000V	1-5A		1.000 to 5.000	0.00-20.00mA	20.00	21.87Ω	0.00 to 20.00
1.00-5.00V	1-5b		1.00 to 5.00	0.0-20.0mA	20.0		0.0 to 20.0
0.000-2.000V	2.000		0.000 to 2.000	4.00-20.00mA	4A20		4.00 to 20.00
0.00-2.00V	2.00		0.00 to 2.00	4.0-20.0mA	4b20		4.0 to 20.0
0.0-500.0mV	500.0	4kΩ	0.0 to 500.0	0.000-5.000mA	5.000		0.000 to 5.000
0-500mV	500		0 to 500	0.00-5.00mA	5.00		0.00 to 5.00
0.0-200.0mV	200.0		0.0 to 200.0	0.000-2.000mA	2.000		0.000 to 2.000
0-200mV	200		0 to 200	0.00-2.00mA	2.00		0.00 to 2.00
0.00-50.00mV	50.00		0.00 to 50.00	-5.000-5.000A	-5.000	0.02Ω	-5.000 to 5.000
0.0-50.0mV	50.0		0.0 to 50.0	-5.00-5.00A	-5.00		-5.00 to 5.00
-500.0-500.0V	-500.0	4.062MΩ	-500.0 to 500.0	-2.000-2.000A	-2.000		-2.000 to 2.000
-500-500V	-500		-500 to 500	-2.00-2.00A	-2.00		-2.00 to 2.00
-200.0-200.0V	-200.0		-200.0 to 200.0	-500.0-500.0mA	-500.0	0.87Ω	-500.0 to 500.0
-200-200V	-200		-200 to 200	-500-500mA	-500		-500 to 500
-50.00-50.00V	-50.00	162kΩ	-50.00 to 50.00	-200.0-200.0mA	-200.0		-200.0 to 200.0
-50.0-50.0V	-50.0		-50.0 to 50.0	-200-200mA	-200		-200 to 200
-20.00-20.00V	-20.00		-20.00 to 20.00	-50.00-50.00mA	-50.00		-50.00 to 50.00
-20.0-20.0V	-20.0		-20.0 to 20.0	-50.0-50.0mA	-50.0		-50.0 to 50.0
-5.000-5.000V	-5.000		-5.000 to 5.000	-20.00-20.00mA	-20.00	21.87Ω	-20.00 to 20.00
-5.00-5.00V	-5.00		-5.00 to 5.00	-20.0-20.0mA	-20.0		-20.0 to 20.0
-2.000-2.000V	-2.000		-2.000 to 2.000	-5.000-5.000mA	-5.000		-5.000 to 5.000
-2.00-2.00V	-2.00		-2.00 to 2.00	-5.00-5.00mA	-5.00		-5.00 to 5.00
-500.0-500.0mV	-500.0	4kΩ	-500.0 to 500.0	-2.000-2.000mA	-2.000		-2.000 to 2.000
-500-500mV	-500		-500 to 500	-2.00-2.00mA	-2.00		-2.00 to 2.00
-200.0-200.0mV	-200.0		-200.0 to 200.0				
-200-200mV	-200		-200 to 200				
-50.00-50.00mV	-50.00		-50.00 to 50.00				
-50.0-50.0mV	-50.0		-50.0 to 50.0				

※Display range of [SCAL] will vary depending on the decimal point. (-9999 to 9999, -999.9 to 999.9, -99.99 to 99.99, -9.999 to 9.999)
※When changing measurement input type, oU□.H/oU□.L/H.PEK/L.PEK/dISP/IN-t/dot/H-SC/L-SC/SPAN/ZERo/E.SPN/H-RG/L-RG/dUNt/oU□.t/HYS.□ parameters are reset.
※Frequency measurement range (AC voltage/current): 0.100 to 1200Hz
※Check the unit indicator when selecting measurement input type.
※Parameter setting order of input range [IN-R] is followed by the above table.
E.g.) AC current: 5.000 → 5.00 → 2.000 → … → 2.000 → 2.00
※When "HHHH" or "LLLL" is flashes with a certain measurement input, disconnect power supply and then check the cables.
※Connect to the input terminals whose 30% to 100% of the input range includes the max. value of the input range to measure.
When the max. input value is under the 30% of the input terminal range, display accuracy is degraded. When the max. input value is over the 100%, it may result in input terminal damage.

▣ Measurement Input

AC voltage				AC current			
Measurement input range	Display	Input impedance	Display range [SENd]	Measurement input range	Display	Input impedance	Display range [SENd]
0.0-500.0V	500.0	4.062MΩ	0.0 to 500.0	0.000-5.000A	5.000	0.02Ω	0.000 to 5.000
0-500V	500		0 to 500	0.00-5.00A	5.00		0.00 to 5.00
0.0-200.0V	200.0		0.0 to 200.0	0.000-2.000A	2.000		0.000 to 2.000
0-200V	200		0 to 200	0.00-2.00A	2.00		0.00 to 2.00
0.0-110.0V	110.0		0.0 to 110.0	0.0-500.0mA	500.0	0.87Ω	0.0 to 500.0
0-110V	110		0 to 110	0-500mA	500		0 to 500
0.00-50.00V	50.00	162kΩ	0.00 to 50.00	0.0-200.0mA	200.0		0.0 to 200.0
0.0-50.0V	50.0		0.0 to 50.0	0-200mA	200		0 to 200
0.00-20.00V	20.00		0.00 to 20.00	0.00-50.00mA	50.00		0.00 to 50.00
0.0-20.0V	20.0		0.0 to 20.0	0.0-50.0mA	50.0		0.0 to 50.0
0.000-5.000V	5.000		0.000 to 5.000	0.00-20.00mA	20.00	21.87Ω	0.00 to 20.00
0.00-5.00V	5.00		0.00 to 5.00	0.0-20.0mA	20.0		0.0 to 20.0
0.000-2.000V	2.000		0.000 to 2.000	0.000-5.000mA	5.000		0.000 to 5.000
0.00-2.00V	2.00		0.00 to 2.00	0.00-5.00mA	5.00		0.00 to 5.00
0.0-500.0mV	500.0	4kΩ	0.0 to 500.0	0.000-2.000mA	2.000		0.000 to 2.000
0-500mV	500		0 to 500	0.00-2.00mA	2.00		0.00 to 2.00
0.0-200.0mV	200.0		0.0 to 200.0				
0-200mV	200		0 to 200				
0.00-50.00mV	50.00		0.00 to 50.00				
0.0-50.0mV	50.0		0.0 to 50.0				

※Display range of [SCAL] will vary depending on the decimal point. (-9999 to 9999, -999.9 to 999.9, -99.99 to 99.99, -9.999 to 9.999)
※When changing measurement input type, oU□.H/oU□.L /H.PEK/L.PEK/dI SP/I N-t/dot/H-SC/L-SC/SPAN/ZERo/E.SPN/H-RG/L-RG/dUNt/oU□.t/HYS.□ parameters are reset.
※Frequency measurement range (AC voltage/current): 0.100 to 1200Hz
※Check the unit indicator when selecting measurement input type.
※Parameter setting order of input range [I N-R] is followed by the above table.
E.g.) AC current: 5.000 → 5.00 → 2.000 → ··· → 2.000 → 2.00
※When "HHHH" or "LLLL" is flashes with a certain measurement input, disconnect power supply and then check the cables.
※Connect to the input terminals whose 30% to 100% of the input range includes the max. value of the input range to measure.
When the max. input value is under the 30% of the input terminal range, display accuracy is degraded. When the max. input value is over the 100%, it may result in input terminal damage.

▣ Functions

◎ AC frequency measurement [PA 1 group: dI SP]

It measures input signal frequency when it is AC input.
It uses fixed decimal point [**PA1**: dot], measured range can be changed by setting and measured range of decimal point position is as below chart. It is available to adjust the upper gradient at [**PA 1**: SPAN]and [**PA 1**: E.SPN]. In order to measure frequency normally, input signal, over 10% F.S. of the measured range, should be supplied. Please select the proper point of

① Measuring range

Decimal point position	0.000	0.00	0.0	0
Measurement range	0.100 to 9.999Hz	0.10 to 99.99Hz	0.1 to 999.9Hz	1 to 1200Hz

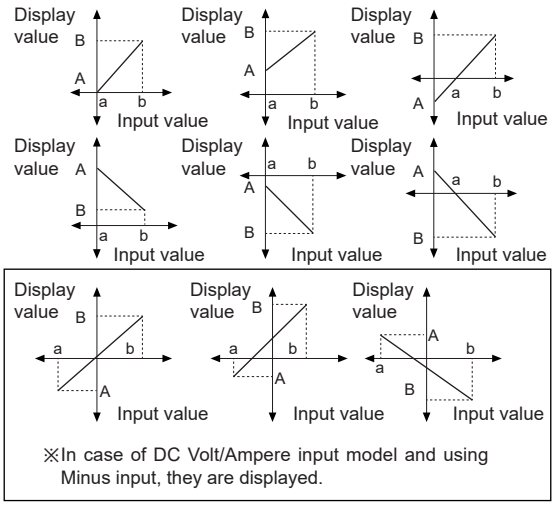
※Accuracy of frequency measurement:
Below 1kHz, F.S. ±0.1rdg ±2-digit.
From 1kHz to 10kHz, F.S. ±0.3rdg ±2-digit.
② SPAN : 0.100 to 9.999 [Gradient adjustment of high value]
③ E.SPN 10^{-2}, 10^{-1}, 10^{0}, 10^{1} [Index adjustment of SPAN]

◎ Error correction [PA 1 group: SPAN / ZERo]

It corrects display value error of measured input.
ZERo : -99 to 99 [Adjust deviation of low value]
SPAN : 0.100 to 9.999 [Correct gradient of high value]
Display value= (measured value × SPAN) + ZERo
E.g.) When the measured range is 0 to 500V, and the display range is 0 to 500.0. If the low display value is "12" to 0V input, set -12 as ZERo value to display "0.0" by adjusting offset of the low value. The display value to 500V measured input varies by adjusting the offset of low value. If this display value is "50 10", calculate 500.0/501.0 (desired display value/the display value), and set the 0.998 correction value as the SPAN to display 500.0 by adjusting gradient of high value.
※The offset correction range of ZERo is within -99 to 99 for D^{-0}, D^{-1} digit regardless of decimal point.
※**High limit error correction function is available as "Gradient correction function"and low limit error correction function is available as "Zero adjustment function".**

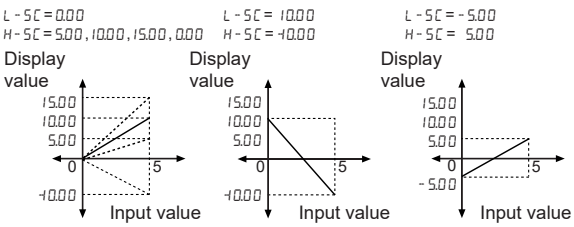
◎ Display scale [PA 1 group: H-SC/L-SC]

This function is to display setting (-1999 to 9999) of particular High/Low-limit value in order to display High/Low-limit value of measured input. If measured inputs are 'a' and 'b' and particular values are 'A' and 'B', it will display a=A, b=B as below graphs.



Display scale function is able to change display value for min./max. measured input by setting high limit scale H-SC and low limit scale L-SC in parameter 1 group.

E.g.) High limit scale value and low limit scale value setting (input range = 0 to 5V)

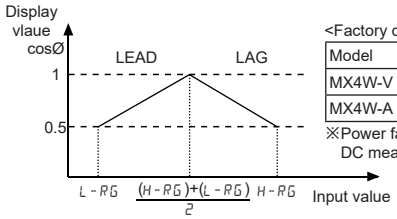


※When changing measured input, high limit scale value and low limit scale value are automatically changed as the default display range of the changed measured input.

◎ Power factor (PF) display [PA 1 group: H-RG/L-RG]

- This function displays LEAD and LAG by analog output signal from the power factor transducer.
- It is available to accept several outputs of the power factor transducer by high-limit [H-RG]/low-limit [L-RG] analog output value setting in the power factor transducer.
- Power factor value is displayed as cosø value -0.50 (LEAD) to 1.00 to 0.50 (LAG).
- LEAD is when current phase leads voltage phase, LAG is when current phase lags behind voltage phase. LEAD and LAG are invalid power.
- Setting range: From min. to max. selected value from measurement input range [IN-R]

E.g.) When setting 200V in input range [IN-R], H-RG and L-RG are available to set from -200.0 to 200.0. When setting 20V, H-RG and L-RG are available to set from -20.00 to 20.00. (※H-RG > L-RG)



<Factory default>

Model	H-RG	L-RG
MX4W-V	500.0	000.0
MX4W-A	5.000	0.000

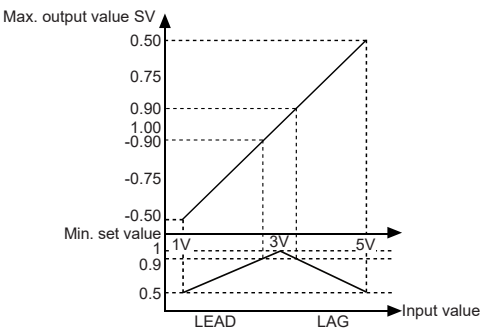
※Power factor display is only for DC measurement input model.

E.g. 1) When the output of the power factor transducer is DC 4-20mA,

① Connect the output to the input terminal 7 (+), 8 (-) of this unit, then set input range [IN-R] as 4-20.
② When setting the input range as 4-20, L-RG is set as 4.00 and H-RG is set as 20.00 automatically. L-RG and H-RG is for the setting of the power factor transducer output.
③ If measured input is 4mA, it displays -0.50. For 12mA measured input, it displays 1.00 and for 20mA, it displays 0.50.

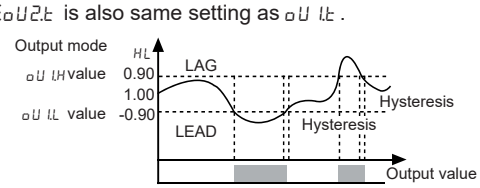
E.g. 2) When the output of the power factor transducer is DC1-5V,

① Connect the output to the input terminal 6 (+), 8 (-) of this unit, then set the input range [IN-R] as 1-5b.
② Set H-RG as 5.00 and L-RG as 1.00 for the output of the power factor transducer.
③ If measured input is 1V, it displays -0.50. For 3V measured input, it displays 1.00 and for 5V, it displays 0.50.



E.g. 3) When LEAD value is smaller than -0.90, LAG value is smaller than 0.90, and OUT1 is used,

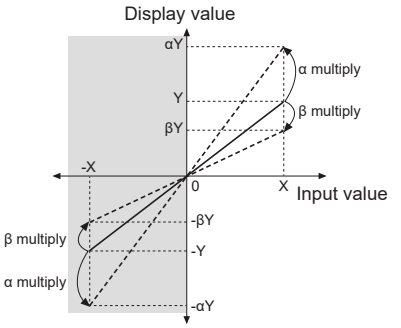
① Set oUT1t as HL at parameter 2 group.
② Set oUT1H as 0.90 and oUT1L as -0.90 at parameter 0 group.
※oUT2t is also same setting as oUT1t.



◎ Gradient correction [PA 1 group: SPAN]

This function is to adjust the gradient of display value or scale value for input value (within measurement range). As followings (Image 1), input value (X) can be adjusted α, β times to display value (Y) by using gradient correction function [SPAN].

- Setting range: 0.100~9.999,
  Factory default: 1.000 (unit: multiply)



(Fig. 1)

※Gradient is adjusted based on input value '0'.
※The part marked with the gray color is not displayed in following cases.

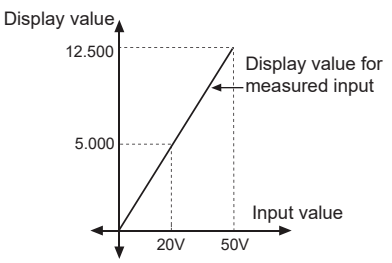
- Input type [dCAC] is set to [dC] or [AC]

E.g. 1) Using both display scale [L-SC/H-SC] and gradient correction [SPAN] (AC input)

① In order to display 20V at measurement input range 0-50V as 5.000, set decimal point [dot] as 0.000 when setting scale value.

② If set to display 20V as 5.000, maximum input value 50V is set to be displayed as 12.500. However it is impossible because maximum value of the display scale [H-SC] is 9.999. In this case, set gradient correction value [SPAN] × high scale value [H-SC] to be 12.500.

H-SC	L-SC	SPAN	Note
12.500	0.000	1.000	**Unavailable**, because maximum setting value of high scale [H-SC] is 9.999.
6.250	0.000	2.000	Any setting value displays same display value.
3.125	0.000	4.000	
2.500	0.000	5.000	

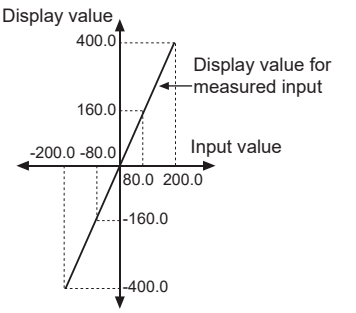


E.g. 2) Using both display scale [L-SC/H-SC] and gradient correction [SPAN] (DC minus input)

① In order to display -80mV at measurement input range -200-200mV as -160.0, set decimal point [dot] as 000.0 when setting scale value.

② If set to display -80mV as -160.0, minimum input value -200mA is set to be displayed as -400.0. In this case, set gradient correction value [SPAN] × high scale value [L-SC] to be -400.0.
Set high limit scale value as value of (-[L-SC]). If high limit scale value is set before, set low limit scale value as value of (-[H-SC]).

H-SC	L-SC	SPAN	Note
400.0	-400.0	1.000	Any setting value displays same display value.
200.0	-200.0	2.000	
100.0	-100.0	4.000	
80.0	-80.0	5.000	



◎ Display cycle delay [PA 2 group: diSt]

In some applications the measured input may fluctuate which in turn causes the display to fluctuate. By adjusting the display cycle delay function time in the diSt of parameter 2, the operator can adjust the display time within a range of 0.2 to 5 sec. For example, if the operator sets the display cycle time to 4.0 sec, the display value displayed will be the average input value over 4 sec and also will show any changes if any every 4 sec.

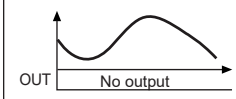
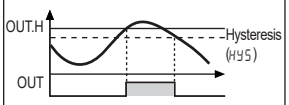
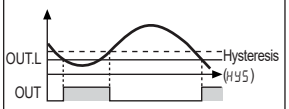
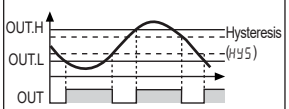
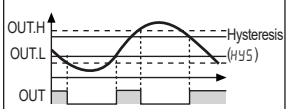
◎ Monitoring peak display value [PA 0 group: H.PEK/L.PEK, PA 2 group: PEAK]

It monitors max./min. value of display value based on the current displays value and then displays the data at H.PEK, L.PEK of parameter 0. Set the delay time (0 to 30 sec) at PEAK of parameter 2 in order to prevent malfunction caused by initial overcurrent or overvoltage, when monitoring the peak value.

Delay time is 0 to 30 sec and it starts to monitor the peak value after the set time. When pressing the ≪+≫ keys for 1 sec at H.PEK, L.PEK of parameter 0, the monitored data is reset.

※H.PEK, L.PEK parameters is not displayed when monitoring delay time [PEAK] of parameter 2 group is set as 00 sec [00 S].

◎ Preset output operation mode [PA 2 group: oU1t/oU2t]

Mode	Output operation	Operation
oFF		No output
HIGH		Period ON: Display value ≥ oU1H Period OFF: Display value ≤ oU1H-HYS.1
LoW		Period ON: Display value ≤ oU1L Period OFF: Display value ≥ oU1L+HYS.1
HL		Period ON: Display value ≤ oU1L Display value ≥ oU1H Period OFF: Display value ≥ oU1L+HYS.1 Display value ≤ oU1H-HYS.1
HL-G		Period ON: Display value ≥ oU1L Display value ≤ oU1H Period OFF: Display value ≤ oU1H-HYS.1 Display value ≥ oU1H+HYS.1

※Set preset output mode separately for each OUT1/OUT2.
※OUT1/OUT2 are operated individually depending on the set preset output operation mode.
※High/low preset value parameters of the parameter 0 group appear by setting preset output operation mode.
※When changing preset output operation mode, oU□.H/oU□.L/HYS.□ are reset.

◎ Zero adjustment

Forces the display value of measured input to 0 (zero).

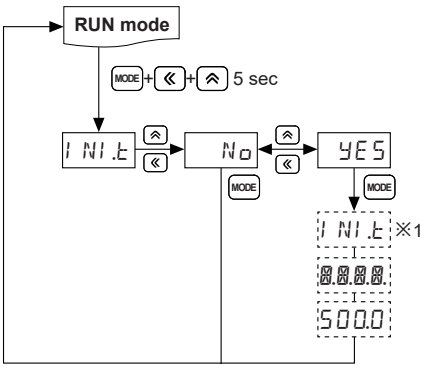
- Zero adjustment range: -99 to 99
- Zero adjustment method:

① Hold ◁+△ keys for 3 sec at the same time.

② Set display holding/zero adjustment [dI-t] of parameter 2 group as zero adjustment [ZERo]. Short 3, 4 terminals and zero adjustment is available.

※When zero adjustment is completed by ① or ② method, the display part displays zero and the adjusted value is saved at [ZERo] of parameter 1 group automatically.
※If zero adjustment range is exceeded, the error [oVER] flashes twice and it returns to RUN mode, by maintaining previous setting value.

◎ Reset



※1: Flashes twice sequentially and returns to RUN mode.

◎ Error display

Display	Description
HHHH	Flashes when measuring input is exceeded the max. allowable input (110%)
LLLL	Flashes when measuring input is exceeded the min. allowable input (-dC setting at dCAC:-110%, dC, AC setting at dCAC: -10%)
d-HH	Flashes when display input is exceeded the max. display range (9999)
d-LL	Flashes when display input is exceeded the min. display range (-9999)
F-HH	Flashes when measuring frequency is exceeded the max. measuring value (9999)
PF-H	Flashes when power factor display value to measured input is over than LAG 0.50
PF-L	Flashes when power factor display value to measured input is less than LEAD -0.50
oVER	Flashes when it exceeds zero adjustment range (±99)

※Error display is released automatically when it is in the measured and display range.

DIN W72×H36mm, W96×H48mm, Digital Multi Panel Meter

▣ Features

- Various input/output (default: indicator)
  - Input: DC voltage, DC current, AC voltage, AC current
  - Output: RS485 communication output, Low speed serial output, transmission (DC4-20mA) output, BCD dynamic output, NPN/PNP open collector output, relay output
- Maximum allowed input
  : 500VDC, 500VAC, DC5A, AC5A
- Display range: -1999 to 9999
- High/low-limit display scale function
- AC frequency measurement (range: 0.1 to 9999Hz)
- Various functions: Monitoring peak display value function, display cycle delay function, zero adjustment function, high display correction function, transmission (DC4-20mA) output scale function etc.
- Power supply: 12-24VDC, 100-240VAC 50/60Hz

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

MT 4 W – DV – 4 N

Item	MT		Multi meter
Digit	4		9999 (4-digit)
Size	Y		DIN W72×H36mm
	W		DIN W96×H48mm
Measurement function (input)	DV		DC voltage
	DA		DC current
	AV		AC voltage
	AA		AC current
Power supply	1※2		12-24VDC
	4		100-240VAC 50/60Hz
Output	MT4Y	N	Indicator
		0	Relay output
		1	NPN open collector output
		2	PNP open collector output
		3※1	Relay (low out)+transmission (DC4-20mA) output
		4※1	Relay (low out)+RS485 communication output
		5	BCD dynamic output
		6	Low speed serial output
	MT4W	N	Indicator
		0	Relay+transmission (DC4-20mA) output
		1	Relay output
		2	NPN open collector+BCD dynamic output
		3	PNP open collector+BCD dynamic output
		4	NPN open collector+transmission (DC4-20mA) output
		5	PNP open collector+transmission (DC4-20mA) output
		6	NPN open collector+low speed serial output
		7	PNP open collector+low speed serial output
		8	NPN open collector+RS485 communication output
		9	PNP open collector+RS485 communication output

※1: Only L.SET (preset output mode) setting is available in MT4Y-□-43 (relay (low out)+transmission (DC4-20mA) output) and MT4Y-□-43 (relay (low out)+transmission (DC4-20mA) output) models.
※2: Only for MT4W.
※To measure the current over DC5A, please select DV type because the shunt should be used.
※In case of selecting frequency display, no output will be provided even if it is output support models. (main output, sub output and RS485 communication output)

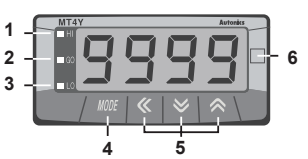
▣ Specifications

Series	MT4Y-DV-4□ MT4Y-DA-4□	MT4Y-AV-4□ MT4Y-AA-4□	MT4W-DV-4□ MT4W-DA-4□	MT4W-AV-4□ MT4W-AA-4□	MT4W-DV-1□ MT4W-DA-1□	MT4W-AV-1□ MT4W-AA-1□
Measurement input	DC voltage, current	AC voltage, current, frequency	DC voltage, current	AC voltage, current, frequency	DC voltage, current	AC voltage, current, frequency
Power supply	100-240VAC~ 50/60Hz				12-24VDC⎓	
Allowable voltage range	90 to 110%				90 to 110%	
Power consumption	5VA				5W	
Display method	7-segment LED display (red) (character height: 14.2mm)					
Display accuracy	• 23℃±5℃ - DC input: F.S. ±0.1% rdg±2-digit / AC input: F.S. ±0.3% rdg±3-digit (frequency: F.S.±0.1% rdg±2-digit) ※For 5A terminal of current Input, F.S +0.3% rdg ±3-digit • -10℃ to 50℃ - DC/AC input: F.S.±0.5% rdg±3-digit					
Max. allowable input	110% F.S. for each measured input range					
A/D conversion method	ΣΔ (Sigma Delta) ADC					
Sampling cycle	DC input: 50ms, AC input: 16.6ms					
Max. display range	-1999 to 9999 (4-digit)					
Preset output	• Relay output - Contact capacity: 250VAC~ 3A, 30VDC⎓ 3A / Contact composition: N.O (1a) • NPN/PNP open collector output - Max. 12-24VDC⎓ ±2V 50mA (resistive load)					
Sub output (transmission output)	• RS485 comm output - Baud rate: 1,200/2,400/4,800/9,600, Communication method: 2-wire half duplex, Synchronous method: Asynchronous method, Protocol: Modbus type • Serial/BCD dynamic output - NPN open collector output: Max. 12-24VDC⎓ 50mA (resistive load) • DC4-20mA output - Resolution: 12,000 division (load resistance max. 600Ω), Response time: max. 450ms					
AC measurement※1	Selectable RMS or AVG					
Frequency measurement※1	Measurement range: 0.100 to 9999Hz (variable by decimal point position)					
Hold function※2	Includes (external hold function)					
Insulation resistance	Over 100MΩ (at 500VDC megger, between external terminal and case)					
Dielectric strength	2000VAC 50/60Hz for 1 min (between external terminal and case)					
Noise immunity	±2kV the square wave noise (pulse width: 1μs) by the noise simulator					
Vibration – Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours					
Vibration – Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min					
Shock – Mechanical	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times					
Shock – Malfunction	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times					
Relay life cycle – Malfunction	Min. 20,000,000 operations					
Relay life cycle – Mechanical	Min. 100,000 operations (250VAC 3A load current)					
Environ-ment – Ambient temperature	-10 to 50℃, storage: -20 to 60℃					
Environ-ment – Ambient humidity	35 to 85%RH, storage: 35 to 85%RH					
Insulation type	Double insulation or reinforced insulation (mark: ⧈, dielectric strength between the measurement input part and the power part: 1kV)					
Approval	CE cULus				CE	
Weight※3	Approx. 213.5g (approx. 134g)		Approx. 326g (approx. 211g)			

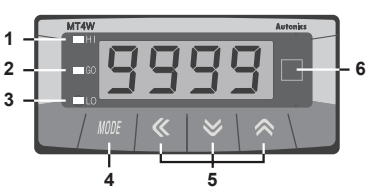
※1: AC, frequency measurement functions are only for AC measurement input type.
※2: MT4Y-□-4N model has no hold function.
※3: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Unit Description

◎ MT4Y Series



◎ MT4W Series



1. HI: High output indication of preset
2. GO: GO output indication of preset
3. LO: Low output indication of preset
4. MODE **key:** mode key
5. ≪ **key:** moves digit, enters parameter mode, ≫ ≪ **key:** changes sv
6. unit label part

※There is no **1**, **2**, **3** on a display panel of MT4Y-□-4N, 45, 46 and MT4W-□-4N.
※In MT4Y-□-□3, □4, OUT is used for Go output display and there is no **1**, **3** in display panel.

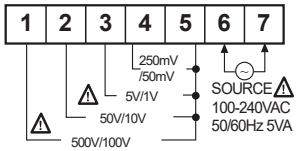
▣ Connections

◎ Measurement input terminal connection of MT4Y Series

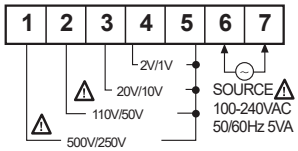
※Use terminals of size specified below.
※Use the Copper-conductor wire with the temperature class 60.

	a	b
 <Forked>	Min. 3.5mm	Max. 7.0mm

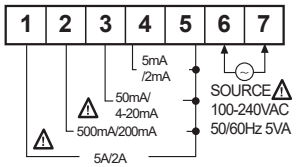
● MT4Y-DV-4□



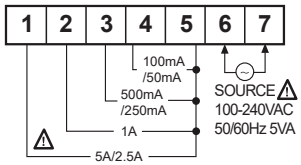
● MT4Y-AV-4□



● MT4Y-DA-4□

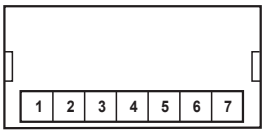


● MT4Y-AA-4□

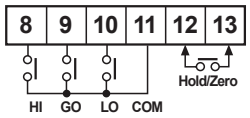


◎ Output terminal connection of MT4Y Series

●MT4Y-□-4N (indicator)

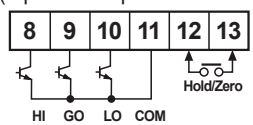


●MT4Y-□-40 (triple relay output)

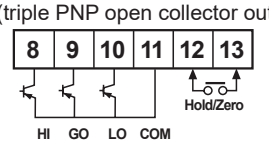


CONTACT OUT
: 250VAC 3A 1a, 30VDC 3A 1a RESISTIVE LOAD

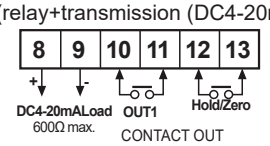
●MT4Y-□-41
(triple NPN open collector output)



●MT4Y-□-42
(triple PNP open collector output)

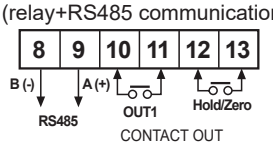


●MT4Y-□-43
(relay+transmission (DC4-20mA) output)



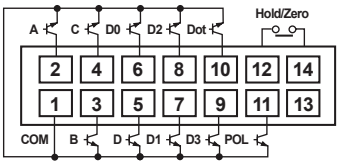
CONTACT OUT
: 250VAC 3A 1a, 30VDC 3A 1a
RESISTIVE LOAD

●MT4Y-□-44
(relay+RS485 communication output)

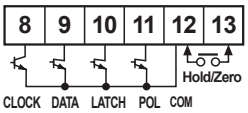


CONTACT OUT
: 250VAC 3A 1a, 30VDC 3A 1a
RESISTIVE LOAD

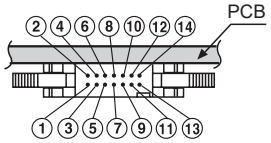
●MT4Y-□-45
(BCD dynamic output)



●MT4Y-□-46 (low speed serial output)



※POL: When a display value is "-",
the signal of "-" will be outputted.

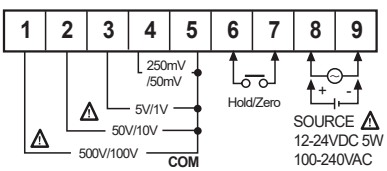


※Hirose connector: HIF3BA-14PA-2.54DS
※Connector socket specification: Contact the manufacture for the socket and cable.

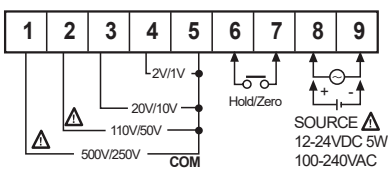
	Specifications	Manufacture
Connector socket	HIF3BA-14D-2.54R	Hirose Electric

◎ Measurement input terminal connection of MT4W Series

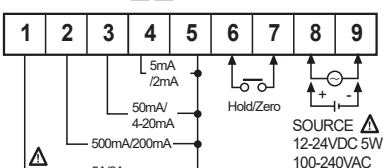
● MT4W-DV- □□



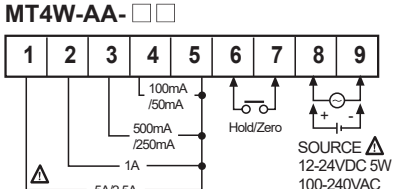
● MT4W-AV- □□



● MT4W-DA- □□



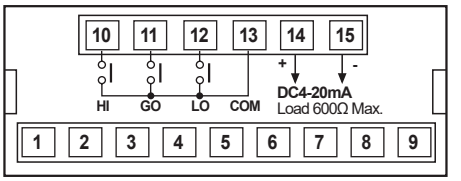
● MT4W-AA- □□

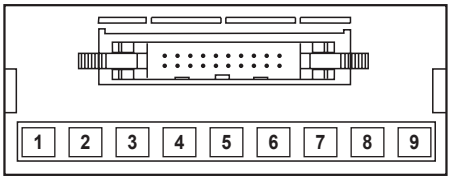


◎ Output terminal connection of MT4W Series

● **MT4W-□-□0** (triple relay+transmission (DC4-20mA) output)

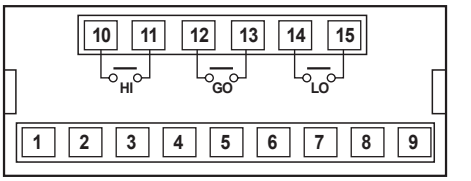
MAIN OUT
CONTACT OUT
: 250VAC 3A 1a, 30VDC 3A 1a RESISTIVE LOAD

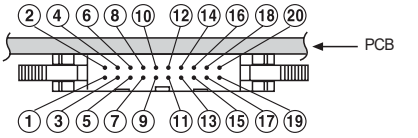




● **MT4W-□-□1** (triple relay output)

MAIN OUT
CONTACT OUT
: 250VAC 3A 1a, 30VDC 3A 1a RESISTIVE LOAD



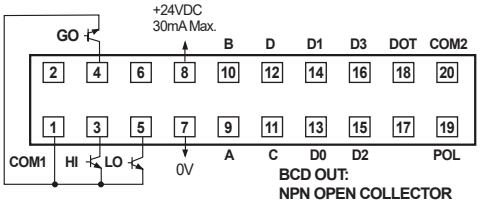


※Hirose connector: HIF3BA-20D-2.54R
※Connector socket specification: Contact the manufacture for the socket and cable.

	Specifications	Manufacture
Connector socket	HIF3BA-20D-2.54R	Hirose Electric
I/O cable (Sold separately)	CO20-HP□-L, CO20-HP□-R	Autonics

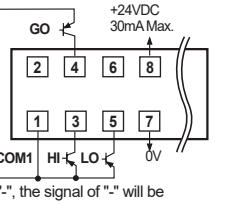
● **MT4W-□-42 / MT4W-□-43** (triple NPN/PNP open collector+BCD dynamic output)

MAIN OUT:
NPN OPEN COLLECTOR
12-24VDC Max. 50mA



BCD OUT:
NPN OPEN COLLECTOR
12-24VDC Max. 50mA

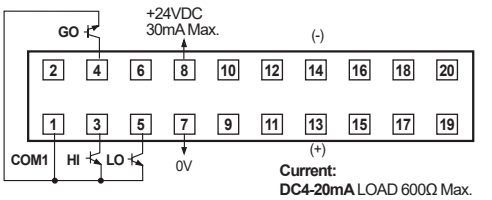
MAIN OUT:
PNP OPEN COLLECTOR
12-24VDC Max. 50mA



※POL: When a display value is "-", the signal of "-" will be outputted.

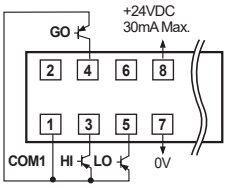
● **MT4W-□-44 / MT4W-□-45** (triple NPN/PNP open collector+transmission (DC4-20mA) output)

MAIN OUT:
NPN OPEN COLLECTOR
12-24VDC Max. 50mA



Current:
DC4-20mA LOAD 600Ω Max.

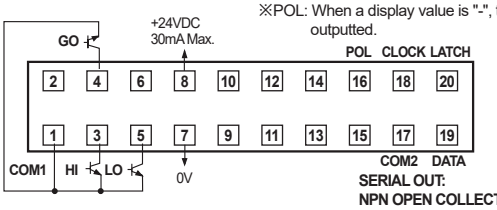
MAIN OUT:
PNP OPEN COLLECTOR
12-24VDC Max. 50mA



● **MT4W-□-46 / MT4W-□-47** (triple NPN/PNP open collector+low speed serial output)

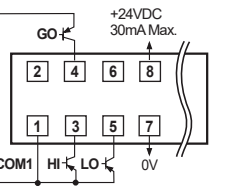
MAIN OUT:
NPN OPEN COLLECTOR
12-24VDC Max. 50mA

※POL: When a display value is "-", the signal of "-" will be outputted.



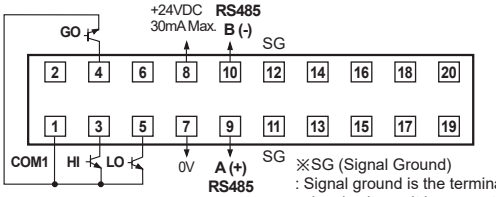
SERIAL OUT:
NPN OPEN COLLECTOR
12-24VDC Max. 50mA

MAIN OUT:
PNP OPEN COLLECTOR
12-24VDC Max. 50mA



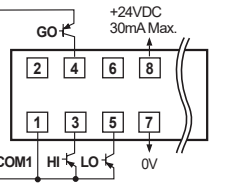
● **MT4W-□-48 / MT4W-□-49** (triple NPN/PNP open collector+RS485 communication output)

MAIN OUT:
NPN OPEN COLLECTOR
12-24VDC Max. 50mA



※SG (Signal Ground)
: Signal ground is the terminal which is base of the signal voltage. It is connected with terminal 7 inside of the product.

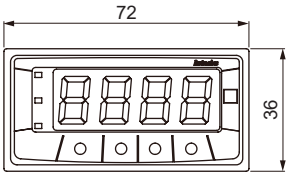
MAIN OUT:
PNP OPEN COLLECTOR
12-24VDC Max. 50mA



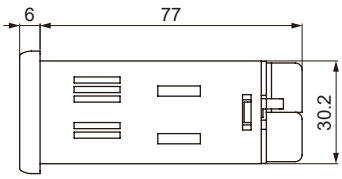
▣ Dimensions

(unit: mm)

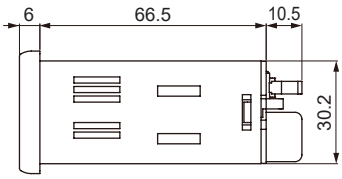
◎ MT4Y Series



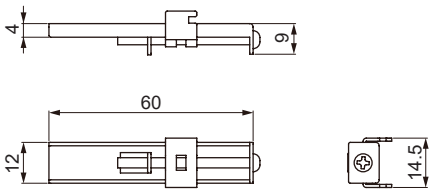
● **MT4Y-□-4N/40~44/46**



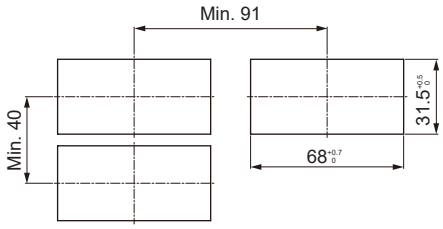
● **MT4Y-□-45**



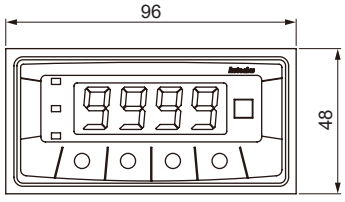
● **Bracket**



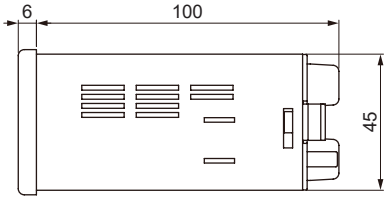
● **Panel cut-out**



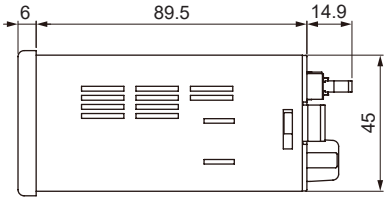
◎ MT4W Series



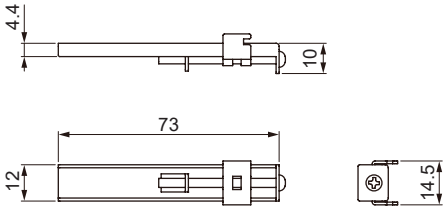
● **MT4W-□-□N/□0/□1**



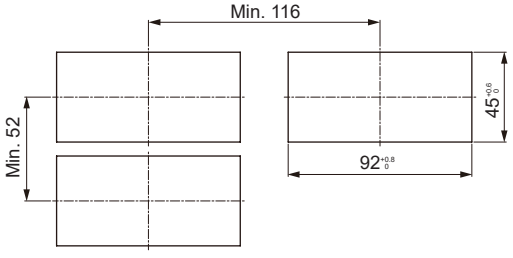
● **MT4W-□-42 to 49**



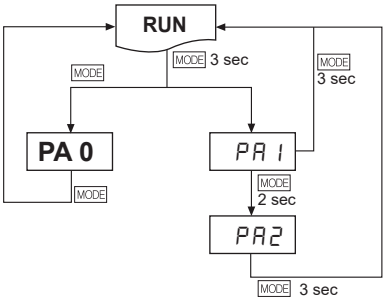
● **Bracket**



● **Panel cut-out**

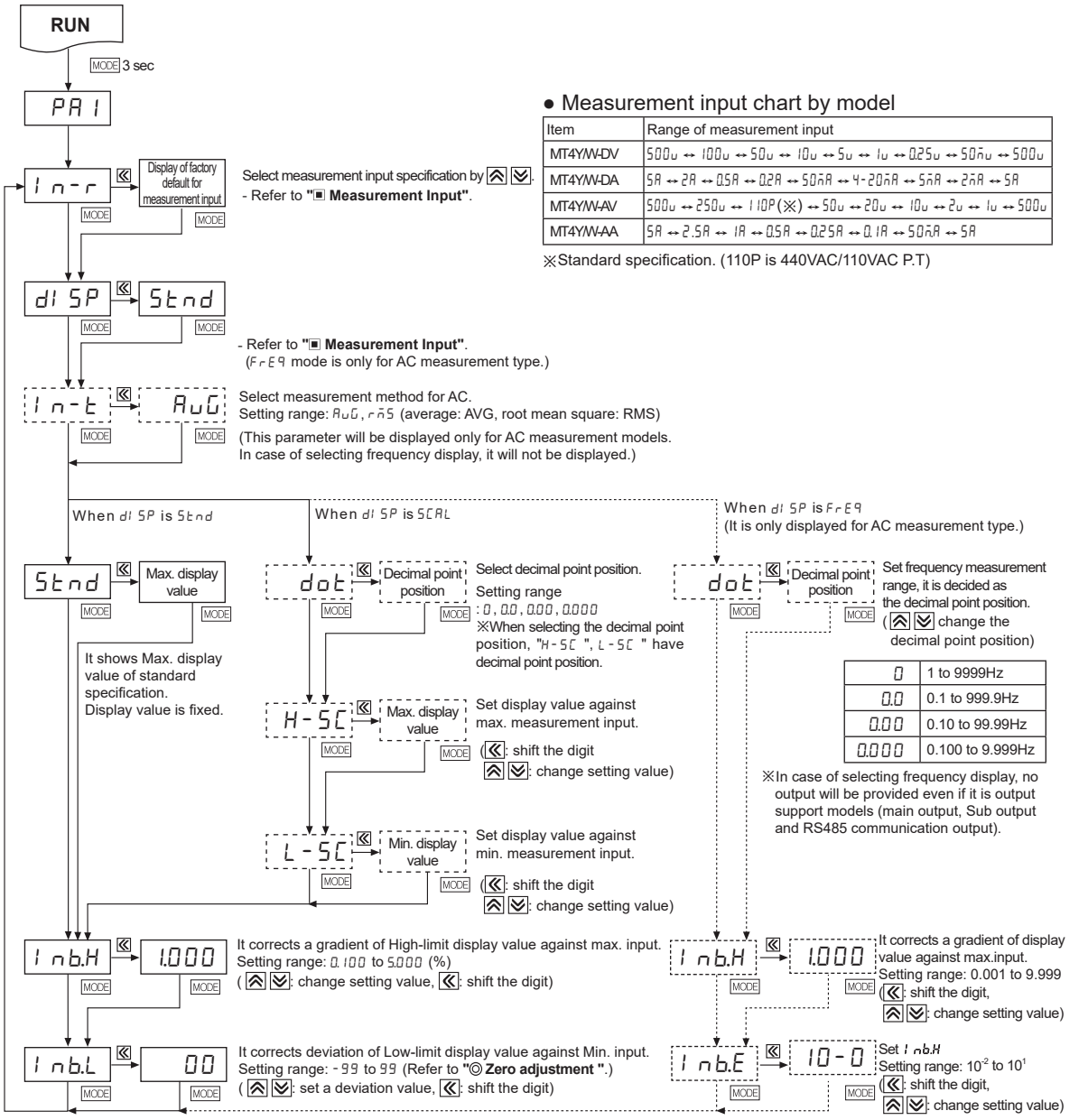


▣ Parameter Setting



※Press MODE key in **RUN** mode and it enters **PA 0** group.
※Press MODE key for over 3 sec in **RUN** mode, it displays [PA 1].
※Press MODE key for over 5 sec in **RUN** mode, it displays [PA2] after [PA 1].
When pressing MODE key continually, it stops displaying at [PA2].
※It is advanced to current display parameter releasing MODE key at [PA 1] or [PA2].
※Press MODE key for over 3 sec in any parameter groups, it returns to **RUN** mode.
※If any key is not entered for 60 sec in each parameter, it returns to **RUN** mode.
※After returning to **RUN** mode, press MODE key within 2 sec, it returns to previous parameter. (Refer to the below descriptions of each parameter group.)
※**PA 0** group cannot be entered when preset output mode of [PA2] group is oFF.

▣ Parameter 1 Group



● Measurement input chart by model

Item	Range of measurement input
MT4Y/W-DV	500u ↔ 100u ↔ 50u ↔ 10u ↔ 5u ↔ 1u ↔ 0.25u ↔ 50mu ↔ 500u
MT4Y/W-DA	5A ↔ 2A ↔ 0.5A ↔ 0.2A ↔ 50mA ↔ 4-20mA ↔ 5mA ↔ 2mA ↔ 5A
MT4Y/W-AV	500u ↔ 250u ↔ 110P(※) ↔ 50u ↔ 20u ↔ 10u ↔ 2u ↔ 1u ↔ 500u
MT4Y/W-AA	5A ↔ 2.5A ↔ 1A ↔ 0.5A ↔ 0.25A ↔ 0.1A ↔ 50mA ↔ 5A

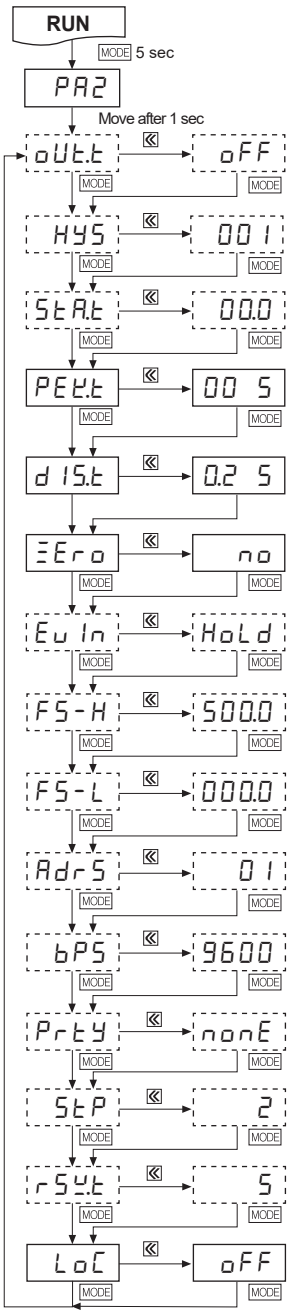
※Standard specification. (110P is 440VAC/110VAC P.T)

※After setting each mode, press MODE key for 2 sec to return to **RUN**.
※If any key is untouched for 60 sec after advance to parameter, it will return to **RUN**.

◎ Factory defaults

Parameter	MT4Y/W-DV	MT4Y/W-DA	MT4Y/W-AV	MT4Y/W-AA	Parameter	MT4Y/W-DV	MT4Y/W-DA	MT4Y/W-AV	MT4Y/W-AA
In-r	500u	5A	500u	5A	InbH	1.000	1.000	1.000	1.000
dI SP	Stnd	Stnd	Stnd	Stnd	InbL	00	00	00	00
In-t	—	—	AvG	AvG	dot	0.0	0.000	0.0	0.000
Stnd	500.0	5.000	500.0	5.000	InbE	—	—	10-0	10-0

▣ Parameter 2 Group



Select preset output mode. (only for available models)
Setting range: oFF, L.St, H.St, L H.St, HH.St, L L.St, Ld.St
※Only L.St setting is available in MT4Y-□-43 and MT4Y-□-44 models.

Set preset hysteresis. The range is within 10% of max. display range (unit: digit).
※ oUt.t mode is oFF, it is not displayed.

Set startup compensation time.
(◁: shift the digit, △ ▽: change setting value)
Setting range: 0.0 to 99.9 sec

When initially supplying power, delays monitoring of high-limit/low-limit value of display value for the set time.
(◁:shift the digit, △ ▽: change setting value)
Setting range: 00 to 30 sec
※If it is set to 00 sec [00 5], parameters of high-peak monitoring value [H.PEr]/low-limit monitoring value [L.PEr] in the parameter 0 group will be not displayed.

Set display cycle and also variable sets by 0.1 sec. (◁: shift the digit, △ ▽: change setting value)
Setting range: 0.1 to 5.0 sec

Select zero function with operation at front. (set with △ ▽ key)
When ◁ + △ Key are pressed for 3 sec to set YES, it will be zero function and the deviation value is saved automatically at Inbl mode.

Select input with 6, 7 (MT4W)[12, 13 (MT4Y)] terminal or zero function for external signal.
(set with △, ▽ Key)
HoLd: Holding display value, ZEro: Zero function using Hold/Zero terminal

Set the high limit value, output point of current output 20mA.
(◁: shift the digit, △ ▽: change setting value)
(When changing measurement input and prescale mode, it is changed automatically as maximum value of input range.)

Set the low limit value, output point of current output 4mA.
(◁: shift the digit, △ ▽: change setting value)
(When changing measurement input and prescale mode, it is changed automatically as minimum value of input range.)

Set the address of RS485 communication output.
(◁: shift the digit, △ ▽: change setting value)
Setting range: 01 to 99

Select Baud rate of RS485 communication output.
Setting range: 9600, 4800, 2400, 1200

Set parity bit of RS485 communication.
Setting range: nonE, EuEn, odd

Set stop bit of RS485 communication.
Setting range: 1, 2

Set response wait time of RS485 communication.
Setting range: 5 to 99

Set key lock function and select from 4 types.
Setting range: oFF, LoC 1, LoC2, LoC3

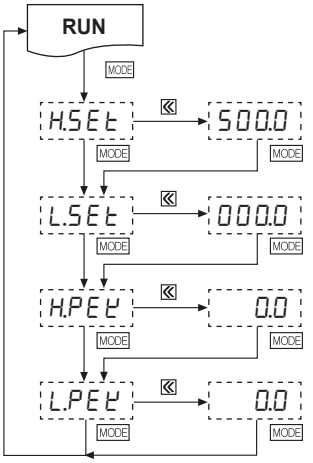
oFF	Disable to lock keys
LoC 1	Lock Parameter 1
LoC2	Lock Parameter 1, 2
LoC3	Lock Parameter 0, 1 and 2

※The dotted mode is only displayed for output type.
※After setting each mode, press MODE key for 2 sec to return to **RUN** mode.
※If any key is untouched for 60 sec after advance to parameter, it will return to **RUN** mode.

◎ Factory defaults

Parameter	MT4Y/W-DV	MT4Y/W-DA	MT4Y/W-AV	MT4Y/W-AA	Parameter	MT4Y/W-DV	MT4Y/W-DA	MT4Y/W-AV	MT4Y/W-AA
oUt.t	oFF	oFF	oFF	oFF	Eu In	HoLd	HoLd	HoLd	HoLd
HYS	001	001	001	001	FS-H	500.0	5.000	500.0	5.000
StAt	00.0	00.0	00.0	00.0	FS-L	000.0	0.000	000.0	0.000
PE.t	00 5	00 5	00 5	00 5	AdrS	01	01	01	01
d 15.t	0.2 5	0.2 5	0.2 5	0.2 5	bPS	9600	9600	9600	9600
ZEro	no	no	no	no	LoC	oFF	oFF	oFF	oFF

▣ Parameter 0 Group



Set preset High-limit value. (set with ≪, ∧, ∨ key)
※It is displayed when set the preset only.
When set oFF in oUt.t mode of the parameter 2 group, the parameter is not displayed.

Set preset Low-limit value. (set with ≪, ∧, ∨ key)
※It is displayed when set the preset only.
When set oFF in oUt.t mode of the parameter 2 group, the parameter is not displayed.

It shows High-limit monitoring value while it is in RUN mode.
It will be reset by pressing ≪, ∧, ∨ key.
※H.PEV parameter is not displayed when PEv.t parameter is set as 00 sec [00 S] at the parameter 2 group.

It shows Low-limit monitoring value while it is in RUN mode.
It will be reset by pressing ≪, ∧, ∨ key.
※L.PEV parameter is not displayed when PEv.t parameter is set as 00 sec [00 S] at the parameter 2 group.

※If any key is untouched for 60 sec after advance to parameter, it will return to **RUN** mode.

◎ Factory defaults

Parameter	MT4Y/W-DV	MT4Y/W-DA	MT4Y/W-AV	MT4Y/W-AA	Parameter	MT4Y/W-DV	MT4Y/W-DA	MT4Y/W-AV	MT4Y/W-AA
H.SEt	500.0	5.000	500.0	5.000	H.PEV	0.0	0.000	0.0	0.000
L.SEt	000.0	0.000	000.0	0.000	L.PEV	0.0	0.000	0.0	0.000

▣ Measurement Input

Type	Measurement input and range		Input impedance	Display range [Stnd]	Prescale display range [SCAL]
DC voltage	0-500V	[500u]	4.33MΩ	0.0 to 500.0 (fixed)	
	0-100V	[100u]	4.33MΩ	0.0 to 100.0 (fixed)	
	0-50V	[50u]	433.48kΩ	0.00 to 50.00 (fixed)	
	0-10V	[10u]	433.48kΩ	0.00 to 10.00 (fixed)	
	0-5V	[5u]	43.48kΩ	0.000 to 5.000 (fixed)	
	0-1V	[1u]	43.48kΩ	0.000 to 1.000 (fixed)	
	0-250mV	[0.25u]	2.28kΩ	0.0 to 250.0 (fixed)	
	0-50mV	[50mu]	2.28kΩ	0.00 to 50.00 (fixed)	
DC current	0-5A	[5A]	0.02Ω	0.000 to 5.000 (fixed)	
	0-2A	[2A]	0.02Ω	0.000 to 2.000 (fixed)	
	0-500mA	[0.5A]	0.22Ω	0.0 to 500.0 (fixed)	
	0-200mA	[0.2A]	0.22Ω	0.0 to 200.0 (fixed)	
	0-50mA	[50mA]	2.22Ω	0.00 to 50.00 (fixed)	
	4-20mA	[4-20]	2.22Ω	4.00 to 20.00 (fixed)	
	0-5mA	[5mA]	22.22Ω	0.000 to 5.000 (fixed)	
	0-2mA	[2mA]	22.22Ω	0.000 to 2.000 (fixed)	
AC voltage	0-500V	[500u]	5.01MΩ	0.0 to 500.0 (fixed)	
	0-250V	[250u]	5.01MΩ	0.0 to 250.0 (fixed)	
	0-110V	[110P]	1.11MΩ	0.0 to 440.0 (fixed)	
	0-50V	[50u]	1.11MΩ	0.00 to 50.00 (fixed)	
	0-20V	[20u]	200.92kΩ	0.00 to 20.00 (fixed)	
	0-10V	[10u]	200.92kΩ	0.00 to 10.00 (fixed)	
	0-2V	[2u]	20.92kΩ	0.000 to 2.000 (fixed)	
	0-1V	[1u]	20.92kΩ	0.000 to 1.000 (fixed)	
AC current	0-5A	[5A]	0.02Ω	0.000 to 5.000 (fixed)	
	0-2.5A	[2.5A]	0.02Ω	0.000 to 2.500 (fixed)	
	0-1A	[1A]	0.10Ω	0.000 to 1.000 (fixed)	
	0-500mA	[0.5A]	0.20Ω	0.0 to 500.0 (fixed)	
	0-250mA	[0.25A]	0.20Ω	0.0 to 250.0 (fixed)	
	0-100mA	[0.1A]	1.02Ω	0.0 to 100.0 (fixed)	
	0-50mA	[50mA]	1.02Ω	0.00 to 50.00 (fixed)	

dot	Display range
0	-1999 to 9999
0.0	-199.9 to 999.9
0.00	-19.99 to 99.99
0.000	-1.999 to 9.999

(Display range is variable according to decimal point position.)

※Connect to the input terminals whose 30% to 100% of the input range includes the max. value of the input range to measure. When the max. input value is under the 30% of the input terminal range, display accuracy is degraded. When the max. input value is over the 100%, it may result in input terminal damage.

※In case of 0 to 110V [110P] of AC voltage range and using P.T (potential transformer) for 440V/110VAC, if 110V is input, and the unit displays 440V automatically by preset scale value for P.T user's convenient.

※When "HHHH" or "LLLL" is flashes with a certain measurement input, disconnect power supply and then check the cables.

▣ Sold Separately

◎ Communication converter

- **SCM-WF48**
  (Wi-Fi to RS485·USB wireless communication converter)

- **SCM-US48I**
  (USB to RS485 converter)

- **SCM-38I**
  (RS232C to RS485 converter)

◎ Display Units (DS/DA-T Series)

- **DS/DA-T Series**
  (RS485 communication input type display unit)

DS16-□T

DS22/DA22-□T

DS40/DA40-□T

DS60/DA60-□T

※Connect RS485 communication input type display unit (DS/DA-T Series) and RS485 communication output model of MT4Y/MT4W Series, the display unit displays present value of the device without PC/PLC.

▣ Functions

◎ AC frequency measurement [PA 1 group: dI SP]

It measures input signal frequency when it is AC input.
It uses fixed decimal point [**PA1**: dot], measured range can be changed by setting and measured range of decimal point position is as below chart. It is available to adjust the upper gradient at [**PA 1**: InbH]and [**PA 1**: InbE]. In order to measure frequency normally, input signal, over 10% F.S. of the measured range, should be supplied. Please select the proper point of

① Measurement range

Decimal point position	0.000	0.00	0.0	0
Measurement range	0.100 to 9.999Hz	0.10 to 99.99Hz	0.1 to 999.9Hz	1 to 9999Hz

※Accuracy of frequency measurement:
Below 1kHz, F.S. ±0.1rdg ±2-digit.
From 1kHz to 10kHz, F.S. ±0.3rdg ±2-digit.

② InbH: 0.100 to 9.999 [Gradient adjustment of high value]

③ InbEh. 10^{-2}, 10^{-1}, 10^{0}, 10^{1} [Index adjustment of InbH]

◎ Zero adjustment [Deviation correction function of low limit display value]

It adjusts the display value of the optional configured input value as zero by force, zero point error can be adjusted with 3 ways as below. When zero point adjustment with front key and Hold terminal is finished normally, zero point of measurement terminal is displayed and the adjusted value at saved in InbL automatically.

Operation	Input correction value	Front panel key	Input external signal
Description	PA 1: Direct input correction value method at InbL .	Press ≪, ≫ key for 3 sec at the RUN mode.	Short-circuit external Hold terminal 11,12 [6, 7 (MT4W)] over min. 50m.

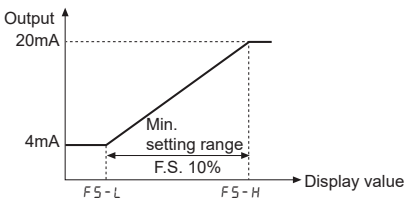
※Refer to "◎ **Error correction", "◎ Error display"** and **"▣ Parameter 2 Group"** for function and error.

◎ Transmission (DC4-20mA) output scale [PA2 group: FS-H / FS-L]

It sets transmission output for the display value at the output current DC4-20mA.
It sets display value for 4mA at FS-L and 20mA at FS-H and the range between FS-H and FS-L should be 10%

※When min. set interval between FS-H and FS-L is set as under 10% F.S., it changed as over 10% F.S. automatically.

※Preset display value is fixed to output as 4mA at under FS-L and 20mA at over FS-H.



◎ Initialization
It initializes as the factory default status. If press ◁, △, ▽ keys together for 2 sec in **RUN** mode, INIT is displayed and press ◁, △, ▽ keys, (no) will flash every 0.5 sec. It will be initialized as the factory default when press MODE key after change no → YES.

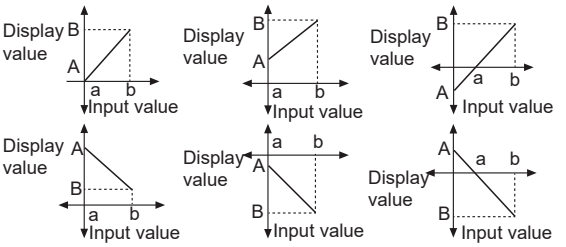
◎ Startup compensation time [PA 2 group: STRT]
This time function limits the operation of an output until the measured input (overvoltage or inrush current) is stable at moment of power on. All outputs are off during startup compensation time setting after power is applied.
Setting range: 00.0 to 99.9 (unit: sec)
Factory default: 00.0

◎ Error display

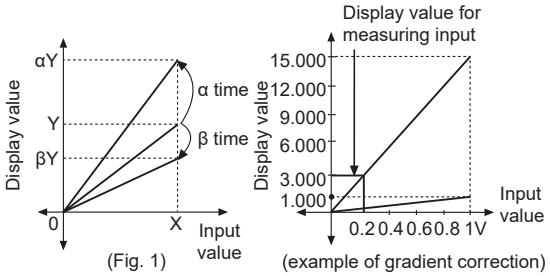
Display	Description
HHHH	Flashes when measured input is exceeded the max. allowable input (110%)
LLLL	Flashes when measured input is exceeded the min. allowable input (-10%)
d-HH	Turns ON when display input is exceeded the max. display range (9999) or H-SC setting value
d-LL	Turns ON when display input is exceeded the min. display range (-1999) or L-SC setting value
F-HH	Turns ON when input frequency is exceeded the max. display value of measurement range
oUEr	Flashes when it exceeds zero range (±99)

※Error display is released automatically when it is in the measured and display range.
※"LLLL" is displayed when the input specification is DC.
※ After flashing "oUEr" 2 times when it exceeds the zero adjustment range, it returns to RUN mode.

◎ Display scale [PA 1 group: H-SC/L-SC]
This function is to display setting (-1999 to 9999) of particular High/Low-limit value in order to display High/Low-limit value of measured input. If measured inputs are 'a' and 'b' and particular values are 'A' and 'B', it will display a=A, b=B as below graphs.



◎ Gradient correction [PA 1 group: InB.H]
This function is to correct a gradient of prescale value and display value. (Fig.1) Display value Y can be used as α, β times against X input value by correction function [InB.H]. And also can be used as correction function of max. display value (H-SC). Adjustment range is 0.100 to 5.000 and multiply current gradient.
E.g.) Input: DC200mV, Display: 3.000 for MT4W-DV



① Select 0-1VDC[1U] for measurement input in Parameter1.
② Standard specification in input: 0-1VDC⎓ and 1.000 therefore it has to be 15.000 (H-SC) for 1VDC⎓ (input) in order to display 3.000 for 200mVDC⎓ (input). But it is disable due to setting range is 9.999
③ In this case, please check below chart. Please set as InB.H × H-SC =15.000

Setting	H-SC	L-SC	InB.H	Other
①	Disable	0.000	1.000	—
②	7.500	0.000	2.000	In this case, any setting methods display the same display value.
③	5.000	0.000	3.000	
④	3.750	0.000	4.000	
⑤	3.000	0.000	5.000	

◎ Error correction [PA 1 group: InB.H / InB.L]
It corrects display value error of measured input.
InB.L : ±99 [Adjust deviation of low value]
InB.H: 5.000 to 0.100 [Correct gradient (%) of high value]
Display value= (measured value × InB.H) + InB.L
E.g.) When the measured range is 0 to 500V, and the display range is 0 to 500.0. If the low display value is "1.2" to 0V input, set -12 as InB.L value to display "0.0" by adjusting offset of the low value. The display value to 500V measured input varies by adjusting the offset of low value. If this display value is "501.0", calculate 500.0/501.0 (desired display value/the display value), and set the 0.998 correction value as the InB.H to display 500.0 by adjusting gradient of high value.
※The offset correction range of InB.L is within -99 to 99 for D^{-0}, D^{-1} digit regardless of decimal point.

◎ Display cycle delay [PA 2 group: dISP]
In some applications the measured input may fluctuate which in turn causes the display to fluctuate. By adjusting the display cycle delay function time in the dISP of parameter 2, the operator can adjust the display time within a range of 0.1 sec to 5 sec. For example, if the operator sets the display cycle time to 4.0 sec, the display value displayed will be the average input value over 4 sec and also will show any changes if any every 4 sec.

◎ Monitoring peak display value [PA 0 group: H.PEU/L.PEU, PA 2 group: PEUt]

It monitors max./min. value of display value based on the current displays value and then displays the data at H.PEU, L.PEU of parameter 0. Set the delay time (0 to 30 sec) at PEUt of parameter 2 in order to prevent malfunction caused by initial overcurrent or overvoltage, when monitoring the peak value.
Delay time is 0 to 30 sec and it starts to monitor the peak value after the set time. When pressing any one of ◁ ▽ △ keys at H.PEU, L.PEU of parameter 0, the monitored data is initialized.

※H.PEU, L.PEU parameters is not displayed when monitoring delay time [PEUt] of parameter 2 group is set as 00 sec [00 S].

◎ Preset output operation mode [PA 2 group: oUt]

Mode	Output operation	Operation
	HSEt / LSEt	H: Hysteresis
oFF		No output
LSt	GO / LO	If it is equal or smaller than low setting value, LO output will be ON. If it is bigger than low setting value, GO output will be ON.
HSt	HI / GO	If it is equal or bigger than high setting value, HI output will be ON. If it is equal or smaller than high setting value, GO output will be ON.
LHSt	HI / GO / LO	If it is equal or smaller than low setting value and equal or bigger than high setting value, the output will be ON. If it is bigger than Low setting value and smaller than high setting value, GO output will be ON.
HHSt	HI / GO / LO	If it is equal or bigger than low set and equal or bigger than high set value, output will be ON. If it is smaller than low setting value and high setting value, GO output will be ON.
LLSt	HI / GO / LO	If it is equal or smaller than low setting value, LO output will be ON. If it is equal or smaller than high setting value, HI output will be ON. If it is bigger than low setting value and High setting value, GO output will be ON.
LdSt	GO / LO	This operation is the same as LSt But it doesn't operate at initial low set value, it will operate at next low set value. If this is higher than low set value, Go output will be ON.

※"H" means hysteresis and able to set 1 to 99 at "HYS" mode in **PA 2** among above comparison output chart.
※ HSEt is displayed according to the setting of output operation mode, when user sets "oFF", HSEt / LSEt are not displayed.
※Only LSt setting is available in MT4Y-□-43 and MT4Y-□-44 models.

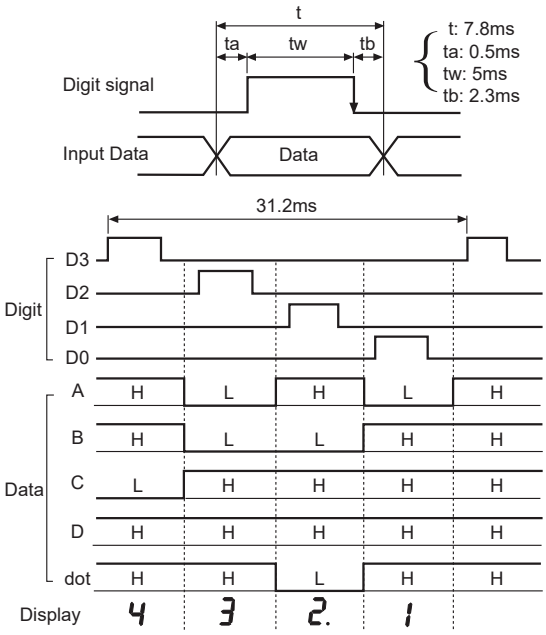
◎ Sub output

- RS485 communication output
  It is able to set address (01 to 99)
  It is able to transmit by selecting modulation speed (transmitted number of signal per 1 sec) of serial trans -mission. (selectable 1200, 2400, 4800, 9600bps)
- Low-speed serial output
  It outputs current display value as Low-frequency (50Hz) type.
- Transmission (DC4-20mA) output
  It outputs DC4-20mA against High/Low-limit scale. (resolution: 12000 division)
- BCD dynamic output
  It outputs display value as BCD Code.

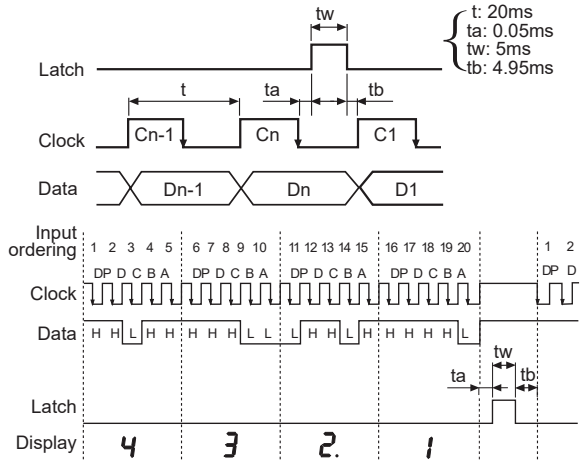
※**Only one sub-output is selectable.**
(More than one sub-output is not allowed.)

◎ Time chart of BCD dynamic output and Serial output

- BCD dynamic output (negative logic)



- Serial output (negative logic)-Clock frequency:50Hz



DIN W48×H24mm Small Size Digital Multi Panel Meter

▣ Features

- Various input/output options (by model)
  - Input options: DC voltage, DC current, AC voltage, AC current
  - Output options: RS485 communication output, PV transmission output (DC 4-20mA), NPN/PNP open collector output, relay contact output
    ※default option: indicator/no output
- Maximum allowed input: 50VDC, 250VAC, DC500mA, AC5A
- Display range: -1999 to 9999
- High/low-limit display scale function
- AC frequency measurement (range: 0.1 to 9999Hz)
- Various functions: peak display value monitoring, display cycle delay, zero-point adjustment, peak display value correction, PV transmission output (DC4-20mA) scale
- Power supply: 12-24VDC/VAC, 100-240VAC

Please read "Safety Considerations" in the instruction manual before using.

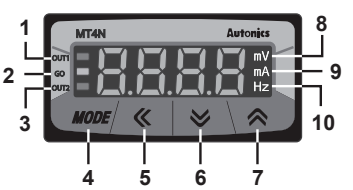
▣ Ordering Information

MT **4** **N** – **DV** – **E** **N**

Output	**N**	Indicator
	0	Relay (OUT1/OUT2) output
	1	NPN open collector output (OUT1, GO, OUT2)
	2	PNP open collector output (OUT1, GO, OUT2)
	3	Relay (OUT1)+transmission (DC4-20mA) output
	4	Relay (OUT1)+RS485 communication output
	5	Relay (OUT1/OUT2)+transmission (DC4-20mA) output
Power supply	**E**	12-24VDC, 12-24VAC 50/60Hz
	4	100-240AC 50/60Hz
Measurement function (input)	**DV**	DC voltage
	DA	DC current
	AV	AC voltage
	AA	AC current
Size	**N**	DIN W48×H24mm
Digit	**4**	9999 (4-digit)
Item	**MT**	Multi Meter

※To measure the current over DC500mA, please select DV type because the shunt should be used.
※In case of selecting frequency display, no output will be provided even if it is output support models. (main output, sub output and RS485 communication output)

▣ Unit Description



1. **OUT1**: Preset output of OUT1
2. **GO**: Preset Go output of OUT1/OUT2
3. **OUT2**: Preset output of OUT2
4. MODE **key**: Mode key
5. ≪ **key**: Shift key
6. ≫ **key**: Down key
7. ≫ **key**: Up key
8. **mV, V unit**
9. **mA, A unit**
10. **Hz unit**

※There is no **1**, **2**, **3** on a display panel of MT4N-□-□N.
※MT4N-□-□3, □4 model has output display part of OUT1 only.

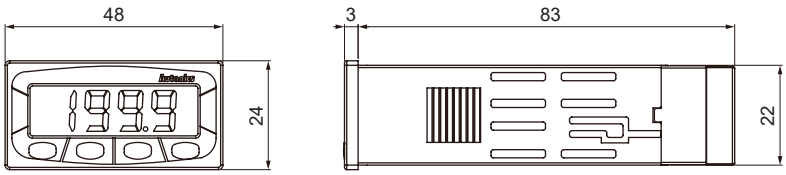
▣ Specifications

Series	MT4N-DV-E□ MT4N-DA-E□	MT4N-AV-E□ MT4N-AA-E□	MT4N-DV-4□ MT4N-DA-4□	MT4N-AV-4□ MT4N-AA-4□
Measurement input	DC voltage, current	AC voltage, current, frequency	DC voltage, current	AC voltage, current, frequency
Power supply	12-24VDC⎓, 12-24VAC~ 50/60Hz		100-240VAC~ 50/60Hz	
Allowable voltage range	90 to 110%			
Power consumption	DC: 3W, AC: 5VA For MT4N-□-E5- DC: 5W, AC: 8VA		5VA	
Display method	7-segment LCD display (red) (character height: 9mm)			
Display accuracy	• 23℃±5℃ - DC input: F.S. ±0.1% rdg ±2-digit / AC input: F.S. ±0.3% rdg ±3-digit ※For 5A terminal of current Input, F.S. +0.3% rdg ±3-digit • -10℃ to 50℃ - DC/AC input: F.S. ±0.5% rdg ±3-digit			
Max. allowable input	110% F.S. for each measured input range			
A/D conversion method	Practical oversampling using successive approximation ADC			
Sampling cycle	DC input: 50ms, AC input: 16.6ms			
Max. display range	-1999 to 9999 (4-digit)			
Preset output	• Relay output - Contact capacity: 125VAC~ 0.3A, 30VDC⎓ 1A/Contact composition: N.O (1a) • NPN/PNP open collector output - Max. 12-24VDC⎓ ±2V 50mA (resistive load)			
Sub output (transmission output)	• RS485 comm. output - Baud rate: 1,200/2,400/4,800/9,600, Communication method: 2-wire half duplex, Synchronous method: Asynchronous method, Protocol: Modbus type • DC4-20mA output - Resolution: 12,000 division (load resistance max. 600Ω)			
AC measurement※1	Selectable RMS or AVG			
Frequency measurement※1	Measurement range: 0.100 to 9999Hz (variable by decimal point position)			
Hold function※2	Includes (external hold function)			
Insulation resistance	Over 20MΩ (at 500VDC megger)			
Dielectric strength	1000VAC 50/60Hz for 1 min (between external terminal and case)		2000VAC 50/60Hz for 1 min (between external terminal and case)	
Noise immunity	±2kV the square wave noise (pulse width: 1μs) by the noise simulator			
Vibration – Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours			
Vibration – Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min			
Shock – Mechanical	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times			
Shock – Malfunction	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times			
Environment – Ambient temperature	-10 to 50℃, storage: -20 to 60℃			
Environment – Ambient humidity	35 to 85%RH, storage: 35 to 85%RH			
Insulation type	Double insulation or reinforced insulation (mark: ⧈, dielectric strength between the measurement input part and the power part: 1kV)			
Approval	CE		—	
Weight※3	Approx. 127g (approx. 64g)			

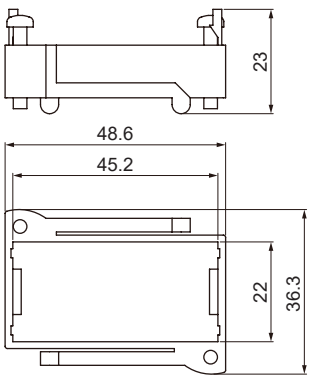
※1: AC, frequency measurement functions are only for AC measurement input type. ※2: The indicator has no Hold function.
※3: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Dimensions

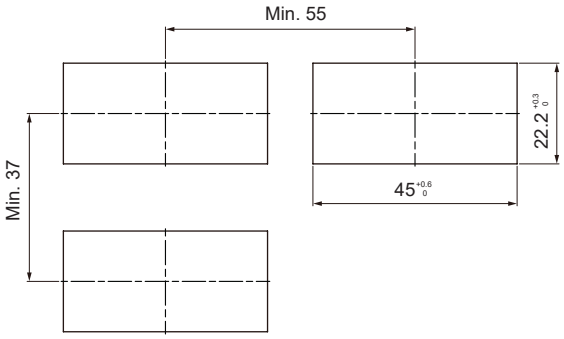
(unit: mm)



● Bracket

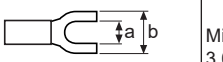


● Panel cut-out



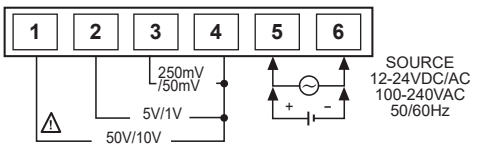
▣ Connections

※Use terminals of size specified below.

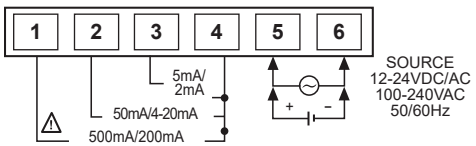
	a	b
 <Forked>	Min. 3.0mm	Min. 6.0mm

◎ Measurement input terminal connection

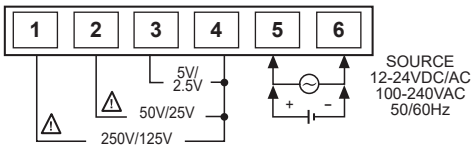
● **MT4N-DV-** □□



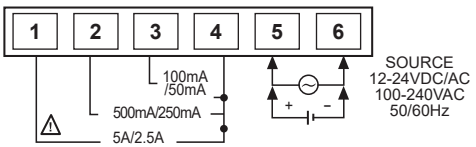
● **MT4N-DA-** □□



● **MT4N-AV-** □□

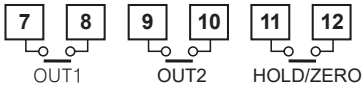


● **MT4N-AA-** □□

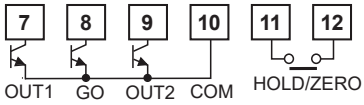


◎ Output terminal connection

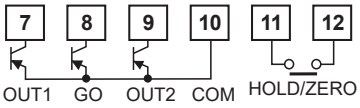
● **MT4N-□-□0**
(Relay output)



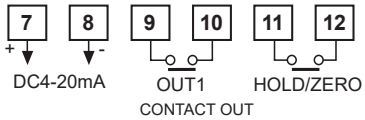
● **MT4N-□-□**
(NPN open collector output)



● **MT4N-□-□2**
(PNP open collector output)

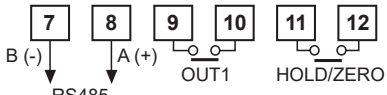


● **MT4N-□-□3**
(Relay+transmission (DC4-20mA) output)



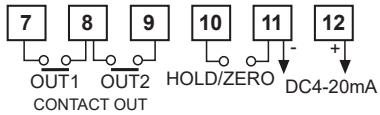
CONTACT OUT
: 125VAC 0.3A 1a, 30VDC 1A 1a RESISTIVE LOAD

● **MT4N-□-□4**
(Relay+RS485 communication output)



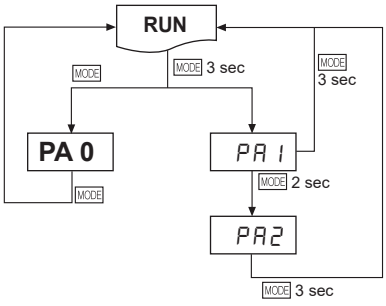
CONTACT OUT
: 125VAC 0.3A 1a, 30VDC 1A 1a RESISTIVE LOAD

● **MT4N-□-□5**
(Relay+transmission (DC4-20mA) output)



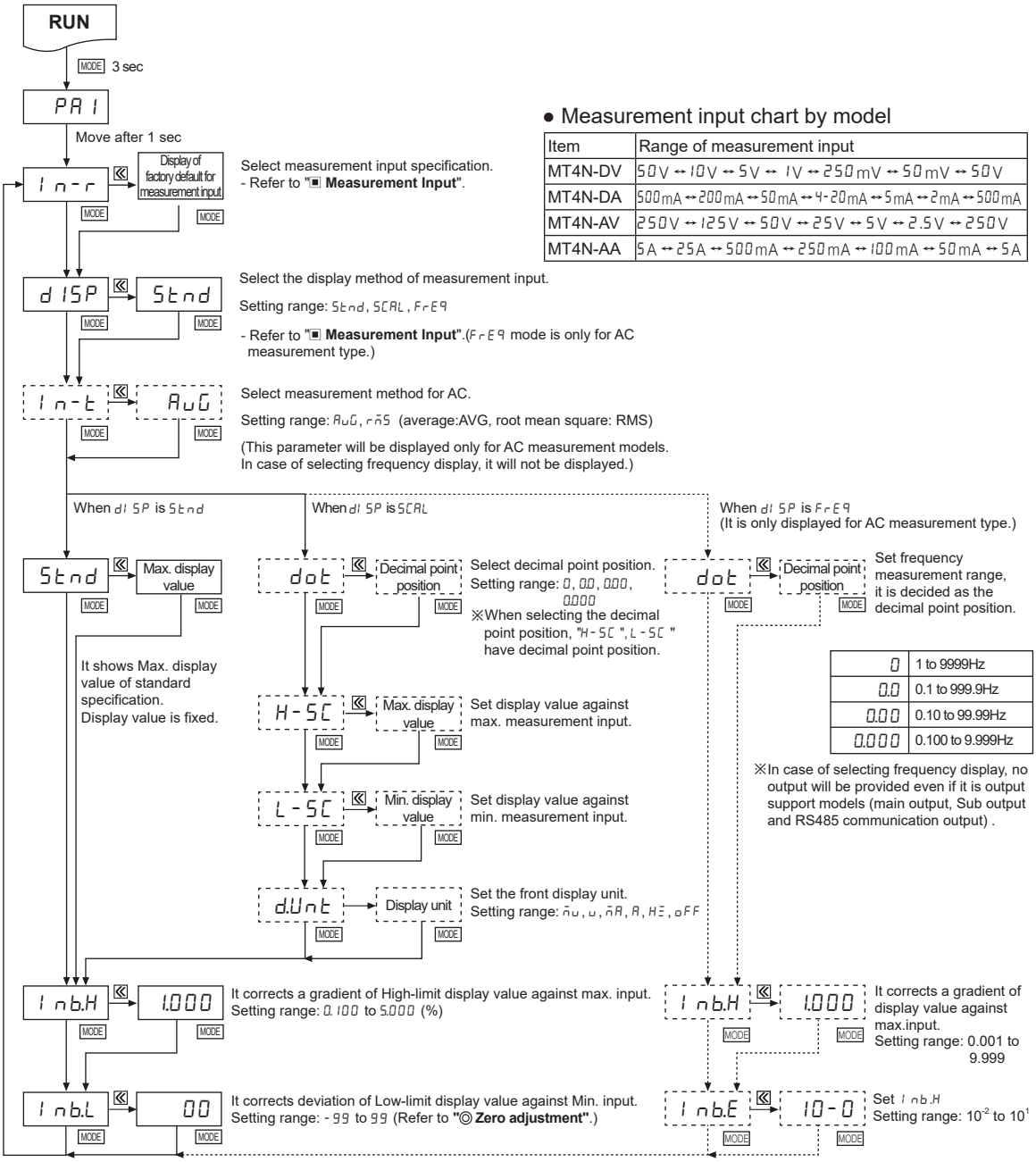
CONTACT OUT
: 125VAC 0.3A 1a, 30VDC 1A 1a RESISTIVE LOAD

▣ Parameter Setting



※Press MODE key in **RUN** mode and it enters **PA 0** group.
※Press MODE key for over 3 sec in **RUN** mode, it displays [PA 1].
※Press MODE key for over 5 sec in **RUN** mode, it displays [PA2] after [PA 1].
When pressing MODE key continually, it stops displaying at [PA2].
※It is advanced to current display parameter releasing MODE key at [PA 1] or [PA2].
※Press MODE key for over 3 sec in any parameter groups, it returns to **RUN** mode.
※If any key is not entered for 60 sec in each parameter, it returns to **RUN** mode.
※After returning to **RUN** mode, press MODE key within 2 sec, it returns to previous parameter. (Refer to descriptions of each parameter group.)
※**PA 0** group cannot be entered when preset output mode of [PA2] group is oFF.

▣ Parameter 1 Group



● Measurement input chart by model

Item	Range of measurement input
MT4N-DV	50V ↔ 10V ↔ 5V ↔ 1V ↔ 250mV ↔ 50mV ↔ 50V
MT4N-DA	500mA ↔ 200mA ↔ 50mA ↔ 4-20mA ↔ 5mA ↔ 2mA ↔ 500mA
MT4N-AV	250V ↔ 125V ↔ 50V ↔ 25V ↔ 5V ↔ 2.5V ↔ 250V
MT4N-AA	5A ↔ 2.5A ↔ 500mA ↔ 250mA ↔ 100mA ↔ 50mA ↔ 5A

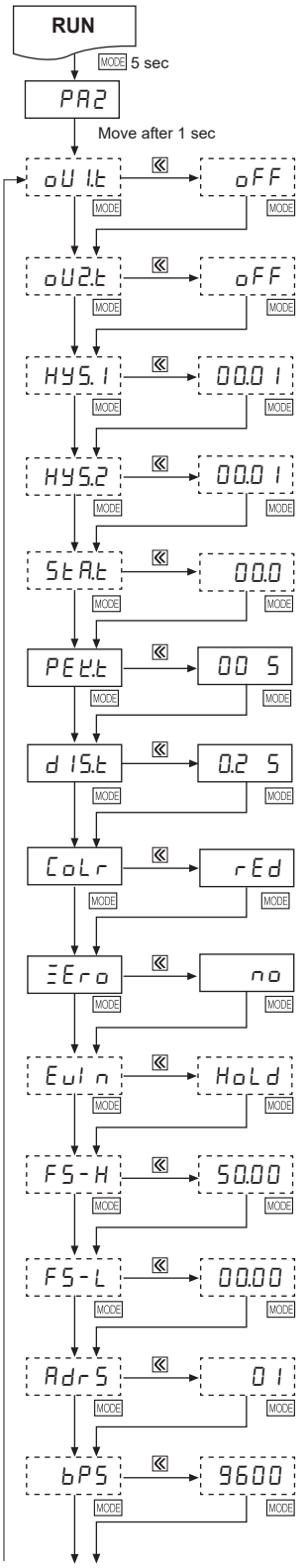
※After setting each mode, press MODE key for 2 sec to return to **RUN**.
※If any key is untouched for 60 sec after advance to Parameter, it will return to **RUN**.

◎ Factory defaults

Parameter	MT4N-DV	MT4N-DA	MT4N-AV	MT4N-AA
In-r	50	500	250	5
dI SP	Stnd	Stnd	Stnd	Stnd
In-t	—	—	AvG	AvG
Stnd	50.00	500.0	250.0	5.000
d-Unt	u	A	u	A

Parameter	MT4N-DV	MT4N-DA	MT4N-AV	MT4N-AA
InbH	1.000	1.000	1.000	1.000
InbL	00	00	00	00
dot	0.00	0.0	0.0	0.000
InbE	—	—	10-0	10-0

▣ Parameter 2 Group



Select Preset output mode of OUT1. (But, it is only displayed in OUT1 output included model.)
Setting range: oFF, HI, Lo, HL, HL-G

Select Preset output mode of OUT2. (But, it is only displayed in OUT2 output included model.)
Setting range: oFF, HI, Lo, HL, HL-G

Select Preset hysteresis of OUT1.
The range is within 10% of max. display range (unit: digit).
※ oUt.t mode is oFF, it is not displayed.

Select Preset hysteresis of OUT2.
The range is within 10% of max. display range (unit: digit).
※oU2.t mode is oFF, it is not displayed.

Set startup compensation time.
Setting range: 00 to 99.9 sec

When initially supplying power, delays monitoring of high-limit/low-limit value of display value for the set time.
Setting range: 00 to 30 sec
※If it is set to 00 sec [00 S], parameters of high-peak monitoring value [HPEA]/low-limit monitoring value [LPEA] in the parameter 0 group will be not displayed.

Set display cycle and also variable sets by 0.1 sec.
Setting range: 0.1 to 5.0 sec

Selectable color with 5 modes.
Setting range: rEd, Grn, YEL, r-G, G-r
rEd, Grn, YEL: Display with 1 color. r-G, G-r: Color is changed when error occurs.
E.g.) r-G: Red is standard and green when error occurs.
※Color is changed only when error in "▣ **Error Display Function**" occurs excluding 'over'.

Select zero function with operation at front.
When ≪ + ≪ Key are pressed for 3 sec to set YES, it will be zero function and the deviation value is saved automatically at Inb.L mode.

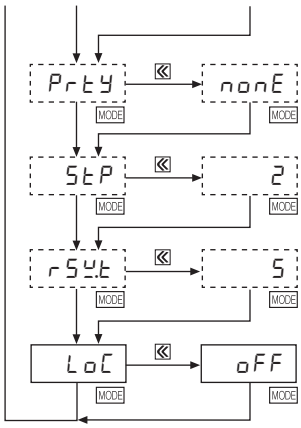
Select HoLd input with 11, 12 terminal or zero function for external signal.
(set with ≪, ≪ Key)
HoLd: Holding display value, ZEro: Zero function using Hold/Zero terminal

Set the high limit value, output point of current output 20mA.
(When changing measurement input and prescale mode, it is changed automatically as maximum value of input range.)

Set the low limit value, output point of current output 4mA.
(When changing measurement input and prescale mode, it is changed automatically as minimum value of input range.)

Set the address of RS485 communication output.
Setting range: 01 to 99

Select baud rate of RS485 communication output.
Setting range: 9600, 4800, 2400, 1200



Set parity bit of RS485 communication.
Setting range: nonE, EuEn, odd

Set stop bit of RS485 communication.
Setting range: 1, 2

Set response wait time of RS485 communication.
Setting range: 5 to 99

Set key lock function and select from 4 types.
Setting range: oFF, LoC 1, LoC2, LoC3

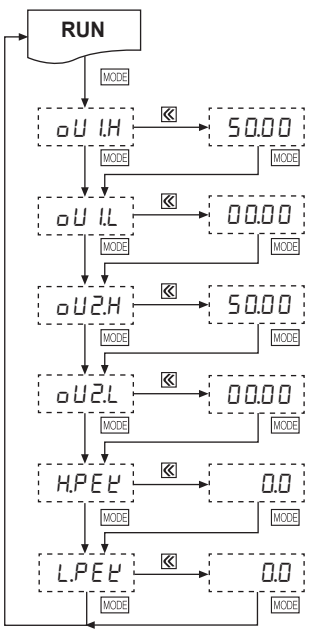
oFF	Disable to lock keys
LoC 1	Lock Parameter 1
LoC2	Lock Parameter 1, 2
LoC3	Lock Parameter 0, 1 and 2

※The dotted mode is only displayed for output type.
※After setting each mode, press [MODE] key for 2 sec to return to **RUN** mode.
※If any key is untouched for 60 sec after advance to parameter, it will return to **RUN** mode.
※The min. setting interval between FS-H and FS-L is 10% F.S., it is fixed as 10% of the setting value when it is small.

◎ Factory defaults

Parameter	MT4N-DV	MT4N-DA	MT4N-AV	MT4N-AA	Parameter	MT4N-DV	MT4N-DA	MT4N-AV	MT4N-AA
oUt	oFF	oFF	oFF	oFF	ΞErO	no	no	no	no
oU2t	oFF	oFF	oFF	oFF	Eut n	HoLd	HoLd	HoLd	HoLd
HYS.1	00.01	000.1	000.1	0.001	FS-H	50.00	500.0	250.0	5.000
HYS.2	00.01	000.1	000.1	0.001	FS-L	00.00	000.0	0.0	0.000
PEVt	00 5	00 5	00 5	00 5	AdrS	01	01	01	01
dISt	0.2 5	0.2 5	0.2 5	0.2 5	bPS	9600	9600	9600	9600
CoLr	rEd	rEd	rEd	rEd	LoC	oFF	oFF	oFF	oFF

▣ Parameter 0 Group



Set High-limit preset value of oU 1H. (set with [◁], [△], [▽] key)
※It is displayed when set the preset only.
When set oFF in oUt mode of the parameter 2 group, the parameter is not displayed.

Set Low-limit preset value of oU 1L. (set with [◁], [△], [▽] key)
※It is displayed when set the preset only.
When set oFF in oUt mode of the parameter 2 group, the parameter is not displayed.

Set High-limit preset value of oU2H. (set with [◁], [△], [▽] key)
※It is displayed when set the preset only.
When set oFF in oU2t mode of the parameter 2 group, the parameter is not displayed.

Set Low-limit preset value of oU2L. (set with [◁], [△], [▽] key)
※It is displayed when set the preset only.
When set oFF in oU2t mode of the parameter 2 group, the parameter is not displayed.

It shows High-limit monitoring value while it is **RUN** status.
It will be reset by pressing any [◁], [△], [▽] key.
※H.PEV parameter is not displayed when PEVt parameter is set as 00 sec [00 5] at the parameter 2 group.

It shows Low-limit monitoring value while it is **RUN** status.
It will be reset by pressing any [◁], [△], [▽] key.
※L.PEV parameter is not displayed when PEVt parameter is set as 00 sec [00 5] at the parameter 2 group.

※If any key is untouched for 60 sec after advance to parameter, it will return to **RUN** mode.

◎ Factory defaults

Parameter	MT4N-DV	MT4N-DA	MT4N-AV	MT4N-AA	Parameter	MT4N-DV	MT4N-DA	MT4N-AV	MT4N-AA
oU 1H	50.00	50.00	250.0	5.000	oU2L	00.00	000.0	000.0	0.000
oU 1L	00.00	000.0	000.0	0.000	H.PEV	0.00	0.0	0.0	0.000
oU2H	50.00	500.0	250.0	5.000	L.PEV	0.00	0.0	0.0	0.000

▣ Measurement Input

Type	Measurement input range		Input impedance	Display range [Stnd]	Prescale display range [SCAL]
DC voltage	0-50V	[50V]	434.35kΩ	0.00 to 50.00 (fixed)	
	0-10V	[10V]	434.35kΩ	0.00 to 10.00 (fixed)	
	0-5V	[5V]	43.35kΩ	0.000 to 5.000 (fixed)	
	0-1V	[1V]	43.35kΩ	0.000 to 1.000 (fixed)	
	0-250mV	[250mV]	2.15kΩ	0.0 to 250.0 (fixed)	
	0-50mV	[50mV]	2.15kΩ	0.00 to 50.00 (fixed)	
DC current	0-500mA	[500mA]	0.1Ω	0.0 to 500.0 (fixed)	
	0-200mA	[200mA]	0.1Ω	0.0 to 200.0 (fixed)	
	0-50mA	[50mA]	1.1Ω	0.00 to 50.00 (fixed)	
	4-20mA	[4-20mA]	1.1Ω	4.00 to 20.00 (fixed)	
	0-5mA	[5mA]	101.1Ω	0.000 to 5.000 (fixed)	
	0-2mA	[2mA]	101.1Ω	0.000 to 2.000 (fixed)	
AC voltage	0-250V	[250V]	1.109MΩ	0.0 to 250.0 (fixed)	
	0-125V	[125V]	1.109MΩ	0.0 to 125.0 (fixed)	
	0-50V	[50V]	200kΩ	0.00 to 50.00 (fixed)	
	0-25V	[25V]	222kΩ	0.00 to 25.00 (fixed)	
	0-5V	[5V]	22kΩ	0 000 to 5.000 (fixed)	
	0-2.5V	[2.5V]	22kΩ	0.000 to 2.500 (fixed)	
AC current	0-5A	[5A]	0.01Ω	0.000 to 5.000 (fixed)	
	0-2.5A	[2.5A]	0.01Ω	0.000 to 2.500 (fixed)	
	0-500mA	[500mA]	0.1Ω	0.0 to 500.0 (fixed)	
	0-250mA	[250mA]	0.1Ω	0.0 to 250.0 (fixed)	
	0-100mA	[100mA]	0.5Ω	0.0 to 100.0 (fixed)	
	0-50mA	[50mA]	0.5Ω	0.00 to 50.00 (fixed)	

Prescale display range [SCAL]:

dot	Display range
0	-1999 to 9999
0.0	-199.9 to 999.9
0.00	-19.99 to 99.99
0.000	-1.999 to 9.999

(Display range is variable according to decimal point position.)

※Connect to the input terminals whose 30% to 100% of the input range includs the max. value of the input range to measure.
When the max. input value is under the 30% of the input terminal range, display accuracy is degraded.
When the max. input value is over the 100%, it may result in input terminal damage.

※When "HHHH" or "LLLL" is flashes with a certain measurement input, disconnect power supply and then check the cables.

▣ Sold Separately

◎ Communication converter

- **SCM-WF48**
  (Wi-Fi to RS485·USB wireless communication converter)

- **SCM-US48I**
  (USB to RS485 converter)

- **SCM-38I**
  (RS232C to RS485 converter)

◎ Display Units (DS/DA-T Series)

- **DS/DA-T Series**
  (RS485 communication input type display unit)

DS16-□T

DS22/DA22-□T

DS40/DA40-□T

DS60/DA60-□T

※Connect RS485 communication input type display unit (DS/DA-T Series) and RS485 communication output model of MT4N Series, the display unit displays present value of the device without PC/PLC.

▣ Functions

◎ AC frequency measurement [PA1 group: dISP]

It measures input signal frequency when it is AC input.
It uses fixed decimal point[**PA 1**: dot], measured range can be changed by setting and measured range of decimal point position is as below chart. It is available to adjust the upper gradient at [**PA 1**: InB.H] and [**PA 1**: InB.E]. In order to measure frequency normally, input signal, over 10% F.S. of the measured range, should be supplied. Please select the proper point of measurement terminal.

① Measurement range

Decimal point position	0.000	0.00	0.0	0
Decimal point position	0.100 to 9.999Hz	0.10 to 99.99Hz	0.1 to 999.9Hz	1 to 9999Hz

※Accuracy of frequency measurement:
Below 1kHz, F.S. ±0.1rdg ±2-digit.
From 1kHz to 10kHz, F.S. ±0.3rdg ±2-digit.

② InB.H: 0.100 to 9.999
[Gradient adjustment of high value]

③ InB.E: 10^{-2}, 10^{-1}, 10^{0}, 10^{1} [Index adjustment of InB.H]

◎ Zero adjustment [Deviation correction function of low limit display value]

It adjusts the display value of the optional configured input value as zero by force, zero point error can be adjusted with 3 ways as below. When zero point adjustment with front key and Hold terminal is finished normally, zero point of measurement terminal is displayed and the adjusted value at saved in InbL automatically.

Operation	Input correction value	Front panel key	Input external signal
Description	**PA 1**:Direct input correction value method at InbL	≪, ≪ keys are pressed for 3 sec at the RUN mode.	Short-circuit External hold terminal 11, 12 over min. 50m.

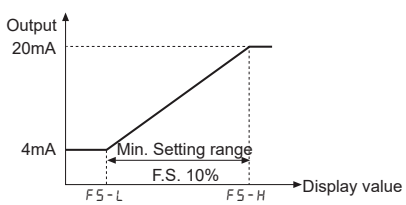
※Refer to "◎ **Error correction**", "◎ **Error display**" and "▣ **Parameter 2 Group**" for function and error.

◎ Transmission (DC4-20mA) output scale [PA 2 group: FS-H / FS-L]

It sets transmission output for the display value at the output current DC4-20mA.
It sets display value for 4mA at FS-L and 20mA at FS-H and the range between FS-H and FS-L should be 10%

※When min. set interval between FS-H and FS-L is set as under 10% F.S., it changed as over 10% F.S. automatically.

※Preset display value is fixed to output as 4mA at under FS-L and 20mA at over FS-H.



◎ Initialization

It initializes as the factory default status. If press ≪, ≪, ≪ keys together for 2 sec in **RUN** mode, InIt mode and the setting value [no] is displayed every 0.5 sec and it will be initialized as the factory default when press MODE key after change no → YES.

◎ Error display

Display	Description
HHHH	Flashes when measurement input is exceeded the max. allowable input (110%)
LLLL	Flashes when measurement input is exceeded the max. allowable input (-10%)
d-HH	Flashes when display input is exceeded max. display range (9999)
d-LL	Flashes when display input is exceeded min. display range (-1999)
F-HH	Flashes when measurement frequency is exceeded the max. measurement value (9999)
ouEr	Flashes when it exceeds zero adjustment range (±99)

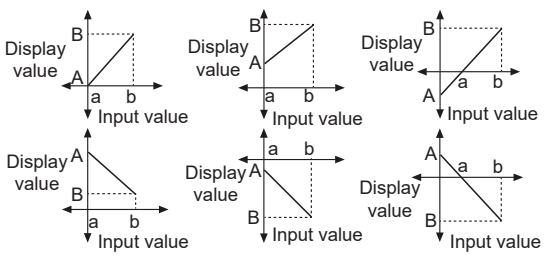
※Error display is released automatically when it is in the measured and display range.

※"LLLL" is displayed when the measurement input is DC4-20mA.

※After flashing "ouEr" 2 times when it exceeds the zero adjustment range, it returns to RUN mode.

◎ Display scale [PA 1 group: H-SC / L-SC]

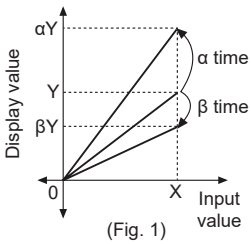
This function is to display setting (-1999 to 9999) of particular High/Low-limit value in order to display High/Low-limit value of measured input. If measured inputs are 'a' and 'b' and particular values are 'A' and 'B', it will display a=A, b=B as below graphs.



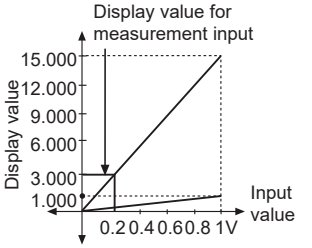
◎ Gradient correction [PA1 group: I nb.H]

It corrects the gradient of prescale value and display value. (Fig. 1) Display value Y can be adjusted as α, β times against X input value by correction function [I nb.H] and used as correction function of max. display value [H-SC]. Adjustment range is 0.100 to 5.000 and multiply current gradient.

E.g.) To display "3.000" in DC 200mV input for measured input specification as 0 to 1V.



(Fig. 1)



(example of gradient correction)

①Select 0-1VDC[Iu] for measured input in Parameter 1.
②Standard specification in input: 0-1VDC and 1.000 therefore it has to be 15.000[H-SC] for 1VDC (input) in order to display 3.000 for 200mVDC (input) .
But it is unable due to setting range is 9.999.
③In this case, please check below chart.
Please set as I nb.H × H-SC = 15.000

Setting	H-SC	L-SC	I nb.H	Note
①	Disable	0.000	1.000	—
②	7.500	0.000	2.000	In this case, any setting methods display the same display value.
③	5.000	0.000	3.000	
④	3.750	0.000	4.000	
⑤	3.000	0.000	5.000	

◎ Error correction [PA 1 group: I nb.H / I nb.L]

It corrects display value error of measured input.
I nb.L : ±99 [Adjust deviation of low value]
I nb.H : 5.000 to 0.100 [Correct gradient (%) of high value]
Display value= (measured value × I nb.H) + I nb.L
E.g.) When the measured range is 0 to 500V, and the display range is 0 to 500.0. If the low display value is "1.2" to 0V input, set -12 as I nb.L value to display "0.0" by adjusting offset of the low value. The display value to 500V measured input varies by adjusting the offset of low value. If this display value is "501.0", calculate 500.0/501.0 (desired display value/the display value) , and set the 0.998 correction value as the I nb.H to display 500.0 by adjusting gradient of high value.
※The offset correction range of I nb.L is within -99 to 99 for D^{-0}, D^{-1} digit regardless of decimal point.

◎ Display cycle delay [PA 2 group: dI SLt]

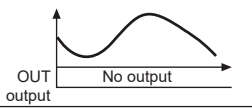
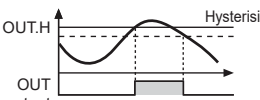
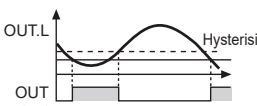
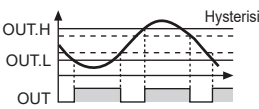
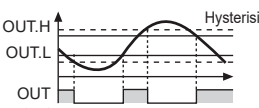
In some applications the measured input may fluctuate which in turn causes the display to fluctuate. By adjusting the display cycle delay function time in the dI SLt of parameter 2, the operator can adjust the display time within a range of 0.1 sec to 5 sec For example, if the operator sets the display cycle time to 4.0 sec, the display value displayed will be the average input value over 4 sec and also will show any changes if any every 4 sec.

◎ Monitoring peak display value [PA 0 group: H.PEU / L.PEU, PA 2 group: PEUt]

It monitors max./min. value of display value based on the current displays value and then displays the data at H.PEU, L.PEU of parameter 0. Set the delay time (0 to 30 sec) at PEUt of parameter 2 in order to prevent malfunction caused by initial overcurrent or overvoltage, when monitoring the peak value.
Delay time is 0 to 30 sec and it starts to monitor the peak value after the set time. When pressing any one of ⟪ ⟫ ⟰ keys at H.PEU, L.PEU of parameter 0, the monitored data is initialized.

※H.PEU, L.PEU parameters is not displayed when monitoring delay time [PEUt] of parameter 2 group is set as 00 sec [00 S].

◎ Preset output operation mode [PA 2 group: oU1t / oU2t]

Mode	Output operation	Operation
oFF		No output
HI		Period ON : Display value ≥ OUT.H Period OFF : Display value ≤ OUT.H-Hys
Lo		Period ON : Display value ≤ OUT.L Period OFF : Display value ≥ OUT.L+Hys
HL		Period ON : Display value ≤ OUT.L or Display value ≥ OUT.H Period OFF : Display value ≥ OUT.L +Hys or Display value ≤ OUT.H-Hys
HL-G		Period ON : OUT.L ≤ Display value ≤ OUT.H+Hys Period OFF : Display value ≤ OUT. L -Hys or Display value ≥ OUT.H+Hys

※Set output mode separately for each OUT1/OUT2.
※OUT1/OUT2 are operated individually depending on output operation mode.
※Setting value mode of parameter group 0 is displayed by output operation mode selection.
※GO is outputted within the period both OUT1/OUT2 are off. (NPN/PNP open collector output type.)

▣ Communication Output

(refer to MT4N/MT4Y/MT4W Command Features section.)

DIN W48×H24mm Small Size Digital Panel Meter

■ Features

- Max. display: 1999
- Auto Zero function and Hold function
- 7-segment LED display
- Power supply: 5VDC, 12-24VDC

Please read "Safety Considerations" in the instruction manual before using.

■ Ordering Information

M 4 N – DV – 0 1

- Item: M – Meter
- Digit: 4 – 1999 (3½-digit)
- Size: N – DIN W48×H24mm
- Measurement function (input): DV – DC Voltage; DA – DC Current; DI – DC4-20mA (scaling meter)※1
- Power supply: 0 – 5VDC; 1 – 12-24VDC
- Measurement input:

	DC voltage input F.S.	DC current input F.S.
1	199.9mV	199.9μA
2	1.999V	1.999mA
3	19.99V	19.99mA
4	199.9V	199.9mA
X	Option	Option

※1: 1-5VDC mearsurement input is option.

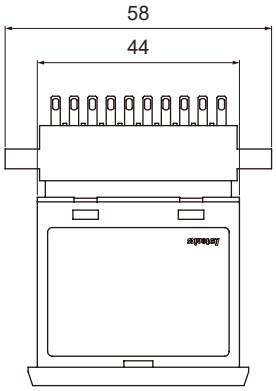
■ Specifications

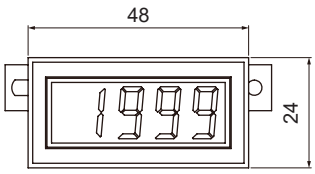
Model		M4N-DV-☐☐	M4N-DA-☐☐	M4N-DI-☐☐
Measurement input		DC voltage	DC current	DC4-20mA
Power supply		5VDC⎓, 12-24VDC⎓		
Allowable voltage range		90 to 110% of rated voltage		
Power consumption		2W		
Display method		7-segment LED display (red) (character height: 10mm)		
Max. display range		1999		
Display accuracy		F.S. ±0.2% rdg ±1-digit		
Sampling period		300ms		
A/D switching method		Dual integral method		
Response time		Approx. 2 sec (0 to 1999)		
Max. allowable input		150% of measurement input range		
Sampling time		2.5 times/sec		
Insulation resistance		Over 100MΩ (at 500VDC megger)		
Dielectric strength		2000VAC 50/60Hz for 1 min		
Noise immunity		±100V the square wave noise (pulse width: 1μs) by the noise simulator		
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour		
	Malfunction	0.5mm amplitude at frquency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min		
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times		
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times		
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃		
	Ambient humidity	35 to 85%RH, storage: 35 to 95%RH		
Unit weight		Approx. 44g		

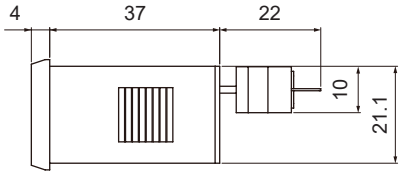
※Environment resistance is rated at no freezing or condensation.

▣ Dimensions

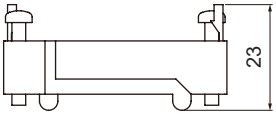
(unit: mm)

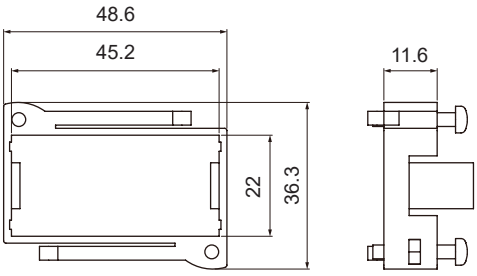




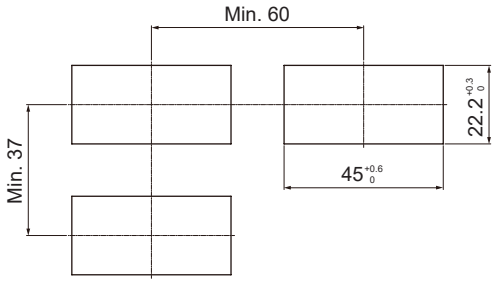


● Bracket

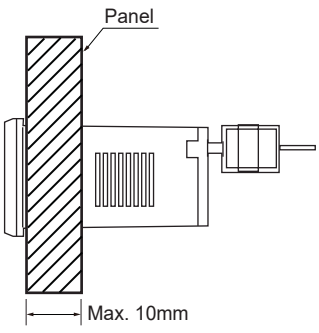




● Panel cut-out

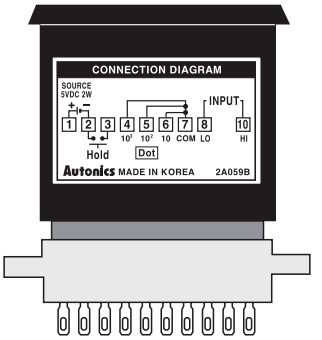


▣ Mounting

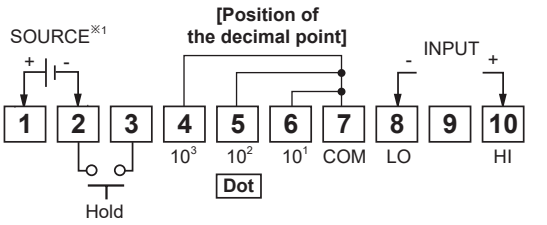


※Panel boad tickness should be less than 10mm.

▣ Connections



※Socket Pin no.: 1 2 3 4 5 6 7 8 9 10



※1: 5VDC, 12-24VDC

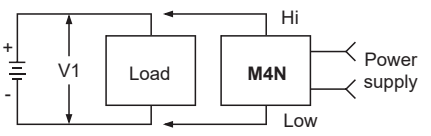
※When changing the position of the decimal point, disconnect switching pattern point on PCB and change the decimal point in the external terminal socket. (Refer to '▣ Proper Usage'.)

※When "𝐼" or "- 𝐼" is flashes with a certain measurement input, disconnect power supply and then check the cables.

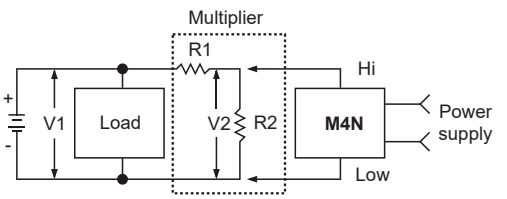
※Socket pin no. 9, NC terminal, is not connected at inside.

▣ Connections of Applications

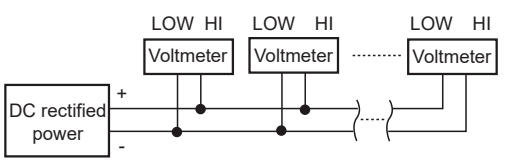
◎ DC voltmeter connection



(Fig. 1) Measuring input (V1) is under 200VDC



(Fig. 2) Measuring input (V1) is under 200VDC



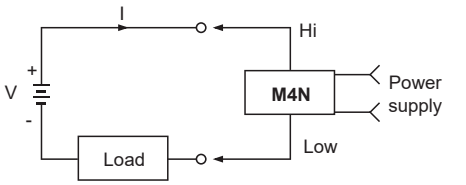
(Fig. 3) In case of using multiple voltmeter

※When the measuring voltage is over 200VDC, please select R1 and R2 in order to make V2 less than max. measuring voltage using multiplier.

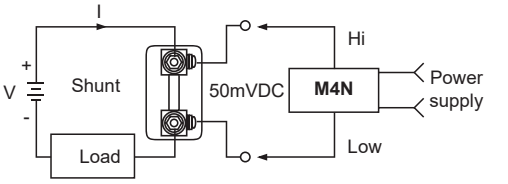
$$V2 = \frac{R2}{R1+R2} \times V1 \qquad R1 > R2$$

※It is available using several voltmeters with providing one DC power. However, the potential difference between - of measurement input and - of power may cause an error.

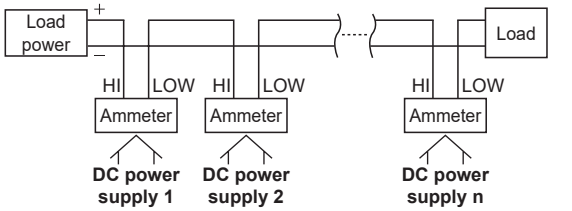
◎ DC ammeter connection



(Fig. 4) Measuring current is under DC200mA



(Fig. 5) Measuring current is 50mVDC



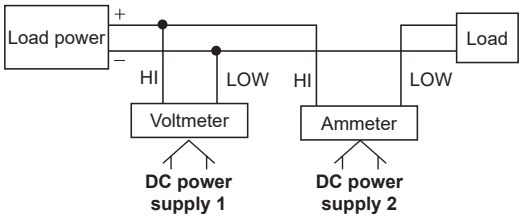
(Fig. 6) In case of using multiple ammeter

※When the current is higher than DC200mA, please use shunt.

※Second section of shunt is DC50mV.

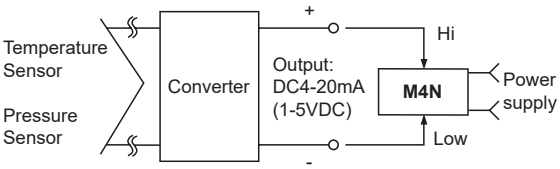
※Ammeter cannot be used with above connection, please provide power separately.

◎ Simultaneous connection of voltmeter and ammeter



※When using voltmeter and ammeter simultaneously, connect the separated power supply each.
※(-) terminal of the power and (-) terminal of measurement input are shorted.
In case of using same power supply, measurement error or overcurrent may occur.

◎ Scaling meter connection

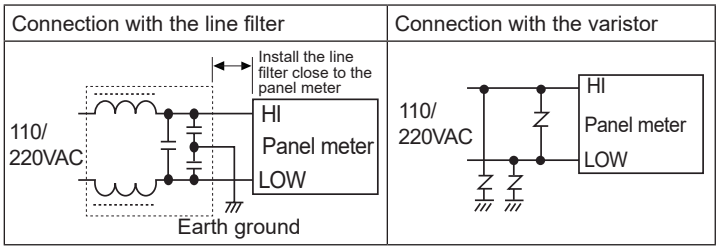


※1-5VDC output of converter is sold separately.

▣ Proper Usage

⚠ Cautions during use

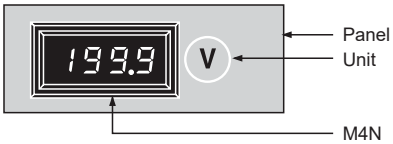
- Follow instructions in 'Cautions during use'. Otherwise, it may cause unexpected accidents.
- 5VAC, 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.



- This unit may be used in the following environments.
  ① Indoors (in the environment condition rated in 'Specifications')
  ② Altitude max. 2,000m
  ③ Pollution degree 2
  ④ Installation category II

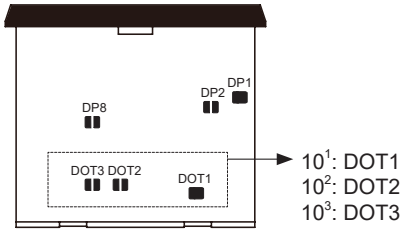
◎ Indicating method of unit

M4N is not indicated a unit on the product, therefore please indicate it in panel.



◎ Display of decimal point

The displaying decimal point is set in the product by your order. (10^1: DOT1, 10^2: DOT2, 10^3: DOT3)
When changing the position of the decimal point, disconnect switching pattern point on PCB and change the decimal point in the external terminal socket.
(If changing only at the external terminal socket not disconnecting switching pattern point on PCB, it displays both set points: one from PCB, one from the external terminal socket)
※DP□ pattern points on PCB are not related with the decimal point. Do not change the soldering.



DIN W48×H24mm, W72×H36mm Loop Powered Digital Scaling Meter

▣ Features

- Loop powered type: Power from measured input
- Measurement input: DC4-20mA
- Max. display range: -1999 to 9999
- High/low-limit display scale function
- Decimal point change function
- High/low-limit input correction function
- Display Max./Min. value monitoring function
- Changeable delay time of monitoring Max./Min. value
- Display cycle change function
  (Selectable 0.5 sec/1 sec/2 sec/3 sec/4 sec/5 sec)
- Error display function

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

M 4 N S – N A

Item	M	Meter
Digit	4	9999 (4-digit)
Size	N	DIN W48×H24mm
	Y	DIN W72×H36mm
Measurement function	S	Scaling
Power supply	N	Loop powered type
Measurement input	A	DC4-20mA

▣ Specifications

Model		M4NS-NA	M4YS-NA
Power supply		Loop powered type	
Display method		7-segment LED display (red)	
Character height		10mm	14mm
Display accuracy※1		F.S. 0.3% rdg ±1-digit	
Display cycle		0.5 sec/1 sec/2 sec/3 sec/4 sec/5 sec	
Resolution		12,000 resolution	
Max. display range		-1999 to 9999	
Setting type		Setting type with the front keys	
Measuring input range※2		DC4-20mA	
Self-diagnosis function		Error display function	
Insulation resistance		Over 100MΩ (at 500VDC megger)	
Dielectric strength		2,000VAC 50/60Hz for 1 min	
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour	
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min	
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times	
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times	
Environment	Ambient temperature	-10 to 50℃, storage: -25 to 60℃	
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH	
Unit weight		Approx. 44g	Approx. 110g

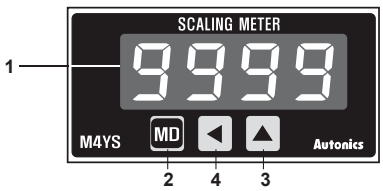
※1: Ambient temperature (25℃±5℃): F.S. 0.3% rdg of ±1-digit (-10 to 50℃: F.S. 0.4% rdg ±1-digit)
※2: Impedance between input lines: Max. 600Ω (based on 24VDC)
Please be aware that activating input power is based on 24VDC, and the recommended impedance also will be lowered if the activating power is lower.
※Environment resistance is rated at no freezing or condensation.

▣ Unit Description

◎ M4NS-NA

1. Display value, parameter, error display
2. M, MD key: When enter into parameter group, return to RUN mode, after completing parameter setting

◎ M4YS-NA

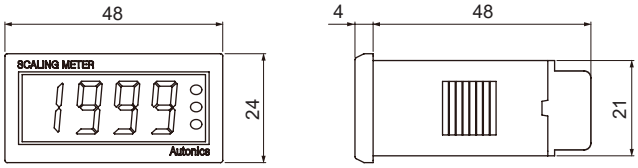


3. ▲, ▲ key: When enter into the status of parameter setting
4. ▲, ◀ key: When enter into the status of parameter setting and move digit

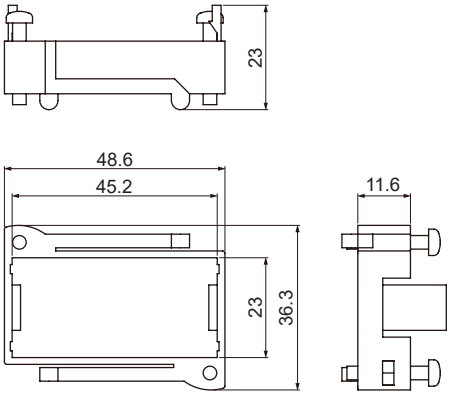
▣ Dimensions

(unit: mm)

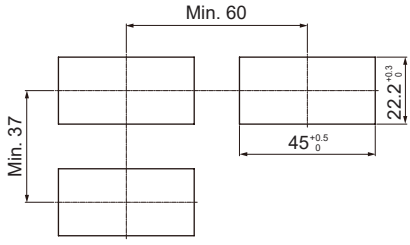
◎ M4NS-NA



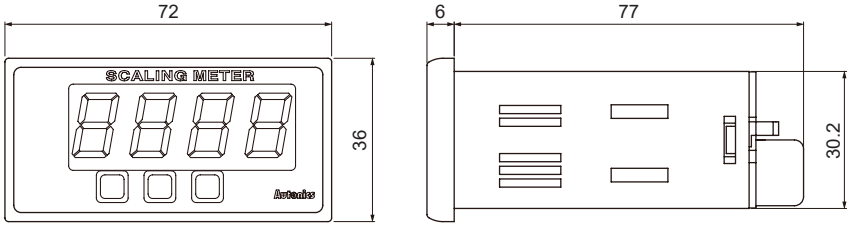
● Bracket



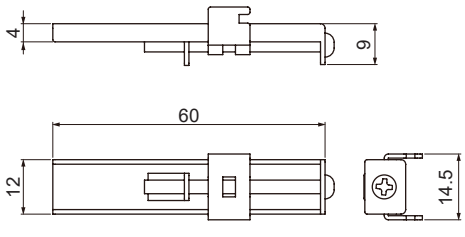
● Panel cut-out



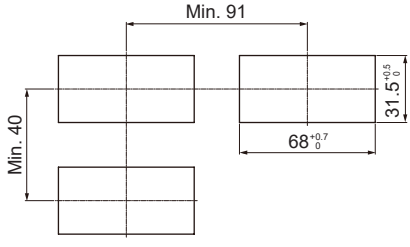
◎ M4YS-NA



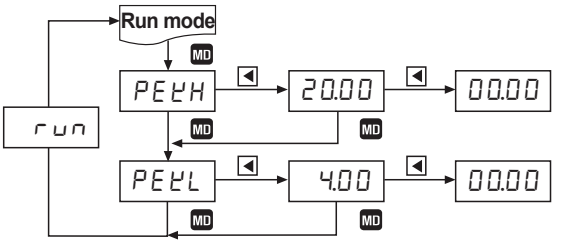
● Bracket



● Panel cut-out

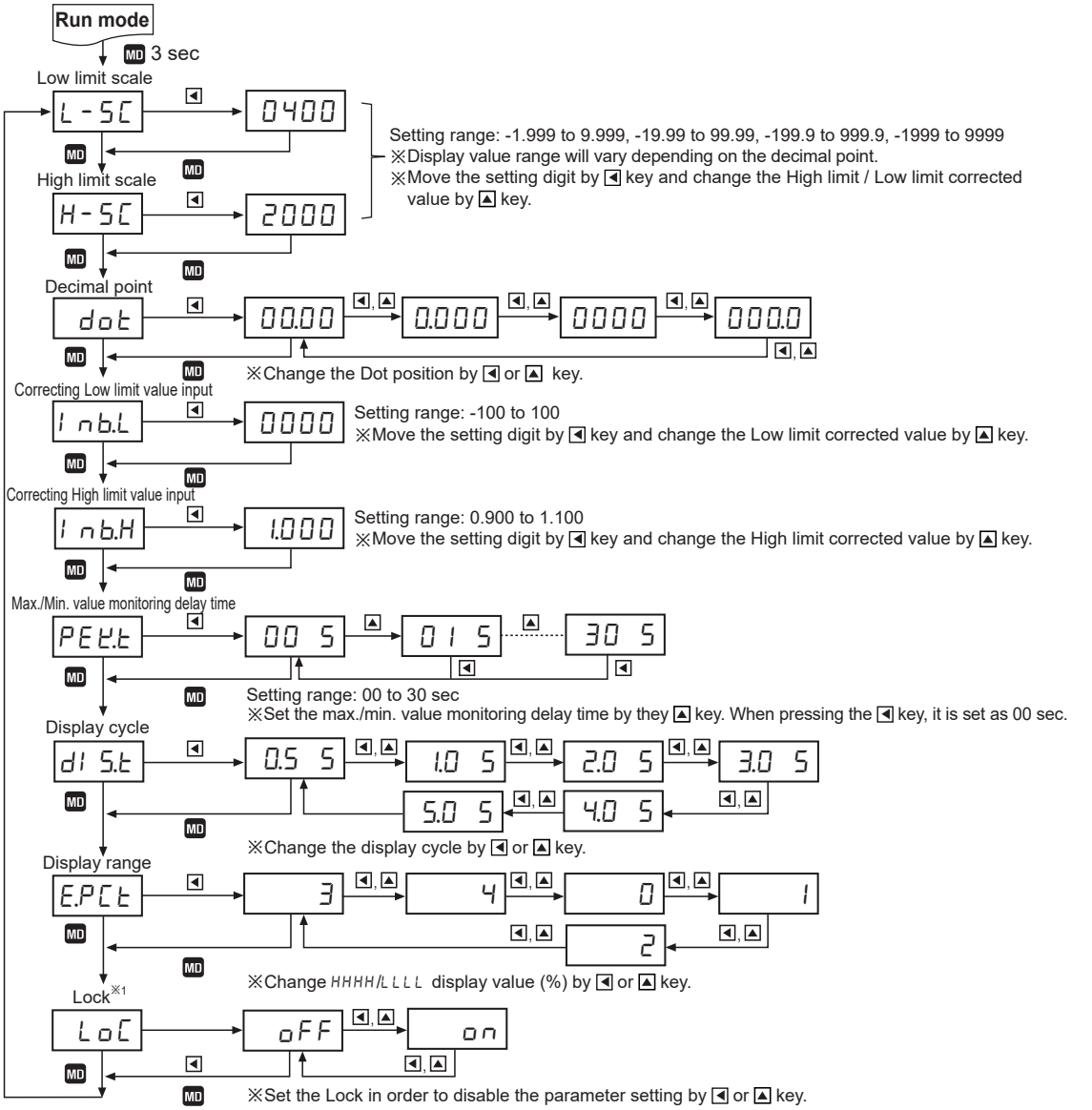


▣ Parameter 0 Group (Monitoring Mode)



1. Pressing MD key to enter monitoring mode in RUN mode.
2. Each Max./Min. value will be shown by pressing ◀ key in monitoring mode and Max./Min. value will be initialized by pressing ◀ key once more.
3. If no key touched for 60 sec, it will return to RUN mode.
4. When do not use monitoring function, set 00 S for PEAt in parameter setting.

▣ Parameter 1 Group



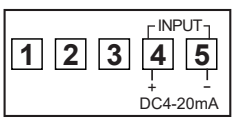
※Press the MD key after changing the setting value of the parameter, the setting value is saved and it moves to next parameter.
※After entering setting parameter, hold the MD key for 3 sec, it displays run and returns to RUN mode
※If any key is untouched for 60 sec, it will return to RUN mode.
※1: Lock ┌ oFF : Enable to change or set Parameter.
└ on : Disable to change or set Parameter but enable to check the setting value in Parameter group.
Disable to enter into the status of change setting value by pressing ◀, ▲ keys.

▣ Parameter

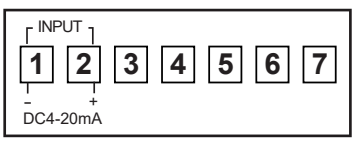
Display		Function	Setting range	Factory default
L-SC	Low scale	Low limit display value for 4mA input	-1.999 to 9.999, -19.99 to 99.99, -199.9 to 999.9, -1999 to 9999	0400
H-SC	High scale	High limit display value for 20mA input		2000
dot	Decimal point	Set Decimal point position	0000, 000.0, 00.00, 0.000	00.00
InbL	Input bias low	Correct the Low-limit value of display value (digit)	-100 to 100	0000
InbH	Input bias high	Correct the High-limit value of display value (%)	0.900 to 1.100	1.000
PEAt	Max./Min. time	See the Max./Min. value monitoring delay time (sec)	0 to 30	015
dISt	Display time	Selectable sampling period (sec)	0.5, 1.0, 2.0, 3.0, 4.0, 5.0	0.5 5
E.PCt	Error %	Set % of HHHH/LLLL display range	0, 1, 2, 3, 4	3
LoC	Lock	Set the lock function	ON, OFF	oFF

▣ Connections

◎ M4NS-NA



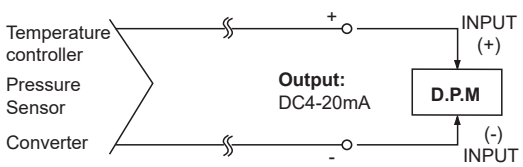
◎ M4YS-NA



※Use terminals of size specified below.

	a	b
 <Forked>	Min. 3.5mm	Min. 7.0mm

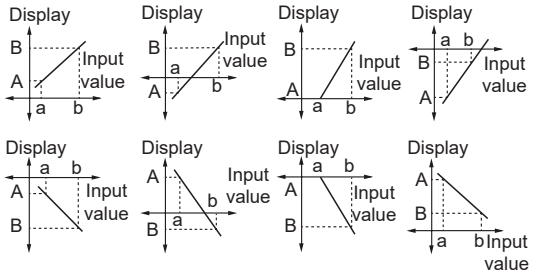
▣ Connections of Applications



▣ Functions

◎ Display scale [L-SC / H-SC]

This function is to display the value setting certain Hi/Low limit value against DC4-20mA input. For example if set a=DC4mA, b=DC20mA and A, B as display value, it will be displayed a=A, b=B.



◎ Correction [InbH / InbL]

This function is to adjust the error of display value after calculating scale value for measuring input and also correct the input error of sensor etc.

InbL :-100 to 100 [Adjust deviation of low value]

InbH : 0.900 to 1.100 [Correct gradient (%) of high value]

E.g.)When display value is 0.0 to 500.0 against 4-20mA input, if the display value is “1.2” for 4mA input, set -12 (ignore the decimal point) as InbL value to display “0.0”.It is enable to remove offset of Low display value.

※When completed above Low value setting then apply 20mA, if the display value is “500.5, the correction value will be 5005/5000=0.999, set 0.999 as InbH value then enable to correct High value is 5005×0.999 = 5000. It is also ignore the decimal point.

◎ Display Max./Min. value monitoring [PEUH / PEUL]

This function is to monitor Max. value and Min. value by current display value then display its Data in PEUH mode and PEUL mode.

Enable to set delay time in PEUt mode to protect the wrong Data by initial over current and set table from 0 to 30 sec and start to monitor after delay time.

◎ Display cycle delay

It is difficult to display when the measuring input value is fluctuating. In this case it is able to make display value stable by delaying display cycle.

Display cycle can be changed in dI 5t mode of Parameter 2 (0.5s/1.0s/2.0s/3.0s/4.0s/5.0s).

If select 5.0 5, it will be the measuring input value on an average for 5 sec, then display it every 5 sec.

◎ Error display [E.PCt]

● Error display

① When LLLL flashes,

1) Input current is lower than 3% in 4-20mADC (16mA scale) LLLL will flash when it is under 3.52mA [16mA×3% =0.48mA] → 4mA-0.48mA=3.52mA
2) When it is beyond Min. display value (-1999) [by display value]

② When HHHH flashes,

1) Input current is higher than 3% in 4-20mADC (16mA scale) HHHH flash [16mA×3%=0.48mA] → 20mA+0.48mA= 20.48mA.
2) When it is higher than 20.48mA. When it is beyond Max. display value (9999) [by display value]

● Turn Error display off

LLLL and HHHH are displayed when input is out of measuring range, therefore it will be disappeared automatically when input returns to measuring range

● Error setting and sort

It will display the error message according to the setting value which set % value against analog input range and set it in E.PCt mode by ◀, ▲ key.

Display		Description
E.PCt	1	LLLL / HHHH are displayed when it is over 0% out DC4-20mA range
E.PCt	2	LLLL / HHHH are displayed when it is over 1% out DC4-20mA range
E.PCt	3	LLLL / HHHH are displayed when it is over 2% out DC4-20mA range
E.PCt	4	LLLL / HHHH are displayed when it is over 3% out DC4-20mA range
E.PCt	5	L-SC / H-SC are displayed always when it is out of DC4-20mA range

DIN W75×H25mm Digital Graphic Panel Meter For Mosaic Panel

■ Features

- Various input function
  : 0-2VDC, 0-10VDC, 1-5VDC, DC0-1mA, DC4-20mA
- High/low-limit display scale function
- Max. display range: -999 to 9999
- Error display function
- High quality by microprocessor built-in
- Display accuracy: F.S. ±0.2% rdg ±1-digit

Please read "Safety Considerations" in the instruction manual before using.

■ Ordering Information

M **4** **V**

Size	V	DIN W75×H25mm
Digit	4	9999 (4-digit)
Item	M	Meter

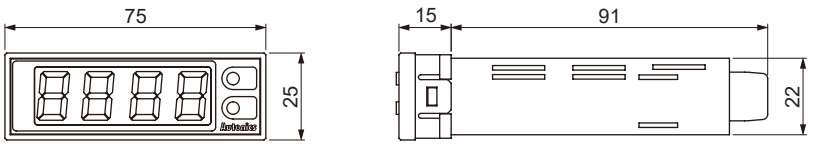
■ Specifications

Model		**M4V**				
Measurement function		DC voltage			DC current	
Measurement input		0-2VDC⎓	1-5VDC⎓	0-10VDC⎓	DC0-1mA	DC4-20mA
Max. allowable input		110% of measurement input				
Power supply		12-24VDC⎓				
Allowable voltage range		90 to 110% of rated voltage				
Power consumption		Max. 2W				
Display method		7-segment LED display (red) (character height: 14mm)				
Display accuracy		0 to 50℃: F.S. ±0.2% rdg ±1-digit -10 to 0℃: F.S. ±0.3% rdg ±1-digit				
Display cycle		500ms				
Setting type		Setting type with the front keys				
Self-diagnosis function		Error display function				
Insulation resistance		Over 100MΩ (at 500VDC megger)				
Dielectric strength		2,000VAC 50/60Hz for 1 min				
Noise immunity		±300V the square wave noise (pulse width: 1μs) by the noise simulator				
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 50Hz (for 1 min) in each X, Y, Z direction for 1 hour				
	Malfunction	0.5mm amplitude at frequency of 10 to 50Hz (for 1 min) in each X, Y, Z direction for 10 min				
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times				
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times				
Environ-ment	Ambient temperature	-10 to 50℃, storage: 20 to 60℃				
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH				
Unit weight		Approx. 83g				

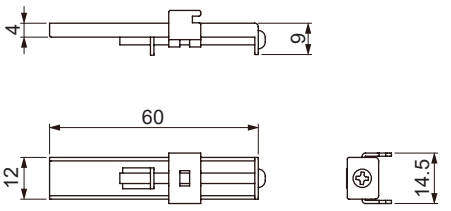
※Environment resistance is rated at no freezing or condensation.

▣ Dimensions

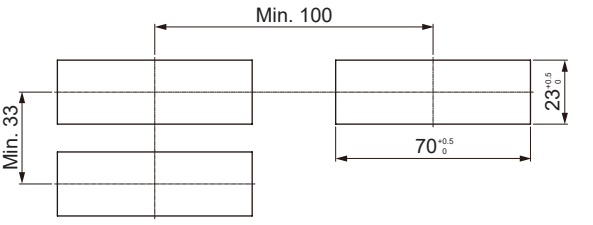
(unit: mm)



• Bracket



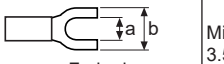
• Panel cut-out



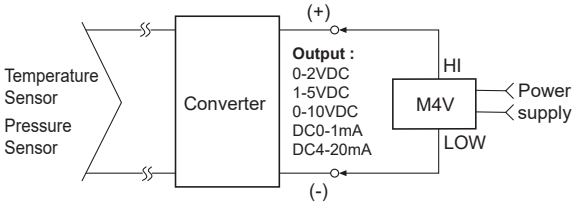
▣ Input and Connection

Input		Display	Connection
Voltage	0-2VDC	0-2U	0-2VDC, 1-5VDC, 0-10VDC SOURCE HI LOW – + 1 2 3 4 5 6
	1-5VDC	1-5U	
	0-10VDC	0-10	
Current	DC0-1mA	1mA	DC0-1mA SOURCE HI LOW – + 1 2 3 4 5 6
	DC4-20mA	4-20	DC4-20mA SOURCE HI LOW – + 1 2 3 4 5 6

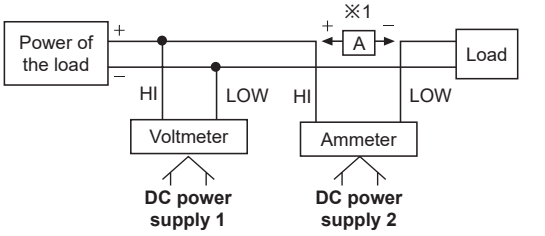
※Use terminals of size specified below.

	a	b
 <Forked>	Min. 3.5mm	Min. 7.0mm

▣ Connections of Applications



◎ Simultaneous connection of voltmeter and ammeter



※1: Compared to measurement input range, higher measuring voltage needs a multiplier and lower measuring voltage needs a shunt.

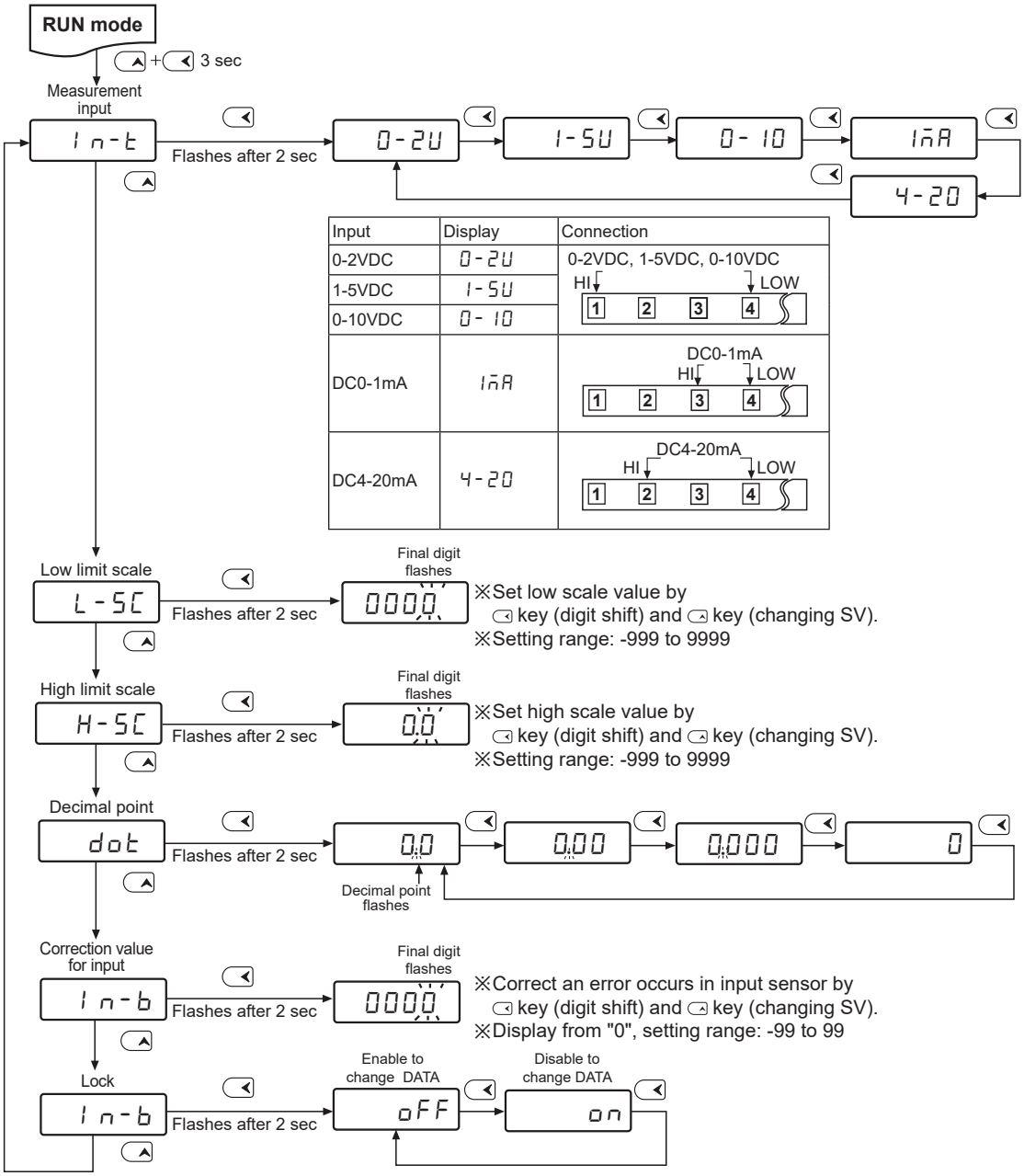
※When using voltmeter and ammeter simultaneously, connect the separated power supply each.

※(-) terminal of the power and (-) terminal of measurement input are shorted.

▣ Factory Defaults

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
In-t	0-2U	H-SC	0.0	In-b	0000
L-SC	0000	dot	0.0	LoC	OFF

▣ Parameter Description



Input	Display	Connection
0-2VDC	0-2U	0-2VDC, 1-5VDC, 0-10VDC HI LOW 1 2 3 4
1-5VDC	1-5U	
0-10VDC	0-10	
DC0-1mA	1mA	DC0-1mA HI LOW 1 2 3 4
DC4-20mA	4-20	DC4-20mA HI LOW 1 2 3 4

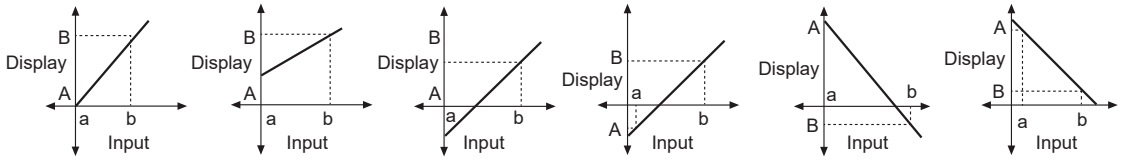
◎ How to change the setting value

1. When advance to MODE, change digit flashing by key then set DATA value by key.
2. After complete DATA value setting, please press key for 2 sec then it will move to next MODE saving DATA.
3. Press key for 2 sec to return RUN mode after changing (setting) DATA value in each MODE.

※Press key for 2 sec, then it will return to RUN without change setting value.
※When checking the setting value only in each mode. Press key for 2 sec, then press for 2 sec again.
(If press continuously, it will not advance to next mode and return to RUN mode)
※If any key is untouched for 60 sec, it will return to RUN mode.

▣ Display Scale Function

This function is to display setting of particular high/low-limit value in order to display high/low-limit value of measurement input.
If measurement inputs are a or b and display values are A or B, it will display a=A, b=B as below graph.



E.g.) Enables to set the display value for input as certain value (not "0") by using High/low-limit display scale function.

Measurement input	Setting value		Display	Graph
0-10VDC	L-Scale: 0	H-Scale: 200	0 to 200	①
	L-Scale: 50	H-Scale: 200	50 to 200	②
	L-Scale: -100	H-Scale: 200	-100 to 200	③
	L-Scale: 200	H-Scale: -50	200 to -50	⑤

※High/low-limit value setting range → L-SC (low limit): -999 to 9999, H-SC (high limit): -999 to 9999
But, there must be offset "1" between L-SC and H-SC.

▣ Error Display Function

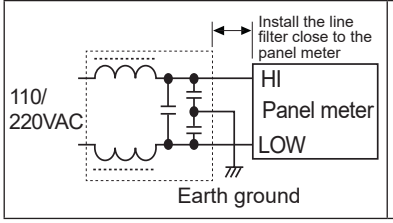
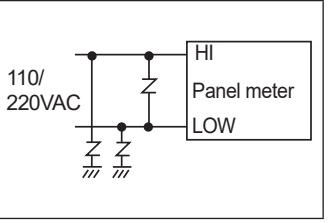
Display indicates "Error" when wrong measurement input value is applied.

Indication	Description	Clearance of Error
LLLL	In case of lower value than measurement input value (in case of applying DC2mA when measurement input range is selected as DC4 to 20mA)	Promptly change the input to a value that falls within the specified range.
HHHH	In case of higher value than measurement input value (in case of applying DC22mA when measurement input range is selected as DC4 to 20mA)	
oUEr	In case of wrong wiring or measurement input error	Please cut off the power and then check measurement input.
Er-E	In case of damaging the memory chip by high frequency noise, strong surge noise	Consult your Autonics sales representative.

▣ Proper Usage

⚠ Cautions during use

- Follow instructions in 'Cautions during use'. Otherwise, it may cause unexpected accidents.
- 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.

Connection with the line filter	Connection with the varistor
	

- This unit may be used in the following environments.
  ① Indoors (in the environment condition rated in 'Specifications')
  ② Altitude max. 2,000m
  ③ Pollution degree 2
  ④ Installation category II

DIN W48×H24mm, Indication Only, LCD Display Pulse Meter

▣ Features

- **Upgraded version of LR7N series**
- Easy of 1 pulse input method per 1 revolution
- Display up to 10000RPM
- No need power supply by internal battery
- Protection structure IP66 (front panel only)
- Displays RPM, RPS of rotator
- Displays AC line frequency

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

LR 5 N — B

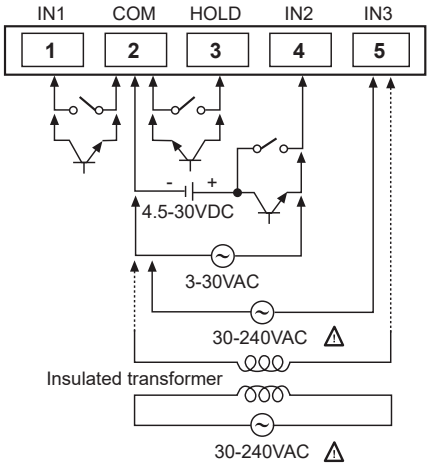
Power supply	B	Internal lithium battery
Size	N	DIN W48×H24mm
Digit	5	10000 (4½-digit)
Item	LR	Compact LCD display pulse meter

▣ Specifications

Model		LR5N-B			
Input method		No-voltage input	Voltage input 1		Voltage input 2
Input signal level		Short-residual voltage : max. 0.5V Max. short-circuit impedance : max. 10kΩ Max. open-circuit impedance : min. 500kΩ	DC	High input voltage range : 4.5-30VDC⎓ Low input voltage range : 0-2VDC	Voltage: 30-240VAC~
			AC	Voltage: 3-30VAC~	
Power		No-power [includes lithium battery (replaceable)]			
Battery life cycle		Over 3 years at 20℃ (replaceable)			
Display method		LCD Zero blanking method (character height: 8.7mm)			
Display digits		4½-digit			
Display range and Display accuracy		Display range		Display accuracy	
		RPM	1 to 10000RPM	1 to 5000RPM: F.S.±0.05%±1-digit	
				5001 to 10000RPM: F.S.±0.1%±1-digit	
		0.1RPM	0.1 to 1000.0RPM	F.S.±0.05%±1-digit	
		Hz	1 to 1000Hz	F.S.±0.1%±1-digit	
		0.1Hz	0.1 to 100.0Hz		
		RPS	1 to 1000RPS		
HOLD function		Includes (external HOLD function)			
Insulation resistance		Over 100MΩ (at 500VDC megger)			
Dielectric strength		2,000VAC 50/60Hz for 1 min (cutoff current=10mA)			
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1min) in each X, Y, Z direction for 1 hour			
	Malfunction	0.3mm amplitude at frequency of 10 to 55Hz (for 1min) in each X, Y, Z direction for 10 min			
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times			
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times			
Envion-ment	Ambient temperature	-10 to 55℃, Storage: -25 to 65℃			
	Ambient humidity	35 to 85%RH, Storage: 35 to 85%RH			
Protection structure		IP66 (when using waterproof rubber for front panel), terminal cover (finger protector)			
Weight※1		Approx. 91.5g (approx. 59g)			

※1: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Connections



※Please use reliable contacts enough to flow 5μA of current when using input signal or reset signal as a contact.
※IN1 - No-voltage input
IN2 - Voltage input
• DC voltage input
• AC voltage input: Display AC frequency.
IN3 - AC voltage input: Display AC frequency.
※**Select one input among IN1, IN2, IN3.**

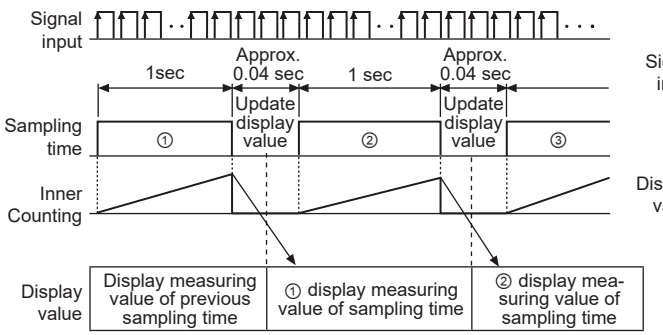
⚠Caution for IN3 input
When supplying high voltage over 50VAC into IN3, use the isolation transformer with 1:1 turn ratio or set up the counterplan, or it may cause electric shock.

※Use terminals of size specified below.

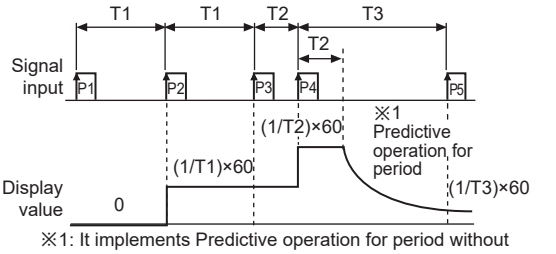
	a	b
 <Forked>	Min. 3.5mm	Max. 7.0mm

▣ Operation Charts

● Setting RPS, Hz



● Setting RPM 0.1, RPM 0.1Hz

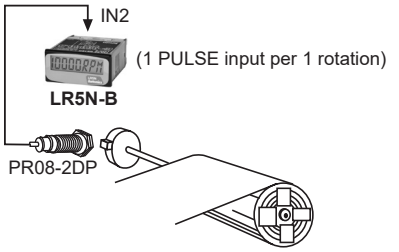


※1: It implements Predictive operation for period without Auto zero time setting function (If there is no pulse input within setting time, it displays the value as zero forcibly). If there is any input signal within certain time (T2), CPU considers input to be supplied, display value is decreased continuously.

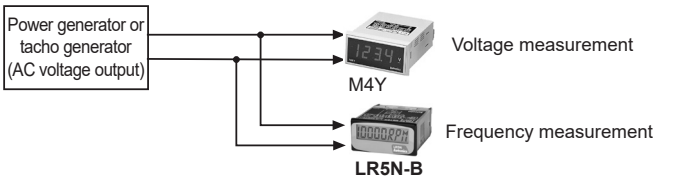
▣ Operation Mode (Frequency/Revolution)

◎ **Frequency (Hz, 0.1Hz) = f, Revolution (RPM, 0.1RPM)= f × 60, Revolution (RPS)= f**

● Revolution



● AC frequency



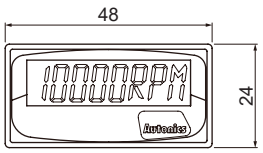
AC input voltage
IN2: 3-30VAC
IN3: 30-240VAC ⚠

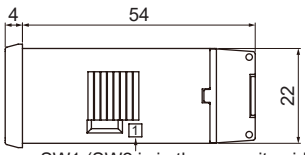
● Display value and unit

Display	Frequency		Revolution		
Unit	Hz	0.1Hz	RPM	0.1RPM	RPS (factory default)

■ Dimensions

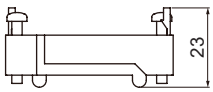
(unit: mm)



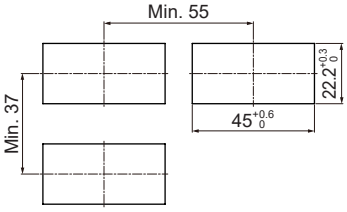


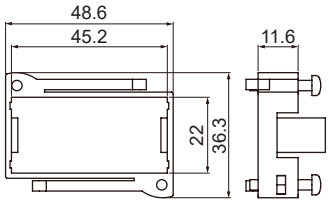
SW1 (SW2 is in the opposite side)

● **Bracket**



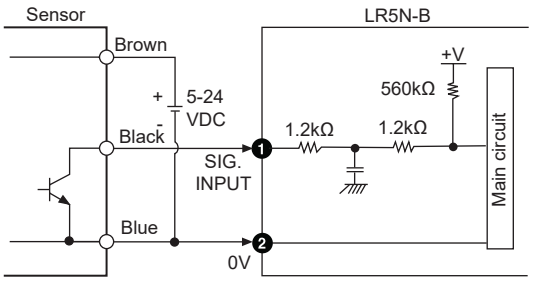
● **Panel cut-out**





■ Input Connections

● **Standard input sensor**
: NPN open collector output type

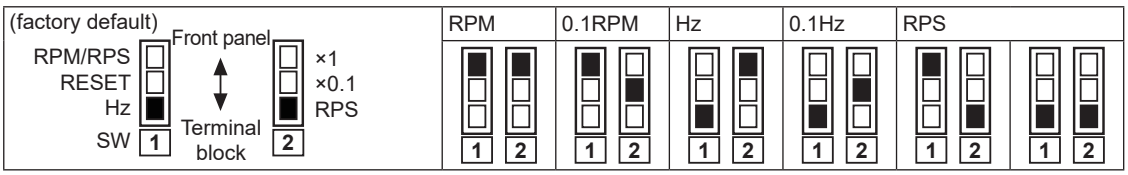


■ Function

● **RESET**
It initializes an unit and front LCD display. There are not indicated when set switch1 as RESET.

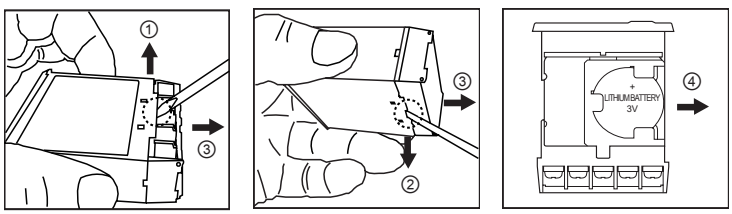
● **HOLD**
It stops display value by short circuit HOLD terminal when it is hard to read the value because of frequent input changes.

■ Display Range Selection



① Select one among ×1, ×0.1 and RPS by SW2.
② Shift SW1 to RESET.
③ Select one again between RPM/RPS and Hz by SW1.
※When display range and unit in front display panel do not conform, move SW 1 to RESET and select RPM/RPS or Hz again.

■ Battery Replacement



1. Pulling terminal towards ③ direction, raise Lock part towards ① and ② direction with the tool to remove case.
   ⚠ Please be careful of the injury from the tool.
2. After removing case, gently press the battery towards ④ direction to remove the battery.
3. Check the polarity of the battery and insert it in reverse order.

※Battery is sold at retailers, and replacement is on user. (sold separately)
※Do not burn or disassemble the lithium battery.
※Do not solder, charge, or modify the battery.
※Do not heat the battery.
※Before discarding the battery, insulate the positive pole and negative pole with the insulating tape.

High Performance, Digital Pulse Meter

▣ Features

- Total 16 types of operation mode
  Frequency/Revolutions/Speed, Passing speed, Cycle, Passing time, Time interval, Time differential , Absolute ratio, Error ratio, Density, Error, Length measurement 1, Length measurement 2, Interval, Accumulation, Addition/Subtraction-individual input, Addition/Subtraction-phase difference input
- Various output models
  Relay triple/quintuple output, NPN/PNP open collector quintuple output, BCD dynamic output, PV transmission output (current output), RS485 communication output (Modbus RTU)
- Various functions
  Selectable NPN solid state/contact input, PNP solid state/contact input, prescale, delay monitoring, hysteresis, auto-zero time setting, lock setting, data bank function (MP5W series)
- Max. display range: -19999 to 99999
- Various display units
  rpm, rps, Hz, kHz, sec, min, m, mm, mm/s, m/s, m/min, m/h, ℓ/s, ℓ/min, ℓ/h, %, counts, etc.

MP5S

MP5Y **MP5W**

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

MP 5 Y - 4 N

Output

		Main output (comparative value output)	Sub output (display value output)
S	**N**	Indicator	—

Y	**N**	Indicator	—
	1	NPN open collector quintuple output	—
	2	PNP open collector quintuple output	—
	3	Indicator	BCD dynamic output
	4	Indicator	PV transmission output (current output)
	5	Indicator	RS485 communication output
	6	Relay triple output (H, GO, L)	—

W	**N**	Indicator	—
	A	Relay quintuple output (HH, H, GO, L, LL)	—
	1	Relay triple output (H, GO, L)	—
	2	NPN open collector quintuple output	BCD dynamic output
	4	NPN open collector quintuple output	PV transmission output (current output)
	5	PNP open collector quintuple output	PV transmission output (current output)
	8	NPN open collector quintuple output	RS485 communication output
	9	PNP open collector quintuple output	RS485 communication output

Power supply

2	24VAC 50/60Hz, 24-48VDC
4	100-240VAC 50/60Hz

Size

S	DIN W48×H48mm
Y	DIN W72×H36mm
W	DIN W96×H48mm

Digits

5	99999 (5-digit)

Item

MP	Pulse meter

▣ Specifications

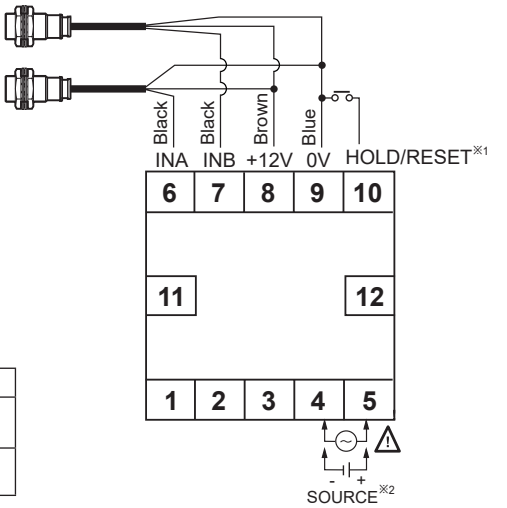
Series			MP5S	MP5Y	MP5W
Display method			7-segment LED (zero blanking method)		
Character size			W4×H8mm	W7×H14mm	
Display range			-19999 to 99999		
Power supply	AC voltage		100-240VAC⎓ 50/60Hz		
	AC/DC voltage		24VAC⎓ 50/60Hz, 24-48VDC⎓		
Power consumption	AC voltage		Max. 7.5VA (100-240VAC⎓ 50/60Hz)	Max. 9VA (100-240VAC⎓ 50/60Hz)	Max. 15VA (100-240VAC⎓ 50/60Hz)
	AC/DC voltage		Max. 6VA (24VAC⎓ 50/60Hz), max. 4.5W (24-48VDC⎓)	Max. 7VA (24VAC⎓ 50/60Hz), max. 6.2W (24-48VDC⎓)	Max. 11VA (24VAC⎓ 50/60Hz), max. 7W (24-48VDC⎓)
Permissible voltage range			90 to 110% of rated voltage		
External power supply			Max. 12VDC⎓ ±10% 80mA		
Sub power supply			—		Max. 24VDC⎓ 30mA
Input frequency			·Solid state input 1: max. 50kHz (pulse width: min. 10μs) ·Solid state input 2: max. 5kHz (pulse width: min. 100μs) ※For F7, F8, F9, F10 operation mode, max. 1kHz (pulse width: min. 500μs) ·Contact input: max. 45Hz (pulse width: min. 11ms)		
Input method			[Voltage input] High: 4.5-24VDC⎓, Low: 0-1VDC, Input impedance: 3.9kΩ [No-voltage input] Short-circuit impedance: max. 80Ω, Residual voltage: max. 1VDC, Open-circuit impedance: min. 100kΩ		
Measurement range			·Operation mode F1, F2, F7, F8, F9, F10 : 0.0005Hz to 50kHz ·Operation mode F3, F4, F5, F6 : 0.01 to max. of each time range ·Operation mode F11, F12, F13, F16 : 0 to 99999 ·Operation mode F14, F15 : -19999 to 99999		
Measurement accuracy (23℃±5℃)			·Operation mode F1, F2, F7, F8, F9, F10 : F.S.±0.05%rdg±1-digit ·Operation mode F3, F4, F5, F6 : F.S.±0.01%rdg±1-digit		
Display cycle			OFF (for F2, F16 operation mode), 0.05, 0.5, 1, 2, 4, 8 sec (same as update output cycle)		
Operation mode			Frequency/Revolutions/Speed (F1), Passing speed (F2), Cycle (F3), Passing time (F4), Time interval (F5), Time differential (F6), Absolute ratio (F7), Error ratio (F8), Density (F9), Error (F10), Length measurement 1 (F11), Interval (F12), Accumulation (F13), Addition/Subtraction-individual input (F14), Addition/Subtraction-phase difference input (F15), Length measurement 2 (F16)		
Prescale function			Direct input method (0.0001×10^{-9} to 9.9999×10^{9})		
Hysteresis			0 to 9999※1		
Output	Main	Relay triple	—	250VAC⎓ 3A, 30VDC⎓ 3A resistive load	
		Relay quintuple		—	250VAC⎓ 3A, 30VDC⎓ 3A resistive load
		NPN/PNP open collector quintuple		Max. 30VDC⎓ 30mA	
	Sub	BCD dynamic		Max. 30VDC⎓ 30mA	
		PV transmission		DC4-20mA/DC0-20mA max. load 500Ω	
		Communication		RS485 communication output (Modbus RTU method)	
Memory retention			Non-volatile memory (number of inputs: 100,000 operations)		
Insulation resistance			Over 100MΩ (at 500VDC megger)		
Dielectric strength			2,000VAC 60Hz for 1 min		
Noise immunity			±2kV the square wave noise (pulse width: 1μs) by the noise simulator		
Vibration	Mechanical		0.75mm amplitude at frequency of 10 to 55Hz in each X, Y, Z direction for 1 hour		
	Malfunction		0.5mm amplitude at frequency of 10 to 55Hz in each X, Y, Z direction for 10 min		
Shock	Mechanical		300m/s² (approx. 30G) in each X, Y, Z direction for 3 times		
	Malfunction		100m/s² (approx. 30G) in each X, Y, Z direction for 3 times		
Relay life cycle	Mechanical		—	Min. 10,000,000 operations	
	Electrical		—	Min. 100,000 operations (250VAC 3A resistive load)	
Environment	Ambient temp.		-10 to 50℃, storage: -20 to 60℃		
	Ambient humi.		35 to 85%RH, storage: 35 to 85%RH		
Approval			CE c UL us		
Weight※2			Approx. 191g (approx. 132g)	Approx. 230g (approx. 140g)	Approx. 334g (approx. 210g)

※1: Setting range will vary depending on the decimal point.
※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Connections

※Terminal connections differ by power supply and output type of each series and model.

◎ MP5S Series



※1: Operation mode F1 to F12
: display value HOLD
Operation mode F13 to F16
: display value RESET

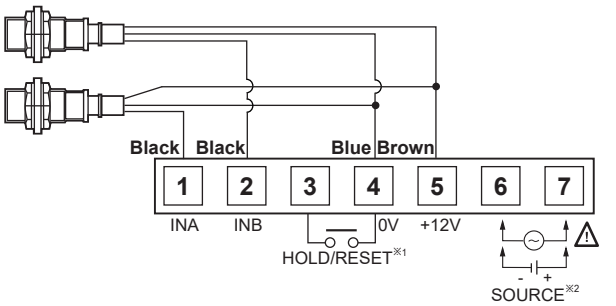
※2:

Model	Source
MP5S-2N	24-48VDC 24VAC 50/60Hz
MP5S-4N	100-240VAC 50/60Hz

◎ MP5Y Series

• Power/Input Terminal (Common)

※MP5Y-□N (indicator) only has 'Power/Input terminals'.



※1: Operation mode F1 to F12
: display value HOLD
Operation mode F13 to F16
: display value RESET

※2:

Model	Source
MP5Y-2□	24-48VDC 24VAC 50/60Hz
MP5Y-4□	100-240VAC 50/60Hz

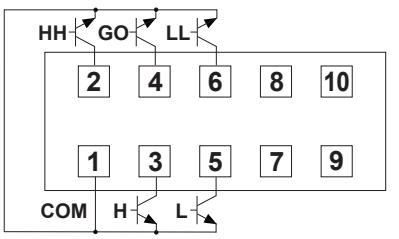
• Output Connector (MP5Y-□1 to 5)

※Hirose connector: HIF3BA-10PA-2.54DS
※Connector socket specification: Contact the manufacture for the socket and cable.

	Specifications	Manufacture
Connector socket	HIF3BA-10D-2.54R	Hirose Electric

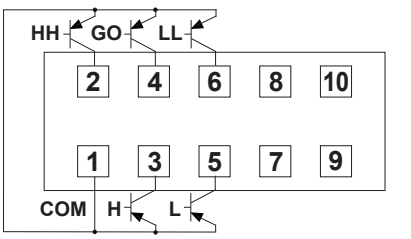
• MP5Y-□1 (NPN open collector output)

MAIN OUT (NPN OPEN COLLECTOR)
30VDC 30mA



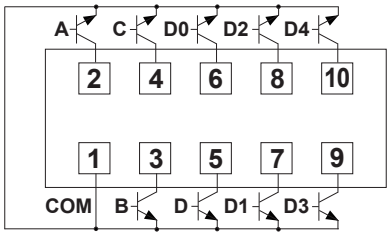
• MP5Y-□2 (PNP open collector output)

MAIN OUT (PNP OPEN COLLECTOR)
30VDC 30mA



● **MP5Y-□3 (BCD dynamic output)**

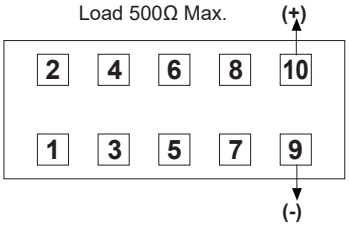
BCD OUT (NPN OPEN COLLECTOR)
30VDC 30mA



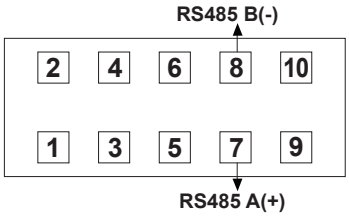
※Autonics display unit (DS/DA Series) is recommended for stable minus (-) sign display.

● **MP5Y-□4 (PV transmission output)**

DC4-20mA/DC0-20mA
Load 500Ω Max.

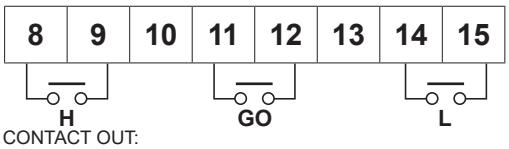


● **MP5Y-□5 (RS485 communication otuput)**



●Output Terminal (MP5Y-□6)

● **MP5Y-□6 (Relay triple output)**

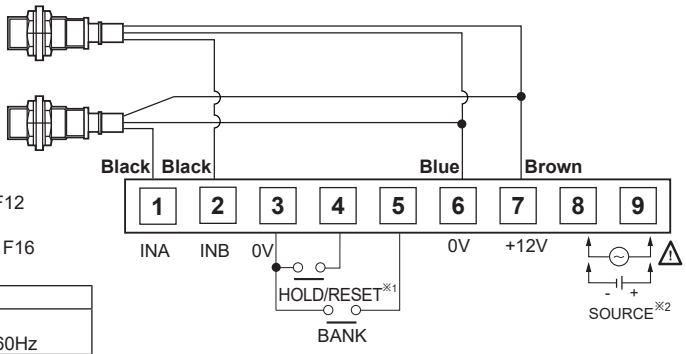


CONTACT OUT:
250VAC 3A, 30VDC 3A RESISTIVE LOAD

◎ MP5W Series

●Power/Input Terminal (Common)

※MP5W-□N (indicator) only has 'Power/Input terminals'.



※1: Operation mode F1 to F12
: display value HOLD
Operation mode F13 to F16
: display value RESET

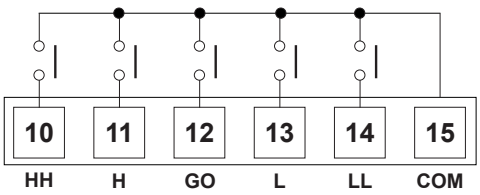
※2:

Model	Source
MP5W-2□	24-48VDC 24VAC 50/60Hz
MP5W-4□	100-240VAC 50/60Hz

●Output Terminal (MP5W-□A/1)

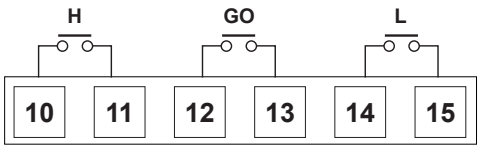
● **MP5W-□A (Relay quintuple output)**

CONTACT OUT:
250VAC 3A, 30VDC 3A RESISTIVE LOAD



● **MP5W-□1 (Relay triple output)**

CONTACT OUT:
250VAC 3A, 30VDC 3A RESISTIVE LOAD

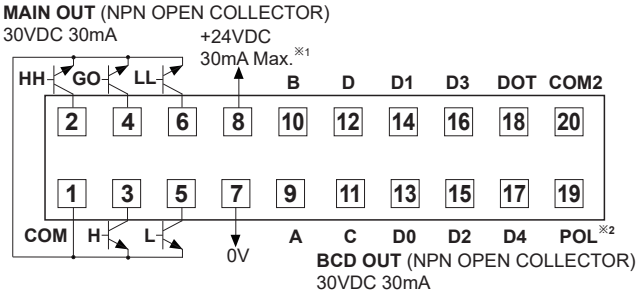


• Output Connector (MP5W-□2/4/5/8/9)

※Hirose connector: HIF3BA-20PA-2.54DS
※Connector socket specification: Contact the manufacture for the socket and cable.

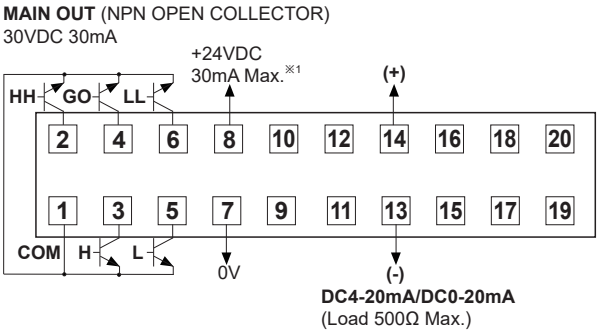
	Specifications	Manufacture
Connector socket	HIF3BA-20D-2.54R	Hirose Electric
I/O cable (sold separately)	CO20-HP□-L, CO20-HP□-R	Autonics

• MP5W-□2 (NPN open collector+BCD dynamic output)

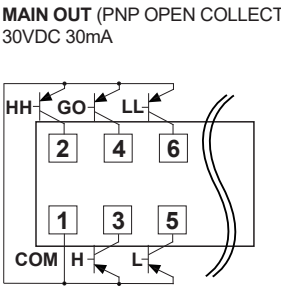


※1: Sub power supply
※2: POL signal turns ON when the display value is a minus (-) value.
※Autonics display unit (DS/DA Series) is recommended for stable minus (-) sign display.

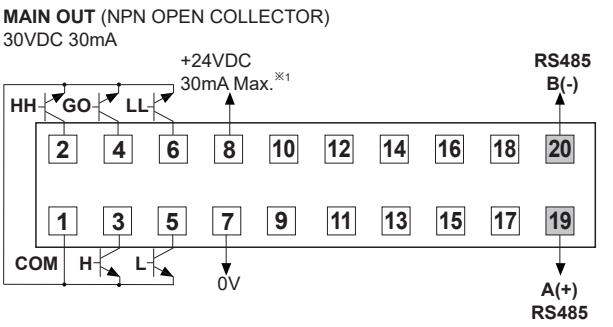
• MP5W-□4 (NPN open collector+PV transmission output)



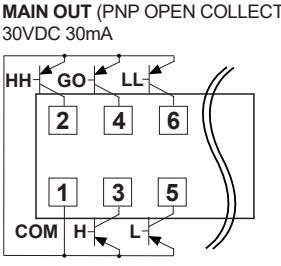
• MP5W-□5 (PNP open collector+PV transmission output)



• MP5W-□8 (NPN open collector+RS485 comm. output)



• MP5W-□9 (PNP open collector+RS485 comm. output)

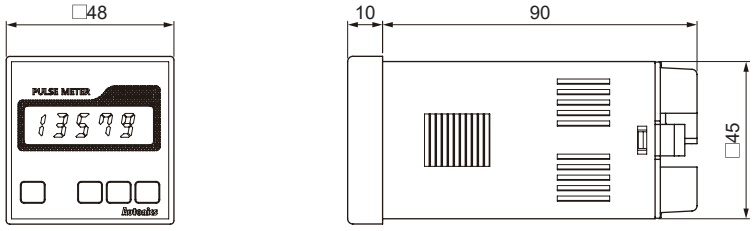


▣ Dimensions

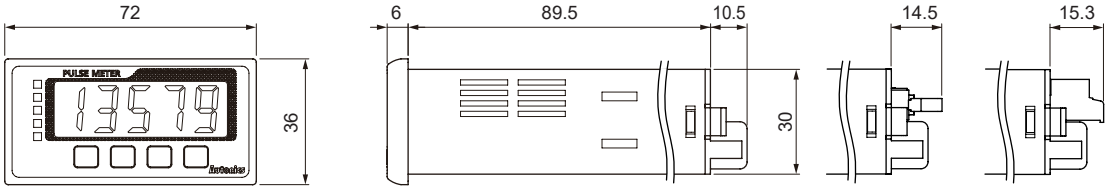
(unit: mm)

※Side dimensions of MP5Y/W differ by output type.

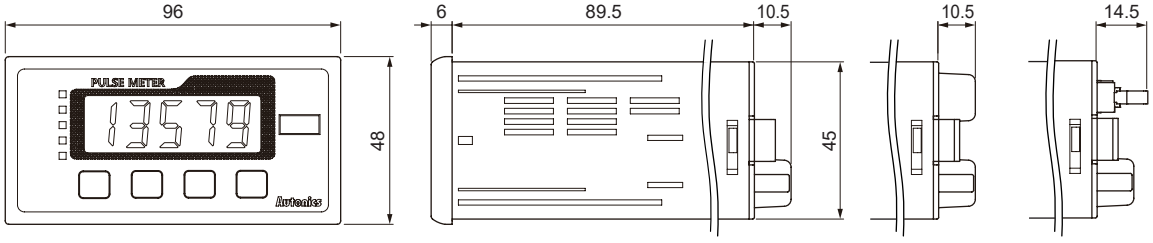
◎ MP5S Series



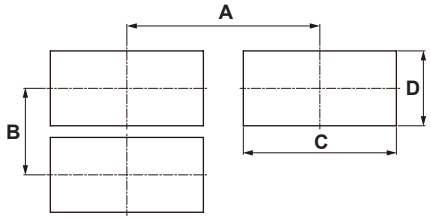
◎ MP5Y Series



◎ MP5W Series



• Panel cut-out

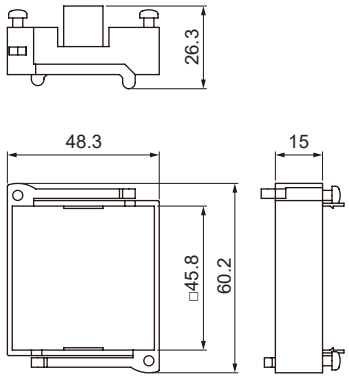


(unit: mm)

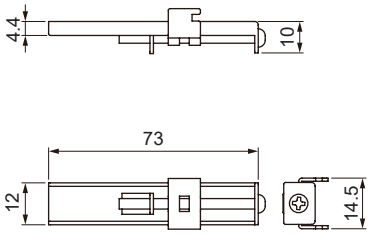
Series \ Size	A	B	C	D
MP5S	Min. 55	Min. 62	$45.5^{+0.5}_{0}$	$45.5^{+0.5}_{0}$
MP5Y	Min. 91	Min. 40	$68^{+0.7}_{0}$	$31.5^{+0.5}_{0}$
MP5W	Min. 116	Min. 52	$92^{+0.8}_{0}$	$45^{+0.6}_{0}$

• Bracket

• For MP5S

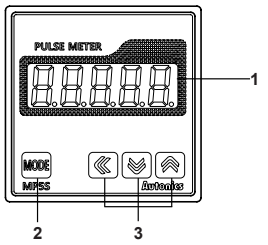


• For MP5Y/W

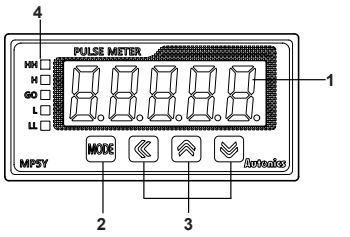


▣ Unit Description

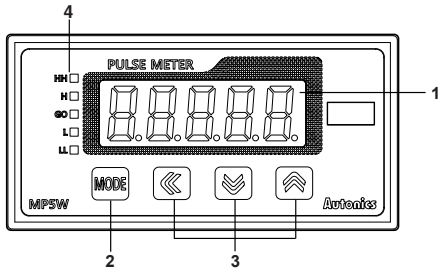
◎ MP5S Series



◎ MP5S Series



◎ MP5S Series



1: Display component
Displays current value in RUN mode.
Alternately displays setting parameters and corresponding value in SETTING mode.
2: MODE key
In RUN mode, press the key once to check max./min. value.
In RUN mode, hold the key for over 2 sec to enter parameter groups.
3: ≪, ≫, ∧ key
Select parameter groups, and select or setting values in the corresponding parameters.
4: Output status indicator

▣ Sold Separately

◎ Communication converter

- **SCM-WF48**
  (Wi-Fi to RS485·USB wireless communication converter)

- **SCM-US48I**
  (USB to RS485 converter)

- **SCM-38I**
  (RS232C to RS485 converter)

◎ Display Units (DS/DA-T Series)

- **DS/DA-T Series**
  (RS485 communication input type display unit)


DS16-□T


DS22/DA22-□T

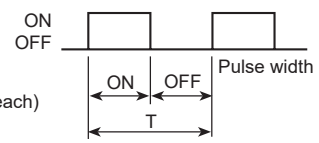

DS40/DA40-□T


DS60/DA60-□T

※Connect RS485 communication input type display unit (DS/DA-T Series) and RS485 communication output model of MP5Y/MP5W Series, the display unit displays present value of the device without PC/PLC.

▣ Input Specifications

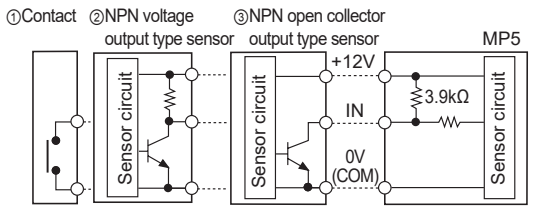
1. Input signal
Standard duty ratio of input signal is 1:1.
(1) Solid state input 1
Input frequency: Max. 50kHz (ON/OFF pulse width: min. 10μs of each)
(2) Solid state input 2
Input frequency: Max. 5kHz (ON/OFF pulse width: min. 100μs of each)
※For F7, F8, F9, F10 operation mode, max. 1kHz (ON/OFF pulse width: min. 500μs of each)
(3) Contact input
① Input frequency: Max. 45Hz (when each ON/OFF pulse width is over 11ms)
② Contact specifications: 12VDC, stable switching of load current as small as 5mA



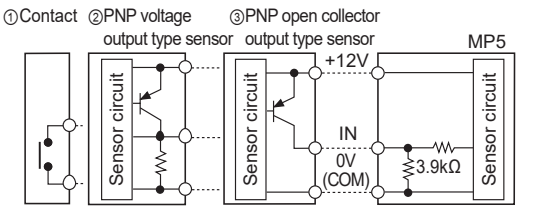
※T: single cycle of input signal

2. Input type [In-A, In-b]
MP5 allows selection between NPN input (solid state/contact) or PNP input (solid state/contact).

(1) NPN input type



(2) PNP input type



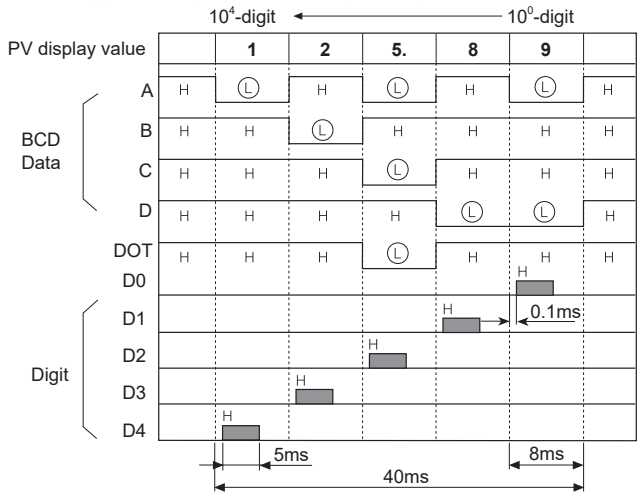
▣ Output Specifications

1. Relay output
① Output: Comparative or alarm output (refer to "▣ Output Modes")
② Output type: Relay
③ Contact capacity: 250VAC 3A resistive load
④ Life cycle: [Mechanical] min. 10,000,000 operations (switching frequency 180 operations/min)
[Electrical] min. 100,000 operations (3A 250VAC, 30VDC resistive load) (switching frequency 20 operations/min)

2. Transistor output
① Output: Comparative output or alarm output (refer to "▣ Output Modes")
② Output type: NPN/PNP open collector
③ Rated load voltage: 30VDC
④ Max. load current: 30mA

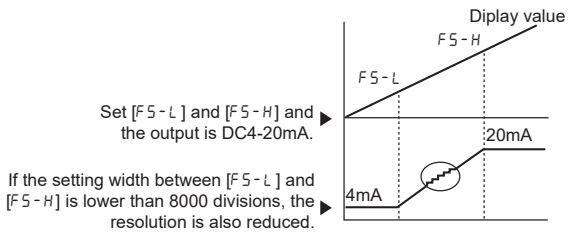
3. BCD dynamic output (negative logic)
① Output: present value
② Output signal: BCD data (A, B, C, D, DOT)
← A: lowest bit, DOT: highest bit
Digit data (D0, D1, D2, D3, D4)
← D0: lowest digit, D4: highest digit
③ Output type: NPN open collector
④ Rated load voltage: 30VDC
⑤ Max. load current: 30mA
⑥ Dynamic COM cycle (T) = 40ms

E.g.) To display value = 125.89 by BCD dynamic output

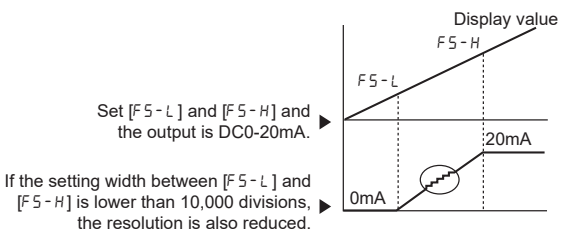


4. PV transmission output
① Application: transmit measured value
② Function: transmit measured value within setting range of high-limit output [F5-H] to low-limit output [F5-L] after conversion into **DC4-20mA** or **DC0-20mA** current.
③ Output range of high/low-limit
·High-limit [F5-H] range: From min. value to max. value within measurement range
·Low-limit [F5-L] range: From min. value to max. value within measurement range ([F5-H]≥[F5-L]+1)

(1) DC4-20mA transmission output
① Transmit measured value within setting range of high-limit output [F5-H] to low-limit output [F5-L] after conversion into DC4-20mA current.
② Resistive load: Max. 500Ω
③ Resolution: 8000 divisions



(2) DC0-20mA transmission output
① Transmit measured value within setting range of high-limit output [F5-H] to low-limit output [F5-L] after conversion into DC0-20mA current.
② Resistive load: Max. 500Ω
③ Resolution: 10,000 divisions

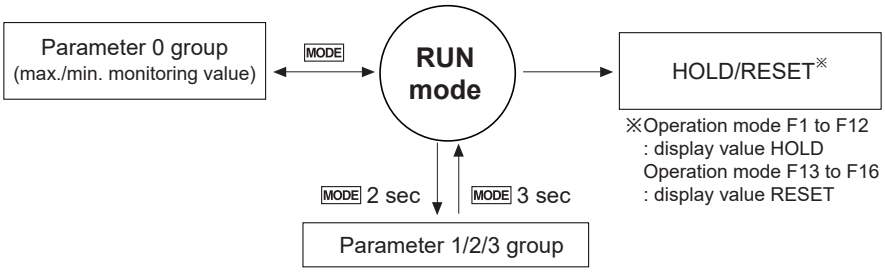


5. RS485 communication output

Comm. protocol	Modbus RTU	Communication Speed	2400, 4800, 9600 (default), 19200, 38400 bps
Connection type	RS485		
Application standard	Compliance with EIA RS485	Communication response time	5 to 99ms (default: 20ms)
Max. connection	31 units (address: 01 to 99)	Start Bit	1-bit fixed
Synchronous method	Asynchronous	Data Bit	8-bit fixed
Comm. method	Two-wire half duplex	Parity Bit	None (default), Even, Odd
Comm. distance	Max. 800m	Stop Bit	1, 2-bit (default)

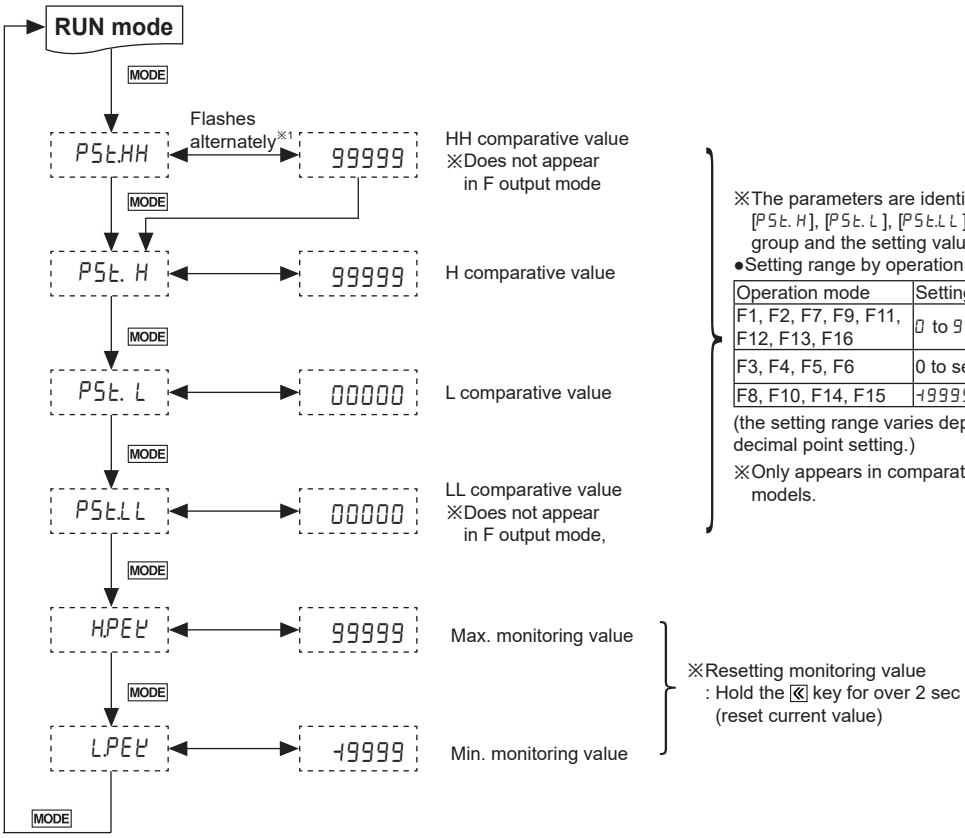
※For more information about RS485 communication output specifications, refer to '▣ RS485 Communication Output'.

▣ Parameter Groups

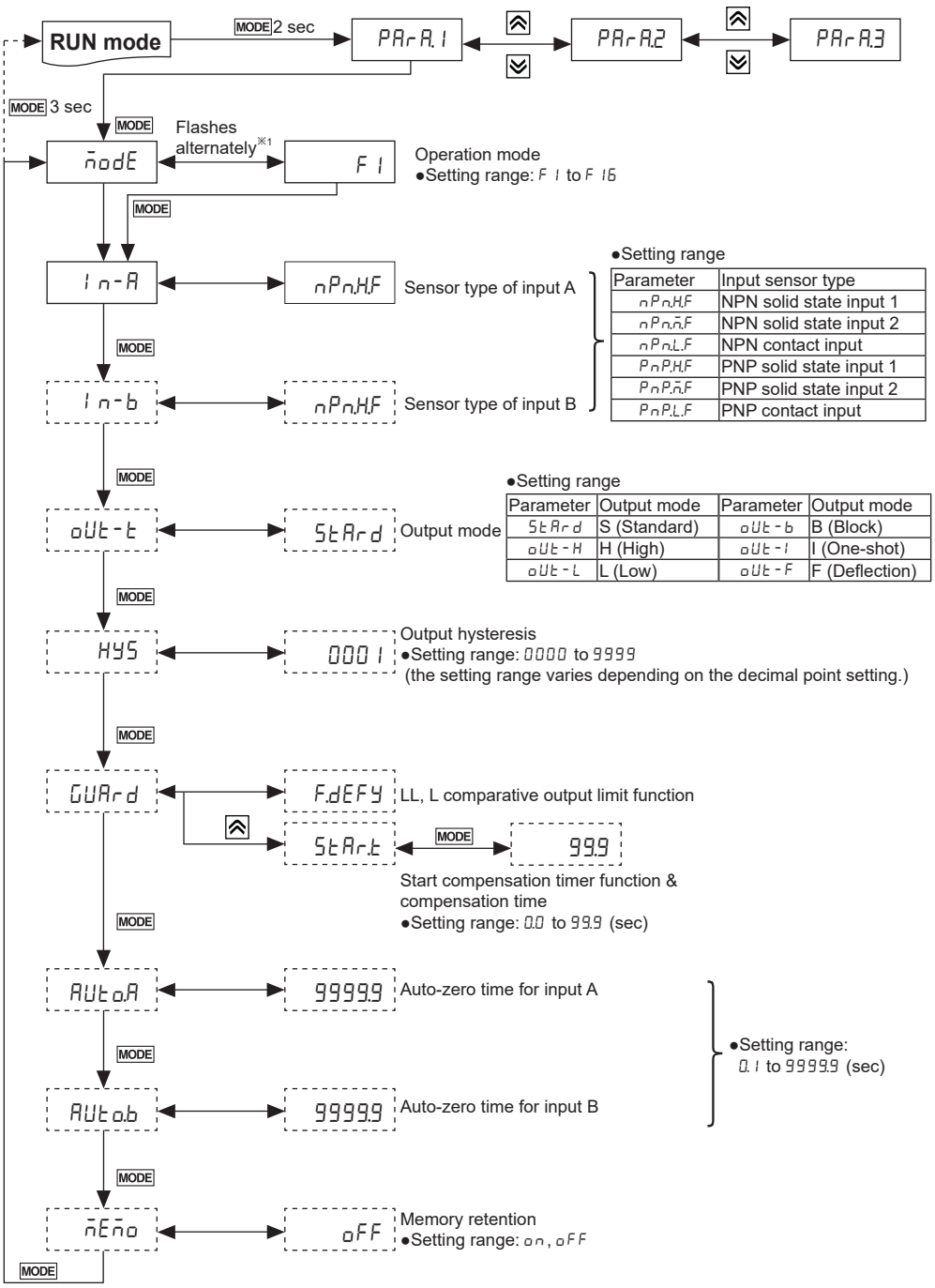


※Press the ≪, ≪, ≪ keys to select or set the desired value.
※Press the MODE key once after changing the setting value, to save the setting value and move to the next parameter.
※Hold the MODE key for 1.5 sec at any parameters to return to the select parameter group mode.
※Hold the MODE key for 3 sec to save the setting value and return to RUN mode after changing the setting value.
※If there is no key input for 60 sec while setting the parameters, the new settings are ignored, and the unit will return to RUN mode with previous settings.
※The dotted line parameters may not appear depending on output specifications or other parameter settings. Please refer to '▣ Operation Mode by Parameter Group'.
※1: Each parameter and corresponding setting value will flash alternately every 0.5 sec.

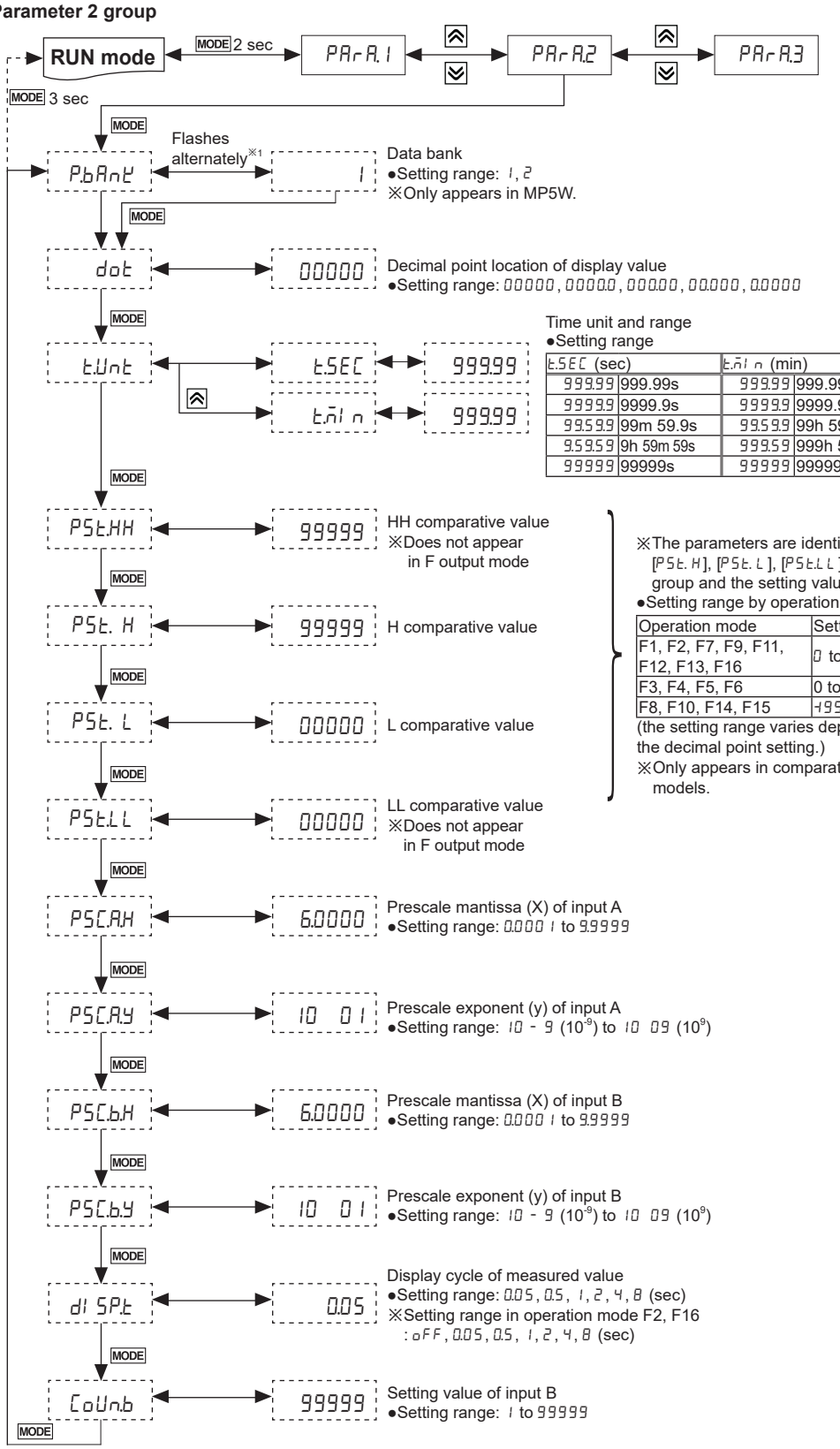
● **Parameter 0 group**



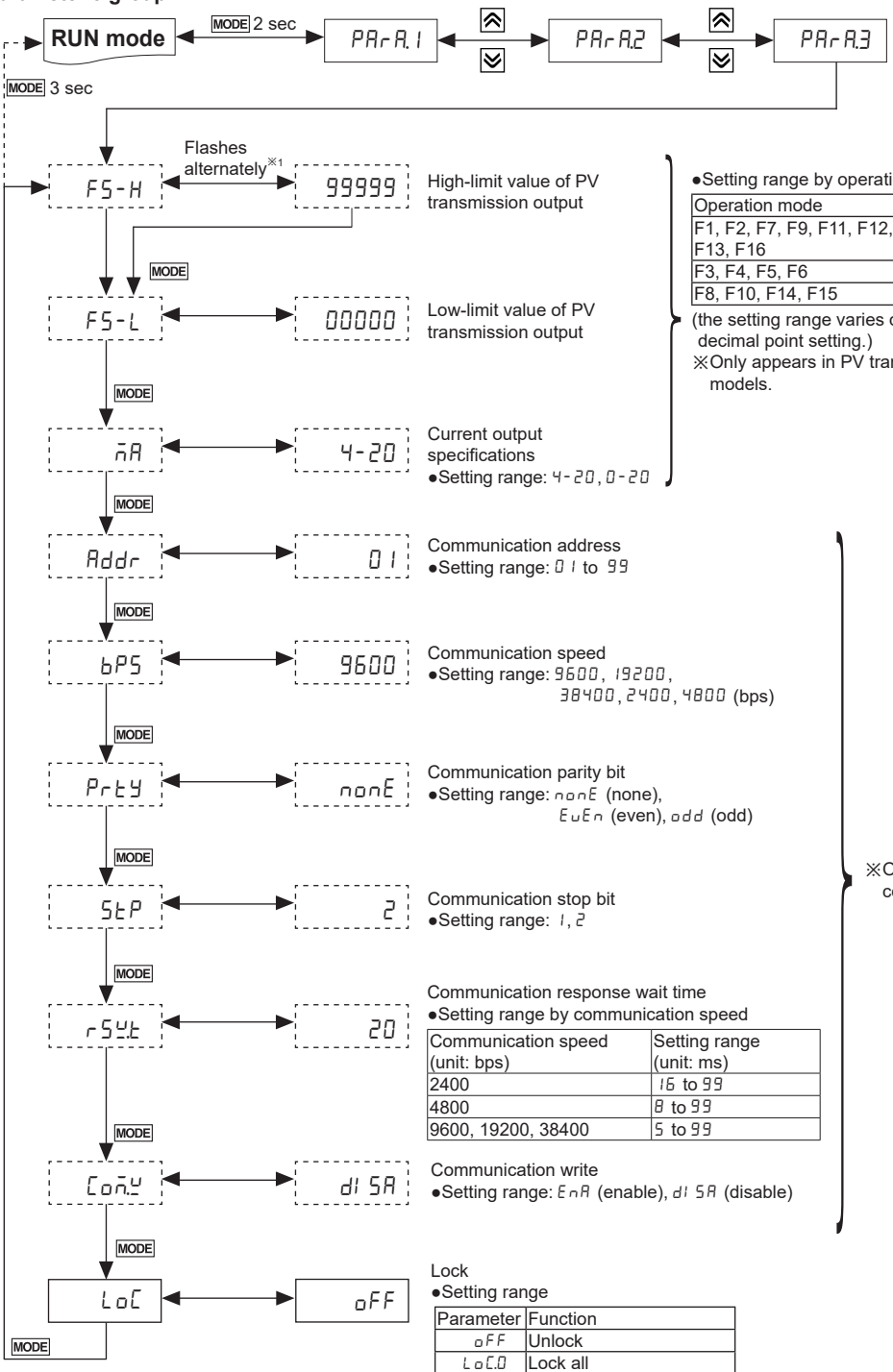
● **Parameter 1 group**



● **Parameter 2 group**



● **Parameter 3 group**



●Setting range by operation mode

Operation mode	Setting range
F1, F2, F7, F9, F11, F12, F13, F16	0 to 99999
F3, F4, F5, F6	0 to set time range
F8, F10, F14, F15	-19999 to 99999

(the setting range varies depending on the decimal point setting.)

※Only appears in PV transmission output models.

※Only appears in RS485 comm. output models.

Communication response wait time
●Setting range by communication speed

Communication speed (unit: bps)	Setting range (unit: ms)
2400	16 to 99
4800	8 to 99
9600, 19200, 38400	5 to 99

Lock
●Setting range

Parameter	Function
oFF	Unlock
LoC.0	Lock all
LoC.1	Parameter 1/2/3 lock
LoC.2	Parameter 2/3 lock
LoC.3	Parameter 3 lock

▣ Operation Mode by Parameter Groups

(◐: parameter display, X: no parameter display)

Parameter \ Operation mode		F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16
0 group	PSt.HH ※1	Appears in all operation modes (F1 to F16).															
	PSt. H ※2																
	PSt. L ※2																
	PSt.LL ※1																
	HPEt	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	X	◐	◐	X
	LPEt	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	X	◐	◐	X
1 group	nodE	Appears in all operation mode (F1 to F16).															
	In-A																
	In-b	X	◐	X	X	X	◐	◐	◐	◐	◐	◐	◐	◐	◐	X ※3	◐
	out-t ※2	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	X	◐	◐	● ※4
	HYS ※2	◐	X	X	X	X	X	◐	◐	◐	◐	X	X	X	X	X	X
	GuArd ※2	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	X	X	X	X
	AutoA	◐	X	X	◐	X	X	◐	◐	◐	◐	X	X	X	X	X	X
	Autob	X	X	X	X	X	X	◐	◐	◐	◐	X	X	X	X	X	X
	nEno	X	X	X	X	X	X	X	X	X	X	X	X	◐	◐	◐	◐
2 group	P.bAnt	※Only appears in MP5W. Appears in all operation modes (F1 to F16).															
	dot	◐	◐	X	X	X	X	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
	t.Unt	X	X	◐	◐	◐	◐	X	X	X	X	X	X	X	X	X	X
	PSt.HH ※1	Appears in all operation modes (F1 to F16).															
	PSt. H ※2																
	PSt.LL ※2																
	PSt. L ※1																
	PSC.AH	◐	◐	X	◐	X	X	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
	PSC.AY	◐	◐	X	◐	X	X	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
	PSC.bH	X	X	X	X	X	X	◐	◐	◐	◐	X	X	X	X	X	X
	PSC.bY	X	X	X	X	X	X	◐	◐	◐	◐	X	X	X	X	X	X
	dI SPt	◐	▣ ※5	X	X	X	X	◐	◐	◐	◐	X	X	X	X	X	▣
	CoUnb	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	◐
3 group	FS-H	※Only appears in PV transmission output models. Appears in operation modes (F1 to F16).															
	FS-L																
	nA																
	Addr	※Only appears in RS485 comm. output models. Appears in all operation modes (F1 to F16).															
	bPS																
	PrtY																
	StP																
	rEYt																
	ConY																
	LoC	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐

※1: Only appears in only for quintuple output models.
※2: Only appears in triple, quintuple output models.
※3: The settings for In-b and In-A are applied.
※4: (●) F output mode [oUt-F] cannot be set.
※5: (▣) setting range: oFF, 0.05, 0.5, 1, 2, 4, 8

• Monitoring delay function by output mode

Output mode	S mode	H mode	L mode	B mode	I mode	F mode
Parameter	StArd	out-h	out-L	out-b	out-I	out-F
Comparative output limit	◐	X	X	◐	X	◐
Start compensation timer	◐	◐	◐	◐	◐	◐

▣ Operation Modes [mode]

- Select operation mode from operation mode[mode]of parameter 1 group..
- MP5 has 16 operation modes.

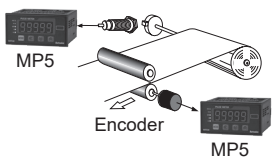
◎ F1 Mode: Frequency/Revolutions/Speed

Measures the frequency of input A and displays the calculated frequency, revolutions, and speed.

1) Frequency (Hz)	= f × α	(α= 1 [sec])
2) Revolutions (rpm)	= f × α	(α= 60 [sec])
3) Speed (m/min)	= f × α	(α= 60L [sec])

※L: travel distance of conveyor belt of 1 pulse cycle[m]
α: prescale value

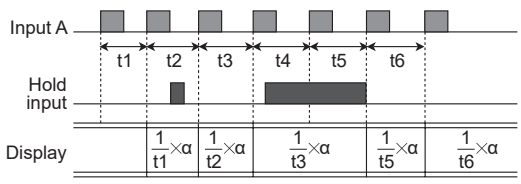
For multiple objects, $\alpha = \frac{60L}{N}$



- Display value and display unit

Display value	Display unit	α (prescale value)
Frequency	Hz	1
	kHz	0.001
Revolutions	rps	1
	rpm (default)	60
Speed	mm/sec	1,000L
	cm/sec	100L
	m/sec	1L
	m/min	60L
	km/hour	3.6L

- Timing chart

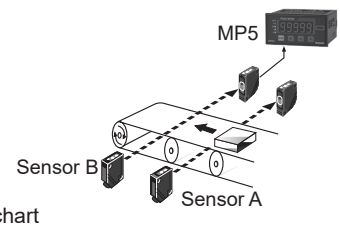


◎ F2 Mode: Passing Speed

Displays the passing speed between input A ON and input B ON.

Passing speed (V) = f × α (α = L[m])

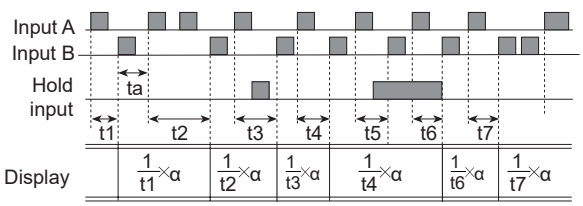
※f : reciprocal of time [sec] between input A (sensor) ON and input B (sensor) ON.
L: distance between input A (sensor) and input B (sensor) [m]
α: prescale value



- Display value and display unit

Display value	Display unit	α (prescale value)
Passing speed	mm/sec	1,000L
	cm/sec	100L
	m/sec (default)	1L
	m/min	60L
	km/hour	3.6L

- Timing chart

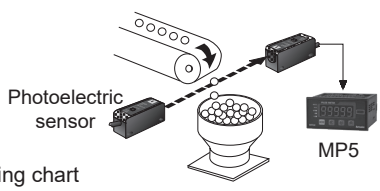


※ta: Return time (over 20ms)

◎ F3 Mode: Cycle

Displays the measured time from Input A ON to the next ON.

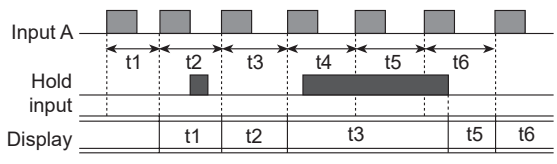
Cycle (T) = t ※t: measurement time [sec]



- Display value and display unit ([Unit] of parameter 2)

Display value	Display unit	
Cycle	Sec	Min
	999.99s (default)	999.99m
	9999.9s	9999.9m
	99m 59.9s	99h 59.9m
	9h 59m 59s	999h 59m
	99999s	99999m

- Timing chart



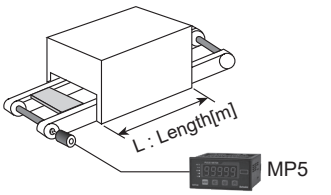
◎ F4 Mode: Passing Time

Measures the time from Input A ON to the next ON, and displays the passing time of the arbitrary distance.

Passing time[sec]= t × α

$$(\alpha = \frac{L[m]}{\text{Distance advanced in 1 pulse cycle [m]}})$$

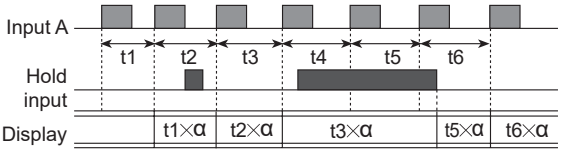
※t : measured time[sec], L : arbitrary distance[m]
α: prescale value



• Display value and display unit ([Unit] of parameter 2)

Display value	Display unit	
Passing time	SEC	MIN
	999.99s (default)	999.99m
	9999.9s	9999.9m
	99m 59.9s	99h 59.9m
	9h 59m 59s	999h 59m
	99999s	99999m

• Timing chart

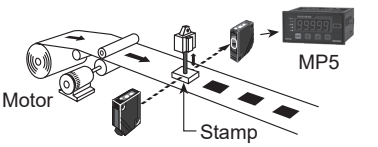


◎ F5 Mode: Time Interval

Displays measured time of Input A ON

Time interval (T) = t

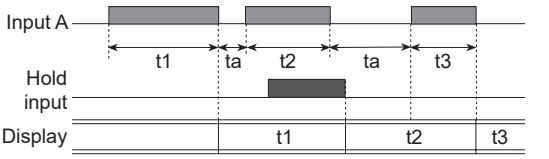
※t: measured time of input A ON [sec]



• Display value and display unit ([Unit] of parameter 2)

Display value	Display unit	
Time interval	SEC	MIN
	999.99s (default)	999.99m
	9999.9s	9999.9m
	99m 59.9s	99h 59.9m
	9h 59m 59s	999h 59m
	99999s	99999m

• Timing chart



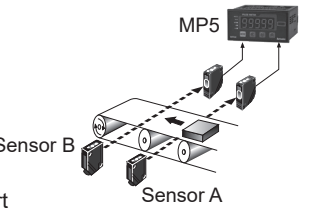
※ta: Return time (over 20ms)

◎ F6 Mode: Time Differential

Displays measured time from Input A ON to Input B ON.

Time differential (T) = t (ta to tb)

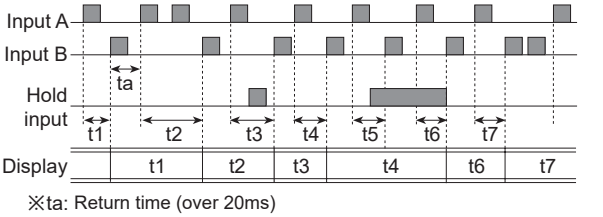
※t (ta to tb): measured time from input A ON to input B ON [sec]



• Display value and display unit ([Unit] of parameter 2)

Display value	Display unit	
Time difference	SEC	MIN
	999.99s (default)	999.99m
	9999.9s	9999.9m
	99m 59.9s	99h 59.9m
	9h 59m 59s	999h 59m
	99999s	99999m

• Timing chart



※ta: Return time (over 20ms)

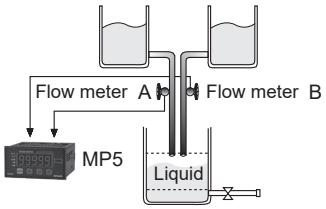
◎ F7 Mode: Absolute Ratio

Measures and displays relative speed, amount, speed, etc. of input B against input A in percentage (%).

Absolute ratio = (Input B / Input A) × 100%

$$\text{Absolute ratio} = \frac{\text{Frequency of input B[Hz]} \times B\alpha}{\text{Frequency of input A[Hz]} \times A\alpha} \times 100[\%]$$

※Aα: Prescale value of input A, Bα: Prescale value of input B

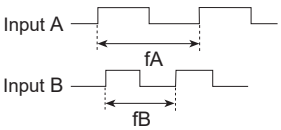


• Display value and display unit

Display value	Display unit
Absolute ratio	%

※Hold: When the hold signal turns ON, the display value is maintained until the display cycle turns to hold OFF.

• Timing chart



$$\text{Display} = \frac{\text{Frequency of input B[Hz]} \times B\alpha}{\text{Frequency of input A[Hz]} \times A\alpha} \times 100[\%]$$

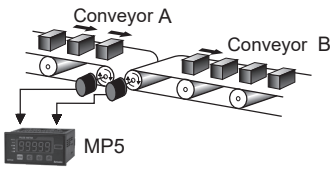
◎ F8 Mode: Error Ratio

Measures and displays the relative rate of input B against the reference value of input A in percentage (%).

$$\text{Error ratio} = \frac{\text{Input B-Input A}}{\text{Input A}} \times 100[\%]$$

$$\text{Error ratio} = \frac{\text{(Frequency of input B [Hz]} \times B\alpha) - \text{(Frequency of input A[Hz]} \times A\alpha)}{\text{Frequency of input A[Hz]} \times A\alpha} \times 100[\%]$$

※Aα: prescale value of input A, Bα: prescale value of input B

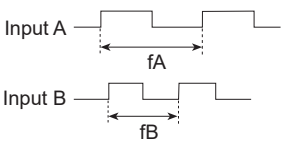


• Display value and display unit

Display value	Display unit
Error ratio	%

※Hold: When the hold signal turns ON, the display value is maintained until the display cycle turns to hold OFF.

• Timing chart



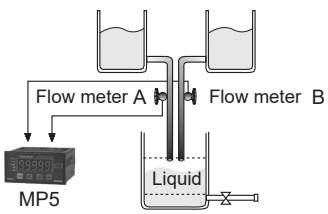
◎ F9 Mode: Density

Measures and displays the density ratio (%) of input B against the total sum of input A and input B.

$$\text{Density} = \frac{\text{Input B}}{\text{Input A + Input B}} \times 100[\%]$$

$$\text{Density} = \frac{\text{Frequency of Input B[Hz]} \times B\alpha}{\text{(Frequency of input A[Hz]} \times A\alpha) + \text{(Frequency of input B[Hz]} \times B\alpha)} \times 100[\%]$$

※Aα: Prescale value of input A, Bα: Prescale value of input B

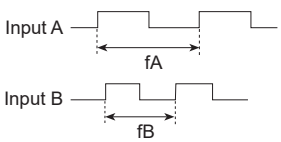


• Display value and display unit

Display value	Display unit
Density	%

※Hold: When the hold signal turns ON, the display value is maintained until the display cycle turns to hold OFF.

• Timing chart



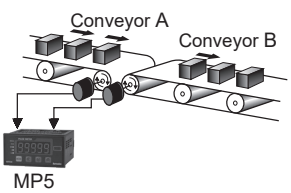
◎ F10 Mode: Error

Measures and displays the error of input B against reference value of input A.

Error = Input B - Input A

Error = (Frequency of input B[Hz] × Bα) - (Frequency of input A[Hz] × Aα)

※Aα: prescale value of input A, Bα: prescale value of input B

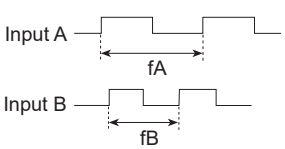


• Display value and display unit

Display value	Display unit
Error	END User setting

※Hold: When the hold signal turns ON, the display value is maintained until the display cycle turns to hold OFF.

• Timing chart

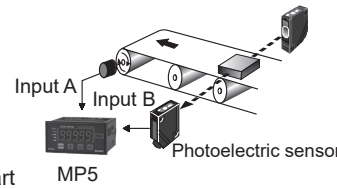


◎ F11 Mode: Length Measurement 1

Measure and display the number of input A pulses during input B ON.

Length measurement = P × α

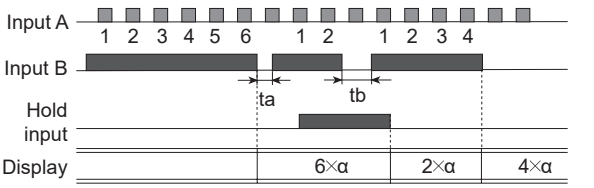
※P: Number of input A pulses, α: Prescale value



• Display value and display unit

Display value	Display unit
Length measurement	Quantity (default)
	mm
	cm
	m

• Timing chart



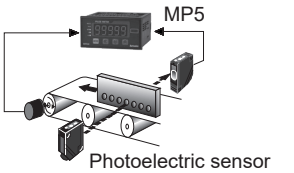
※ta, tb: return time (over 20ms)

◎ F12 Mode: Interval

Measures and displays the number of input A pulses from Input B ON to the next ON.

Interval = P × α

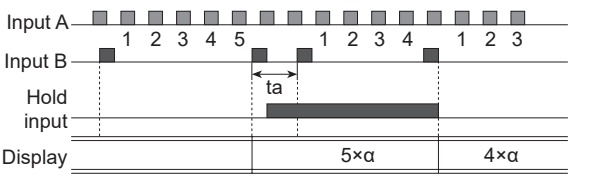
※P: Number of input A pulses, α: Prescale value



• Display value and display unit

Display value	Display unit
Interval	Quantity (default)
	mm
	cm
	m

• Timing chart



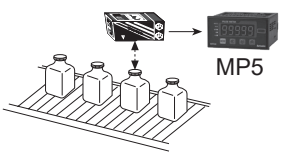
※ta: return time (over 20ms)

◎ F13 Mode: Accumulation

Measures and displays the counted value of input A pulses.

Accumulation = P × α

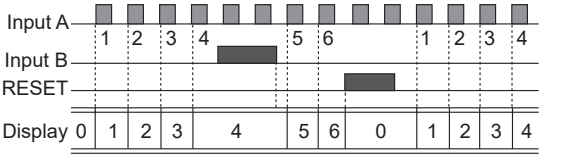
※P: Number of input A pulses, α: Prescale value



• Display value and display unit

Display value	Display unit
Accumulation	Quantity[EA]

• Timing chart



※α=1 display value

• Operation

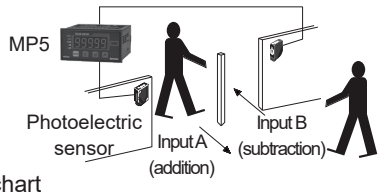
①Counts the number of input A pulses.
②Input B is an enable input signal. During ON, the quantity and display value of input A will be held, and during OFF input A will be re-counted.
③When RESET input is ON, the integrated counted value will be reset to "0".

◎ F14 Mode: Addition/Subtraction-Individual Input

Displays the counted value from added input A pulses and subtracted input B pulses. When there are two inputs simultaneously, it will not count.

Addition/Subtraction = Input A × α - Input B × α

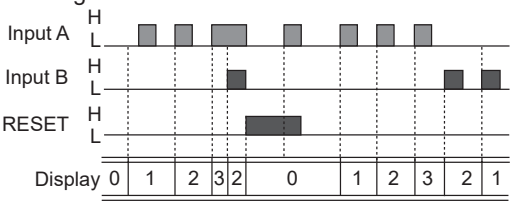
※α: Prescale value of input A



• Display value and display unit

Display value	Display unit
Addition/ Subtraction (individual input)	Quantity

• Timing chart



• Operation and timing chart

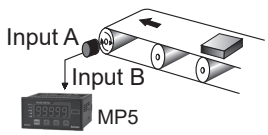
Pulse of input A is added, and pulse of input B is subtracted.

※α=1 display value

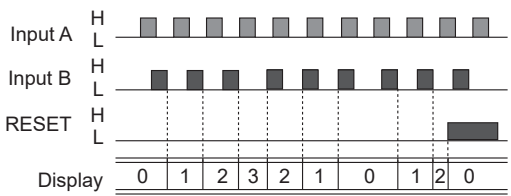
◎ F15 Mode: Addition/Subtraction- Phase difference input

When input A is low, counting is added to the low of input B.
When input A is low, counting is subtracted from the high of input B.

Addition/Subtraction (phase difference)
= Detects position and speed using A and B phases of encoder outputs as input.



• Timing chart



• Display value and display unit

Display value	Display unit
Up/Down counting (phase difference input)	Quantity

◎ F16 Mode: Length Measurement 2

Measures and displays the number of pulses from input A until the value of input B reaches the set value.

Length measurement 2 = P × α (until the setting value of Input B)

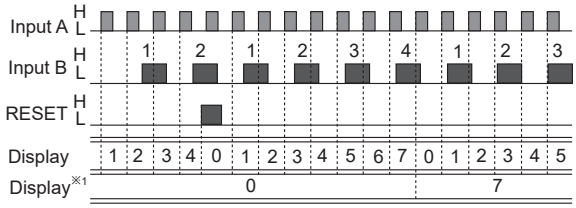
※P: Number of input A pulses, α: Prescale value

• Display value and display unit

Display value	Display unit
Length measurement 2	Quantity[EA]

※If input A and input B are ON during initial power supply, it will not count and only count the number of rising edge.
※Display value is renewed depending on the display cycle [dI SPt] setting.

• Timing chart (e.g.) setting value of Input B=4



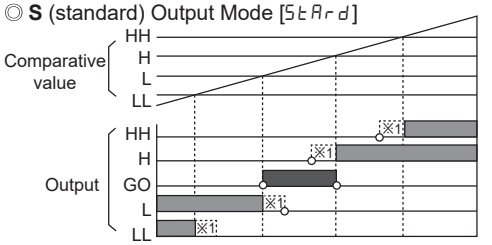
※1: When the display cycle [dI SPt] setting is oFF, it will maintain the quantity of input A until the value of input B reaches the setting value B [CoUnb].

▣ Output Modes [out-t]

- MP5 Series supports 6 output modes. (There is no output mode in indicator models).
- Requirement for setting comparative value: (B output mode) LL<L<H<HH, (F output mode) L<H, (other output modes) individual output operation regardless of size or order of set comparative values.

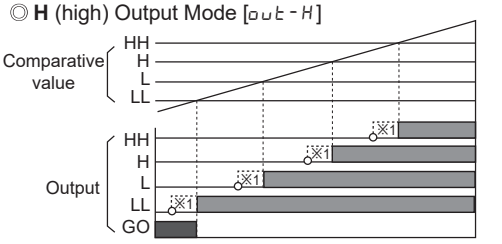
※1: hysteresis

◎ S (standard) Output Mode [StAnd]



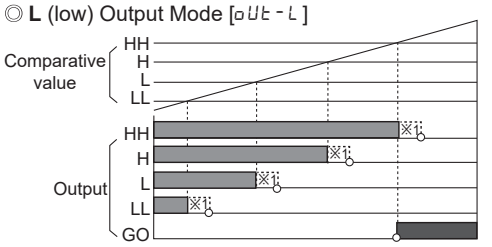
HH output : Display value ≥ Comparative setting value HH
H output : Display value ≥ Comparative setting value H
L output : Display value ≤ Comparative setting value L
LL output : Display value ≤ Comparative setting value LL
※1: GO output ON when there are no HH, H, L, LL outputs

◎ H (high) Output Mode [out-H]



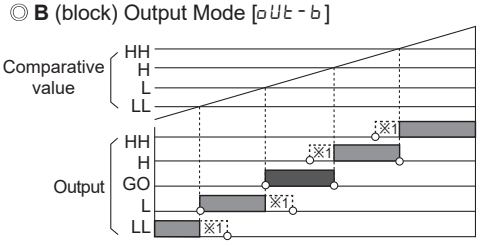
HH output : Display value ≥ Comparative setting value HH
H output : Display value ≥ Comparative setting value H
L output : Display value ≥ Comparative setting value L
LL output : Display value ≥ Comparative setting value LL
※1: GO output ON when there are no HH, H, L, LL outputs

◎ L (low) Output Mode [out-L]



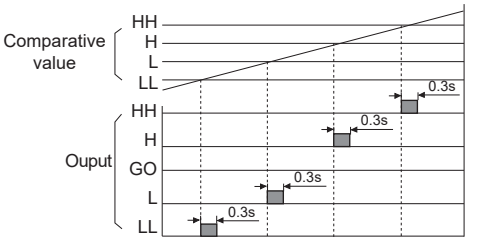
HH output : Display value ≤ Comparative setting value HH
H output : Display value ≤ Comparative setting value H
L output : Display value ≤ Comparative setting value L
LL output : Display value ≤ Comparative setting value LL
※1: GO output ON when there are no HH, H, L, LL outputs

◎ B (block) Output Mode [out-b]



HH output : Display value ≥ Comparative setting value HH
H output : Comparative setting value HH > Display value ≥ Comparative setting value H
L output : Comparative setting value LL < Display value ≤ Comparative setting value L
LL output : Display value ≤ Comparative setting value LL
※1: GO output ON when there are no HH, H, L, LL outputs

◎ I (one-shot) Output Mode [out-i]



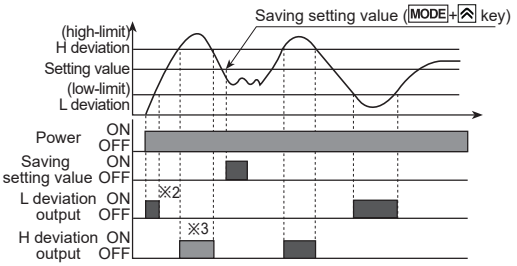
HH output : Display value ≥ Comparative setting value HH
H output : Comparative setting value HH > Display value ≥ Comparative setting value H
L output : Comparative setting value H > Display value ≥ Comparative setting value L
LL output : Comparative setting value L > Display value ≥ Comparative setting value LL
※No GO output
※One-shot output time is fixed at 0.3 sec.
※No hysteresis

◎ F (deflection) Output Mode [out-F]

Transmits outputs when the saved setting value exceeds H deviation or L deviation.

- Saving setting value: press the MODE+▲ keys to save as setting value.
- Checking setting value: press the ▲ key to check the setting value.
- Setting deviation: Sets H deviation [PSt. H], and L deviation[PSt. L] of parameter group 0,2 with the setting value as reference. (The set deviation value is saved during Power OFF until it is re-set.)
- Deviation setting range: 0.0001 to 99999 (the setting range varies depending on the decimal point [dot] setting.)

E.g.)Decimal point[dot]: 0000.0, Setting range: 0.1 to 9999.9



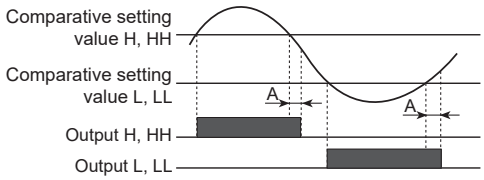
※2: When selecting initial comparative output limit function, it does not transmit outputs.
※3: The graph is assuming that there is a saved setting value prior to the setting value save point. The actual output position may be different.
※There are no HH, GO, LL outputs.
※The deviation can be set to "0" but the actual operation will be the same as "1".

▣ Function

◎ Hysteresis [HYS]

Near the comparative setting value, the output may turn ON/OFF frequently and unstably.
To prevent this, hysteresis value is set based on the comparative setting value.

※A: hysteresis value
※The hysteresis value can be set to "0" but the actual operation value is "1".

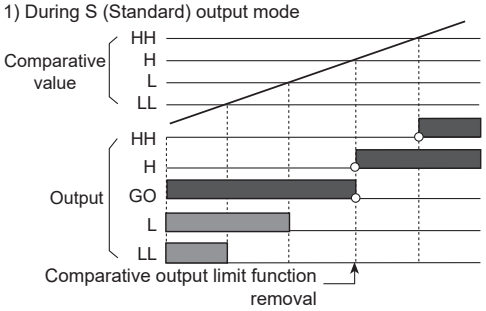


◎ Delay monitoring [GUAr.d]

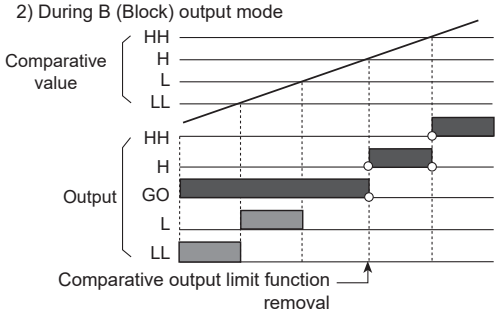
After supplying power, the starting current of motors and other inputs are changeable. This function allows stable control by limiting all outputs for a certain period of time, until the target measurement unit stabilizes. It may also control L, LL outputs until a specific output is reached.

- Comparative output limit function [F.dEFY]
  : Only for S (Standard), B (Block), F (Deflection) output mode.
  : Limits L, LL output before H, HH output.
  ※Initial L, LL outputs does not operate, so GO output operates.

1) During S (Standard) output mode

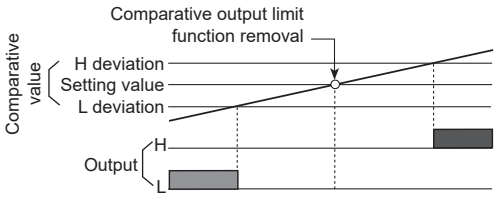


2) During B (Block) output mode



※After supplying power, there is no initial L, LL comparative outputs ( ) .
※Each setting value of HH, H, LL, L is not related to their relative sizes. Hence, HH value may be lower or equal to LL value.

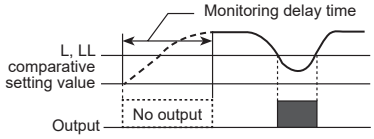
3) During F (Deflection) output mode



※After supplying power, there is no comparative output ( ) of L deviation.
※In F output mode, the comparative output limiting function is removed at the set value (standard setting)
※H and L deviation are not related to their relative sizes.
(H deviation setting value > L deviation setting value,
H deviation setting value < L deviation setting value)

- Start compensation timer function [StAr.t]

Set monitoring delay time so that there is no output during the delay time.



◎ Auto-zero time setting [AUt o.A, AUt o.b]

When there is no input signal during auto-zero setting time, the display value is automatically set to 0 (zero). Please set the auto-zero setting time so that it is longer than the interval of the slowest input signal. If the setting time is too long and there is no input signal, the rate at which the display value falls to 0 (zero) decrease, and output response rate may slow down.

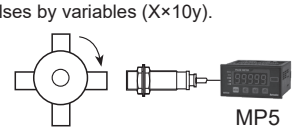
◎ Data bank [P.bAnK] (only for MP5W)

Comparative setting value and prescale value are saved as two types (data bank 1, 2) and can be selected for use by opening or shorting of terminals.

- Terminal 3, 5 open: use value of data bank 1
- Terminal 3, 5 short: use value of data bank 2

◎ Prescale [PSC.□.H, PSC.□.Y]

Displays values in required units or specific multiples by counting the number of input pulses, then multiplying the number of pulses or the length of pulses by variables (X×10y).



Number of revolutions (rpm) = f×α
= f×60×(1 / N)
= f×60×(1 / 4)
= f×60×0.25
= f×15

※f: The number of input pulses per second [Hz],
α: Prescale value
N: The number of pulses per revolution

- Setting prescale value (α=15)
  Set mantissa (X) as 1.5000, and exponent (Y) as 1 for prescale value (α)=15.
  The same display value can be obtained with α value set as X=0.1500, and Y=2.

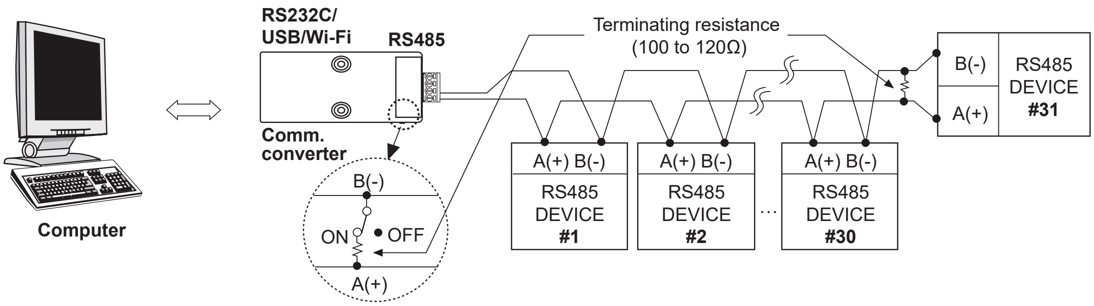
▣ RS485 Communication Output

- Applicable for models with RS485 communication output through sub output (MP5Y-□5, MP5W-□8/9).
  Please refer to '▣ Ordering Information'.

1. Communication specifications

Comm. protocol	Modbus RTU	Communication Speed	2400, 4800, 9600 (default), 19200, 38400 bps
Connection type	RS485		
Application standard	Compliance with EIA RS485	Communication response time	5 to 99ms (default: 20ms)
Max. connection	31 units (address: 01 to 99)	Start Bit	1-bit fixed
Synchronous method	Asynchronous	Data Bit	8-bit fixed
Comm. method	Two-wire half duplex	Parity Bit	None (default), Even, Odd
Comm. distance	Max. 800m	Stop Bit	1, 2-bit (default)

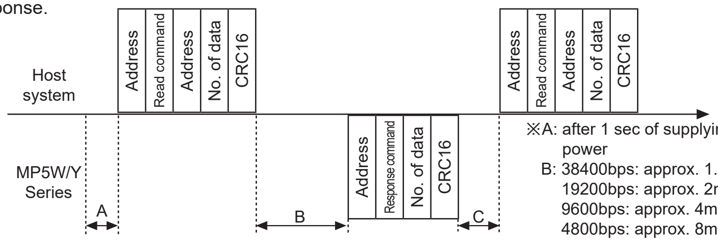
2. System configuration



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately).
Please use twisted pair wire for RS485 communication.

3. Communication control sequence

1. Communication sequence follows Modbus RTU protocol.
2. Communication with the host system can be established after 1sec (1,000ms) of supplying power.
3. The initial transmission authority is held by the host device (PC). When the host device transmits a request, the MP5W/Y Series sends a response.



※A: after 1 sec of supplying power
B: 38400bps: approx. 1.75ms
19200bps: approx. 2ms
9600bps: approx. 4ms
4800bps: approx. 8ms
2400bps: approx.16ms
C: over 20ms

※The longer of the communication response wait time [rSUt] of parameter group 3 and response time of B is applied.

4. Cautions for communication

1. Twisted pair cable (AWG24) is recommended for RS485 communication. When not using twisted pair cables, please make sure that A (+) and B (-) cable lengths are equal.
2. After connecting the communication cable, terminating resisters (100 to 120Ω) must be attached at both ends.

5. Communication command and block definition

5-1. Read coil status (func 01 H), read input status (func 02 H)

1) Query (Master)

Slave Address	Function (command)	Starting Address		No. of Points (no. of data)		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

2) Response (slave)

Slave Address	Function (command)	Byte Count (no. of data byte)	Data (low)	Data	Data (high)	Error Check (CRC 16)	
						Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

5-2. Read Holding registers (func 03 H), read input registers (func 04 H)

1) Query (Master)

Slave Address	Function (command)	Starting Address		No. of Points (no. of data)		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

2) Response (Slave)

Slave Address	Function (command)	Byte Count (no. of data byte)	Data		Data		Data		Error Check (CRC 16)	
			High	Low	High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

5-3. Force single coil (func 05 H)

1) Query (Master)

Slave Address	Function (command)	Coil Address		Force Data		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

2) Response (Slave)

Slave Address	Function (command)	Coil Address		Force Data		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

5-4. Preset single register (func 06 H)

1) Query (Master)

Slave Address	Function (command)	Register Address		Preset Data		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

2) Response (Slave)

Slave Address	Function (command)	Register Address		Preset Data		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

5-5. Preset multiple registers (func 10 H)

1) Query (Master)

Slave Address	Function (command)	Starting Address		No. of Register		Byte Count	Data		Data		Error Check (CRC 16)	
		High	Low	High	Low		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

2) Response (Slave)

Slave Address	Function (command)	Starting Address		No. of Register		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

5-6. Exception response-error code (exception processing)

Slave Address	Function +80H	Exception code	Error Check (CRC 16)	
			Low	High
1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

- When a communication error occurs, the highest bit from the received command (function) is set (1), a response command is sent, and the corresponding exception code is transmitted.

(1) ILLEGAL FUNCTION (exception code: 01 H)
: Unsupported command

(2) ILLEGAL DATA ADDRESS (exception code: 02 H)
: The requested start address does not not match the transmission address of the device.

(3) ILLEGAL DATA VALUE (exception code: 03 H)
: The number of requested data does not match the transmission number of the device.

(4) SLAVE DEVICE FAILURE (exception code: 04 H)
: The requested command cannot be processed properly. (CRC)

6. Address mapping table

6-1. Read coil status (func 01)

No.(Address)	Func	R/W	Parameter		Description	Setting range	Note
000001(0000)	01	R	HH	HH comparative output	Comparative output LED	0: OFF / 1: ON	
000002(0001)	01	R	H	H comparative output		0: OFF / 1: ON	
000003(0002)	01	R	GO	GO comparative output		0: OFF / 1: ON	
000004(0003)	01	R	L	L comparative output		0: OFF / 1: ON	
000005(0004)	01	R	LL	LL comparative output		0: OFF / 1: ON	
000006 to 000050	01	R	Reserved				

6-2. Read input status (func 02)

No.(Address)	Func	R/W	Parameter		Description	Setting range	Note
100001(0000)	02	R		RESET(HOLD)	External input variables	RESET input status	
100002(0001)	02	R		BANK		BANK input status	
100003 to 100050	02	R	Reserved				

6-3. Read input registers (func 04)

No.(Address)	Func	R/W	Parameter	Description	Factory default	Note
300001 to 300100	04	R	Reserved			
300101(0064)	04	R		Product number H	0	Dedicated model number
300102(0065)	04	R		Product number L	0	
300103(0066)	04	R		Hardware Version	1	
300104(0067)	04	R		Software Version	1	
300105(0068)	04	R		Model 1	"MP"	MP5Y-□5, MP5W-□8 (※MP5W-□9 displayed as MP5W-□8)
300106(0069)	04	R		Model 2	"5□"	
300107(006A)	04	R		Model 3	"-□"	
300108(006B)	04	R		Model 4	"□"	
300109(006C)	04	R		Model 5	" "	
300110(006D)	04	R		Model 6	" "	
300111(006E)	04	R		Model 7	" "	
300112(006F)	04	R		Model 8	" "	
300113(0070)	04	R		Model 9	" "	
300114(0071)	04	R		Model 10	" "	
300115(0072)	04	R	Reserved			
300116(0073)	04	R	Reserved			
300117(0074)	04	R	Reserved			
300118(0075)	04	R		Coil Status Start Address	0000	
300119(0076)	04	R		Coil Status Quantity	0	
300120(0077)	04	R		Input Status Start Address	0000	
300121(0078)	04	R		Input Status Quantity	0	
300122(0079)	04	R		Holding Register Start Address	0000	
300123(007A)	04	R		Holding Register Quantity	0	
300124(007B)	04	R		Input Register Start Address	0000	
300125(007C)	04	R		Input Register Quantity	0	
300126 to 300200	04	R	Reserved			

No.(Address)	Func	R/W	Parameter		Description	Setting range	Note
301001(03E8)	04	R	HH H GO L LL	Front display LED	HH LED Display H LED Display GO LED Display L LED Display LL LED Display	0: OFF 1: ON 0: OFF 1: ON 0: OFF 1: ON 0: OFF 1: ON 0: OFF 1: ON	0 Bit 1 Bit 2 Bit 3 Bit 4 Bit
301002(03E9) 301003(03EA)	04	R	PV		Measurement value	-19999 to 99999	
301004(03EB)	04	R	DOT		Decimal point	0: □□□□□ 1: □□□□.□ 2: □□□.□□ 3: □□.□□□ 4: □.□□□□	
301005(03EC)	04	R	UNIT		Time range	0: 999.99s 5: 999.99m 1: 9999.9s 6: 9999.9m 2: 99m 59.9s 7: 99h 59.9m 3: 9h 59m 59s 8: 999h 59m 4: 99999s 9: 99999m	
301006(03ED)	04	R	MODE		Operation mode	0: F1 to 1: F2 14: F15 2: F3 15: F16	

6-4. Read holding registers (func 03) / Preset single register (func 06) / Preset multiple registers (func 16)

6-4-1. Comparative value settings and peak value check group

No.(Address)	Func	R/W	Parameter		Description	Setting range	Factory default
400001(0000) 400002(0001)	03/16	R/W	PSt.HH	Preset HH	HH comparative value	0 to 99999	99999
400003(0002) 400004(0003)	03/16	R/W	PSt.H	Preset H	H comparative value	0 to 99999	99999
400005(0004) 400006(0005)	03/16	R/W	PSt.L	Preset L	L comparative value	0 to 99999※1	00000
400007(0006) 400008(0007)	03/16	R/W	PSt.LL	Preset LL	LL comparative value	0 to 99999※1	00000
400009(0008) 400010(0009)	03/16	R/W	H.PEAK	High Peak	High peak value of measured value	99999※2	—
400011(000A) 400012(000B)	03/16	R/W	L.PEAK	Low peak value of measured value		-19999※2	—
400013 to 400050	03/06/16	R/W	Reserved				

※1: In operation modes F8, F10, F14, F15,the setting range is -19999 to 99999
※2: Max./Min. measurement value

6-4-2. Parameter 1 group

No.(Address)	Func	R/W	Parameter		Description	Setting range	Factory default
400051(0032)	03/06/16	R/W	mode	Mode	Input operation mode	0: F1 to 1: F2 14: F15 2: F3 15: F16	0
400052(0033)	03/06/16	R/W	In-A	Input A	Sensor type	0: nPn.H.F 1: nPn.n.F 2: nPn.L.F 3: PnP.H.F 4: PnP.n.F 5: PnP.L.F	0
400053(0034)	03/06/16	R/W	In-b	Input B			
400054(0035)	03/06/16	R/W	out-t	Output type	Output mode	0: StAr d 1: out-H 2: out-L 3: out-b 4: out-I 5: out-F	0
400055(0036)	03/06/16	R/W	HYS	Hysteresis	Hysteresis value	1 to 9999	1
400056(0037)	03/06/16	R/W	GUAr.d	Output limit	Output limit function	0: F.dEFY 1: StAr.t	0
400057(0038)	03/06/16	R/W	StAr.t	Start limit value	Start compensation timer value	0.0 to 99.9	0.0
400058(0039)	03/16	R/W	AUto.A	Auto-zero A	Auto-zero time	0.1 to 9999.9	9999.9
400059(003A)	03/16	R/W					
400060(003B)	03/16	R/W	AUto.b	Auto-zero B			
400061(003C)	03/16	R/W					
400062(003D)	03/06/16	R/W	nEno	Memory	Memory retention	0: oFF 1: on	0
400063 to 400100	03/06/16	R/W	Reserved				

6-4-3. Parameter 2 group

No.(Address)	Func	R/W	Parameter		Description	Setting range	Factory default
400101(0064)	03/06/16	R/W	P.bAnK	Data bank	Data bank	0: 1 1: 2	0
400102(0065)	03/06/16	R/W	dot	Dot	Decimal point	0: 0000.0 1: 000.00 2: 00.000 3: 0.0000 4: 0.0000	0
400103(0066)	03/06/16	R/W	t.Unt	Time unit	Time unit	0: t.SEC 1: t.nin	0
400104(0067)	03/06/16	R/W	t.SEC	Time sec	Time range	0: 99.99 99.99s 1: 999.9 999.9s 2: 99.59 99m 59.9s 3: 9.59.59 9h 59m 59s 4: 99999 99999s 5: 999.99 999.99m 6: 9999.9 9999.9m 7: 99.59.9 99h 59.9m 8: 999.59 999h 59m 9: 99999 99999m	0

6-4-3. Parameter 2 group

No.(Address)	Func	R/W	Parameter		Description	Setting range	Factory default
400105(0068)	03/16	R/W	PSt.HH	Preset HH	HH comparative value	0 to 99999	99999
400106(0069)	03/16	R/W					
400107(006A)	03/16	R/W	PSt. H	Preset H	H comparative value	0 to 99999	99999
400108(006B)	03/16	R/W					
400109(006C)	03/16	R/W	PSt. L	Preset L	L comparative value	0 to 99999※1	0
400110(006D)	03/16	R/W					
400111(006E)	03/16	R/W	PSt.LL	Preset LL	LL comparative value	0 to 99999※1	0
400112(006F)	03/16	R/W					
400113(0070)	03/16	R/W	PSC.AM	Prescale A Mantissa	Prescale A mantissa	0.0001 to 9.9999	6.0000
400114(0071)	03/16	R/W					
400115(0072)	03/06/16	R/W	PSC.AY	Prescale A Exponent	Prescale A exponent	00 to 09: + (0 to 9) 10 to 19: - (0 to 9)	01
400116(0073)	03/16	R/W	PSC.bM	Prescale B Mantissa	Prescale B mantissa	0.0001 to 9.9999	6.0000
400117(0074)	03/16	R/W					
400118(0075)	03/06/16	R/W	PSC.bY	Prescale B Exponent	Prescale B exponent	00 to 09: + (0 to 9) 10 to 19: - (0 to 9)	01
400119(0076)	03/06/16	R/W	dISP.t	Display time	Display cycle	0: oFF 4: 2 1: 0.05 5: 4 2: 0.5 6: 8 3: 1	1
400120(0077)	03/16	R/W	CoUnb	INB Setting value	Operation mode F16 INB	1 to 99999	99999
400121(0078)	03/16	R/W					
400122 to 400150	03/06/16	R/W	Reserved				

※1: In operation modes F8, F10, F14, F15, the setting range is -19999 to 99999

6-4-4. Parameter 3 group

No.(Address)	Func	R/W	Parameter		Description	Setting range	Factory default
400151(0096)	03/16	R/W	FS-H	Full scale High	High-limit value of PV transmission output	Setting range varies by model and operation mode※1	99999
400152(0097)							
400153(0098)	03/16	R/W	FS-L	Full scale Low	Low-limit value of PV transmission output		0
400154(0099)							
400155(009A)	03/06/16	R/W	nA	mA	Transmission output spec.	0: 4-20(mA) 1: 0-20(mA)	0
400156(009B)	03/06/16	R/W	Addr	Unit address	Communication address	1 to 99	1
400157(009C)	03/06/16	R/W	bPS	Bit per Sec	Communication Speed	0: 2400 1: 4800 2: 9600 3: 19200 4: 38400	2
400158(009D)	03/06/16	R/W	PrtY	Parity bit	Communication parity bit	0: nonE 1: EuEn 2: odd	0
400159(009E)	03/06/16	R/W	StP	Stop bit	Communication stop bit	0: 1 1: 2	1
400160(009F)	03/06/16	R/W	rSUt	Response waiting time	Communication response waiting time	5 to 99(ms)	20
400161(00A0)	03/06/16	R/W	ConU	Communi cation write	Communication write enable/disable	0: diSA 1: EnA	0
400162(00A1)	03/06/16	R/W	LoC	Lock	Lock	0: oFF 1: LoC.0 2: LoC.1 3: LoC.2 4: LoC.3	0
400163 to 400200	03/06/16	R/W	Reserved				

※1: High-limit/low-limit setting value of PV transmission output. (varies by model and operation mode)

Series	Operation mode	Setting range
MP5Y MP5W	F1, F2, F7, F9, F11, F12, F13, F16	0 to 99999
	F3, F4, F5, F6	0.01 to set time range
	F8, F10, F14, F15	-19999 to 99999

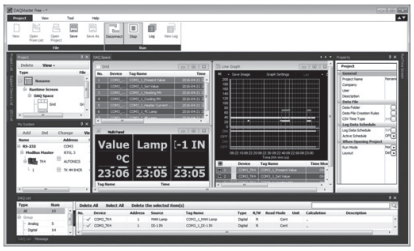
▣ Comprehensive Device Management Program (DAQMaster)

- DAQMaster is comprehensive device management program for convenient management of parameters and multiple device data monitoring.
- Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



▣ Proper Usage

⚠ Cautions during use

1. Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
2. 24VAC, 24-48VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
3. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
4. Keep away from high voltage lines or power lines to prevent inductive noise.
   In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
   Do not use near the equipment which generates strong magnetic force or high frequency noise.
5. This unit may be used in the following environments.
   ① Indoors (in the environment condition rated in 'Specifications')
   ② Altitude max. 2,000m
   ③ Pollution degree 2
   ④ Installation category II

Bar Graph Temperature Indicators

▣ Features

- High accuracy with 16 bit ADC (±0.2% F.S.)
- Multi-input
  - Thermometer 12 types
  - RTD 5 types
  - Analog: current 2 types/voltage 4 types
- 101 LED bar graph (green)
- Various output options
  - Alarm output: 2 points/4 points
  - 4-20mA transmission output (isolated), RS485 communication output
- Various functions
  - Bar graph alarm display
  - High/Low peak input monitoring
  - Alarm output (upper/lower, sensor break)
  - Transmission output/display scale
  - Digital input (DI), etc.
- Built-in power supply for sensor/transmitter (24VDC)
- Small size (rear length: 70mm)

Please read "Safety Considerations" in the instruction manual before using.

CE

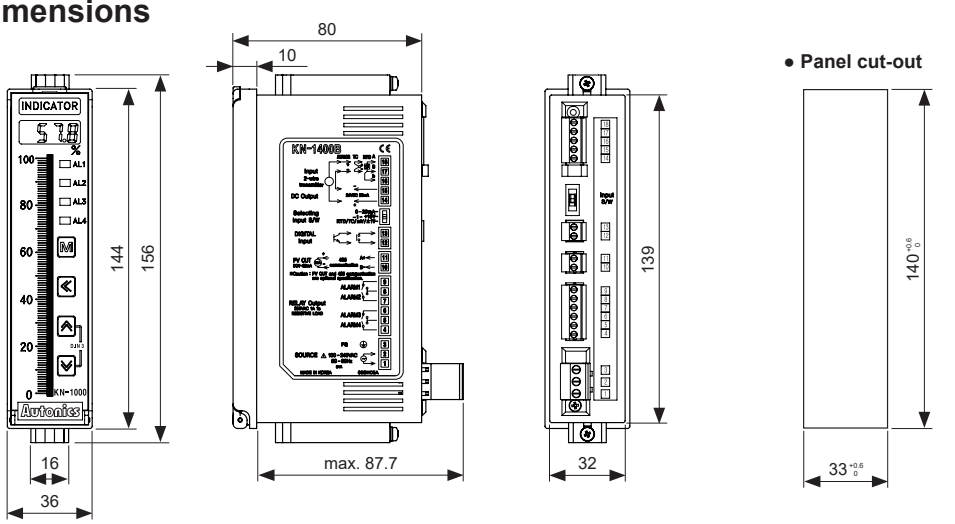
▣ Ordering Information

KN	—	1	0	0	0	B

Size	B	DIN W36×H144mm
Power supply	0	100-240VAC 50/60Hz
	1	24VDC
Option output	0	No option
	1	Transmission output (4-20mA)
	4	RS485 communication output
Alarm output	0	No alarm output
	2	Alarm output: 2
	4	Alarm output: 4
Item	KN-1	Bar Graph Temperature Indicators

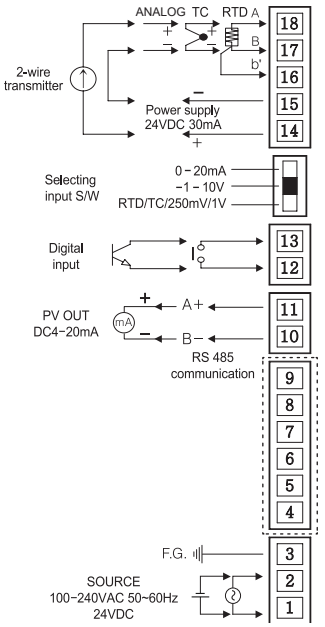
▣ Dimensions

(unit: mm)

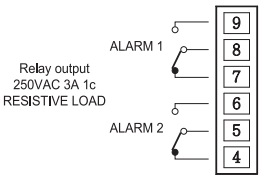


■ Connections

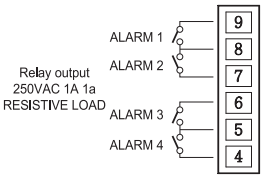
● **KN-10□□B**



● **KN-12□□B**



● **KN-14□□B**



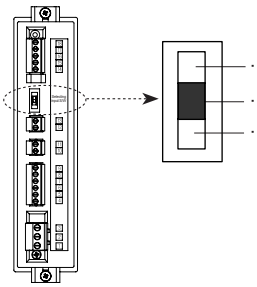
■ Specifications

Series		KN-1000B
Power supply	AC voltage	100-240VAC～ 50/60Hz
	DC voltage	24VDC⎓
Allowable voltage range		90 to 110% of rated voltage
Power consumption	AC voltage	Max. 6VA
	DC voltage	Max. 4W
Display method		7-segment LED (red), graphic bar (green) LED method
Input type	RTD	JPt100Ω, DPt100Ω, DPt50Ω, Cu50Ω, Cu100Ω (5 types)
	Thermocouple	K, J, E, T, R, B, S, N, C (W5), L, U, PLII (12 types)
	Analog	· Voltage: ±1.000V, ±50.00mV, -199.9-200.0mV, -1.00-10.00V (4 types) · Current: 4.00-20.00mA, 0.00-20.00mA (2 types)
Digital input		· Contact input: max. 2kΩ in ON, min. 90kΩ in OFF · Non-contact input: residual voltage max. 1.0V in ON, leakage current max. 0.03mA in OFF · Outflow current: approx. 0.2mA
Sub output	Alarm output	· 2-point: relay contact capacity 250VAC～ 3A 1c · 4-point: relay contact capacity 250VAC～ 1A 1a
	Transmission output	ISOLATED DC4-20mA(PV transmission) load resistance max. 600Ω
	Communication output	RS485 (Modbus RTU)
Display accuracy		±0.2% F.S. ±1-digit (25℃±5℃), ±0.3% F.S. ±1-digit (−10℃ to 20℃, 30℃ to 50℃) In case of thermocouple and below -100°C input, [±0.4%F.S.] ±1-digit ※TC-T, TC-U is min. ±2.0℃
Setting method		Set by front keys, or RS485 communication
Alarm output hysteresis		Set ON/OFF interval (1 to 999-digit)
Sampling cycle		Analog input: 100ms, temperature sensor input: 250ms
Dielectric voltage		2000VAC 50/60Hz for 1 min (between input terminal and power terminal)
Vibration		0.75mm amplitude at frequency 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours
Relay life cycle	2-point	Mechanical: min. 10,000,000, electrical: min. 100,000 (250VAC 3A resistance load)
	4-point	Mechanical: min. 20,000,000, electrical: min. 500,000 (250VAC 1A resistance load)
Insulation resistance		Over 100MΩ (at 500VDC megger)
Noise immunity		±2kV the square wave noise (pulse width 1μs) by noise simulator
Memory retention		Approx. 10 years (non-volatile semiconductor memory type)
Environment	Ambient temperature	−10 to 50℃, storage: −20 to 60℃
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH
Approval		CE
Weight ※1		Approx. 304g (approx. 182g)

※1: The weight includes packaging. The weight in parenthesis is for unit only.
※ Environment resistance is rated at no freezing or condensation.

■ Input Type and Range

● Input type selection switch



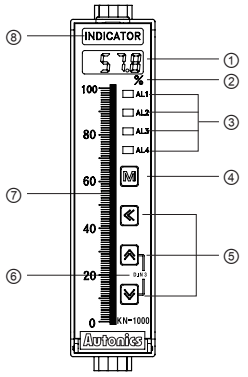
- 0-20mA: Select it for 0(4)-20mA input
- −1-10V: Select it for −1-10V input
- RTD/TC/mV/±1V: Select it for RTD, TC temperature sensor or ±1V, mV input

This unit is multi input product. Select the proper input with the input type selection switch and select this input type in In-P in program mode. The setting of input type selection switch and the input type In-P parameter should be same and it can display the proper measurement value. Factory default is 0-20mA.

Input type			Parameter	Input range(℃)	Input range(℉)
Thermocouple	K(CA)		tC.H1	−200 to 1350	−328 to 2462
	K(CA)		tC.H2	−199.9 to 999.9	−328 to 1832
	J(IC)		tC-J	−199.9 to 800.0	−328 to 1472
	E(CR)		tC-E	−199.9 to 800.0	−328 to 1472
	T(CC)		tC-t	−199.9 to 400.0	−199.9 to 752.0
	B(PR)*		tC-b	100 to 1800	212 to 3272
	R(PR)		tC-r	0 to 1750	32 to 3182
	S(PR)*		tC-S	0 to 1750	32 to 3182
	N(NN)*		tC-n	−200 to 1300	−328 to 2372
	C(W5)*		tC-C	0 to 2300	32 to 4172
	L(IC)*		tC-L	−199.9 to 900.0	−328 to 1652
	U(CC)*		tC-U	−199.9 to 400.0	−199.9 to 752.0
	Platinel II*		tC-P	0 to 1390	32 to 2534
RTD	Cu50Ω*		Cu.50	−199.9 to 200.0	−199.9 to 392.0
	Cu100Ω*		Cu.10	−199.9 to 200.0	−199.9 to 392.0
	JPt100Ω		JPt.1	−199.9 to 600.0	−328 to 1112
	DPt50Ω		dPt.5	−199.9 to 600.0	−328 to 1112
	DPt100Ω		dPt.1	−199.9 to 850.0	−328 to 1530
Analog	Current	0.00 - 20.00mA	A.nA1	−1999 to 9999 (display range depends on the decimal point position)	
		4.00 - 20.00mA	A.nA2		
	Voltage	−50.0 - 50.0mV	A.nu1		
		−199.9 - 200.0mV	A.nu2		
		−1.000 - 1.000V	A-u1		
		−1.00 - 10.00V	A-u2		

※Above input types which have the * mark are not displayed.
※To display the above input types, supply the power with pressing the M key.

■ Unit Descriptions



① Display part (red)
- Run mode: Displays current measurement value.
- Parameter set mode: Displays parameter and SV.

② Unit sticker part (unit sticker is an accessory.)

③ Alarm output indicator: Turns ON when the alarm is ON.

④ M key: Used to enter parameter set mode, move to parameters, save SV and return to RUN mode.

⑤ ≪, ∧, ∨ key: Used to enter and change parameter SV.

⑥ D.IN3: Press the ∧ and ∨ keys for 3 sec at the same time, it operates the set function (alarm clear, display hold, zero-point adjustment) at di-H at program mode.

⑦ Bar Graph (with 101 bar LEDs, green): Displays measured value as bar graph.

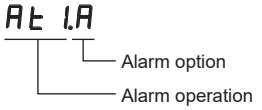
⑧ Space for recognition device by user

▣ Functions

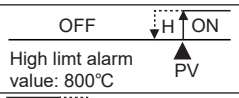
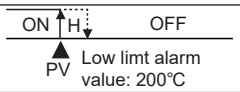
■ Alarm [AL-1, AL-2, AL-3, AL-4]

This product has 2 or 4 alarms to operate individually when the value is too high or low. Alarm function is set by the combination of alarm operation and alarm option. To clear alarm, use digital input function (setting di-b, di-U as AL.rE) or turn the power OFF and ON.

※For the model (KN-10□□B) without alarm output, these parameters are not displayed.



◎ **Alarm operation**

Mode	Name	Alarm operation	Descriptions
AL0._	—	—	No alarm operation
AL 1.□	High limit alarm		PV ≥ alarm temperature, alarm is ON
AL2.□	Low limit alarm		PV ≤ alarm temperature, alarm is ON
SbA._	Sensor break alarm	—	It will be ON when it detects sensor disconnection. Sensor break alarm does not have alarm option.

※H: Alarm output hysteresis

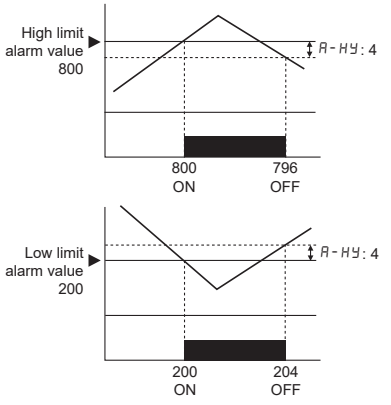
◎ **Alarm option**

Mode	Name	Descriptions
AL□.A	Standard alarm	If it is an alarm condition, alarm output is ON. Unless an alarm condition, alarm output is OFF.
AL□.b	Alarm latch	If it is an alarm condition, alarm output is ON. Before clearing the alarm, an ON condition is latched. (Holding the alarm output)
AL□.C	Standby sequence	First alarm condition is ignored. From the second alarm condition, standard alarm operates. When power is ON and it is an alarm condition, it is ignored. From the second alarm condition, standard alarm operates.
AL□.d	Alarm latch and standby sequence	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is ON and it is an alarm condition, it is ignored. From the second alarm condition, alarm latch operates.

■ Alarm output hysteresis [Program mode: A-HY]

Set the interval of ON/OFF alarm output.
The set hysteresis is applied to AL1 to AL4 and it is as below.

※E.g.) A-HY: 4 , high limit alarm value: 800
low limit alarm value: 200



■ High/Low peak monitoring [Monitoring mode: H.PEU, L.PEU]

This function is to save high/low peak to check the invisible abnormal condition of system at [H.PEU] or [L.PEU] in monitoring mode.

When the high/low peak is out of the temperature range, it displays HHHH or LLLL.

To initialize high/low peak, press the ▲, ▼ keys at the same time for 3 sec at [H.PEU] or [L.PEU].

In this case, peak value is the present input value.

■ Error

Display	Descriptions	Troubleshooting
LLLL	Flashes when measured sensor input is lower than the temperature range.	When input is moved within the temperature range, it is cleared.
HHHH	Flashes when measured sensor input is higher than the temperature range	
bUrn	Flashes when the sensor is break or not connected.	Check temperature sensor connection.
Err	Flashes when there is error to SV	Check set conditions and re-set it.

▣ Functions

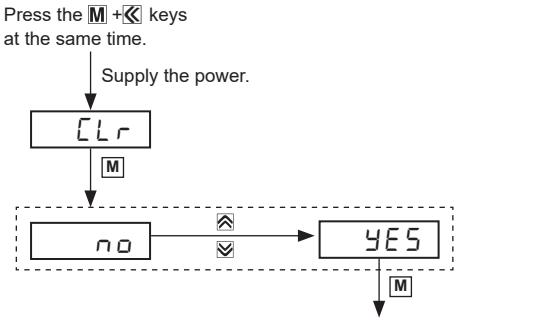
■ Temperature unit [Program mode: Unit]

Temperature unit (℃/℉) is selectable. When changing temperature unit, user input range, display scale, output scale, alarm SV are initialized. You should set the parameters again for your purpose.

※When selecting analog input, temperature unit [Unit] parameter is not displayed.

■ Parameter initialization

To initialize all parameter as factory default, supply the power to the product with pressing the M and ≪ keys at the same time and it enters initialization parameter.



■ Decimal point [Program mode: d.P]

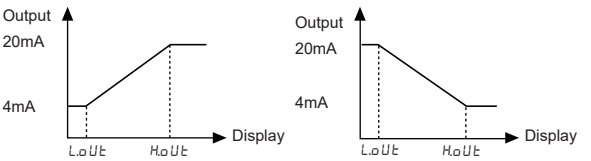
It is able to change decimal point position for high/low limit scale value. It changes decimal point position of display value.

■ Transmission output scale [Program mode: L.oUt , H.oUt]

For 4-20mA current output, this function is to set the display value for 4mA [L.oUt] and the display value for 20mA [H.oUt].

The interval between L.oUt and H.oUt is 10% F.S.

If it is below 10%, it is fixed as 10% of SV.



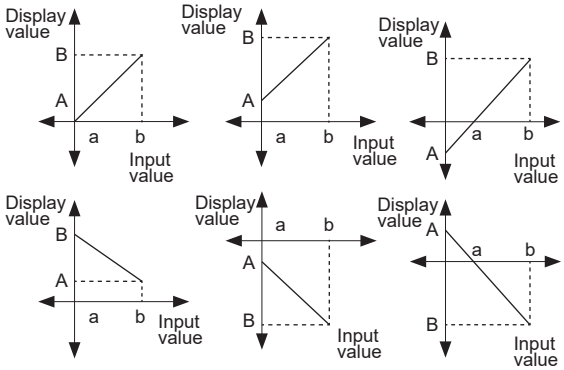
■ User input range [Program mode: L-rG , H-rG]

When selecting analog input, you can set the input range for your purpose. Set low limit input value [L-rG] and high limit input value [H-rG] to limit the input range.

- Setting range
  : Low limit input value [L-rG] +20%F.S.
  < High limit input value [H-rG]

■ Display scale [Program mode: L-SC , H-SC]

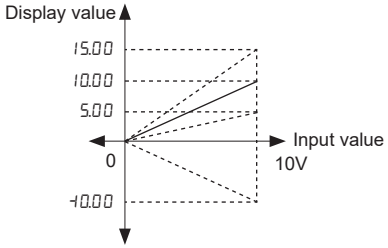
For analog input, this function is to set (-1999 to 9999) for particular high/low limit value in order to display high/low limit value of measurement input. If measurement inputs are 'a' and 'b' and particular values are 'A' and 'B', it will display a=A, b=B as below graphs.



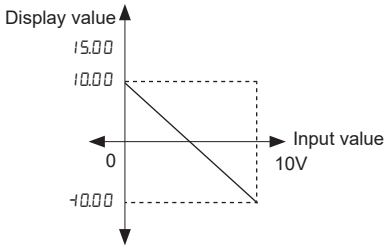
Display scale function is able to change display value for max./min. measured input by setting high limit scale [H-SC] and low limit scale [L-SC] in program mode.

※E.g.) Set high/low scale value (input range is 0 to 10V)

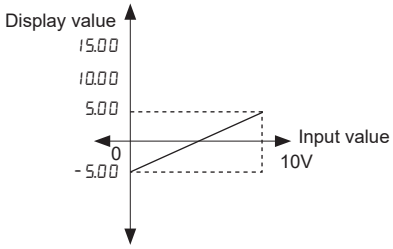
- L-SC = 0.00
- H-SC = 5.00 , 10.00 , 15.00 , 40.00



- L-SC = 10.00 , H-SC = -10.00



- L-SC = - 5.00 , H-SC = 5.00



※When changing input type, high/low scale is changed as factory default.

▣ Functions

■ Input correction [Program mode: In-b]

This function is to correct the error occurring from a thermocouple, a RTD or analog input out of allowable error range of this unit.

This is also available to correct error when a sensor cannot contact the subject position by calculating the error temperature.

Variable temperature sensors have accuracy level. Because high accuracy type is expansive, standard thermocouples are generally used.

In this case, temperature sensor may occur error. By executing this function, you can get more accurate temperature.

When executing input correction function, you should measure the error from a sensor accurately. If the measured error is not correct, error may be greater. (If In.SF = tUF, In-b as atmospheric pressure input value not as input correction function. Refer to '■ Two unit function'.)

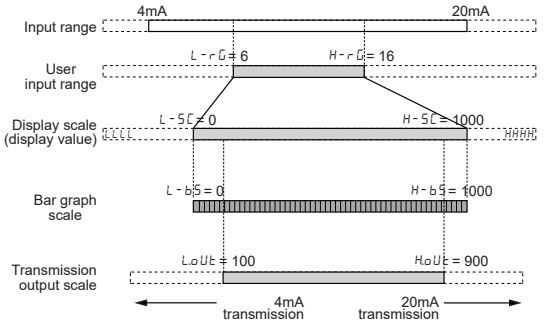
E.g.)When measured temperature is 4℃ and actual temperature is 0℃. Set In-b as -4, and display value is 0℃.

■ Bar graph scale [Program mode: L-bS, H-bS]

This is to set display range for bar graph. Display range is as below.

Parameter	Input	Display range
L-bS	Temp. sensor input	Input range (low limit) ≤ L-bS ≤ (H-bS-1)
	Analog input	L-SC ≤ L-bS ≤ (H-SC-1)
H-bS	Temp. sensor input	(L-bS+1) ≤ H-bS ≤ Input range (high limit)
	Analog input	(L-SC+1) ≤ H-bS ≤ H-SC

※Relation among input range, user input range, display scale, bar graph scale, and transmission scale
The below figure is the example for 4 to 20mA.



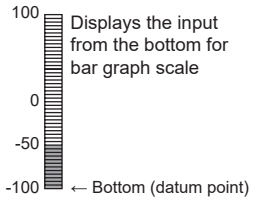
■ Bar graph display method [Program mode: bAr]

There are two methods for bar graph display; full bar and center bar.

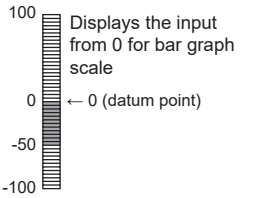
Full bar [F.bAr] displays input from the bottom, and center bar method [C.bAr] displays input from “0” as below figures.

※ E.g.)When L-bS = –100, H-bS = 100, PV = –50,

◎ **Full Bar:** F.bAr



◎ **Center Bar:** C.bAr



■ Input and transmission output extension [Program mode: Ex.Io]

This function is to extend analog input and 4 to 20mA transmission output to 5% or 10% range.

Mode	Operation
OP	Outputs 4 to 20mA within analog input range.
5P	Outputs 3.2 to 20.8mA for 5% out of the analog input range.
10P	Outputs 2.4 to 21.6mA for 10% out of the analog input range.

※This parameter is displayed only for transmission output (4-20mA) model. But it is not displayed when selecting temperature sensor input.

※The below of 0mA, 0V cannot be extended.

※±1V, 10V inputs are only available for 5% extension.

▣ Functions

■ Alarm display in bar graph

When setting or occurring the alarm, it displays the status by the bar graph.

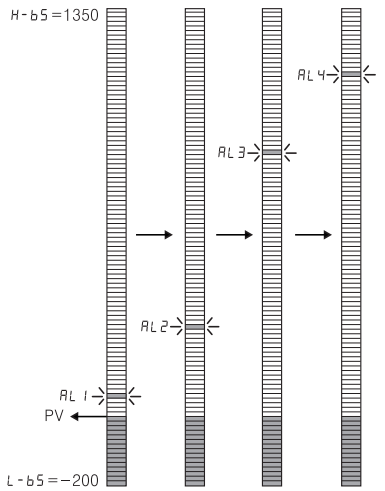
You can check the alarm status. When setting alarm value, the bar LED for this alarm value turns ON. When alarm occurs, the bar LED for this alarm value flashes.

① When setting alarm value,
The bar LED for alarm SV flashes. When alarm set is complete, the bar LED for this alarm value turns ON.

② RUN mode
- All set alarm values are displays in RUN mode.
- When it is alarm value, the bar LED for this alarm value flashes.

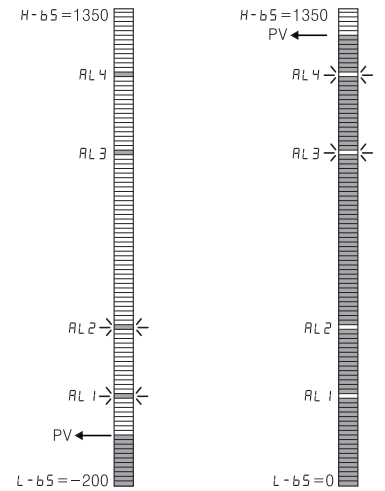
※If alarm set value is out of bar graph scale when setting the value or in RUN mode, this value does not display in bar graph.

◎ **When setting alarm value in monitoring mode,**
When all alarms are OFF,



※The bar LED for the alarm value flashes.

◎ **Alarm display in RUN mode**
When AL 1 and AL2 are low limit alarm, and AL3 and AL4 are high limit alarm.



■ Input special function [Program mode: In.SF]

When selecting analog input, this function is to display the calculated actual value by square, root (√), or two unit function (TUF) as display value.

Parameter	Function	Graph	Applications
Lin	Outputs as input value	Display, Y = AX + B, Input	Standard characteristics. Input for linearity.
root	Outputs the rooted (√) input value	Display, Y = A(√X) + B (X ≥ 0), Y=0(X < 0), Input	Used for measuring flows by pressure signal.
SQAr	Outputs the squared input value	Display, Y = A(X)² + B (X > 0), Input, Y = -A(X)² + B (X < 0)	Used for outputting differential pressure by flow signal.
tUF	Refer to '■ Two unit function'		

※Display value and mA output value for SQAr

: Display value={($\frac{\text{Input value - L-rG}}{\text{H-rG - L-rG}}$)^2×(H-SC-L-SC)}+L-SC
(output value)

※Display value and mA output value for root

: Display value={($\sqrt{\frac{\text{Input value - L-rG}}{\text{H-rG - L-rG}}}$)×(H-SC-L-SC)}+L-SC
(output value)

■ Two unit function [Program mode: tUF]

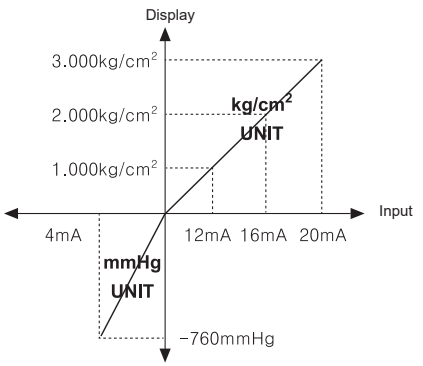
When connecting a pressure sensor, compound pressure which is below atmospheric pressure (0) is for vacuum as mmHg and which is atmospheric pressure or over it is for positive pressure as kg/cm^2.

Atmospheric pressure is 0kg/cm^2 . When this unit does not display 0kg/cm^2, you can correct zero-point adjustment function.

When using two unit function, L-SC is fixed as -760.0

L-SC parameter is displayed but you cannot set this. You can set H-SC within 0 to 9999 range.

E.g.)When pressure range is −760.0mmHg to 3.000kg/cm^2, and pressure transmitter outputs 4-20mA, set the scale as H-SC : 3000, dP : 0.000. This unit displays for 4mA input as -760.0, and for 20mA input as 3.000.



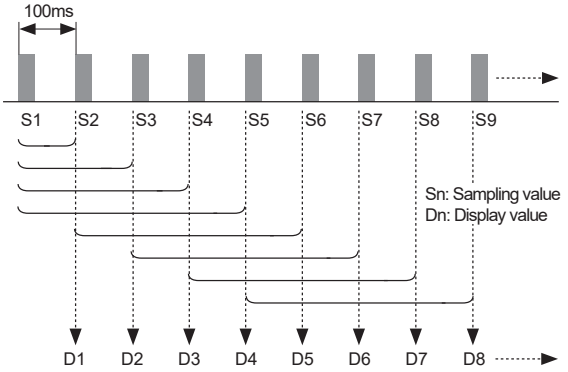
▣ Functions

■ Digital filter [Program mode: nAuF]

Moving average digital filter is able to stably display and output the noise from input line and irregular signals as software.

- Filter Setting range: 01 to 16
  (When setting as 01, digital filter function does not run.)

※Display cycle is same when executing moving average digital filter.



D1=S1, D2=S2, D3=S3
: Initial operation before averaging 4

$$D4=\frac{S1+S2+S3+S4}{4} \qquad D5=\frac{S2+S3+S4+S5}{4}$$

$$D6=\frac{S3+S4+S5+S6}{4} \qquad D7=\frac{S4+S5+S6+S7}{4}$$

$$D8=\frac{S5+S6+S7+S8}{4}$$

■ Burn out [Program mode: bUrn]

When disconnecting input sensor, you can set the status of transmission output.

- When setting bUrn as on, 4-20mA transmission output is fixed as 20mA.
- When setting bUrn as oFF, 4-20mA transmission output is fixed as 4mA.

※It is available only for temperature sensor input and 4-20mA transmission output.

■ Lock [Program mode: LoCK]

It limits to check parameter set value and to change it.

	oFF	LoC 1	LoC2
Program mode	●	◐	○
Monitoring mode	●	●	◐

●: Enable to check/set
◐: Enable to check, disable to set
○: Disable to check

※In LoC2, only LoCK parameter displays in program mode.

■ Digital input [Program mode: di -t , di -U]

By digital input terminal [di -t] (terminal 12, 13) or digital input key [di -U] (D.IN3: ▽ + △ for 3 sec), one of three functions executes as the below table.

Function		Operation
ALrE	Alarm clear	When alarm is ON in RUN mode, it clears alarm forcibly. (It applies only for alarm latch, alarm latch and standby sequence options.) Alarm clear operates only when the value is out of the alarm value range. After clearing alarm, alarm operates its option normally. ※ For the model without alarm output (KN-10□□B), this parameter is not displayed.
HoLd	Display HOLD	Temporarily indicated value is stopped in order to check indicated value in unstable input.
ZEro	Zero-point adjustment	Set preset display value as 0. This function is related with input correction [in -b]. When executing zero adjustment function in display value as 4, input correction value [in -b] is set as -4 automatically.

▣ Communications

■ Communication set [Program mode: Addr , bAUd]

You can set communication address [Addr] and communication speed [bAUd] for RS485 communication.

■ Communication manual

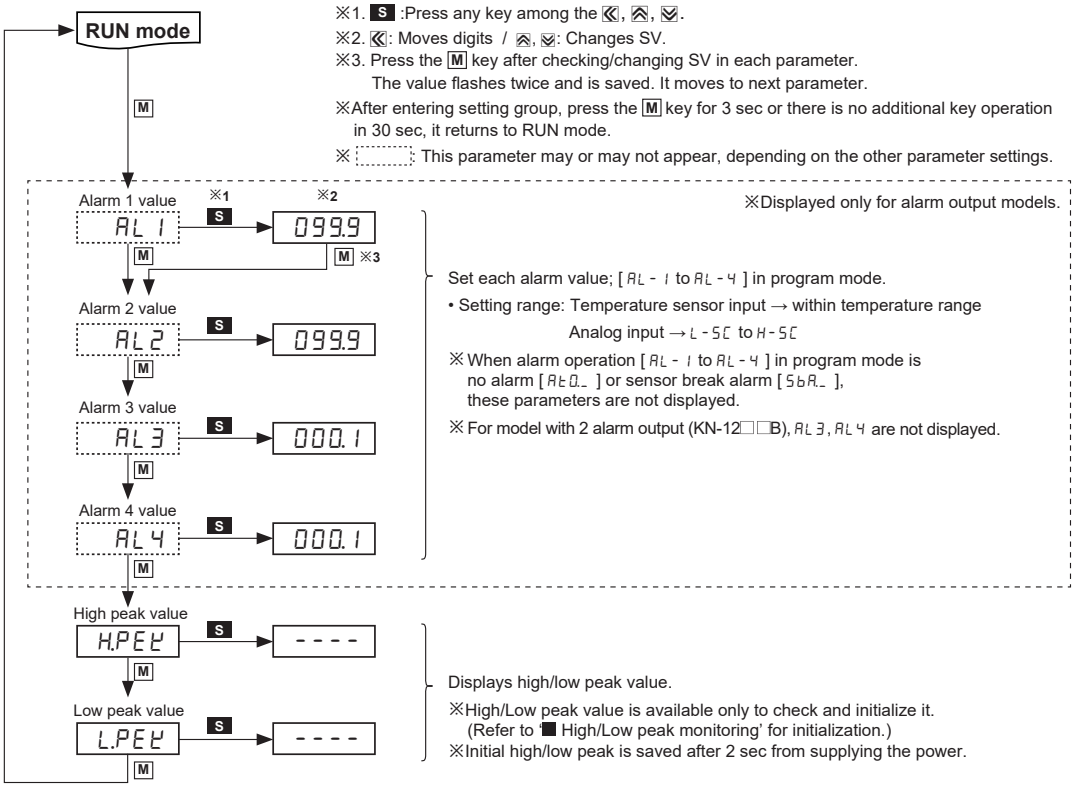
Refer to communication manual for RS485 communication.

Visit our web site (www.autonics.com) to download communication manual.

■ Communication specifications

Item	Specifications
Communication method	RS485 2-wire half duplex
Communication speed (BPS)	9600, 4800, 2400, 1200
Converter	Converter built in RS232
Max. connections	32 units
Communication distance	Max. 1200m (within 700m recommended)
Protocol	Modbus 1.1 RTU
Parity	None
Stop Bit	1-bit
Data length	8-bit

■ Monitoring Mode



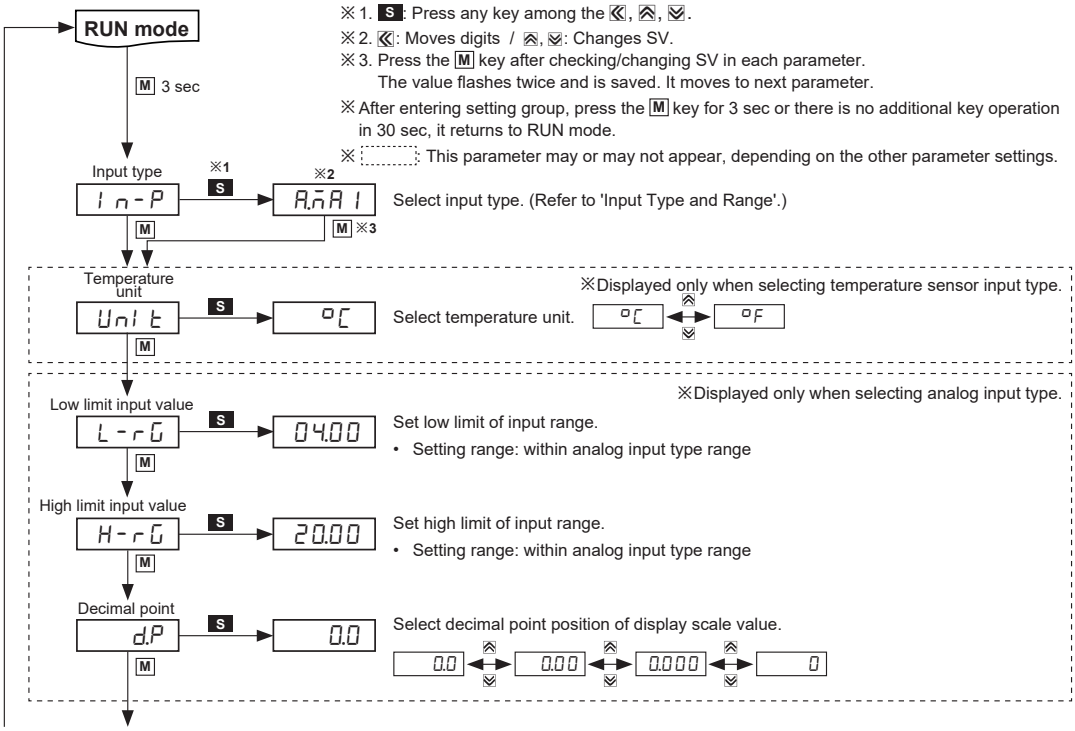
※1. S :Press any key among the ≪, ∧, ∨.
※2. ≪: Moves digits / ∧, ∨: Changes SV.
※3. Press the M key after checking/changing SV in each parameter.
The value flashes twice and is saved. It moves to next parameter.
※After entering setting group, press the M key for 3 sec or there is no additional key operation in 30 sec, it returns to RUN mode.
※ [ ]: This parameter may or may not appear, depending on the other parameter settings.

※Displayed only for alarm output models.

Set each alarm value; [AL - 1 to AL - 4] in program mode.
• Setting range: Temperature sensor input → within temperature range
Analog input → L - SC to H - SC
※When alarm operation [AL - 1 to AL - 4] in program mode is no alarm [AtO_] or sensor break alarm [SbA_], these parameters are not displayed.
※For model with 2 alarm output (KN-12□□B), AL 3, AL 4 are not displayed.

Displays high/low peak value.
※High/Low peak value is available only to check and initialize it. (Refer to '■ High/Low peak monitoring' for initialization.)
※Initial high/low peak is saved after 2 sec from supplying the power.

■ Program Mode



※1. S : Press any key among the ≪, ∧, ∨.
※2. ≪: Moves digits / ∧, ∨: Changes SV.
※3. Press the M key after checking/changing SV in each parameter.
The value flashes twice and is saved. It moves to next parameter.
※After entering setting group, press the M key for 3 sec or there is no additional key operation in 30 sec, it returns to RUN mode.
※ [ ]: This parameter may or may not appear, depending on the other parameter settings.

Select input type. (Refer to 'Input Type and Range'.)

※Displayed only when selecting temperature sensor input type.
Select temperature unit. °C ↔ °F

※Displayed only when selecting analog input type.
Set low limit of input range.
• Setting range: within analog input type range

Set high limit of input range.
• Setting range: within analog input type range

Select decimal point position of display scale value.
0.0 ↔ 0.00 ↔ 0.000 ↔ 0

※Displayed only when selecting analog input type.

Low limit scale value — L-SC — S — 000.0
Set low limit scale value.
• Setting range: -1999 to 9999

High limit scale value — H-SC — S — 100.0
Set high limit scale value.
• Setting range: -1999 to 9999

Input correction — In-b — S — 0000
Set input correction value.
• Setting range: -999 to 999

Bar graph low limit scale value — L-bS — S — 000.0
Set low limit scale value for bar graph display.
• Setting range: Temperature sensor input
→ within temperature range (low limit) ≤ L-bS ≤ (H-bS-1)
Analog input → L-SC ≤ L-bS ≤ (H-SC-1)

Bar graph high limit scale value — H-bS — S — 000.0
Set high limit scale value for bar graph display.
• Setting range: Temperature sensor input
→ (L-bS+1) ≤ H-bS ≤ within temperature range (high limit)
Analog input → (L-SC+1) ≤ H-bS ≤ H-SC

Bar graph display method — bAr — S — F.bAr
Set display method for bar graph. F.bAr ↔ C.bAr

※Displayed only for transmission output model.

4 mA output scale value — L.oUt — S — 000.0
Set output scale value for 4mA.
• Setting range: Temperature sensor input → within temperature range,
Analog input → L-SC to H-SC

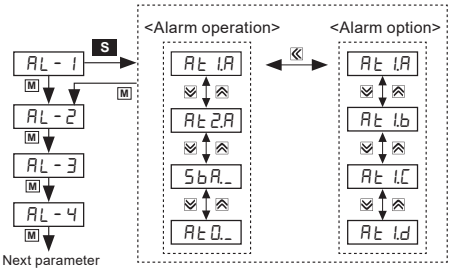
20 mA output scale value — H.oUt — S — 100.0
Set output scale value for 20mA.
• Setting range: Temperature sensor input → within temperature range,
Analog input → L-SC to H-SC

※Displayed only when selecting analog input type.

Input and transmission output extension — Ex.IO — S — SP
Select extension range of 4-20mA input and transmission output.
SP ↔ IOP ↔ OP

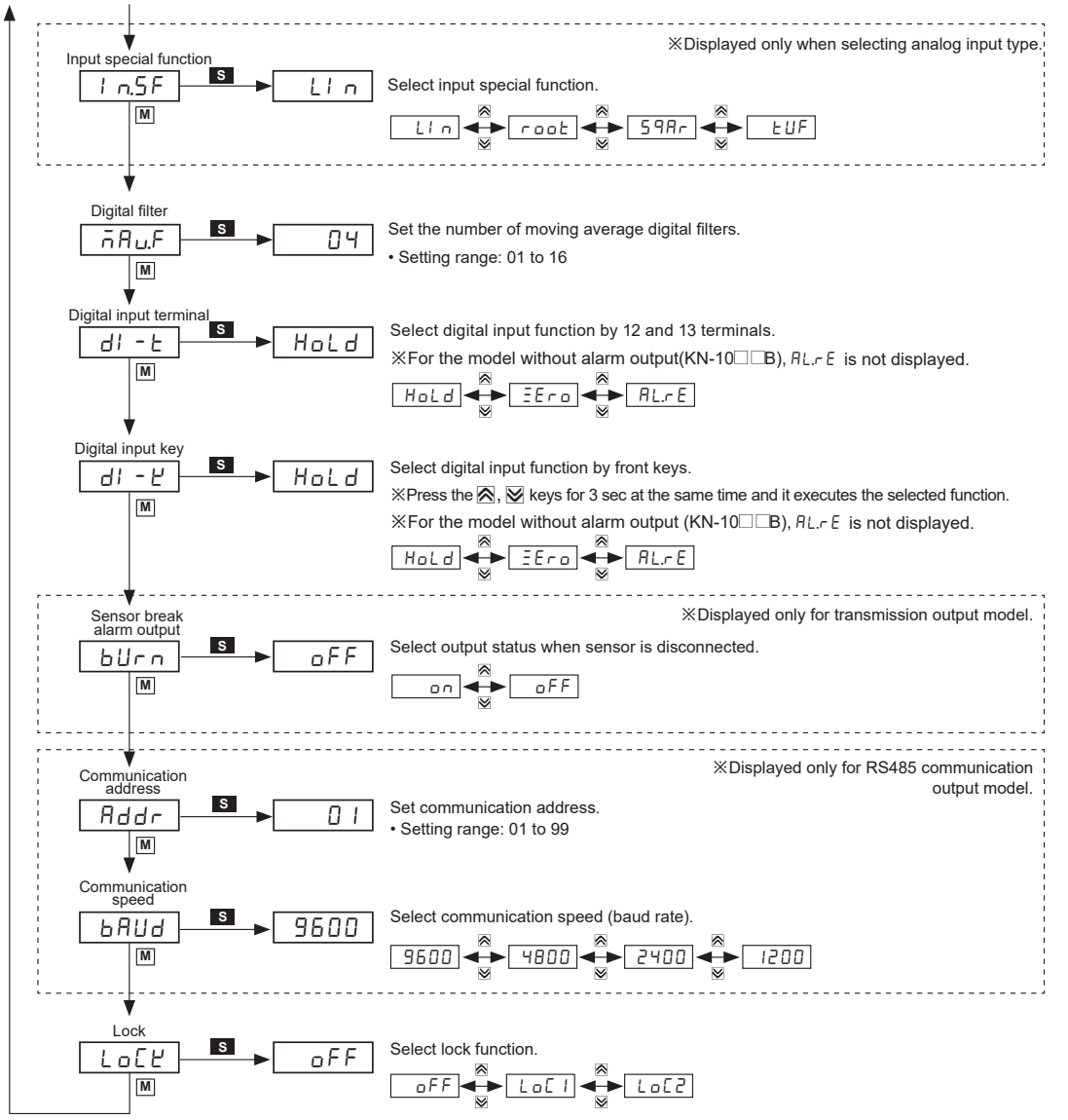
※Displayed only for alarm output models.

AL1 mode — AL-1 — S — AtI.A
AL2 mode — AL-2 — S — AtI.A
AL3 mode — AL-3 — S — At2.A
AL4 mode — AL-4 — S — At2.A
Set AL1 to AL4 alarm operation and option.



※SV changing method of AL-2 to AL-4 is same as AL-1's.
※For model with 2 alarm output (KN-12□□B), AL3, AL4 are not displayed.
※No alarm [AtO_], sensor break alarm [SbA_] do not have alarm option.
※Set alarm value [AL1 to AL4] in monitoring mode.

AL output hysteresis — A-HY — S — 001
Set alarm output hysteresis.
• Setting range: 001 to 999
※When alarm operation [AL-1 to AL-4] in program mode is no alarm [AtO_] or sensor break alarm [SbA_], this parameter is not displayed.



▣ Factory Default

■ Monitoring mode

Parameter	Default	Parameter	Default	Parameter	Default
AL1	099.9	AL3	000.1	H.PEY	----
AL2	099.9	AL4	000.1	L.PEY	----

■ Program mode

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
In-P	AnA.1	In-b	0000	AL-1	At 1.A	dI-t	HoLd
Unit	°C	L-bS	000.0	AL-2	At 1.A	dI-Y	HoLd
L-rG	00.00	H-bS	100.0	AL-3	At2.A	bUrn	oFF
H-rG	20.00	bAr	F.bAr	AL-4	At2.A	Addr	01
d.P	0.0	L.oUt	000.0	A-HY	001	bAUd	9600
L-SC	000.0	H.oUt	100.0	In.SF	LIn	LoCY	oFF
H-SC	100.0	Ey.10	SP	nAU.F	04		

▣ Proper Usage

- Follow instructions in ‘Cautions during Use’. Otherwise, It may cause unexpected accidents.
- For connecting the power, use the crimp terminal (M3.5, max. 7.2 mm)
- 24 VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in ‘Specifications’)
  ②Altitude max. 2,000 m
  ③Pollution degree 2
  ④Installation category II

Single-Channel Temperature Indicators

▣ Features

- High accuracy with 16 bit ADC (±0.2% F.S.)
- Max. display range: -19999 to 19999
- Multi-input
  - Thermometer 12 types
  - RTD 5 types
  - Analog: current 2 types/voltage 6 types
- Auto display color change function
  - Selectable indicator colors when error occurs or alarm operates
- Various output options
  - Alarm output: 2 points/4 points
  - 4-20mA transmission output (isolated), RS485 communication output
- Various functions
  - High/Low peak input monitoring
  - Alarm output (upper/lower, sensor break)
  - Transmission output/display scale
  - Digital input (DI), etc.
- Built-in power supply for sensor/transmitter (24VDC)

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

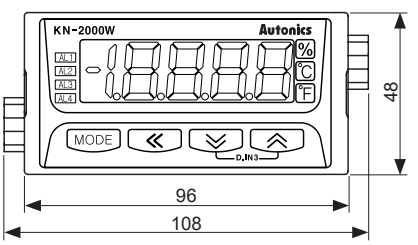
KN-2	0	0	0	W

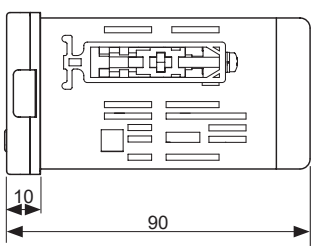
Size	W	DIN W96×H48mm
Power supply	0	100-240VAC 50/60Hz
	1	24VDC
Option output	0	No option
	1	Transmission output (4-20mA)※1
	4	RS485 communication output
	5	Transmission output (4-20mA) + RS485 communication output
Alarm output	0	No alarm output
	2	Alarm output: 2
	4	Alarm output: 4
Item	KN-2	Single-Channel Temperature Indicators

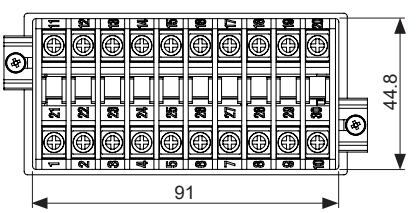
※1: For transmission output(4-20mA), select one between transmission output+alarm output 2 or transmission output+alarm output 4.

▣ Dimensions

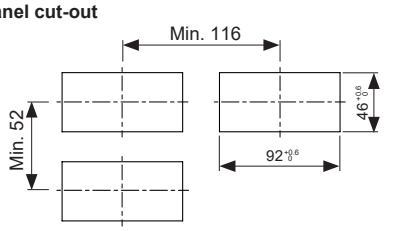
(unit: mm)





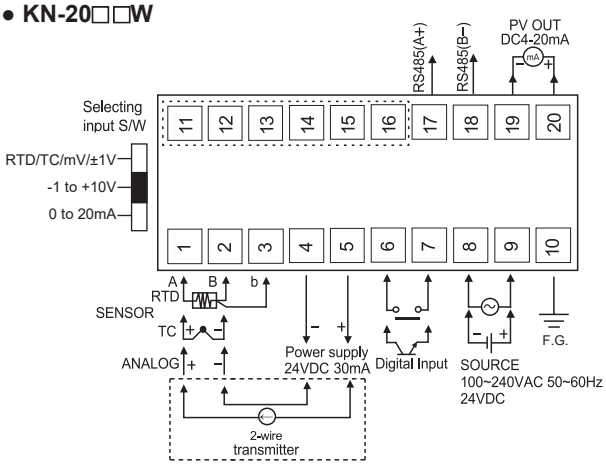


● **Panel cut-out**

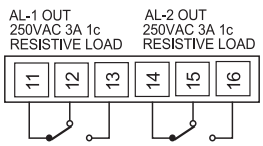


▣ Connections

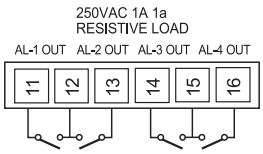
● **KN-20□□W**



● **KN-22□□W**



● **KN-24□□W**



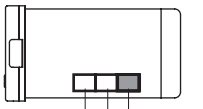
▣ Specifications

Series		KN-2000W
Power supply	AC voltage	100-240VAC～ 50/60Hz
	DC voltage	24VDC⎓
Allowable voltage range		90 to 110% of rated voltage
Power consumption	AC voltage	Max. 8VA
	DC voltage	Max. 3W
Display method		4 ½-digit, 7-segment LED display (selectable red, green, yellow) method
Character size		W10×H17mm
Input type	RTD	JPt100Ω, DPt100Ω, DPt50Ω, Cu50Ω, Cu100Ω (5 types)
	Thermocouple	K, J, E, T, R, B, S, N, C (W5), L, U, PLII (12 types)
	Analog	· Voltage: ±1.0000V, ±50.00mV, ±200.0mV, −1.000-10.000V (4 types) · Current: 4.00-20.00mA, 0.00-20.00mA (2 types)
Digital input		· Contact input: max. 2kΩ in ON, min. 90kΩ in OFF · Non-contact input: residual voltage max. 1.0V in ON, leakage current max. 0.03mA in OFF · Outflow current: approx. 0.2mA
Sub output	Alarm output	· 2-point: relay contact capacity 250VAC～ 3A 1c · 4-point: relay contact capacity 250VAC～ 1A 1a
	Transmission output	ISOLATED DC4-20mA (PV transmission) load resistance max. 600Ω
	Communication output	RS485 (Modbus RTU)
Display accuracy		±0.2% F.S. ±1-digit (25±5℃) ±0.3% F.S. ±1-digit (−10 to 20℃, 30 to 50℃) In case of thermocouple and below -100°C input, [±0.4% F.S.]±1-digit ※TC-T, TC-U is min. ±2.0℃
Setting method		Set by front keys, or RS485 communication
Alarm output hysteresis		Set ON/OFF interval (1 to 999-digit)
Sampling cycle		Analog input: 100ms, temperature sensor input: 250ms
Dielectric voltage		2000VAC 50/60Hz for 1 min (between input terminal and power terminal)
Vibration		0.75mm amplitude at frequency 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours
Relay life cycle	2-point	Mechanical: min. 10,000,000, electrical: min. 100,000 (250VAC 3A resistance load)
	4-point	Mechanical: min. 20,000,000, electrical: min. 500,000 (250VAC 1A resistance load)
Insulation resistance		Over 100MΩ (at 500VDC megger)
Noise immunity		±2kV the square wave noise (pulse width 1μs) by noise simulator
Memory retention		Approx. 10 years (non-volatile semiconductor memory type)
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH
Approval		CE
Weight※1		Approx. 332g (approx. 200g)

※1: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Input Type and Range

◎ **Input type selection switch**



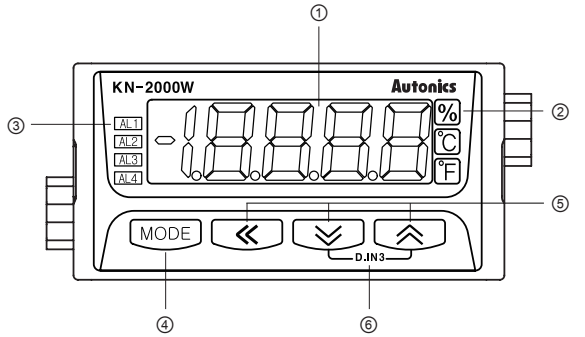
- 0-20mA: Select it for 0(4)-20mA input
- −1-10V: Select it for −1-10V input
- TD/TC/mV/±1V: Select it for RTD, TC temperature sensor or ±1V, mV input

This unit is multi input product. Select the proper input with the input type selection switch and select this input type in I n-P in program mode. The setting of input type selection switch and the input type I n-P parameter should be same and it can display the proper measurement value. Factory default is 4-20mA.

Input type			Parameter	Input range (℃)	Input range (℉)
Thermocouple	K(CA)		tC-K	−200.0 to 1350.0	−328 to 2462
	J(IC)		tC-J	−200.0 to 800.0	−328.0 to 1472.0
	E(CR)		tC-E	−200.0 to 800.0	−328.0 to 1472.0
	T(CC)		tC-t	−200.0 to 400.0	−328.0 to 752.0
	R(PR)		tC-r	0.0 to 1750.0	32 to 3182
	B(PR)*		tC-b	400.0 to 1800.0	752 to 3272
	S(PR)*		tC-S	0.0 to 1750.0	32 to 3182
	N(NN)*		tC-n	−200.0 to 1300.0	−328 to 2372
	C(W5)*		tC-C	0 to 2300	32 to 4172
	L(IC)*		tC-L	−200.0 to 900.0	−328.0 to 1652.0
	U(CC)*		tC-U	−200.0 to 400.0	−328.0 to 752.0
	Platinel II*		tC-P	0.0 to 1390.0	32 to 2534
RTD	Cu50Ω*		CU.50	−200.0 to 200.0	−328.0 to 392.0
	Cu100Ω*		CU.10	−200.0 to 200.0	−328.0 to 392.0
	JPt100Ω		JPt.1	−200.0 to 600.0	−328.0 to 1112.0
	DPt50Ω		dPt.5	−200.0 to 600.0	−328.0 to 1112.0
	DPt100Ω		dPt.1	−200.0 to 850.0	−328.0 to 1530.0
Analog	Current	0.00 - 20.00mA	A.nA1	−19999 to 19999 (display range depends on the decimal point position)	
		4.00 - 20.00mA	A.nA2		
	Voltage	−50.00 - 50.00mV	A.nu1		
		−200.0 - 200.0mV	A.nu2		
		−1.0000 - 1.0000V	A-u1		
		−1.000 - 10.000V	A-u2		

※Above input types which have the * mark are not displayed.
※To display the above input types, supply the power with pressing the **MODE** key.

▣ Unit Descriptions



① Display part (red)
- Run mode: Displays current measurement value.
- Parameter set mode: Displays parameter and SV.

② Unit indicator: Displays the set unit.

③ Alarm output indicator: Turns ON when the alarm is ON.

④ **MODE** key: Used to enter parameter set mode, move to parameters, save SV and return to RUN mode.

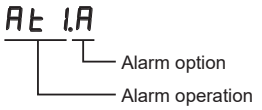
⑤ ≪, ≫, ∧ key: Used to change parameter SV.

⑥ D.IN3: Press the ≫ and ∧ keys for 3 sec at the same time, it operates the set function (alarm clear, display hold, zero-point adjustment) at [dI-K] at program mode.

▣ Functions

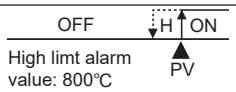
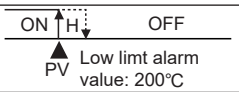
■ Alarm [AL-1, AL-2, AL-3, AL-4]

This product has 2 or 4 alarms to operate individually when the value is too high or low.
Alarm function is set by the combination of alarm mode and alarm option.
To clear alarm, use digital input function (setting dI-t, dI-U as AL.rE) or turn the power OFF and ON.
※For the model (KN-20□□W) without alarm output, these parameters are not displayed.



◎ **Alarm operation**

※H: Alarm output hysteresis

Mode	Name	Alarm operation	Descriptions
AL0._	—	—	No alarm operation
AL 1□	High limit alarm		PV ≥ alarm temperature, alarm is ON
AL2□	Low limit alarm		PV ≤ alarm temperature, alarm is ON
SbA._	Sensor break alarm	—	It will be ON when it detects sensor disconnection. Sensor break alarm does not have alarm option.

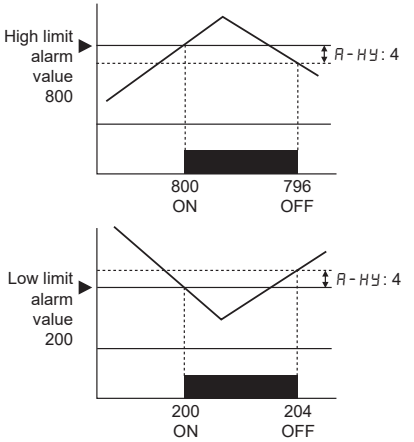
◎ **Alarm option**

Mode	Name	Descriptions
AL□.A	Standard alarm	If it is an alarm condition, alarm output is ON. Unless an alarm condition, alarm output is OFF.
AL□.b	Alarm latch	If it is an alarm condition, alarm output is ON. Before clearing the alarm, an ON condition is latched. (holding the alarm output)
AL□.C	Standby sequence	First alarm condition is ignored. From the second alarm condition, standard alarm operates. When power is ON and it is an alarm condition, it is ignored. From the second alarm condition, standard alarm operates.
AL□.d	Alarm latch and standby sequence	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is ON and it is an alarm condition, it is ignored. From the second alarm condition, alarm latch operates.

■ Alarm output hysteresis [Program mode: A-HY]

Set the interval of ON/OFF alarm output.
The set hysteresis is applied to AL1 to AL4 and it is as below.

※E.g.) A-HY: 4
high limit alarm value: 800,
low limit alarm value: 200



■ High/Low peak monitoring [Monitoring mode: H.PEU, L.PEU]

This function is to save high/low peak to check the invisible abnormal condition of system at [H.PEU] or [L.PEU] in monitoring mode.
When the high/low peak is out of the temperature range, it displays HHHH or LLLL.
To initialize high/low peak, press the ▲, ▼keys at the same time for 3 sec at [H.PEU] or [L.PEU].
In this case, peak value is the present input value.

■ Error

Display	Descriptions	Troubleshooting
LLLL	Flashes when measured sensor input is lower than the temperature range.	When input is moved within the temperature range, it is cleared.
HHHH	Flashes when measured sensor input is higher than the temperature range	
bUrn	Flashes when the sensor is break or not connected.	Check temperature sensor connection.
Err	Flashes when there is error to SV.	Check set conditions and re-set it.
Err 1	Flashes when In-P setting and input type selection switch setting are not same.	Check input type.

▣ Functions

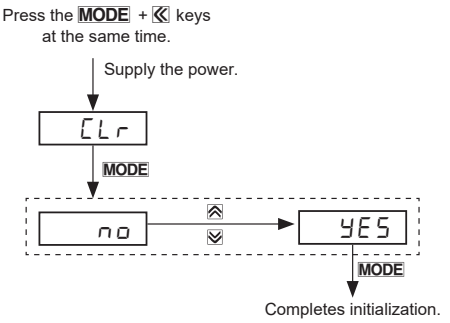
■ User input range [Program mode: L-rG, H-rG]

When selecting analog input, you can set the input range for your purpose. Set low limit input value [L-rG] and high limit input value [H-rG] to limit the input range.

- Setting range
  : Low limit input value [L-rG]+20%F.S.
  < High limit input value [H-rG]

■ Parameter initialization

To initialize all parameter as factory default, supply the power to the product with pressing the MODE and ≪ keys at the same time and it enters initialization parameter.



■ Input and transmission output extension [Program mode: Ex.io]

This function is to extend analog input and 4 to 20mA transmission output to 5% or 10% range.

Mode	Operation
OP	Outputs 4 to 20mA within analog input range.
SP	Outputs 3.2 to 20.8mA for 5% out of the analog input range.
10P	Outputs 2.4 to 21.6mA for 10% out of the analog input range.

※This parameter is displayed only for transmission output (4-20mA) model. But it is not displayed when selecting temperature sensor input.

■ Input correction [Program mode: in-b]

This function is to correct the error occurring from a thermocouple, a RTD or analog input out of allowable error range of this unit.

This is also available to correct error when a sensor cannot contact the subject position by calculating the error temperature.

Variable temperature sensors have accuracy level. Because high accuracy type is expansive, standard thermocouples are generally used.

In this case, temperature sensor may occur error. By executing this function, you can get more accurate temperature.

When executing input correction function, you should measure the error from a sensor accurately. If the measured error is not correct, error may be greater.

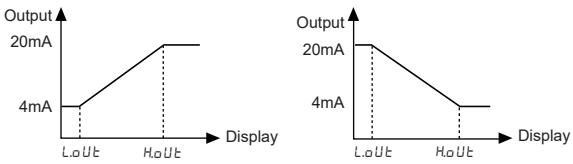
(If in.SF = tUF, in-b as atmospheric pressure input value not as input correction function. Refer to '■ Two unit function'.)

E.g.)When measured temperature is 4℃ and actual temperature is 0℃. Set in-b as -4, and display value is 0℃.

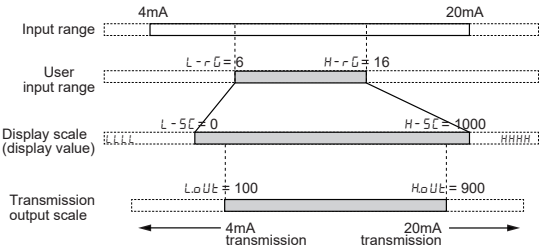
■ Transmission output scale [Program mode: L.oUt, H.oUt]

For 4-20mA current output, this function is to set the display value for 4mA [L.oUt] and the display value for 20mA [H.oUt].

The interval between L.oUt and H.oUt is 10% F.S. If it is below 10%, it is fixed as 10% of SV.



※Relation among input range, user input range, display scale, and transmission scale
The below figure is the example for 4 to 20mA.



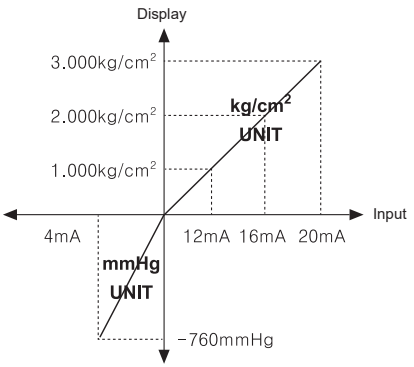
■ Two unit function [Program mode: tUF]

When connecting a pressure sensor, compound pressure which is below atmospheric pressure (0) is for vacuum as mmHg and which is atmospheric pressure or over it is for positive pressure as kg/cm^2.

Atmospheric pressure is 0kg/cm^2. When this unit does not display 0kg/cm^2, you can correct zero-point adjustment function.

When using two unit function, L-SC is fixed as -760.0
L-SC parameter is displayed but you cannot set this.
You can set H-SC within 0 to 19999 range.

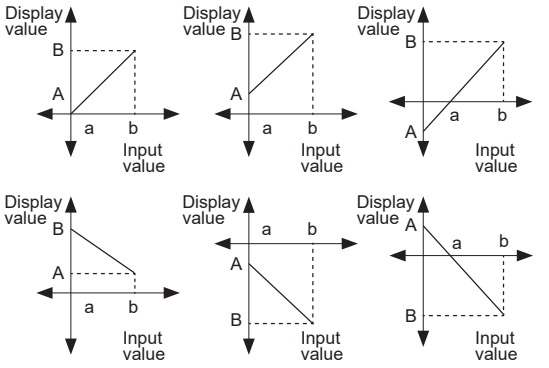
E.g.)When pressure range is −760.0mmHg to 3.000kg/cm^2, and pressure transmitter outputs 4-20mA, set the scale as H-SC: 3000, dP: 0.000.
This unit displays for 4mA input as -760.0, and for 20mA input as 3.000.



▣ Functions

■ Display scale [Program mode: L-SC, H-SC]

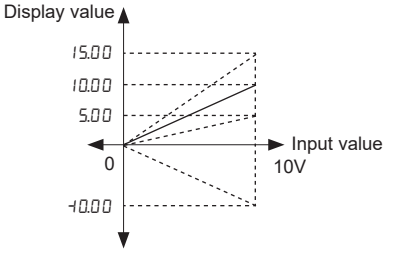
For analog input, this function is to set (-19999 to 19999) for particular high/low limit value in order to display high/ low limit value of measurement input. If measurement inputs are 'a' and 'b' and particular values are 'A' and 'B', it will display a=A, b=B as below graphs.



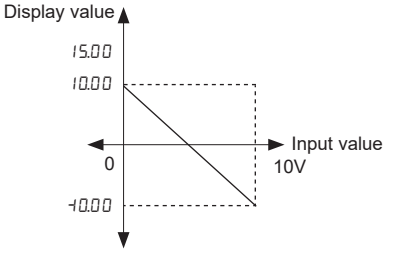
Display scale function is able to change display value for max./min. measured input by setting high limit scale [H-SC] and low limit scale [L-SC] in program mode.

※E.g.) Set high/low scale value (input range is 0 to 10V)

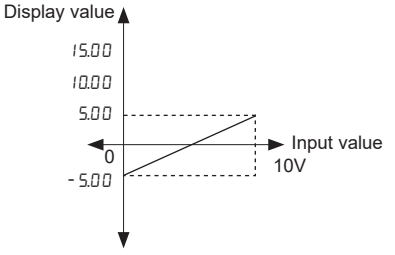
- L-SC = 0.00
- H-SC = 5.00, 10.00, 15.00, 40.00



- L-SC = 10.00, H-SC = -10.00



- L-SC = -5.00, H-SC = 5.00



※When changing input type, high/low scale is changed as factory default.

■ Input special function [Program mode: In.SF]

When selecting analog input, this function is to display the calculated actual value by square, root (√), or two unit function (TUF) as display value.

Parameter	Function	Graph	Applications
Lin	Outputs as input value	Display, Y = AX + B, Input	Standard characteristics. Input for linearity.
root	Outputs the rooted (√) input value	Display, Y = A(√X) + B (X ≥ 0), Y=0(X < 0), Input	Used for measuring flows by pressure signal.
SQR	Outputs the squared input value	Display, Y = A(X)² + B (X > 0), Input, Y = -A(X)² + B (X < 0)	Used for outputting differential pressure by flow signal.
tUF	Refer to '■ Two unit function'		

※Display value and mA output value for SQR

: Display value={($\frac{\text{Input value - L-rG}}{\text{H-rG - L-rG}}$)² × (H-SC - L-SC)}+L-SC

(output value)

※Display value and mA output value for root

: Display value={($\sqrt{\frac{\text{Input value - L-rG}}{\text{H-rG - L-rG}}}$) × (H-SC - L-SC)}+L-SC

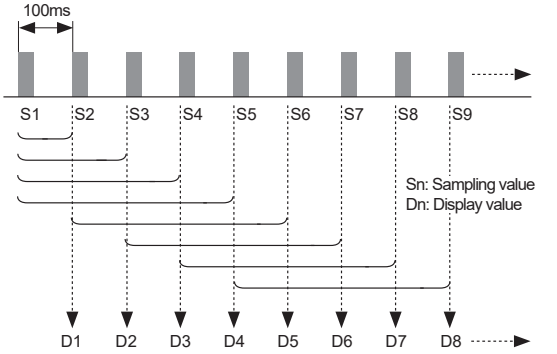
(output value)

■ Digital filter [Program mode: AVG.F]

Moving average digital filter is able to stably display and output the noise from input line and irregular signals as software.

- Filter Setting range : 01 to 16 (when setting as 01, digital filter function does not run.)

※Display cycle is same when executing moving average digital filter.



D1=S1, D2=S2, D3=S3

: Initial operation before averaging 4

$D4 = \frac{S1+S2+S3+S4}{4}$ $D5 = \frac{S2+S3+S4+S5}{4}$

$D6 = \frac{S3+S4+S5+S6}{4}$ $D7 = \frac{S4+S5+S6+S7}{4}$

$D8 = \frac{S5+S6+S7+S8}{4}$

▣ Functions

■ Digital input [Program mode: dI-t, dI-P]

By digital input terminal [dI-t] (terminal 6, 7) or digital input key [dI-P] (D.IN3: ▽+△ for 3 sec), one of three functions executes as the below table.

Function		Operation
AL.rE	Alarm clear	When alarm is ON in RUN mode, it clears alarm forcibly. (It applies only for alarm latch, alarm latch and standby sequence options.) Alarm clear operates only when the value is out of the alarm value range. After clearing alarm, alarm operates its option normally. ※For the model without alarm output (KN-20□□W), this parameter is not displayed.
HoLd	Display HOLD	Temporarily indicated value is stopped in order to check indicated value in unstable input.
ZEro	Zero-point adjustment	Set preset display value as 0. This function is related with input correction [in-b]. When executing zero adjustment function in display value as 4, input correction value [in-b] is set as -4 automatically.

■ Alarm output for disconnecting input sensor [Program mode: bUrn]

When disconnecting input sensor, you can set the status of transmission output.

Parameter	SV	Transmission output (4-20 mA)
bUrn	on	20 mA+5% output
	oFF	4 mA-5% output

■ Display color [Program mode: CLor / C-AL]

This function is to change display color for occurring error, operating alarm automatically. User can check the status of this unit directly.

※Color of monitoring mode, program mode is red.

■ Lock [Program mode: LoCK]

It limits to check parameter set value and to change it.

	oFF	LoC1	LoC2
Program mode	●	◐	○
Monitoring mode	●	●	◐

●: Enable to check/set

◐: Enable to check, disable to set

○: Disable to check

※In LoC2, only LoCK parameter displays in program mode.

◎ **RUN mode and error display color [Program mode: CLor]**

Parameter	Display color	
SV	RUN	Error
rEd	Red	Red
Grn	Green	Green
YELo	Yellow	Yellow
r--G	Red	Green
G--r	Green	Red

◎ **Alarm display color[Program mode: C-AL]**

This parameter is displayed only for the alarm output models (KN-22□□W, KN24□□W).

- The number of set digit is same as the number of alarm output.

  [2 alarm outputs (KN-22□□W)]

  C-AL → S → rr

  [4 alarm outputs(KN-24□□W)]

  C-AL → S → rrrr

- Set color for each alarm.
  It changes as r → G → Y → r in turn.

※E.g.)

S: Press any one among the ◁, △, ▽ keys.

C-AL → S → Grn	RUN mode color is green.
C-AL → S → rGrY AL-4 color AL-3 color AL-2 color AL-1 color	① AL-1 is ON, display is green → yellow. ② AL-2 is ON, display is yellow → red. ③ AL-3 is ON, display is red → green. ④ AL-4 is ON, display is green → red.

- When alarm is cleared, or two alarms operate at the same time, the latest alarm's color is applied.
- When error occurs [HHHH, LLLL, bUrn, Err, Err1] during alarm, the set color of CLor is applied.

■ Temperature unit [Program mode: Unit]

Temperature unit (℃/℉) is selectable. When changing temperature unit, user input range, display scale, output scale, alarm SV are initialized. You should set the parameters again for your purpose.

※When selecting analog input, temperature unit [Unit] parameter is not displayed.

■ Front display unit [Program mode: d.Unt]

When selecting analog input, select the unit (%, °C, °F, not display) of display value.

※When not displaying unit, set oFF and it turns OFF all indicators.

※When selecting temperature sensor input, this parameter [d.Unt] is not displayed.

▣ Communications

■ Communication set
[Program mode: Addr , bAUd]

You can set communication address [Addr] and communication speed [bAUd] for RS485 communication.

■ Communication write enable/disable
[Program mode: Com.Y]

You can set to enable [EnA] or disable [diSA] or writing parameter setting by RS485 communication.

■ Communication manual

Refer to communication manual for RS485 communication.

Visit our web site (www.autonics.com) to download communication manual and software [Integrated device management program (DAQMaster)].

■ Communication specifications

Item	Specifications
Communication method	RS485 2-wire half duplex
Communication speed (BPS)	19200, 9600, 4800, 2400, 1200
Converter	Converter built in RS232
Max. connections	32 units
Communication distance	Max. 1200m (within 700m recommended)
Protocol	Modbus 1.1 RTU
Parity	None
Stop Bit	1-bit
Data length	8-bit

■ Integrated device management program (DAQMaster)

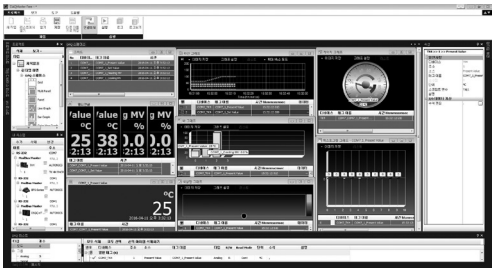
DAQMaster is the integrated device management program to set parameters and manage monitoring data.

Visit our website (www.autonics.com) to download user manual and integrated device management program.

< Computer specification for using software >

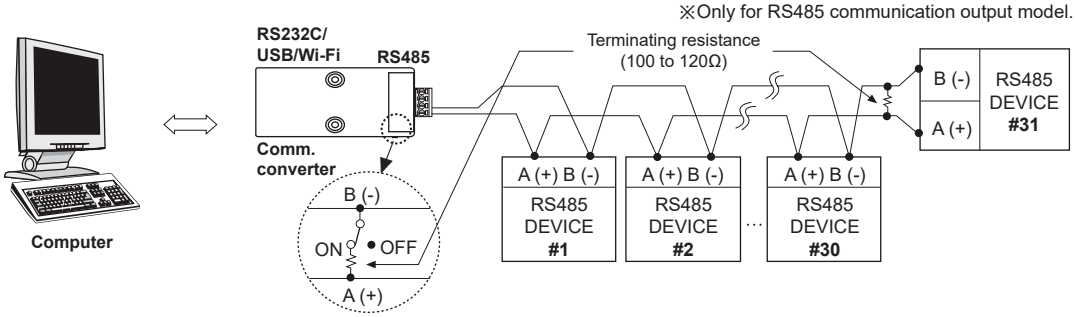
Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operating system	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB or more
Hard disk	More than 1GB of free hard disk space
VGA	1024×768 or higher resolution display
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



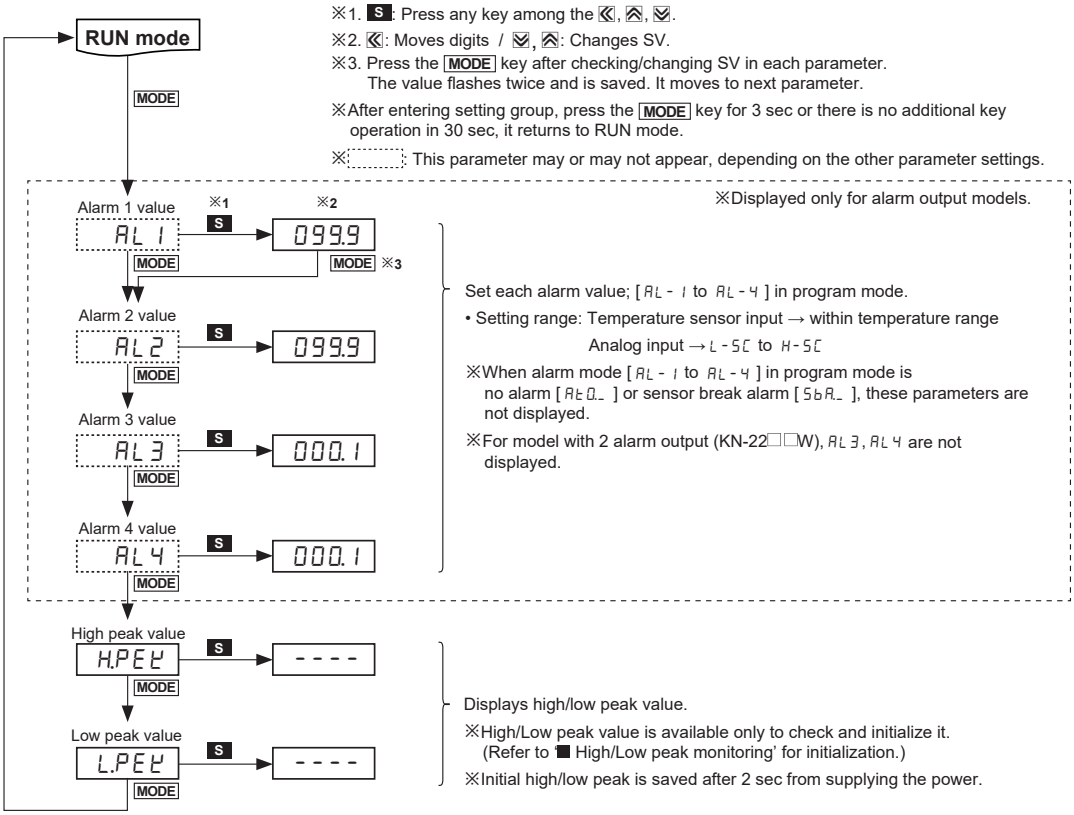
■ Application of system organization

※Only for RS485 communication output model.



※It is recommended to use Autonics communication converter;
SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately),
SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately),
SCM-US (USB to Serial converter, sold separately).
Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

■ Monitoring Mode



※1. S: Press any key among the ≪, ∧, ∨.

※2. ≪: Moves digits / ∨, ∧: Changes SV.

※3. Press the MODE key after checking/changing SV in each parameter.
The value flashes twice and is saved. It moves to next parameter.

※After entering setting group, press the MODE key for 3 sec or there is no additional key operation in 30 sec, it returns to RUN mode.

※[ ]: This parameter may or may not appear, depending on the other parameter settings.

※Displayed only for alarm output models.

Set each alarm value; [AL-1 to AL-4] in program mode.

• Setting range: Temperature sensor input → within temperature range
Analog input → L-SC to H-SC

※When alarm mode [AL-1 to AL-4] in program mode is no alarm [AtO_] or sensor break alarm [SbR_], these parameters are not displayed.

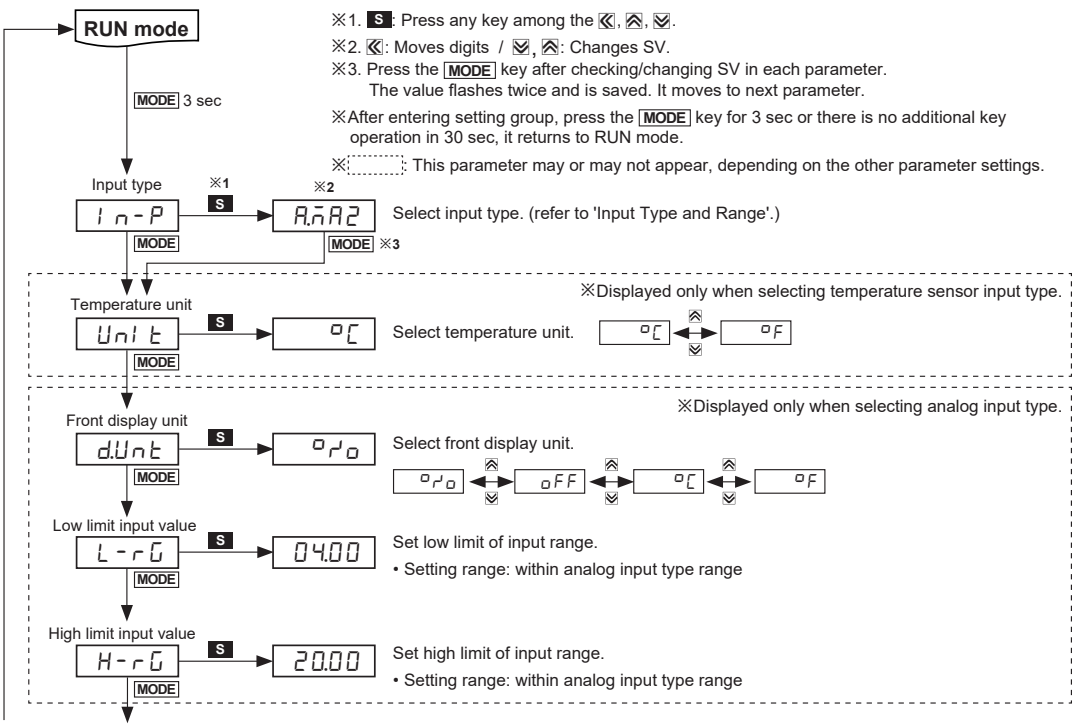
※For model with 2 alarm output (KN-22□□W), AL3, AL4 are not displayed.

Displays high/low peak value.

※High/Low peak value is available only to check and initialize it.
(Refer to '■ High/Low peak monitoring' for initialization.)

※Initial high/low peak is saved after 2 sec from supplying the power.

■ Program Mode



※1. S: Press any key among the ≪, ∧, ∨.

※2. ≪: Moves digits / ∨, ∧: Changes SV.

※3. Press the MODE key after checking/changing SV in each parameter.
The value flashes twice and is saved. It moves to next parameter.

※After entering setting group, press the MODE key for 3 sec or there is no additional key operation in 30 sec, it returns to RUN mode.

※[ ]: This parameter may or may not appear, depending on the other parameter settings.

Select input type. (refer to 'Input Type and Range'.)

※Displayed only when selecting temperature sensor input type.

Select temperature unit. °C ↔ °F

※Displayed only when selecting analog input type.

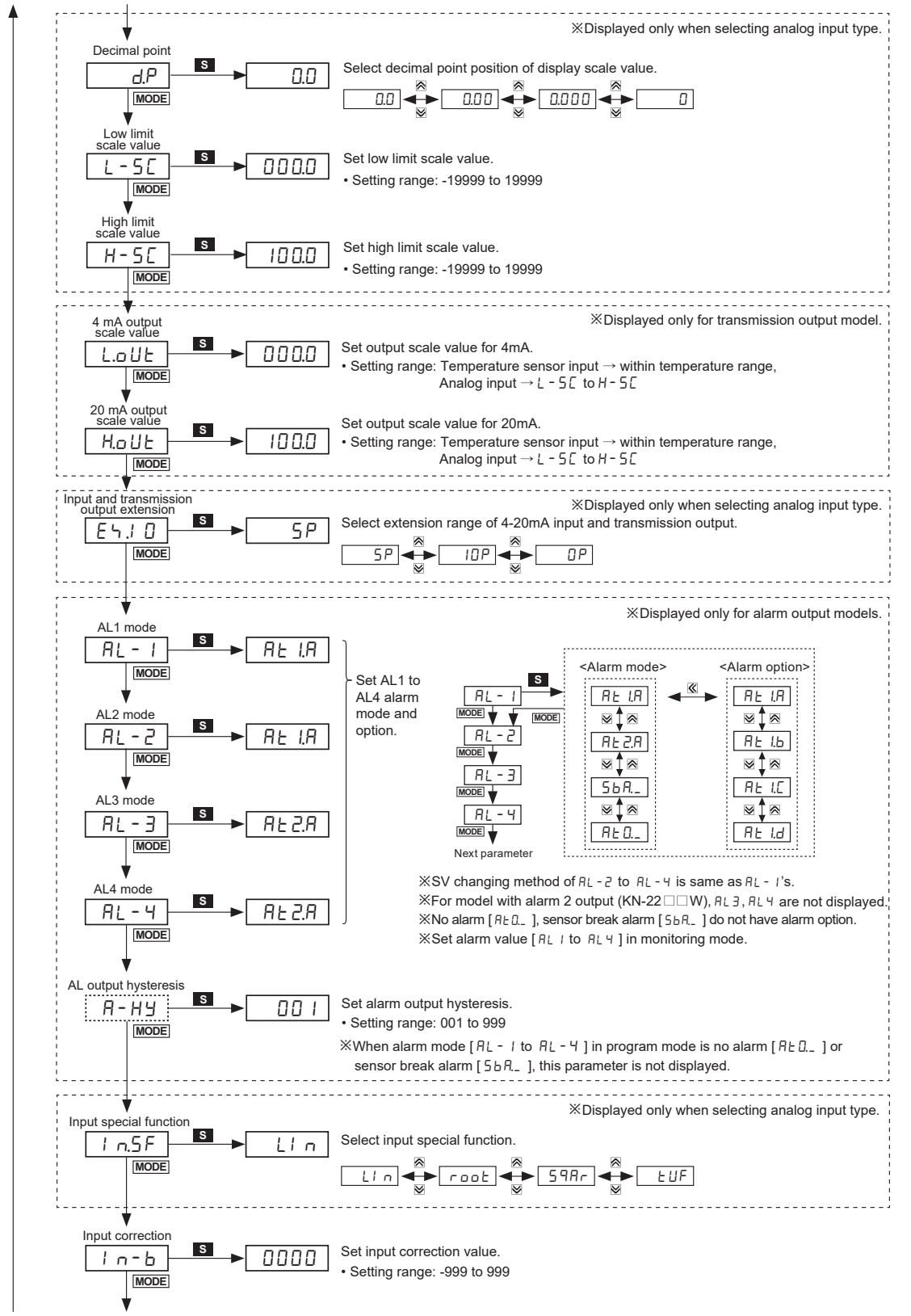
Select front display unit. °rO ↔ oFF ↔ °C ↔ °F

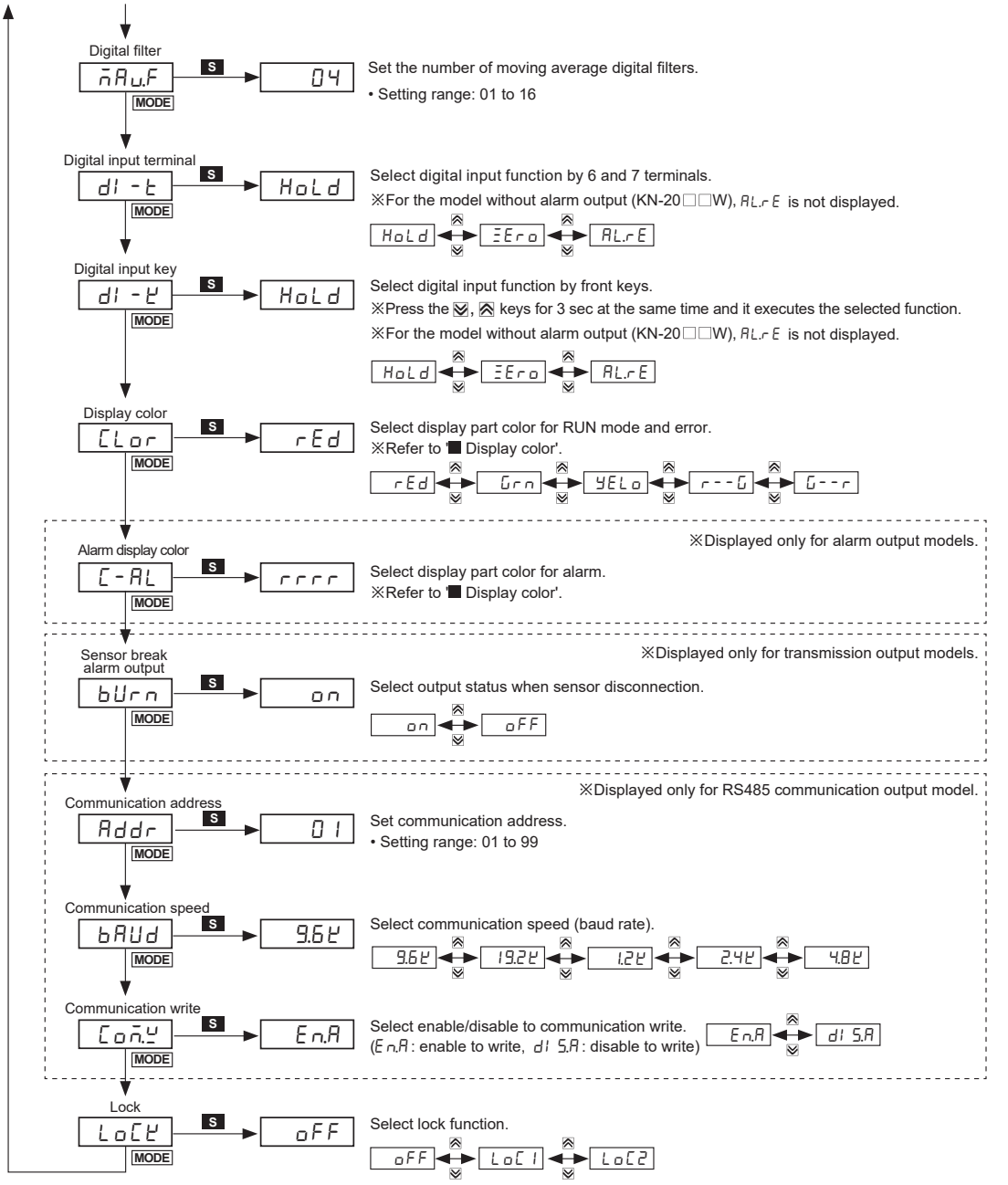
Set low limit of input range.

• Setting range: within analog input type range

Set high limit of input range.

• Setting range: within analog input type range


※Displayed only when selecting analog input type.
Decimal point
d.P
S
0.0
MODE
Select decimal point position of display scale value.
0.0
0.00
0.000
0
Low limit scale value
L-SC
000.0
Set low limit scale value.
• Setting range: -19999 to 19999
High limit scale value
H-SC
100.0
Set high limit scale value.
• Setting range: -19999 to 19999
※Displayed only for transmission output model.
4 mA output scale value
L.oUt
000.0
Set output scale value for 4mA.
• Setting range: Temperature sensor input → within temperature range,
Analog input → L-SC to H-SC
20 mA output scale value
H.oUt
100.0
Set output scale value for 20mA.
• Setting range: Temperature sensor input → within temperature range,
Analog input → L-SC to H-SC
Input and transmission output extension
※Displayed only when selecting analog input type.
E4.IO
5P
Select extension range of 4-20mA input and transmission output.
5P
10P
0P
※Displayed only for alarm output models.
AL1 mode
AL-1
AL1A
AL2 mode
AL-2
AL1A
AL3 mode
AL-3
AL2A
AL4 mode
AL-4
AL2A
Set AL1 to AL4 alarm mode and option.
<Alarm mode>
<Alarm option>
AL-1
AL-2
AL-3
AL-4
Next parameter
AL1A
AL2A
Sbr_
At0_
AL1A
AL1b
AL1C
AL1d
※SV changing method of AL-2 to AL-4 is same as AL-1's.
※For model with alarm 2 output (KN-22□□W), AL3, AL4 are not displayed.
※No alarm [At0_], sensor break alarm [Sbr_] do not have alarm option.
※Set alarm value [AL1 to AL4] in monitoring mode.
AL output hysteresis
A-HY
001
Set alarm output hysteresis.
• Setting range: 001 to 999
※When alarm mode [AL-1 to AL-4] in program mode is no alarm [At0_] or sensor break alarm [Sbr_], this parameter is not displayed.
※Displayed only when selecting analog input type.
Input special function
In.SF
Lin
Select input special function.
Lin
root
SQRr
tUF
Input correction
In-b
0000
Set input correction value.
• Setting range: -999 to 999


Digital filter
nAu.F
S
MODE
04
Set the number of moving average digital filters.
• Setting range: 01 to 16
Digital input terminal
dI -t
HoLd
Select digital input function by 6 and 7 terminals.
※For the model without alarm output (KN-20□□W), AL.rE is not displayed.
HoLd
ZEro
AL.rE
Digital input key
dI -t
HoLd
Select digital input function by front keys.
※Press the ▽, △ keys for 3 sec at the same time and it executes the selected function.
※For the model without alarm output (KN-20□□W), AL.rE is not displayed.
HoLd
ZEro
AL.rE
Display color
CLor
rEd
Select display part color for RUN mode and error.
※Refer to '■ Display color'.
rEd
Grn
YELo
r--G
G--r
※Displayed only for alarm output models.
Alarm display color
C-AL
rrrr
Select display part color for alarm.
※Refer to '■ Display color'.
※Displayed only for transmission output models.
Sensor break alarm output
bUrn
on
Select output status when sensor disconnection.
on
oFF
※Displayed only for RS485 communication output model.
Communication address
Addr
01
Set communication address.
• Setting range: 01 to 99
Communication speed
bAUd
9.6k
Select communication speed (baud rate).
9.6k
19.2k
1.2k
2.4k
4.8k
Communication write
Con.y
En.A
Select enable/disable to communication write.
(En.A: enable to write, dI S.A: disable to write)
En.A
dI S.A
Lock
LoCK
oFF
Select lock function.
oFF
LoC1
LoC2

▣ Factory Default

■ Monitoring mode

Parameter	Default	Parameter	Default	Parameter	Default
AL 1	099.9	AL3	000.1	H.PEt	----
AL2	099.9	AL4	000.1	L.PEt	----

■ Program mode

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
In-P	A.nA2	L.oUt	000.0	In.SF	LIn	Addr	01
Unit	°C	H.oUt	100.0	In-b	0000	bAUd	9.6t
d.Unt	°r/o	EnJ 0	SP	nAU.F	04	Cony	En.A
L-rG	04.00	AL-1	At 1.A	dI-t	HoLd	LoCt	oFF
H-rG	20.00	AL-2	At 1.A	dI-t	HoLd		
d.P	0.0	AL-3	At2.A	CLor	rEd		
L-SC	000.0	AL-4	At2.A	C-AL	rrrr		
H-SC	100.0	A-HY	001	bUrn	on		

▣ Proper Usage

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- For connecting the power, use the crimp terminal (M3.5, max. 7.2 mm)
- 24 VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000 m
  ③Pollution degree 2
  ④Installation category II


Analogue Meter

Am Meter, Volt meter, Etc

- 1.15kV Insulation Voltage
- 4.0kV - 1min Withstanding Voltage
- 50/60Hz Frequency
- 40 Over current Strength
- IEC 60044-1 Standard

CE

Ordering Information

KA – **A** - **45** **300**

① ② ③

① Measurement Value	**A**	AC Ammeter
	B	AC Voltmeter
	C	DC Ammeter
	D	DC Voltmeter
	E	Analog Signal Meter
	F	Frequency Meter

			Scale Arc	Mounting Type	Terminal Bolt	Terminal Protection	Color of Bezel	Weight (g)
② Size (Type)	**45**	45(W) x 42(H)	90°	Bolt	M4	X	Translucent	40
	50	51(W) x 49(H)	80°	Bolt	M4, M5	O	Translucent	60
	60	62(W) x 62(H)	84°	Iron Tub	M4	O	Translucent	80
	68	80(W) x 66(H)	100°	Iron Tub	M4	X	Black	130
	80	80(W) x 80(H)	90°	Iron Tub	M5	O	Translucent	130
	81	100(W) x 83(H)	95°	Iron Tub	M5	O	Translucent	140
	08	80(W) x 80(H)	235°	Bolt	M5	O	Black	350
	08N	80(W) x 80(H)	235°	Bolt	M4	O	Black	350
	11	110(W) x 110(H)	235°	Bolt	M5	O	Black	450

		User Define
③ Range		

Technical Data

Size 45,50,60,68,80,81

81 Type : *
45,50 Type : **

Measurement	Accuracy Class	Inputs	Movement
A	2.5(1.5*)	2.1~30A	Moving-Iron
B	2.5(1.5*)	10~600V	Rectifier
C	2.5(1.5*)	150μA~30A (150μA~5A**), 50mV, 200mV	Rectifier
D	2.5(1.5*)	1~600V	Rectifier
E	2.5(1.5*)	DC4~20mA, DC10V, AC18V	Rectifier
F	1.0	45~65Hz	Rectifier

Size 08, 08N, 11

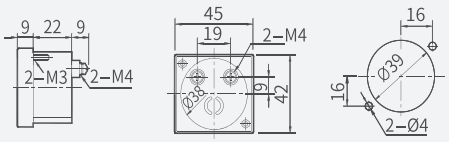
Measurement	Accuracy Class	Inputs	Movement
A	1.5	1~30A	Rectifier
B	1.5	10~600V	Rectifier
C	1.5	200μA~5A, 50mV, 200mV	Rectifier
D	1.5	1~600V	Rectifier
E	1.5	DC4~20mA, DC10V, AC18V	Rectifier
F	1.5	45~65Hz	Rectifier

Environmental Condition

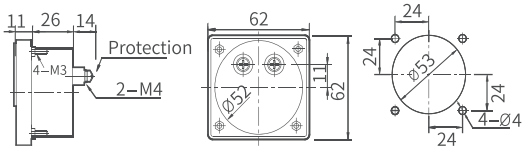
Operationg Temperature	0~55℃
Storage Temperature	-20~85℃
Relative Humidity	≤80%
Ingress Protection Rating	IP52(Front), IP20(Case)

Dimensions

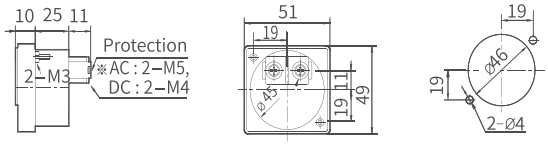
45 Type



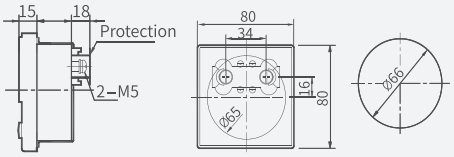
60 Type



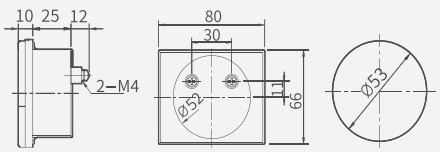
50 Type



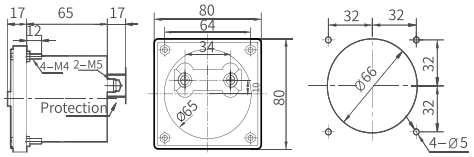
80 Type



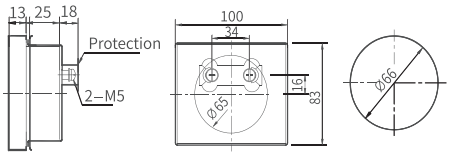
68 Type



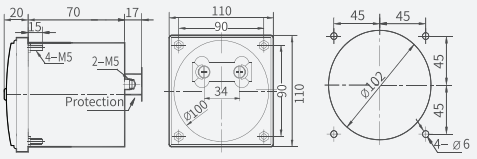
08 Type



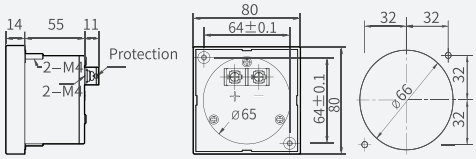
81 Type



11 Type



08N Type



KDX Series

Digital Power Meter

- Large LCD Display
- I/O 4 Inputs, 2 Outputs
- RS-485 or TCP/IP Communication

CE

Specifacations

Display	Type	5.1inch LCD, White Backlight KDX-300:3.5inch LCD, White Black Light
	Number of Line	4DigitsX3Lines+9DigitsX1Line
	Max.Height of Character	15mm, KDX-300:10.8mm
Communication	RS-485 Modbus RTU	2wire, 0~255 Address 4800~1900dps
	TCP/IP Modbus	Lan, RJ45 Port(KDX-2 Only)
Environmental Condition	Operationg Temperature	0℃~55℃ (32℉~131℉)
	Storage Temperature	-20℃~85℃ (-4℉~185℉)
	Relative Humidity	≤ 80%
	Ingress Protection Rating	IP52(front),IP20(case)
Weight(g)		620g (approximately) KDX-300:420g (approximately)
I/O		4 Digital Inputs, 2 Digital Outputs, 2Temp(PT100 Ω)

Measurement & Accuracy

Current	≤0.5% of reading + 1digit
Voltage	≤0.5% of reading + 1digit
Frequency	≤0.1% of reading + 1digit KDX-300: ≤0.0.5% of reading + 1digit
Active Power(Import/Export)	≤0.5% of reading + 1digit
Reactive Power(Import/Export)	≤1.5% of reading + 1digit
Apparent Power(Import/Export)	≤1.5% of reading + 1digit
Power Factor	≤1.5% of reading + 1digit
Active Energy (Import/Export)	≤1.0% of reading + 1digit
Reactive Energy (Import/Export)	≤3.0% of reading + 1digit

Ordering Information

KDX – 2 ① **4** ② **0** ③ **U** / **KDX-300**

① Function	**0**	Basic Measurement
	1	Basic+2DO* Put+4DI*
	2	Basic+2Temp
	3	Basic+2DO*+4DI*+2Temp
	4	Basic+2DO*+4DI*+Leakage Current
② Output Voltage	**0**	None
	1	RS-485
	2	TCP/IP
③ Terminal	**U**	**Bolt**
	I	Pin

*DO - Digital Out Put *DI - Digital In Put

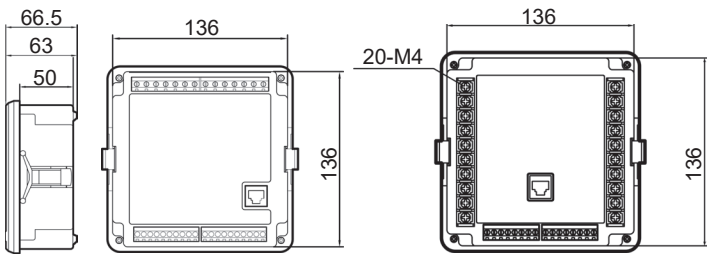
Inputs

Auxiliary Supply	AC 90~260V(50 or 60Hz), DC110V
Voltage(Direct or Secondary)	AC 40~500V
Current (Direct or Secondary)	AC 0.1~6.0A
Voltage Ratio	Max. 154KV(3P3W), 22.9KV(3P4W)/110V
Current Ratio	Max. 6000A/5A

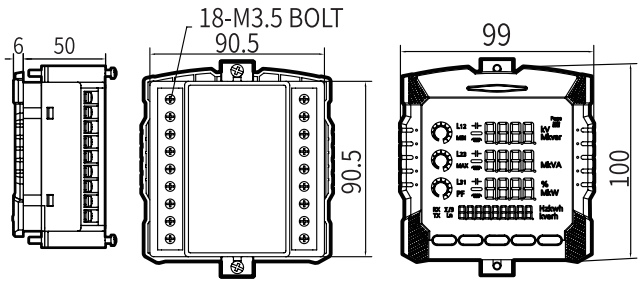
Connections

Circuit	Three Phase 3Wire, Three Phase 4Wire
CT, PT, Aux Terminal	M4 Bolt
RS-485,I/O Terminal	Solid:0.2~4.0 mm²(30~12AWG) Stranded:0.2~2.5mm²(30~12AWG)

Dimension

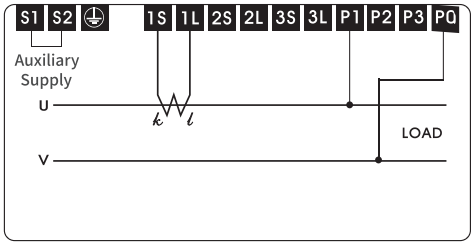


KDX-2

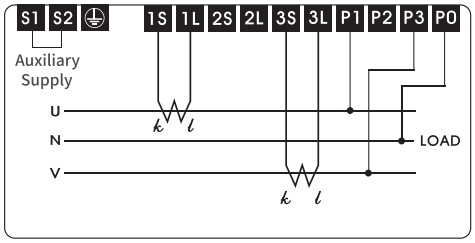


KDX-300

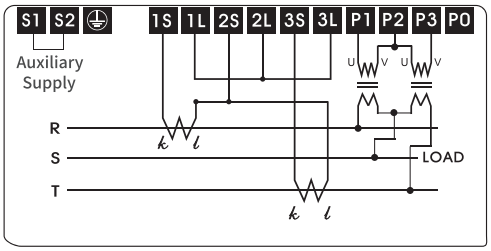
Connection Diagram (KDX-2/KDX-300)



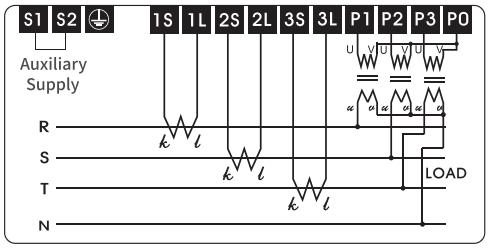
1Phase 2Wire



1Phase 3Wire

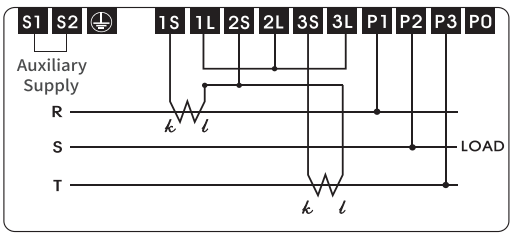


3Phase 3Wire

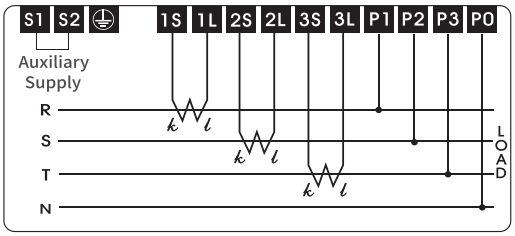


3Phase 4Wire

Method of direct connection without PT of line-to-line voltage 40~500V (KDX-2 Only)

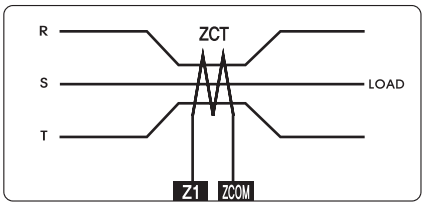


3Phase 3Wire

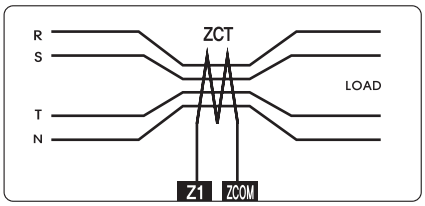


3Phase 4Wire

Method of Connection with ZCT (KDX-2 Only)

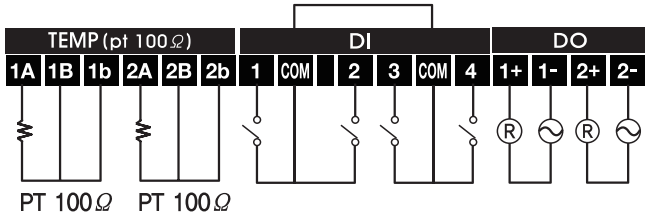


3Phase 3Wire

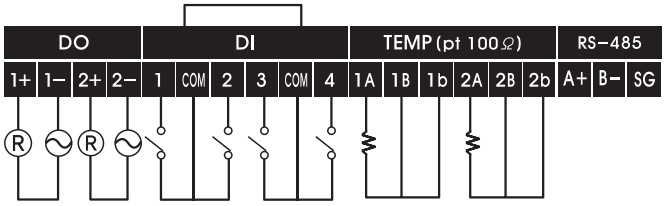


3Phase 4Wire

DI, DO, Temperature Method of Connection (KDX-2 Only)



Bolt Terminal Type



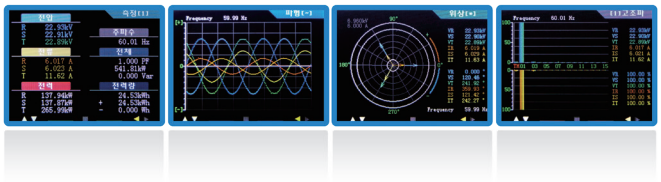
Pin Terminal Type

*DO - Digital Out Put
*DI - Digital In Put

KDQ-100 Series

Power Quality Meter

- Color LCD Display
- Waveform, Vector Diaram
- 15th Harmonic



Specifacations

Display	Type	TFT Color LCD 3.2inch
	Resolution	320X240
Communication	RS-485 Modbus RTU	2-wire, 0~255 Address, 4800~19200bps
Power Quaility Measurement	Waveform	7680sampling/sec
	Phase Angle	Vector Diagram
	Harmonic	1st~15th
Environmental Condition	Operation Temperature	0~55℃
	Storage Temperature	-20~85℃
	Relative Humidity	≤80%
	Ingress Protection Ration	IP54(Front), IP20(case)
Connections	Circuit	Three Phase 3wire, Three phase 4wire,
	CT,PT,Aux Terminal	M4 Bolt
	RS-485 Terminal	M4 Bolt
Weight		820g (approximately)

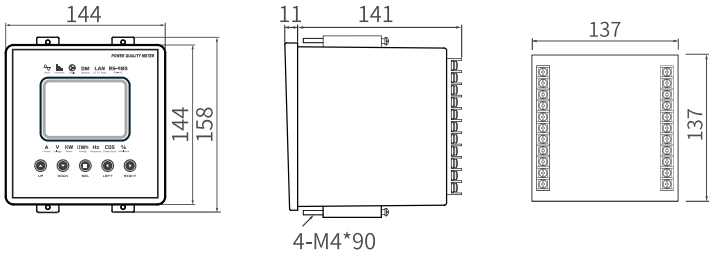
Measurement & Accuracy

Current	≤0.2% of reading + 1digit
Voltage	≤0.2% of reading + 1digit
Frequency	≤0.1% of reading + 1digit
Active Power	≤0.5% of reading + 1digit
Reactive Power	≤1.0% of reading + 1digit
Power Factor	≤1.0% of reading + 1digit
Active Energy	≤1.0% of reading + 1digit
Reactive Energy	≤1.0% of reading + 1digit
Phase Angle	≤0.5°

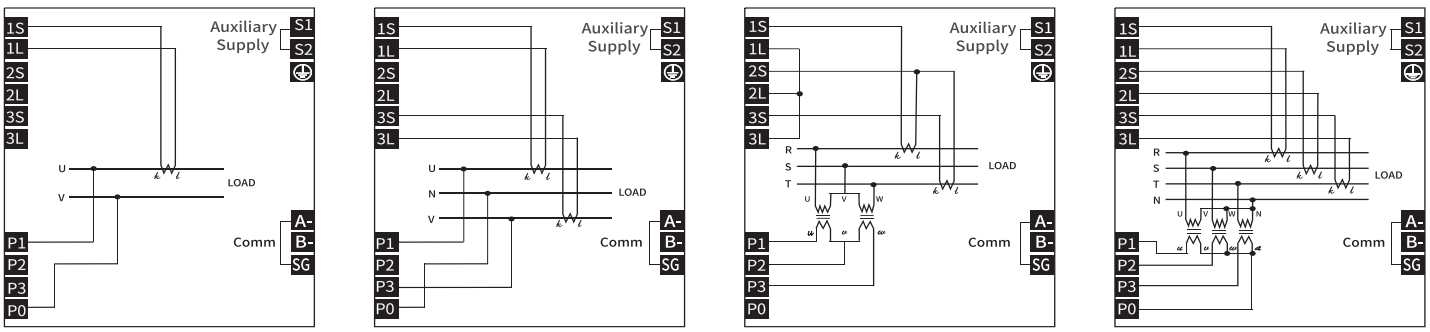
Inputs

Auxiliary Supply	AC 90~260V(50 or 60Hz), DC110V
Voltage(Direct or Secondary)	AC 40~500V
Current (Direct or Secondary)	AC 0.05~5.5A
Voltage Ratio	2000:1
Current Ratio	2000:1

Dimension



Connection Diagram



1Phase 2Wire | 1Phase 3Wire | 3Phase 3Wire | 3Phase 4Wire

- Miniature size (width 5mm, height 12.5mm) high density and easy to install
- Extended switching capability (1mA 5VDC to 5A 250VAC, 30VDC)
- Twin Cross Bar Contact Mechanism for enhanced contact reliability
- High sensitive operation: 120mW ~ 180mW (5 to 24VDC)

KDQ-200 Series

Power Quality Meter

Specifacations

Display	Type	Character LCD
	Number of Line	20Character X 4Lines
	Screen Size	123.5(W)mm X43.0(H)mm (Vewing area)
Communication	RS-485 Modbus RTU	2-wire, 0~255 Address, 9600,19200bps, 38400bps
	Bluetooth v2.0 EDR	Android application(5m)
Power Quaility Measurement	Waveform	7680sampling/sec
	Phase Angle	Vector Diagram
	Harmonic	1st~15th
Environmental Condition	Operation Temperature	0~55℃
	Storage Temperature	-20~85℃
	Relative Humidity	≤80%
	Ingress Protection Ration	IP54(Front), IP20(case)
Connections	Circuit	Single Phase 2wire, Single phase 3wire,
	CT,PT,Aux Terminal	M4 Bolt
	RS-485 Terminal	M4 Bolt
Weight		1810g (approximately)

Measurement & Accuracy

Current	≤0.3% of reading + 0.2% of F.S
Voltage	≤0.3% of reading + 0.2% of F.S
Frequency	≤0.1% of reading + 0.02% Hz
Active Power	≤1.0% of reading + 0.2% of F.S
Reactive Power	≤1.0% of reading + 0.2% of F.S
Power Factor	≤1.0% of reading + 0.2% of F.S
Active Energy	≤Active Power Accuracy + 0.1 Count/h

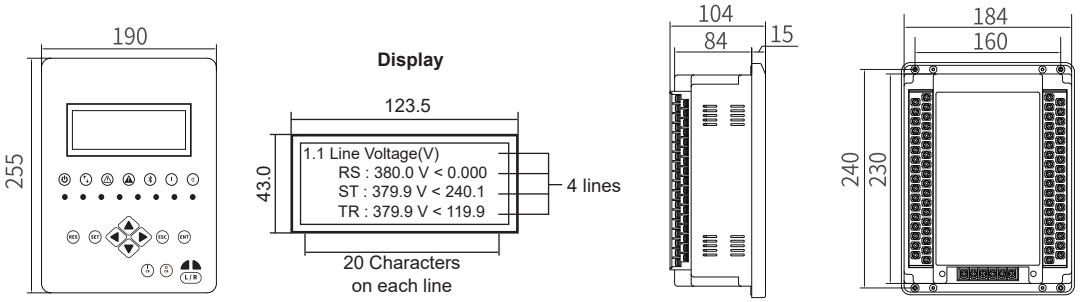
Inputs

Auxiliary Supply	AC 90~260V(50 or 60Hz)
Voltage(Direct or Secondary)	AC 500V
Current (Direct or Secondary)	AC 5A
Voltage Ratio	0~3200.000
Current Ratio	0~2,000
CB* OPEN/ELOSE DI*	AC/DC 110V or 220V

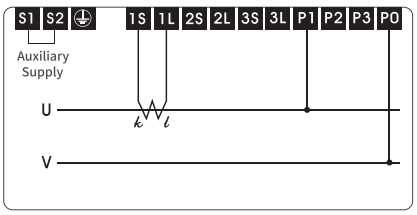
Ouputs

CB* OPEN/CLOSE DO*	16A AC 240V, 30A DC 125V
DI 1~8	5A AC 240V, 5A DC 30V

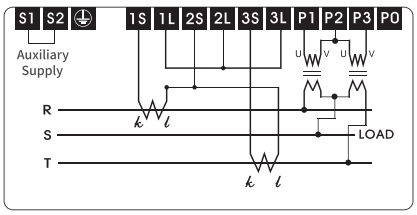
Dimension



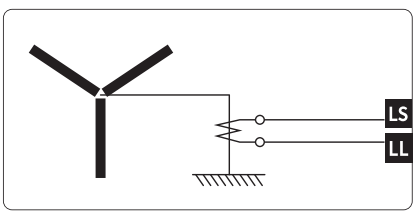
Connection Diagram



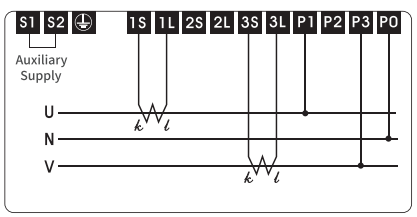
1Phase 2Wire



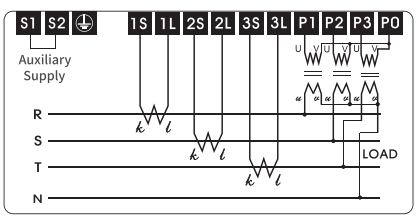
1Phase 3Wire



Connection-LCT



3Phase 3Wire



3Phase 4Wire

*DO - Digital Output *DI - Digital Input *CB - Circuit Breaker

KCP-12 Series

Digital Auto Power Factor Controller

- For Balanced Three Phase

CE

Ordering Information

KCP – 06 C

① ②

① Digital Output	06	6 Point
	12	12 Point
② Communication	C	RS-485 Modbus
	N	None

Specifacations

Display	Type	FND, Red color
	Number of Line	4DigitsX3Lines
	Height of Character	14mm
Communication	RS-485 Modbus RTU	2wire, 0~255 Address 9600dps
Environmental Condition	Operationg Temperature	0°C~55°C (32°F~131°F)
	Storage Temperature	-20°C~85°C (-4°F~185°F)
	Relative Humidity	≤ 80%
	Ingress Protection Rating	IP54(front),IP20(case)
Weight(g)		630g (approximately)

Inputs

Auxiliary Supply	AC 90~260V(50 or 60Hz), DC110V
Voltage(Direct or Secondary)	Line to Line Voltage(S-T) Max. 500V
Current (Direct or Secondary)	Current R Max. 5A
Voltage Ratio	22.9kV/110V
Current Ratio	Max. 6000A/5A

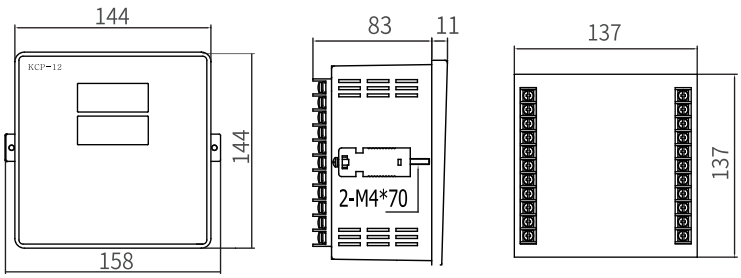
Measurement& Accuracy

Current	≤0.5% of reading + 2digit
Voltage	≤0.5% of reading + 2digit
Active Power	≤0.5% of reading + 2digit
Reactive Power	≤1.5% of reading + 2digit
Power Factor	≤3.0% of reading + 2digit
Minimum Measureable	100mA at AC 110V

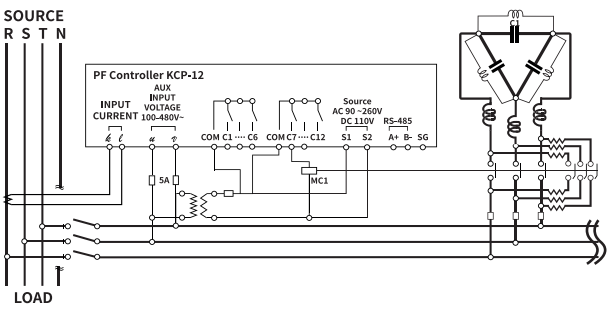
Connections

Circuit	One Phase 1Wire,
CT, PT, Aux Terminal	M4 Bolt
RS-485,I/O Terminal	Solid:0.2~4.0 mm^2(30~12AWG) Stranded:0.2~2.5mm^2(30~12AWG)

Dimension



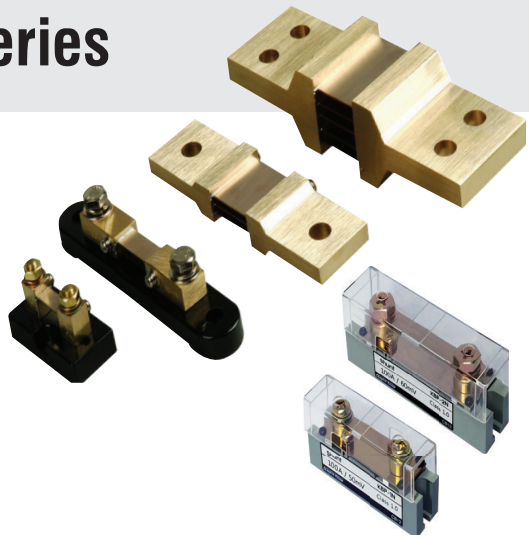
Connection Diagram



KBP Series

Shunt

- Shunt is used to measure DC current
- 1.0 Class
- 2kV-1min Withstanding Voltage
- 50.0mV or 60.0mV Voltage Drop
- 10MΩ Insulation Resistance

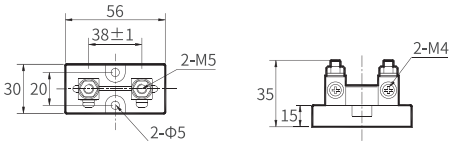
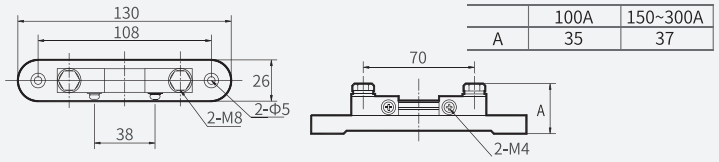
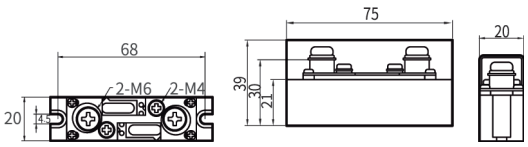
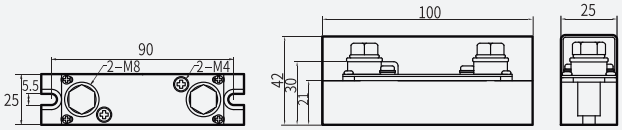
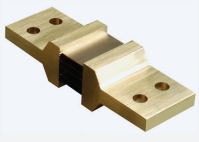
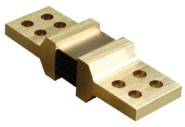


Ordering Information

KBP – 1

①

① Current	**1**	1~75A
	2	100~300A
	1N	400~1000A
	2N	1500A~2000A
	3	2500~3000A
	4	1~75A
	5	60~15A

Type	Primary(A)	Weight(g)	Dimentions(mm)
1	1~75	100	
2	100~300	300	
1N	1~50	50	
2N	60~150	90	
3	400	300	
	500	600	
	600	600	
	750	1800	
	1000	2100	
4	1500	2500	
	2000	3500	
5	2500	5800	
	3000	7000	

- 1.15kV Insulation Voltage
- 4.0kV - 1 min Withstanding Voltage
- 50/60 Hz Frequency
- 40 Overcurrent Strength
- IEC 60044-1 Standard

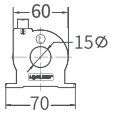
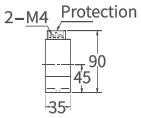
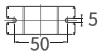
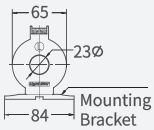
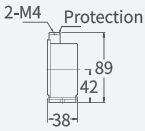
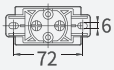
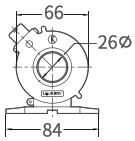
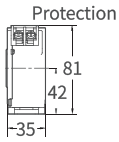
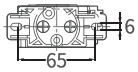
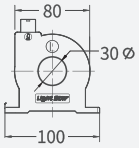
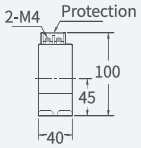
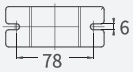
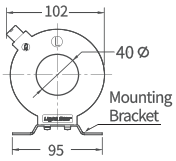
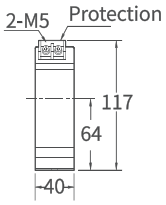
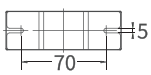
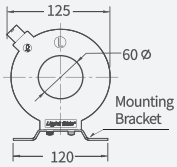
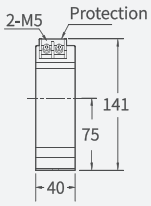
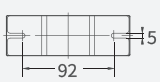
KBJ Series

Ring Type Current Transformer

Ordering Information

KBJ – 15 , 3.0 Class , 2.5 VA , 50~75 / 5 A

① ② ③ ④ ⑤

① Type		② Class	③ VA	④ Primary	⑤ Secondary	Weight(g)	Certificates	Dimensions(mm)		
15		3.0	2.5	40	5 or 1	400	CE			
		1.0	5	50~75						
			5	100~150						
23		3.0	2.5	40	5 or 1	320	CE			
			5	50~75						
		1.0	5	100~2000						
			15	250~300						
25		1.0	5	5~300	5 or 1	320	CE			
			15	250~300						
03	Meter type	1.0	5	100~150	5 or 1	550	CE			
			15	200~350						
			40	400~600						
	Relay Type	5P10	2.5	250~450						
			5	500~600						
04	Meter type	1.0	5	100~150	5 or 1	800	-			
			15	200~350						
			40	400~2000						
	Relay Type	5P10	2.5	200~250						
			5	300~800						
			15	1000~2000						
06	Meter type	1.0	5	150~250	5 or 1	1100	-			
			15	300~400						
			40	500~3000						
	Relay Type	5P10	5	400~1000						
			15	1200~3000						

KBD Series

3Phase Ring Type Current Transformer

Ordering Information

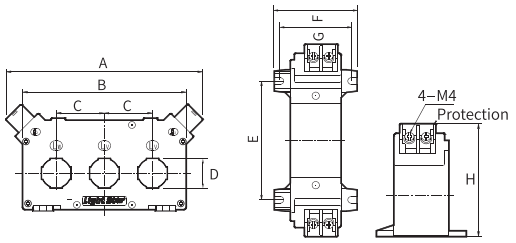
KBD – 12 , 3.0 Class , 2.5 VA , 50~80 / 5 A

① ② ③ ④ ⑤

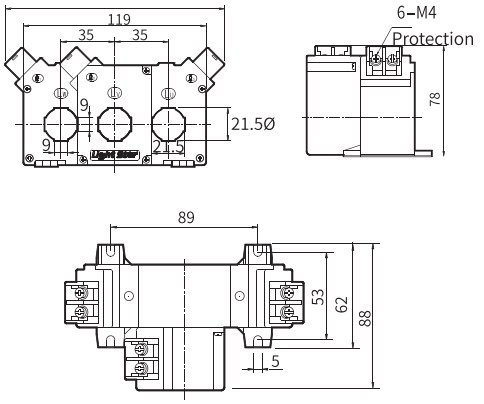
	① Type		② Class	③ VA	④ Primary	⑤ Secondary	Weight (g)	Dimensions(mm) A	B	C	D	E	F	G	H
3P3W (2CT)	Meter Type	12	3.0 or 1.0	2.5	50~80	5 or 1	370	119	99	30	14	63	62	55	59
				5	100~120										
				5	150~200										
	Relay type		5P5	1.5	150~200										
	Meter Type	12S	3.0 or 1.0	2.5	40~60	5 or 1	390	119	99	30	14	75	63	61	59
				5	75~80										
				5	100~150										
				15	200										
	Relay type		5P5 or 5P10	1.5	40~60										
				1.5	75~120										
				2.5	150~200										
	Meter Type	22	3.0 or 1.0	2.5	60	5 or 1	550	136	119	35	21.5	62	89	53	78
				5	75										
				5	100~300										
	Relay type		5P5	1.5	100~300										
	Meter Type	42	3.0 or 1.0	5	100~150	5 or 1	630	170	149	44	27	63	117	53	93
				5	200~250										
				15	300~500										
	Relay type		5P5 or 5P10	1.5	150~250										
				1.5	300~400										
				2.5	500										
	Meter Type	62	1.0	5	200~250	5 or 1	720	KBD-62							
				15	300~1200										
	Relay type		5P10	2.5	250~400										
				5	500~1000										
3P4W (3CT)	Meter Type	13	3.0 or 1.0	2.5	50~100	5 or 1	410	119	99	30	14	63	62	55	59
				5	120										
				5	150~200										
	Relay type		5P5	1.5	150~200										
	Meter Type	13S	3.0 or 1.0	2.5	40~60	5 or 1	520	119	99	30	14	75	63	61	59
				5	75~80										
				5	100~150										
				15	200										
	Relay type		5P5 or 5P10	1.5	40~60										
				1.5	75~120										
				2.5	150~200										
	Meter Type	23	3.0 or 1.0	2.5	75	5 or 1	460	136	119	35	21.5	62	89	53	78
				5	100~120										
				5	150~300										
	Relay type		5P5	1.5	200~300										
	Meter Type	43	3.0 or 1.0	5	100~150	5 or 1	690	170	149	44	27	63	117	53	93
				5	200~300										
				15	400~500										
	Relay type		5P5 or 5P10	1.5	150~250										
				1.5	300~400										
				2.5	500										
	Meter Type	21	3.0 or 1.0	2.5	60	5 or 1	820	KBD-21							
				5	75										
				5	100~200										
	Relay type		5P5	1.5	100~200										
	Meter Type	63	1.0	5	200~250	5 or 1	1360	KBD-63							
				15	300~1200										
	Relay type		5P10	2.5	250~400										
				5	500~1000										

- 1.15kV Insulation Voltage •
- 4.0kV - 1 min Withstanding Voltage •
- 50/60 Hz Frequency •
- 40 Overcurrent Strength •
- IEC 60044-1 Standard •

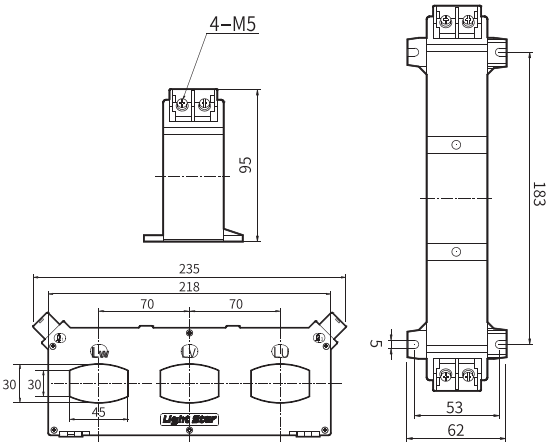
KBD-12,13,12S,13S,22,23,42,43



KBD-21



KBD-62,63



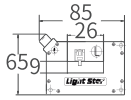
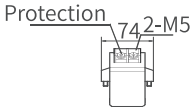
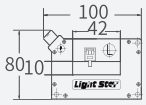
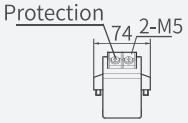
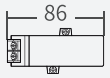
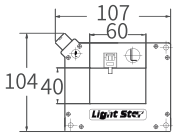
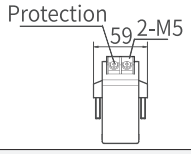
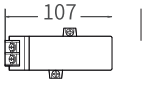
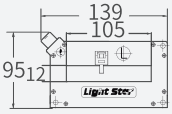
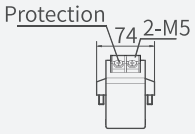
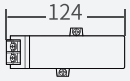
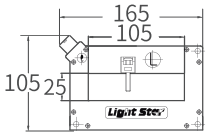
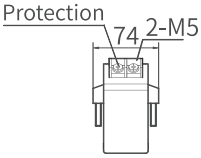
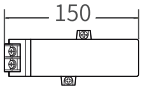
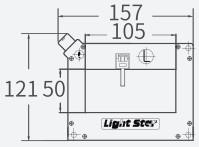
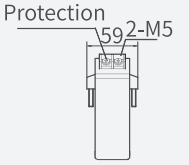
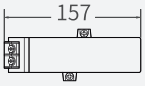
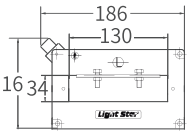
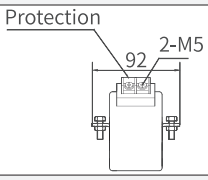
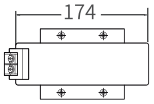
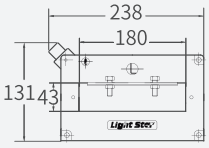
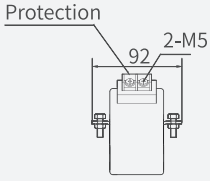
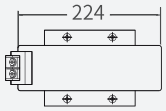
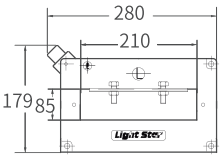
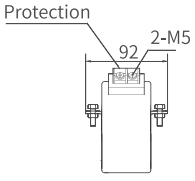
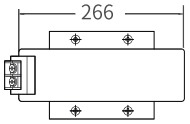
KBM Series

Window Type Current Transformer

- 1.15kV Insulation Voltage
- 4.0kV - 1min Withstanding Voltage
- 50/60Hz Frequency
- 40 Over current Strength
- IEC 60044-1 Standard

Ordering Information

KBM – ① , ② Class , ③ VA , ④ / ⑤ A

① Type		② Class	③ VA	④ Primary	⑤ Secondary	Weight(g)	Certificates	Dimensions(mm)		
Meter Type	25	1.0	5	100~150	5 or 1	500	CE			
			15	200~300						
Relay type		5P10	5	350~400						
Meter Type	03	1.0	5	120~150	5 or 1	700	CE			
			15	200~350						
			40	400~600						
Relay type		5P10	5	400~600						
Meter Type	05	1.0	5	200~300	5 or 1	800	CE			
			15	400~800						
			40	1000~2000						
Relay type		5P10	5	400~600						
Meter Type	08	1.0	5	100~250	5 or 1	1000	CE			
			15	300~400						
			40	500~2000						
Relay type		5P10 or 5P20	5	400~800						
			15	1000~2000						
			5	700~800						
Meter Type	10	1.0	5	200~300	5 or 1	1300	-			
			15	400~500						
			40	600~3200						
Relay type		5P10 or 5P20	5	350~600						
			15	1000~2000						
			40	3000~4000						
			5	700~800						
			15	2500~4000						
Meter Type	12	1.0	5	300~400	5 or 1	840	CE			
			15	500~800						
			40	1000~3200						
Relay type		5P10	5	1200~3000						
Meter Type	14	1.0	15	400~500	5 or 1	2000	-			
			40	600~6000						
Relay type		5P10 or 5P20	15	1000~2500						
			40	3000~4000						
			15	3000~4000						
Meter Type	18	1.0	15	500~600	5 or 1	2700	-			
			40	700~7500						
Relay type		5P10 or 5P20	15	1200~2500						
			40	3000~5000						
			15	3000~5000						
Meter Type	21	1.0	15	500~750	5 or 1	3200	-			
			40	800~8000						
Relay type		5P10 or 5P20	15	1200~2000						
			40	3000~5000						
			15	2500~5000						
			40	6000~8000						

KBF Series

3Phase Window Type Current Transformer

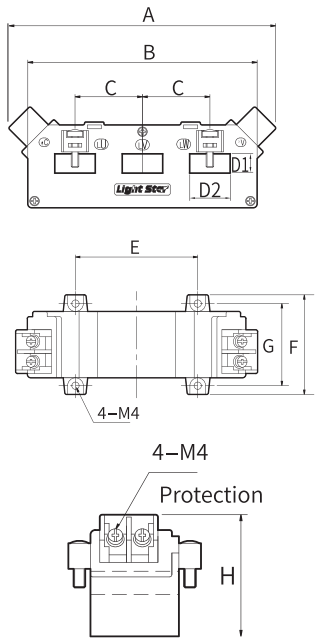
- 1.15kV Insulation Voltage
- 4.0kV - 1min Withstanding Voltage
- 50/60Hz Frequency
- 40 Over current Strength
- IEC 60044-1 Standard

Ordering Information

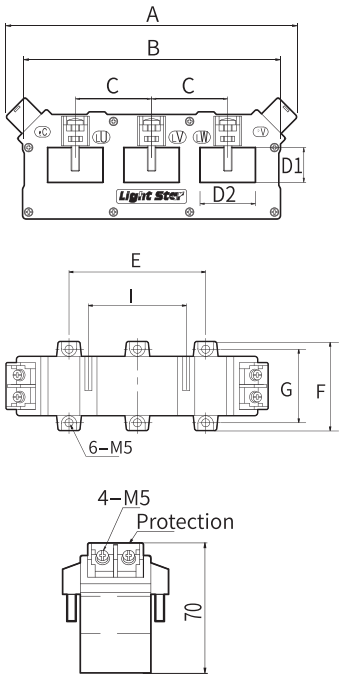
KBF – ① , ② Class , ③ VA , ④ / ⑤ A

	①		②	③	④	⑤	Weight(g)	Dimensions(mm)							
	Type		Class	VA	Primary	Secondary		A	B	C	D1 X D2	E	F	G	H
3P3W (2CT)	Meter Type	12	3.0 or 1.0	2.5	50~75	5 or 1	310	122	102	30	7X16	60	59	49	52
				5	100										
				5	120~200										
	Relay type		5P5	1.5	150~200										
	Meter Type	12S	3.0 or 1.0	2.5	50~75	5 or 1	380	122	102	30	7X16	60	69	59	52
				5	100~150										
				5	200										
				15	200										
	Relay type		5P5 or 5P10	1.5	100~150										
				1.5	200										
	Meter Type	22	3.0 or 1.0	5	100~150	5 or 1	310	139	119	35	10X21	70	57	47	25
				5	200~300										
	Relay type		5P5	1.5	150~350										
	Meter Type	42	1.0	5	200~400	5 or 1	410	168	149	44	20X32	87	57	47	70
				15	500										
	Relay type		5P5 or 5P10	1.5	400~500										
				1.5	300~400										
	Meter Type	62	1.0	5	300	5 or 1	770	237	218	70	25X46	140	57	47	85
				15	400~1200										
	Relay type		5P10	1.5	250~300										
				2.0	350~500										
				2.5	600~1000										
3P4W (3CT)	Meter Type	13	3.0 or 1.0	2.5	50~100	5 or 1	410	122	102	30	7X16	60	59	49	52
				5	120										
				5	150~200										
	Relay type		5P5	1.5	150~200										
	Meter Type	13S	3.0 or 1.0	2.5	40~60	5 or 1	510	122	102	30	7X16	60	69	59	52
				5	75~80										
				5	100~150										
				15	200										
	Relay type		5P5 or 5P10	1.5	100~150										
				1.5	200										
	Meter Type	23	3.0 or 1.0	2.5	100	5 or 1	390	139	119	35	10X21	70	57	47	25
				5	120~150										
				5	200~300										
	Relay type		5P5	1.5	150~250										
	Meter Type	43	1.0	5	200~400	5 or 1	570	168	149	44	20X32	87	57	47	70
				15	500										
	Relay type		5P5 or 5P10	1.5	150~250										
				1.5	400~500										
	Meter Type	63	1.0	5	60	5 or 1	1020	237	218	70	25X46	140	57	47	85
				15	75										
	Relay type		5P10	1.5	250~300										
				2.0	350~500										
				2.5	600~1000										

KBF-12, 12S, 22, 13, 13S, 23



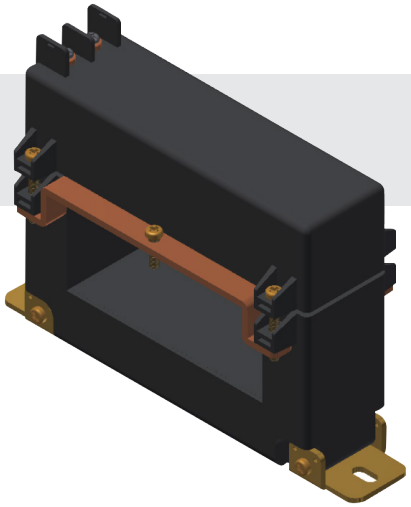
KBF-42, 62, 43, 63



- 4kV - 1 min Withstanding Voltage
- 50/60Hz Frequency
- 1.15kV Insulation Voltage
- 40 Overcurrent Strength

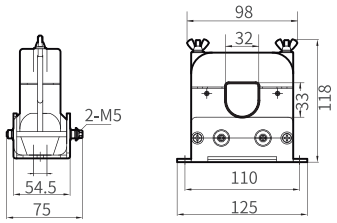
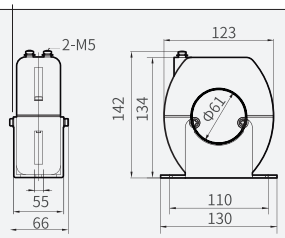
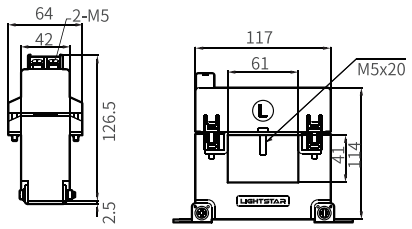
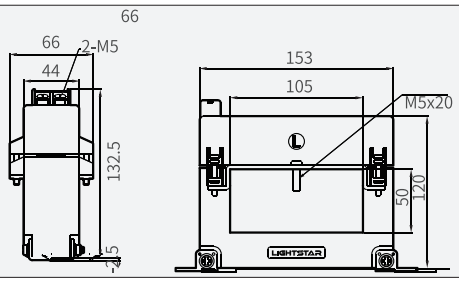
KBC Series

Split-Type Current Transformer



Ordering Information

KBC – ① ② , ③ Class , ④ VA , ⑤ A

① Type		②	③ Class	④ VA	⑤ Primary	⑤ Secondary	Dimension
Meter Type	03	S (With Support) or None (Without Support)	3.0 or 1.0	5	100~150	5 or 1	
				5	200~300		
				15	350~600		
Relay type			5P5 or 5P10	2.5	100~150		
				2.5	200~300		
				5	350~600		
Meter Type	06		1.0	5	400~600	5 or 1	
				15	750~1500		
Relay type			5P10	2.5	400~600		
				5	750~1500		
Meter Type	05		1.0	5	200~300	5 or 1	
				15	400~1200		
Relay type			5P10	2.5	300~500		
				5	600~1200		
Meter Type	12		1.0	5	400	5 or 1	
				15	500~2000		
Relay type			5P10	2.5	400~600		
				5	750~2000		

Isolated Signal Conditioners

▣ Features

- Multi-input
  - CN-610□-□ : Thermocouple 12 types, RTD 5 types,
    Analog (mV, V, mA) 6 types
  - CN-640□-□ : 0 to 50.00kHz
- Improved visibility with negative LCD
  : 12 segment, 3 colors (selectable red, green, yellow)
- Displays input type and unit on display part
- Various outputs
  - Alarm output: 1 EA/2 EA/4 EA
  - 0-20mA transmission output (adjustable insulation, output range), 0-10VDC voltage output (adjustable insulation, output range)
- Various functions
  - High/Low peak input monitoring
  - Alarm output (upper/lower, sensor break)
  - Transmission output/display scale
  - Digital input key (DI), etc.
- Built-in power supply for sensor/transmitter (24VDC)

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

CN — 6 | 10 | 0 — C1

Output	C1	Transmission output (0-20mA): 1
	C2	Transmission output (0-20mA): 2
	V1	Transmission output (0-10VDC): 1
	V2	Transmission output (0-10VDC): 2
	R1	Alarm output: 1
	R2	Alarm output: 2
	R4	Alarm output: 4
Power supply	0	100-240VAC 50/60Hz
	1	24VDC
Input	10	Universal input
	40	Pulse input (※option)
Item	CN-6	Isolated Signal Conditioners

▣ Specifications

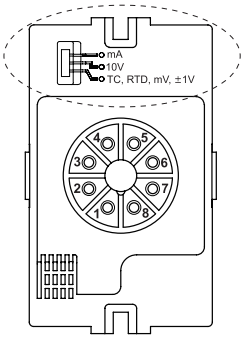
Model		CN-610□-□	CN-640□-□
Power supply	AC voltage	100-240VAC～ 50/60Hz	
	DC voltage	24VDC⎓	
Allowable voltage range		90 to 110% of rated voltage	
Power consumption	AC voltage	Max. 8VA	
	DC voltage	Max. 3W	
Display method		12-segment (selectable red, green, yellow) graphic bar and input type/unit display part (red) with LCD method	
Character size		Display part: 6.4×11.0mm (12-segment), input type/unit display part: 1.4×2.75mm (unit)	
Input type	RTD	JPt100Ω, DPt100Ω, DPt50Ω, Cu50Ω, Cu100Ω	—
	Thermocouple	K, J, E, T, R, B, S, N, C, L, U, PLII	—
	Analog	• Voltage: -50.0-50.0mV, -199.9-200.0mV, -1.000-1.000V, -1.00-10.00V • Current: 0.00-20.00mA, 4.00-20.00mA	—
	Pulse input	—	0 to 50.00kHz (input impedance: 10kΩ)
Output	Transmission output	0-20mA (adjustable output range), load resistance max. 600Ω (accuracy: ±0.3 F.S., resolutions: 8000)	
		0-10VDC⎓ (adjustable output range), load resistance min. 10kΩ (accuracy: ±0.3 F.S., resolutions: 8000)	
	Alarm output	1-point: relay contact capacity 250VAC 5A 1a 2-point: relay contact capacity 250VAC 3A 1c 4-point: relay contact capacity 250VAC 5A 1a	
Display accuracy		±0.2%F.S. ±1-digit (25±5℃), ±0.3%F.S. ±1-digit (-10 to 20℃, 30 to 50℃) ※CN-610□-□: for TC, the input below -100℃ is ±0.4%F.S. ±1-digit (TC-T, TC-U is min. ±2.0℃)	
Setting method		Set by front keys	
Sampling cycle		Analog input: 100ms, temperature sensor input: 250ms	—
Display cycle		—	Same with pulse input cycle When pulse input cycle is over 10 sec, it is updated by every 10 sec
Dielectric voltage		2000VAC 50/60Hz for 1 min (between input terminal and power terminal)	
Vibration		0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Insulation resistance		Over 100MΩ (at 500VDC megger)	
Noise immunity		±2kV the square wave noise (pulse width 1μs) by noise simulator	
Memory retention		Approx. 10 years (non-volatile semiconductor memory type)	
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃	
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH	
Approval		CE	—
Weight※1		Approx. 301g (approx. 160g)	Approx. 340g (approx. 200g)

※1: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

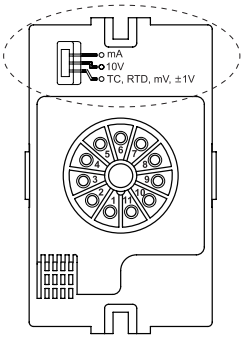
▣ Input Type and Range

◎ Input type selection switch

- **8-pin**



- **11-pin**



- mA: Select it for 0(4)-20mA input
- 10V: Select it for -1V-10V input
- TC, RTD, mV, ±1V: Select it for TC, RTD or ±1mV, V input

※The pulse input model (CN-640□-□) does not have this input type selection switch.

- This product is multi-input. Select the desired input type by the input type selection switch and select the input type at [INP]
- The selection of the input type selection switch and that of [INP] should be same to display correct value.
  Factory default is 4-20mA.

◎ CN-610□-□ (universal input)

Input type			Parameter	Input range (℃)	Input range (℉)
Thermocouple	K(CA)		tC.K1	-200 to 1350	-328 to 2462
			tC.K2	-199.9 to 999.9	-328 to 1832
	J(IC)		tC-J	-199.9 to 800.0	-328 to 1472
	E(CR)		tC-E	-199.9 to 800.0	-328 to 1472
	T(CC)		tC-t	-199.9 to 400.0	-199.9 to 752.0
	B(PR)		tC-b	400 to 1800	752 to 3272
	R(PR)		tC-R	0 to 1750	32 to 3182
	S(PR)		tC-S	0 to 1750	32 to 3182
	N(NN)		tC-N	-200 to 1300	-328 to 2372
	C(W5)		tC-C	0 to 2300	32 to 4172
	L(IC)		tC-L	-199.9 to 900.0	-328 to 1652
	U(CC)		tC-U	-199.9 to 400.0	-199.9 to 752.0
	Platinel II		tC-P	0 to 1390	32 to 2534
RTD	Cu50Ω		CU.50	-199.9 to 200.0	-199.9 to 392.0
	Cu100Ω		CU.10	-199.9 to 200.0	-199.9 to 392.0
	JPt100Ω		JPt.1	-199.9 to 600.0	-328 to 1112
	DPt50Ω		dPt.5	-199.9 to 600.0	-328 to 1112
	DPt100Ω		dPt.1	-199.9 to 850.0	-328 to 1530
Analog	Current	0.00 - 20.00mA	A.MA1	-1999 to 9999 (display range depends on the decimal point position)	
		4.00 - 20.00mA	A.MA2		
	Voltage	-50.0 - 50.0mV	A.MV1		
		-199.9 - 200.0mV	A.MV2		
		-1.000 - 1.000V	A-V1		
		-1.00 - 10.00V	A-V2		

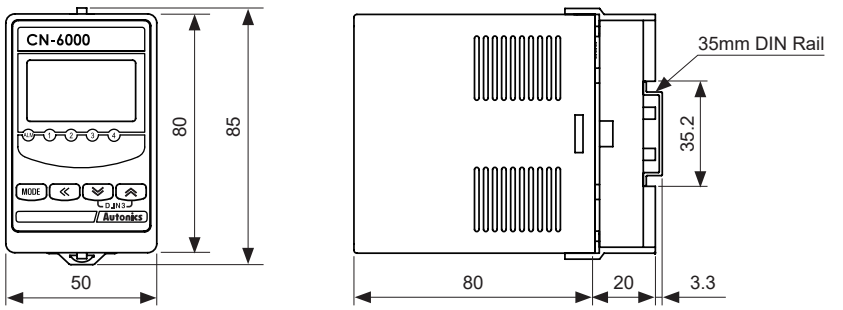
◎ CN-640□-□ (pulse input)

Input type		Measuring cycle	Parameter	Range
Pulse	0 to 9.999Hz	Max. 10 sec	10H	-1999 to 9999 (display range is variable according to decimal point position.)
	0 to 99.99Hz	Max. 10 sec	100H	
	0 to 999.9Hz	Max. 10 sec	1KH	
	0 to 9.999kHz	Max. 1 sec	10KH	
	0 to 50.00kHz	Max. 0.1 sec	50KH	

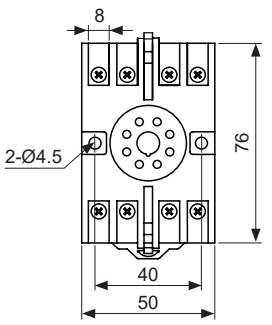
※Pulse input: Non-contact 0 to 50kHz, Contact 0 to 45Hz (displays 0 for below 0.1Hz)
※Input Low Level: 0-1VDC / Input High Level: 5-24VDC
※Duty Ratio: 30 to 70%
※The principle of displaying frequency is converting the time difference between input pulses to the frequency. 1 sec is required to measure 1Hz, and 10 sec is required to measure 0.1Hz. Therefore, it is normal that the lower pulse, the slower response speed. In case of 0Hz, if there are no pulses for over 2 sec, it is programmed to display 0Hz to prevent slow response speed.

▣ Dimensions

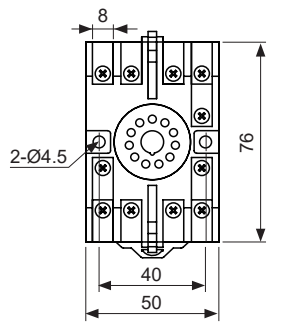
(unit: mm)

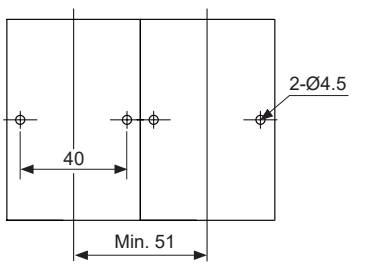


● 8-pin socket

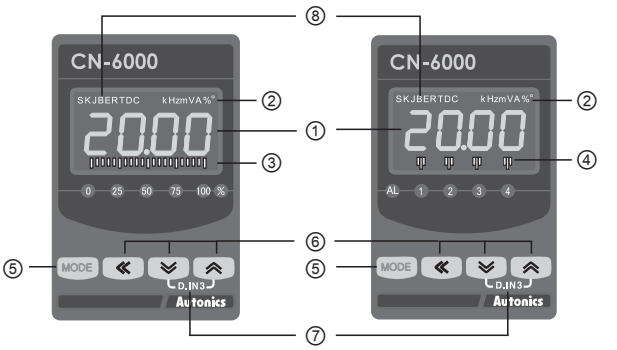


● 11-pin socket





▣ Unit Description



[Transmission output model] [Alarm output model]

① Display part (selectable red, green, yellow)
- Run mode: Displays current measured value.
- Set mode: Displays parameters.

② Unit display part (red)

③ Output scale bar: For transmission output mode, displays output as % by scale bars.

④ Alarm output indicator: Turns ON when the alarm output is on.

⑤ **MODE** key: Used to enter parameter set mode, move to parameters, save SV and return to RUN mode.

⑥ ≪, ∨, ∧ key: Used to change parameter SV.

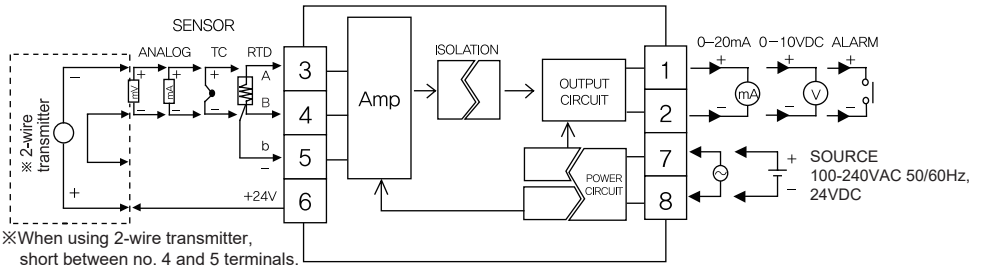
⑦ D.IN3: Press the ∨ and ∧ keys for 3 sec at the same time, it operates the set function (alarm clear, display hold, zero-point adjustment) at [dI-K].

⑧ Input type (only for CN-610□-□): Turns ON the selected temperature sensor type at [IN-P] parameter.
(In case of thermocouple type, L, N, U, P types are not displayed.
In case of RTD type, RTD is displayed.)

▣ Connections

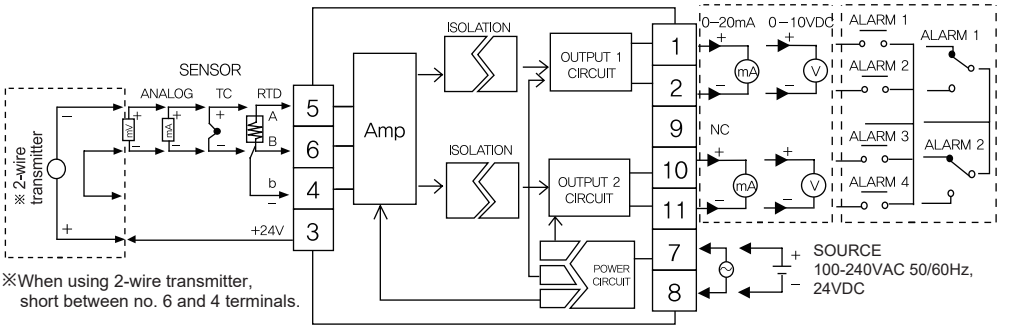
◎ CN-610□-□

● 8-pin



※When using 2-wire transmitter, short between no. 4 and 5 terminals.

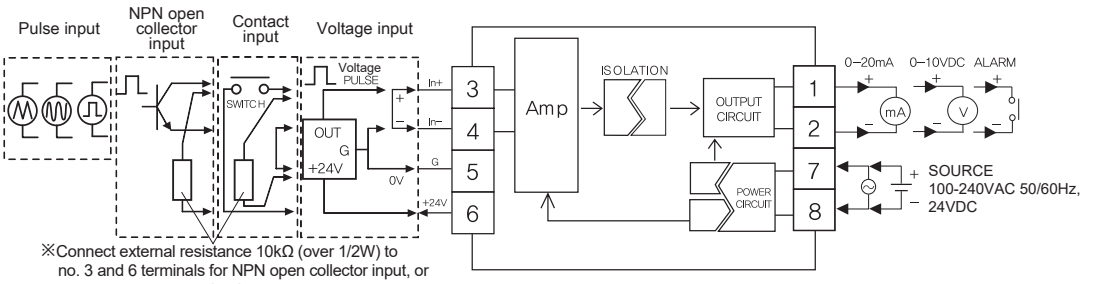
● 11-pin



※When using 2-wire transmitter, short between no. 6 and 4 terminals.

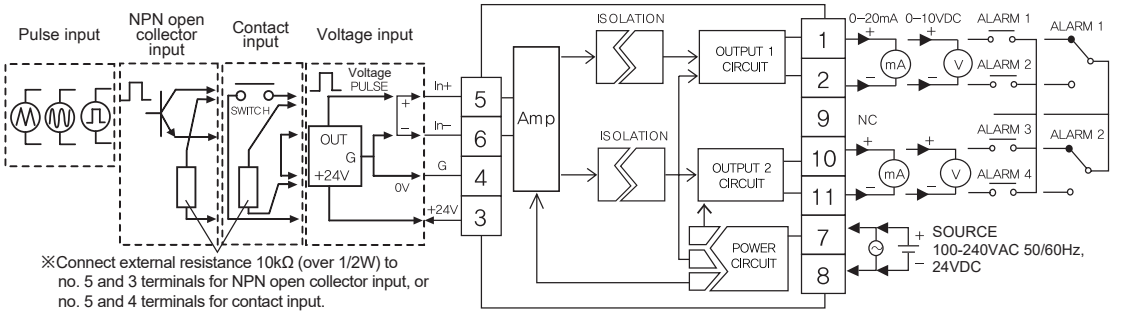
◎ CN-640□-□

● 8-pin



※Connect external resistance 10kΩ (over 1/2W) to no. 3 and 6 terminals for NPN open collector input, or no. 3 and 5 terminals for for contact input.

● 11-pin



※Connect external resistance 10kΩ (over 1/2W) to no. 5 and 3 terminals for NPN open collector input, or no. 5 and 4 terminals for contact input.

▣ Functions

◎ Alarm [AL-1, AL-2, AL-3, AL-4]

This product has 1, 2 or 4 alarms to operate individually when the value is too high or low.
Alarm function is set by the combination of alarm operation and alarm option.
To clear alarm, use digital input function (setting as AL.RE for dI-K) or turn the power OFF and ON.
※For the model without alarm output (CN-6□□-C1/C2/V1/V2), these parameters are not displayed.

AL 1.A
- Alarm option
- Alarm operation

※1: Only for CN-610□-□.
※H: alarm output hysteresis

● Alarm operation

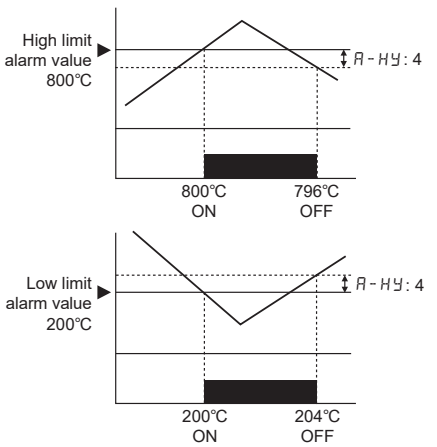
Mode	Name	Alarm operation	Description
AL0._	—	—	No alarm operation
AL 1.□	High limit alarm	OFF H ON; High limit alarm value: 800℃; PV	PV ≥ alarm temperature, alarm is ON
AL2.□※1	Low limit alarm	ON H OFF; PV; Low limit alarm value: 200℃	PV ≤ alarm temperature, alarm is ON
SbA._	Sensor break alarm	—	It will be ON when it detects sensor disconnection. Sensor break alarm does not have alarm option.

● Alarm option

Mode	Name	Descriptions
AL□.A	Standard alarm	If it is an alarm condition, alarm output is ON. Unless an alarm condition, alarm output is OFF.
AL□.b	Alarm latch	If it is an alarm condition, alarm output is ON. Before clearing the alarm, an ON condition is latched. (Holding the alarm output)
AL□.C	Standby sequence	First alarm condition is ignored. From the second alarm condition, standard alarm operates. When power is ON and it is an alarm condition, it is ignored. From the second alarm condition, standard alarm operates.
AL□.d	Alarm latch and standby sequence	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is ON and it is an alarm condition, it is ignored. From the second alarm condition, alarm latch operates.

◎ Alarm output hysteresis [Program mode: A-HY]

Set the interval of ON/OFF alarm output.
The set hysteresis is applied to AL1 to AL4 and it is as below.
E.g.) A-HY 4
high limit alarm value: 800℃
low limit alarm value: 200℃



◎ High/Low peak monitoring [Monitoring mode: H.PEK, L.PEK]

This function is to save high/low peak to check the invisible abnormal condition of system at [H.PEK] or [L.PEK] in monitoring mode.
When the high/low peak is out of the temperature range, it displays HHHH or LLLL.
To initialize high/low peak, press the ▽, △ keys at the same time for 3 sec at [H.PEK] or [L.PEK].
In this case, peak value is the present input value.

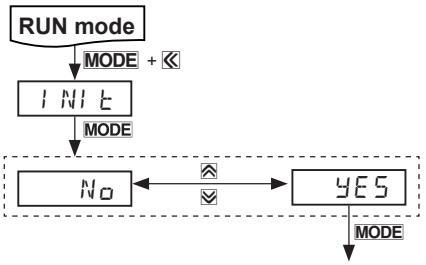
◎ Error

※1: Only for CN-610□-□.

Display	Descriptions	Troubleshooting
LLLL	Flashes when measured sensor input is lower than the temperature range.	When input is moved within the temperature range, it is cleared.
HHHH	Flashes when measured sensor input is higher than the temperature range	
bURN※1	Flashes when the sensor is break or not connected.	Check temperature sensor connection.
ERR	Flashes when there is error to SV.	Check set conditions and re-set it.
ERR2※1	Flashes when [IN-P] setting and input type selection switch setting are not same.	Check input type.

◎ Parameter initialization

To initialize all parameter as factory default, press the MODE and ≪ keys at the same time in RUN mode and it enters initialization parameter.



※Parameter initialization is available only when lock [LOCK] is set as OFF.

◎ Temperature unit [Program mode: UNIT]

Temperature unit (℃/℉) is selectable. When changing temperature unit, user input range, display scale, output scale, alarm SV are initialized.
You should set the parameters again for your purpose.

※When selecting analog input, this parameter [UNIT] is not displayed.

◎ Front display unit [Program mode: d.UNT]

- When selecting analog input, select the unit (%, mV, V, mA, A, ℃, ℉) of display value.(CN-610□-□)
- When selecting pulse input, select the unit (kHz, Hz, %) of display value. (CN-640□-□)
- When not displaying unit, set OFF and it turns OFF all indicators.

◎ User input range [Program mode: L-RG, H-RG]

When selecting analog input, you can set the input range for your purpose. Set low limit input value [L-RG] and high limit input value [H-RG] to limit the input range.

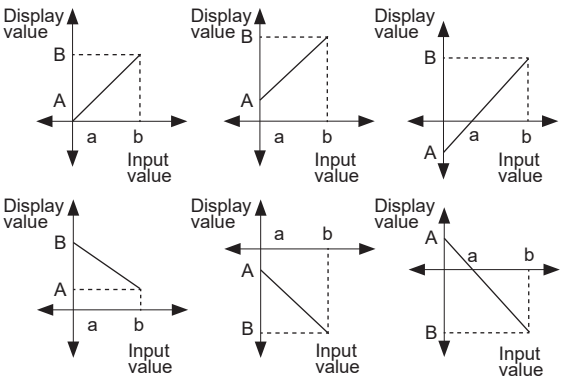
- Setting range: Low limit input value [L-RG] +20% F.S. < High limit input value [H-RG]

◎ Decimal point [Program mode: d.P]

It is able to change decimal point position for high/low limit scale value. It changes decimal point position of display value.

◎ Display scale [Program mode: L-SC, H-SC]

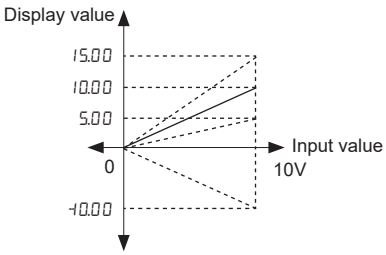
For analog input, this function is to set (−1999 to 9999)for particular high/low limit value in order to display high/low limit value of measurement input. If measurement inputs are 'a' and 'b' and particular values are 'A' and 'B', it will display a=A, b=B as below graphs.



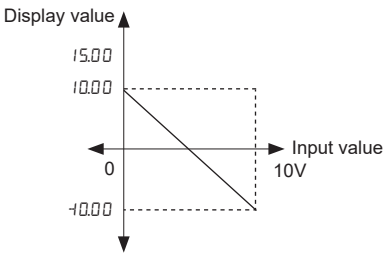
Display scale function is able to change display value for max./min. measured input by setting high limit scale [H-SC] and low limit scale [L-SC] in program mode.

E.g.) Set high/low scale value (input range is 0 to 10V)

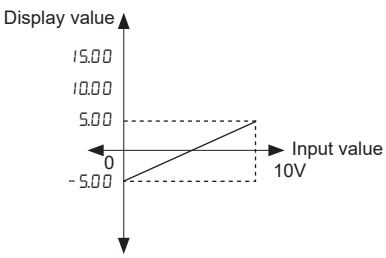
- L-SC = 0.00
- H-SC = 5.00, 10.00, 15.00, 40.00



- L-SC = 10.00, H-SC = -10.00



- L-SC = -5.00, H-SC = 5.00



※When changing input type, high/low scale is changed as factory default.

▣ Functions

◎ Input correction [Program mode: IN-b]

This function is to correct the error occurring from a thermocouple, a RTD or analog input out of allowable error range of this unit.

This is also available to correct error when a sensor cannot contact the subject position by calculating the error temperature.

Variable temperature sensors have accuracy level. Because high accuracy type is expansive, standard thermocouples are generally used.

In this case, temperature sensor may occur error.

By executing this function, you can get more accurate temperature.

When executing input correction function, you should measure the error from a sensor accurately.

If the measured error is not correct, error may be greater.

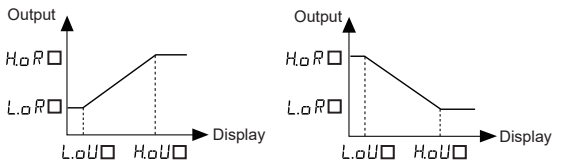
E.g.)When measured temperature is 4℃ and actual temperature is 0℃. Set IN-b as -4, and display value is 0℃.

◎ Transmission output range [Program mode: L.oR□, H.oR□]

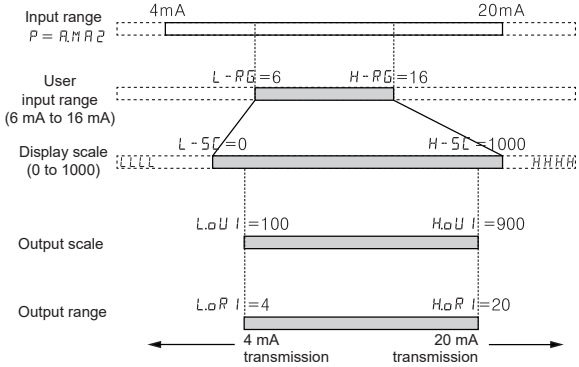
This function is to set output scale and range for display value for transmission output.

When the input value set at L.oU1/L.oU2 is displayed, the output value set at L.oR1/L.oR2 is transmitted.

When the input value set at H.oU1/H.oU2 is displayed, the output value set at H.oR1/H.oR2 is transmitted.



※Relation among input range, user input range, display scale, transmission scale, and output range.
The below figure is the example for 4 to 20mA input.



When display value is 100, it outputs 4mA.
When display value is 900, it outputs 20mA.

◎ Bar display channel [Program mode: bAR, User level: HIGH]

This function is to select OUT1 or OUT2 for Bar display of transmission output scale.

※Only for the model which has two transmission outputs (CN-6□□□-C2/V2), this parameter is displayed.

◎ Input and transmission output extension [Program mode: EXIo]

This function is to extend analog input and 4 to 20mA, 0-10VDC transmission output to 5% or 10% range.

The below table is the case of 4 to 20mA transmission output range setting.

Mode	Operation
OP	Outputs 4 to 20mA within analog input range.
5P	Outputs 3.2 to 20.8mA for 5% out of the analog input range.
10P	Outputs 2.4 to 21.6mA for 10% out of the analog input range.

※This parameter is not displayed for not transmission output (4-20mA, 0-10V) model, or for selecting temperature sensor input.

※Below 0mA, 0VDC cannot extend.

※±1VDC, 10VDC input are available to extend only 5%.

◎ Input special function [Program mode: IN.SF]

When selecting analog input, this function is to display the calculated actual value by square, root (√), or two unit function (TUF) as display value.

Parameter	Functions	Graph	Applications
LIN	Outputs as input value	Display, Y = AX + B, Input	Standard characteristics. Input for linearity.
Root	Outputs the rooted (√) input value	Display, Y = A(√X) + B (X ≥ 0), Y = 0 (X < 0), Input	Used for measuring flows by pressure signal.
SQAR	Outputs the squared input value	Display, Y = A(X)² + B (X > 0), Input, Y = -A(X)² + B (X < 0)	Used for outputting differential pressure by flow signal.
tUF	Refer to '◎ Atmospheric pressure (0) setting for Two Unit Function'		

※Display value and mA output value for SQAR

: Display value=$\{(\frac{\text{Input value - L-RG}}{\text{H-RG - L-RG}})^2 \times (\text{H-SC - L-SC})\} + \text{L-SC}$ (output value)

※Display value and mA output value for Root

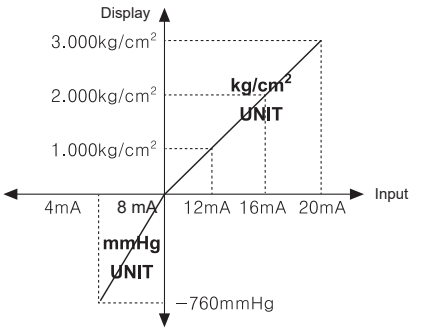
: Display value=$\{(\sqrt{\frac{\text{Input value - L-RG}}{\text{H-RG - L-RG}}}) \times (\text{H-SC - L-SC})\} + \text{L-SC}$ (output value)

※This function is only for CN-610□-□.

◎ Atmospheric pressure (0) setting for Two Unit Function [Program mode: 0.PSI , I N.SF : tUF]

When connecting a pressure sensor, compound pressure which is below atmospheric pressure (0) is for vacuum as mmHg and which is atmospheric pressure or over it is for positive pressure as kg/cm^2.
Atmospheric pressure is 0kg/cm^2.
When this unit does not display 0kg/cm^2, you can correct zero-point adjustment function.
When using two unit function, L-SC is fixed as -760.
L-SC parameter is displayed but you cannot set this. You can set H-SC within 0 to 9999 range.

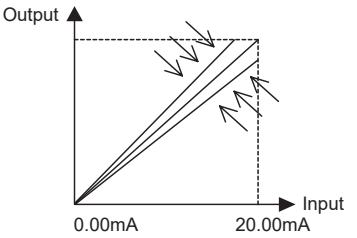
E.g.) When pressure range is -760.0mmHg to 3.000kg/cm^2, and pressure transmitter outputs 4-20mA and it outputs 8.00mA for atmospheric pressure(0), set input special function as tUF, H-SC : 3000, d.P : 0.000, 0.PSI : 0800. This unit displays for 4mA input as -760, for 8mA input as 0.000 and 20mA input as 3.000.



※This function is only for CN-610□-□.

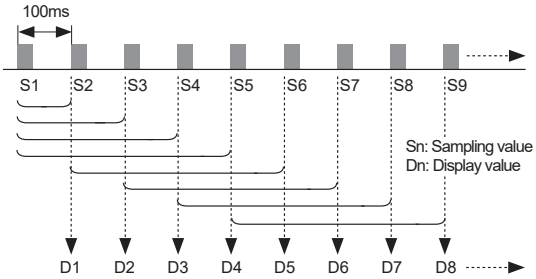
◎ Span correction [Program mode: SPAN, User level: HI GH]

It corrects the error of display value for 100% input.
• Setting range: 0.900 to 1.100



◎ Digital filter [Program mode: AVF / MAVF , User level: HI GH]

Digital filter is able to stably display and output the noise from input line and irregular signals.
Normal average filter AV.F displays the averaged N times of input values periodically. Moving average filter MAV.F displays the moving averaged N times of input values in real time.
• Setting range: 01 to 16
※When setting as 01, digital filter function does not run.



D1=S1, D2=S2, D3=S3: Initial operation before averaging 4

$$D4=\frac{S1+S2+S3+S4}{4} \qquad D5=\frac{S2+S3+S4+S5}{4}$$

$$D6=\frac{S3+S4+S5+S6}{4} \qquad D7=\frac{S4+S5+S6+S7}{4}$$

$$D8=\frac{S5+S6+S7+S8}{4}$$

◎ Digital input [Program mode: dI -K]

By front digital input keys (D.IN3: ☑ + ⍓ for 3 sec), one of three functions executes as the below table.

Function		Operation
AL.RE	Alarm clear	When alarm is ON in RUN mode, it clears alarm forcibly. (It applies only for alarm latch, alarm latch and standby sequence options.) Alarm clear operates only when the value is out of the alarm value range. After clearing alarm, alarm operates its option normally. ※For the model without alarm output (CN-6□□□-C1/C2/V1/V2), this parameter is not displayed.
HoLd	Display HOLD	Temporarily indicated value is stopped in order to confirm indicated value in unstable input.
ZERo	Zero-point adjust-ment	Set preset display value as 0. This function is related with input correction [IN-b]. When executing zero adjustment function in display value as 4, input correction value IN-b is set -4 automatically.

▣ Functions

◎ Display color [Program mode: CLoR]

This function is to change display color for occurring error, operating alarm automatically. User can check the status of this unit directly.
※Color of monitoring mode, program mode is red.

● **EVENT: When operating alarm and displaying** HHHH, LLLL, bURN, ERR

Parameter	Display color	
SV	RUN	EVENT
REd	Red	Red
GRN	Green	Green
YELo	Yellow	Yellow
R--G	Red	Green
G--R	Green	Red

◎ Alarm output for disconnecting input sensor [Program mode: bURN]

When disconnecting input sensor, you can set the status of transmission output.
It flashes bURN and it outputs the set value of HHHH or LLLL.
For transmission output, it outputs the set max./min. value of I/O expansion function.

Parameter	SV	Transmission output (4-20mA)	Alarm output	
bURN	oN	20mA	High limit alarm ON	Low limit alarm OFF
	oFF	4mA	High limit alarm OFF	Low limit alarm ON

※This function is only for CN-610□-□.

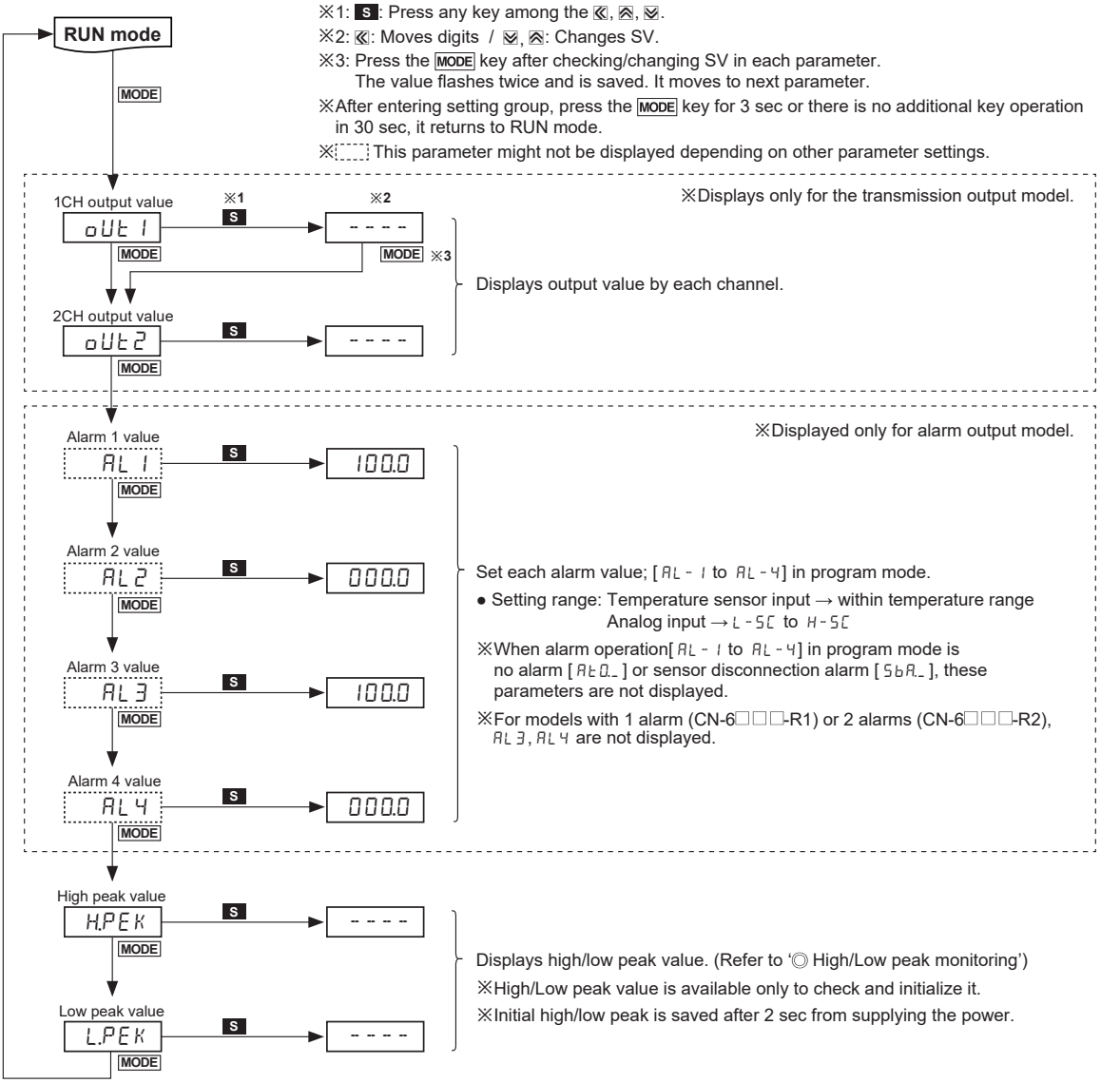
◎ Lock [Program mode: LoCK]

It limits to check parameter set value and to change it.

	oFF	LoC1	LoC2
Program mode	●	◐	○
Monitoring mode	●	●	◐

●: Enable to check/set
◐: Enable to check, disable to set
○: Disable to check/set
※In LoC2, only LoCK parameter displays in program mode.

▣ Monitoring Mode



※1: **S**: Press any key among the ◁, △, ▽.
※2: ◁: Moves digits / ▽, △: Changes SV.
※3: Press the MODE key after checking/changing SV in each parameter.
The value flashes twice and is saved. It moves to next parameter.
※After entering setting group, press the MODE key for 3 sec or there is no additional key operation in 30 sec, it returns to RUN mode.
※: This parameter might not be displayed depending on other parameter settings.

※Displays only for the transmission output model.

Displays output value by each channel.

※Displayed only for alarm output model.

Set each alarm value; [AL-1 to AL-4] in program mode.

- Setting range: Temperature sensor input → within temperature range
  Analog input → L-SC to H-SC

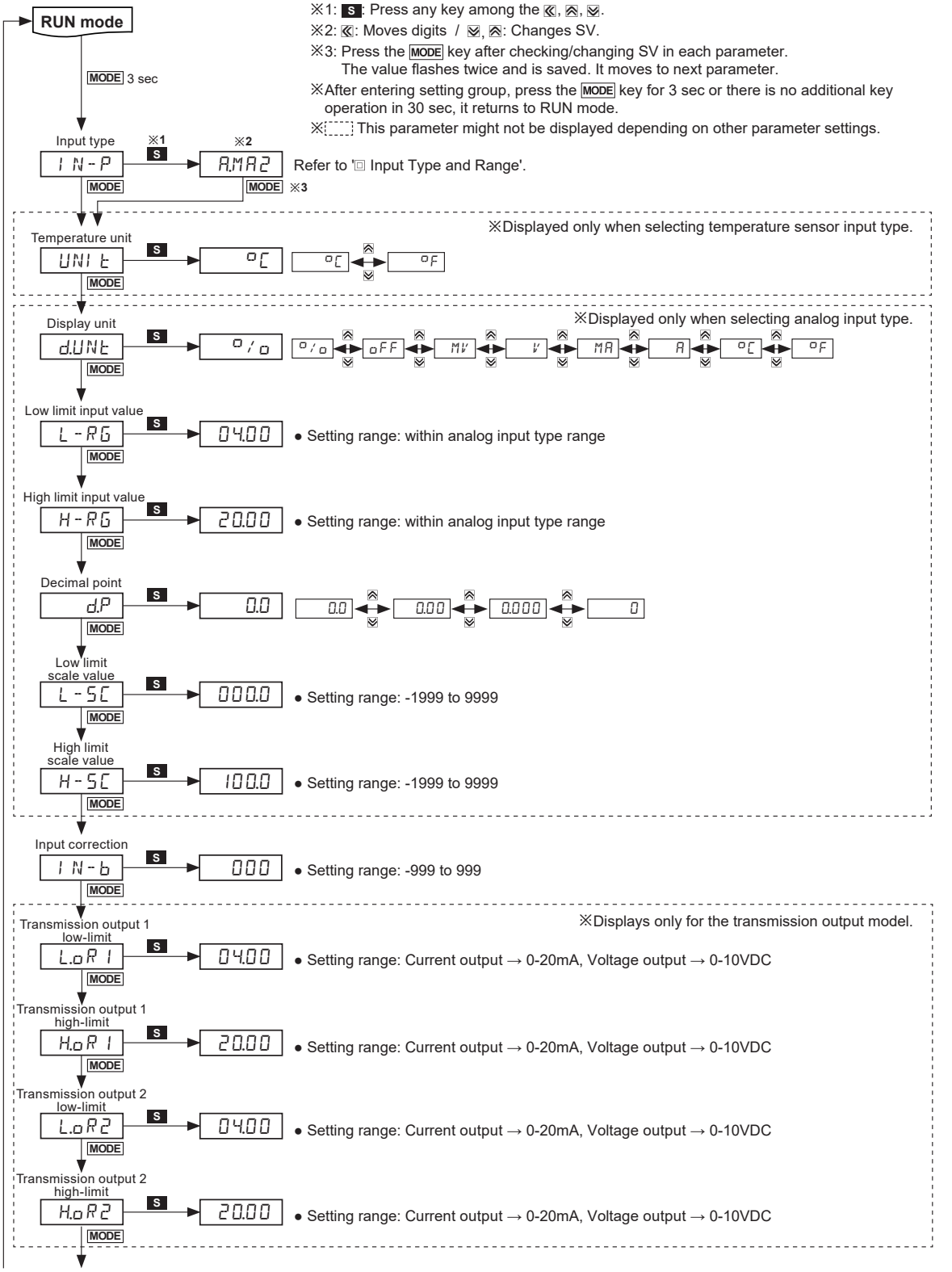
※When alarm operation[AL-1 to AL-4] in program mode is no alarm [AtO_] or sensor disconnection alarm [SbA_], these parameters are not displayed.

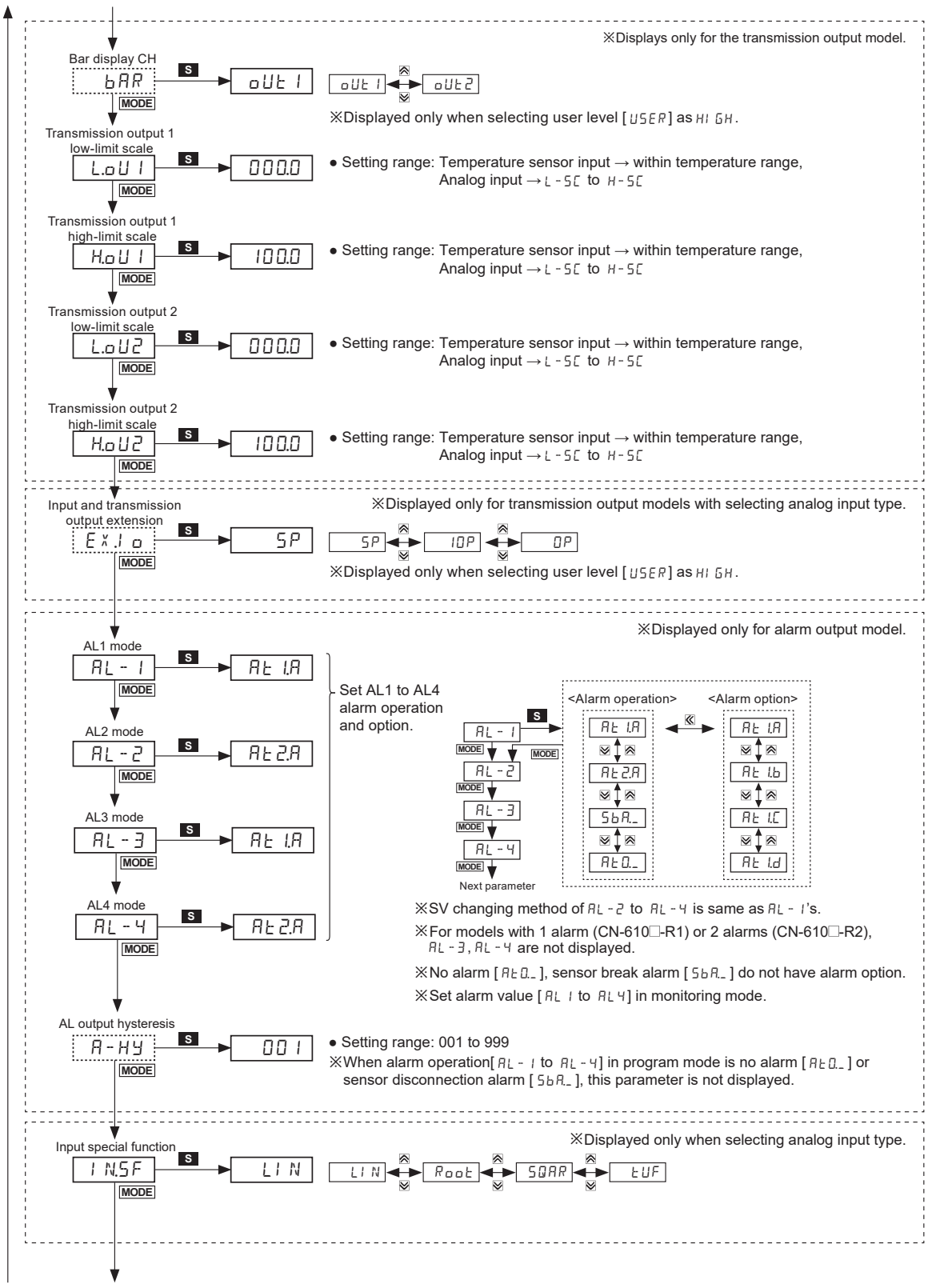
※For models with 1 alarm (CN-6□□□-R1) or 2 alarms (CN-6□□□-R2), AL3, AL4 are not displayed.

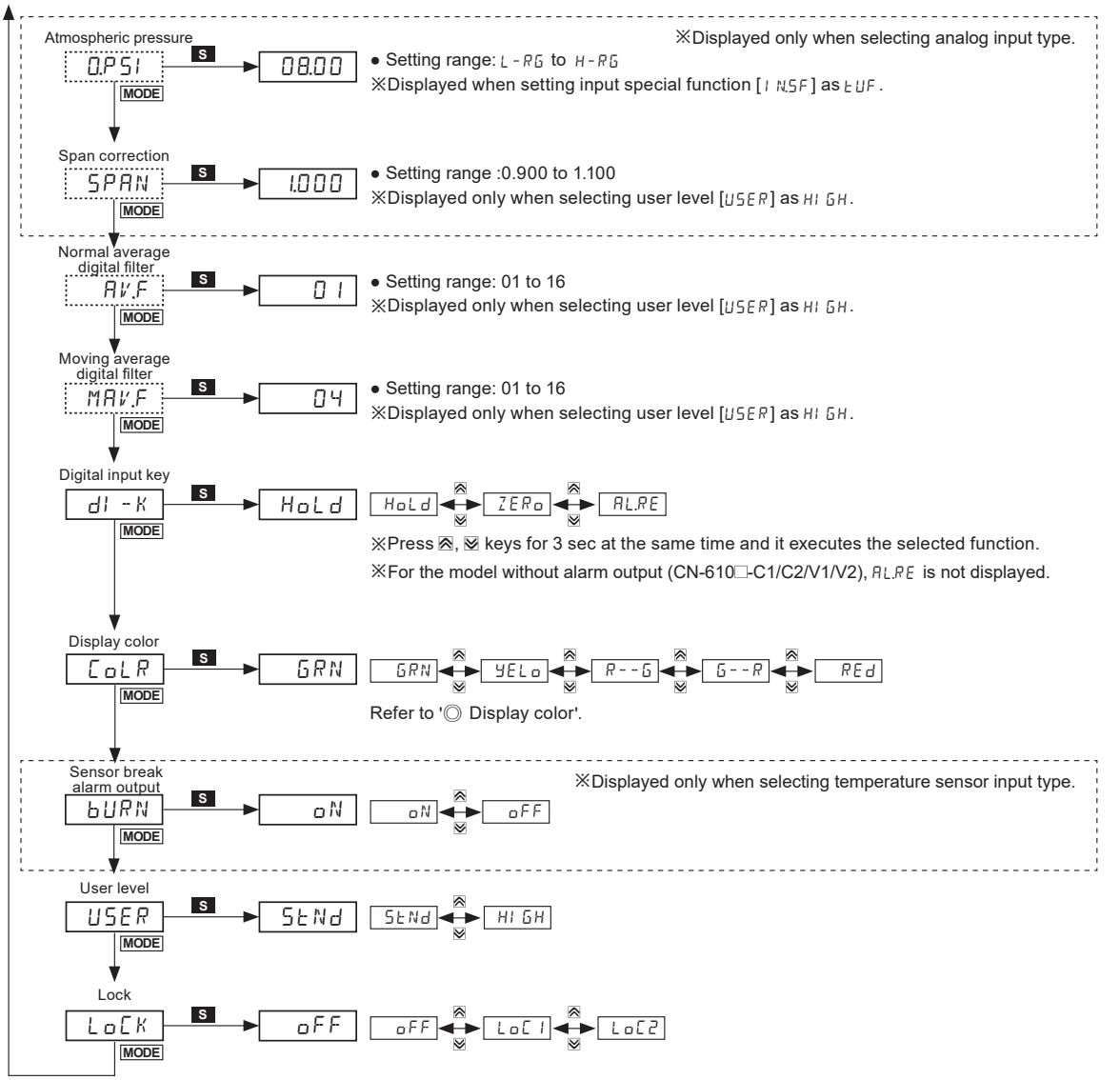
Displays high/low peak value. (Refer to '◎ High/Low peak monitoring')
※High/Low peak value is available only to check and initialize it.
※Initial high/low peak is saved after 2 sec from supplying the power.

▣ Program Mode

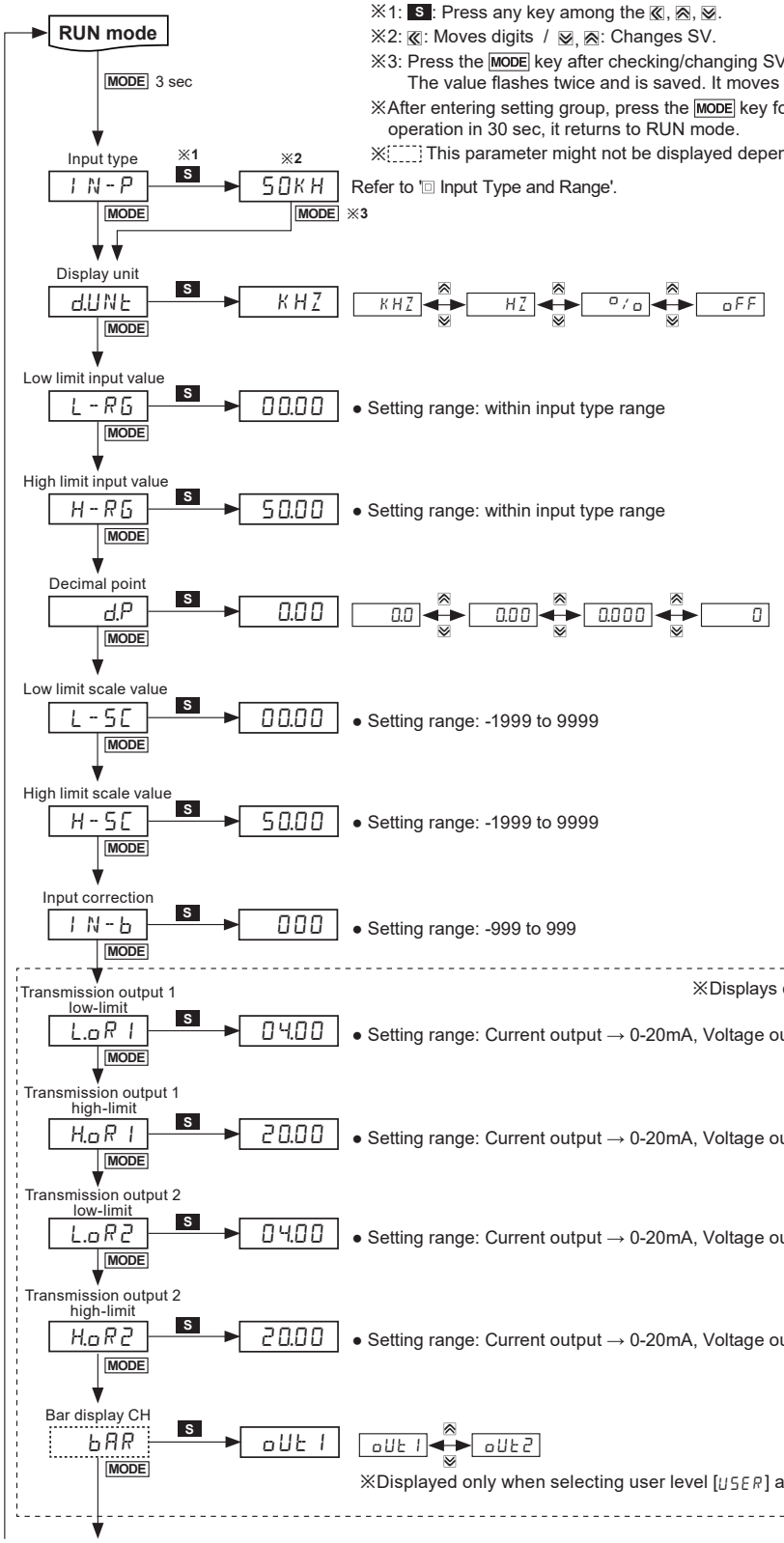
◎ CN-610□-□ (universal input)



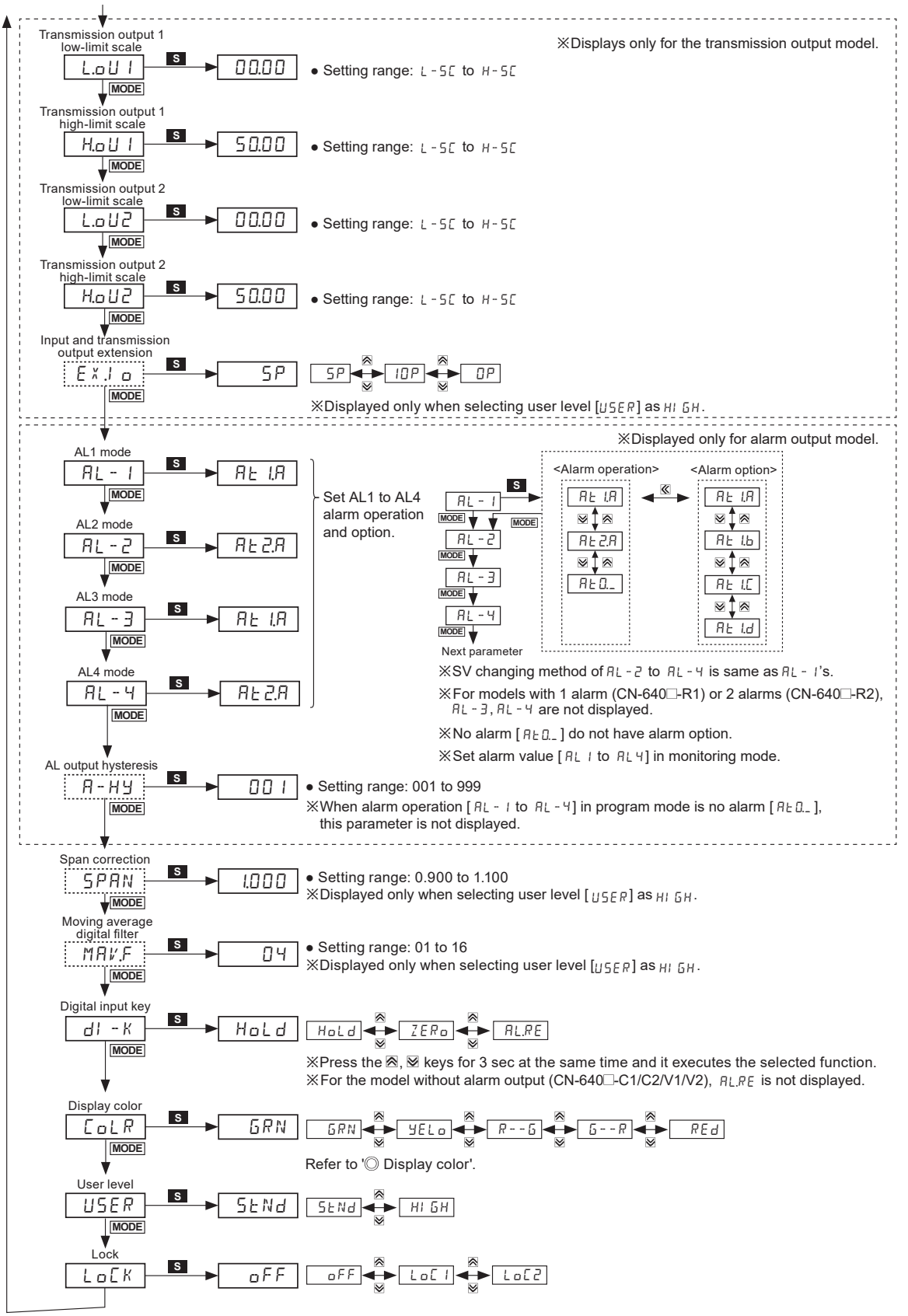

※Displays only for the transmission output model.
Bar display CH
bAR
S
MODE
oUt 1
oUt 1
oUt2
※Displayed only when selecting user level [USER] as HIGH.
Transmission output 1 low-limit scale
L.oU 1
000.0
● Setting range: Temperature sensor input → within temperature range,
Analog input → L-SC to H-SC
Transmission output 1 high-limit scale
H.oU 1
100.0
● Setting range: Temperature sensor input → within temperature range,
Analog input → L-SC to H-SC
Transmission output 2 low-limit scale
L.oU2
000.0
● Setting range: Temperature sensor input → within temperature range,
Analog input → L-SC to H-SC
Transmission output 2 high-limit scale
H.oU2
100.0
● Setting range: Temperature sensor input → within temperature range,
Analog input → L-SC to H-SC
Input and transmission output extension
EXIo
SP
※Displayed only for transmission output models with selecting analog input type.
SP
IOP
OP
※Displayed only when selecting user level [USER] as HIGH.
※Displayed only for alarm output model.
AL1 mode
AL-1
AL2 mode
AL-2
AL3 mode
AL-3
AL4 mode
AL-4
AL1 HA
AL2 HA
Set AL1 to AL4 alarm operation and option.
<Alarm operation>
<Alarm option>
AL-1
AL-2
AL-3
AL-4
AL1 HA
AL2 HA
SBR_
AL0_
AL1A
AL1b
AL1C
AL1d
Next parameter
※SV changing method of AL-2 to AL-4 is same as AL-1's.
※For models with 1 alarm (CN-610□-R1) or 2 alarms (CN-610□-R2), AL-3, AL-4 are not displayed.
※No alarm [AL0_], sensor break alarm [SBR_] do not have alarm option.
※Set alarm value [AL 1 to AL4] in monitoring mode.
AL output hysteresis
A-HY
001
● Setting range: 001 to 999
※When alarm operation[AL-1 to AL-4] in program mode is no alarm [AL0_] or sensor disconnection alarm [SBR_], this parameter is not displayed.
※Displayed only when selecting analog input type.
Input special function
INSF
LIN
LIN
Root
SQRR
tUF


Atmospheric pressure
0.PSI
S
MODE
08.00
※Displayed only when selecting analog input type.
● Setting range: L-RG to H-RG
※Displayed when setting input special function [INSF] as BUF.
Span correction
SPAN
1.000
● Setting range :0.900 to 1.100
※Displayed only when selecting user level [USER] as HIGH.
Normal average digital filter
AV.F
01
● Setting range: 01 to 16
※Displayed only when selecting user level [USER] as HIGH.
Moving average digital filter
MAV.F
04
● Setting range: 01 to 16
※Displayed only when selecting user level [USER] as HIGH.
Digital input key
di-K
HoLd
HoLd
ZERo
AL.RE
※Press ▲, ▼ keys for 3 sec at the same time and it executes the selected function.
※For the model without alarm output (CN-610□-C1/C2/V1/V2), AL.RE is not displayed.
Display color
CoLR
GRN
GRN
YELo
R--G
G--R
REd
Refer to '◎ Display color'.
Sensor break alarm output
bURN
oN
oN
oFF
※Displayed only when selecting temperature sensor input type.
User level
USER
StNd
StNd
HIGH
Lock
LoCK
oFF
oFF
LoC1
LoC2

◎ CN-640□-□ (pulse input)



※1: S: Press any key among the ≪, ⩓, ⩔.
※2: ≪: Moves digits / ⩔, ⩓: Changes SV.
※3: Press the MODE key after checking/changing SV in each parameter.
The value flashes twice and is saved. It moves to next parameter.
※After entering setting group, press the MODE key for 3 sec or there is no additional key operation in 30 sec, it returns to RUN mode.
※[ ]: This parameter might not be displayed depending on other parameter settings.


※Displays only for the transmission output model.
Transmission output 1 low-limit scale
L.oU1
00.00
● Setting range: L-SC to H-SC
Transmission output 1 high-limit scale
H.oU1
50.00
● Setting range: L-SC to H-SC
Transmission output 2 low-limit scale
L.oU2
00.00
● Setting range: L-SC to H-SC
Transmission output 2 high-limit scale
H.oU2
50.00
● Setting range: L-SC to H-SC
Input and transmission output extension
Ex.Io
SP
SP
IOP
OP
※Displayed only when selecting user level [USER] as HIGH.
※Displayed only for alarm output model.
AL1 mode
AL-1
AL2 mode
AL-2
AL3 mode
AL-3
AL4 mode
AL-4
AL1.A
AL2.A
Set AL1 to AL4 alarm operation and option.
<Alarm operation>
<Alarm option>
AL1.b
AL1.C
AL1.d
Next parameter
※SV changing method of AL-2 to AL-4 is same as AL-1's.
※For models with 1 alarm (CN-640□-R1) or 2 alarms (CN-640□-R2), AL-3, AL-4 are not displayed.
※No alarm [AL0_] do not have alarm option.
※Set alarm value [AL1 to AL4] in monitoring mode.
AL output hysteresis
A-HY
001
● Setting range: 001 to 999
※When alarm operation [AL-1 to AL-4] in program mode is no alarm [AL0_], this parameter is not displayed.
Span correction
SPAN
1.000
● Setting range: 0.900 to 1.100
※Displayed only when selecting user level [USER] as HIGH.
Moving average digital filter
MAV.F
04
● Setting range: 01 to 16
※Displayed only when selecting user level [USER] as HIGH.
Digital input key
dI-K
HoLd
HoLd
ZERo
AL.RE
※Press the ▲, ▼ keys for 3 sec at the same time and it executes the selected function.
※For the model without alarm output (CN-640□-C1/C2/V1/V2), AL.RE is not displayed.
Display color
CoLR
GRN
GRN
YELo
R--G
G--R
REd
Refer to '◎ Display color'.
User level
USER
StNd
StNd
HIGH
Lock
LoCK
oFF
oFF
LoC1
LoC2

▣ Factory Default

◎ CN-610□-□ (universal input)

● Monitoring mode

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
oUt1	----	AL1	100.0	AL3	100.0	H.PEK	----
oUt2	----	AL2	000.0	AL4	000.0	L.PEK	----

● Program mode

Parameter	Default	Parameter	Default		Parameter	Default	Parameter	Default
IN-P	A.MA2	L.oR1	04.00※1	00.00※2	ExJo	SP	SPAN	1.000
UNIt	°C	H.oR1	20.00※1	10.00※2	AL-1	At1.A	AV.F	01
d.UNt	°/o	L.oR2	04.00※1	00.00※2	AL-2	At2.A	MAV.F	04
L-RG	04.00	H.oR2	20.00※1	10.00※2	AL-3	At1.A	dI-K	HoLd
H-RG	20.00	bAR	oUt1		AL-4	At2.A	CoLR	GRN
d.P	0.0	L.oU1	000.0		A-HY	001	bURN	oN
L-SC	000.0	H.oU1	100.0		IN.SF	LIN	USER	StNd
H-SC	100.0	L.oU2	000.0		0.PSI	08.00	LoCK	oFF
IN-b	000	H.oU2	100.0					

※1: Displayed only for current transmission output, alarm output model (CN-610□-C1/C2/R1/R2/R4).
※2: Displayed only for voltage transmission output model (CN-610□-V1/V2).

◎ CN-640□-□ (pulse input)

● Monitoring mode

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
oUt1	----	AL1	000.0	AL3	100.0	H.PEK	----
oUt2	----	AL2	000.0	AL4	100.0	L.PEK	----

● Program mode

Parameter	Default	Parameter	Default		Parameter	Default	Parameter	Default
IN-P	50KH	L.oR1	04.00※1	00.00※2	H.oU2	50.00	MAV.F	04
d.UNt	KHZ	H.oR1	20.00※1	10.00※2	Exjo	SP	dI-K	HoLd
L-RG	00.00	L.oR2	04.00※1	00.00※2	AL-1	At1.A	CoLR	GRN
H-RG	50.00	H.oR2	20.00※1	10.00※2	AL-2	At1.A	USER	StNd
d.P	0.00	bAR	oUt1		AL-3	At1.A	LoCK	oFF
L-SC	00.00	L.oU1	00.00		AL-4	At1.A		
H-SC	50.00	H.oU1	50.00		A-HY	001		
IN-b	000	L.oU2	00.00		SPAN	1.000		

※1: Displayed only for current transmission output, alarm output model (CN-640□-C1/C2/R1/R2/R4).
※2: Displayed only for voltage transmission output model (CN-640□-V1/V2).

▣ Proper Usage

- Follow instructhions in 'Cautions during Use'.
  Otherwise, it may cause unexpected accidents.
- 24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④ installation Category II

Serial Communication Converters

SCM Series

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.
The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Major Features

[SCM-US: USB ↔ Serial]
- Both USB1.1 and USB 2.0 HOST controller compatible
- Data transmission / power supply indicating LED
- Easy to connect with PC
- Built-in protection circuit
- Ferrite core cable for noise reduction
- Non-isolation type

[SCM-38I: RS232C ↔ RS485]
- Built-in surge protection circuit
- The insulation type of signal line (insulating RS232C and RS485)
- Create Tx-Enable signal automatically

[SCM-US48I: USB ↔ RS485]
- Available to transmit signals to max. 1.2km by converting USB signal to RS485 signal
- Realizing electrical insulation (2500VRMS) between USB port and RS485 port through RS485 transceiver
- Improved stability and durability with built-in surge protection circuit
- Easy connections between devices with bus power supplied from USB host controller without external power supply
- Offering USB 2.0 A/B type cable with built-in ferrite core for noise reduction
- User friendly features through compatibility with USB 1.1 and USB 2.0

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g., nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)
Failure to follow this instruction may result in personal injury, fire or economic loss.
02. Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.
Failure to follow this instruction may result in explosion or fire.
03. Do not disassemble or modify the unit.
Failure to follow this instruction may result in fire.
04. Do not connect, repair, or inspect the unit while connected to a power source.
Failure to follow this instruction may result in fire.
05. Check 'Connections' before wiring.
Failure to follow this instruction may result in fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. Use the unit within the rated specifications.
Failure to follow this instruction may result in fire or product damage.
02. Use dry cloth to clean the unit, and do not use water or organic solvent.
Failure to follow this instruction may result in fire.
03. Keep metal chip, dust, and wire residue from flowing into the unit.
Failure to follow this instruction may result in fire or product damage.
04. Do not disconnect connector or power, when the product is operating.
Failure to follow this instruction may result in fire or malfunction.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- 12-24 VDC⎓ power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Use only designated connector and do not apply excessive power when connecting or disconnecting the connectors.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Do not connect or disconnect the USB cable, earphone jack, or RS485 cable quickly and repeatedly while communicating.
  It may cause damage or malfunction of the product and PC.
- After supplying power, connect with the communication output product. When disconnect, communication output product first and power last.
- When connecting multiple SCM units to a PC, number of COM port goes up in sequential order and it takes some time to identify and assign number of COM port.
- When connecting the RS485 communication output product, connect the terminating resistance (100 to 120Ω) at each end of the communication cable.
- Use twist pair wire for RS485 communication. If not, use A(+) and B(-) cables in the same length.
- Use USB cable of designated standard, and do not use extension cable.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000m
  - Pollution degree 2
  - Installation category I

Specifications

• There might be some differences depending on PC environment. (Supported OS: Microsoft Windows)

Model	SCM-US
Power supply	5 VDC⎓ USB bus power [01]
Power consumption	≈ 1 W
Max. com. speed [02]	1,200 to 115,200 bps (recommended: 9,600 bps)
Communication type	Half duplex type
Available com. distance	1.5 m (not extension)
Connection type	USB: USB 2.0 A type (male)
	Earphone jack (4 pole stereo phone plug)
Isolation type	Non-isolation
Indicator	A.C.C (green), O.P.R (red)
Approval	CE KC EAC
Weight (packaging)	≈41 g (≈80 g)

Model	SCM-38I	SCM-US48I
Power supply	12-24 VDC⎓ ±10%	5 VDC⎓ USB bus power [01]
Power consumption	≈ 1.7 W	≈ 1 W
Max. com. speed [02]	1,200 to 115,200 bps (recommended: 9,600 bps)	
Communication type	Half duplex type	
Available com. distance	≤ 1.2 km	USB: ≤ 1 m ± 30%, RS485: ≤ 1.2 km
Multi-drop	≤ 31 Multi-drop	
Protocol [02]	Data bit: 5bit, 6bit, 7bit, 8bit / Stop bit: 1bit, 2bit / Parity bit: None, Odd, Even	
Connection type	RS232C: D-sub 9-pin	USB: USB 2.0 B type (male)
	RS485: 4-wire screw terminal (2-wire communication type)	
Protection circuit	Surge protection circuit	
Isolation type	Isolation	
Dielectric strength	Between whole terminals and case: 2,000 VAC~ 50/60 Hz for 1 min Between RS232C and RS485: 2,500 VAC~ 50/60 Hz for 1 min	Between whole terminals and case: 2,500 VAC~ 50/60 Hz for 1 min Between RS232C and RS485: 2,500 VAC~ 50/60 Hz for 1 min
Isolation resistance	≥ 100 MΩ (500 VDC⎓ megger)	
Noise immunity	±500 VDC⎓ the square wave noise (pulse width: 1μs) by the noise simulator	
Indicator	RUN (red)	
Accessory	-	USB 2.0 AB type cable (length: 1 m, sold separately, model: USB AB CABLE)
Approval	CE KC EAC	
Weight (packaging)	≈46g (≈106 g)	≈34.5 g (≈197 g)

01) USB bus Power is supplied from PC or USB host controller.
02) They are set by Hyper terminal, DAQMaster, ParaSet, and Modbus Poll.

Vibration	0.75 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 1 hour
Vibration (malfunction)	0.5 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 10 min
Shock	300 m/s² (≈ 30 G) in each X, Y, Z direction for 3 times
Shock (malfunction)	100 m/s² (≈ 10 G) X, Y, Z in each X, Y, Z direction for 3 times
Ambient temperature	-10 to 55 °C, storage: -20 to 60 °C (a non freezing or condensation environment)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (a non freezing or condensation environment)

Cautions for Installation

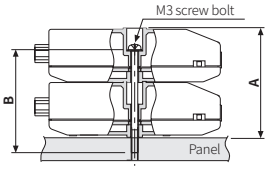
• See 'Dimensions.'
• When wiring the RS485 connector, use AWG 24 cable.
• Tighten the connector screw with a tightening torque of 0.22 to 0.4 N m with the screwdriver for M2 screw.

■ SCM-US

• Use only for our products that support SCM-US.

■ SCM-38I / SCM-US48I

• Multi-layer



A: 23N+0.5, B: 23N-3

N (number of layers)	A (height of layer)	B (length of screw)
1	23.5 mm	20 mm
2	46.5 mm	43 mm
3	69.5 mm	66 mm
4	92.5 mm	89 mm

• RS485

[Pin assignments]

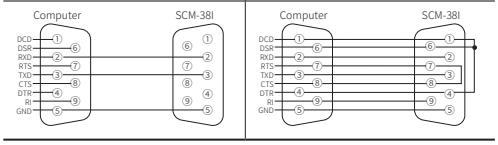
Pin	Function	
	SCM-38I	SCM-US48I
A	RS485 (+)	
B	RS485 (–)	
V	+V	–
G	Ground	–

[Terminating resistance selection switch]

RT	Using terminating resistance
OFF	Not using terminating resistance

• RS232C (SCM-38I)

Standard connection	Using Auto-loop Back



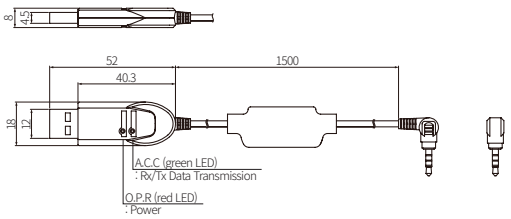
Driver Installation (SCM-US, SCM-US48I)

• Visit our webstie to download the driver.
• If the computer is connected to the Internet, your PC automatically searches for the driver and install it.
• After completing the USB driver installation, follow the steps of the Serial Port driver installer.
• Check the status of all drivers installed on your computer via Device Manager.

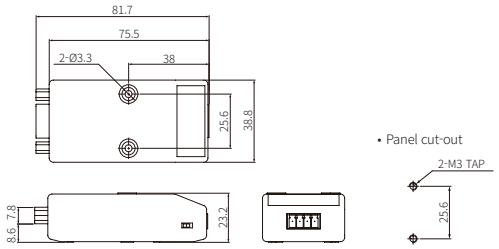
Dimensions

• Unit: mm, For the detailed dimensions of the product, follow the Autonics web site.

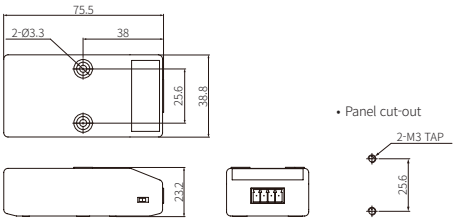
■ SCM-US



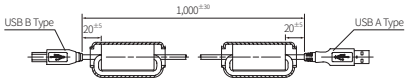
■ SCM-38I



■ SCM-US48I



• USB AB CABLE



18, Bansong-ro 513Beon-gil, Haeundae-gu, Busan, Republic of Korea, 48002
www.autonics.com | +82-51-519-3232 | sales@autonics.com

Wireless to Serial Communication Converters

SCM-WF48

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.
The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Major Features

- Converting USB or RS485 signal to Wi-Fi signal, and wireless communication up to max. 100 m
- Compact size (W 48×H 25.6×L 76.3 mm, except antenna)
- Built-in surge protection circuit, reverse polarity protection circuit
- Supports AP mode and station mode
- Various mounting methods (DIN rail, panel)

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

01. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g., nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
    Failure to follow this instruction may result in personal injury, fire or economic loss.
02. **Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
    Failure to follow this instruction may result in explosion or fire.
03. **Do not disassemble or modify the unit.**
    Failure to follow this instruction may result in fire.
04. **Do not connect, repair, or inspect the unit while connected to a power source.**
    Failure to follow this instruction may result in fire.
05. **Check 'Connections' before wiring.**
    Failure to follow this instruction may result in fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. **Use the unit within the rated specifications.**
    Failure to follow this instruction may result in fire or product damage.
02. **Use dry cloth to clean the unit, and do not use water or organic solvent.**
    Failure to follow this instruction may result in fire.
03. **Keep metal chip, dust, and wire residue from flowing into the unit.**
    Failure to follow this instruction may result in fire or product damage.
04. **Do not disconnect connector or power, when the product is operating.**
    Failure to follow this instruction may result in fire or malfunction.

Cautions during Use

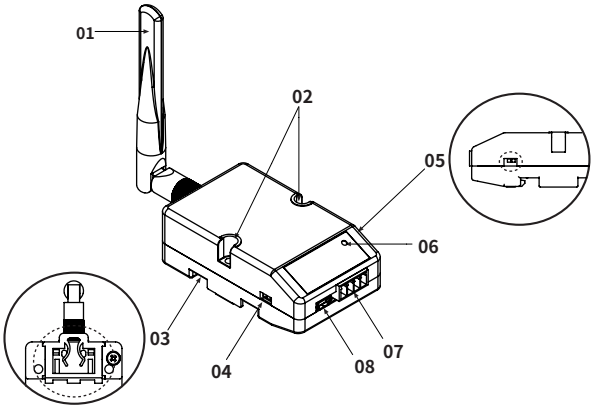
- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- 24 VDC⎓ power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Use only designated connector and do not apply excessive power when connecting or disconnecting the connectors.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Do not connect or disconnect the USB cable and RS485 cable quickly and repeatedly while communicating.
  It may cause damage or malfunction of the product and PC.
- After supplying power, connect with the communication output product. When disconnect, communication output product first and power last.
- When connecting multiple SCM-WF48 units to a PC, number of COM port goes up in sequential order and it takes some time to identify and assign number of COM port.
- When connecting the RS485 communication output product, connect the terminating resistance (120Ω, 1% (F) grade chip resistance, 1/4W) at each end of the communication cable.
- Use twist pair wire for RS485 communication. If not, use A(+) and B(-) cables in the same length.
- Use USB cable of designated standard, and do not use extension cable.

- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000m
  - Pollution degree 2
  - Installation category I

Cautions for Installation

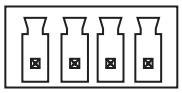
- When wiring the RS485 connector, use AWG 24 cable.
- Tighten the connector screw with a tightening torque of 0.22 to 0.4 N m with the screwdriver for M2 screw.
- Do not apply excessive pressure to the WiFi antenna. It may cause product damage.

Part Descriptions



01. WiFi antenna
02. Fixing screw hole
03. Rail Lock
04. Communication method switch (USB ↔ RS485)
05. Terminating resistance switch (RT ↔ OFF)
06. Indicator for modes
07. RS485 connector
08. USB connector

RS485 Connector



Pin	Function
A	RS485 (+)
B	RS485 (–)
V	+V
G	Ground

Installation

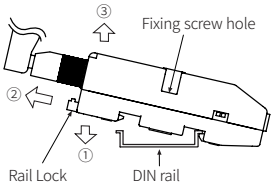
■ DIN rail mounting and removal

• Mounting

1. Hang up the backside holder on a DIN rail.
2. Press the unit toward ① direction until it snaps.

• Removing

1. Pull rail locks of the backside of the unit to ② direction.
2. Pull the unit to ③ direction.



■ Mounting to panel

- This unit is able to mount on a panel with two fixing screws at center of both sides.
- Use M3 screws with a tightening torque of 0.4 N m.

■ USB driver installation

- Visit our website to download the driver.
- If the computer is connected to the Internet, your PC automatically searches for the driver and install it.
- Check the status of the driver installed on your computer via Device Manager.

DAQMaster

- DAQMaster is the comprehensive device management program for Autonics' products, providing parameter setting, monitoring and data management.
- Visit our website to download the DAQMaster installer and user manual.

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operating system	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB or more
Hard disk	More than 1GB of free hard disk space
VGA	1024×768 higher resolution display
Others	RS232 serial port (9-pin), USB port

How to use DAQMaster

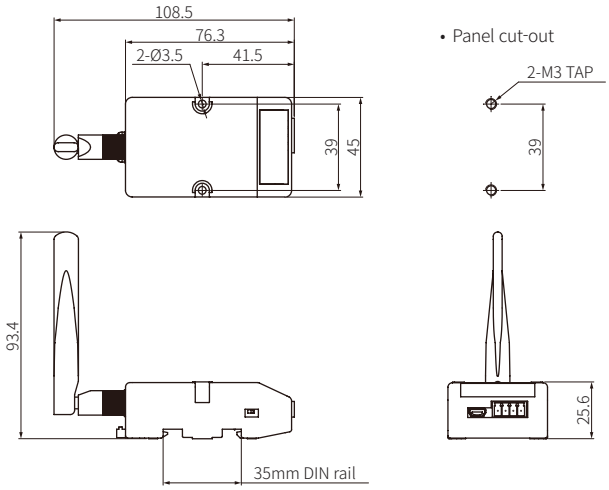
01. Select USB via Communication method switch.
02. Connect your PC and SCM-WF48 with the enclosed USB.
03. Proceed device connection and communication mode via DAQMaster.
For detailed setting method, see the "DAQMaster User Manual."
04. Select RS485 via Communication method switch to connect with other units.
Select RT via Terminating resistance switch to use terminating resistance.

Indicator for Modes

Mode	Indicator	State
AP mode	Green ON	Power ON / AP ready
	Red ON	Station or device connection is complete
	OFF	No power
Station mode	Green ON	Power ON
	Red ON	AP connection is complete
	OFF	No power

Dimensions

- Unit: mm, For the detailed dimensions for the product, follow the Autonics web site.



Specifications

Model name	SCM-WF48
Power supply	24 VDC⎓
Allowable voltage range	12 - 28 VDC⎓
Power consumption	≈ 3 W
Communication type	RS485, USB, WiFi
Isolation resistance	≥ 200 MΩ (at 500 VDC⎓ megger between external terminal and case)
Protection circuit	Reverse polarity protection circuit, surge protection circuit
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min (between external terminal and case)
Noise immunity	± 500 VDC⎓ the square wave noise (pulse width: 1μs) by the noise simulator
Vibration	1.5 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s² (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient temperature	-10 to 55 °C, storage: -20 to 60 °C (a non freezing or condensation environment)
Ambient humidity	35 to 80 %RH, storage: 35 to 80 %RH (a non freezing or condensation environment)
Protection structure	IP20 (IEC standards)
Mounting	DIN rail or panel mounting
Accessories	USB 2.0 Mini B type cable (length: 1 m): 1, Connector for RS485 (4-pin, male type): 1
Indicator	Indicates state of mode
Approval	CE KC EAC
Weight (packaging)	≈ 57 g (≈ 160 g)

Communication	WiFi
Standard	802.11b/g/n (IEEE 802.11b) compatible
Communication speed	≤ 11 Mbps
Communication distance	≤ 100 m
Protocol	TCP/IP (IPv4)
Frequency range	2.4 to 2.497 GHz
Security	WEP, WPA, WPA2-PSK, Enterprise
Antenna	2dBi external antenna

Communication	RS485
Standard	EIA RS485
communication speed 01)	4800, 9600, 19200, 38400, 57600, 115200bps (default: 9600bps)
communication method	2-wire half duplex
Synchronous method	Asynchronous
Communication distance	≤ 800 m
Multi-drop	≤ 31 Multi-drop
Protocol 01)	Data bit: 5bit, 6bit, 7bit, 8bit (default: 8bit) Stop bit: 1bit, 2bit (default: 1bit) Parity bit: None, Even, Odd (default: None)
Connection type	4-wire screw terminal (2-wire communication method)

01) You can set via DAQMaster.

Communication	USB
Power	5 VDC⎓, 500mA
Standard	USB 2.0 (compatible sub-transmission)
Communication method	2-wire half duplex
Communication distance	≤ 1 m ± 30%
Connection type	USB 2.0 Mini B type (male)

LCD Display PID Control Temperature Controller

▣ Features

- Super high-speed sampling with 50ms
- Improved visibility with LCD display
- Communication function supported: RS485 (Modbus RTU)
- Convenient parameter setting
  (USB or RS485 communication)
  : Free download the comprehensive device management program (DAQMaster)
- SSR drive output / Current output selectable
- SSRP output (standard/phase/cycle control selectable
- Mounting space saving with compact design
  : downsized by approx. 30% in depth compared with same size of other Series (panel back length: 60mm)

Please read "Safety Considerations" in the instruction manual before using.

▣ Manual

For the detail information and instructions of communication setting and Modbus mapping table, please refer to the user manual for communication, and be sure to follow cautions written in the technical descriptions (catalog, website).
Visit our website (www.autonics.com) to download manuals.

▣ Comprehensive Device Management Program (DAQMaster)

- DAQMaster is comprehensive device management program. It is available for parameter setting, monitoring.
- Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operating system	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB or more
Hard disk	More than 1GB of free hard disk space
VGA	1024×768 or higher resolution display
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >

▣ Ordering Information

TX	4	S	–	1	4	R

Control output

R	Relay output
S	SSR drive output
C	Selectable current output or SSR drive output

Power supply

4	100-240VAC 50/60Hz

Option output

1	Alarm output 1
2	Alarm output 1+Alarm output 2
A	Alarm output 1+Alarm output 2+Trans. output
B	Alarm output 1+Alarm output 2+RS485 com. output

Size

S	DIN W48×H48mm
M	DIN W72×H72mm
H	DIN W48×H96mm
L	DIN W96×H96mm

Digit

4	9999 (4-digit)

Item

TX	LCD display standard PID temperature controller

▣ Specifications

Series		TX4S	TX4M	TX4H	TX4L
Power supply		100-240VAC～ 50/60Hz			
Allowable voltage range		90 to 110% of rated voltage			
Power consumption		Max. 8VA			
Display method		11-segment (PV: white, SV: green), other display (yellow) with LCD method※1			
Character size	PV(W×H)	7.2×14mm	10.7×17.3mm	7.2×15.8mm	16×26.8mm
	SV(W×H)	3.9×7.6mm	6.8×11mm	6.2×13.7mm	10.7×17.8mm
Input type	RTD	DPt100Ω, Cu50Ω (permissible line resistance max. 5Ω)			
	TC	K(CA), J(IC), L(IC), T(CC), R(PR), S(PR)			
Display accuracy※2	RTD	●At room temperature (23℃±5℃): (PV ±0.3% or ±1℃, select the higher one) ±1-digit ●Out of room temperature: (PV ±0.5% or ±2℃, select the higher one) ±1-digit			
	TC				
Control output	Relay	250VAC～ 3A, 30VDC⎓ 3A, 1a			
	SSR	Max. 12VDC⎓ ±2V 20mA	Max. 13VDC⎓ ± 3V 20mA		
	Current	DC4-20mA or DC0-20mA (load resistance max. 500Ω)			
Option output	Alarm output	AL1, AL2 Relay: 250VAC～ 3A 1a			
	Trans. output	DC4-20mA (load resistance max. 500Ω, output accuracy: ±0.3%F.S.)			
	Com. output	RS485 Communication output (Modbus RTU method)			
Control method		ON/OFF control, P, PI, PD, PID control			
Hysteresis		1 to 100℃/℉ (0.1 to 50.0℃/℉) variable			
Proportional band(P)		0.1 to 999.9℃/℉			
Integral time(I)		0 to 9999 sec			
Derivative time(D)		0 to 9999 sec			
Control period(T)		0.5 to 120.0 sec			
Manual reset		0.0 to 100.0%			
Sampling period		50ms			
Dielectric strength		3,000VAC 50/60Hz for 1 min (between all terminals and case)			
Vibration		0.75mm amplitude at frequency 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours			
Relay life cycle	Mechanical	OUT, AL1/2: min. 5,000,000 operations			
	Electrical	OUT, AL1/2: min. 200,000 (250VAC 3A resistance load)			
Insulation resistance		Over 100MΩ (at 500VDC megger)			
Noise immunity		Square shaped noise by noise simulator (pulse width 1μs) ±2kV R-phase, S-phase			
Memory retention		Approx. 10 years (non-volatile semiconductor memory type)			
Environment	Ambient temp.	-10 to 50℃, storage: -20 to 60℃			
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH			
Protection structure		IP50 (front panel, IEC standards)			
Insulation type		Double insulation or reinforced insulation (mark: ⧈, dielectric strength between primary circuit and secondary circuit: 3kV)			
Approval		CE c UL us KC			
Weight※3		Approx. 146.1g (approx. 86.7g)	Approx. 233g (approx. 143g)	Approx. 214g (approx. 133g)	Approx. 290g (approx. 206g)

※1: When using the unit at low temperature (below 0℃), display cycle is slow.
Control output operates normally.

※2: ◎ At room temperature(23℃±5℃)
- TC R(PR), S(PR), below 200℃: (PV ±0.5% or ±3℃, select the higher one) ±1-digit
  , over 200℃: (PV ±0.5% or ±2℃, select the higher one) ±1-digit
- TC L(IC), RTD Cu50Ω: (PV ±0.5% or ±2℃, select the higher one) ±1-digit

◎ Out of room temperature range
- TC R(PR), S(PR): (PV ±1.0% or ±5℃, select the higher one) ±1-digit
- TC L(IC), RTD Cu50Ω: (PV ±0.5% or ±3℃, select the higher one) ±1-digit

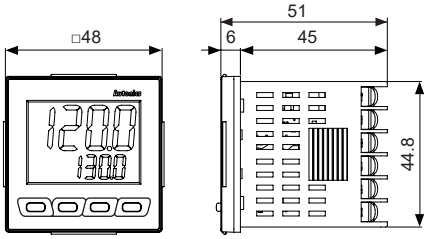
※3: The weight includes packaging. The weight in parenthesis is for unit only.

※Environment resistance is rated at no freezing or condensation.

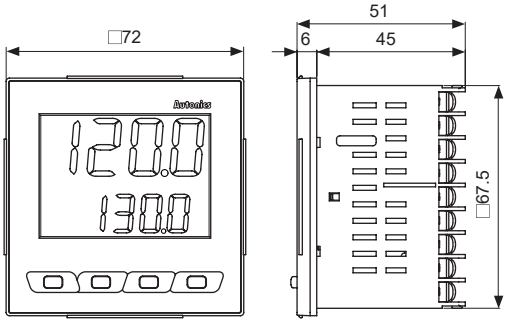
▣ Dimensions

(unit: mm)

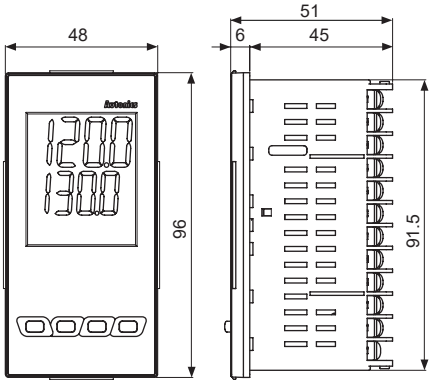
● TX4S



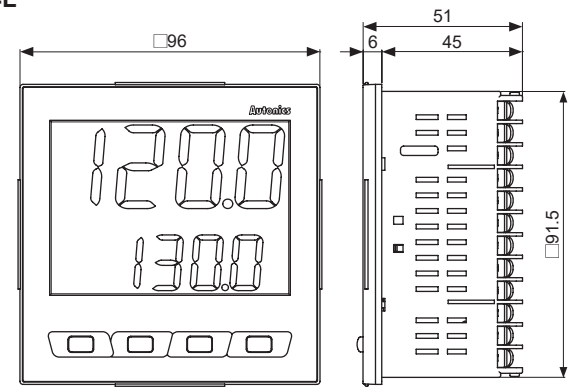
● TX4M



● TX4H

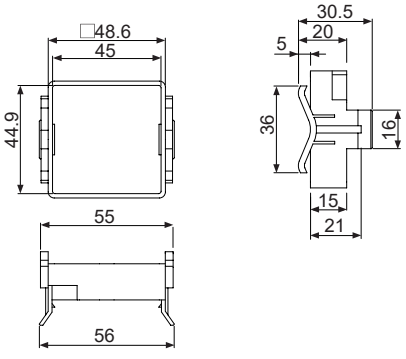


● TX4L

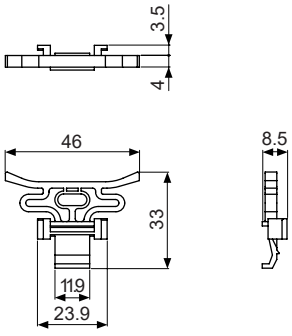


● Bracket

・ TX4S Series

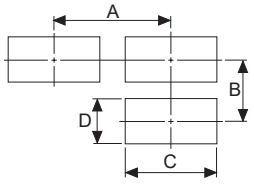


・ TX4M/H/L Series



● Panel cut-out

(unit: mm)

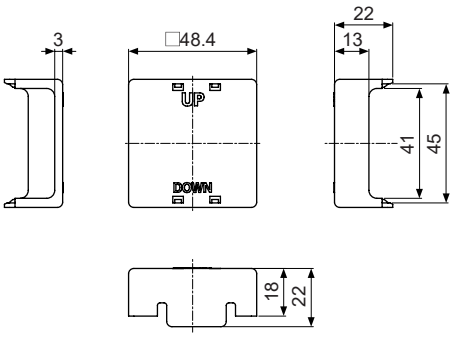


Model \ Size	A	B	C	D
TX4S	Min. 65	Min. 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
TX4M	Min. 90	Min. 90	$68^{+0.7}_{0}$	$68^{+0.7}_{0}$
TX4H	Min. 115	Min. 65	$45^{+0.6}_{0}$	$92^{+0.8}_{0}$
TX4L	Min. 115	Min. 115	$92^{+0.8}_{0}$	$92^{+0.8}_{0}$

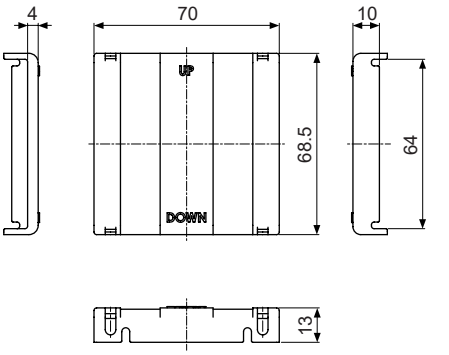
● Terminal cover (sold separately)

(unit: mm)

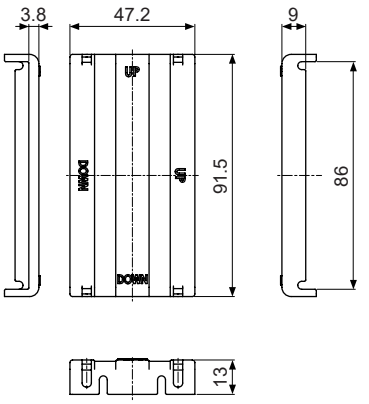
・RSA-COVER(48×48mm)



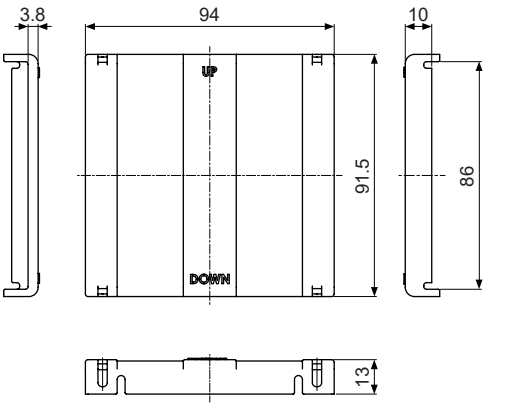
・RMA-COVER(72×72mm)



・RHA-COVER(48×96mm)

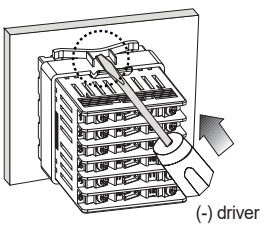


・RLA-COVER(96×96mm)

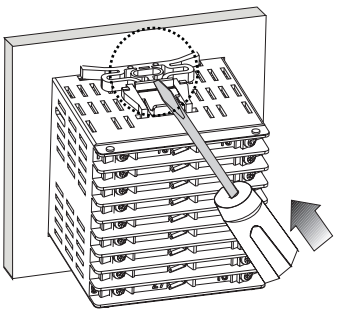


▣ Product Mounting

● TX4S(48×48mm) series



● Other series



※Mount the unit on the panel. Push the bracket with tools to fix the unit as the figure.

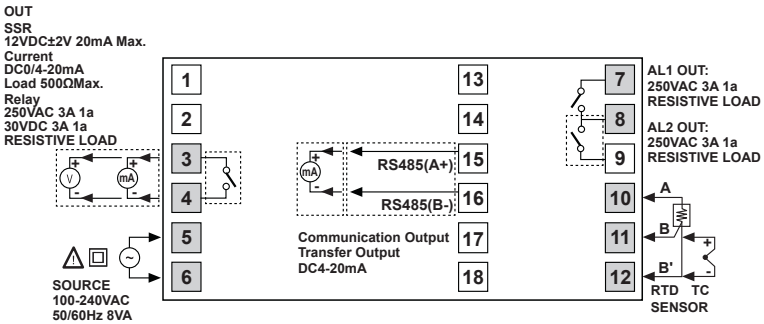
▣ Connections

※Shaded terminals are standard model.

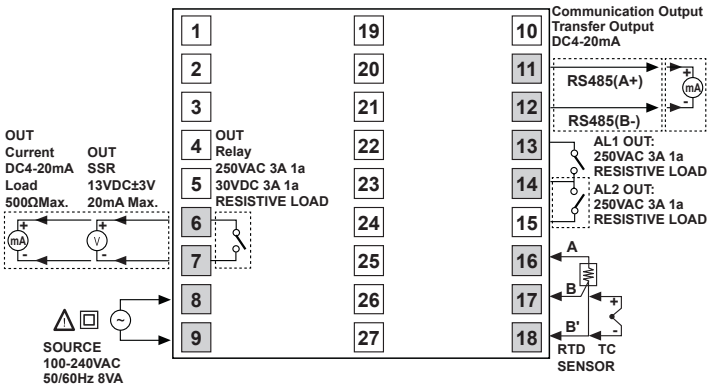
※Use teminals of size specified below.

	<Round>	<Forked>
a	Min. 3.0mm	Min. 3.0mm
b	Max. 5.8mm	Max. 5.8mm

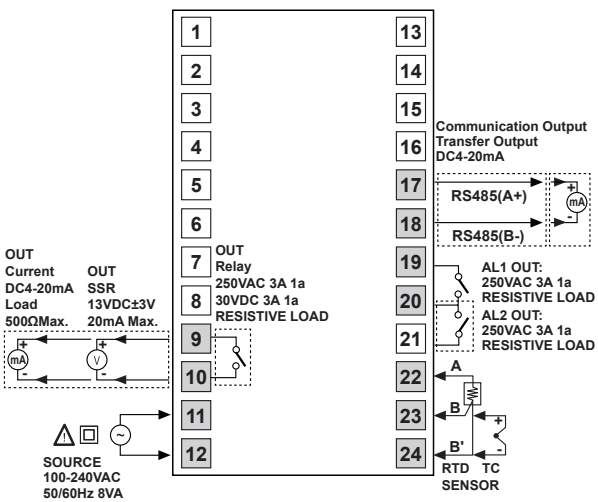
● TX4S series



● TX4M series



● TX4H, L series



▣ Sold Separately

◎ Communication converter

- **SCM-WF48**
  (Wi-Fi to RS485·USB wireless communication converter)

- **SCM-US48I**
  (USB to RS485 converter)

- **SCM-38I**
  (RS232C to RS485 converter)

- **SCM-US**
  (USB to Serial converter)

- **EXT-US**
  (converter cable)

◎ Display units (DS/DA-T Series)

- **DS/DA-T Series**
  (RS485 communication input type display unit)

DS16-□T

DS22/DA22-□T

DS40/DA40-□T

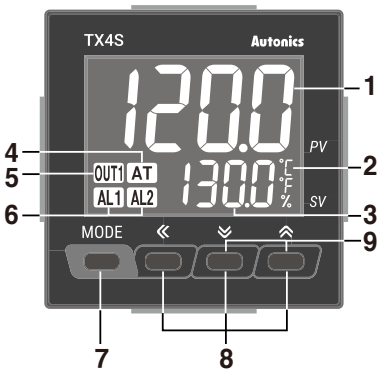
DS60/DA60-□T

※Connect RS485 communication input type display unit (DS/DA-T Series) and RS485 communication output model of TX Series, the display unit displays present value of the device without PC/PLC.

▣ Input Type and Range

Input type		Decimal point	Display	Input range(℃)	Input range(℉)
Thermocouple	K(CA)	1	K CA.H	-50 to 1200	-58 to 2192
		0.1	K CA.L	-50.0 to 999.9	-58.0 to 999.9
	J(IC)	1	J IC.H	-30 to 800	-22 to 1472
		0.1	J IC.L	-30.0 to 800.0	-22.0 to 999.9
	L(IC)	1	L IC.H	-40 to 800	-40 to 1472
		0.1	L IC.L	-40.0 to 800.0	-40.0 to 999.9
	T(CC)	1	t CC.H	-50 to 400	-58 to 752
		0.1	t CC.L	-50.0 to 400.0	-58.0 to 752.0
	R(PR)	1	RPR	0 to 1700	32 to 3092
	S(PR)	1	SPR	0 to 1700	32 to 3092
RTD	DPt 100Ω	1	dPt.H	-100 to 400	-148 to 752
		0.1	dPt.L	-100.0 to 400.0	-148.0 to 752.0
	Cu50Ω	1	CUS.H	-50 to 200	-58 to 392
		0.1	CUS.L	-50.0 to 200.0	-58.0 to 392.0

▣ Unit Description



1. Measured value (PV) component:
RUN mode: Displays current measured value (PV).
SETTING mode: Displays parameters.

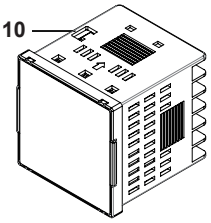
2. Temperature unit(℃/℉) indicator:
Displays the set temperature unit as temperature unit [UNIT] of parameter group 2.

3. Setting value (SV) display component:
RUN mode: Displays setting value(SV).
SETTING mode: Displays setting value of parameter.

4. Auto-tuning indicator:
Flashes during auto-tuning every 1 sec.

5. Control output (OUT1) indicator:
Turns ON while control output is ON.
※Turns ON when MV is over 3.0% at cycle/phase control of SSR drive output method.

6. Alarm output (AL1, AL2) indicator:
Turns ON when the corresponding alarm output turns ON.



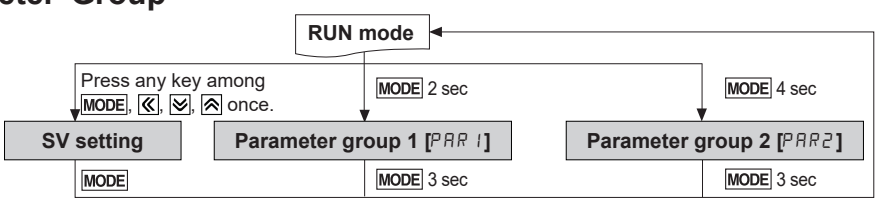
7. MODE key: Enters parameter group, returns to RUN mode, moves parameters, and saves the setting value.

8. Setting value adjustment key: Enters SV setting mode and move digits.

9. Digital input key:
Press the ▼+▲ keys for 3 sec to execute the digital input key functions which is set at digital input key [DI-K]of parameter group 2 (RUN/STOP, clear alarm output, auto-tuning).

10. PC loader port:
It is for serial communication to set parameter by DAQMaster installed in PC. Use this for connection EXT-US (converter cable, sold separately) + SCM-US (USB to Serial converter, sold separately).

▣ Parameter Group



※Order of parameter setup **Parameter group 2** → **Parameter group 1** → **SV setting**

●All parameters are related one another. Set the parameters as above order.

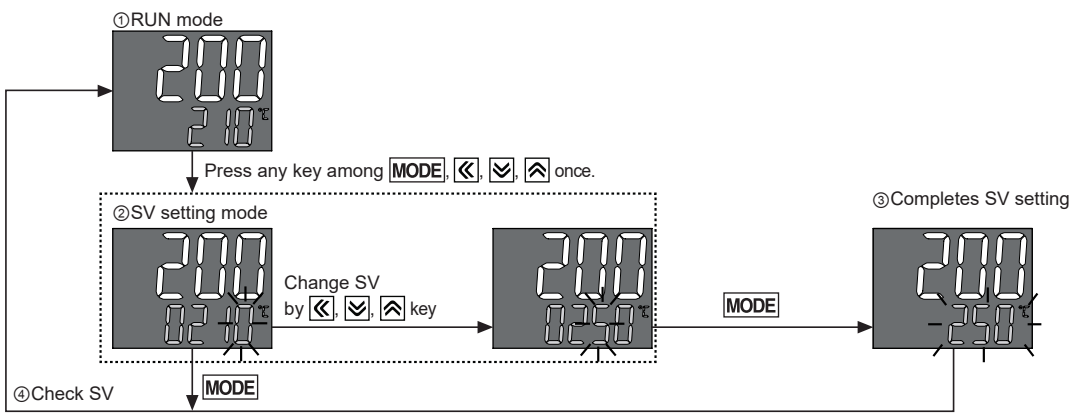
※If there is no key input for 30 sec while setting SV or the parameters, the new settings are ignored, and the unit will return to RUN mode with previous settings.

※When returning to RUN mode by holding the MODE key for over 3 sec, press the MODE key within 1 sec to re-enter the first parameter of previous parameter group.

※Hold the ≪+▼+▲ keys for 5 sec in RUN mode, to enter re-set parameter menu. Select 'YES' and all parameters are reset as factory default.

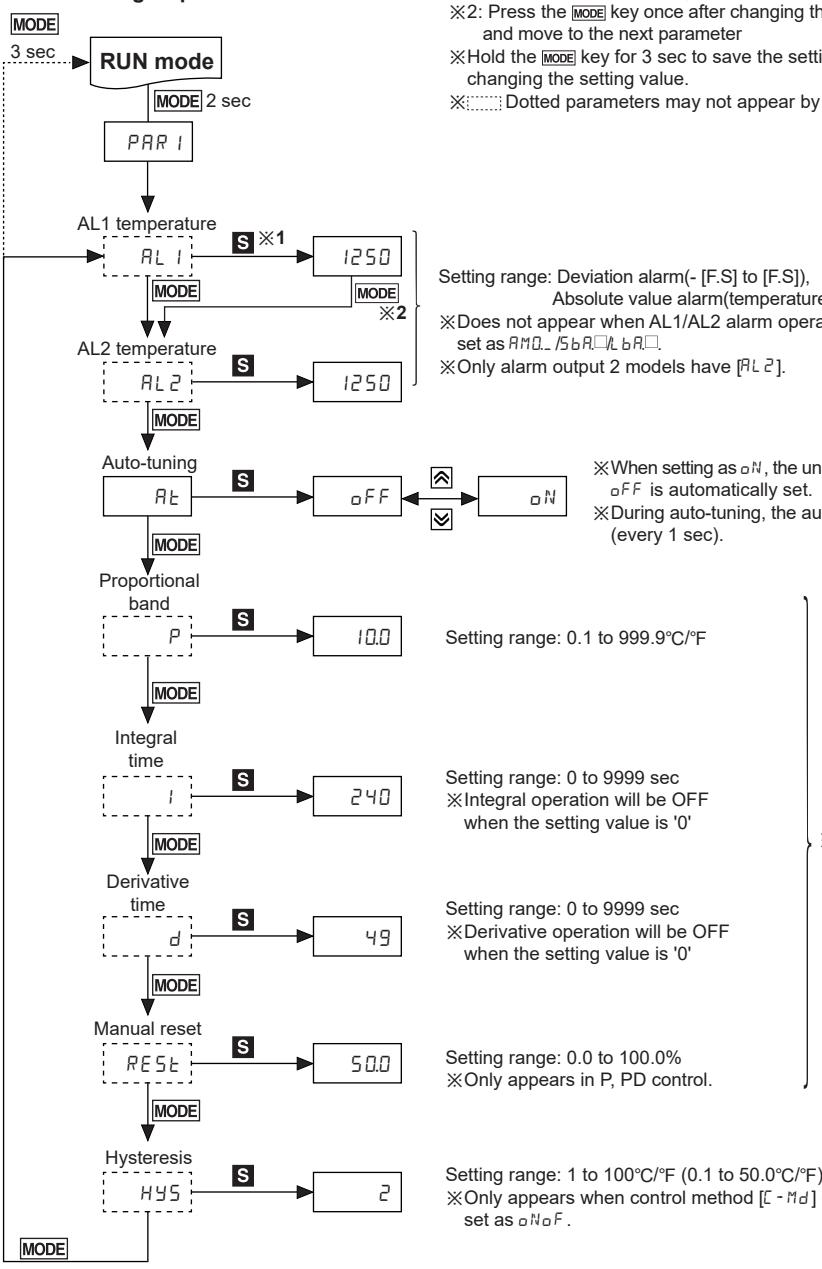
● SV setting

※To change set temperature from 210℃ to 250℃



※If there is no key input for 3 sec while setting SV, the new setting is applied and the unit will return to RUN mode.

● **Parameter group 1**



※1: S: Press any key among ≪, ≫, ≪.
※2: Press the MODE key once after changing the setting value, to save the setting value and move to the next parameter
※Hold the MODE key for 3 sec to save the setting value and return to RUN mode after changing the setting value.
※: Dotted parameters may not appear by model type or other parameter settings.

Setting range: Deviation alarm(- [F.S] to [F.S]),
Absolute value alarm(temperature range)
※Does not appear when AL1/AL2 alarm operation [AL-1, AL-2] of parameter group 2 is set as AMO_/SbA□/LbA□.
※Only alarm output 2 models have [AL2].

※When setting as oN, the unit starts auto-tuning. After completing, oFF is automatically set.
※During auto-tuning, the auto-tuning indicator flashes (every 1 sec).

Setting range: 0.1 to 999.9℃/℉

Setting range: 0 to 9999 sec
※Integral operation will be OFF when the setting value is '0'

Setting range: 0 to 9999 sec
※Derivative operation will be OFF when the setting value is '0'

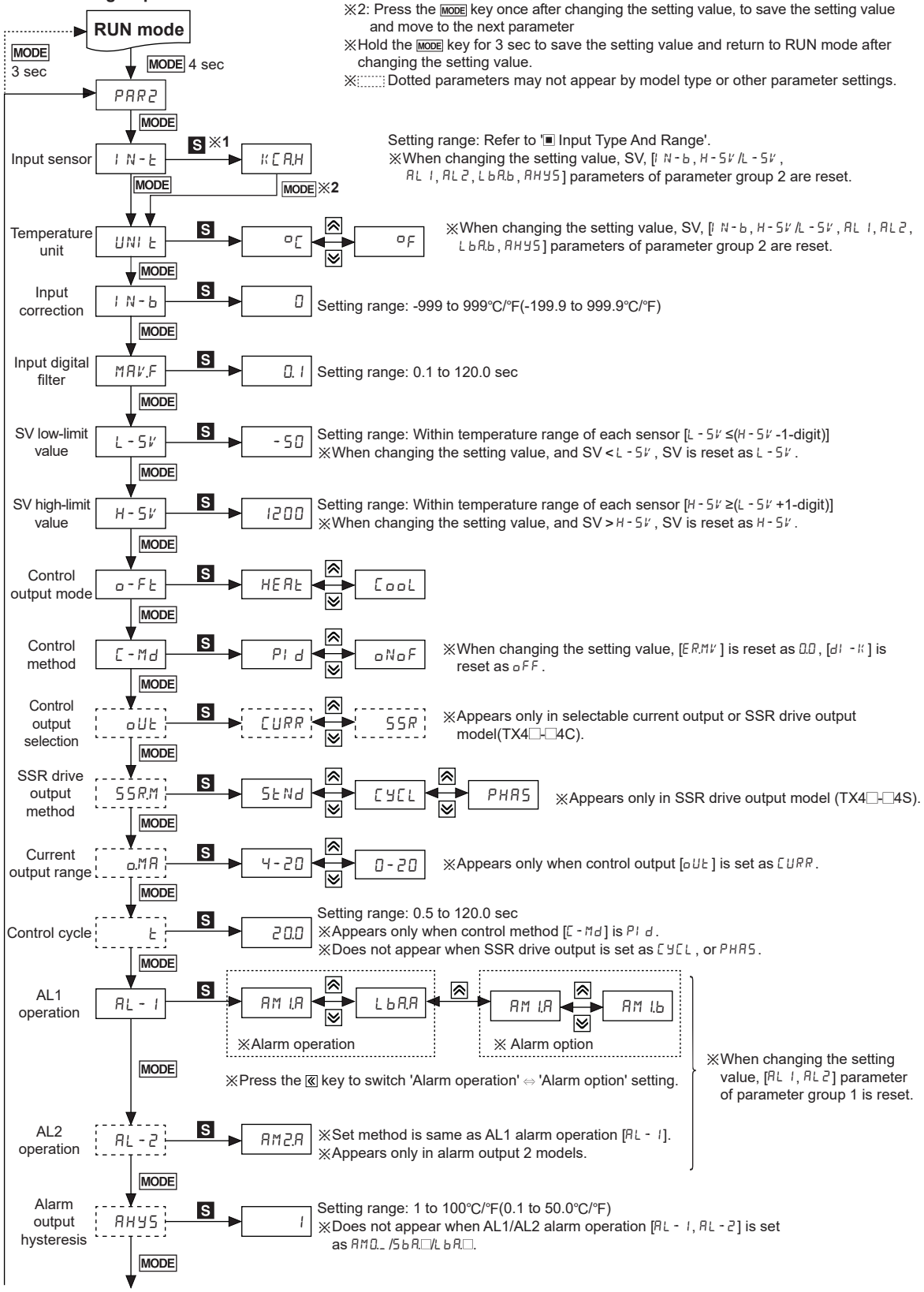
Setting range: 0.0 to 100.0%
※Only appears in P, PD control.

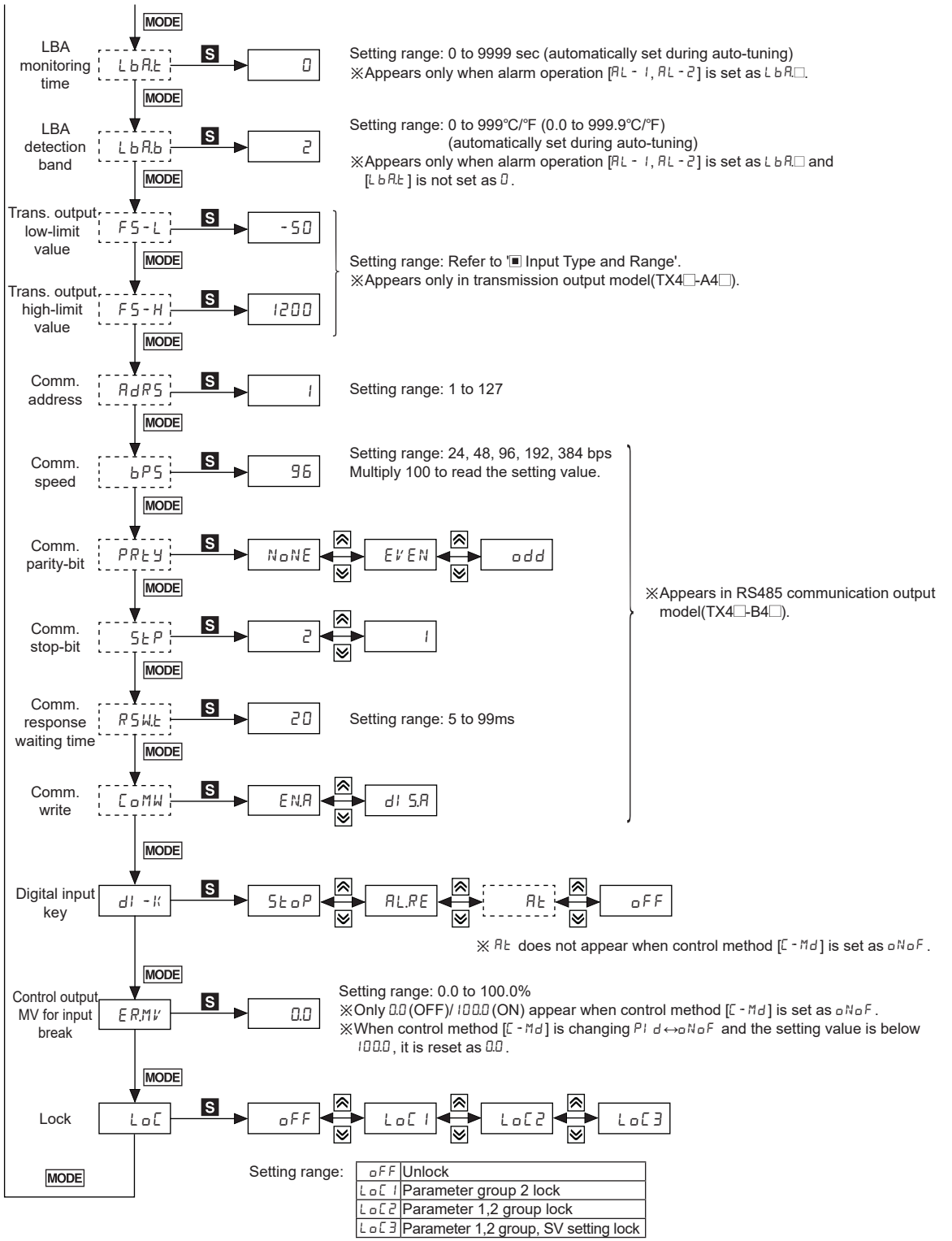
※Only appears when control method [C-Md] of parameter group 2 is set as PId.

Setting range: 1 to 100℃/℉ (0.1 to 50.0℃/℉)
※Only appears when control method [C-Md] of parameter group 2 is set as oNoF.

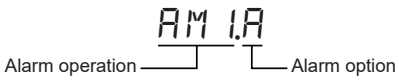
● Parameter group 2

※1: S: Press any key among ≪, ≫, ≫.
※2: Press the MODE key once after changing the setting value, to save the setting value and move to the next parameter
※Hold the MODE key for 3 sec to save the setting value and return to RUN mode after changing the setting value.
※ Dotted parameters may not appear by model type or other parameter settings.



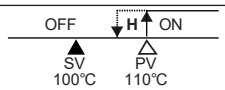
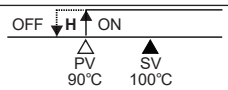
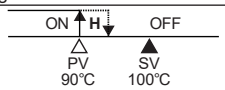
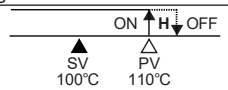
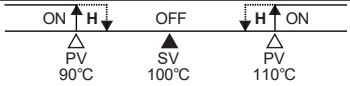
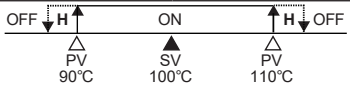
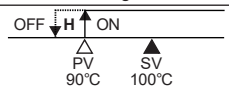
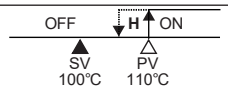
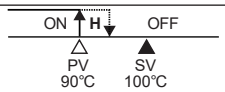
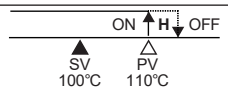

MODE
LBA monitoring time
LbA.t
S
0
Setting range: 0 to 9999 sec (automatically set during auto-tuning)
※Appears only when alarm operation [AL - 1, AL - 2] is set as LbA.□.
LBA detection band
LbA.b
2
Setting range: 0 to 999℃/℉ (0.0 to 999.9℃/℉)
(automatically set during auto-tuning)
※Appears only when alarm operation [AL - 1, AL - 2] is set as LbA.□ and [LbA.t] is not set as 0.
Trans. output low-limit value
FS-L
-50
Trans. output high-limit value
FS-H
1200
Setting range: Refer to '▣ Input Type and Range'.
※Appears only in transmission output model(TX4□-A4□).
Comm. address
AdRS
1
Setting range: 1 to 127
Comm. speed
bPS
96
Setting range: 24, 48, 96, 192, 384 bps
Multiply 100 to read the setting value.
Comm. parity-bit
PRtY
NONE
EVEN
odd
Comm. stop-bit
StP
2
1
※Appears in RS485 communication output model(TX4□-B4□).
Comm. response waiting time
RSWt
20
Setting range: 5 to 99ms
Comm. write
ComW
ENA
diSA
Digital input key
di-K
StoP
AL.RE
At
oFF
※ At does not appear when control method [C - Md] is set as oNoF.
Control output MV for input break
ER.MV
0.0
Setting range: 0.0 to 100.0%
※Only 0.0 (OFF)/ 100.0 (ON) appear when control method [C - Md] is set as oNoF.
※When control method [C - Md] is changing PId↔oNoF and the setting value is below 100.0, it is reset as 0.0.
Lock
LoC
oFF
LoC1
LoC2
LoC3
Setting range:
oFF Unlock
LoC1 Parameter group 2 lock
LoC2 Parameter 1,2 group lock
LoC3 Parameter 1,2 group, SV setting lock

▣ Alarm



Set both alarm operation and alarm option by combining.
Each alarm operates individually in two alarm output models.
When the current temperature is out of alarm range, alarm clears automatically. If alarm option is alarm latch or alarm latch and standby sequence 1/2, press digital input key(▽+△ 3 sec, digital input key [dI -K] of parameter group 2 set as AL.RE), or turn OFF the power and turn ON to clear alarm.

◎ Alarm operation

Mode	Name	Alarm operation		Description
AM0_	—	—		No alarm output
AM 1□	Deviation high-limit alarm	 High-limit deviation: Set as 10℃	 High-limit deviation: Set as -10℃	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
AM2□	Deviation low-limit alarm	 Low-limit deviation: Set as 10℃	 Low-limit deviation: Set as -10℃	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AM3□	Deviation high/low-limit alarm	 High, Low-limit deviation: Set as 10℃		If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AM4□	Deviation high/low-limit reserve alarm	 High, Low-limit deviation: Set as 10℃		If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF.
AM5□	Absolute value high limit alarm	 Alarm absolute-value: Set as 90℃	 Alarm absolute-value: Set as 110℃	If PV is higher than the absolute value, the output will be ON.
AM6□	Absolute value low limit alarm	 Alarm absolute-value: Set as 90℃	 Alarm absolute-value: Set as 110℃	If PV is lower than the absolute value, the output will be ON.
Sbr□	Sensor break alarm	—		It will be ON when it detects sensor disconnection.
LbR□	Loop break alarm	—		It will be ON when it detects loop break.

※ H: Alarm output hysteresis [AHYS]

◎ Alarm option

Option	Name	Description
AM□.A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AM□.b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status. (Alarm output HOLD)
AM□.C	Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.
AM□.d	Alarm latch and standby sequence 1	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.
AM□.E	Standby sequence 2	First alarm condition is ignored and from second alarm condition, standard alarm operates. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, standard alarm operates.
AM□.F	Alarm latch and standby sequence 2	Basic operation is same as alarm latch and standby sequence 1. It operates not only by power ON/OFF, but also alarm setting value, or alarm option changing. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates.

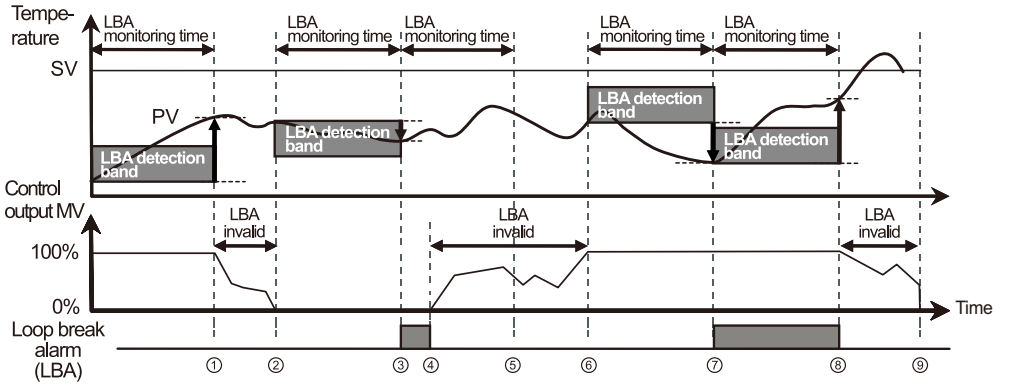
※Condition of re-applied standby sequence for standby sequence 1, alarm latch and standby sequence 1: Power ON
Condition of re-applied standby sequence for standby sequence 2, alarm latch and standby sequence 2: Power ON, changing set temperature, alarm temperature [AL 1, AL2] or alarm operation [AL-1, AL-2], switching STOP mode to RUN mode.

● Sensor break alarm

The function that alarm output will be ON when sensor is not connected or when sensor's disconnection is detected during temperature controlling. You can check whether the sensor is connected with buzzer or other units using alarm output contact. It is selectable between standard alarm [SbAA] or alarm latch [SbAb].

● Loop break alarm(LBA)

It checks control loop and outputs alarm by temperature change of the subject. For heating control(cooling control), when control output MV is 100%(0% for cooling control) and PV is not increased over than LBA detection band [LbAb] during LBA monitoring time [LbAt], or when control output MV is 0%(100% for cooling control) and PV is not decreased below than LBA detection band [LbAb] during LBA monitoring time [LbAt], alarm output turns ON.



Start control to ①	When control output MV is 100%, PV is increased over than LBA detection band [LbAb] during LBA monitoring time [LbAt].
① to ②	The status of changing control output MV (LBA monitoring time is reset.)
② to ③	When control output MV is 0% and PV is not decreased below than LBA detection band [LbAb] during LBA monitoring time [LbAt], loop break alarm (LBA) turns ON after LBA monitoring time.
③ to ④	Control output MV is 0% and loop break alarm (LBA) turns and maintains ON.
④ to ⑥	The status of changing control output MV (LBA monitoring time is reset.)
⑥ to ⑦	When control output MV is 100% and PV is not increased over than LBA detection band [LbAb] during LBA monitoring time [LbAt], loop break alarm (LBA) turns ON after LBA monitoring time.
⑦ to ⑧	When control output MV is 100% and PV is increased over than LBA detection band [LbAb] during LBA monitoring time [LbAt], loop break alarm (LBA) turns OFF after LBA monitoring time.
⑧ to ⑨	The status of changing control output MV (LBA monitoring time is reset.)

※When executing auto-tuning, LBA detection band [LbAb] and LBA monitoring time are automatically set based on auto tuning value. When alarm operation mode [AL-1, AL-2] is set as loop break alarm(LBA) [LbA□], LBA detection band [LbAb] and LBA monitoring time [LbAt] parameter is displayed.

▣ Functions

● Input correction [IN-b]

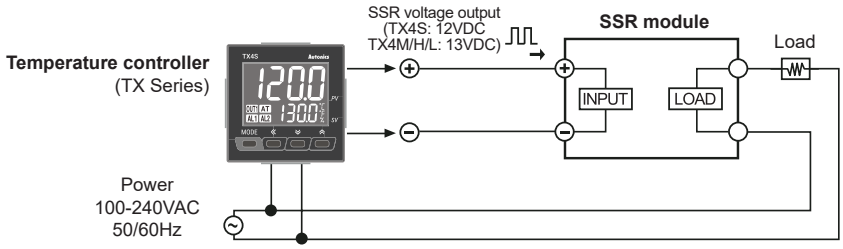
Controller itself does not have errors but there may be error by external input temperature sensor. This function is for correcting this error.
E.g.) If actual temperature is 80℃ but controller displays 78℃, set input correction value [IN-b] as '2' and controller displays 80℃.
※As the result of input correction, if current temperature value (PV) is over each temperature range of input sensor, it displays HHHH or LLLL.

● Input digital filter [MAV.F]

If current temperature (PV) is fluctuating repeatedly by rapid change of input signal, it reflects to MV and stable control is impossible. Therefore, digital filter function stabilizes current temperature value.
For example, set input digital filter value as 0.4 sec, and it applies digital filter to input values during 0.4 sec and displays these values. Current temperature may be different by actual input value.

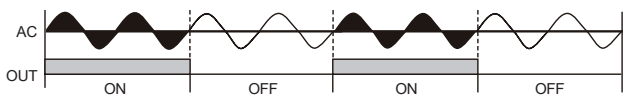
● SSR drive output method (SSRP function) [SSRM]

- SSRP function is selectable one of standard ON/OFF control, cycle control, phase control by utilizing standard SSR drive output.
- This function parameter appears only in SSR drive output model (TX4□-□4S).
- Realizing high accuracy and cost effective temperature control with both current output (4-20mA) and linear output(cycle control and phase control)
- Select one of standard ON/OFF control [StNd], cycle control [CYCL] , phase control [PHAS] at SSRM parameter of parameter group 2. For cycle control, connect a zero cross turn-on SSR or random turn-on SSR. For phase control, connect random turn-on SSR.

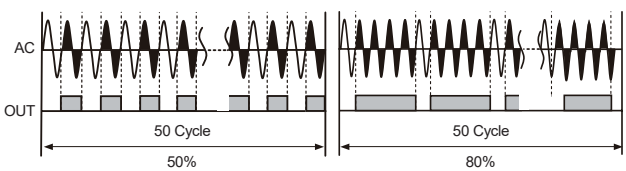


※When selecting cycle or phase control mode, **the power supply for a load and a temperature controller must be the same.**
※Control cycle [t] is able to set only when control method [C-Md]of parameter group 2 is set as PId and SSR drive output method [SSRM] is set as StNd.
※In case of selectable current output or SSR drive output model(TX4□-□4C), this parameter does not appear.
Standard ON/OFF control by SSR is only available.

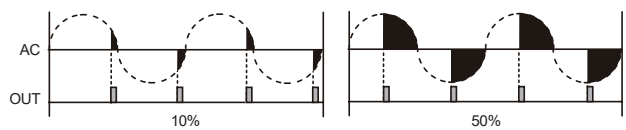
1)Standard ON/OFF control [StNd]
Controls ON (100% output)/OFF (0% output) as same as standard relay output.



2)Cycle control [CYCL]
Controls the load by repeating output ON / OFF according to the rate of output within setting cycle based on certain period (50-cycle).
Control accuracy is almost the same with phase control's.
This control has improved ON/OFF noise than phase control's due to zero cross type which turns ON/OFF at zero point of AC.



3)Phase control [PHAS]
Controls the load by controlling the phase within AC half cycle. Serial control is available.
Must use random turn-on SSR for this mode.



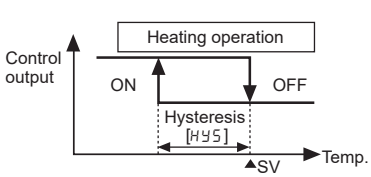
● Current output range [oMA]

In case of selectable current output or SSR drive output model(TX4S-□4C), when control output [oUt] parameter group 2 is set as [CURR], you can select high/low-limit range, 4-20mA [4-20] or 0-20mA [0-20] of current output.

● Hysteresis [HYS]

Set interval between ON and OFF of control output for ON/OFF control.

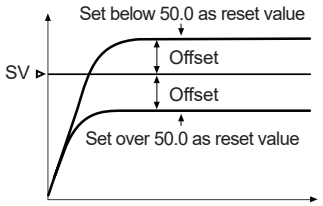
- If hysteresis is too narrow, hunting(oscillation, chattering) could occur due to external noise.
- In case of ON / OFF control mode, even if PV reaches stable status, there still occurs hunting. It could be due to hysteresis [HYS] setting value, load's response characteristics or sensor's location. In order to reduce hunting to a minimum, it is required to take into following factors consideration when designing temp. controlling; proper Hysteresis [HYS], heater's capacity, thermal characteristics, sensor's response and location.



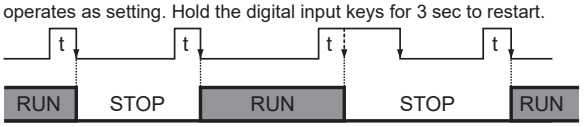
● **Manual reset [RESt]**

When selecting P/PD control mode, certain temperature difference exists even after PV reaches stable status because heater's rising and falling time is inconsistent due to thermal characteristics of controlled objects, such as heat capacity, heater capacity. This temperature difference is called offset and manual reset [RESt] function is to set/correct offset.
When PV and SV are equal, reset value is 50.0%. After control is stable, PV is lower than SV, reset value is over 50.0% or PV is higher than SV, reset value is below 50.0%.

●Manual reset [RESt] by control result



● **Digital input key(▽ + △ 3 sec) [dI -K]**

Parameter		Operation
OFF	oFF	It does not use digital input key function.
RUN/STOP	StoP	Pauses control output. Auxiliary output (except loop break alarm, sensor break alarm)except Control output operates as setting. Hold the digital input keys for 3 sec to restart.  Digital input key (t: over 3 sec)
Clear alarm	AL.RE	Clears alarm output by force. (only when alarm option is alarm latch, or alarm latch and standby sequence 1/2 .) This function is applied when present value is out of alarm operation range but alarm output is ON. Alarm operates normally right after clearing alarm.
Auto-tuning	At	Starts/Stops auto-tuning. This function is same as auto-tuning [At] of parameter group 1. (You can start auto-tuning [At] of parameter group 1 and stop it by digital input key.) ※This parameter At appears only when control method [C-Md] parameter group 2 is set as PId. When control method [C-Md] parameter group 2 is set as onoF, this parameter is changed as oFF.

● **Control output MV for input break [ER.MV]**

When input sensor is break, set control output MV.
When control method [C-Md] of parameter group 2 is set as onoF, set control output MV as 0.0(OFF) or 100.0(ON). When control method [C-Md] is set as PId, setting range for control output MV is 0.0 to 100.0.

▣ Communication Setting

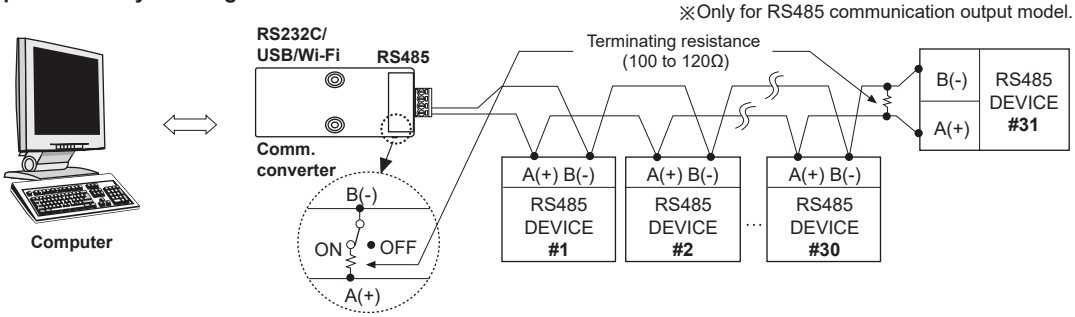
It is for parameter setting and monitoring via external devices (PC, PLC, etc.).
Applicable for models with RS485 communication output through option output(TX4□-B4□).
Please refer to '▣ Ordering Information'.

● **Interface**

Comm. protocol	Modbus RTU	Comm. speed	4800, 9600 (default), 19200, 38400, 115200 bps
Connection type	RS485	Response waiting time	5 to 99ms (default: 20ms)
Application standard	EIA RS485 Compliance with	Start bit	1bit (fixed)
Max. connection	32 units (address: 01 to 127)	Data bit	8bit (fixed)
Synchronous method	Asynchronous	Parity bit	None (default), Odd, Even
Comm. method	Two-wire half duplex	Stop bit	1bit, 2bit (default)
Comm. effective range	Max. 800m		

● **Application of system organization**

※Only for RS485 communication output model.



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately).
Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

▣ Factory Default

● SV setting

Parameter	Factory default
—	0

● Parameter group 1

Parameter	Factory default
AL1	1250
AL2	
At	oFF
P	10.0
I	240
d	49
RESt	50.0
HYS	2

● Parameter group 2

Parameter	Factory default	Parameter	Factory default
IN-t	KCRH	AHYS	1
UNIt	°C	LbAt	0
IN-b	0	LbAb	2
MAV.F	0.1	FS-L	-50
L-SV	-50	FS-H	1200
H-SV	1200	AdRS	1
o-Ft	HEAt	bPS	96
C-Md	PId	PRtY	NoNE
oUt	CURR	StP	2
SSR.M	StNd	RSWt	20
o.MA	4-20	CoMW	ENA
t	20.0 (Relay)	dI-K	StoP
	2.0 (SSR drive)	ER.MV	0.0
AL-1	AM1A	LoC	oFF
AL-2	AM2A		

▣ Error

Display	Description	Troubleshooting
oPEN	Flashes when input sensor is disconnected or sensor is not connected.	Check input sensor status.
HHHH	Flashes when measured value is higher than input range.	When input is within the rated input range, this display disappears.
LLLL	Flashes when measured value is lower than input range.	

▣ Proper Usage

◎ Cautions during use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Do not apply excessive power when connecting or disconnecting the connectors of the product.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- When changing the input sensor, turn off the power first before changing.
  After changing the input sensor, modify the value of the corresponding parameter.
- Do not overlapping communication line and power line.
  Use twisted pair wire for communication line and connect ferrite bead at each end of line to reduce the effect of external noise.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

High Performance, General-Purpose, PID Control Temperature Controller

▣ Features

- 50ms high-speed sampling rate and ±0.3% display accuracy
- Simultaneous heating and cooling control function
- Automatic/manual control option
- Switch between current output and SSR drive output
- SSR drive output (SSRP function) control options: ON/OFF control, cycle control, phase control
- Communication output models available: RS485 (Modbus RTU)
- Parameter configuration via PC (RS485 communication)
  - DAQMaster software included (comprehensive device management software)
  - Communication converter sold separately
    : SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter), SCM-US48I (USB to RS485 converter), SCM-38I (RS232C to RS485 converter), SCM-US (USB to serial converter)
- User-friendly parameter features (via DAQMaster)
- SV preset function (up to 4 set values) using digital input terminals
- Heater disconnect alarm function (CT input)
  - Current transformer (CT) sold separately: CSTC-E80LN, CSTC-E200LN, CSTS-E80PP
- Various input types and temperature ranges

Please read "Safety Considerations" in the instruction manual before using.

▣ Manual

- For the detail information and instructions, please refer to the user manual and user manual for communication, and be sure to follow cautions written in the technical descriptions (catalog, website).
  Visit our website (www.autonics.com) to download manuals.
- User manual describes for specifications and function, and communication manual describes for RS485 communication (Modbus RTU protocol) and parameter address map data.

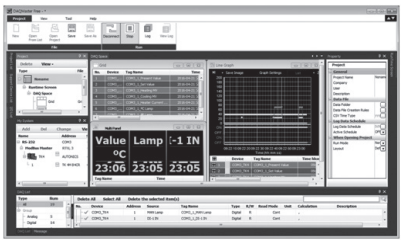
▣ Comprehensive Device Management Program (DAQMaster)

- DAQMaster is comprehensive device management program. It is available for parameter setting, monitoring, and user parameter group setting, parameter mask setting for only TK4 Series.
- Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operating system	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB or more
Hard disk	More than 1GB of free hard disk space
VGA	1024×768 or higher resolution display
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



▣ Ordering Information

TK 4 S — 1 4 R R

OUT 2 control output※9	Standard	N	None ※Select in case of standard control (Heating or Cooling)	
	Heating & Cooling※10	R	Relay output	
		C	Current output or SSR drive output selectable	
OUT 1 control output※7	R		Relay output	
	S※8		SSR drive output (standard ON/OFF control, phase control, cycle control)	
	C		Current output or SSR drive output selectable	
Power supply	2※6		24VAC 50/60Hz, 24-48VDC	
	4		100-240VAC 50/60Hz	
Option input/output※2	N	1	Standard	Alarm output 1+CT input※3
			Heating&Cooling	Alarm output 2※4
		2	Standard	Alarm output 1+Alarm output 2
		D	Standard	Alarm output 1+Digital input (DI-1, DI-2)
			Heating&Cooling	Digital input (DI-1, DI-2)
		R	Standard	Alarm output 1+Transmission output
			Heating&Cooling	Transmission output
		T	Standard	Alarm output 1+RS485 communication output
			Heating&Cooling	RS485 communication output
	SP	1	Alarm output 1	
	S M W H L	1	Alarm output 1	
		2	Alarm output 1+Alarm output 2	
		R	Alarm output 1+Transmission output	
		T	Alarm output 1+RS485 communication output	
		A	Alarm output 1+Alarm output 2+Transmission output	
		B	Alarm output 1+Alarm output 2+RS485 communication output	
		D	Alarm output 1+Alarm output 2+Digital input (DI-1, DI-2)※5	
Size	N		DIN W48×H24mm	
	SP		DIN W48×H48mm (11-pin plug type)※1	
	S		DIN W48×H48mm (Terminal block type)	
	M		DIN W72×H72mm	
	W		DIN W96×H48mm	
	H		DIN W48×H96mm	
	L		DIN W96×H96mm	
Digit	4		9999 (4-digit)	
Item	TK		Temperature/Process Controller	

※1. 11Pin socket(PG-11, PS-11(N)): Sold separately
※2. In case of TK4N/TK4SP Series, option control output selection and digital input will be limited due to number of terminals.
※3. The CT input model of TK4N is selectable only for standard model which has alarm 1.
※4. The Heaing & Cooling model of TK4N-1□□□ has only alarm output 2.
※5. Only for TK4S-D□□□, OUT2 output terminal is used as DI-2 input terminal.
※6. Does not support in TK4N.
※7. “S” represents SSR drive output support models which SSRP function (standard ON/OFF, cycle, phase)control are available. “C” represents selectable current and SSR drive output support models.
※8. Does not support in AC/DC voltage type model.
※9. Select “R” or “C” type in case of using heating & cooling control. “N” type in case of using standard control.
※10. In case of Relay OUT2 model, alarm output 3 is available only when control output operation mode [o-Ft] is set heating [HEAt] or cooling [CooL]. In case of current output, trans. output 2 is available only when control output operation mode [o-Ft] is set heating [HEAt] or cooling[CooL].

▣ Specifications

Series		TK4N	TK4SP	TK4S	TK4M	TK4W	TK4H	TK4L
Power supply	AC voltage	100-240VAC～ 50/60Hz						
	AC/DC voltage	—	24VAC～ 50/60Hz, 24-48VDC⎓					
Allowable voltage range		90 to 110% of rated voltage						
Power consumption	AC voltage	Max. 6VA	Max. 8VA					
	AC/DC voltage	—	Max. 8VA (24VAC 50/60Hz), max. 5W (24-48VDC)					
Display method		7-segment (PV: red, SV: green), other display part (green, yellow, red) LED method						
Character size	PV (W×H)	4.5×7.2mm	7.0×14.0mm		9.5×20.0mm	8.5×17.0mm	7.0×14.6mm	11.0×22.0mm
	SV (W×H)	3.5×5.8mm	5.0×10.0mm		7.5×15.0mm	6.0×12.0mm	6.0×12.0mm	7.0×14.0mm
Input type	RTD	JPt100Ω, DPt100Ω, DPt50Ω, Cu100Ω, Cu50Ω, Nikel 120Ω (6 types)						
	Thermocouple	K(CA), J(IC), E(CR), T(CC), B(PR), R(PR), S(PR), N(NN), C(TT), G(TT), L(IC), U(CC), Platinel II (13 types)						
	Analog	• Voltage: 0-100mVDC⎓, 0-5VDC⎓, 1-5VDC⎓, 0-10VDC⎓ (4 types) • Current: 0-20mA, 4-20mA (2 types)						
Display accuracy	RTD	• At room temperature (23℃±5℃): (PV ±0.3% or ±1℃, select the higher one) ±1-digit ※1 • Out of room temperature range: (PV ±0.5% or ±2℃, select the higher one) ±1-digit ※In case of TK4SP Series, ±1℃ will be added.						
	Thermocouple							
	Analog	• At room temperature (23℃±5℃): ±0.3% F.S. ±1-digit • Out of range of room temperature: ±0.5% F.S. ±1-digit						
	CT input	±5% F.S. ±1-digit						
Control output	Relay	OUT1, OUT2: 250VAC～ 3A, 30VDC⎓ 3A, 1a						
	SSR	11VDC⎓±2V 20mA Max.						
	Current	DC4-20mA or DC0-20mA selectable (load 500Ω max.)						
Alarm output	Relay	AL1, AL2: 250VAC～ 3A 1a ※TK4N AL2: 250VAC～ 0.5A 1a (max.125VA), TK4SP has only AL1.						
Option output	Transmission	DC4-20mA (load 500Ω max., accuracy: ±0.3% F.S.)						
	Communication	RS485 communication output (Modbus RTU)						
Option input	CT input	0.0-50.0A (primary heater current value measuring range) ※CT ratio = 1/1000 (except TK4SP)						
	Digital input	• Contact Input: ON - max. 2kΩ, OFF - min. 90kΩ • Non-contact Input: ON - residual votage max. 1.0VDC⎓, OFF - leakage current max. 0.1mA • Outflow current: approx. 0.5mA ※TK4S/M: 1 (TK4S-D□ □ □: 2, TK4SP: none), TK4N/H/W/L: 2						
Control type	Heating, cooling	ON/OFF, P, PI, PD, PID control						
	Heating&cooling							
Hysteresis		• RTD/Thermocouples: 1 to 100℃/℉ (0.1 to 100.0℃/℉) variable • Analog: 1 to 100-digit						
Proportional band (P)		0.1 to 999.9℃/℉ (0.1 to 999.9%)						
Integral time (I)		0 to 9999 sec						
Derivative time (D)		0 to 9999 sec						
Control period (T)		• Relay output, SSR drive output: 0.1 to 120.0 sec • Current output or SSR drive output selectable: 1.0 to 120.0 sec						
Manual reset value		0.0 to 100.0%						
Sampling period		50ms						
Dielectric strength		2,000VAC 50/60Hz for 1 min (between power source terminal and input terminal)						
Vibration		0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours						
Relay life cycle	Mechanical	• OUT1/2: min. 5,000,000 times • AL1/2: min. 20,000,000 times (TK4H/W/L: min. 5,000,000 times)						
	Electrical	OUT1/OUT2, AL1/AL2: min. 100,000 operations						
Insulation resistance		Over 100MΩ (at 500VDC megger)						
Noise immunity		±2kV R-phase, S-phase the square wave noise (pulse width: 1μs) by the noise simulator						
Memory retention		Approx. 10 years (when using non-volatile semiconductor memory type)						
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃						
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH						
Protection structure		IP65 (front panel) ※TK4SP: IP50 (front panel)						
Insulation type		Double insulation or reinforced insulation (mark: ⊡, dielectric strength between the measuring input part and the power part: 2kV)						
Approval		CE cULus						
Weight※2		Approx. 140g (approx. 70g)	Approx. 130g (approx. 85g)	Approx. 150g (approx. 105g)	Approx. 210g (approx. 140g)	Approx. 211g (approx. 141g)		Approx. 294g (approx. 198g)

※1: ◎ At room temperature (23℃±5℃)
- Thermocouple K, J, T, N, E type, below -100℃/Thermocouple L, U, PLII type, RTD Cu50Ω, DPt50Ω : (PV ±0.3% or ±2℃, select the higher one) ±1-digit
- Thermocouple C, G, R, S type, below 200℃: (PV ±0.3% or ±3℃, select the higher one) ±1-digit
- Thermocouple B type, below 400℃: there is no accuracy standards.

◎ Out of room temperature range
- RTD Cu50Ω, DPt50Ω: (PV ±0.5% or ±3℃, select the higher one) ±1-digit
- Thermocouple R, S, B, C, G type: (PV ±0.5% or ±5℃, select the higher one) ±1-digit
- Others, Below -100℃: within ±5℃

In case of TK4SP Series, ±1℃ will be added to the degree standard.

※2: The weight includes packaging. The weight in parenthesis is for unit only.

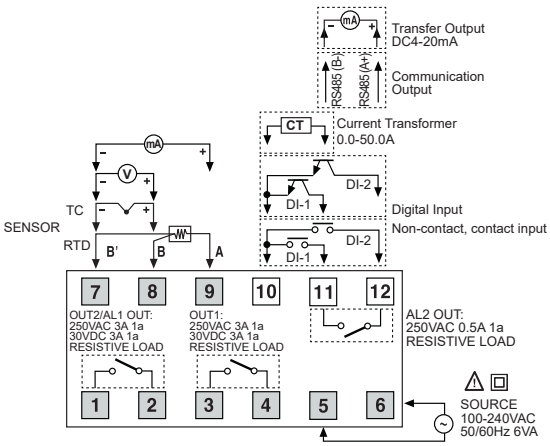
※Environment resistance is rated at no freezing or condensation.

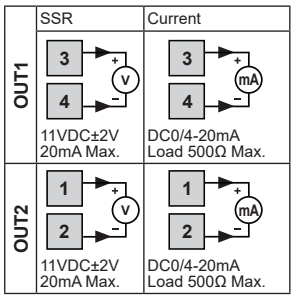
▣ Connections

※Please check the polarity when connecting temperature sensor or analog input.
※Standard model has shaded terminals only.
※Operation mode of heating&cooling OUT 2 relay output model is heating or cooling, OUT 2 is available as alarm output 3. (except TK4N Series).
※Operation mode of heating&cooling OUT 2 current output model is heating or cooling, OUT 2 is available as transmission output 2.
※Use teminals of size specified below.

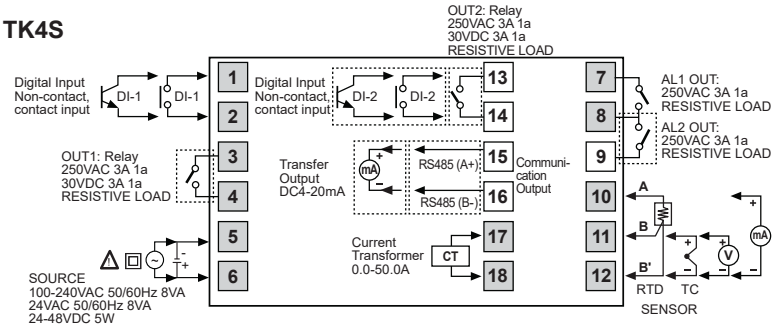
	a	b
<Round>	Min. 3.0mm	Max. 5.8mm
<Forked>	Min. 3.0mm	Max. 5.8mm

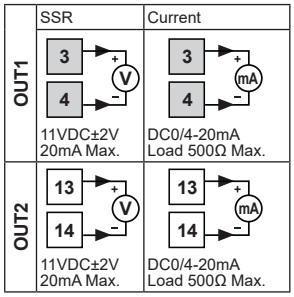
● TK4N



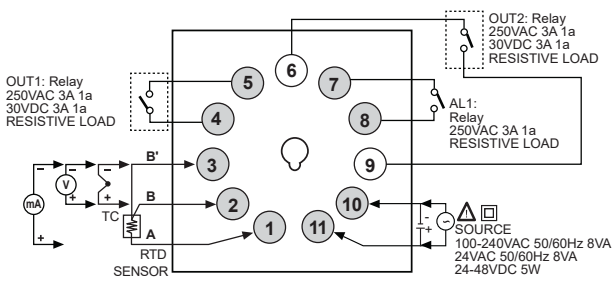


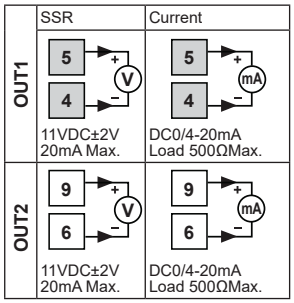
● TK4S





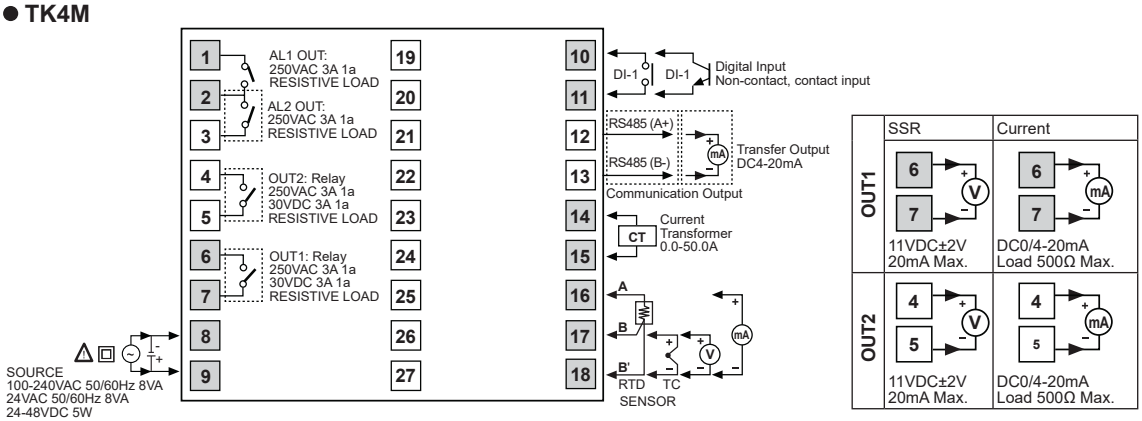
● TK4SP



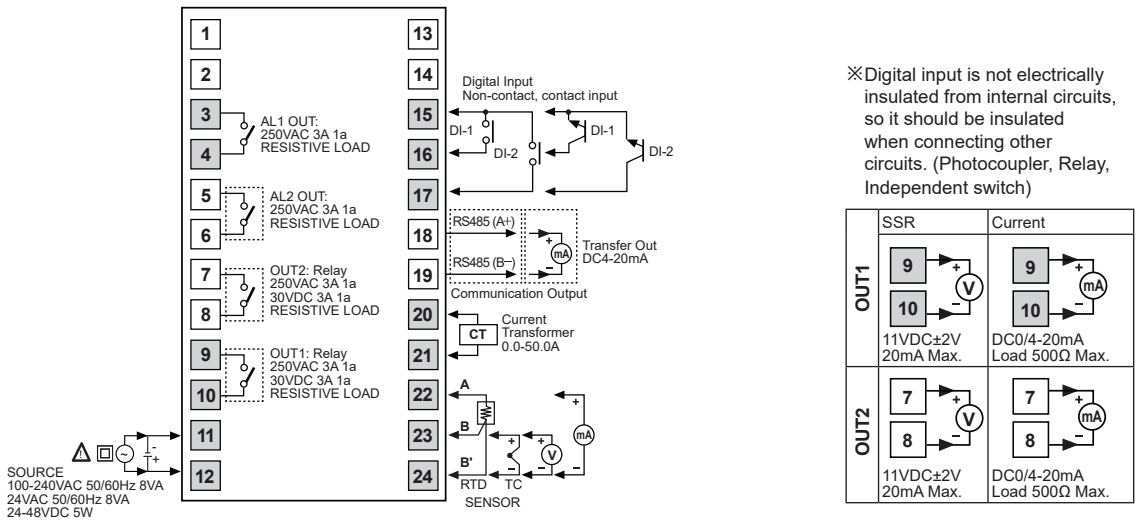


▣ Connections

● TK4M



● TK4H/TK4W/TK4L

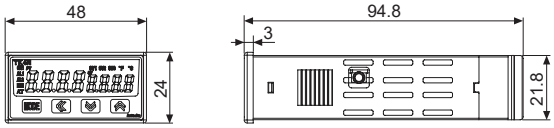


※Digital input is not electrically insulated from internal circuits, so it should be insulated when connecting other circuits. (Photocoupler, Relay, Independent switch)

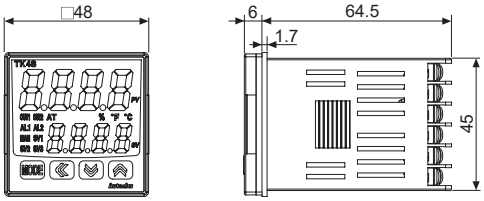
▣ Dimensions

(unit: mm)

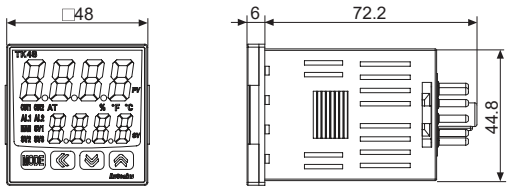
● TK4N Series



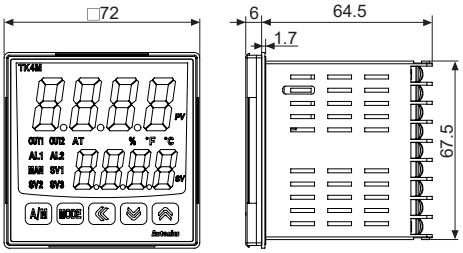
● TK4S Series



● TK4SP Series



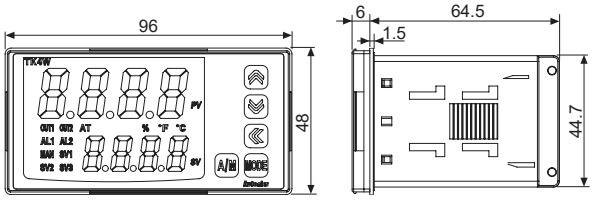
● TK4M Series



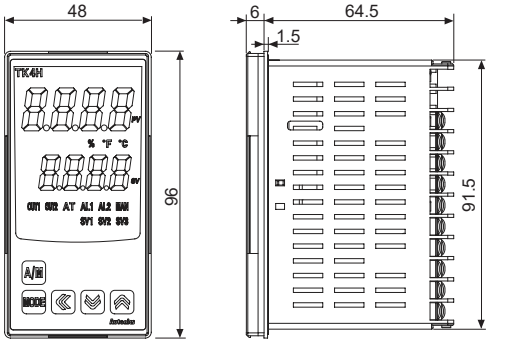
▣ Dimensions

(unit: mm)

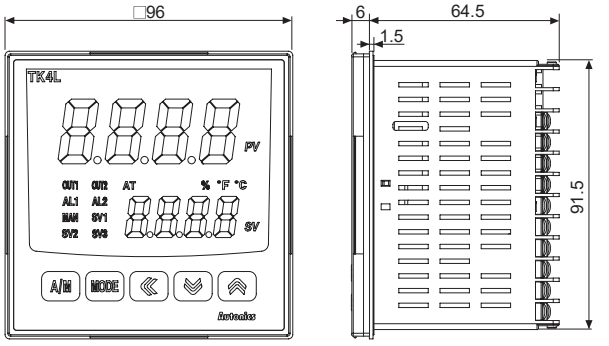
● TK4W Series



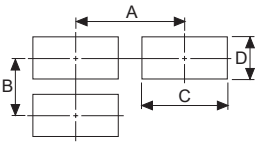
● TK4H Series



● TK4L Series



● Panel cut-out

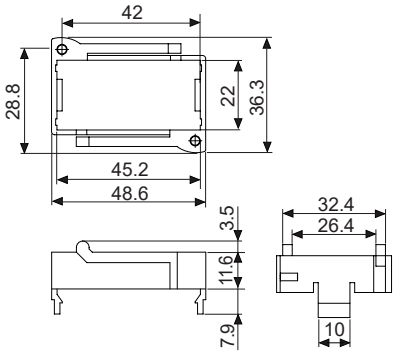


(unit: mm)

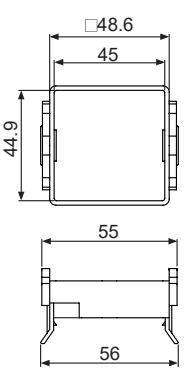
Model \ Size	A	B	C	D
TK4N	Min. 55	Min. 37	$45^{+0.6}_{0}$	$22.2^{+0.3}_{0}$
TK4S	Min. 65	Min. 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
TK4SP	Min. 65	Min. 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
TK4M	Min. 90	Min. 90	$68^{+0.7}_{0}$	$68^{+0.7}_{0}$
TK4H	Min. 65	Min. 115	$45^{+0.6}_{0}$	$92^{+0.8}_{0}$
TK4W	Min. 115	Min. 65	$92^{+0.8}_{0}$	$45^{+0.6}_{0}$
TK4L	Min. 115	Min. 115	$92^{+0.8}_{0}$	$92^{+0.8}_{0}$

● Bracket

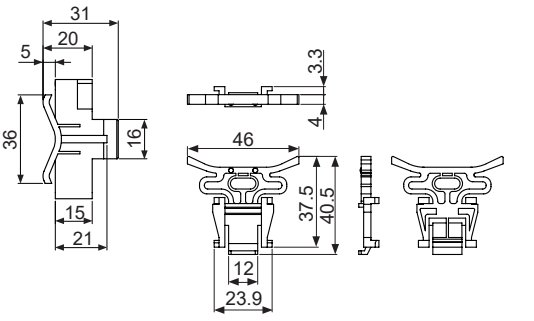
●TK4N Series



●TK4S, TK4SP Series

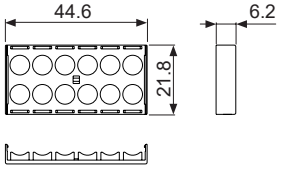


●TK4M/W/H/L Series



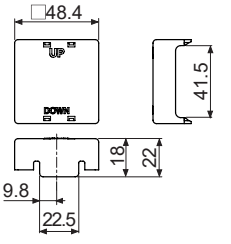
● Terminal cover (sold separately)

●TK4N Cover (48×24mm)

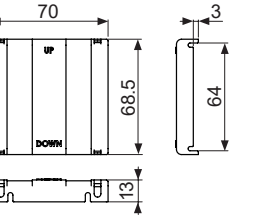


※TK4N COVER is accessory.

●RSA Cover (48×48mm)



●RMA Cover (72×72mm)

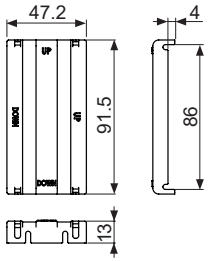


▣ Dimensions

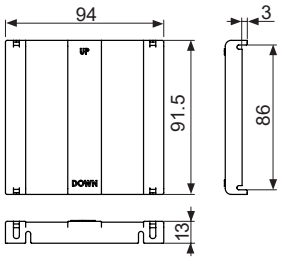
(unit: mm)

● **Terminal cover (sold separately)**

●RHA Cover (48×96mm, 96×48mm)

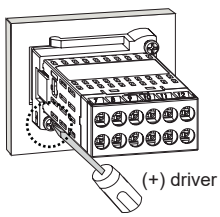


●RLA Cover (96×96mm)



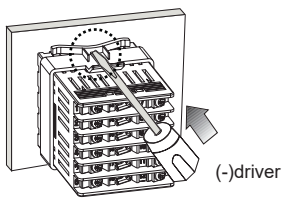
▣ Product Mounting

● **TK4N (48×24mm) Series**



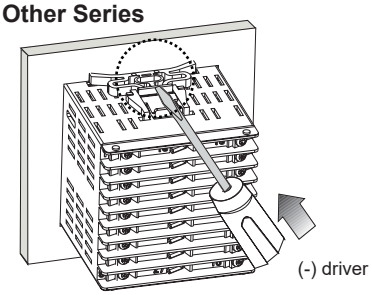
※Insert the unit into a panel, fasten the bolt with a (+) driver.

● **TK4S/SP (48×48mm) Series**

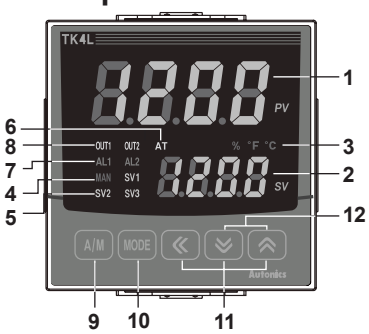


※Insert the unit into a panel, fasten the bracket by pushing with tools with a (-) driver.

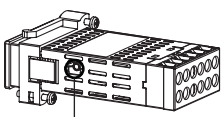
● **Other Series**



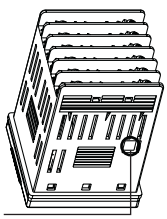
▣ Unit Description



TK4N Series

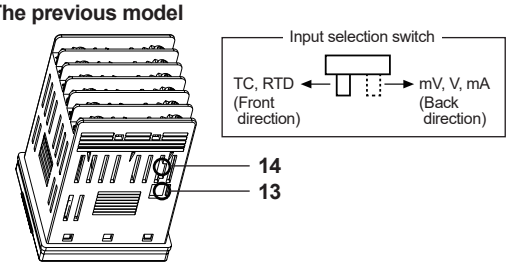


Other Series



※The input selection switch (TC, RTD/mV, V, mA) switch disappears. Select input type [ㅅ-ㅌ] in parameter 3 group.

The previous model



1. **Measured value (PV) display part:**
   • RUN mode: It displays currently measured value (PV).
   • Setting mode: It displays the parameter.
2. **Set value (SV) display part:**
   • RUN mode: It displays the set value (SV).
   • Setting mode: It displays the set value of the parameter.
3. **Unit (℃/℉/%) indicator:** It displays the unit set at display unit [ㅂㅅㅌ] in parameter 3 group. (In case of TK4N, % is not supported)
4. **Manual control indicator:** It turns ON during manual controlling.
5. **Multi SV indicator:** One of SV1 to 3 indicators will be ON in case of selecting multi SV function.
6. **Auto tuning indicator:** It flashes by 1 sec when executing auto tuning.
7. **Alarm output (AL 1, AL 2) indicator:** It turns ON when the alarm output is ON.
8. **Control output (OUT 1, OUT 2) indicator:** It turns ON when the control output is ON.
   ※During cycle/phase controlling in SSRP function model (TK4□-□4S□) when MV is over 5.0%, it turns ON.
   ※To use current output, when MV is 0.0% in manual control, it turns OFF. Otherwise, it always turns ON. When MV is over 3.0% in auto control, it turns ON and when MV is below 2.0%, it turns OFF.
9. **A/M key:** It is used when switching auto control to manual control.
   ※TK4N/S/SP do not have A/M key. MODE key operates switching simultaneously.
10. **MODE key:** It is used when entering parameter setting group, returning to RUN mode, moving parameter, saving the set value.
11. **, , key:** It is used when entering the set value changing mode and moving or changing up/down digit.
12. **Digital input key:** When pressing + keys for 3 sec at the same time, it operates the function (RUN/STOP, alarm clear, auto tuning) set at digital input key [ㄷㅣ-ㅂ] in parameter 5 group.
13. **PC loader port:** It is the PC loader port for serial communication to set parameter and monitoring by DAQMaster installed in PC. Use this for connecting SCM-US (USB to Serial converter, sold separately).
14. **Input selection switch:** Used when switching sensor (TC, RTD) input ↔ analog input (mV, V, mA). (only the previous model)

▣ Sold Separately

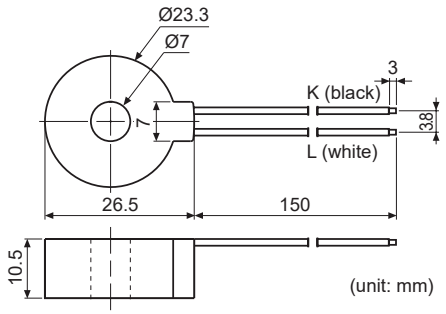
◎ Communication converter

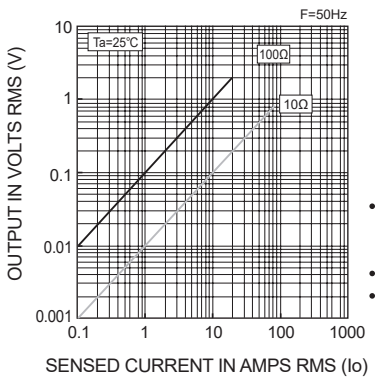
- **SCM-WF48** (Wi-Fi to RS485·USB wireless communication converter)
- **SCM-US48I** (USB to RS485 converter)
- **SCM-38I** (RS232C to RS485 converter)
- **SCM-US** (USB to Serial converter)




◎ Current transformer (CT)

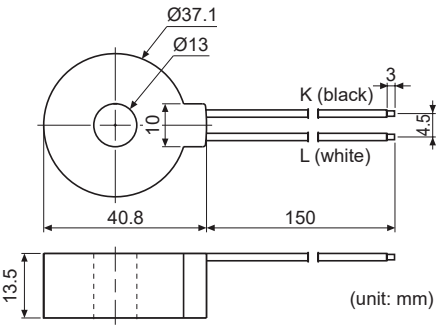
- **CSTC-E80LN**

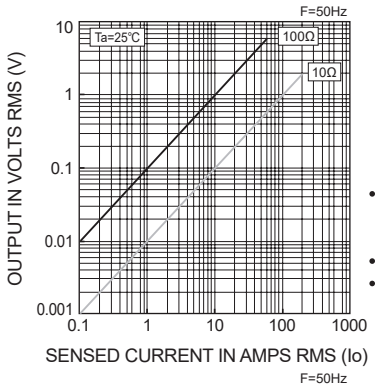




- Max. load current: 80A (50/60Hz)
  ※Max. load current for TK4 Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance: 31Ω±10%

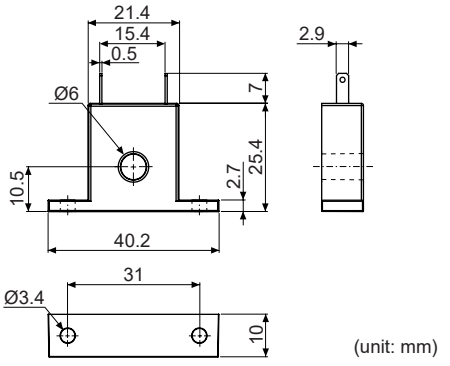
- **CSTC-E200LN**

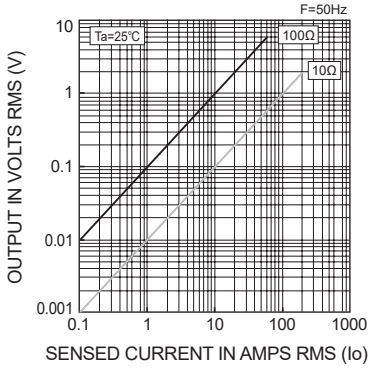




- Max. load current: 200A (50/60Hz)
  ※Max. load current for TK4 Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance: 20Ω±10%

- **CSTS-E80PP**





- Max. load current: 80A (50/60Hz)
  ※Max. load current for TK4 Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance 31Ω±10%

※Do not supply primary current in case that CT output is open. High voltage will be generated in CT output.
※The current for above CTs is 50A same but inner hole sizes are different. Please use this for your environment.

▣ Sold Separately

◎ Display units (DS/DA-T Series)

- **DS/DA-T Series**
  (RS485 communication input type display unit) CE


DS16-□T


DS22/DA22-□T


DS40/DA40-□T


DS60/DA60-□T

※Connect RS485 communication input type display unit (DS/DA-T Series) and RS485 communication output model of TK Series, the display unit displays present value of the device without PC/PLC.

▣ Input Type and Range

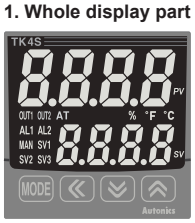
Input type			Decimal point	Display	Input range (℃)	Input range (℉)
Thermocouple	K(CA)		1	K CA.H	-200 to 1350	-328 to 2463
			0.1	K CA.L	-199.9 to 999.9	-199.9 to 999.9
	J(IC)		1	J IC.H	-200 to 800	-328 to 1472
			0.1	J IC.L	-199.9 to 800.0	-199.9 to 999.9
	E(CR)		1	E Cr.H	-200 to 800	-328 to 1472
			0.1	E Cr.L	-199.9 to 800.0	-199.9 to 999.9
	T(CC)		1	t CC.H	-200 to 400	-328 to 752
			0.1	t CC.L	-199.9 to 400.0	-199.9 to 752.0
	B(PR)		1	b Pr	0 to 1800	32 to 3272
	R(PR)		1	r Pr	0 to 1750	32 to 3182
	S(PR)		1	S Pr	0 to 1750	32 to 3182
	N(NN)		1	n nn	-200 to 1300	-328 to 2372
	C(TT)※1		1	C tt	0 to 2300	32 to 4172
	G(TT)※2		1	G tt	0 to 2300	32 to 4172
	L(IC)		1	L IC.H	-200 to 900	-328 to 1652
			0.1	L IC.L	-199.9 to 900.0	-199.9 to 999.9
	U(CC)		1	U CC.H	-200 to 400	-328 to 752
			0.1	U CC.L	-199.9 to 400.0	-199.9 to 752.0
	Platinel II		1	PL II	0 to 1390	32 to 2534
RTD	Cu 50Ω		0.1	CU 5	-199.9 to 200.0	-199.9 to 392.0
	Cu 100Ω		0.1	CU 10	-199.9 to 200.0	-199.9 to 392.0
	JPt 100Ω		1	JPt.H	-200 to 650	-328 to 1202
			0.1	JPt.L	-199.9 to 650.0	-199.9 to 999.9
	DPt 50Ω		0.1	dPt5	-199.9 to 600.0	-199.9 to 999.9
	DPt 100Ω		1	dtt.H	-200 to 650	-328 to 1202
			0.1	dPt.L	-199.9 to 650.0	-199.9 to 999.9
	Nickel 120Ω		1	ni 12	-80 to 200	-112 to 392
Analog	Voltage	0-10V		Au 1	-1999 to 9999 (Display point will be changed according to decimal point position)	
		0-5V		Au2		
		1-5V		Au3		
		0-100mV		An u 1		
	Current	0-20mA		AnA 1		
		4-20mA		AnA2		

※1: C (TT): Same as existing W5 (TT) type sensor
※2: G (TT): Same as existing W (TT) type sensor

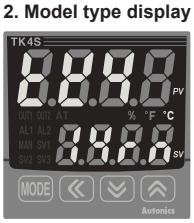
▣ Front Panel Display When Power Is On

When power is supplied, display will flash for 1 sec. Afterwards, model name and input sensor type will flash twice and then enter into RUN mode.

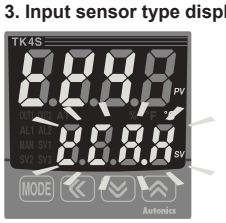
1. Whole display part



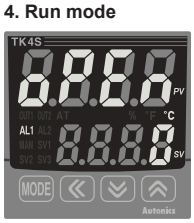
2. Model type display



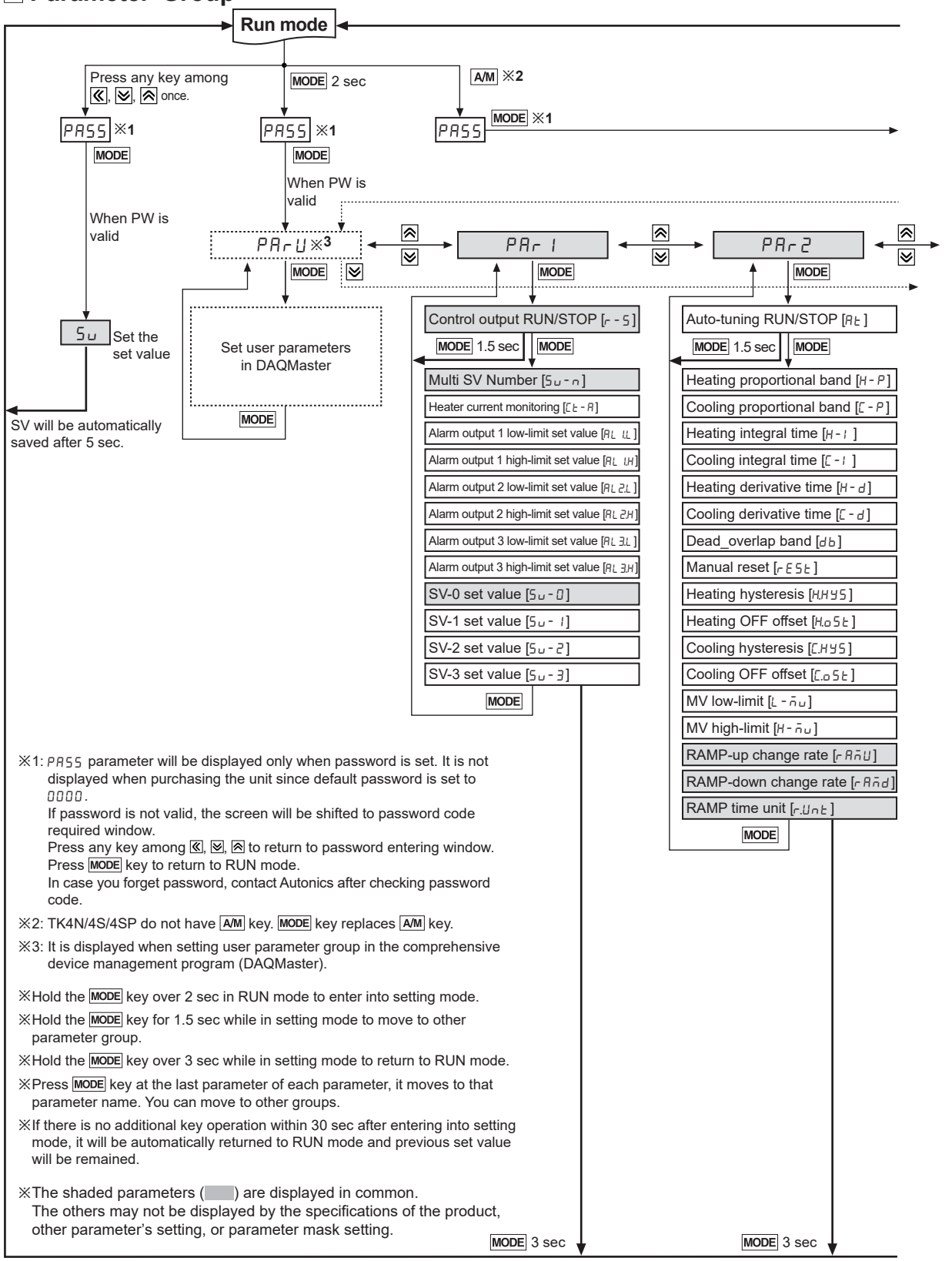
3. Input sensor type display



4. Run mode



■ Parameter Group



※1: PASS parameter will be displayed only when password is set. It is not displayed when purchasing the unit since default password is set to 0000.
If password is not valid, the screen will be shifted to password code required window.
Press any key among ≪, ≫, ≪ to return to password entering window.
Press MODE key to return to RUN mode.
In case you forget password, contact Autonics after checking password code.

※2: TK4N/4S/4SP do not have A/M key. MODE key replaces A/M key.

※3: It is displayed when setting user parameter group in the comprehensive device management program (DAQMaster).

※Hold the MODE key over 2 sec in RUN mode to enter into setting mode.

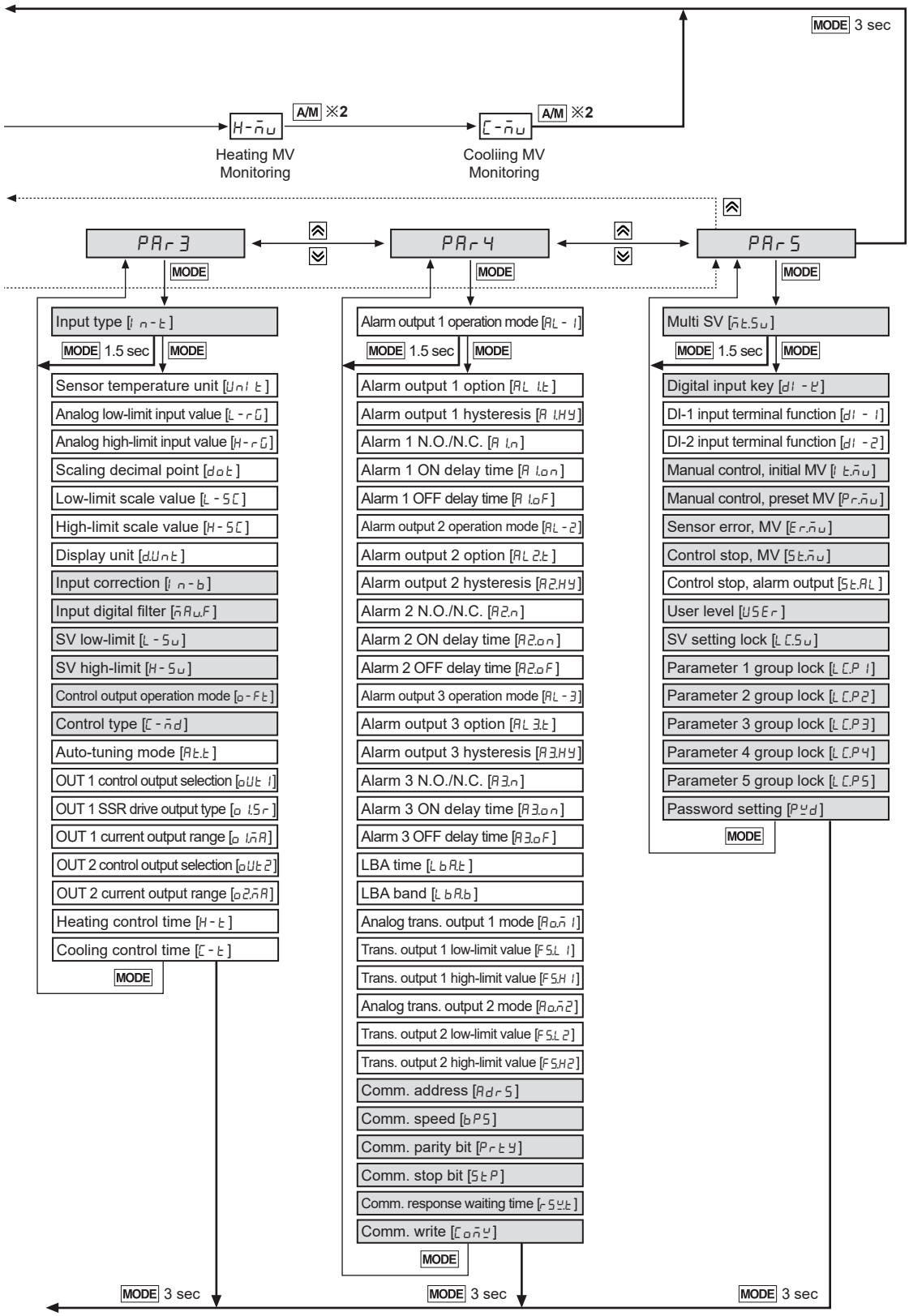
※Hold the MODE key for 1.5 sec while in setting mode to move to other parameter group.

※Hold the MODE key over 3 sec while in setting mode to return to RUN mode.

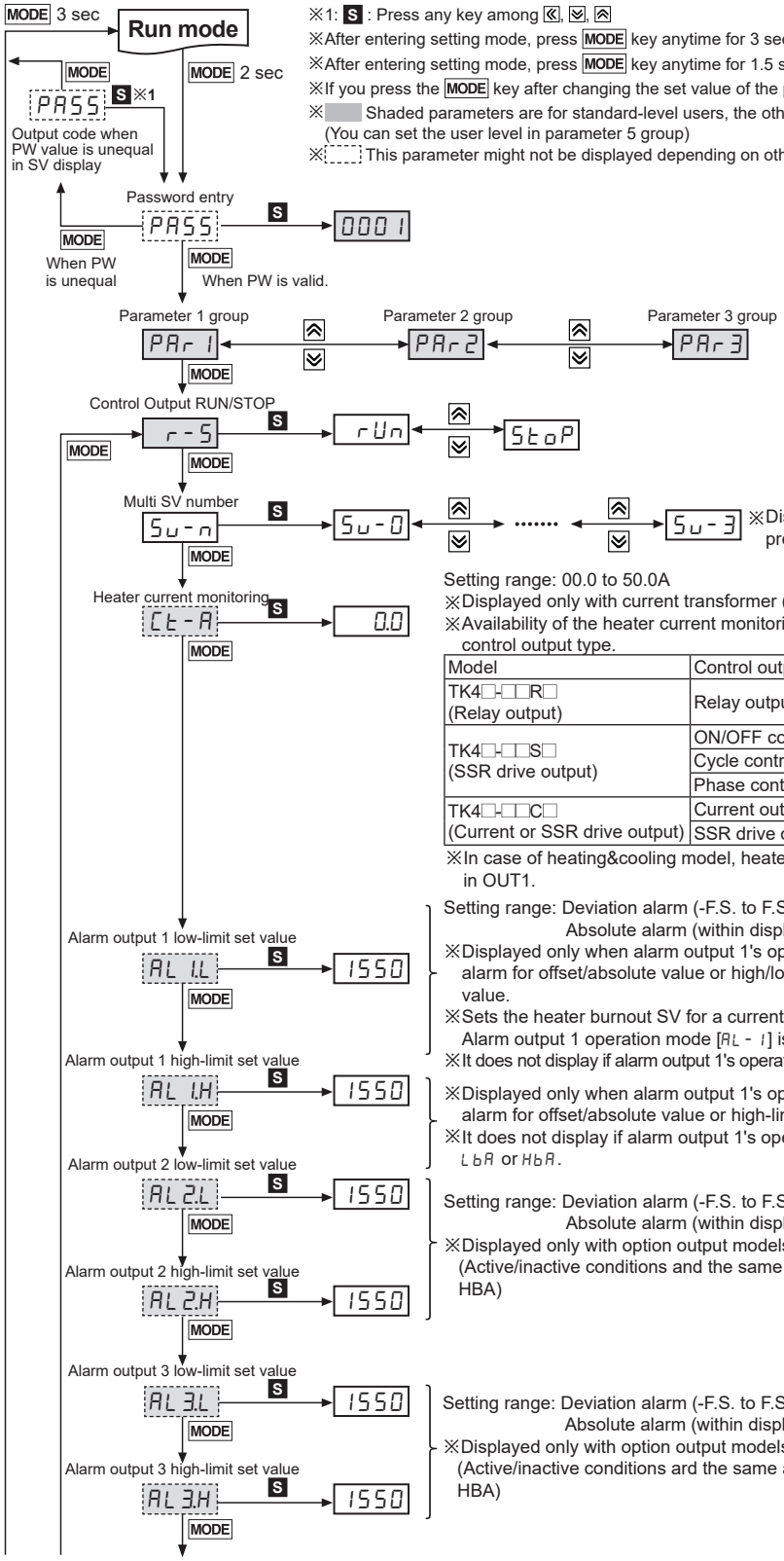
※Press MODE key at the last parameter of each parameter, it moves to that parameter name. You can move to other groups.

※If there is no additional key operation within 30 sec after entering into setting mode, it will be automatically returned to RUN mode and previous set value will be remained.

※The shaded parameters ( ) are displayed in common.
The others may not be displayed by the specifications of the product, other parameter's setting, or parameter mask setting.


MODE 3 sec
A/M ※2
H-ou
Heating MV Monitoring
A/M ※2
C-ou
Cooliing MV Monitoring
PAr3
PAr4
PAr5
MODE
Input type [in-t]
MODE 1.5 sec
Sensor temperature unit [Unit]
Analog low-limit input value [L-rG]
Analog high-limit input value [H-rG]
Scaling decimal point [dot]
Low-limit scale value [L-SC]
High-limit scale value [H-SC]
Display unit [d.Unt]
Input correction [in-b]
Input digital filter [oAu.F]
SV low-limit [L-Su]
SV high-limit [H-Su]
Control output operation mode [o-Ft]
Control type [C-md]
Auto-tuning mode [AtE]
OUT 1 control output selection [oUt1]
OUT 1 SSR drive output type [o1Sr]
OUT 1 current output range [o1rA]
OUT 2 control output selection [oUt2]
OUT 2 current output range [o2rA]
Heating control time [H-t]
Cooling control time [C-t]
MODE
Alarm output 1 operation mode [AL-1]
MODE 1.5 sec
Alarm output 1 option [AL1t]
Alarm output 1 hysteresis [A1HY]
Alarm 1 N.O./N.C. [A1n]
Alarm 1 ON delay time [A1on]
Alarm 1 OFF delay time [A1oF]
Alarm output 2 operation mode [AL-2]
Alarm output 2 option [AL2t]
Alarm output 2 hysteresis [A2HY]
Alarm 2 N.O./N.C. [A2n]
Alarm 2 ON delay time [A2on]
Alarm 2 OFF delay time [A2oF]
Alarm output 3 operation mode [AL-3]
Alarm output 3 option [AL3t]
Alarm output 3 hysteresis [A3HY]
Alarm 3 N.O./N.C. [A3n]
Alarm 3 ON delay time [A3on]
Alarm 3 OFF delay time [A3oF]
LBA time [LbAt]
LBA band [LbAb]
Analog trans. output 1 mode [Aomo1]
Trans. output 1 low-limit value [FSL1]
Trans. output 1 high-limit value [FSH1]
Analog trans. output 2 mode [Aomo2]
Trans. output 2 low-limit value [FSL2]
Trans. output 2 high-limit value [FSH2]
Comm. address [Adrs]
Comm. speed [bPS]
Comm. parity bit [Prty]
Comm. stop bit [StP]
Comm. response waiting time [rSdt]
Comm. write [Comd]
MODE
Multi SV [mSv.Su]
MODE 1.5 sec
Digital input key [di-K]
DI-1 input terminal function [di-1]
DI-2 input terminal function [di-2]
Manual control, initial MV [mt.ou]
Manual control, preset MV [Pr.ou]
Sensor error, MV [Er.ou]
Control stop, MV [St.ou]
Control stop, alarm output [St.AL]
User level [USEr]
SV setting lock [LCK.Su]
Parameter 1 group lock [LCP1]
Parameter 2 group lock [LCP2]
Parameter 3 group lock [LCP3]
Parameter 4 group lock [LCP4]
Parameter 5 group lock [LCP5]
Password setting [PWd]
MODE
MODE 3 sec
MODE 3 sec
MODE 3 sec

▣ Parameter 1 Group



※1: S : Press any key among ≪, ≫, ≪

※After entering setting mode, press MODE key anytime for 3 sec to return to Run mode.

※After entering setting mode, press MODE key anytime for 1.5 sec to go to the concerned group name.

※If you press the MODE key after changing the set value of the parameter the set value will be stored.

※ Shaded parameters are for standard-level users, the others are for high-level users.
(You can set the user level in parameter 5 group)

※ This parameter might not be displayed depending on other parameter settings.

Setting range: 00.0 to 50.0A

※Displayed only with current transformer (CT) input models (Expect for TK4SP)

※Availability of the heater current monitoring function is different by model and control output type.

Model	Control output type	Heater current monitoring
TK4□-□□R□ (Relay output)	Relay output	O
TK4□-□□S□ (SSR drive output)	ON/OFF control [Stnd]	O
	Cycle control [CycL]	X
	Phase control [PHAS]	X
TK4□-□□C□ (Current or SSR drive output)	Current output [CUrr]	X
	SSR drive output [SSr]	O

※In case of heating&cooling model, heater current monitoring function can be used in OUT1.

Setting range: Deviation alarm (-F.S. to F.S.),
Absolute alarm (within display range), Unit (℃/℉)

※Displayed only when alarm output 1's operation mode [AL - 1] is set to low-limit alarm for offset/absolute value or high/low-limit alarm/reverse alarm for offset value.

※Sets the heater burnout SV for a current transformer (with option inputs) when Alarm output 1 operation mode [AL - 1] is in heater burnout alarm [HbA].

※It does not display if alarm output 1's operation mode [AL - 1] is set to oFF, SbA or LbA.

※Displayed only when alarm output 1's operation mode [AL - 1] is set to high-limit alarm for offset/absolute value or high-limit alarm/reserve alarm for offset value.

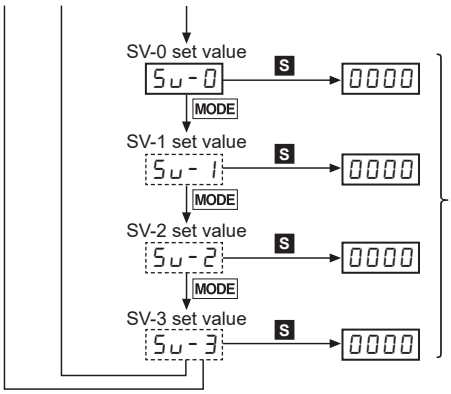
※It does not display if alarm output 1's operation mode [AL - 1] is set to oFF, SbA, LbA or HbA.

Setting range: Deviation alarm (-F.S. to F.S.),
Absolute alarm (within display range), Unit (℃/℉)

※Displayed only with option output models that support alarm output 2. (Active/inactive conditions and the same as alarm output 1 with the exception for HBA)

Setting range: Deviation alarm (-F.S. to F.S.),
Absolute alarm (within display range), Unit (℃/℉)

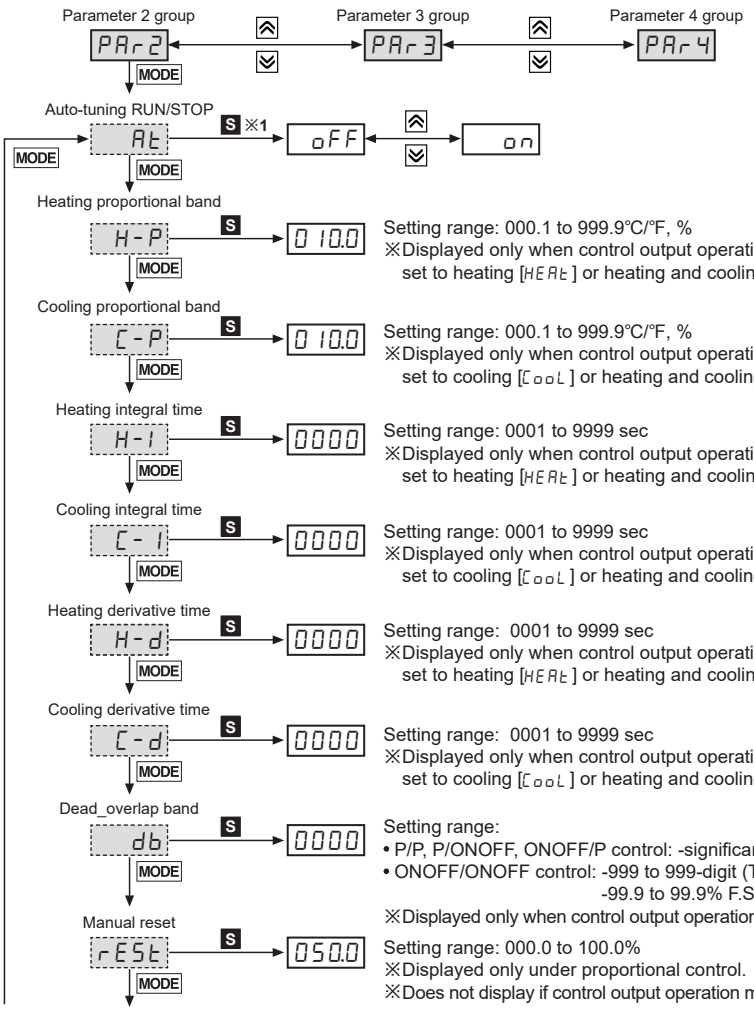
※Displayed only with option output models that support alarm output 3. (Active/inactive conditions ard the same as alarm output 1 with the exception for HBA)

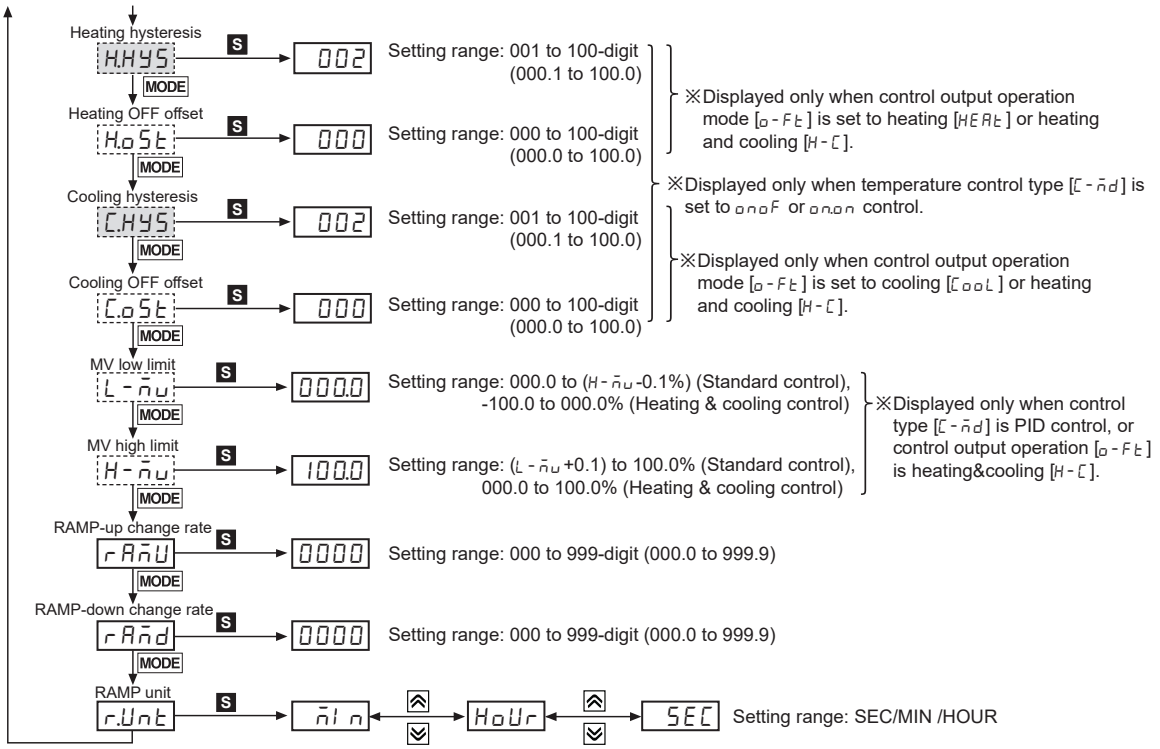


Setting range: L - SU to H - SU, unit (℃/℉)
※The number of multi SVs [SU0 to SU3] set at Multi SV [n1.SU] are displayed.

■ Parameter 2 Group

※1: S : Press any key among ≪, ≫, ≪
※After entering setting mode, press MODE key anytime for 3 sec to return to Run mode.
※After entering setting mode, press MODE key anytime for 1.5 sec to go to the concerned group name.
※If you press the MODE key after changing the set value of the parameter the set value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users.
(You can set the user level in parameter 5 group)
※ This parameter might not be displayed depending on other parameter settings.





■ Parameter 3 Group

※1: S : Press any key among ≪, ≫, ≪

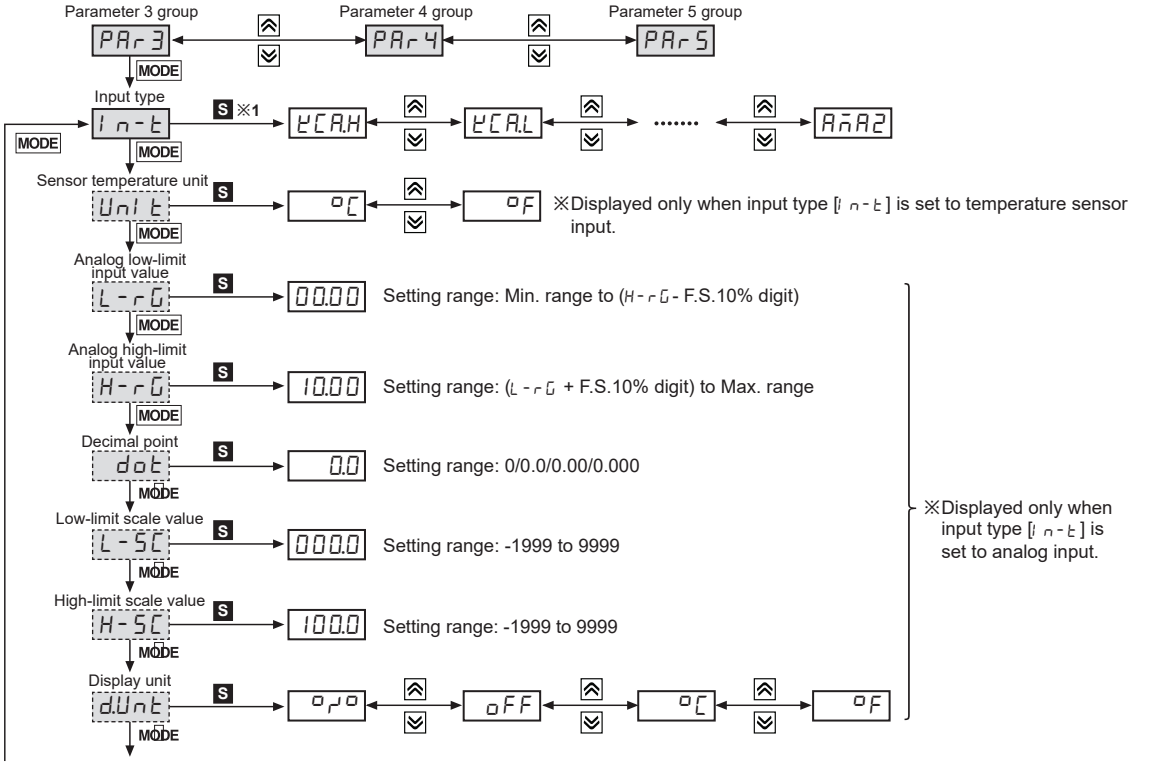
※After entering setting mode, press MODE key anytime for 3 sec to return to Run mode.

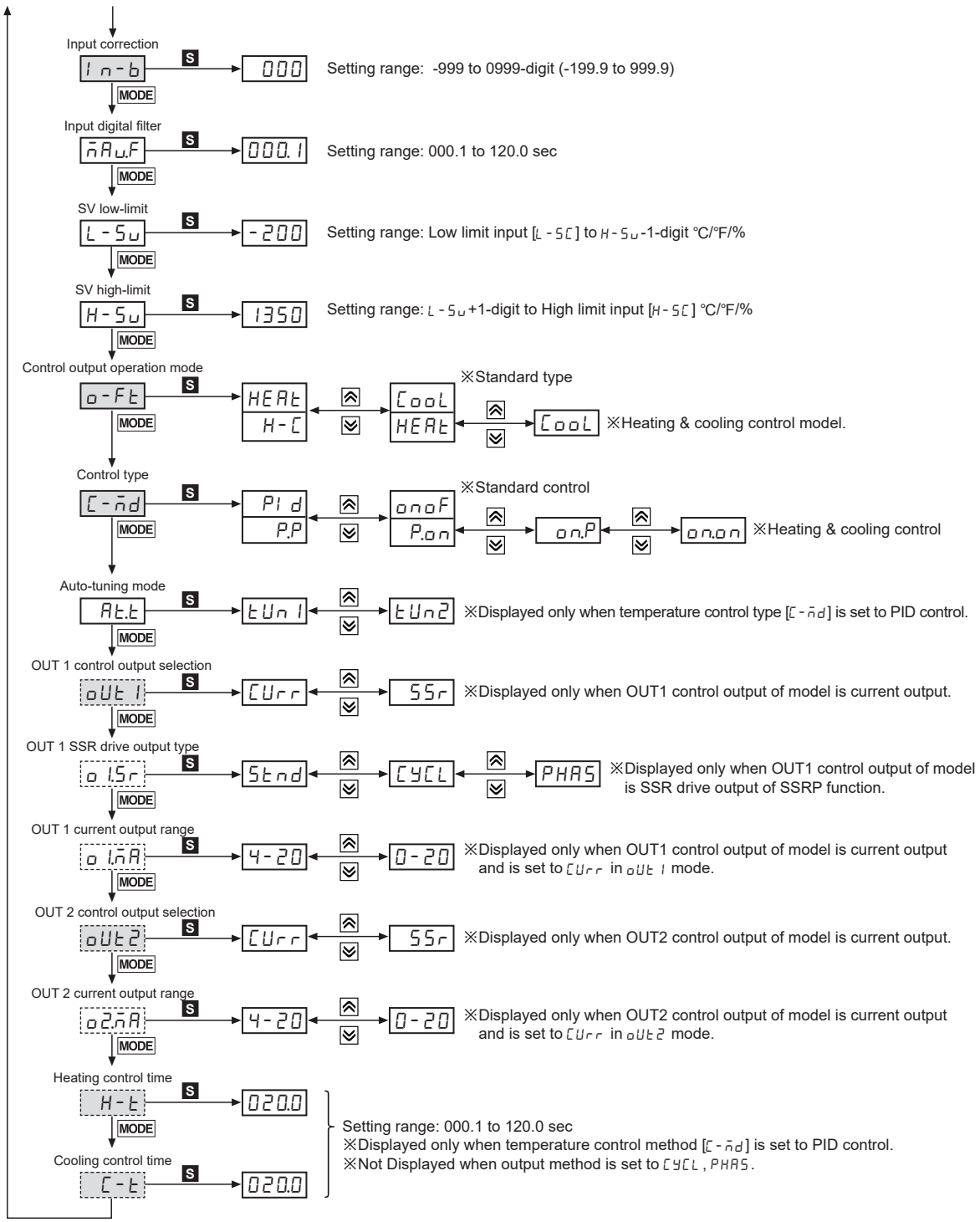
※After entering setting mode, press MODE key anytime for 1.5 sec to go to the concerned group name.

※If you press the MODE key after changing the setting value of the parameter the setting value will be stored.

※ Shaded parameters are for standard-level users, the others are for high-level users. (You can set the user level in parameter 5 group)

※ This parameter might not be displayed depending on other parameter settings.



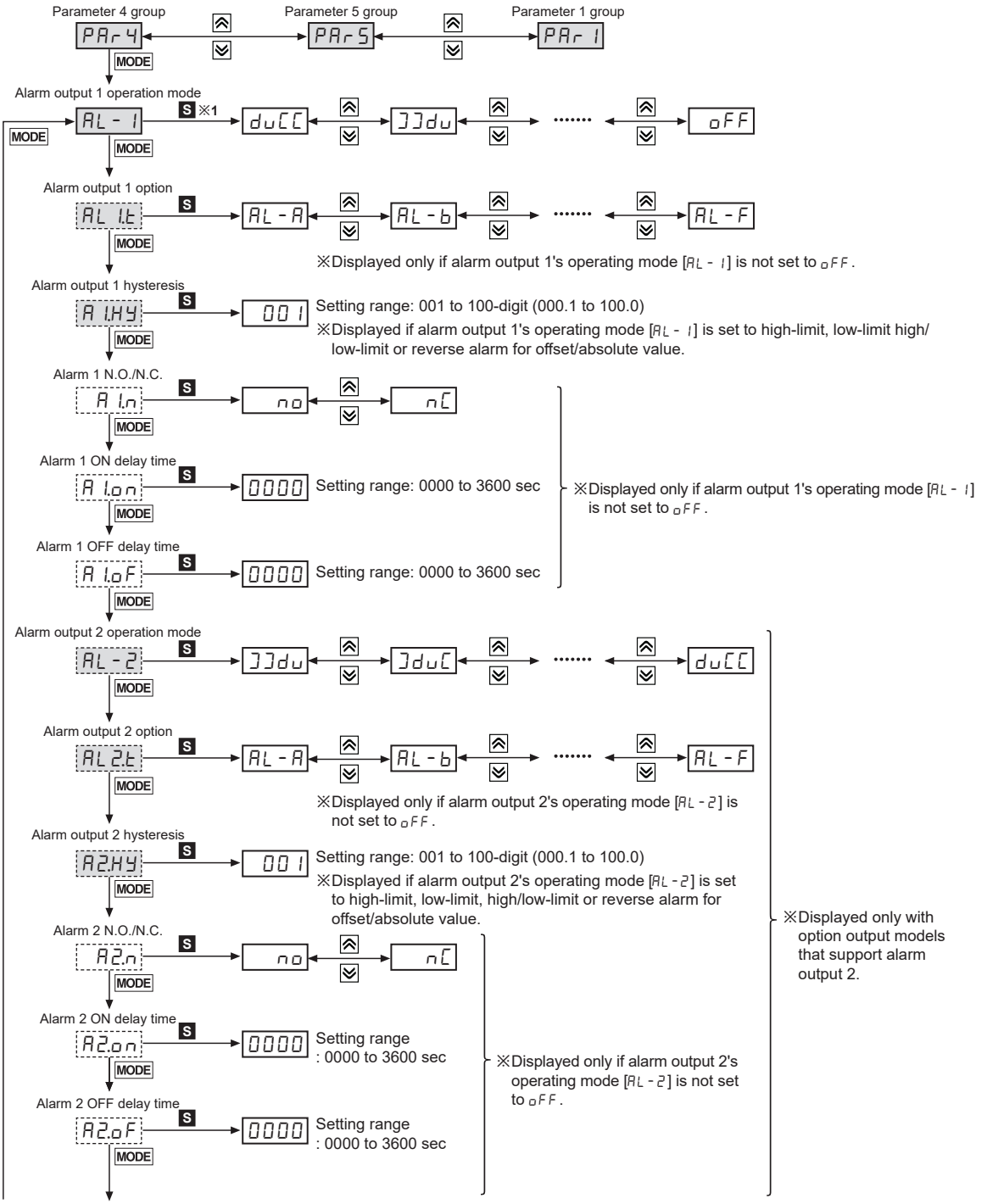


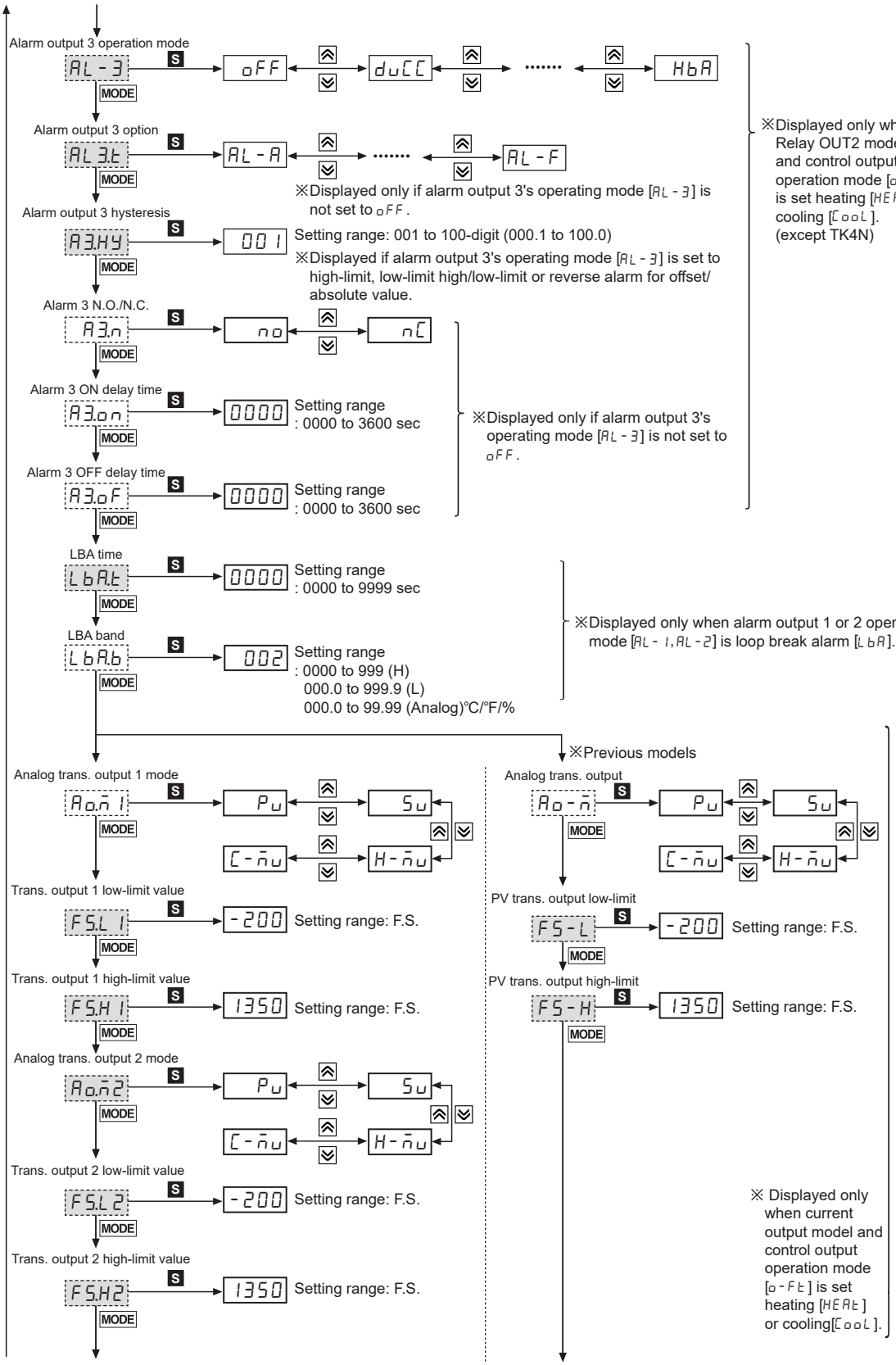
※OUT1, OUT2 output:

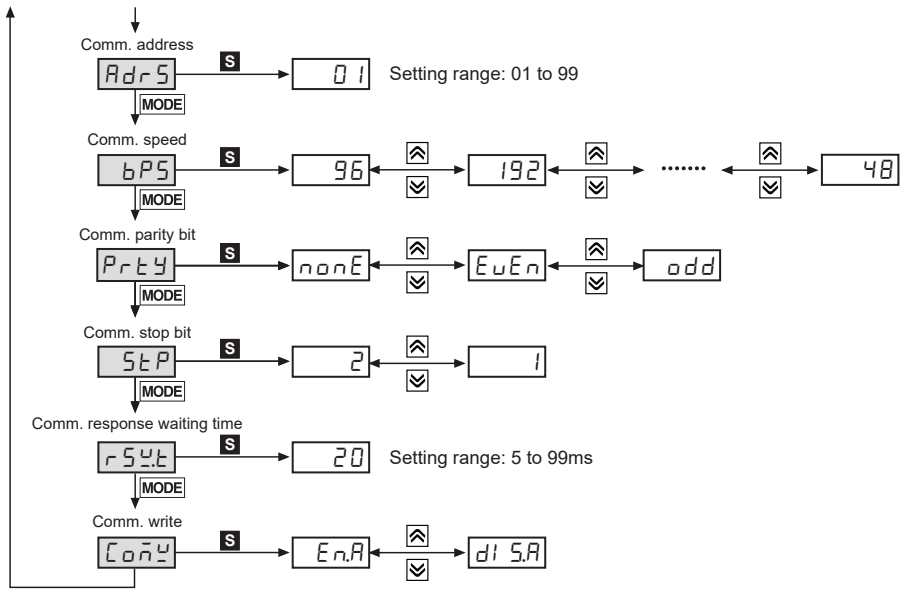
- In case that OUT1,OUT2 output is relay output type , oUt1, o1Sr, o1nA, oUt2, o2Sr, o2nA parameter are not displayed.
- In case that OUT1,OUT2 output is current + SSR drive output type, when OUT1,OUT2 output is set to SSr.
  : Output method of o1Sr, o2Sr is held in Stnd and parameter is not displayed.
- In case that OUT1, output is SSR drive output model of SSRP function and OUT2 output is current + SSR drive output
  - oUt1, o1nA are not displayed.
  - o1Sr can set to Stnd, CYCL, PHAS
  - When o2Sr is set to SSr it is held in Stnd and parameter is not displayed.

▣ Parameter 4 Group

※1: S : Press any key among ≪, ≫, ≪
※After entering setting mode, press MODE key anytime for 3 sec to return to Run mode.
※After entering setting mode, press MODE key anytime for 1.5 sec to go to the concerned group name.
※If you press the MODE key after changing the set value of the parameter the set value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users.
(You can set the user level in parameter 5 group)
※ This parameter might not be displayed depending on other parameter settings.

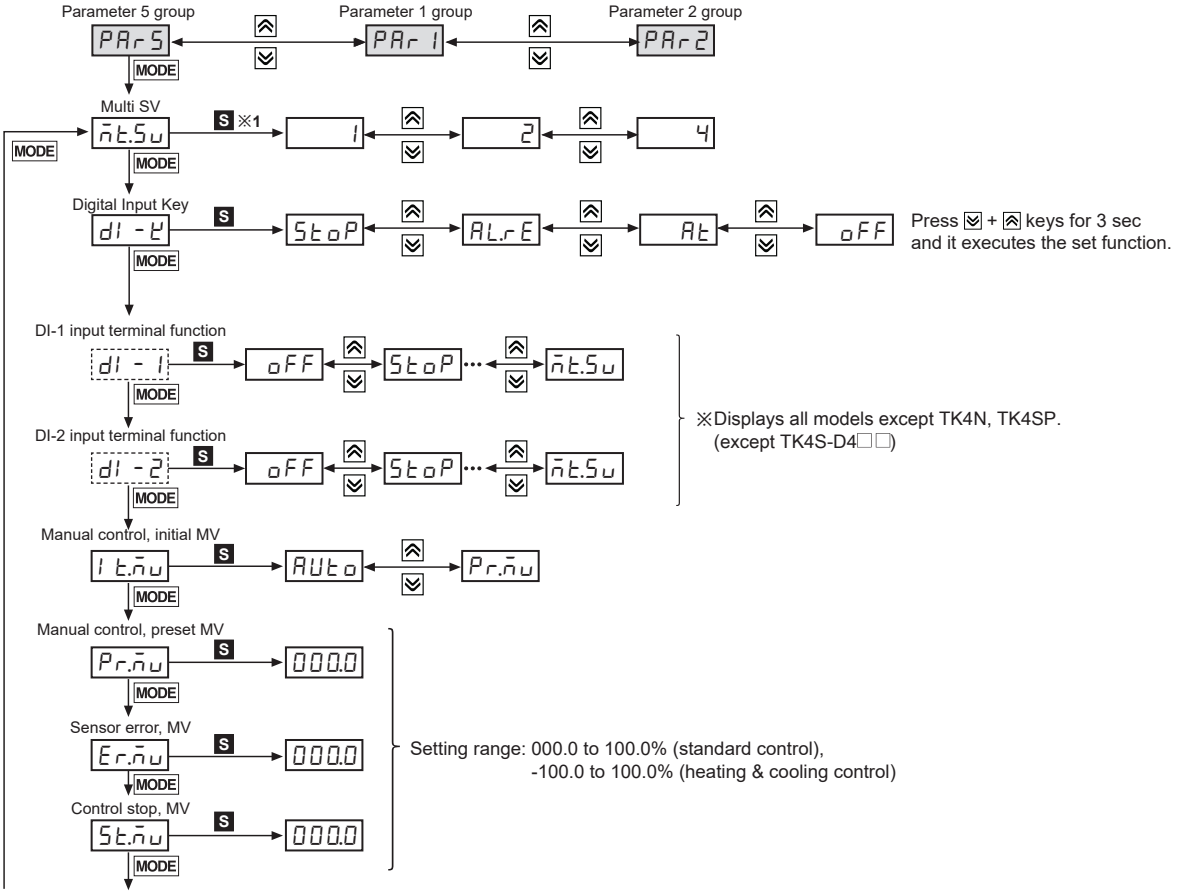


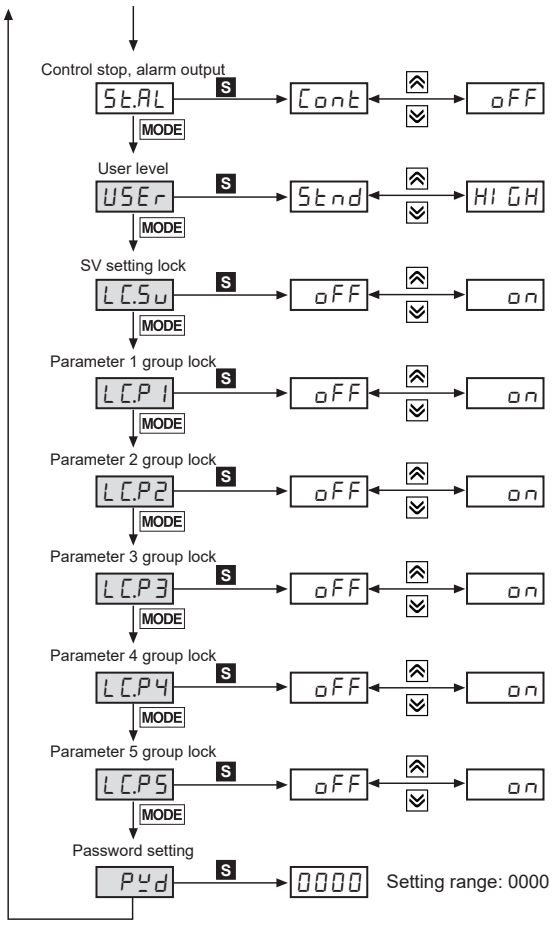

Alarm output 3 operation mode
AL-3
S
MODE
oFF
duCC
HbA
Alarm output 3 option
AL3t
AL-A
AL-F
※Displayed only if alarm output 3's operating mode [AL-3] is not set to oFF.
※Displayed only when Relay OUT2 model and control output operation mode [o-Ft] is set heating [HEAt] or cooling [CooL]. (except TK4N)
Alarm output 3 hysteresis
A3HY
001
Setting range: 001 to 100-digit (000.1 to 100.0)
※Displayed if alarm output 3's operating mode [AL-3] is set to high-limit, low-limit high/low-limit or reverse alarm for offset/ absolute value.
Alarm 3 N.O./N.C.
A3n
no
nC
Alarm 3 ON delay time
A3on
0000
Setting range : 0000 to 3600 sec
Alarm 3 OFF delay time
A3oF
0000
Setting range : 0000 to 3600 sec
※Displayed only if alarm output 3's operating mode [AL-3] is not set to oFF.
LBA time
LbAt
0000
Setting range : 0000 to 9999 sec
LBA band
LbAb
002
Setting range : 0000 to 999 (H) 000.0 to 999.9 (L) 000.0 to 99.99 (Analog)℃/℉/%
※Displayed only when alarm output 1 or 2 operation mode [AL-1,AL-2] is loop break alarm [LbA].
※Previous models
Analog trans. output 1 mode
Ao.n1
Pu
Su
C-nu
H-nu
Trans. output 1 low-limit value
FSL1
-200
Setting range: F.S.
Trans. output 1 high-limit value
FSH1
1350
Setting range: F.S.
Analog trans. output 2 mode
Ao.n2
Trans. output 2 low-limit value
FSL2
Trans. output 2 high-limit value
FSH2
Analog trans. output
Ao-n
PV trans. output low-limit
FS-L
PV trans. output high-limit
FS-H
※ Displayed only when current output model and control output operation mode [o-Ft] is set heating [HEAt] or cooling[CooL].



▣ Parameter 5 Group

※1: S : Press any key among ≪, ≫, ≪
※After entering setting mode, press MODE key anytime for 3 sec to return to Run mode.
※After entering setting mode, press MODE key anytime for 1.5 sec to go to the concerned group name.
※If you press the MODE key after changing the setting value of the parameter the setting value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users.
(You can set the user level in parameter 5 group)
※ This parameter might not be displayed depending on other parameter settings.





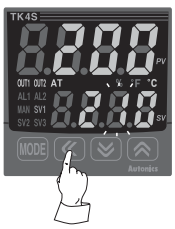
■ SV Setting

You can set the temperature to control with ≪, ≫, ≫ keys.
Setting range is within SV low-limit value [L-Su] to SV high-limit value [H-Su].

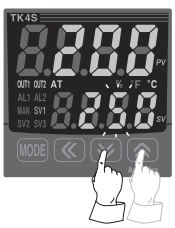
E.g.) In case of changing set temperature from 210ºC to 250ºC

1 

Press any key among ≪, ≫, ≫ key in RUN mode, the right digit at SV display flashes and it enters to SV setting.

2 

Press ≪ key to move the desired digit.
($10^0 \rightarrow 10^1 \rightarrow 10^2 \rightarrow 10^3 \rightarrow 10^0$)

3 

Press ≫ or ≫ key to move the desired number
(1 → 5).

4 

Press MODE key to save the value and it controls with this set value.
(even though there is no key input for over 3 sec, it saves automatically.)

■ Parameter Reset

Press ≪, ≫, ≫ to reset all parameters in memory to default value.
Set Init parameter to YES to reset all parameters.
In case password function is on, it is required to enter valid password to reset parameters.
Password is also reset.

▣ Factory Default

● SV setting [Su]

Parameter	Factory default
Su	0

● Password input parameter

Parameter	Factory default
PASS	0001

● Parameter 1 group [PAr 1]

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
r-S	rUn	AL 1H	1550	AL3H	1550	Su-3	0000
Su-n	Su-0	AL2L	1550	Su-0	0000		
Ct-A	0.0	AL2H	1550	Su-1	0000		
AL 1L	1550	AL3L	1550	Su-2	0000		

● Parameter 2 group [PAr 2]

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
At	oFF	H-d	0000	HoSt	000	rAñU	000
H-P	0 10.0	C-d	0000	C.HYS	002	rAñd	000
C-P	0 10.0	db	0000	C.oSt	000	r.Unt	ñ1 n
H-1	0000	rESt	050.0	L-ñu	-100.0		
C-1	0000	H.HYS	002	H-ñu	100.0		

● Parameter 3 group [PAr 3]

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
In-t	tCAH	H-SC	100.0	o-Ft	HEAt (standard)	o 1.Sr	Stnd
Unit	°C	d.Unt	°Fo		H-C (heating & cooling)	o 1.ñA	4-20
L-rG	00.00	In-b	0000	C-ñd	PId (standard)	oUt2	CUrr
H-rG	10.00	ñAu.F	000.1		P.P (heating & cooling)	o2.ñA	4-20
dot	0.0	L-Su	-200	AtE	tUn1	H-t	020.0 (relay) 002.0 (SSR)
L-SC	000.0	H-Su	1350	oUt1	CUrr	C-t	

● Parameter 4 group [PAr 4]

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
AL-1	duCC	A2n	no	LbAt	0000	bPS	96
AL 1t	AL-A	A2on	0000	LbAb	002 (003※1)	PrtY	nonE
A 1HY	001	A2oF	0000	Aou1 (Ao-ñ※1)	Pu	StP	2
A 1n	no	AL-3	oFF	FS.L1 (FS-L※1)	-200	rSYt	20
A 1on	0000	AL3.t	AL-A	FS.H1 (FS-H※1)	1350	CoñY	EnA
A 1oF	0000	A3.HY	001	Aou2	Pu		
AL-2	JJdu	A3n	no	FS.L2	-200		
AL2t	AL-A	A3on	0000	FS.H2	1350		
A2.HY	001	A3oF	0000	AdrS	01		

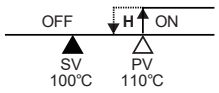
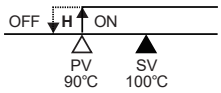
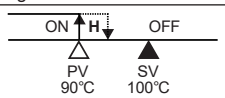
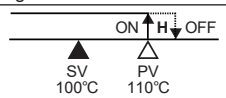
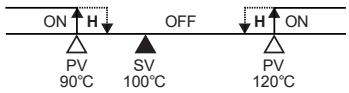
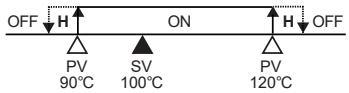
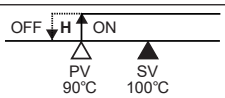
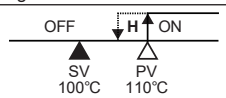
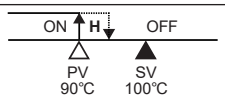
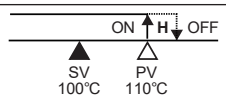
● Parameter 5 group [PAr 5]

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
ñt.Su	1	Pr.ñu	000.0	LC.Su	oFF	LC.PS	oFF
dI-E	StoP	Er.ñu	000.0	LC.P1	oFF	PYd	0000
dI-1	oFF	St.ñu	000.0	LC.P2	oFF		
dI-2	oFF	St.AL	Cont	LC.P3	oFF		
It.ñu	AUto	USEr	Stnd	LC.P4	oFF		

※ shaded parameters are only for the new model.
※1: This parameter is for previous models.

▣ Alarm

◎ Alarm operation

Mode	Name	Alarm operation	Description
oFF	—	—	No alarm output
duCC	Deviation high-limit alarm	 High deviation: Set as 10℃  High deviation: Set as -10℃	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
]]du	Deviation low-limit alarm	 Lower deviation: Set as 10℃  Lower deviation: Set as -10℃	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
]du[	Deviation high/low-limit alarm	 Lower deviation: Set as 10℃, High deviation: Set as 20℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
[du]	Deviation high/low-limit reserve alarm	 Lower deviation: Set as 10℃, High deviation: Set as 20℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF.
PuCC	Absolute value high limit alarm	 Absolute-value Alarm: Set as 90℃  Absolute-value Alarm: Set as 110℃	If PV is higher than the absolute value, the output will be ON.
]]Pu	Absolute value low limit alarm	 Absolute-value Alarm: Set as 90℃  Absolute-value Alarm: Set as 110℃	If PV is lower than the absolute value, the output will be ON.
LbA	Loop break Alarm	—	It will be ON when it detects loop break.
SbA	Sensor break Alarm	—	It will be ON when it detects sensor disconnection.
HbA	Heater break alarm	—	It will be ON when CT detects heater break.

※H: Alarm □ output hysteresis [A□.HY]

※Availability of the heater burnout alarm function is different by model and control output type.

Model	Control output type	Heater burnout alarm
TK4□-□□R□ (Relay output)	Relay output	O
TK4□-□□S□ (SSR drive output)	ON/OFF control [Stnd]	O
	Cycle control [CYCL]	X
	Phase control [PHAS]	X
TK4□-□□C□ (Current or SSR drive output)	Current output [CUrr]	X
	SSR drive output [SSr]	O

※In case of heating&cooling model, heater burnout alarm function can be used in OUT1.

◎ Alarm option

Mode	Name	Description
AL-A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AL-b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status.
AL-C	Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.
AL-d	Alarm latch and standby sequence 1	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.
AL-E	Standby sequence 2	First alarm condition is ignored and from second alarm condition, standard alarm operates. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, standard alarm operates.
AL-F	Alarm latch and standby sequence 2	Basic operation is same as alarm latch and standby sequence 1. It operates not only by power ON/OFF, but also alarm set value, or alarm option changing. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates.

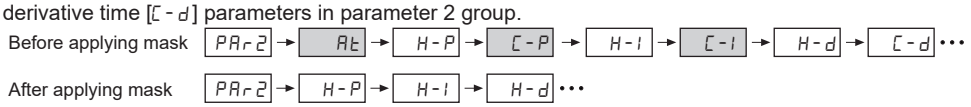
※Condition of re-applied standby sequence for standby sequence 1, alarm latch and standby sequence 1: Power ON
Condition of re-applied standby sequence for standby sequence 2, alarm latch and standby sequence 2: Power ON, changing set temperature, alarm temperature [AL 1, AL2] or alarm operation [AL-1, AL-2], switching STOP mode to RUN mode.

▣ Functions

◎ Parameter mask

- This function is able to hide unnecessary parameters to user environment or less frequently used parameters in parameter setting group. You can set this in the comprehensive device management program (DAQMaster).
- Though masked parameters are not displayed in parameter setting group, the parameter set values are applied. For more information, refer to the DAQMaster user manual.
- Visit our web site (www.autonics.com) to download the DAQMaster program and the user manual.

※E.g.)The above is masking auto tuning [AT], cooling proportional band [C-P], cooling integral time [C-I], cooling derivative time [C-d] parameters in parameter 2 group.

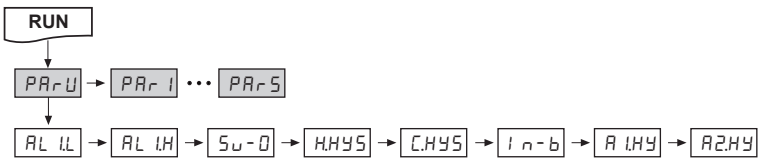


※This function is for new model.

◎ User parameter group [PArU] setting

- This function is able to set the frequently used parameters to the user parameter group. You can quickly and easily set parameter settings.
- User parameter group can have up to 30 parameters in the comprehensive device management program (DAQMaster). For more information, refer to the DAQMaster user manual.
- Visit our website (www.autonics.com) to download the DAQMaster program and the user manual.

※E.g.)The above is setting user parameter group in the DAQMaster with alarm output 1 low-limit value [AL 1.L], alarm output 1 high-limit value [AL 1.H], SV-0 set value [Su-0] parameter of parameter 1 group, heating hysteresis [H.HYS], cooling hysteresis [C.HYS] parameters of parameter 2 group, input correction [In-b] parameter of parameter 3 group, alarm output 1 hysteresis [A1.HY], alarm output 2 hysteresis [A2.HY] parameters of parameter 4 group.



※This function is for new model.

◎ Auto tuning [AT]

In PID control, auto-tuning determines the control subject's thermal characteristics and thermal response rate, and then determines the necessary PID time constant. Application of the PID time constant realizes fast response and high precision temperature control.

- Auto-tuning automatically stores PID time constants upon termination. These PID time constants can then be modified by the user to suit their usage environment.
- When auto-tuning is in progress, the AT indicator located on the front of the controller flashes in 1 second intervals. When auto-tuning finishes, the AT indicator automatically goes off and the auto-tuning parameter will return to OFF.

Set value	Descriptions
oFF	Auto tuning end
on	Auto tuning run

Setting group	Parameter	Setting range	Factory default	Unit
PAr2	AT	oFF/on	oFF	—

※Manual interruption or a sensor disconnection error when auto-tuning is in progress restores the PID time constant to the value used prior to the auto-tuning session.

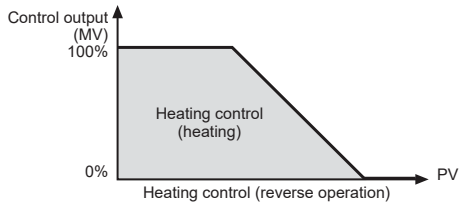
※Auto-tuning continues to run even if the temperature reading exceeds or falls below the input range.

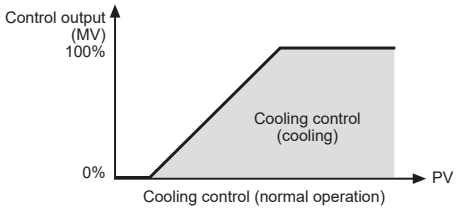
※When auto-turning is in progress, parameters can only be referenced and not altered.

※Auto-tuning is not available in manual control.

◎ Control output operation mode [o-Ft]

- Control output modes for general temperature control include heating, cooling, and heating and cooling.
- Heating control and cooling control are mutually opposing operations with inverse outputs.
- The PID time constant varies based on the controlled objects during PID control.





Setting group	Parameter	Setting range	Factory default	Unit
PAr3	o-Ft	Standard model HEAt/CooL	HEAt	—
		Heating & Cooling model HEAt/CooL/H-C	H-C	—

● Heating control [HEAt]

Heating control mode: the output will be provided in order to supply power to the load (heater) if PV (Present Value) falls below SV (Set value).

● Cooling control [CooL]

Cooling control mode: the output will be provided in order to supply power to the load (cooler) if PV (Present Value) rises above SV (Set value).

● Heating and cooling control [H-C]

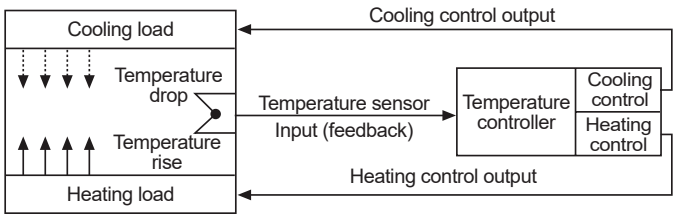
Heating and cooling control mode: heating and cooling with a single temperature controller when it is difficult to control subject temperature with only heating or cooling.

Heating and cooling control mode controls the object using different PID time constants for each heating and cooling.

It is also possible to set heating and cooling control in both PID control or ON/OFF control mode.

Heating/cooling output can be selected among Relay output, SSR drive output and current output depending on model types chosen according to your application environment.

(Note that only standard SSR control is available for SSR drive output in OUT2.)



※For heating and cooling control, OUT1 control output is dedicated to heating control and OUT2 control output to cooling control.

◎ Control output (OUT1/OUT2) selection [oUt1/oUt2]

- In case of selecting the Models with current control output, both current and SSR drive outputs are available. You can therefore choose the right output type depending on application environments.
  - OUT1: Selects OUT1 control output.
  - OUT2: Selects OUT2 control output.

Setting group	Parameter	Setting range	Factory default	Unit
PAr3	oUt1	SSr/CUrr	SSr	—
	oUt2			

◎ Communication output

It is for parameter setting and monitoring via external devices (PC, PLC, etc.).

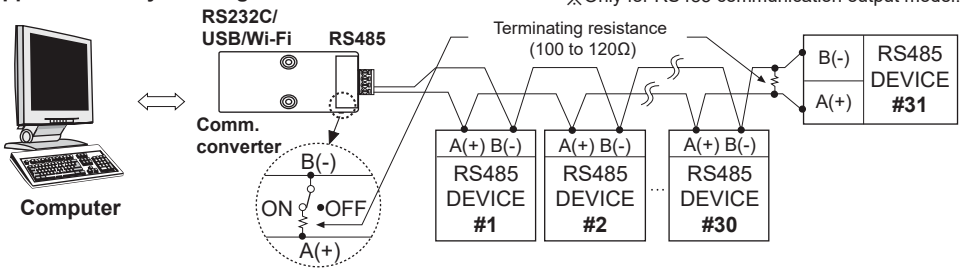
• Interface

Comm. protocol	Modbus RTU	Comm. speed	2400, 4800, 9600, 19200, 38400 bps
Connection type	RS485	Comm. response wait time	5 to 99 ms
Application standard	Compliance with EIA RS485	Start bit	1-bit (fixed)
Max. connection	31 units (address: 01 to 99)	Data bit	8-bit (fixed)
Synchronous method	Asynchronous	Parity bit	None, Odd, Even
Comm. method	Two-wire half duplex	Stop bit	1-bit, 2-bit
Comm. distance	Max. 800m		

※It is not allowed to set overlapping communication address at the same communication line.
Use twisted pair wire for RS485 communication.

• Application of system organization

※Only for RS485 communication output model.



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately), SCM-US (USB to Serial converter, sold separately).
Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

◎ For more information, refer to the user manual.

▣ Proper Usage

◎ Simple "Error" diagnosis

● When the load (heater etc) is not operated

Please check operation of the OUT indicator located in front panel of the unit.

If the OUT indicator does not operate, please check the parameter of all programmed mode.
If OUT indicator is operating, please check the output (Relay, SSR drive voltage) after separating output line from the unit.

● When it displays oPEn during operation

This is a warning that external sensor is open.
Please turn off the power and check the wire state of the sensor. If sensor is not open disconnect sensor line from the unit and short the input +, - terminal. Turn on the power of the unit and check the controller displays room temperature.

If this unit cannot display room temperature, this unit is broken. Please remove this unit and contact our service center. (When the input mode is thermocouple, it is available to display room temperature.)

● In case of indicating "Error" in display

This Error message is indicated in case of damaging inner chip program data by outer strong noise.

In this case, please send the unit to our after service center after removing the unit from system.

Noise protection is designed in this unit, but it does not stand up strong noise continuously. If bigger noise than specified (Max. 2kV) flows in the unit, it can be damaged.

◎ Cautions during use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Do not apply excessive power when connecting or disconnecting the connectors of the product.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- When changing the input sensor, turn off the power first before changing.
  After changing the input sensor, modify the value of the corresponding parameter.
- 24VAC, 24-48VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Do not overlapping communication line and power line.
  Use twisted pair wire for communication line and connect ferrite bead at each end of line to reduce the effect of external noise.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications') ②Altitude max. 2,000m
  ③Pollution degree 2 ④Installation category II

Dual PID Control Temperature Controller

▣ Features

- Dual PID auto tuning function:
  High-speed response of PID control to reach to the desired value fast, low-speed of response of PID control to minimize the overshoot even though response is a little bit slow.
- High display accuracy: ±0.3% (by F.S. value of each input)
- 2-step auto tuning control function
- Multi-input function
  (13 kinds of multi-input selection function):
  Temperature sensor, voltage and current selection function.
- Various sub output function:
  Includes in LBA, SBA, 7 kinds of alarm output and 4 kinds of alarm option function, PV transmission output (DC4-20mA), RS485 communication output
- Display the decimal point for analog input

Please read "Safety Considerations" in the instruction manual before using.

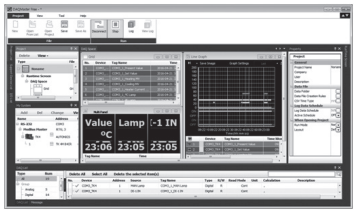
▣ Comprehensive Device Management Program (DAQMaster)

- DAQMaster is comprehensive device management program for convenient management of parameters and multiple device data monitoring.
- Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operating system	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB or more
Hard disk	More than 1GB of free hard disk space
VGA	1024×768 or higher resolution display
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



▣ Ordering Information

TZ 4 M — 1 4 R

Control output	R	Relay output
	S	SSR drive output
	C	Current output(DC4-20mA)
Power supply	4	100-240VAC 50/60Hz
Option output (TZ4SP/TZN4S)	1	Event 1 output
Option output (TZ4ST)	1	Event 1 output
	2	Event 1 + Event 2 output
	R	Event 1 + PV transmission output(DC4-20mA)
Option output (Others)	1	Event 1 output
	2	Event 1 + Event 2 output
	R	Event 1 + PV transmission output(DC4-20mA)
	A	Event 1 + Event 2 + PV transmission output(DC4-20mA)
	T	Event 1 + RS485 communication output
	B	Event 1 + Event 2 + RS485 communication output
Size (TZN4)	S	DIN W48×H48mm (terminal block type)
Size (TZ4)	SP	DIN W48×H48mm (plug type)※1
	ST	DIN W48×H48mm (terminal block type)
Size (TZ4/TZN4)	M	DIN W72×H72mm
	W	DIN W96×H48mm
	H	DIN W48×H96mm
	L	DIN W96×H96mm
Digit	4	9999 (4-digit)
Item	TZ	Temperature Controller
	TZN	Temperature Controller

※The unit cannot be configured with any random combination from the above ordering information.
Please refer to '▣ Specifications' for possible configurations.
※1: 11-pin sockets (PG-11, PS-11(N)) are sold separately.

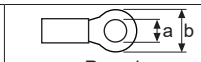
▣ Specifications

Series		TZ4SP TZN4S	TZ4ST	TZ4M TZN4M	TZ4W TZN4W	TZ4H TZN4H	TZ4L TZN4L
Power supply		100-240VAC～ 50/60Hz					
Allowable voltage range		90 to 110% of rated power voltage					
Power consumption		Max. 5VA (100-240VAC～ 50/60Hz)		Max. 6VA (100-240VAC～ 50/60Hz)			
Display method		7-segment LED (PV: red, SV: green)					
Character size (W×H)	PV	**TZ4SP:** 4.8×7.8mm **TZN4S:** 7.8×11.0mm	4.8×7.8mm	**TZ4M:** 9.8×14.2mm **TZN4M:** 8.0×13.0mm	8.0×10.0mm	**TZ4H:** 3.8×7.6mm **TZN4H:** 7.8×11.0mm	9.8×14.2mm
	SV	**TZ4SP:** 4.8×7.8mm **TZN4S:** 5.8×8.0mm		**TZ4M:** 8.0×10.0mm **TZN4M:** 5.0×9.0mm		**TZ4H:** 3.8×7.6mm **TZN4H:** 5.8×8.0mm	8.0×10.0mm
Input type	RTD	DPt100Ω, JPt100Ω, 3-wire (allowed resistance: max. 5Ω per line)					
	TC	K(CA), J(IC), R(PR), E(CR), T(CC), S(PR), N(NN), W(TT) (allowed resistance: max. 100Ω per line)					
	Analog	1-5VDC⎓, 0-10VDC⎓, DC4-20mA					
Display accuracy		F.S. ±0.3% or 3℃, greater value					
Control output	Relay	250VAC～ 3A, 30VDC⎓ 3A, 1c					
	SSR	Max. 12VDC⎓ ±3V 30mA					
	Current	DC4-20mA (load resistance max. 600Ω)					
Option output	EVENT1	250VAC～ 1A 1a					
	EVENT2	—	250VAC～ 1A 1a				
	PV transmission	—	DC4-20mA (load resistance max. 600Ω)				
	Communication	—		RS485 communication			
Control method		ON/OFF, P, PI, PD, PIDF, PIDS control					
Alarm output hysteresis		1 to 100℃ (0.1 to 100.0℃) variable					
Proportional band (P)		0.0 to 100.0%					
Integral time (I)		0 to 3,600 sec					
Derivative time (D)		0 to 3,600 sec					
Control period (T)		1 to 120 sec					
Sampling period		0.5 sec					
LBA setting		1 to 999 sec					
Ramp setting		Ramp Up, Ramp Down: 1 to 99 min each					
Dielectric strength		2,000VAC 50/60Hz for 1 min (between input and power terminals)					
Vibration	Mechanical	0.75mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours					
	Electrical	0.5mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min					
Relay life cycle	Control output	Mechanical: min. 10,000,000 operations, Electrical: min. 100,000 operations (250VAC 3A resistance load)					
	Option output	Mechanical: min. 20,000,000 operations, Electrical: min. 500,000 operations (250VAC 1A resistance load)					
Insulation resistance		Over 100MΩ (at 500VDC megger)					
Noise immunity		Square shaped noise by noise simulator (pulse width 1μs) ±2kV R-phase, S-phase					
Memory retention		Approx. 10 years (non-volatile semiconductor memory type)					
Environment	Ambient temp.	-10 to 50℃, storage: -20 to 60℃					
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH					
Approval		CE c UL us					
Weight※1		**TZ4SP:** approx. 205g (approx. 144g) **TZN4S:** approx. 226g (approx. 164g)	Approx. 218g (approx. 162g)	**TZ4M:** approx. 360g (approx. 228g) **TZN4M:** approx.355g (approx. 246g)	**TZ4W:** approx. 365g (approx. 246g) **TZN4W:** approx. 351g (approx. 232g)	**TZ4H:** approx. 365g (approx. 246g) **TZN4H:** approx. 351g (approx. 232g)	**TZ4L:** approx. 474g (approx. 304g) **TZN4L:** approx. 474g (approx. 303g)

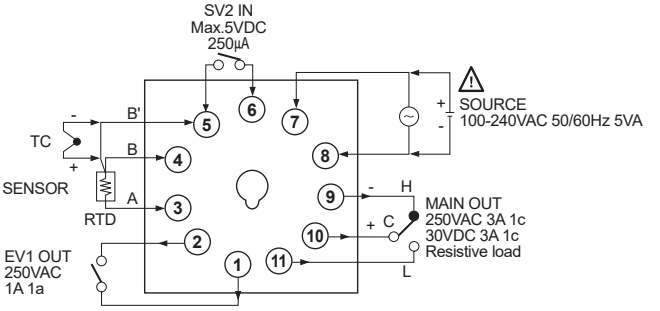
※1: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

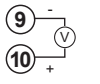
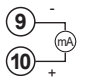
▣ Connections

※RTD: DPt100Ω (3-wire type), JPt100Ω (3-wire type)
※TC (Thermocouple): K(CA), J(IC), R(PR), E(CR), T(CC), S(PR), N(NN), W(TT)
※In case of analog input, please use TC (Thermocouple) terminal and be careful about polarity.
※Use teminals of size specified below.

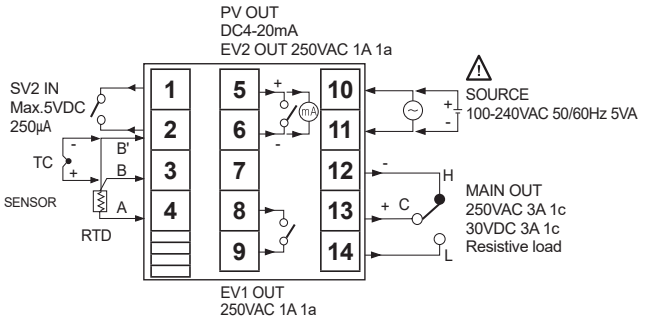
	 <Round>	 <Forked>
a	Min. 3.5mm	Min. 3.5mm
b	Max. 7.2mm	Max. 7.2mm

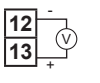
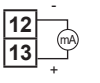
● TZ4SP



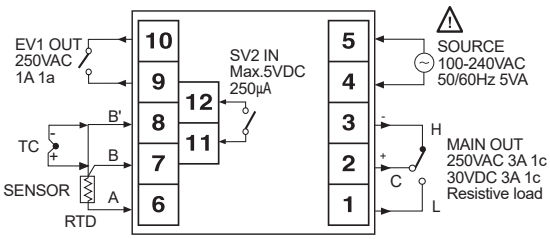
MAIN OUT	
SSR	Current
 12VDC ±3V 30mA Max.	 DC4-20mA Load 600Ω Max.

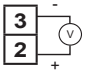
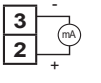
● TZ4ST



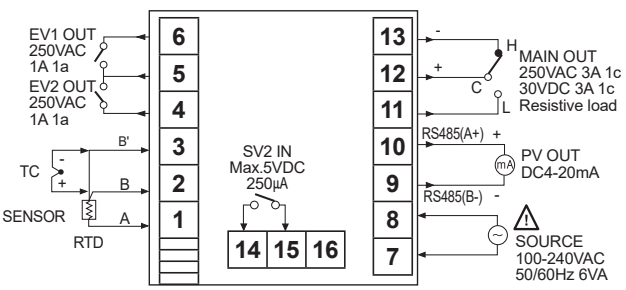
MAIN OUT	
SSR	Current
 12VDC ±3V 30mA Max.	 DC4-20mA Load 600Ω Max.

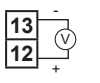
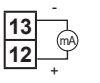
● TZN4S



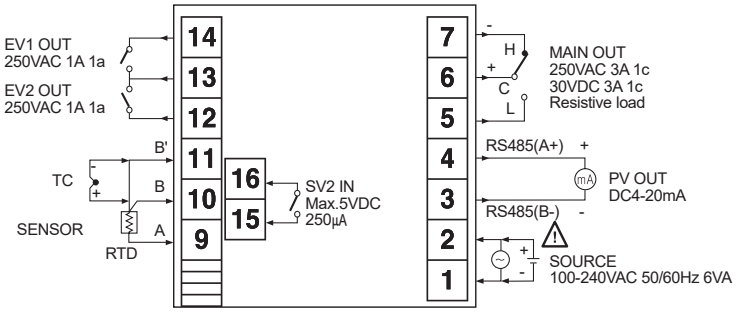
MAIN OUT	
SSR	Current
 12VDC ±3V 30mA Max.	 DC4-20mA Load 600Ω Max.

● TZ4M



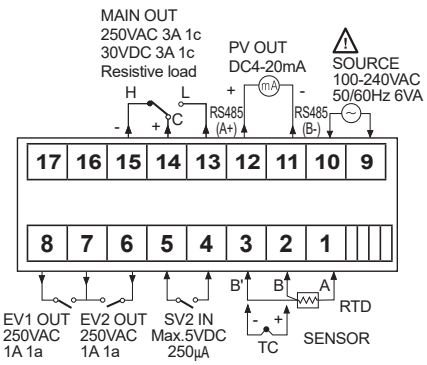
MAIN OUT	
SSR	Current
 12VDC ±3V 30mA Max.	 DC4-20mA Load 600Ω Max.

● TZN4M



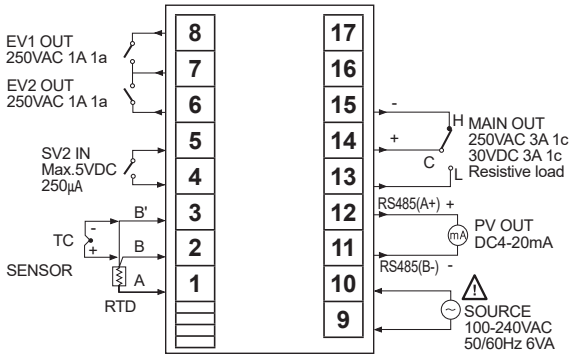
MAIN OUT	
SSR	Current
12VDC ±3V 30mA Max.	DC4-20mA Load 600Ω Max.

● TZ4W/TZN4W



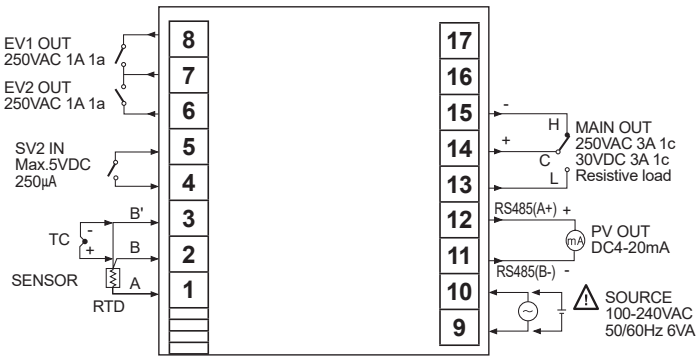
MAIN OUT	
SSR	Current
12VDC ±3V 30mA Max.	DC4-20mA Load 600Ω Max.

● TZ4H/TZN4H



MAIN OUT	
SSR	Current
12VDC ±3V 30mA Max.	DC4-20mA Load 600Ω Max.

● TZ4L/TZN4L

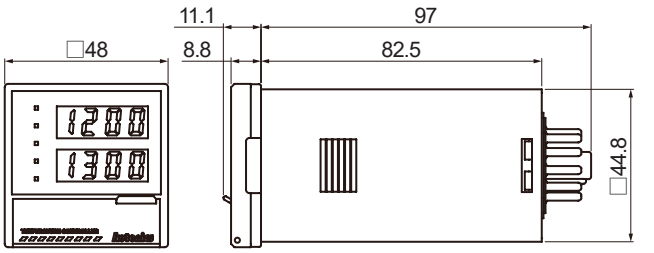


MAIN OUT	
SSR	Current
12VDC ±3V 30mA Max.	DC4-20mA Load 600Ω Max.

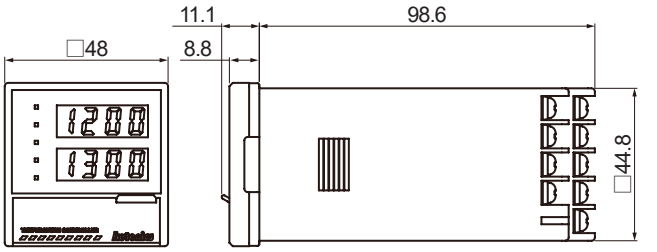
▣ Dimensions

(unit: mm)

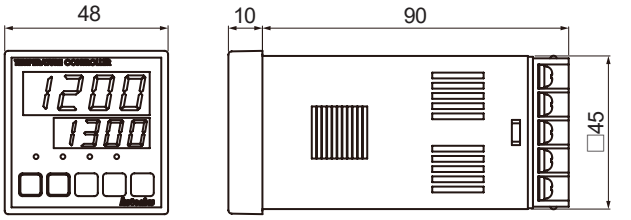
● **TZ4SP**



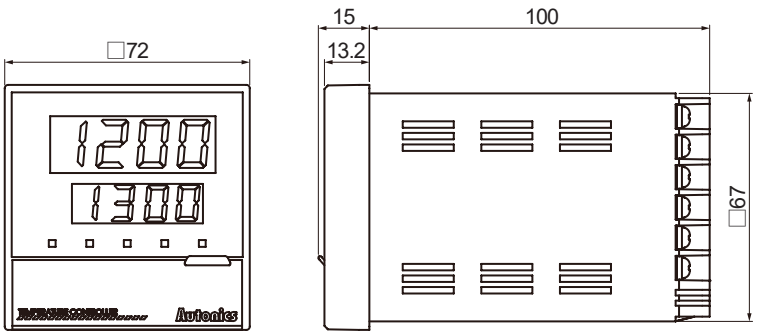
● **TZ4ST**



● **TZN4S**

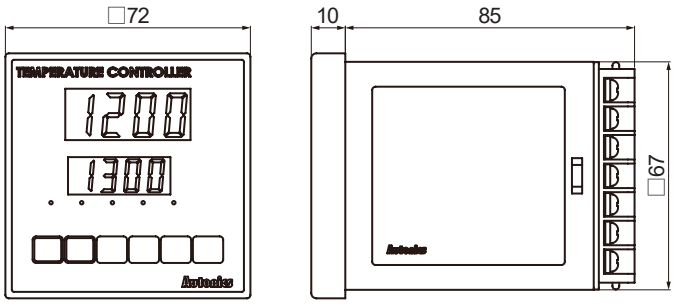


● **TZ4M**

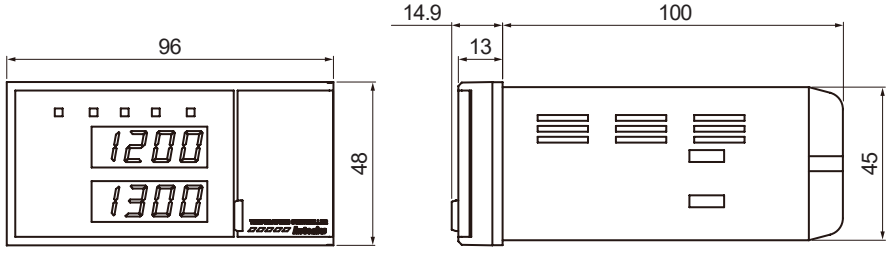


● **TZN4M**

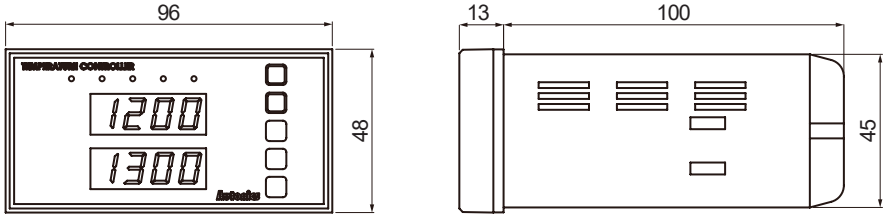
(unit: mm)



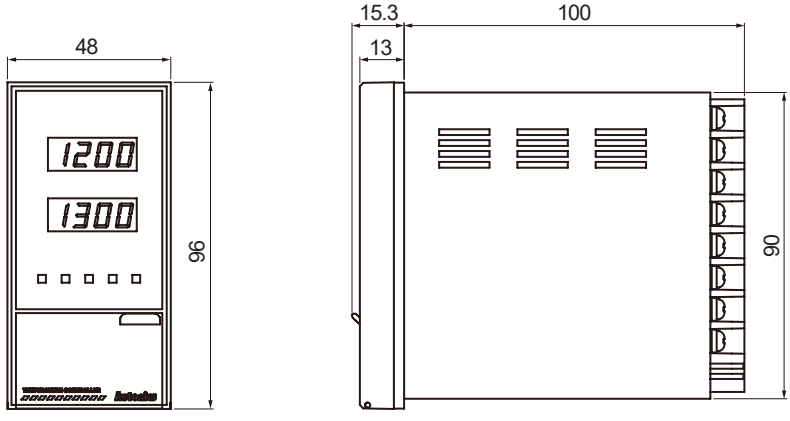
● **TZ4W**



● **TZN4W**



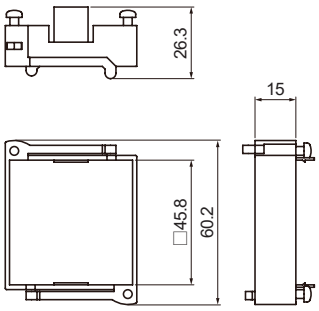
● **TZ4H**



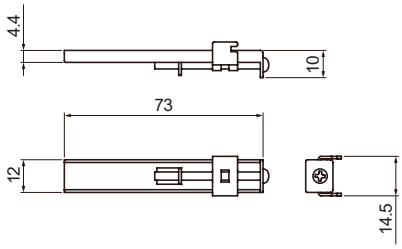
(unit: mm)

• Bracket

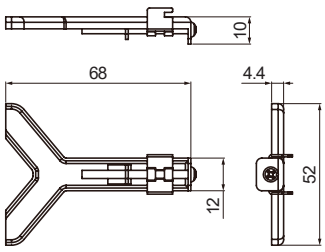
• TZ4ST, TZ4SP, TZN4S Series



• TZ4L, TZN4L, TZ4M, TZ4H, TZN4H, TZ4W, TZN4W Series



• TZN4M Series



▣ Sold Separately

◎ Communication converter

• SCM-WF48
(Wi-Fi to RS485·USB wireless communication converter)

• SCM-US48I
(USB to RS485 converter)

• SCM-38I
(RS232C to RS485 converter)

▣ Input Type and Range

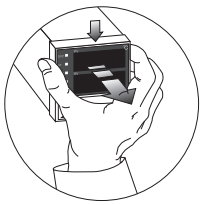
Input type		Decimal point	Display	Temperature range (℃)	Temperature range (℉)
Thermocouple	K(CA)	1	K CA.H	-100 to 1300	-148 to 2372
	K(CA)	0.1	K CA.L	-100.0 to 999.9	Not supported
	J(IC)	1	J I C.H	0 to 800	32 to 1472
	J(IC)	0.1	J I C.L	0.0 to 800.0	Not supported
	R(PR)	1	r Pr	0 to 1700	32 to 3092
	E(CR)	1	E Cr.H	0 to 800	32 to 1472
	E(CR)	0.1	E Cr.L	0.0 to 800.0	Not supported
	T(CC)	1	t CC.H	-200 to 400	-328 to 752
	T(CC)	0.1	t CC.L	-199.9 to 400.0	Not supported
	S(PR)	1	S Pr	0 to 1700	32 to 3092
	N(NN)	1	n nn	0 to 1300	32 to 2372
	W(TT)	1	U tt	0 to 2300	32 to 4172
RTD	JPt100Ω	1	JPt.H	0 to 500	32 to 932
	JPt100Ω	0.1	JPt.L	-199.9 to 199.9	-199.9 to 391.8
	DPt100Ω	1	dPt.H	0 to 500	32 to 932
	DPt100Ω	0.1	dPt.L	-199.9 to 199.9	-199.9 to 391.8
Analog	Voltage	0 - 10VDC	A--1	-1999 to 9999 (display range will vary depending on the decimal point.)	
		1 - 5VDC	A--2		
	Current	DC4 - 20mA	A--3		

▣ Configuring Input Type

Please configure the internal switches before supplying power. After supplying power, configure the input type [In-t] in parameter group 2 according to the input type.

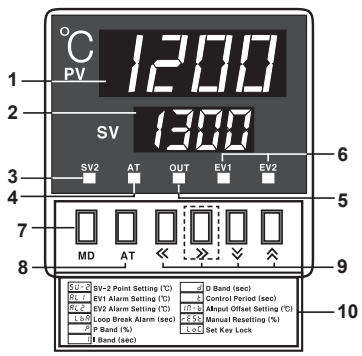
Input type		S/W 1	S/W 2
Thermocouple		 1 1	 mA V
RTD			
Analog	Voltage (0-10VDC, 1-5VDC)	 2 2	 mA V
	Current (DC4-20mA)	 2 2	 mA V

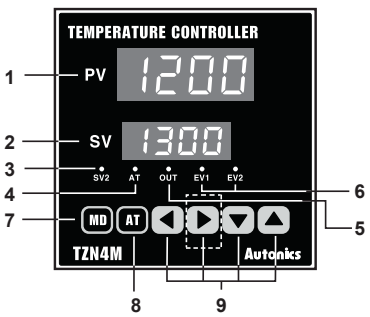
● Detaching the case



Press the front case then pull the case to detach the case from the body.
Configure the internal switches as input type.

▣ Unit Description





1. Present value (PV) display (red):
RUN mode: displays the current value (PV)
Setting mode: displays parameters

2. Set value (SV) display (green):
RUN mode: displays the set value (SV)
Setting mode: displays parameter setting values

3. SV2 operation indicator: turns ON when SV2 is operating

4. Auto-tuning indicator: turns ON when auto-tuning

5. Control output operation indicator: turns ON when control output is ON. Does not operate when the control output is current output.

6. Event output indicator: turns ON when the according event output is ON.
※The Event 2 output indicator does not operate in TZ4SP.

7. Mode key: enter parameter group, return to RUN mode, switch parameters, save setting values

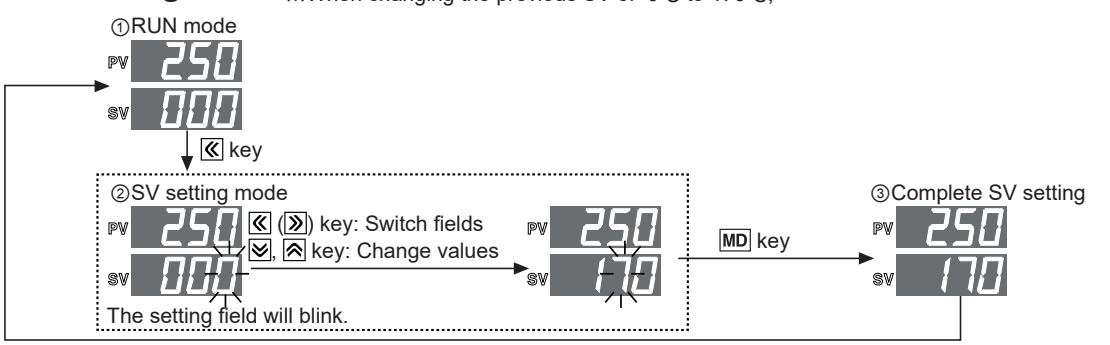
8. Auto-tuning key: hold the key for 3 sec to start auto-tuning. Hold the key for 5 sec while auto-tuning to stop auto-tuning.

9. Setting keys: enter SV change mode, switch fields, change value
(» key in the dotted line is only available in TZ4M and TZ4L models)

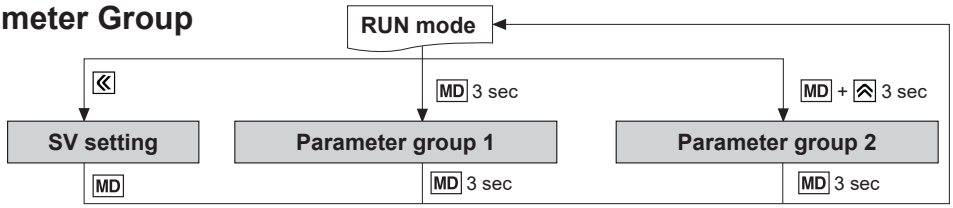
10. Key adjustment order chart

▣ SV Setting

※When changing the previous SV of 0℃ to 170℃,



▣ Parameter Group



※Parameter setting order **Parameter group 2** → **Parameter group 1** → **SV setting**

The parameters are related to each other. Please set the parameters in the order above.

※When there is no key input for 60 sec while in SV setting mode or parameter groups, the unit will return to RUN mode automatically.

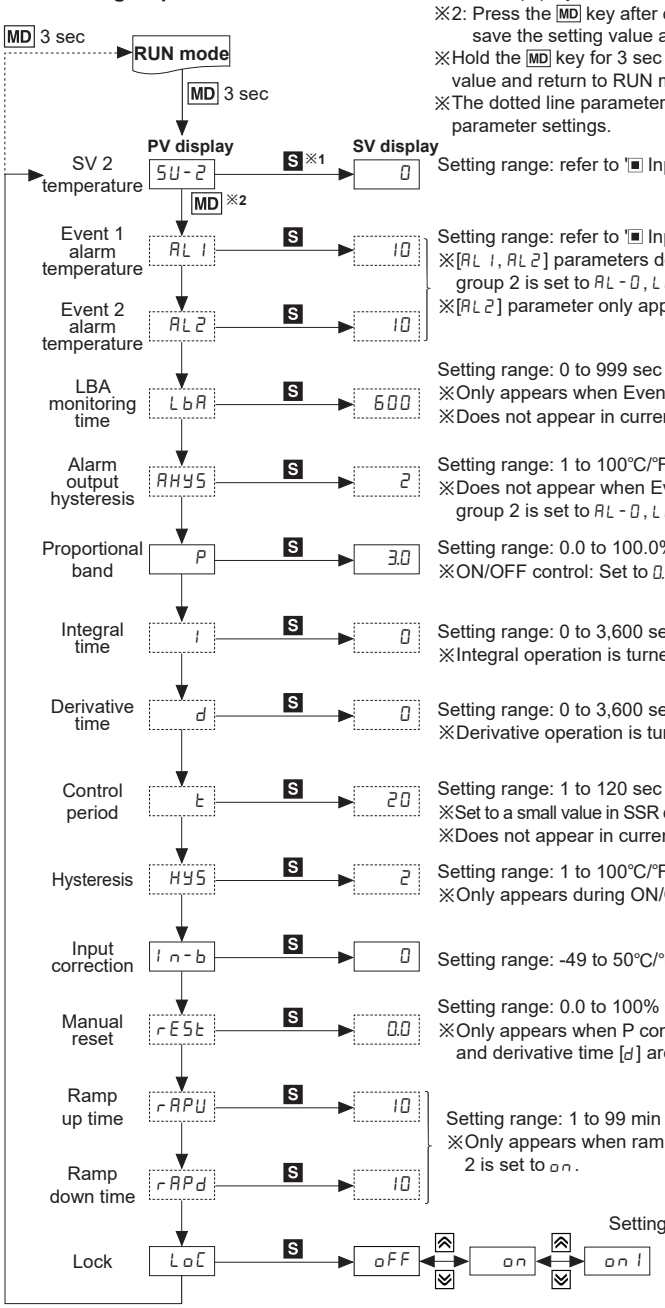
● Parameter group 1

※1: S: ((»))key-Switch fields, ⩒, ⩓ key-Change values

※2: Press the MD key after checking or changing the values in parameter settings to save the setting value and move to the next parameter.

※Hold the MD key for 3 sec anytime during parameter settings to save the setting value and return to RUN mode.

※The dotted line parameters ⋯ may not appear depending on the model or other parameter settings.



Setting range: refer to '▣ Input Type and Range'.

Setting range: refer to '▣ Input Type and Range'.
※[AL 1, AL2] parameters do not appear when Event 1/2 [EU-1, EU-2] of parameter group 2 is set to AL-0, LbA, SbA.
※[AL2] parameter only appears in models that support Event 2 output.

Setting range: 0 to 999 sec
※Only appears when Event1/2 [EU-1, EU-2] of parameter group 2 is set to LbA.
※Does not appear in current output models.

Setting range: 1 to 100℃/℉ (0.1 to 100.0℃/℉)
※Does not appear when Event 1/2 [EU-1, EU-2] of parameter group 2 is set to AL-0, LbA, SbA.

Setting range: 0.0 to 100.0%
※ON/OFF control: Set to 0.0, PID control: Set to over 0.0

Setting range: 0 to 3,600 sec
※Integral operation is turned OFF when set to 0.

Setting range: 0 to 3,600 sec
※Derivative operation is turned OFF when set to 0.

Setting range: 1 to 120 sec
※Set to a small value in SSR drive output models. (e.g. 2 sec)
※Does not appear in current output models.

※Only appears during PID control (proportional band [P] set to over 0.0).

Setting range: 1 to 100℃/℉ (0.1 to 100.0℃/℉)
※Only appears during ON/OFF control (proportional band [P] set to 0.0).

Setting range: -49 to 50℃/℉ (-50.0 to 50.0℃/℉)

Setting range: 0.0 to 100%
※Only appears when P control (proportional band [P] set to over 0.0, integral time [I], and derivative time [d] are set to 0)

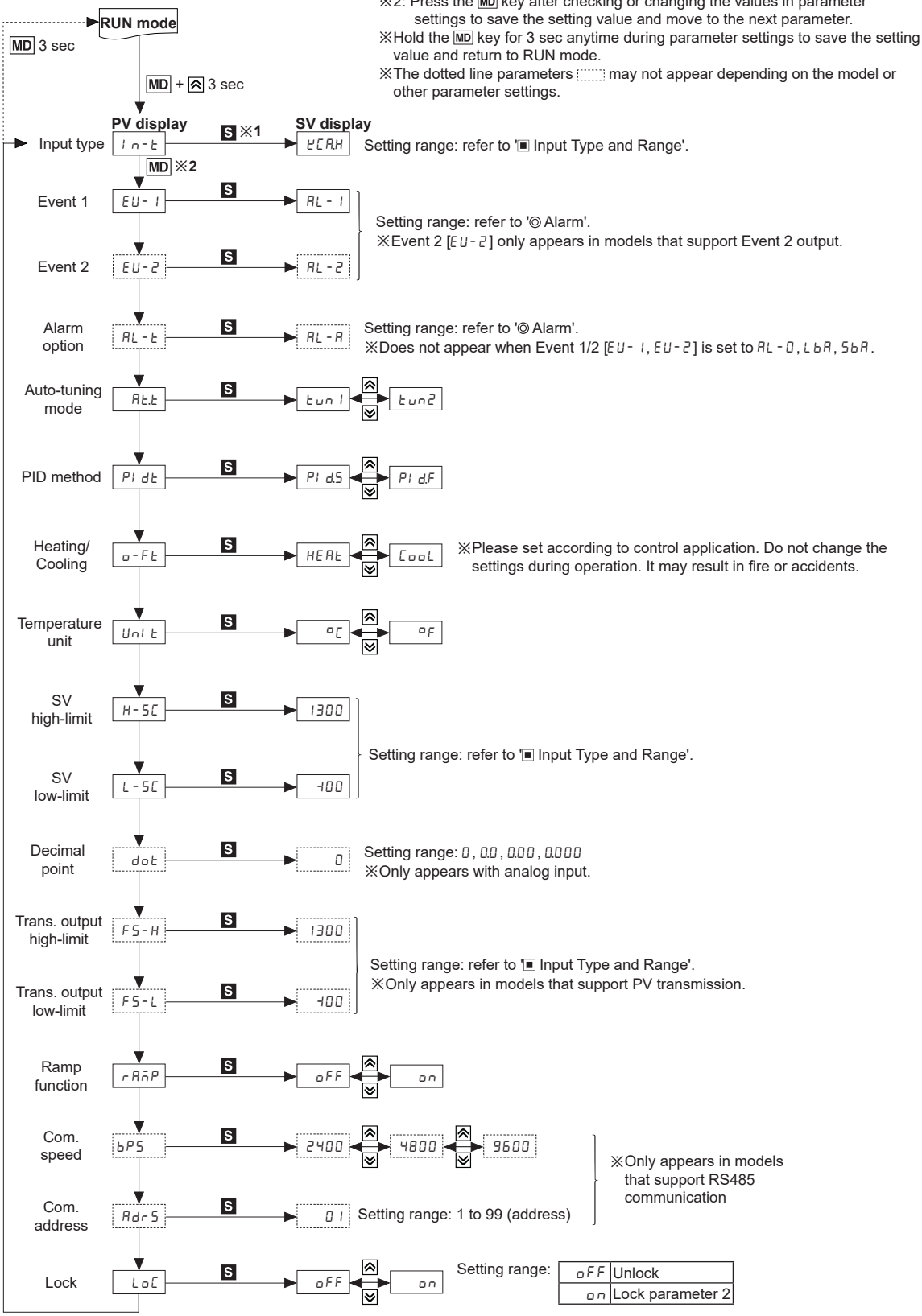
Setting range: 1 to 99 min
※Only appears when ramp function [rAnP] of parameter group 2 is set to on.

Setting range:

oFF	Unlock
on	Lock parameter 1 (AT key available)
on1	Lock parameter 1 (AT key unavailable)

● Parameter group 2

※1: S: ◁ (▷)key-Switch fields, ▽, △ key-Change values
※2: Press the MD key after checking or changing the values in parameter settings to save the setting value and move to the next parameter.
※Hold the MD key for 3 sec anytime during parameter settings to save the setting value and return to RUN mode.
※The dotted line parameters ⋯ may not appear depending on the model or other parameter settings.



▣ Factory Defaults

• Parameter group 1

Parameter	Default	Parameter	Default	Parameter	Default
SV-2	0	P	30	In-b	0
AL 1	10	I	0	rESt	0.0
AL2	10	d	0	rAPU	10
LbA	600	t	20	rAPd	10
AHYS	2	HYS	2	LoC	oFF

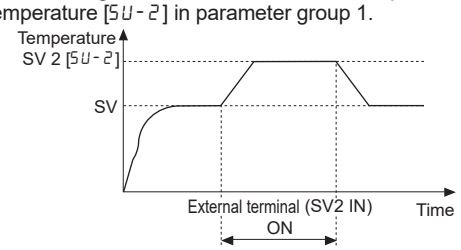
• Parameter group 2

Parameter	Default	Parameter	Default	Parameter	Default
In-t	tCAH	o-Ft	HEAt	FS-L	400
EU-1	AL-1	Unit	°C	rAñP	oFF
EU-2	AL-2	H-SC	1300	bPS	2400
AL-t	AL-A	L-SC	400	Adr5	01
Att	tun1	dot	0	LoC	oFF
PIdt	PId5	FS-H	1300		

▣ Functions

◎ SV 2 temperature

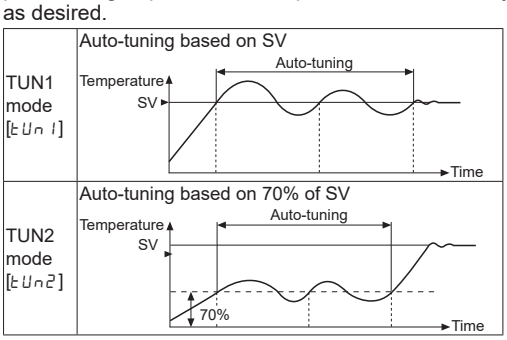
You can control an additional temperature value at a desired range by using SV2. Connect a contact signal (under 5VDC, 250μA) at the external terminal, to operate in the range where the signal turns ON. Set the SV2 temperature in SV2 temperature [SU-2] in parameter group 1.



E.g.)The internal temperature of an electric oven may drop rapidly if the door is opened while the oven is maintaining a specific temperature. Set SV2 temperature [SU-2] to a higher value than SV, and input a signal to the external terminal (SV2 IN), to quickly raise the temperature.

◎ Auto-tuning

Auto-tuning allows the temperature controller to detect the thermal characteristics and response rates of the control target. It then calculates the PID time constant and sets the value to allow fast response rates and high accuracy. Hold the AT key for 3 sec during RUN mode to start auto-tuning. The auto-tuning indicator will blink. When auto-tuning is completed, the auto-tuning indicator will durn off and the PID time constant will be saved to each parameter of parameter group 1. The saved parameters can be adjusted as desired.



To manually stop auto-tuning, hold the AT key for 5 sec. When auto-tuning is stopped, the controller maintains the PID value before auto-tuning. TZ Series supports 2 auto-tuning modes.

Select TUN1 mode or TUN2 mode [tUn1, tUn2] from auto-tuning mode [Att] of parameter group 2.

※Run auto-tuning during initial setup of the temperature controller.

※If the thermal characteristics of the control target device has changed after extended usage, re-run auto-tuning.

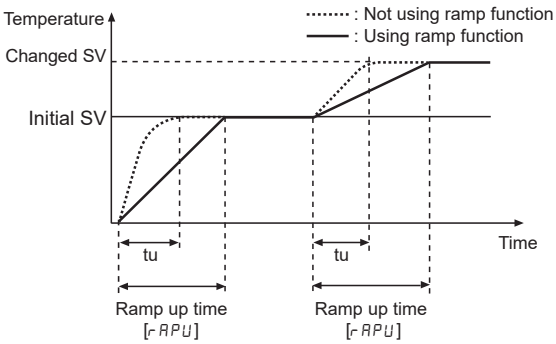
◎ Ramp

The ramp function can delay the rate of temperature rise/fall. If the SV value is changed during stabilized control, the temperature of the controlled target will rise/fall during ramp up/down time [rAPU, rAPd] of parameter group 1. The ramp function activates when the power is reset or when the SV value is changed during stable control.

※The ramp up/down time [rAPU, rAPd] appear only when the ramp function [rAñP] of parameter group 2 is set to on.

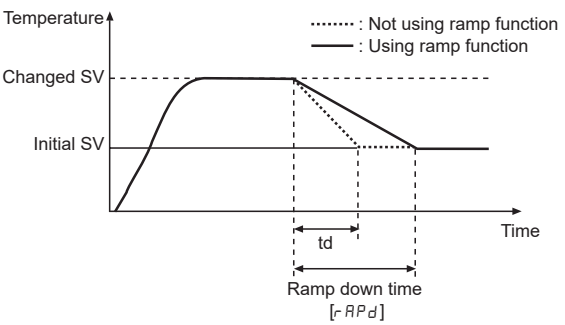
●RAMP up time[rAPU]

When delaying the rise of initial control temperature or changing the SV during stable control, you can delay temperature rise. Set the ramp up time [rAPU] longer than the temperature rise time (tu) when not using the ramp function.



●Ramp down time [rAPd]

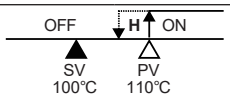
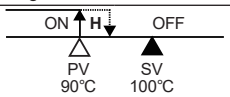
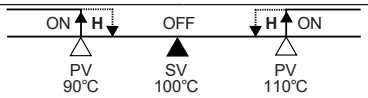
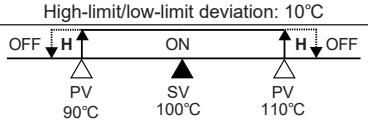
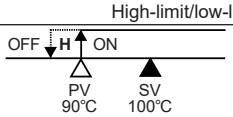
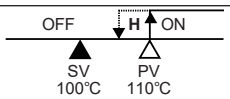
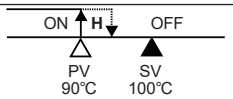
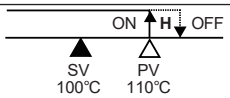
Delays declining temperature. Set the ramp down time [rAPd] longer than the temperature decline time (td) when not using the ramp function.



◎ Alarm (event)

Alarm output can be configured by combining alarm operation and alarm options. Set the alarm operation in event 1/2 [EU1, EU2] of parameter group 2, and set the alarm options in alarm option [AL-t].

1) Alarm operation

Mode	Name	Alarm operation	Description
AL-0	—	—	Alarm output not used.
AL-1	Deviation high-limit alarm	 High-limit deviation: 10℃	If the deviation of PV and SV are higher than the high-limit deviation, the alarm output turns ON.
AL-2	Deviation low-limit alarm	 Low-limit deviation: 10℃	If the deviation of PV and SV are higher than the low-limit deviation, the alarm output turns ON.
AL-3	Deviation high-limit /low-limit alarm	 High-limit/low-limit deviation: 10℃	If the deviation of PV and SV are higher than the high-limit deviation or low-limit deviation, the alarm output turns ON.
AL-4	Deviation high-limit /low-limit reverse alarm	 High-limit/low-limit deviation: 10℃	If the deviation of PV and SV are higher than the high-limit deviation or low-limit deviation, the alarm output turns OFF.
AL-5	Absolute value high-limit alarm	 Absolute value alarm: 90℃  Absolute value alarm: 110℃	Alarm output turns ON when PV is higher than the absolute value.
AL-6	Absolute value low-limit alarm	 Absolute value alarm: 90℃  Absolute value alarm: 110℃	Alarm output turns ON when PV is lower than the absolute value.
SbA	Sensor break	—	Alarm output turns ON when sensor disconnection is detected.
LbA	Loop break	—	Alarm output turns ON when loop break is detected.

※ H: Alarm output hysteresis[AHYS]

2) Alarm options

Mode	Name	Description
AL-A	Standard alarm	Alarm output turns ON upon alarm condition, and alarm output turns OFF when condition is cleared.
AL-b	Alarm latch	Alarm output turns ON and maintains ON upon alarm condition.
AL-C	Standby sequence	The first alarm condition is ignored. It will operate as standard alarm from the second alarm condition. If it is under alarm condition when power is supplied, it will ignore the condition and operate as standard alarm from the next alarm condition.
AL-d	Alarm latch and standby sequence	It will operate as both alarm latch and standby sequence upon alarm condition. If it is under alarm condition when power is supplied, it will ignore the condition and operate as alarm latch from the next alarm condition.

3) Sensor break alarm

Alarm output turns ON when sensor is not connected or loses its connection during temperature control. Sensor disconnection can be tested by connecting buzzers or other devices to the alarm output contact. Sensor break alarm output operates through EV1 OUT or EV2 OUT contacts. Alarm output is disengaged after resetting the power.

4) Loop break Alarm (LBA)

Diagnose control loop and transmit alarm output through temperature change of control target. During heating(cooling) control, the alarm output turns ON if the PV does not rise/drop by a specific amount (approx. 2℃) during LBA monitoring period [LbA] while control output amount is at 100%(0%).

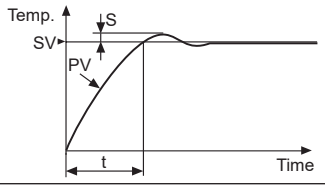
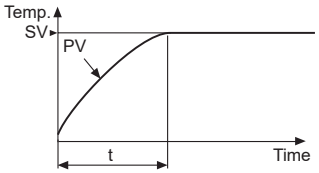
※If the thermal response of the control target is slow, the LBA monitoring period [LbA] of parameter group 1 should be set longer.

※LBA only operates when the control output amount is 100%(0%) so it cannot be used in current output models.

※If the alarm output turns ON after the sensor has been disconnected, the alarm output will not turn OFF even after reconnecting the sensor. To disengage the alarm output, the temperature controller power must be reset.

◎ Dual PID control

The response rate of the PID control can be selected depending on the characteristics of the control target. Select high-speed response mode or low-speed response mode [Pi dF , Pi dS] from PID method [Pi dt] of parameter group 2.

High-speed response mode [Pi dF]	
	Used to minimize the time (t) required to reach the SV. Overshoot (S) occurs. Used in machinery that may require warming up. (injection molding machine, electric furnace, etc.)
Low-speed response [Pi dS]	
	Used to minimize overshoot (S). Time (t) required to reach SV may be slower. Used for machinery or environments where overshoot may cause explosion or fire. (oil temperature control, metal plating machinery, etc.)

◎ Input correction [in-b]

Used to correct deviation from external devices such as temperature controllers.

E.g.)If the actual temperature is 80℃ but the display value is 78℃, set the input correction [in-b] value to 2 and it will display 80℃ as the display value.

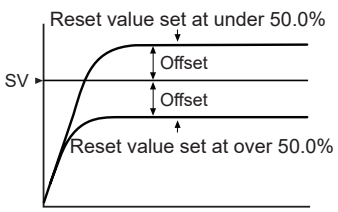
◎ Manual reset [rESt]

When using proportional control (P control), the time of temperature rising time and falling time may differ depending on factors such as the heat capacity of the control device or the heater. A certain amount of deviation occurs even under stable conditions.

This deviation is referred to as offset, and can be configured/corrected using manual reset [rESt].

When PV and SV are equal, the reset value is 50.0%. If the PV is lower than the SV during stable control, set the value to over 50.0%, and if the PV is higher than the SV, set the value to under 50.0%

• Configuring manual reset [rESt] according to control results.



▣ RS485 Communication

Applicable for models that support RS485 communication. Please refer to '▣ Ordering Information'.

It is used to transmit PV or SV, and/or set the SV.

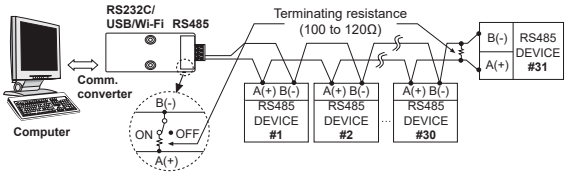
◎ Interface

Protocol	BCC
Applied standard	EIA RS485
Max. connections	31 units (address: 1 to 99)
Communication method	2-wire half duplex
Synchronization method	Asynchronous
Communication distance	Within 1.2km
Communication speed	2400, 4800, 9600bps
Start bit	1-bit fixed
Data bit	8-bit fixed
Parity bit	None
Stop bit	1-bit fixed

※It is not allowed to set overlapping communication address at the same communication line. Use twisted pair wire for RS485 communication.

◎ Application of system organization

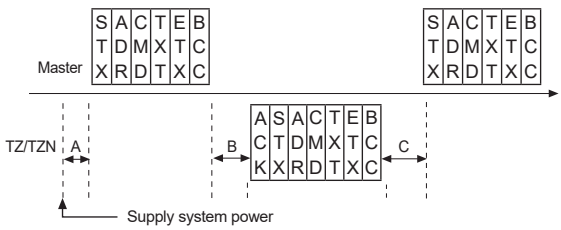
※Only for RS485 communication output model.



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately).
Please use twisted pair wire for RS485 communication.

◎ Communication control ordering

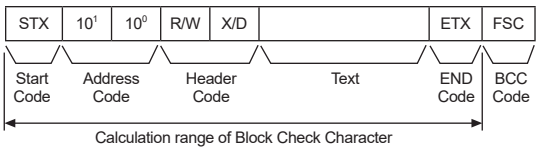
1. The communication control ordering of TZ/TZN Series is exclusive protocol.
2. After 4 sec being supplied the power into master system, then able to start communicating.
3. Initial communication will be started by master system. When Command signal comes out from master system then TZ/TZN Series will respond.



※A → Over min. 4 sec, B → Within max. 300ms, C → Over min. 20ms

◎ Communication command and block

Format of command and response



① Start code
It indicates the first of Block STX → [02H],
in case of response, ACK will be added.

② Address code
This code is master system can discern TZ/TZN Series and able to set within range of 01 to 99. (BCD ASCII)

③ Header code
It indicates command as 2 alphabets as below.
RX (Read request) → R [52H], X [58H]
RD (Read response) → R [52H], D [44H]
WX (Write request) → W [57H], R [58H]
WD (Write response) → W [57H], D [44H]

④ Text: It indicates the detail contents of command/ response. (see command)

⑤ END code: It indicates the end of Block. ETX → [03H]

⑥ BCC: It indicates XOR operating value from the first to ETX of the protocol as abbreviation of TZ/TZN.

◎ Communication command

● Read [RX] of measurement/setting value: address 01, command RX

1.Command (master)

① Command

STX	0	1	R	X	P	0	ETX	FSC
Start	Address		Command head		P:Process value S:Setting value		End	BCC

② Application: address (01), header code (RX), process value (P)

STX	0	1	R	X	P	0	ETX	FSC
02	30	31	52	58	50	30	03	BCC

● Write [WX] of setting value: address 01, command WX

1.Command (master)

① Command

STX	0	1	W	X	S	0	Symbol	10^3	10^2	10^1	10^0	ETX	FSC
Start	Address		Command head		S:Setting value		Space/-	10^3	10^2	10^1	10^0	End	BCC

② Application: In case of writing address (01), heading coad (WX), setting value (S) +123.

STX	0	1	W	X	S	0	Symbol	10^3	10^2	10^1	10^0	ETX	FSC
02	30	31	57	58	53	30	20	30	31	32	33	03	BCC

◎ Response

● Read of process/Setting value

1. In case of receiving normal process value:
The data is transmitted adding ACK [60H].
(In case process value is +123.4)

ACK	STX	0	1	R	D	P	0	Symbol	10^3	10^2	10^1	10^0	Decimal point	ETX	FSC	NULL
ACK	STX	0	1	R	D	P	0	Space	1	2	3	4	1	ETX	BCC	NULL
06	02	30	31	52	44	50	30	20	31	32	33	34	31	03	BCC	00

2. In case process value is -100

ACK	STX	0	1	R	D	P	0	—	0	1	0	0	0	ETX	BCC	NULL
06	02	30	31	52	44	50	30	2D	30	31	30	30	30	03	BCC	00

※It is responded with 1 byte sized NULL (00H) at the end of response frame (next BCC 16).

● Write of setting value

In case setting value is -100

ACK	STX	0	1	W	D	S	0	Symbol	10^3	10^2	10^1	10^0	ETX	FSC
ACK	STX	0	1	W	D	S	0	—	0	1	0	0	ETX	BCC
06	02	30	31	57	44	53	30	2D	30	31	30	30	03	BCC

● Others: In case of no response of ACK

① When the address is not the same after receiving STX.
② When receiving buffer overflow is occurred.
③ When the baud rate or others communication setting value are not the same.

● When there are no ACK response

① Check the status of lines
② Check the communication condition (setting value)
③ When assuming the problem is due to noise, try to operate communication 3 times more until recovery.
④ When occurred communication failure frequently, please adjust the communicating speed.

▣ Error Display

Display	Description	Troubleshooting
oPEn	Blinks when input is disconnected.	Check input status.
HHHH	Blinks when the measured input value is higher than the temperature range.	Adjust the value to within the temperature range.
LLLL	Blinks when the measured input value is lower than the temperature range.	

▣ Proper Usage

◎ Troubleshooting

Symptoms	Troubleshooting
oPEn is displayed on the PV display during operation	Disconnect the power and check the input connection. If the input is connected, disconnect the input wiring from the temperature controller and short the + and - terminals. Power the temperature controller and check if it displays the room temperature. If it does not display the room temperature and continues to display oPEn, the controller is broken. Please contact our technical support. (Input type is thermocouple)
Load (heater, etc.) does not operate during operation	Check the state of the control output indicator on the front panel. If the indicator is not working, check parameter settings. If the indicator is working, disconnect the wiring from the output terminal of the temperature controller and check the output (replay contact, SSR drive, current).
Err0 (error) is displayed on the PV display during operation	Indicates damage to internal chip by strong noise (2kVAC). Please contact our technical support. Locate the source of the noise and devise countermeasures.

◎ Cautions during use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- When changing the input sensor, turn off the power first before changing.
  After changing the input sensor, specify internal switch and modify the value of the corresponding parameter.
- Do not overlapping communication line and power line.
  Use twisted pair wire for communication line and connect ferrite bead at each end of line to reduce the effect of external noise.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Dual Display, PID Control Temperature Controller

▣ Features

- Realizes ideal temp. controlling with newly developed PID control algorithm and 100ms high speed sampling
- **Built-in relay output or SSR drive output selectable : Enables to phase control and cycle control with SSR drive output (SSRP function)**
- Dramatically increased visibility using wide display part
- Enhanced convenience of wiring and maintenance by connector plug type (TCN4S-□-P)
- Mounting space saving with compact design : Approx. 38% reduced size compared with existing model (depth-based)

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

T CN 4 S — 2 4 R — P

Wiring method	No-mark	Bolt wiring method
	P	Connector plug connection method※1
Control output	R	Relay contact output+SSR drive output※2
Power supply	2	24VAC 50/60Hz, 24-48VDC
	4	100-240VAC 50/60Hz
Auxiliary output	2	Alarm1+Alarm2 output
Size	S	DIN W48×H48mm
	M	DIN W72×H72mm
	H	DIN W48×H96mm
	L	DIN W96×H96mm
Digit	4	9999 (4-digit)
Setting type	CN	Dual display type, set by touch switch
Item	T	Temperature controller

※**1:** Only for TCN4S model.
※**2:** In case of the AC voltage model, SSR drive output method (standard ON/OFF control, cycle control, phase control) is available to select.

▣ Specifications

Series		TCN4S	TCN4M	TCN4H	TCN4L
Power supply	AC power	100-240VAC∼ 50/60Hz			
	AC/DC power	24VAC∼ 50/60Hz, 24-48VDC⎓			
Allowable voltage range		90 to 110% of rated voltage			
Power consumption	AC power	Max. 5VA (100-240VAC 50/60Hz)			
	AC/DC power	Max. 5VA (24VAC 50/60Hz), max. 3W (24-48VDC)			
Display method		7-segment (PV: red, SV: green), Other display (green, red) LED			
Character size	PV (W×H)	7.0×15.0mm	9.5×20.0mm	7.0×14.6mm	11.0×22.0mm
	SV (W×H)	5.0×9.5mm	7.5×15.0mm	6.0×12.0mm	7.0×14.0mm
Input type	RTD	DPt100Ω, Cu50Ω (allowable line resistance max. 5Ω per a wire)			
	Thermocouple	K(CA), J(IC), L(IC), T(CC), R(PR), S(PR)			
Display accuracy※1	RTD	• At room temperature (23℃ ±5℃): (PV ±0.5% or ±1℃, select the higher one) ±1-digit • Out of room temperature range: (PV ±0.5% or ±2℃, select the higher one) ±1-digit For TCN4S-□-P, add ±1℃ by accuracy standard.			
	Thermocouple				
Control output	Relay	250VAC∼ 3A, 30VDC⎓ 3A, 1a			
	SSR	12VDC⎓ ±2V 20mA Max.			
Alarm output		AL1, AL2 Relay output: 250VAC 1A 1a			
Control method		ON/OFF control, P, PI, PD, PID control			
Hysteresis		1 to 100℃/℉ (0.1 to 50.0℃/℉) variable			
Proportional band (P)		0.1 to 999.9℃/℉			
Integral time (I)		0 to 9999 sec			
Derivative time (D)		0 to 9999 sec			
Control period (T)		0.5 to 120.0 sec			
Manual reset		0.0 to 100.0%			
Sampling period		100ms			

※1: ◎ At room temperature (23℃ ±5℃)
- Thermocouple R (PR), S (PR), below 200℃: (PV ±0.5% or ±3℃, select the higher one) ±1-digit
- Thermocouple R (PR), S (PR), over 200℃: (PV ±0.5% or ±2℃, select the higher one) ±1-digit
- Thermocouple L (IC), RTD Cu50Ω: (PV ±0.5% or ±2℃, select the higher one) ±1-digit

◎ Out of room temperature range
- Thermocouple R (PR), S (PR), below 200℃: (PV ±1.0% or ±6℃, select the higher one) ±1-digit
- Thermocouple R (PR), S (PR), over 200℃: (PV ±0.5% or ±5℃, select the higher one ±1-digit
- Thermocouple L (IC), RTD Cu50Ω: (PV ±0.5% or ±3℃, select the higher one) ±1-digit

For TCN4S-□-P, add ±1℃ by accuracy standard.

▣ Specifications

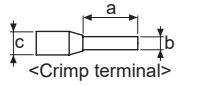
Series		TCN4S	TCN4M	TCN4H	TCN4L
Dielectric strength	AC Power	2,000VAC 50/60Hz for 1 min (between input terminal and power terminal)			
	AC/DC power	1,000VAC 50/60Hz for 1 min (between input terminal and power terminal)			
Vibration		0.75mm amplitude at frequency of 5 to 55Hz in each X, Y, Z direction for 2 hours			
Relay life cycle	Mechanical	OUT: over 5,000,000 times, AL1/2: Over 5,000,000 times			
	Electrical	OUT: over 200,000 times (250VAC 3A resistive load) AL1/2: over 300,000 times (250VAC 1A resistive load)			
Insulation resistance		Over 100MΩ (at 500VDC megger)			
Noise immunity		±2kV R-phase, S-phase the square wave noise (pulse width: 1us) by the noise simulator			
Memory retention		Approx. 10 years (when using non-volatile semiconductor memory type)			
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃			
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH			
Insulation type		Double insulation or reinforced insulation (mark: ⊡, dielectric strength between the measuring input part and the power part: AC power 2kV, AC/DC Power 1kV)			
Approval		CE c UL us			
Weight※2		Approx. 147g (approx. 100g)	Approx. 203g (approx. 133g)	Approx. 194g (approx. 124g)	Approx. 275g (approx. 179g)

※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Connections

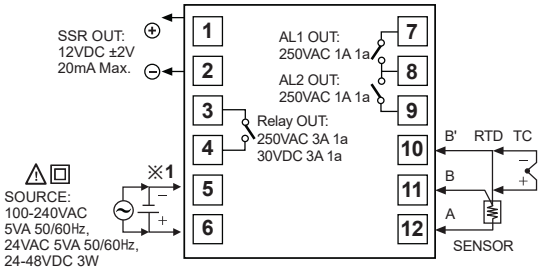
※TCN4 Series has selectable control output; Relay output, and SSR drive output. AC/DC voltage type does not have SSRP function.
※Use crimp terminals or teminals of size specified below. (unit: mm)

	<Round>	<Forked>
a	Min. 3.0	Min. 3.0
b	Max. 5.8	Max. 5.8

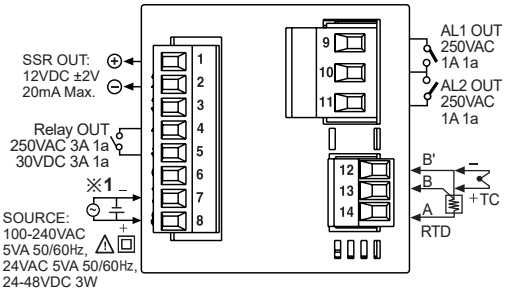


Terminal number	a	b	c
1 to 8	6	Max. 1.7	Max. 3.7
9 to 11	6 to 8	Max. 2.1	Max. 4.2
12 to 14	6 to 8	Max. 1.5	Max. 3.5

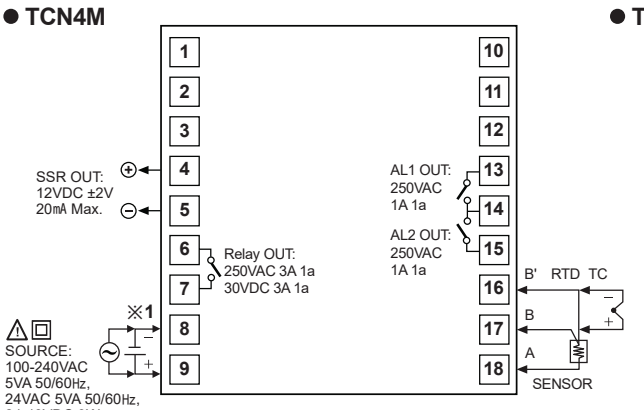
● TCN4S



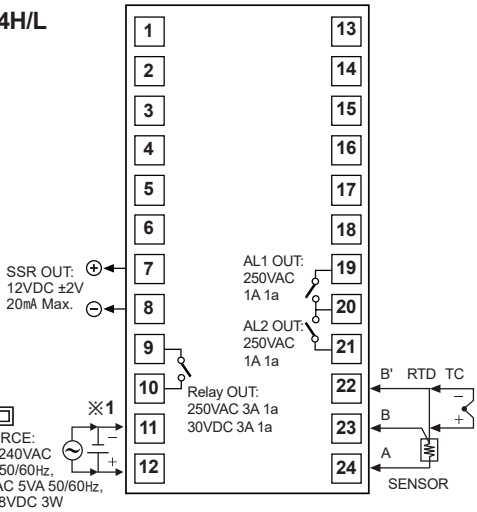
● TCN4S-□-P



● TCN4M



● TCN4H/L

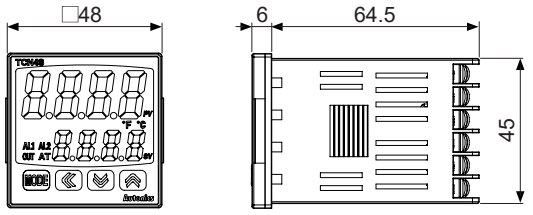


※1: Power supply
- AC power: 100-240VAC 5VA 50/60Hz
- AC/DC power: 24VAC 5VA 50/60Hz, 24-48VDC 3W

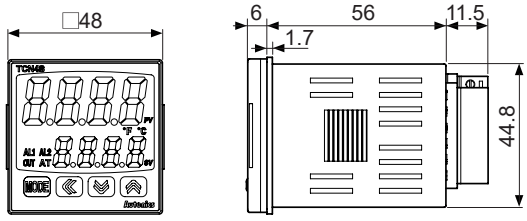
▣ Dimensions

(unit: mm)

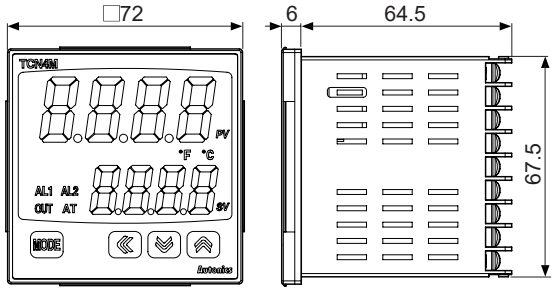
● TCN4S



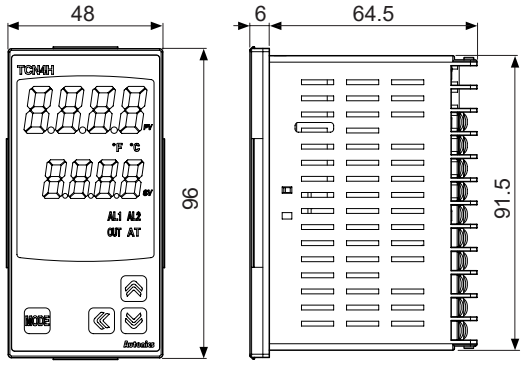
● TCN4S-□-P



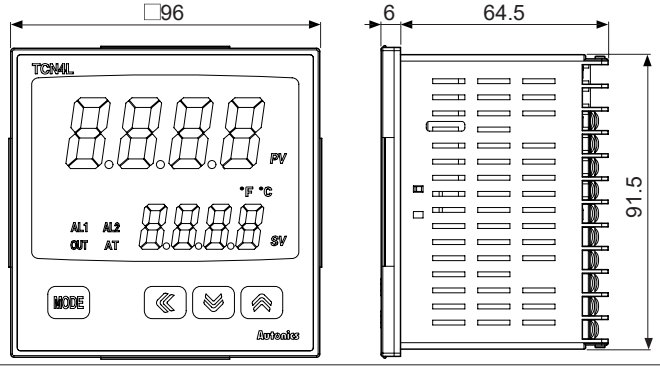
● TCN4M



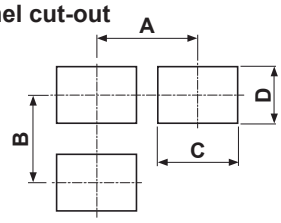
● TCN4H



● TCN4L



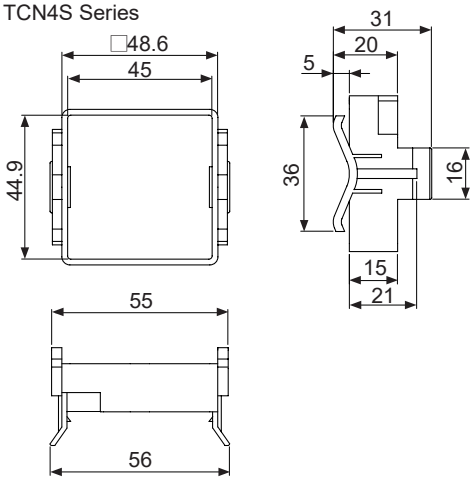
● Panel cut-out



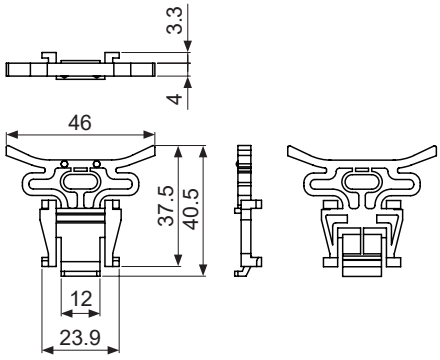
Size / Series	A	B	C	D
TCN4S	Min. 65	Min. 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
TCN4M	Min. 90	Min. 90	$68^{+0.7}_{0}$	$68^{+0.7}_{0}$
TCN4H	Min. 65	Min. 115	$45^{+0.6}_{0}$	$92^{+0.8}_{0}$
TCN4L	Min. 115	Min. 115	$92^{+0.8}_{0}$	$92^{+0.8}_{0}$

● Bracket

● TCN4S Series



● TCN4M, TCN4H, TCN4L Series

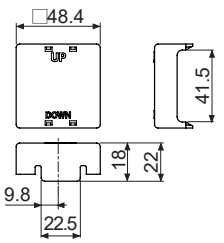


▣ Dimensions

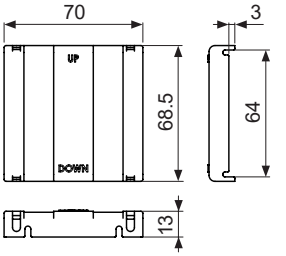
(unit: mm)

● **Terminal cover (sold separately)**

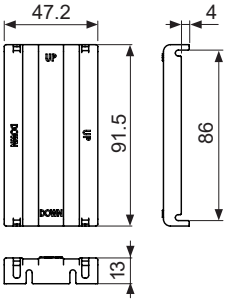
● RSA-COVER (48×48mm)



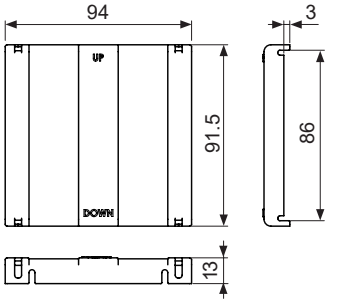
● RMA-COVER (72×72mm)



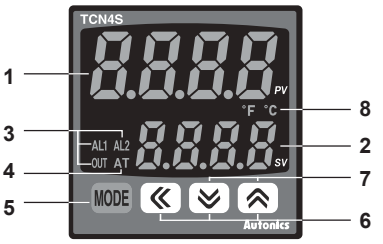
● RHA-COVER (48×96mm)



● RLA-COVER (96×96mm)



▣ Unit Description



1. Present value (PV) display (red)
- RUN mode: Currently measured value (PV) display.
- Parameter setting mode: Parameter display.

2. Setting value (SV) display (green)
- RUN mode: Setting temperature value (SV) display.
- Parameter setting mode: Parameter setting value display.

3. Control/Alarm output display indicator
- OUT: It turns ON when the control output is ON.
  ※During SSR drive output type in CYCLE/PHASE control, this indicator turns ON when MV is over 3.0%. (only AC voltage type)
- AL1/AL2: It turns ON when the alarm output is ON.

4. Auto tuning indicator: AT indicator flashes by every 1 sec during operating auto tuning.

5. MODE **key:** Used when entering into parameter setting group, returning to RUN mode, moving parameter, and saving setting values.

6. Adjustment: Used when entering into set value change mode, digit moving and digit up/down.

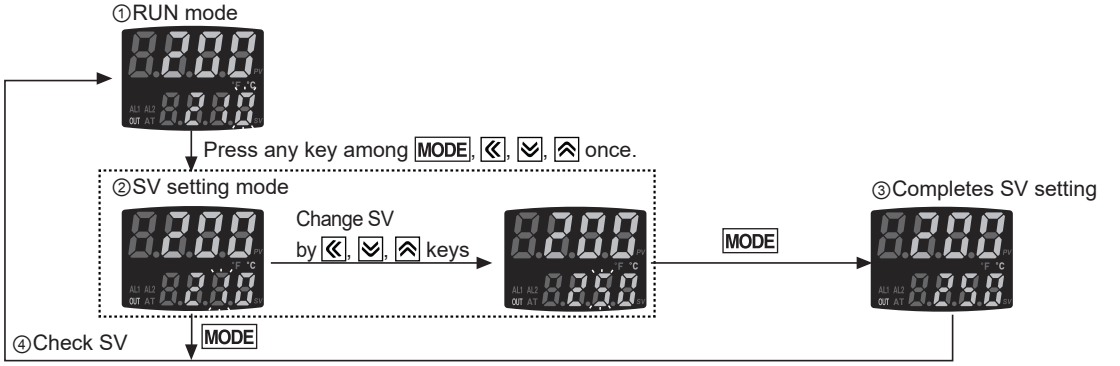
7. Digital input key: Press ▼ + ▲ keys for 3 sec to operate the set function (RUN/STOP, alarm output reset, auto tuning) in digital input key [dI -Y].

8. Temperature unit (℃/℉**) indicator:** It shows current temperature unit.

▣ SV Setting

You can set the temperature to control with MODE, ◀, ▼, ▲ keys.
Setting range is within SV lower limit value [L -SV] to SV higher limit value [H -SV].

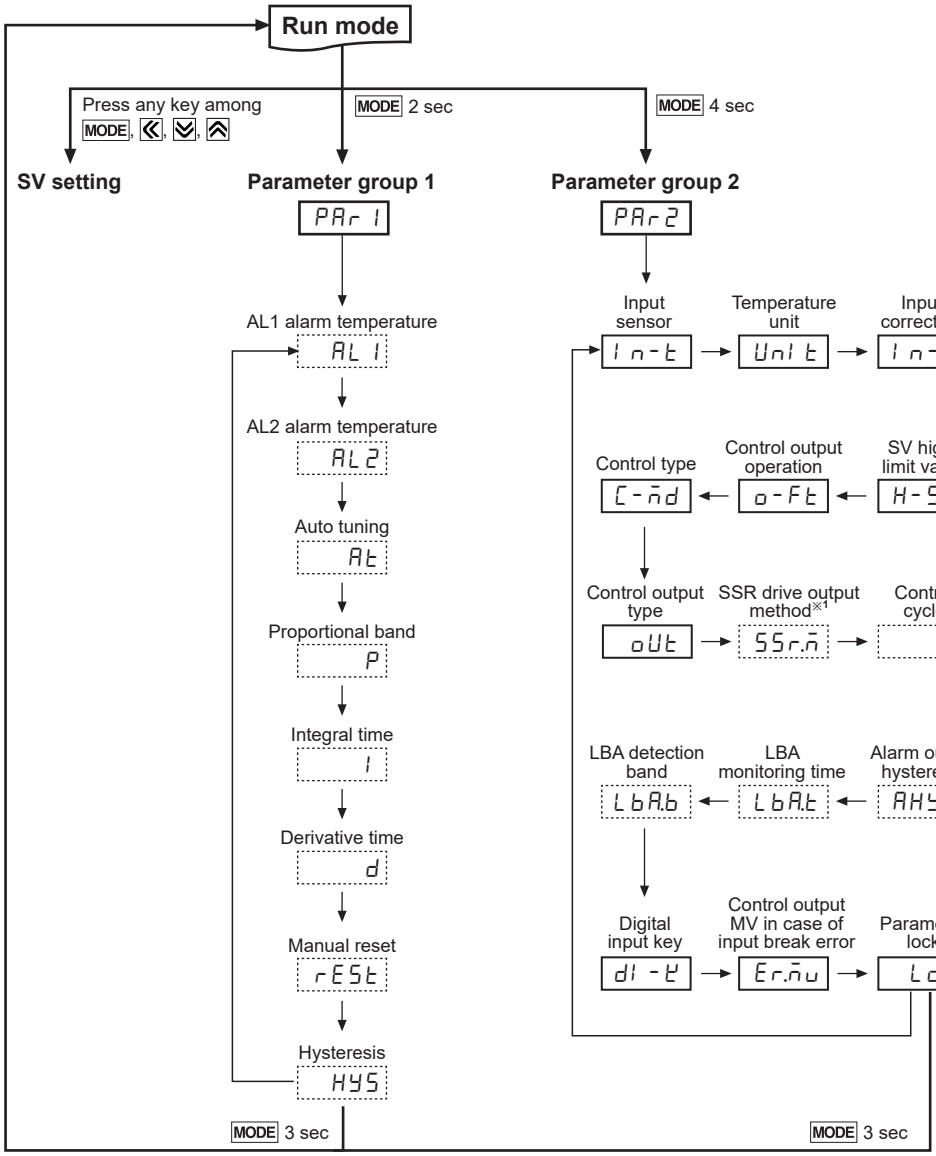
E.g.) In case of changing set temperature from 210ºC to 250ºC



▣ Parameter Reset

Reset all parameters as factory default. Hold the front ◀+▼+▲ keys for 5 sec, to enter parameter reset [rnIt] parameter. Select 'YES' and all parameters are reset as factory default. Select 'no' and previous settings are maintained. If setting parameter lock [LoC] or processing auto-tuning, parameter reset is unavailable.

▣ Parameter Group



※Press MODE key over 3 sec in any setting group, it saves the set value and returns to RUN mode.
(Press MODE key once in SV setting, it returns to RUN mode).

※If no key entered for 30 sec, it returns to RUN mode automatically and the set value of parameter is not be saved.

※Press MODE key again within 1 sec after returning to RUN mode, it advances of the first parameter of previous setting group.

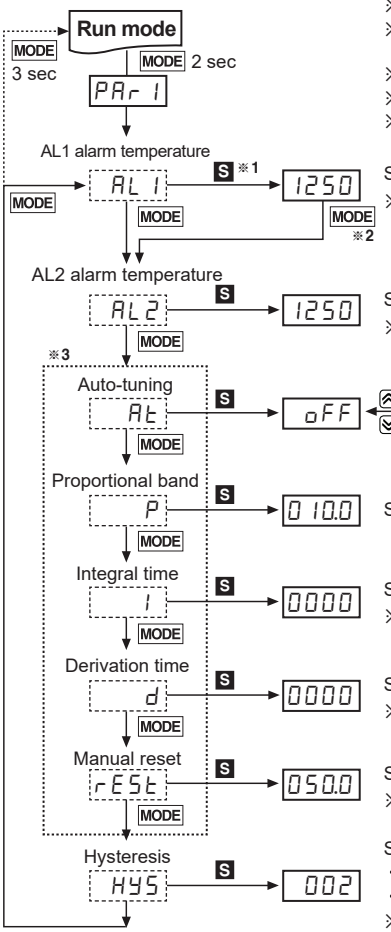
※Press MODE key to move next parameter.

※[ ] This parameter might not be displayed depending on other parameter settings.

※Set parameter as 'Parameter group 2 → Parameter group 1 → Setting of set value' order considering parameter relation of each setting group.

※1: It is not displayed for AC/DC power model (TCN4□-22R).

▣ Parameter Group 1



※1: S: Press any key among ≪, ≫, ≫.
※2: After checking or changing setting value in each parameter, press MODE key to save and move to next parameter setting.
※3: It is displayed when control type parameter [C-nd] of parameter group 2 is set PId.
※Press MODE key for 3 sec to return RUN mode at any parameter.
※[ ] This parameter might not be displayed depending on other parameter settings.

Setting range: Deviation alarm (-F.S to F.S), Absolute value alarm (temperature range)
※In case alarm operation mode [AL-1] of Parameter group 2 is AnO_/SbA□ /bA□, no parameters is displayed.

Setting range: Deviation alarm (-F.S to F.S), Absolute value alarm (temperature range)
※In case alarm operation mode [AL-2] of Parameter group 2 is AnO_/SbA□ /bA□, no parameters is displayed.

※Front AT indicator flashes during auto tuning operation.

Setting range: 0.1 to 999.9 ℃/℉

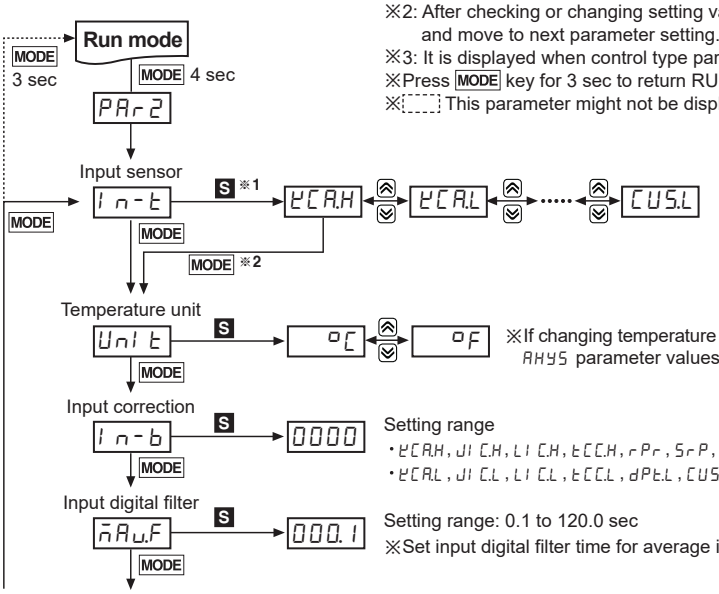
Setting range: 0 to 9999 sec
※Integral operation is OFF when set value is "0".

Setting range: 0 to 9999 sec
※Derivative operation is OFF when set value is "0".

Setting range: 0.0 to 100.0%
※It is displayed in P, PD control.

Setting range
・UCA.H, UIC.H, LIC.H, tCC.H, rPr, SrP, dPt.H, CUS.H: 1 to 100℃/℉
・UCA.L, UIC.L, LIC.L, tCC.L, dPt.L, CUS.L : 0.1 to 50.0℃/℉
※It is displayed when control type [C-nd] of parameter group 2 is set onoF.

▣ Parameter Group 2



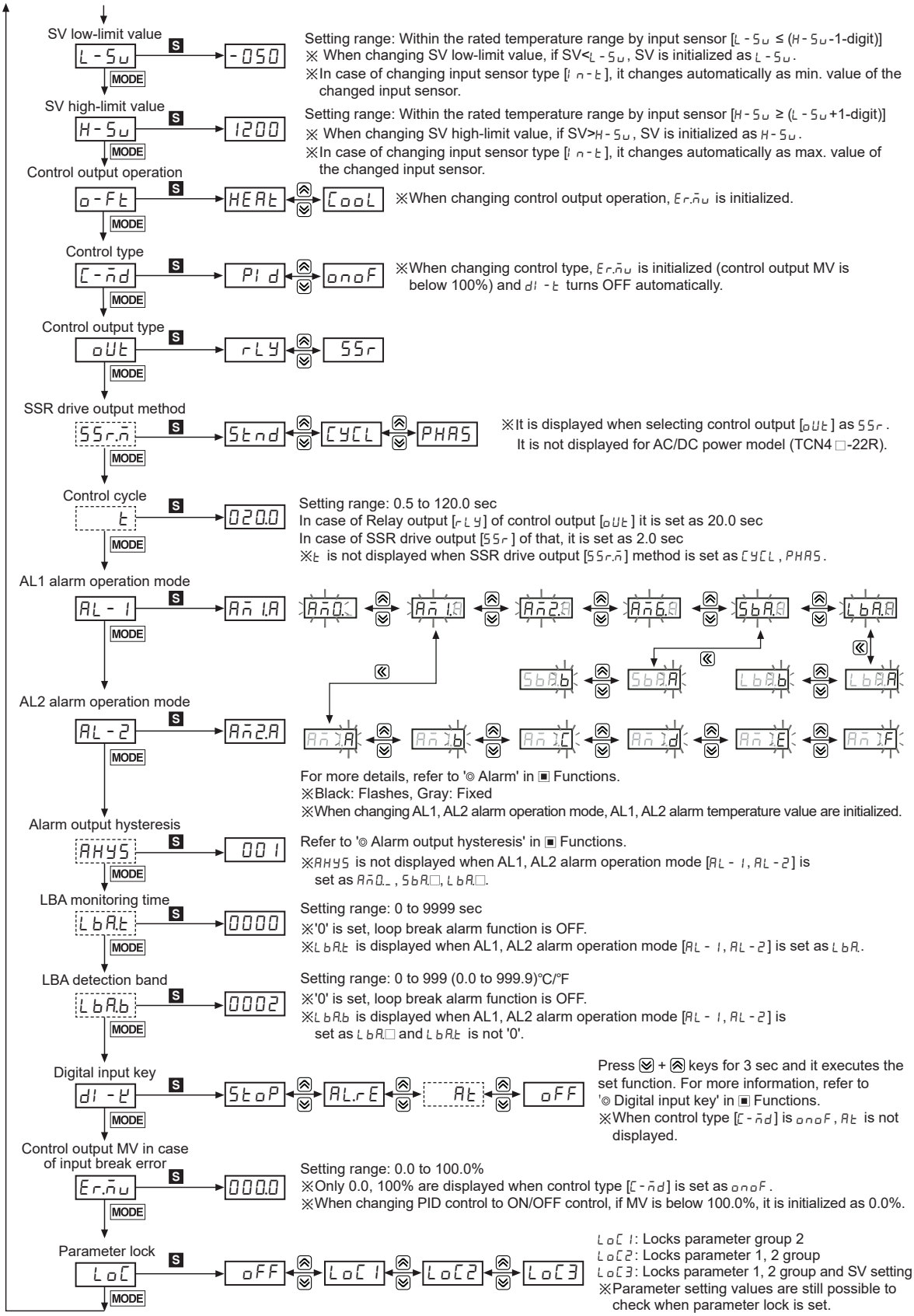
※1: S: Press any key among ≪, ≫, ≫.
※2: After checking or changing setting value in each parameter, press MODE key to save and move to next parameter setting.
※3: It is displayed when control type parameter [C-nd] of parameter group 2 is set PId.
※Press MODE key for 3 sec to return RUN mode at any parameter.
※[ ] This parameter might not be displayed depending on other parameter settings.

Setting range: Refer to '▣ Input sensor and temperature range'.
※If changing input sensor, SV, In-b, H-Su, L-Su, AL 1, AL2, LbA.t, LbA.b, AHYS parameter values are initialized.

※If changing temperature unit, SV, In-b, H-Su, L-Su, AL 1, AL2, LbA.t, LbA.b, AHYS parameter values are initialized.

Setting range
・UCA.H, UIC.H, LIC.H, tCC.H, rPr, SrP, dPt.H, CUS.H: -999 to 999℃/℉
・UCA.L, UIC.L, LIC.L, tCC.L, dPt.L, CUS.L : -199.9 to 999.9℃/℉

Setting range: 0.1 to 120.0 sec
※Set input digital filter time for average input value affected control, and display value.


SV low-limit value
L-SU
-050
MODE
Setting range: Within the rated temperature range by input sensor [L-SU ≤ (H-SU-1-digit)]
※ When changing SV low-limit value, if SV<L-SU, SV is initialized as L-SU.
※In case of changing input sensor type [In-t], it changes automatically as min. value of the changed input sensor.
SV high-limit value
H-SU
1200
MODE
Setting range: Within the rated temperature range by input sensor [H-SU ≥ (L-SU+1-digit)]
※ When changing SV high-limit value, if SV>H-SU, SV is initialized as H-SU.
※In case of changing input sensor type [In-t], it changes automatically as max. value of the changed input sensor.
Control output operation
o-Ft
HEAt
CooL
MODE
※When changing control output operation, Er.nu is initialized.
Control type
C-nd
PId
onoF
MODE
※When changing control type, Er.nu is initialized (control output MV is below 100%) and dI-t turns OFF automatically.
Control output type
oUt
rLY
SSr
MODE
SSR drive output method
SSr.n
Stnd
CYCL
PHAS
MODE
※It is displayed when selecting control output [oUt] as SSr.
It is not displayed for AC/DC power model (TCN4 □-22R).
Control cycle
t
020.0
MODE
Setting range: 0.5 to 120.0 sec
In case of Relay output [rLY] of control output [oUt] it is set as 20.0 sec
In case of SSR drive output [SSr] of that, it is set as 2.0 sec
※t is not displayed when SSR drive output [SSr.n] method is set as CYCL, PHAS.
AL1 alarm operation mode
AL-1
AnIA
MODE
AL2 alarm operation mode
AL-2
An2A
MODE
An0_
An1A
An2A
An6A
SbA.A
LbA.A
SbA.b
SbA.A
LbA.b
LbA.A
AnIA
AnIb
AnIC
AnId
AnIE
AnIF
For more details, refer to '◎ Alarm' in ▣ Functions.
※Black: Flashes, Gray: Fixed
※When changing AL1, AL2 alarm operation mode, AL1, AL2 alarm temperature value are initialized.
Alarm output hysteresis
AHYS
001
MODE
Refer to '◎ Alarm output hysteresis' in ▣ Functions.
※AHYS is not displayed when AL1, AL2 alarm operation mode [AL-1, AL-2] is set as An0_, SbA.□, LbA.□.
LBA monitoring time
LbAt
0000
MODE
Setting range: 0 to 9999 sec
※'0' is set, loop break alarm function is OFF.
※LbAt is displayed when AL1, AL2 alarm operation mode [AL-1, AL-2] is set as LbA.
LBA detection band
LbAb
0002
MODE
Setting range: 0 to 999 (0.0 to 999.9)℃/℉
※'0' is set, loop break alarm function is OFF.
※LbAb is displayed when AL1, AL2 alarm operation mode [AL-1, AL-2] is set as LbA.□ and LbAt is not '0'.
Digital input key
dI-t
StoP
AL.rE
At
oFF
MODE
Press ⩒ + ⩓ keys for 3 sec and it executes the set function. For more information, refer to '◎ Digital input key' in ▣ Functions.
※When control type [C-nd] is onoF, At is not displayed.
Control output MV in case of input break error
Er.nu
000.0
MODE
Setting range: 0.0 to 100.0%
※Only 0.0, 100% are displayed when control type [C-nd] is set as onoF.
※When changing PID control to ON/OFF control, if MV is below 100.0%, it is initialized as 0.0%.
Parameter lock
LoC
oFF
LoC1
LoC2
LoC3
MODE
LoC1: Locks parameter group 2
LoC2: Locks parameter 1, 2 group
LoC3: Locks parameter 1, 2 group and SV setting
※Parameter setting values are still possible to check when parameter lock is set.

▣ Input Sensor and Temperature Range

Input sensor		Display	Temperature range (℃)	Temperature range (℉)
Thermocouple	K(CA)	K CA.H	-50 to 1200	-58 to 2192
		K CA.L	-50.0 to 999.9	-58.0 to 999.9
	J(IC)	J IC.H	-30 to 800	-22 to 1472
		J IC.L	-30.0 to 800.0	-22.0 to 999.9
	L(IC)	L IC.H	-40 to 800	-40 to 1472
		L IC.L	-40.0 to 800.0	-40 to 999.9
	T(CC)	T CC.H	-50 to 400	-58 to 752
		T CC.L	-50.0 to 400.0	-58.0 to 752.0
	R(PR)	r Pr	0 to 1700	32 to 3092
	S(PR)	S Pr	0 to 1700	32 to 3092
RTD	DPt100Ω	dPt.H	-100 to 400	-148 to 752
		dPt.L	-100.0 to 400.0	-148.0 to 752.0
	Cu50Ω	CUS.H	-50 to 200	-58 to 392
		CUS.L	-50.0 to 200.0	-58.0 to 392.0

▣ Factory Default

● SV setting

Parameter	Factory default
—	0

● Parameter group 1

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
AL 1	1250	At	oFF	I	0000	rESt	050.0
AL2	1250	P	0 10.0	d	0000	HYS	002

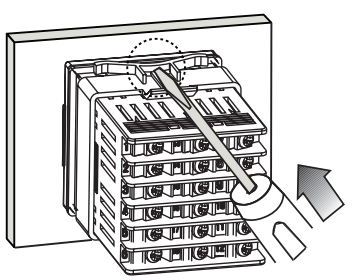
● Parameter group 2

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
In-t	K CA.H	H-Su	1200	t	020.0	LbA.b	0002
Unit	°C	o-Ft	HEAt	AL-1	AñI.A	di-U	StoP
In-b	0000	C-ñd	PId	LA-2	Añ.2.A	Er.ñu	000.0
ñAu.F	000.1	oUt	rLY	AHYS	001	LoC	oFF
L-Su	-050	SSr.ñ	Stnd	LbAt	0000		

※The AC/DC voltage models do not have SSR drive output method [SSr.ñ]. In case of control output [oUt], if set as SSr , it supports only ON/OFF output.

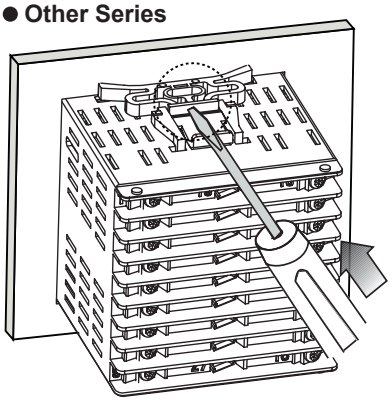
▣ Mounting

● TCN4S (48×48mm) Series



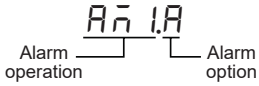
※Mount the product on the panel, fasten bracket by pushing with tools as shown above.

● Other Series



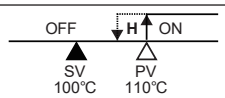
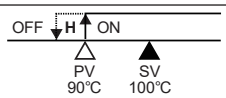
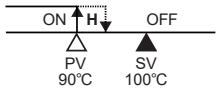
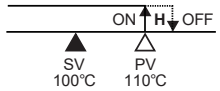
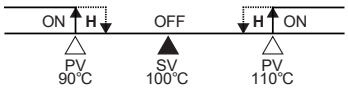
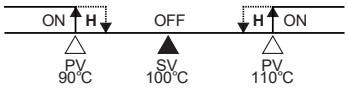
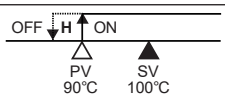
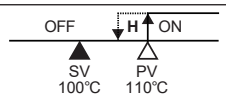
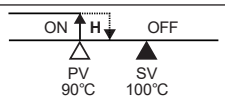
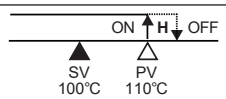
▣ Functions

◎ Alarm [AL-1/AL-2]



Set both alarm operation and alarm option by combining.
Alarm outputs are two and each one operates individually.
When the current temperature is out of alarm range, alarm clears automatically. If alarm option is alarm latch or alarm latch and standby sequence 1/2, press digital input key(▽+△ 3 sec, digital input key[di-F] of parameter group 2 set as AL.rE), or turn OFF the power and turn ON to clear alarm.

● Alarm operation

Mode	Name	Alarm operation	Description
AN0.□	—	—	No alarm output
AN1.□	Deviation high-limit alarm	 High deviation: Set as 10℃  High deviation: Set as -10℃	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
AN2.□	Deviation low-limit alarm	 Lower deviation: Set as 10℃  Lower deviation: Set as -10℃	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AN3.□	Deviation high/low-limit alarm	 High/Lower deviation: Set as 10℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AN4.□	Deviation high/low-limit reverse alarm	 High/Lower deviation: Set as 10℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF.
AN5.□	Absolute value high limit alarm	 Absolute-value Alarm: Set as 90℃  Absolute-value Alarm: Set as 110℃	If PV is higher than the absolute value, the output will be ON.
AN6.□	Absolute value low limit alarm	 Absolute-value Alarm: Set as 90℃  Absolute-value Alarm: Set as 110℃	If PV is lower than the absolute value, the output will be ON.
SBA.□	Sensor break Alarm	—	It will be ON when it detects sensor disconnection.
LBA.□	Loop break Alarm	—	It will be ON when it detects loop break.

※ H: Alarm output hysteresis [AHYS]

● Alarm option

Mode	Name	Description
AN□.A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AN□.b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status.
AN□.C	Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.
AN□.d	Alarm latch and standby sequence 1	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.
AN□.E	Standby sequence 2	First alarm condition is ignored and from second alarm condition, standard alarm operates. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, standard alarm operates.
AN□.F	Alarm latch and standby sequence 2	Basic operation is same as alarm latch and standby sequence 1. It operates not only by power ON/OFF, but also alarm setting value, or alarm option changing. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates.

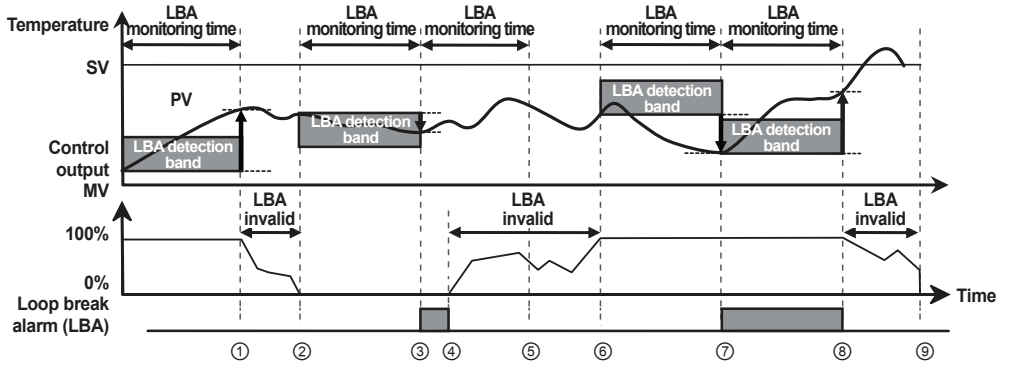
※Condition of re-applied standby sequence for standby sequence 1, alarm latch and standby sequence 1: Power ON
Condition of re-applied standby sequence for standby sequence 2, alarm latch and standby sequence 2: Power ON, changing set temperature, alarm temperature [AL1, AL2] or alarm operation [AL-1, AL-2], switching STOP mode to RUN mode.

◎ Sensor break alarm

The function that alarm output will be ON when sensor is not connected or when sensor's disconnection is detected during temperature controlling. You can check whether the sensor is connected with buzzer or other units using alarm output contact. It is selectable between standard alarm [SBAA], or alarm latch [SBAb].

◎ Loop break alarm (LBA)

It checks control loop and outputs alarm by temperature change of the subject. For heating control (cooling control), when control output MV is 100% (0% for cooling control) and PV is not increased over than LBAdetection band [LbA.b] during LBA monitoring time [LbA.t], or when control output MV is 0% (100% for cooling control) and PV is not decreased below than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], alarm output turns ON.

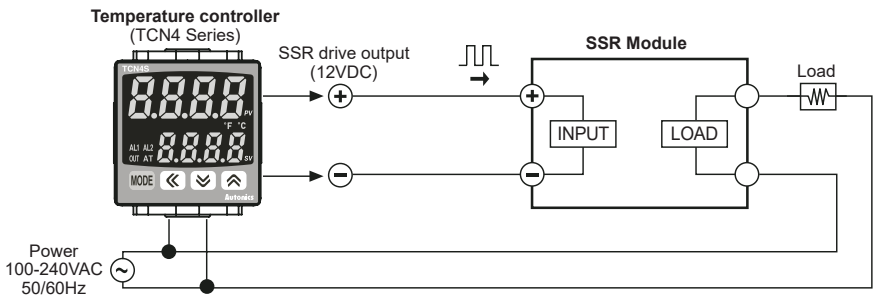


Start control to ①	When control output MV is 0% and PV is not decreased below than LBA detection band [LbA.b] during LBA monitoring time [LbA.t]
① to ②	The status of changing control output MV (LBA monitoring time is reset.)
② to ③	When control output MV is 0% and PV is not decreased below than LBA detection band [LbA.b] during LBA monitoring time [LbA.] loop break alarm (LBA) turns ON after LBA monitoring time.
③ to ④	Control output MV is 0% and loop break alarm (LBA) turns and maintains ON.
④ to ⑥	The status of changing control output MV (LBA monitoring time is reset.)
⑥ to ⑦	When control output MV is 100% and PV is not increased over than LBA detection band [LbA.t] during LBA monitoring time [LbA.t], loop break alarm (LBA) turns ON after LBA monitoring time.
⑦ to ⑧	When control output MV is 100% and PV is increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t] loop break alarm (LBA) turns OFF after LBA monitoring time.
⑧ to ⑨	The status of changing control output MV (LBA monitoring time is reset.)

※When executing auto-tuning, LBA detection band [LbA.b] and LBA monitoring time are automatically set based on auto tuning value. When AL1, AL2 alarm operation [AL-1, AL-2] is set as loop break alarm (LBA) [LbA.□], LBA detection band [LbA.b] and LBA monitoring time [LbA.t] parameter is displayed.

◎ SSR drive output function (SSRP function) [SSr.n]

- SSRP function is selectable one of standard ON/OFF control, cycle control, phase control by utilizing standard SSR drive output.
- Realizing high accuracy and cost effective temperature control as linear output(cycle control and phase control).
- Select one of standard ON/OFF control [Snd], cycle control [CYCL] , phase control [PHAS] at [SSr.n] parameter of parameter group 2. For cycle control, connect zero cross turn-on SSR or random turn-on SSR. For phase control, connect random turn-on SSR.



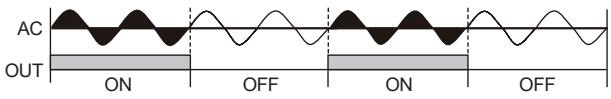
※When selecting phase or cycle control mode, **the power supply for load and temperature controller must be the same.**

※In case of selecting PID control type and phase [PHAS] / cycle [CYCL] control output modes, control cycle [t] is not allowed to set.

※For AC/DC power model (TCN4 □-22R), this parameter is not displayed and it is available only standard control by relay or SSR.

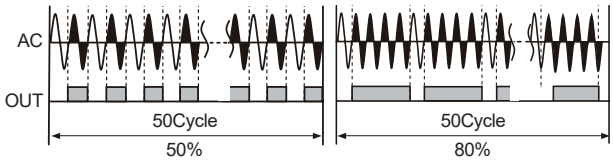
● Standard ON/OFF control mode [Stnd]

A mode to control the load in the same way as Relay output type.
(ON: output level 100%, OFF: output level 0%)



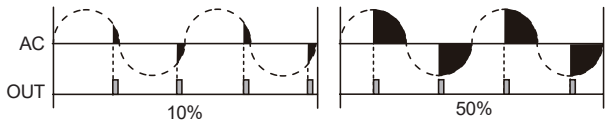
● Cycle control mode [CYCL]

A mode to control the load by repeating output ON / OFF according to the rate of output within setting cycle.
Having improved ON / OFF noise feature by Zero Cross type.



● Phase control mode [PHAS]

A mode to control the load by controlling the phase within AC half cycle. Serial control is available.
RANDOM Turn-on type SSR must be used for this mode.



◎ Auto tuning [At]

- Auto tuning measures the control subject's thermal characteristics and thermal response rate, and then determines the necessary PID time constant. (When control type [C-nd] is set as PId, it is displayed.)
- If error [oPEn] occurs during auto tuning, it stops this operation automatically.
- To stop auto tuning, change the set as oFF. (It maintains P, I, D values of before auto tuning.)

◎ Input correction [In-b]

Controller itself does not have errors but there may be error by external input temperature sensor.

E.g.) If actual temperature is 80℃ but controller displays 78℃, set input correction value [In-b] as 002 and controller displays 80℃.

※As the result of input correction, if current temperature value (PV) is over each temperature range of input sensor, it displays HHHH or LLLL.

◎ Input digital filter [nAuF]

If current temperature (PV) is fluctuating repeatedly by rapid change of input signal, it reflects to MV and stable control is impossible. Therefore, digital filter function stabilizes current temperature value.

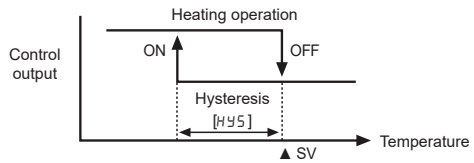
- For example, set input digital filter value as 0.4 sec, and it applies digital filter to input values during 0.4 sec and displays this values. Current temperature may be different by actual input value.

◎ SV High/Low limit [H-Su/L-Su]

- It sets SV high/low limit Limit range of using temperature within temperature range for each sensor, user can set/change set temperature (SV) within SV high limit [H-Su] to SV low limit [L-Su]. (※L-Su > H-Su cannot be set.)
- When changing input type [In-t], SV high limit [H-Su] and SV low limit [L-Su] of using temperature will be initialized as max./min.value of sensor temperature range automatically.

◎ Hysteresis [HYS]

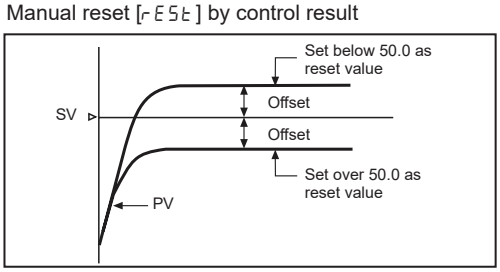
- In case of ON/OFF control, set between ON and OFF intervals as hysteresis. (When control type [C-nd] is set as onoF, it is displayed.)
- If hysteresis is too small, it may cause control output hunting (take off, chattering) by external noise, etc.



◎ Manual reset [rESt]

When selecting P/PD control mode, certain temperature difference exists even after PV reaches stable status because heater's rising and falling time is inconsistent due to thermal characteristics of controlled objects, such as heat capacity, heater capacity. This temperature difference is called offset and manual reset [rESt] function is to set/correct offset.

- When PV and SV are equal, reset value is 50.0%. After control is stable, PV is lower than SV, reset value is over 50.0% or PV is higher than SV, reset value is below 50.0%.
- Manual reset [rESt] by control result



※Manual reset function is applicable only to P / PD control mode.

◎ Temperature unit selection [Unit]

- A function to select display temperature unit.
- Unit display indicator will be ON when converting temperature unit.

◎ Cool / Heat function [o-Ft]

Generally there are two ways to control temperature, one (heat-function) is to heat when PV is getting down (heater). The other (cool-function) is to cool when PV is getting higher (freezer).

These functions are operating oppositely when it is ON/OFF control or proportional control. But in this case PID time constant will be different due to PID time constant will be decided according to control system when it is PID control.

- Cool-function [CooL] and heat-function [HEAt] must be set correctly according to the application, if set as opposite function, it may cause a fire. (If set cool-function [CooL] at heater, it will be maintained ON and it may cause a fire.)
- Avoid changing heat-function to cool-function or cool-function to heat-function when the unit is operating.
- It is impossible to operate both function at once in this unit. Therefore, only one function should be selected only.

◎ Control method selection [C-md]

It is selectable PID, ON/OFF control.

- In case of ON/OFF [onoF] mode, Hysteresis [HYS] parameter is displayed.
- In case of PID [PId] mode, Proportional band [P], Integral time [I], and Derivative time [t] parameters are displayed.

◎ Control output type selection [oUt]

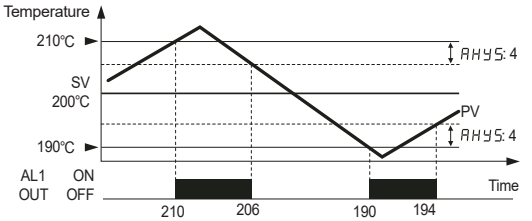
It is selectable output type ; relay output [rLY], SSr drive output [SSr].

◎ Alarm output hysteresis [AHYS]

It displays alarm output ON and OFF interval and hysteresis is applied to both AL1 OUT and AL2 OUT.

- PCA.H, JIC.H, LIC.H, tCC.H, rPr, SPr, dPt.H, CUS.H : 1 to 100
- PCA.L, JIC.L, LIC.L, tCC.L, dPt.L, CUS.L : 0.1 to 50.0

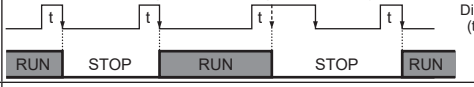
E.g.) AL1 alarm operation [AL-1]: An3.A,
AL1 alarm operation [AL 1]: 10℃,
Alarm output hysteresis [AHYS]: 4



◎ Control output MV when input sensor line is broken [Er.mv]

When input sensor line is broken or setting value error occurs, this function is to set control output. You can set ON/OFF setting for ON/OFF control, MV setting for PID control.

◎ Digital input key (▼ + ▲ 3 sec) [dI-P]

Parameter		Operation
OFF	oFF	It does not use digital input key function.
RUN/STOP	StoP	Pauses control output. Auxiliary output (except loop break alarm, sensor break alarm)except Control output operates as setting. Hold the digital input keys for 3 sec to restart. 
Clear alarm	AL.rE	Clears alarm output by force. (only when alarm option is alarm latch, or alarm latch and standby sequence 1/2 .) This function is applied when present value is out of alarm operation range but alarm output is ON. Alarm operates normally right after clearing alarm.
Auto-tuning	At	Starts/Stops auto-tuning. This function is same as auto-tuning[At] of parameter group 1. (You can start auto-tuning [At] of parameter group 1 and stop it by digital input key.) ※This parameter At appears only when control method [C-md] parameter group 2 is set as PId. When control method [C-md] parameter group 2 is set as onoF, this parameter is changed as oFF.

◎ Parameter lock [LoC]

A function to prevent changing SV and parameters of each setting group. Parameter setting values are still possible to check when parameter lock is set.

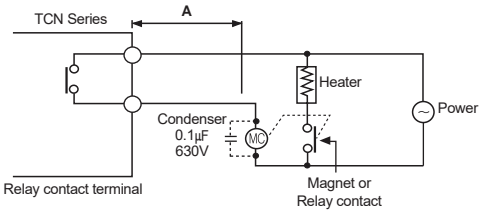
Display	Description
oFF	Lock off
LoC 1	Lock parameter group 2
LoC2	Lock parameter group 1, 2
LoC3	Lock parameter group 1, 2, SV setting

◎ Error

Display	Description	Troubleshooting
oPEn	Flashes if input sensor is disconnected or sensor is not connected.	Check input sensor state.
HHHH	Flashes if measured sensor input is higher than temperature range.	When input is within the rated temperature range, this display disappears.
LLLL	Flashes if measured sensor input is lower than temperature range.	

◎ Output connections

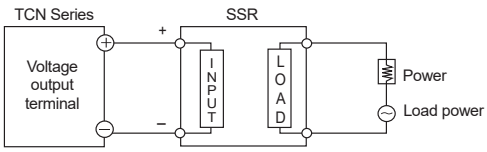
● Application of relay output type



Keep **A** length as long as possible when wiring the temperature controller and the load. If wire length of **A** is short, counter electromotive force which occurs from a coil of magnet switch & power relay may flow in power line of the unit, and it may cause malfunction.

If wire length of **A** is short, please connect mylar condensers 104 (630V) on the both ends of "Ⓜ" (magnet coil) to protect electromotive force.

● Application of SSR drive output method



※SSR should be selected by the capacity of load, otherwise, it may short-circuit and result in a fire. Indirect heated should be used with SSR for efficient working.

※Please use a cooling plate or it may cause the capability deterioration, breakdown of SSR for a long usage.

※Refer to '◎ SSR drive output function' for phase/cycle control connections.

▣ Proper Usage

◎ Simple "error" diagnosis

● When the load (Heater etc) is not operated

Please check operation of the OUT indicator located in front panel of the unit.

If the OUT indicator does not operate, please check the parameter of all programmed mode.
If indicator is operating, please check the output (Relay, SSR drive voltage) after separating output line from the unit.

● When it displays oPEn during operation

This is a warning that external sensor is open.
Please turn off the power and check the wire state of the sensor. If sensor is not open disconnect sensor line from the unit and short the input +, - terminal. Turn on the power of the unit and check the controller displays room temperature.

If this unit cannot display room temperature, this unit is broken. Please remove this unit and contact our service center. (When the input mode is thermocouple, it is available to display room temperature.)

◎ Cautions during use

- Follow instructions in 'Cautions during use'. Otherwise, It may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- When changing the input sensor, turn off the power first before changing.
  After changing the input sensor, modify the value of the corresponding parameter.
- 24VAC, 24-48VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- This unit may be used in the following environments.
  ①Indoors
  (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Single Display, PID Control Temperature Controller

▣ Features

- Realizes ideal temp. controlling with newly developed PID control algorithm and 100ms high speed sampling
- **Built-in relay output or SSR output selectable : Enables to phase control and cycle control with SSR drive output (SSRP function)**
- Dramatically increased visibility using wide display part
- Mounting space saving with compact design : Approx. 38% reduced size compared with existing model (depth-based)
- SV/PV deviation indicatable

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

T C 4 S — 1 4 R

Control output	N	Indicator - Without control output
	R	Relay output + SSR drive output※1
Power supply	2	24VAC 50/60Hz, 24-48VDC
	4	100-240VAC 50/60Hz
Alarm output	N	No alarm output
	1	Alarm 1 output
	2	Alarm 1 output + Alarm 2 output※2
Size	S	DIN W48×H48mm (terminal block type)
	SP	DIN W48×H48mm (11-pin plug type)※3
	Y	DIN W72×H36mm
	M	DIN W72×H72mm
	H	DIN W48×H96mm
	W	DIN W96×H48mm
	L	DIN W96×H96mm
Digit	4	9999 (4-digit)
Setting type	C	Set by touch switch
Item	T	Temperature controller

※1: In case of the AC voltage model, SSR drive output method (standard ON/OFF control, cycle, control, phase control) is available to select.
※2: It is unavailable for TC4SP, TC4Y.v
※3: 11-pin socket (PG-11, PS-11(N)) for TC4SP: sold separately.

▣ Specifications

Series		TC4S	TC4SP	TC4Y	TC4M	TC4W	TC4H	TC4L
Power supply	AC power	100-240VAC～ 50/60Hz						
	AC/DC power	24VAC～ 50/60Hz, 24-48VDC⎓						
Allowable voltage range		90 to 110% of rated voltage						
Power consumption	AC power	Max. 5VA (100-240VAC～ 50/60Hz)						
	AC/DC power	Max. 5VA (24VAC～ 50/60Hz), max. 3W (24-48VDC⎓)						
Display method		7-segment (red), other display (green, yellow, red) LED						
Character size (W×H)		7.0×15.0mm		7.4×15.0mm	9.5×20.0mm	9.5×20.0mm	7.0×14.6mm	11.0×22.0mm
Input type	RTD	DPt100Ω, Cu50Ω (allowable line resistance max. 5Ω per a wire)						
	Thermocouple	K(CA), J(IC), L(IC)						
Display accuracy※1	RTD	• At room temperature (23℃±5℃): (PV ±0.5% or ±1℃, select the higher one) ±1-digit • Out of room temperature range: (PV ±0.5% or ±2℃, select the higher one) ±1-digit ※For TC4SP, add ±1℃ by accuracy standard.						
	Thermocouple							

※1: Thermocouple L(IC) type, RTD Cu50Ω
• At room temperature (23℃ ±5℃): (PV ±0.5% or ±2℃, select the higher one) ±1-digit
• Out of room temperature range: (PV ±0.5% or ±3℃, select the higher one) ±1digit
In case of TC4SP Series, ±1℃ will be added.

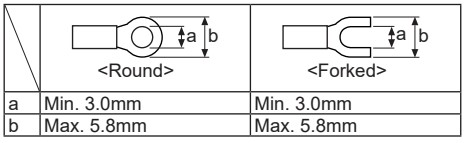
■ Specifications

Series		TC4S	TC4SP	TC4Y	TC4M	TC4W	TC4H	TC4L
Control output	Relay	250VAC～ 3A, 30VDC⎓ 3A, 1a						
	SSR	12VDC⎓ ±2V 20mA Max.						
Alarm output		AL1, AL2 Relay: 250VAC 1A 1a (※TC4SP, TC4Y have AL1 only.)						
Control method		ON/OFF and P, PI, PD, PID control						
Hysteresis		1 to 100℃/℉ (0.1 to 50.0℃/℉) variable						
Proportional band (P)		0.1 to 999.9℃/℉						
Integral time (I)		0 to 9999 sec						
Derivative time (D)		0 to 9999 sec						
Control period (T)		0.5 to 120.0 sec						
Manual reset		0.0 to 100.0%						
Sampling period		100ms						
Dielectric strength	AC power	2,000VAC 50/60Hz for 1 min (between input terminal and power terminal)						
	AC/DC power	1,000VAC 50/60Hz for 1 min (between input terminal and power terminal)						
Vibration		0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours						
Relay life cycle	Mechanical	OUT: over 5,000,000 operations, AL1/2: Over 5,000,000 operations						
	Electrical	OUT: over 200,000 operations (250VAC 3A resistive load) AL1/2: over 300,000 operations (250VAC 1A resistive load)						
Insulation resistance		Over 100MΩ (at 500VDC megger)						
Noise immunity		Square-wave noise by noise simulator (pulse width 1us) ±2kV R-phase and S-phase						
Memory retention		Approx. 10 years (when using non-volatile semiconductor memory type)						
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃						
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH						
Insulation type		Double insulation or reinforced insulation (mark: ⧈, Dielectric strength between the measuring input part and the power part: AC power 2kV, AC/DC Power 1kV)						
Approval		CE cULus						
Weight※2		Approx. 141g (approx. 94g)	Approx. 123g (approx. 76g)	Approx. 174g (approx. 85g)	Approx. 204g (approx. 133g)	Approx. 194g (approx. 122g)	Approx. 194g (approx. 122g)	Approx. 254g (approx. 155g)

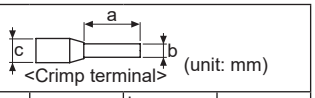
※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

■ Connections

※TC4 Series has selectable control output; Relay output, and SSR drive output. AC/DC power type does not have SSRP function.
※Use crimp terminals or teminals of size specified below.

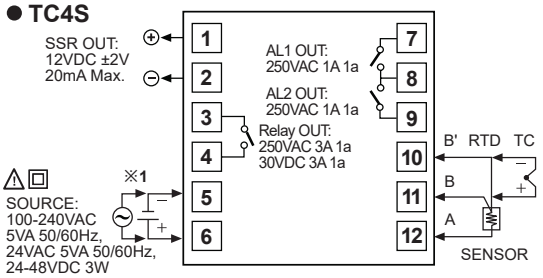


	<Round>	<Forked>
a	Min. 3.0mm	Min. 3.0mm
b	Max. 5.8mm	Max. 5.8mm

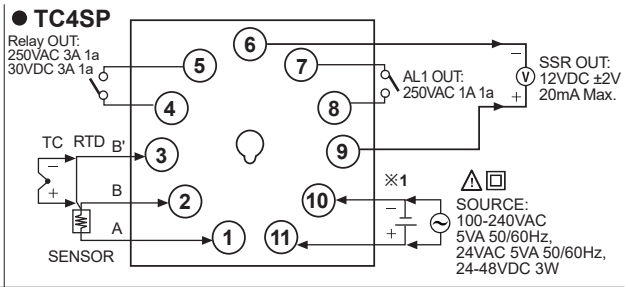


Terminal number	a	b	c
1 to N	6	Max. 1.9	Max. 4.0

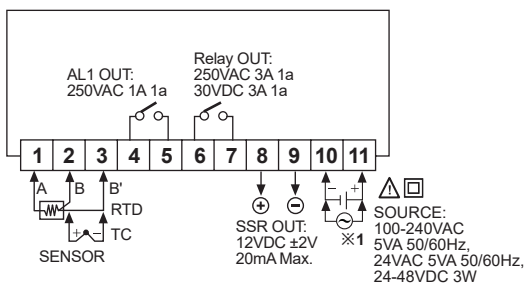
● TC4S



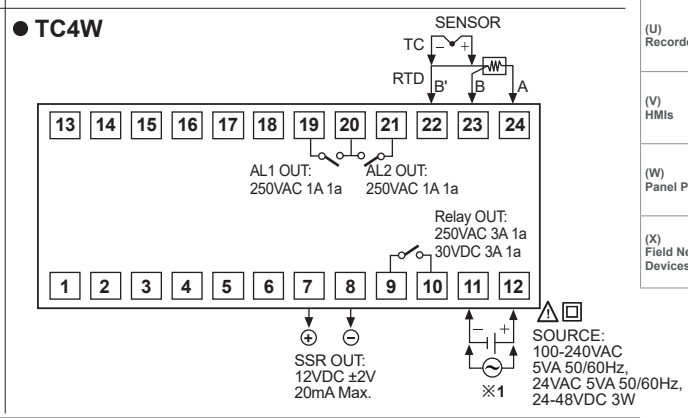
● TC4SP



● TC4Y

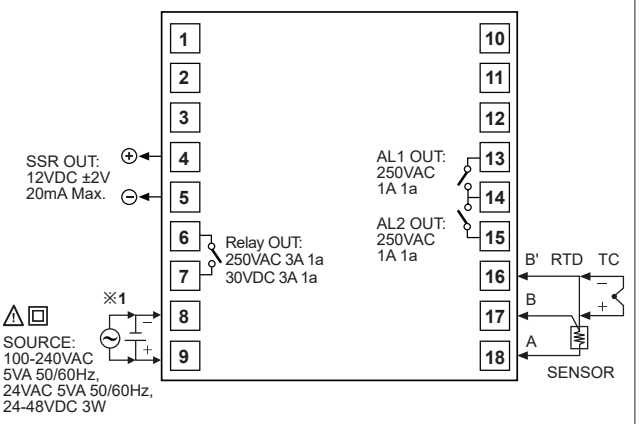


● TC4W



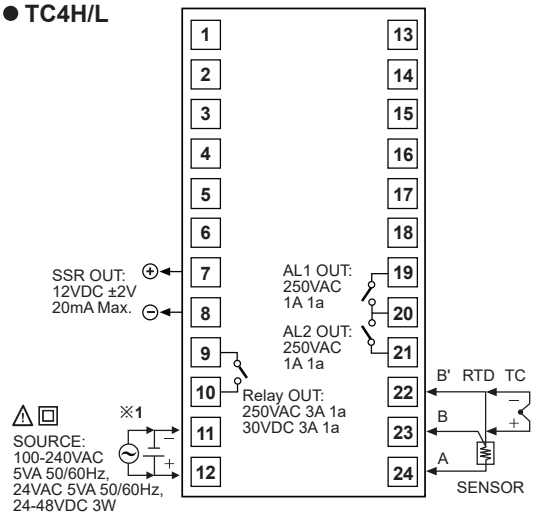
※1: AC power: 100-240VAC 5VA 50/60Hz
AC/DC power: 24VAC 5VA 50/60Hz, 24-48VDC 3W

● TC4M



※1: AC power: 100-240VAC 5VA 50/60Hz
AC/DC power: 24VAC 5VA 50/60Hz, 24-48VDC 3W

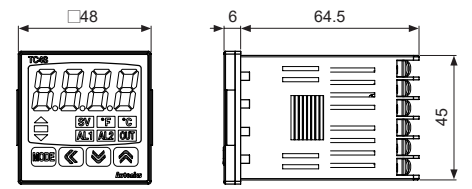
● TC4H/L



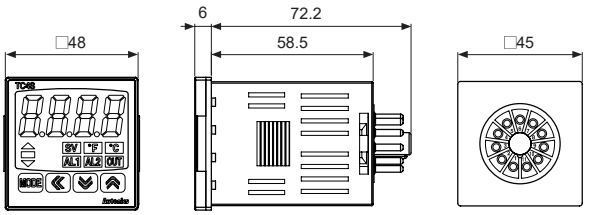
▣ Dimensions

(unit: mm)

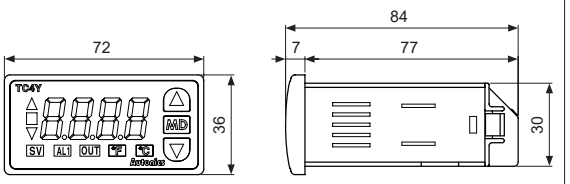
● TC4S



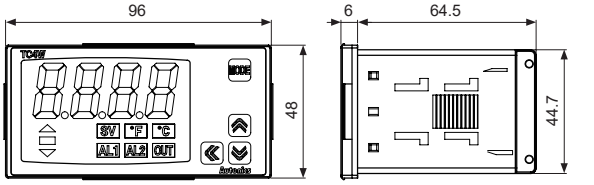
● TC4SP



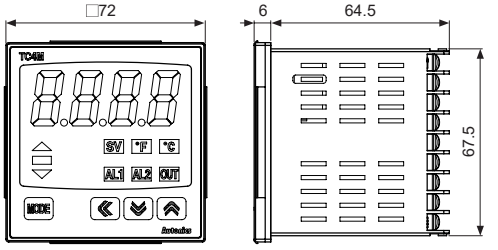
● TC4Y



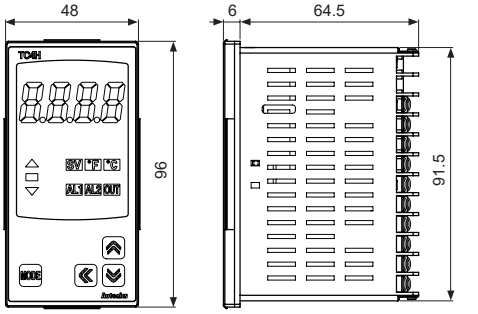
● TC4W



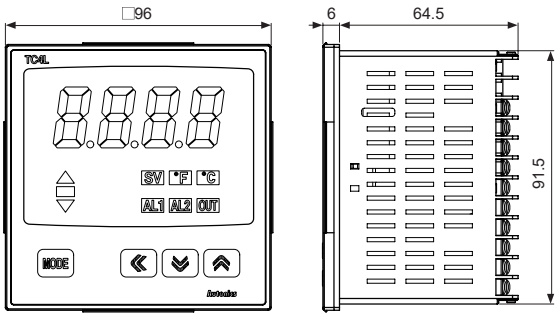
● TC4M



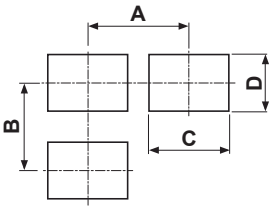
● TC4H



● TC4L



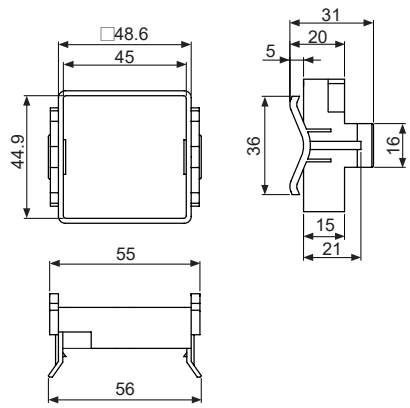
● Panel cut-out



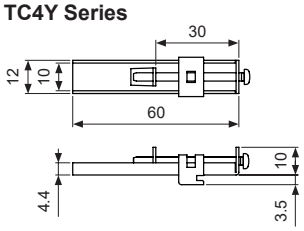
Model \ Size	A	B	C	D
TC4S	Min. 65	Min. 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
TC4SP	Min. 65	Min. 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
TC4Y	Min. 91	Min. 40	$68^{+0.7}_{0}$	$31.5^{+0.5}_{0}$
TC4M	Min. 90	Min. 90	$68^{+0.7}_{0}$	$68^{+0.7}_{0}$
TC4H	Min. 65	Min. 115	$45^{+0.6}_{0}$	$92^{+0.8}_{0}$
TC4W	Min. 115	Min. 65	$92^{+0.8}_{0}$	$45^{+0.6}_{0}$
TC4L	Min. 115	Min. 115	$92^{+0.8}_{0}$	$92^{+0.8}_{0}$

● Bracket

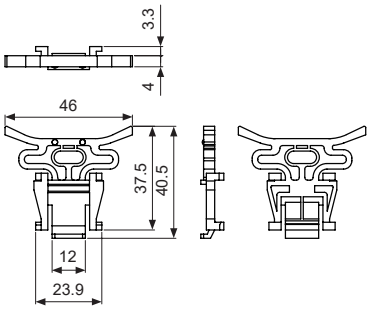
• TC4S/TC4SP Series



• TC4Y Series

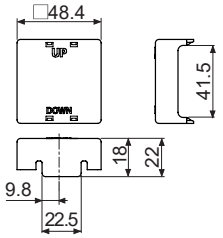


• TC4M, TC4W, TC4H, TC4L Series

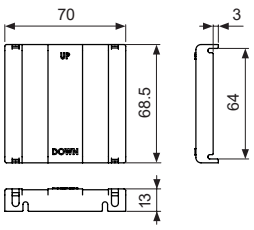


● Terminal cover (sold separately)

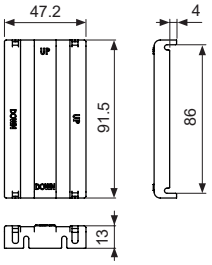
• RSA-COVER
(48×48mm)



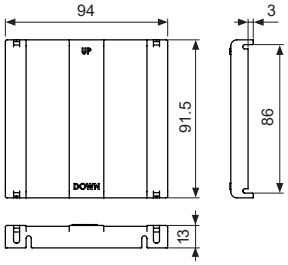
• RMA-COVER
(72×72mm)



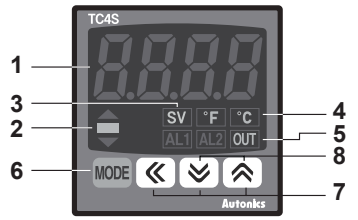
• RHA-COVER
(48×96mm)

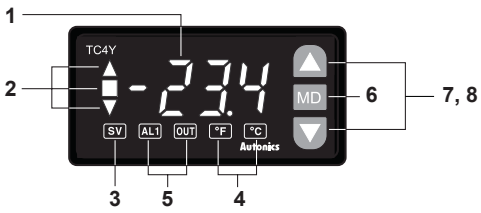


• RLA-COVER
(96×96mm)



▣ Unit Description





1. Present value (PV) display
- RUN mode: Currently measured value (PV) display.
- Parameter setting mode: Parameter or parameter setting value display.

2. Deviation indicator, Auto-tuning indicator
It shows current temperature (PV) deviation based on set temperature (SV) by LED.

No.	PV deviation temp.	Deviation display
1	Over 2℃	▲ indicator ON
2	Below ±2℃	■ indicator ON
3	Under -2℃	▼ indicator ON

The deviation indicators (▲, ■, ▼) flash by every 1 sec when operating auto tuning.

3. Set temperature (SV) indicator
Press any front key once to check or change current set temperature (SV), the set temperature (SV) indicator is ON and preset set value is flashed.

4. Temperature unit (℃/℉) indicator
It shows current temperature unit.

5. Control/alarm output indicator
- OUT: It will turn ON when control output (Main Control Output) is ON.

※In case of CYCLE/PHASE control of SSR drive output, it will turn ON when MV is over 3.0%. (only for AC voltage type)

- AL1/AL2: It will light up when alarm output Alarm 1/ Alarm 2 are on.

6. MODE key
Used when entering into parameter group, returning to RUN mode, moving parameter, and saving setting values.

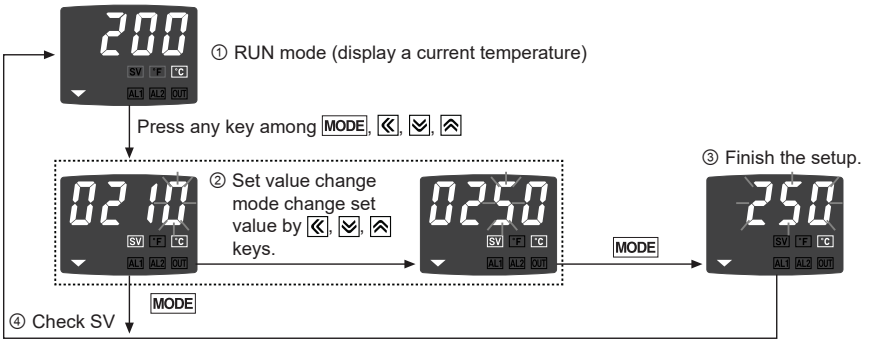
7. Adjustment
Used when entering into set value change mode, digit moving and digit up/down.

8. FUNCTION key
Press ▼+▲ keys for 3 sec to operate function (RUN/ STOP, alarm output cancel, auto-tuning) set in inner parameter [dI-U].

※Press ▼+▲ keys at the same time in set value operation to move digit.

▣ SV Setting

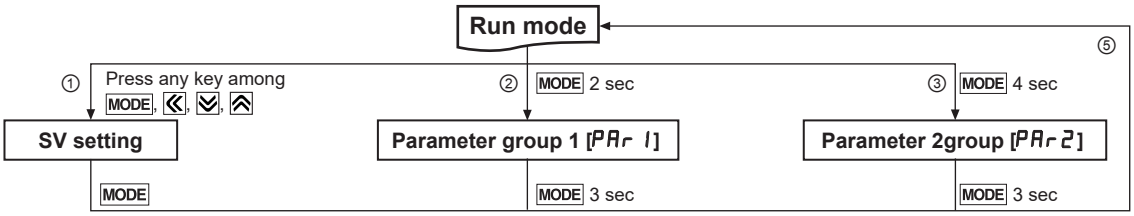
※In case of changing set temperature from 210℃ to 250℃.



▣ Parameter Reset

Reset all parameters as factory default. Hold the front ◀+▼+▲ keys for 5 sec, to enter parameter reset [rnIt] parameter. Select 'YES' and all parameters are reset as factory default. Select 'no' and previous settings are maintained. If setting parameter lock [LoC] or processing auto-tuning, parameter reset is unavailable. (except TC4Y Series)

▣ Parameter Group



④

AL 1	AL1 alarm temperature
AL2	AL2 alarm temperature
At	Auto tuning
P	Proportional band
I	Integral time
d	Derivative time
rSEt	Manual reset (Normal deviation correction)
HYS	ON/OFF control hysteresis

In-t	Input type
Unit	Temperature unit
In-b	Input correction
nAu.F	Input digital filter
L-Su	SV low-limit value
H-Su	SV high-limit value
o-Ft	Control output operation
C-nd	Control type
oUt	Control output
SSr.n	SSR drive output method※1
t	Control cycle
AL-1	AL1 alarm operation mode
AL-2	AL2 alarm operation mode
AHYS	Alarm output hysteresis
LbAt	LBA monitoring time
LbAb	LBA detection range
di-t	Digital input key
Er.nu	Control output MV in case of input break error
LoC	Parameter lock

※1: It is not displayed for AC/DC power model (TC4□-□2R).
※If no key entered for 30 sec, it returns to RUN mode automatically and the set value of parameter is not be saved.
※ This parameter might not be displayed depending on other parameter settings.
① Press any key once in RUN mode, it advances to set value setting group.
② Press MODE key over 2 sec in RUN mode, it advances to parameter group 1.
③ Press MODE key over 4 sec in RUN mode, it advances to parameter group 2.
④ First parameter will be displayed on viewer when it advances to the setting group.
⑤ Press MODE key over 3 sec in the setting group, it returns to RUN mode.
※Exception: Press MODE key once in SV setting group it returns to RUN mode.

※Press MODE key again within a sec after return to RUN mode by press MODE key over 3 sec, it advances to the first parameter of previous setting group.

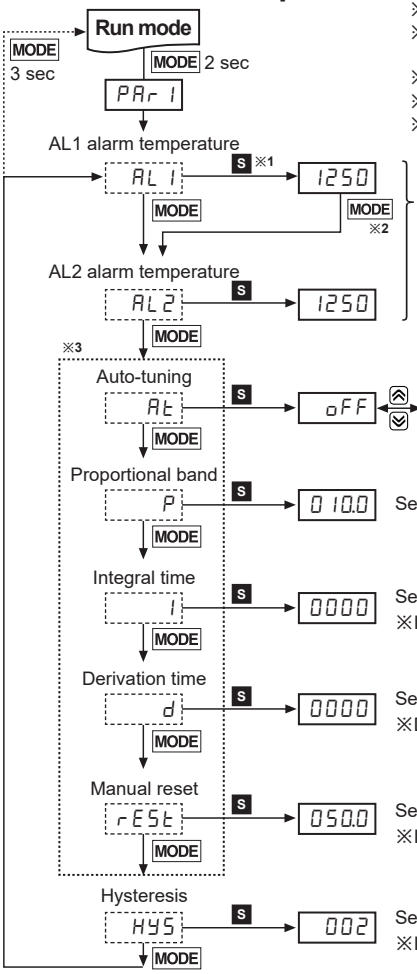
※Parameter setup

Parameter group 2 → **Parameter group 1** → **SV setting**

- Set parameter as the above considering parameter relation of each setting group.
- Check parameter set value after change parameter of setting group 2.

※Indicator model (TC4□-N□N)displays shaded parameter ( ) of parameter group 2.
※Alarm operation mode [AL-1, AL-2] parameter of parameter group 2 is decided whether to display according by alarm output type.
※If alarm operation mode [AL-1, AL-2] of parameter group 2 is set to Ano_ / SbA.□ / LbA.□, AHYS parameter is not displayed.

▣ Parameter Group 1



※1: S: Press any key among ≪, ≫, ≫.
※2: After checking/changing set value at each parameter, and press MODE key, set value flashes twice and it moves to next parameter automatically.
※3: It is displayed when control type parameter [C-nd] of parameter 2group is set PId.
※Press MODE key for 3 sec to return RUN mode at any parameter.
※[ ] This parameter might not be displayed depending on other parameter settings.

Setting range: Deviation alarm (- [F.S] to [F.S], Absolute value alarm (temperature range)
※In case alarm operation mode [AL-1, AL-2], AA0_ / SbA□ / LbA□ of parameter group 2 is set to [AL-1, AL-2], no parameters is displayed.

※It starts to operate auto-tuning when it is ON and set as OFF automatically after finish the operation.
※**Deviation indicators** (▲, ■, ▼) flash (cycle:1 sec) during auto tuning function.

Setting range: 0.1 to 999.9℃/℉

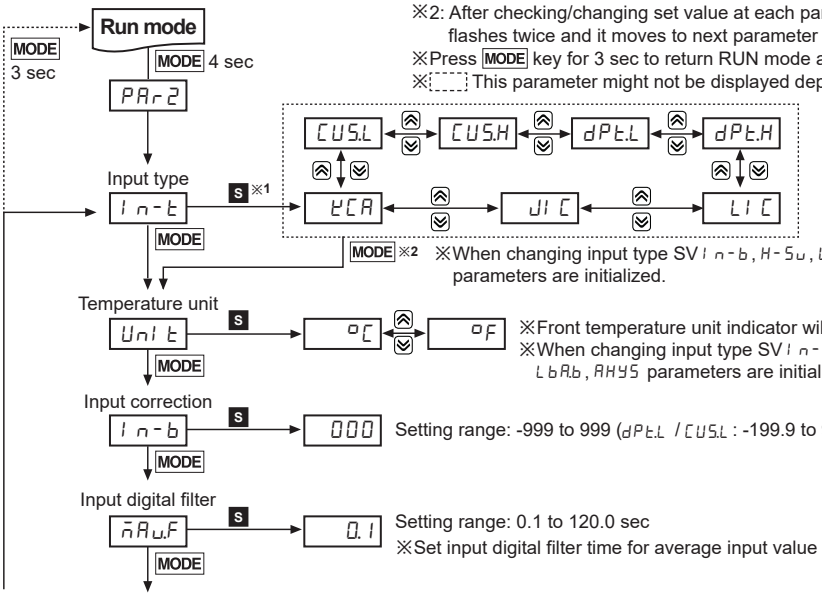
Setting range: 0 to 9999 sec
※Integral operation will be OFF when set value is "0".

Setting range: 0 to 9999 sec
※Derivative operation will be OFF when set value is "0".

Setting range: 0.0 to 100.0%
※It is displayed in P/PD control.

Setting range: 1 to 100℃/℉ (0.1 to 50.0℃/℉)
※It is displayed when control type parameter [C-nd] of parameter group 2 is set onoF.

▣ Parameter Group 2



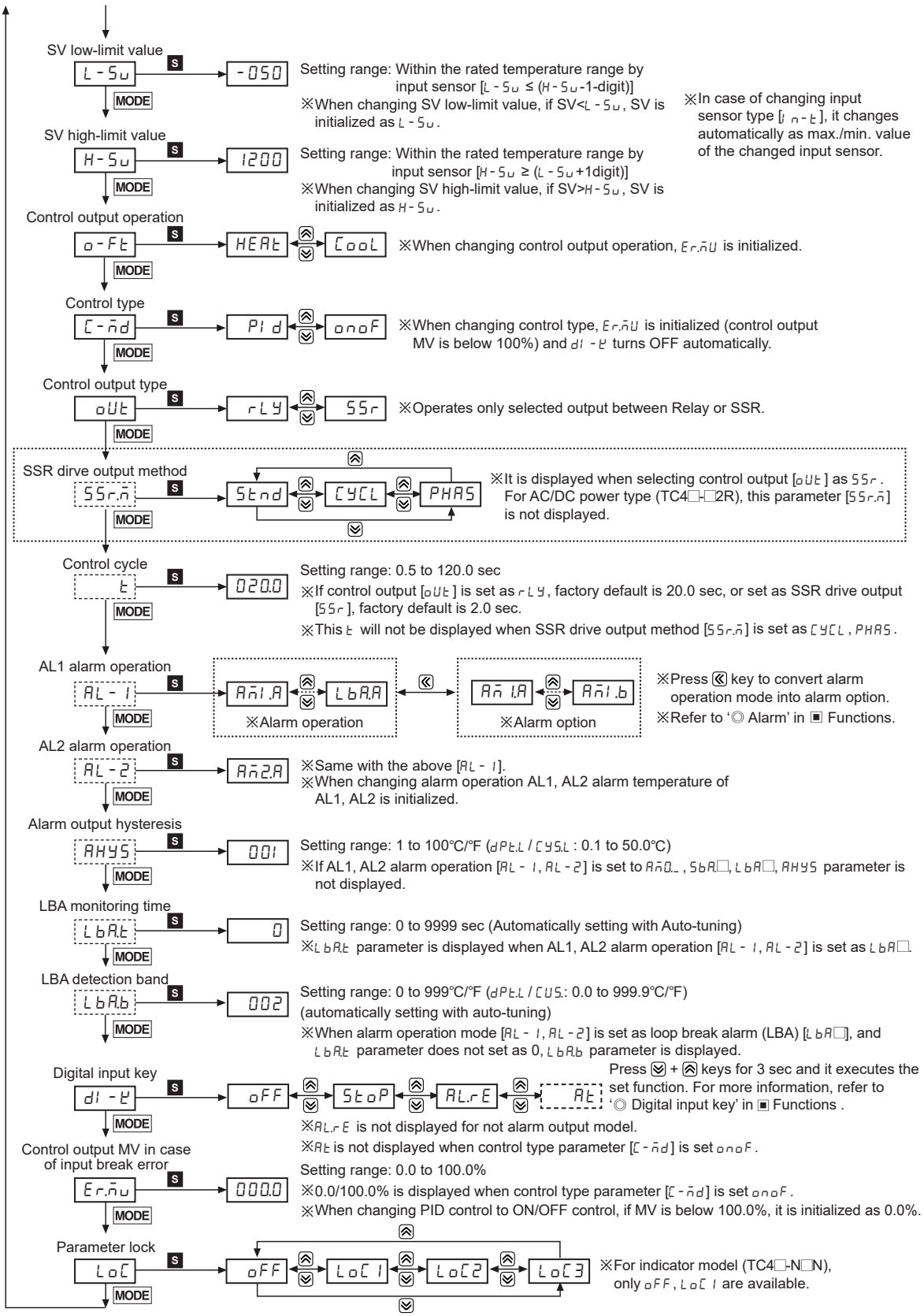
※1: S: Press any key among ≪, ≫, ≫.
※2: After checking/changing set value at each parameter, and press MODE key, set value flashes twice and it moves to next parameter automatically.
※Press MODE key for 3 sec to return RUN mode at any parameter.
※[ ] This parameter might not be displayed depending on other parameter settings.

※When changing input type SV In-b, H-Su, L-Su, AL 1, AL2, LbAt, LbAb, AHYS parameters are initialized.

※Front temperature unit indicator will flash when selecting the unit.
※When changing input type SV In-b, H-Su, L-Su, AL 1, AL2, LbAt, LbAb, AHYS parameters are initialized.

Setting range: -999 to 999 (dPt.L / CUS.L : -199.9 to 999.9)

Setting range: 0.1 to 120.0 sec
※Set input digital filter time for average input value affected control, and display value.


SV low-limit value
L-SU
S
-050
MODE
Setting range: Within the rated temperature range by input sensor [L-SU ≤ (H-SU-1-digit)]
※When changing SV low-limit value, if SV<L-SU, SV is initialized as L-SU.
SV high-limit value
H-SU
1200
Setting range: Within the rated temperature range by input sensor [H-SU ≥ (L-SU+1digit)]
※When changing SV high-limit value, if SV>H-SU, SV is initialized as H-SU.
※In case of changing input sensor type [In-t], it changes automatically as max./min. value of the changed input sensor.
Control output operation
o-Ft
HEAt
CooL
※When changing control output operation, Er.AU is initialized.
Control type
C-Ad
PId
onoF
※When changing control type, Er.AU is initialized (control output MV is below 100%) and dI-U turns OFF automatically.
Control output type
oUt
rLY
SSr
※Operates only selected output between Relay or SSR.
SSR dirve output method
SSr.A
Stnd
CYCL
PHAS
※It is displayed when selecting control output [oUt] as SSr. For AC/DC power type (TC4□-□2R), this parameter [SSr.A] is not displayed.
Control cycle
t
020.0
Setting range: 0.5 to 120.0 sec
※If control output [oUt] is set as rLY, factory default is 20.0 sec, or set as SSR drive output [SSr], factory default is 2.0 sec.
※This t will not be displayed when SSR drive output method [SSr.A] is set as CYCL, PHAS.
AL1 alarm operation
AL-1
AA1.A
LbAA
※Alarm operation
AA1.A
AA1.b
※Alarm option
※Press key to convert alarm operation mode into alarm option.
※Refer to '◎ Alarm' in ▣ Functions.
AL2 alarm operation
AL-2
AA2.A
※Same with the above [AL-1].
※When changing alarm operation AL1, AL2 alarm temperature of AL1, AL2 is initialized.
Alarm output hysteresis
AHYS
001
Setting range: 1 to 100℃/℉ (dPt.L / CYS.L : 0.1 to 50.0℃)
※If AL1, AL2 alarm operation [AL-1, AL-2] is set to AA0._ , SbA□, LbA□, AHYS parameter is not displayed.
LBA monitoring time
LbA.t
0
Setting range: 0 to 9999 sec (Automatically setting with Auto-tuning)
※LbA.t parameter is displayed when AL1, AL2 alarm operation [AL-1, AL-2] is set as LbA□.
LBA detection band
LbA.b
002
Setting range: 0 to 999℃/℉ (dPt.L / CUS.: 0.0 to 999.9℃/℉)
(automatically setting with auto-tuning)
※When alarm operation mode [AL-1, AL-2] is set as loop break alarm (LBA) [LbA□], and LbA.t parameter does not set as 0, LbA.b parameter is displayed.
Digital input key
dI-U
oFF
StoP
AL.rE
AT
Press + keys for 3 sec and it executes the set function. For more information, refer to '◎ Digital input key' in ▣ Functions .
※AL.rE is not displayed for not alarm output model.
※AT is not displayed when control type parameter [C-Ad] is set onoF.
Control output MV in case of input break error
Er.AU
000.0
Setting range: 0.0 to 100.0%
※0.0/100.0% is displayed when control type parameter [C-Ad] is set onoF.
※When changing PID control to ON/OFF control, if MV is below 100.0%, it is initialized as 0.0%.
Parameter lock
LoC
oFF
LoC1
LoC2
LoC3
※For indicator model (TC4□-N□N), only oFF, LoC1 are available.

▣ Input Sensor and Temperature Range [In-t]

Input sensor		Display	Input range (℃)	Input range (℉)
Thermocouple	K(CA)	K CA	-50 to 1200	-58 to 2192
	J(IC)	J IC	-30 to 500	-22 to 932
	L(IC)	L IC	-40 to 800	-40 to 1472
RTD	DPt100Ω	dPt.H	-100 to 400	-148 to 752
		dPt.L	-100.0 to 400.0	-148.0 to 752.0
	Cu50Ω	CU5.H	-50 to 200	-58 to 392
		CU5.L	-50.0 to 200.0	-58.0 to 392.0

▣ Factory Default

● SV setting

Parameter	Factory default
–	0

● Parameter group 1

Parameter	Factory default
AL 1	1250
AL2	
At	oFF
P	010.0
I	0000
d	
rESt	050.0
HYS	002

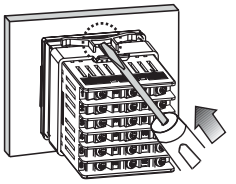
● Parameter group 2

Parameter	Factory default	Parameter	Factory default
In-t	K CA	t	020.0
Unit	°C	AL-1	AM1.A
In-b	0000		
AMoF	000.1	AL-2	AM2.A
L-Su	-050	AHYS	0001
H-Su	1200	LbAt	0000
o-Ft	HEAt	LbAb	002
C-Md	PId	dI-t	StoP
oUt	rLY	Er.Mu	000.0
SSr.M	Stnd	LoC	oFF

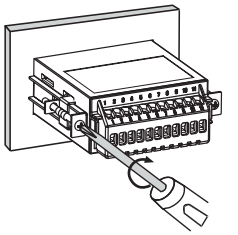
※AC/DC power type has no SSR drive output method [SSr.M] and supports only ON/OFF output when selecting SSr in control output [oUt].

▣ Mounting

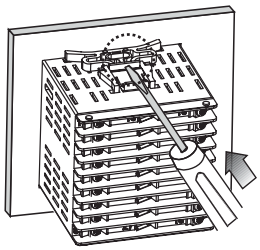
● TC4S/SP (48×48mm) Series



● TC4Y (72×36mm) Series



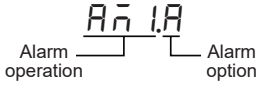
● Other Series



※Mount the product on the panel, fasten bracket by pushing with tools as shown above.
(In case of TC4Y, fasten bolts for bracket.)

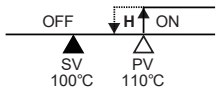
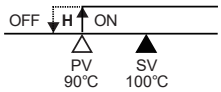
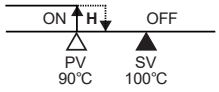
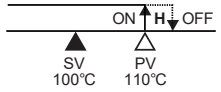
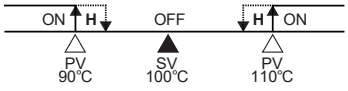
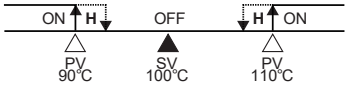
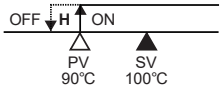
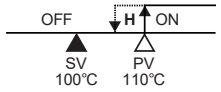
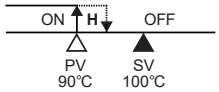
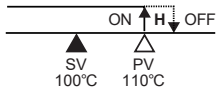
▣ Functions

◎ Alarm [AL-1/AL-2]



Set both alarm operation and alarm option by combining.
Each alarm operates individually in two alarm output models.
When the current temperature is out of alarm range, alarm clears automatically. If alarm option is alarm latch or alarm latch and standby sequence 1/2, press digital input key(▽+△ 3 sec, digital input key[di-F] of Parameter group 2 set as AL.rE), or turn OFF the power and turn ON to clear alarm.

● Alarm operation

Mode	Name	Alarm operation	Description
AN0._	—	—	No alarm output
AN1.□	Deviation high-limit alarm	 High deviation: Set as 10℃  High deviation: Set as -10℃	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
AN2.□	Deviation low-limit alarm	 Lower deviation: Set as 10℃  Lower deviation: Set as -10℃	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AN3.□	Deviation high/low-limit alarm	 High/Lower deviation: Set as 10℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AN4.□	Deviation high/low-limit reserve alarm	 High/Lower deviation: Set as 10℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF.
AN5.□	Absolute value high limit alarm	 Absolute-value Alarm: Set as 90℃  Absolute-value Alarm: Set as 110℃	If PV is higher than the absolute value, the output will be ON.
AN6.□	Absolute value low limit alarm	 Absolute-value Alarm: Set as 90℃  Absolute-value Alarm: Set as 110℃	If PV is lower than the absolute value, the output will be ON.
SBA.□	Sensor break Alarm	—	It will be ON when it detects sensor disconnection.
LBA.□	Loop break Alarm	—	It will be ON when it detects loop break.

※ H: Alarm output hysteresis [AHYS]

● Alarm option

Mode	Name	Description
AN□.A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AN□.b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status. (Alarm output HOLD)
AN□.C	Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.
AN□.d	Alarm latch and standby sequence 1	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.
AN□.E	Standby sequence 2	First alarm condition is ignored and from second alarm condition, standard alarm operates. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, standard alarm operates.
AN□.F	Alarm latch and standby sequence 2	Basic operation is same as alarm latch and standby sequence 1. It operates not only by power ON/OFF, but also alarm setting value, or alarm option changing. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates.

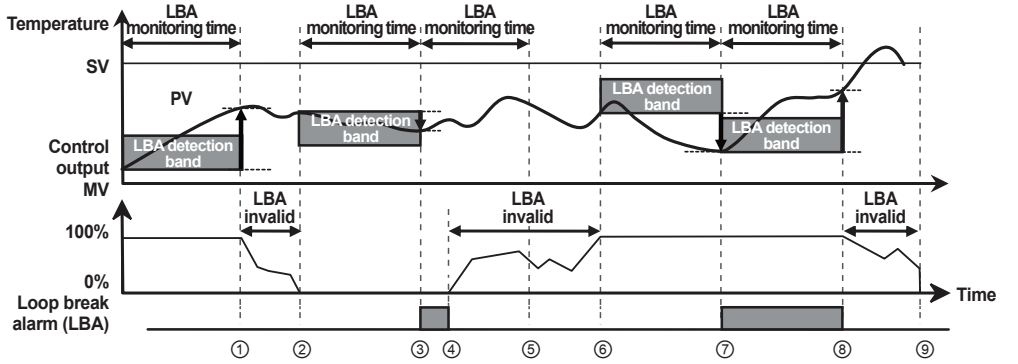
※Condition of re-applied standby sequence for standby sequence 1, alarm latch and standby sequence 1: Power ON
Condition of re-applied standby sequence for standby sequence 2, alarm latch and standby sequence 2: Power ON, changing set temperature, alarm temperature [AL1, AL2] or alarm operation [AL-1, AL-2], switching STOP mode to RUN mode.

◎ Sensor break alarm

The function that alarm output will be ON when sensor is not connected or when sensor's disconnection is detected during temperature controlling. You can check whether the sensor is connected with buzzer or other units using alarm output contact. It is selectable between standard alarm [SBA.A], or alarm latch [SBA.b].

◎ Loop break alarm (LBA)

It checks control loop and outputs alarm by temperature change of the subject. For heating control (cooling control), when control output MV is 100% (0% for cooling control) and PV is not increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], or when control output MV is 0% (100% for cooling control) and PV is not decreased below than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], alarm output turns ON.

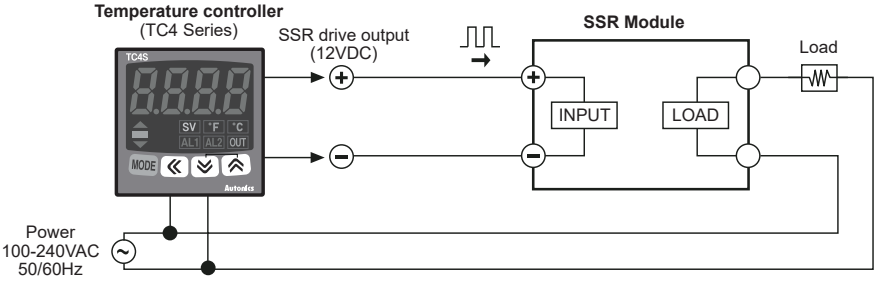


Start control to ①	When control output MV is 0% and PV is not decreased below than LBA detection band [LbA.b] during LBA monitoring time [LbA.t]
① to ②	The status of changing control output MV (LBA monitoring time is reset.)
② to ③	When control output MV is 0% and PV is not decreased below than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], loop break alarm (LBA) turns ON after LBA monitoring time.
③ to ④	Control output MV is 0% and loop break alarm (LBA) turns and maintains ON.
④ to ⑥	The status of changing control output MV (LBA monitoring time is reset.)
⑥ to ⑦	When control output MV is 100% and PV is not increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], loop break alarm (LBA) turns ON after LBA monitoring time.
⑦ to ⑧	When control output MV is 100% and PV is increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t] loop break alarm (LBA) turns OFF after LBA monitoring time.
⑧ to ⑨	The status of changing control output MV (LBA monitoring time is reset.)

※When executing auto-tuning, LBA detection band [LbA.b] and LBA monitoring time are automatically set based on auto tuning value. When AL1, AL2 alarm operation [AL-1, AL-2] is set as loop break alarm (LBA) [LbA.□], LBA detection band [LbA.b] and LBA monitoring time [LbA.t] parameter is displayed.

◎ SSR drive output function (SSRP function) [SSr.n]

- SSRP function is selectable one of standard ON/OFF control, cycle control, phase control by utilizing standard SSR drive output.
- Realizing high accuracy and cost effective temperature control as linear output(cycle control and phase control).
- Select one of standard ON/OFF control [Stnd], cycle control [CYCL] , phase control [PHAS] at [SSr.n] parameter of Parameter group 2. For cycle control, connect zero cross turn-on SSR or random turn-on SSR. For phase control, connect random turn-on SSR.



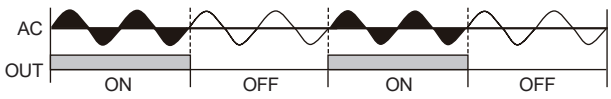
※When selecting cycle or phase control mode, **the power supply for load and temperature controller must be the same.**

※In case of selecting cycle [CYCL] or phase [PHAS] control mode for PID control, control cycle [t] is not allowed to set.

※For AC/DC power model (TC4□-□2R), this parameter [SSr.n] is not displayed and it is available only standard control by relay or SSR.

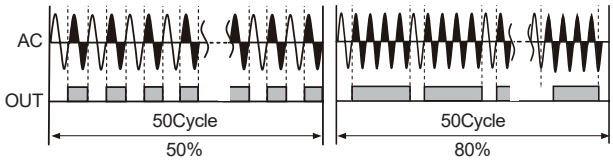
● **Standard ON/OFF control mode [Stnd]**

A mode to control the load in the same way as Relay output type.
(ON: output level 100%, OFF: output level 0%)



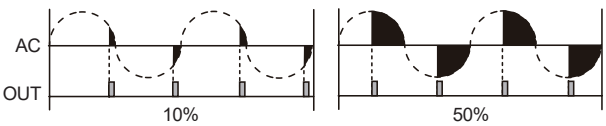
● **Cycle control [CYCL]**

A mode to control the load by repeating output ON / OFF according to the rate of output within setting cycle.
Having improved ON / OFF noise feature by Zero Cross type.



● **Phase control [PHAS]**

A mode to control the load by controlling the phase within AC half cycle. Serial control is available.
RANDOM Turn-on type SSR must be used for this mode.



◎ Auto tuning [AT]

- When setting AT parameter to on, front temperature unit display (℃ or ℉) indicator will be flickering during Auto tuning. After completing auto tuning, temperature unit display indicator returns to normal operation and AT parameter automatically becomes [on → oFF].
- Set as oFF to stop auto tuning.
  ※It keeps previous P, I, D set values.
- If SV is changed during auto tuning mode, auto tuning is stopped.
- PID time constants figured out through auto tuning function can be changed.
- If control method [C-md] is set to onoF, no parameters are displayed.
- Finish auto tuning when [oPEn] error occurs during the operation.

※In case of [oPEn] error, auto tuning operation is not applicable.

◎ Input correction [In-b]

Controller itself does not have errors but there may be error by external input temperature sensor.

E.g.)If actual temperature is 80℃ but controller displays 78℃, set input correction value [In-b] as 002 and controller displays 80℃.

※As the result of input correction, if current temperature value (PV) is over each temperature range of input sensor, it displays HHHH or LLLL.

◎ Input digital filter [nAuF]

If current temperature (PV) is fluctuating repeatedly by rapid change of input signal, it reflects to MV and stale control is impossible. Therefore, digital filter function stabilizes current temperature value.

- For example, set input digital filter value as 0.4 sec, and it applies digital filter to input values during 0.4 sec and displays this values. Current temperature may be different by actual input value.

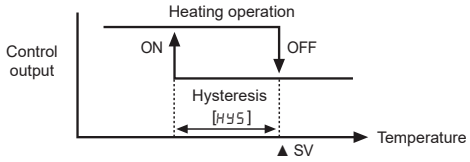
◎ Control method selection [C-md]

It is selectable PID, ON/OFF control.

- In case of ON/OFF [onoF] mode, Hysteresis [HYS] parameter is displayed.
- In case of PID [PId] mode, Proportional band [P], Integral time [I], and Derivative time [t] parameters are displayed.

◎ Hysteresis [HYS]

- Set control output ON / OFF interval in ON / OFF control mode.



- If Hysteresis is too narrow, hunting (oscillation, chattering) could occur due to external noise.
- In case of ON / OFF control mode, even if PV reaches stable status, there still occurs hunting. It could be due to Hysteresis [HYS] SV, load's response characteristics or sensor's location. In order to reduce hunting to a minimum, it is required to take into following factors consideration when designing temp. controlling; proper Hysteresis [HYS], heater's capacity, thermal characteristics, sensor's response and location.

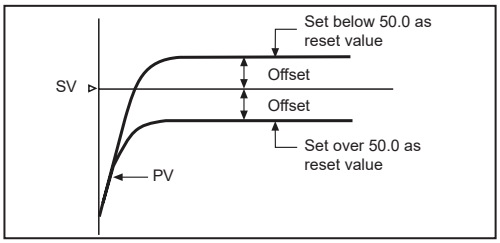
◎ Temperature unit selection [Unit]

- A function to select display temperature unit
- Unit display indicator will be ON when converting temperature unit.

◎ Manual reset [rESt]

When selecting P/PD control mode, certain temperature difference exists even after PV reaches stable status because heater's rising and falling time is inconsistent due to thermal characteristics of controlled objects, such as heat capacity, heater capacity. This temperature difference is called offset and manual reset [rESt] function is to set/ correct offset.

- When PV and SV are equal, reset value is 50.0%. After control is stable, PV is lower than SV, reset value is over 50.0% or PV is higher than SV, reset value is below 50.0%.
- Manual reset [rESt] by control result



※Manual reset function is applicable only to P / PD control mode.

◎ Control output MV when input sensor line is broken [Er.mu]

The function to set control output MV in case of open error. Users are able to set by ON/OFF setting or MV setting. It executes control output by set MV regardless of ON/OFF or PID control output.

◎ Cool / Heat function [o-Ft]

Generally there are two ways to control temperature, one (Heat-function) is to heat when PV is getting down (Heater). The other (Cool-function) is to cool when PV is getting higher (Freezer).

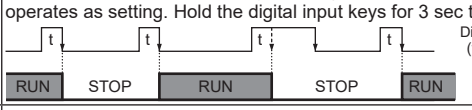
These functions are operating oppositely when it is ON/ OFF control or proportional control. But in this case PID time constant will be different due to PID time constant will be decided according to control system when it is PID control.

- Cool-function [CooL] and heat-function [HEAt] must be set correctly according to the application, if set as opposite function, it may cause a fire. (If set cool-function [CooL] at heater, it will be maintained ON and it may cause a fire.)
- Avoid changing heat-function to cool-function or cool-function to heat-function when the unit is operating.
- It is impossible to operate both function at once in this unit. Therefore, only one function should be selected only.

◎ SV High/Low limit [H-Su / L-Su]

- It sets SV high/low limit Limit range of using temperature within temperature range for each sensor, user can set/ change set temperature (SV) within SV high limit [H-Su] to SV low limit [L-Su]. (※ L-Su > H-Su cannot be set.)
- When changing input type [In-t], SV high limit [H-Su] and SV low limit [L-Su] of using temperature will be initialized as max./min. value of sensor temperature range automatically.

◎ Digital input key (▼ + ▲ 3 sec) [dI-t]

Parameter		Operation
OFF	oFF	It does not use digital input key function.
RUN/STOP	StoP	Pauses control output. Auxiliary output (except loop break alarm, sensor break alarm)except Control output operates as setting. Hold the digital input keys for 3 sec to restart. 
Clear alarm	AL.rE	Clears alarm output by force. (only when alarm option is alarm latch, or alarm latch and standby sequence 1/2 .) This function is applied when present value is out of alarm operation range but alarm output is ON. Alarm operates normally right after clearing alarm.
Auto-tuning	At	Starts/Stops auto-tuning. This function is same as auto-tuning[At] of parameter group 1. (You can start auto-tuning [At] of parameter group 1 and stop it by digital input key.) ※This parameter At appears only when control method [C-md] Parameter group 2 is set as PId. When control method [C-md] Parameter group 2 is set as onoF, this parameter is changed as oFF.

◎ Parameter lock [LoC]

A function to prevent changing SV and parameters of each setting group. Parameter setting values are still possible to check when parameter lock is set.

Display	Description
oFF	Lock off
LoC 1	Lock parameter group 2
LoC2	Lock parameter group 1, 2
LoC3	Lock parameter group 1, 2, SV setting

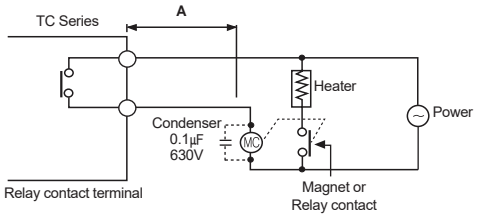
※ oFF, LoC 1 are available only for indicator (TC4□-N□N).

◎ Error

Display	Description	Troubleshooting
oPEn	Flashes if input sensor is disconnected or sensor is not connected.	Check input sensor state.
HHHH	Flashes if measured sensor input is higher than temperature range.	When input is within the rated temperature range, this display disappears.
LLLL	Flashes if measured sensor input is lower than temperature range.	

◎ Output connections

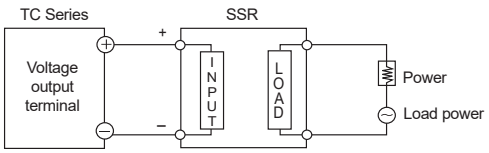
● Application of relay output type



Keep **A** length as long as possible when wiring the temperature controller and the load. If wire length of **A** is short, counter electromotive force which occurs from a coil of magnet switch & power relay may flow in power line of the unit, and it may cause malfunction.

If wire length of **A** is short, please connect mylar condensers 104 (630V) on the both ends of "Ⓜ" (magnet coil) to protect electromotive force.

● Application of SSR drive output method



※SSR should be selected by the capacity of load, otherwise, it may short-circuit and result in a fire. Indirect heated should be used with SSR for efficient working.

※Please use a cooling plate or it may cause the capability deterioration, breakdown of SSR for a long usage.

※Refer to page '◎ SSR drive output function (SSRP function)' for phase/cycle control connections.

▣ Proper Usage

◎ Simple "error" diagnosis

● When the load (Heater etc) is not operated

Please check operation of the OUT indicator located in front panel of the unit.

If the OUT indicator does not operate, please check the parameter of all programmed mode.
If indicator is operating, please check the output (Relay, SSR drive voltage) after separating output line from the unit.

● When it displays oPEn during operation

This is a warning that external sensor is open.
Please turn off the power and check the wire state of the sensor. If sensor is not open disconnect sensor line from the unit and short the input +, - terminal. Turn on the power of the unit and check the controller displays room temperature.

If this unit cannot display room temperature, this unit is broken. Please remove this unit and contact our service center. (When the input mode is thermocouple, it is available to display room temperature.)

◎ Cautions during use

- Follow instructions in 'Cautions during use'. Otherwise, It may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- When changing the input sensor, turn off the power first before changing.
  After changing the input sensor, modify the value of the corresponding parameter.
- 24VAC, 24-48VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- This unit may be used in the following environments.
  ①Indoors
  (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Bar Graph Temperature Controllers

▣ Features

- High speed sampling of 50ms and ±0.3% display accuracy
- Enable to check control output operation amount by adopting bar graph
- Simultaneous heating/cooling control and automatic/ manual control for high performance control
- Selection function of current output or SSR drive output
- Parameter setting available via PC (USB and RS485 communication)
  - Free device comprehensive management program (DAQMaster)
  ※ Communication converter sold separately: SCM-US(USB/Serial converter), SCM-38I(RS232C/RS485 converter) SCM-US48I(USB/RS485 converter)
- Multi-SV (max. 4) function (select via digital input terminal)
- Heater break alarm
  ※ CT sold separately: CSTC-E80LN, CSTC-E200LN, CSTS-E80PP
- Small size (rear length: 60mm)
- Multi input/multi range

Please read "Safety Considerations" in the instruction manual before using.

▣ Manuals

- For the detail information and instructions, please refer to user manual and user manual for communication, and be sure to follow cautions written in the technical descriptions (catalog, website).
  Visit our website (www.autonics.com) to download manuals.
- The user manual includes product specifications, functions, and operations.
- The user manual for communication includes information about Modbus RTU protocol, and Modbus mapping table.

▣ Comprehensive Device Management Program (DAQMaster)

DAQMaster is the comprehensive device management program to set parameters and manage monitoring data and user group, parameter mask which are the dedicated function of KPN.
Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >

■ Ordering Information

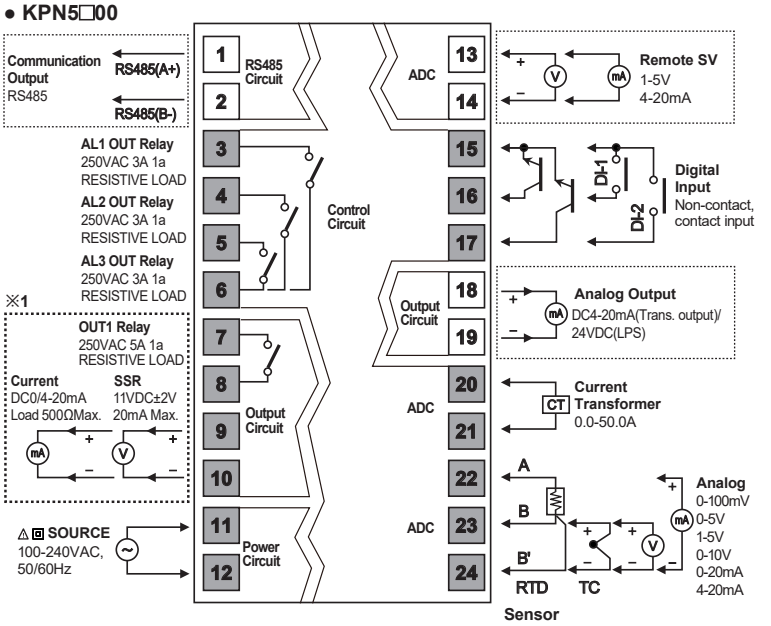
KPN5 5 0 0 – 0 0 0

Power supply	0		100-240VAC 50/60Hz
Option input/output	0		None
	3		Transmission output + Remote SV
Option communication output	0		None
	2		RS485
Control output※1	1 output type	0	Selectable Relay output, Current output, SSR drive output
	2 output type	1	OUT1: Selectable Current output, SSR drive output OUT2: Selectable Current output, SSR drive output
		3	OUT1: Selectable Current output, SSR drive output OUT2: Relay output
		7	OUT1: Relay output OUT2: Selectable Current output, SSR drive output
		9	OUT1: Relay output OUT2: Relay output
The number of control outputs	0		1 output type (Heating or Cooling type)
	1		2 output type (Heating&Cooling type)
Size	2		DIN W96×H48mm
	3		DIN W48×H96mm
	5		DIN W96×H96mm
Item	KPN5		Bar Graph Temperature Controllers

※ 1: The 1 output type is heating or cooling output type and the 2 output type is heating & cooling output type.
The 1 output type is able to use only one output among relay output, current output, SSR drive output.
OUT1 of the 2 output type is fixed as heating output and OUT2 of the 2 output type is fixed as cooling output.
If you select the SSR drive output or current output model, you can select the appropriate control output.

■ Connections

● **KPN5□00**

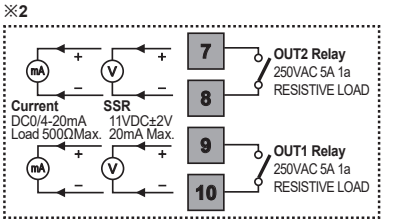


※1:Set relay output [rLY], current [CUrr], or SSR drive output [SSr] at OUT1 control output [oUt1] in parameter 3 group.

※ Standard model has shaded terminals only.
⋯ is option specification.

● **KPN5□1□**

※2



※2: OUT1, OUT2

Model	OUT1 control output	OUT2 control output
KPN5□11	Selectable Current output, SSR drive output	Selectable Current output, SSR drive output
KPN5□13	Selectable Current output, SSR drive output	Relay output
KPN5□17	Relay output	Selectable Current output, SSR drive output
KPN5□19	Relay output	Relay output

※Use teminals of size specified below.

	a	b
<Round>	Min. 3.0mm	Max. 5.8mm
<Forked>	Min. 3.0mm	Max. 5.8mm

■ Specifications

Series		KPN52□□	KPN53□□	KPN55□□
Power supply		100-240VAC～ 50/60Hz		
Allowable voltage range		90 to 110% of rated voltage		
Power consumption		Max. 15VA		
Display method		7-segment (red, green), control bar graph: red, green		
Character size	PV (W×H)	8.5×17.0mm	7.0×14.6mm	11.0×22.0mm
	SV (W×H)	6.0×12.0mm	6.0×12.0mm	6.0×12.0mm
Input type	RTD	JPt100Ω, DPt100Ω, DPt50Ω, Cu100Ω, Cu50Ω, Nikel120Ω (6 types)		
	TC	K, J, E, T, L, N, U, R, S, B, C, G, PLII (13 types)		
	Analog	・Voltage: 0-100 mV, 0-5 V, 1-5 V, 0-10 V (4 types) ・Current: 0-20mA, 4-20mA (2 types)		
Display accuracy	RTD	・At room temperature (23±5℃): (PV ±0.3% or ±1℃, select the higher one) ±1-digit ※1 ・Out of room temperature range: (PV ±0.5% or ±2℃, select the higher one) ±1-digit		
	TC			
	Analog	At room temperature (23±5℃): ±0.3% F.S.±1-digit, out of room temperature range: ±0.5% F.S.±1-digit		
	CT input	±5% F.S.±1-digit		
Control output	Relay	OUT1, OUT2: 250VAC～ 5A 1a		
	SSR	Max. 11VDC⎓±2V 20mA		
	Current	0-20mA or 4-20mA selectable (max. load 500Ω)		
Alarm output	Relay	AL1, AL2, AL3: 250VAC～ 3A 1a		
Option output	Transmission	4-20mA (load max. 600Ω, output accuracy: ±0.3% F.S.±1-digit)		
	Communication	RS485 communication output (modbus RTU method)		
Option input	CT	0.0-50.0A (primary heater current value measuring range) ※CT ratio is 1/1000		
	Remote SV	1-5VDC⎓ or 4-20mA (current input: using external resistance 250Ω)		
	Digital input	・Contact input: ON - max. 2kΩ, OFF - min. 90kΩ ・Non-contact input: ON - residual votage max. 1.0V, OFF - leakage current max. 0.1mA		
Control type	Heating, Cooling	ON/OFF control, P, PI, PD, PID control		
	Heating&Cooling			
Hysteresis		・Thermocouple/RTD: 1 to 100℃/℉ (0.1 to 100.0℃/℉) variable ・Analog: 1 to 100-digit		
Proportional band (P)		0.1 to 999.9℃(0.1 to 999.9%)		
Integral time (I)		0 to 9999 sec		
Derivative time (D)		0 to 9999 sec		
Control period (T)		Relay output, SSR drive output: 0.1 to 120.0 sec Current output + SSR drive output: 1.0 to 120.0 sec		
Manual reset value		0.0 to 100.0%		
Sampling period		50ms		
Dielectric strength		2000VAC 50/60Hz for 1 min (between input terminal and power source terminal)		
Vibration		0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours		
Relay life cycle	Mechanical	Over 10,000,000 operations		
	Electrical	Over 100,000 operations (250VAC 3A resistance load)		
Insulation resistance		Over 100MΩ (at 500VDC megger)		
Noise immunity		Square shaped noise by noise simulator (pulse width 1μs) ±2kV R-phase, S-phase		
Memory retention		Approx. 10 years (when using non-volatile semiconductor memory type)		
Environ-ment	Ambient temp.	-10 to 50℃, storage: -20 to 60℃		
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH		
Protection		IP65 (front panel, IEC standard)		
Insulation type		Double insulation or reinforced insulation (mark: □, dielectric strength between the measuring input part and the power part: 1kV)		
Approval		CE		
Weight※2		Approx. 230g (approx. 160g)		Approx. 316g (approx. 220g)

※1. ◎ At room temperature (23℃±5℃)
- ・TC K, J, T, N, E type, below -100℃ / L, U, PLII, RTD Cu50, DPt50: (PV ±0.3% or ±2℃, select the higher one) ±1-digit
- ・TC C, G and R, S type, below 200℃: (PV ±0.3% or ±3℃, select the higher one) ±1-digit
- ・TC B type, below 400℃, there is no accuracy standards.

◎ Out of room temperature range
- ・RTD Cu50, DPt50: (PV 0.5% or ±3℃, select the higher one) ±1-digit
- ・RTD R, S, B, C, G: (PV ±0.5% or ±10℃, select the higher one) ±1-digit
- ・Other sensors: below -100℃, within ±5℃

※2. The weight includes packaging. The weight in parenthesis is for unit only.
※ Environment resistance is rated at no freezing or condensation.

▣ Input Type and Range

Input type		Demical point	display	Input range (℃)	Input range (℉)
Thermocouple	K(CA)	1	tC.K1	-200 to 1350	-328 to 2463
		0.1	tC.K2	-199.9 to 999.9	-199.9 to 999.9
	J(IC)	1	tC.J1	-200 to 800	-328 to 1472
		0.1	tC.J2	-199.9 to 800.0	-199.9 to 999.9
	E(CR)	1	tC.E1	-200 to 800	-328 to 1472
		0.1	tC.E2	-199.9 to 800.0	-199.9 to 999.9
	T(CC)	1	tC.t1	-200 to 400	-328 to 752
		0.1	tC.t2	-199.9 to 400.0	-199.9 to 752.0
	B(PR)	1	tC-b	0 to 1800	32 to 3272
	R(PR)	1	tC-r	0 to 1750	32 to 3182
	S(PR)	1	tC-S	0 to 1750	32 to 3182
	N(NN)	1	tC-n	-200 to 1300	-328 to 2372
	C(TT)※1	1	tC-C	0 to 2300	32 to 4172
	G(TT)※2	1	tC-G	0 to 2300	32 to 4172
	L(IC)	1	tC.L1	-200 to 900	-328 to 1652
		0.1	tC.L2	-199.9 to 900.0	-199.9 to 999.9
	U(CC)	1	tC.U1	-200 to 400	-328 to 752
		0.1	tC.U2	-199.9 to 400.0	-199.9 to 752.0
	Platinel II	1	tC-P	0 to 1390	32 to 2534
RTD	Cu50Ω	0.1	Cu.50	-199.9 to 200.0	-199.9 to 392.0
	Cu100Ω	0.1	Cu.10	-199.9 to 200.0	-199.9 to 392.0
	JPt100Ω	1	JPt.1	-200 to 650	-328 to 1202
		0.1	JPt.2	-199.9 to 650.0	-199.9 to 999.9
	DPt50Ω	0.1	dPt.5	-199.9 to 650.0	-199.9 to 999.9
	DPt100Ω	1	dPt.1	-200 to 650	-328 to 1202
		0.1	dPt.2	-199.9 to 650.0	-199.9 to 999.9
	Nickel120Ω	1	ni.12	-80 to 200	-112 to 392
Analog	0 - 10V		A-u1	-1999 to 9999 (display range depends on the decimal point position)	
	0 - 5V		A-u2		
	1 - 5V		A-u3		
	0 - 100mV		A.nu1		
	0 - 20mA		A.nA1		
	4 - 20mA		A.nA2		

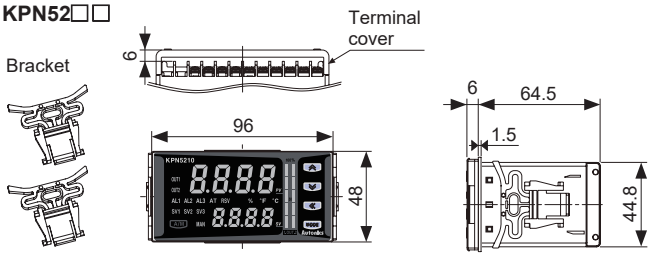
※ 1: C(TT): Same as existing W5(TT) type sensor.

※ 2: G(TT): Sane as existing W(TT) type sensor.

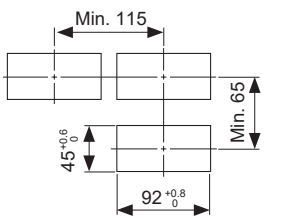
▣ Dimensions

(unit:mm)

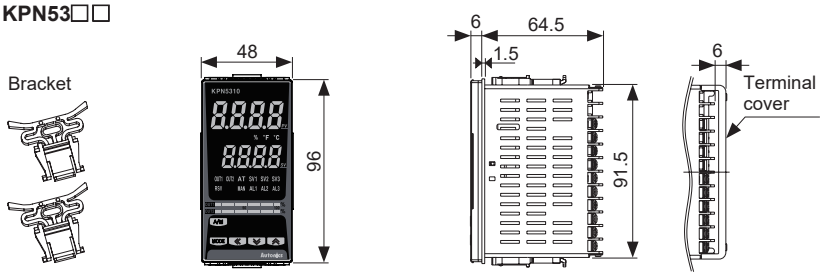
• **KPN52□□**



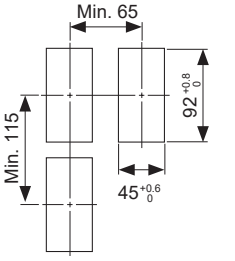
• **Panel cut-out**



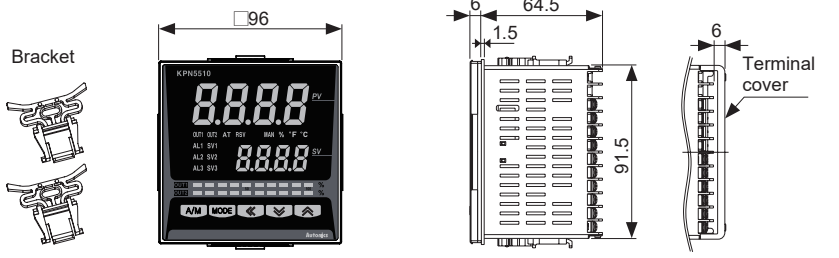
• **KPN53□□**



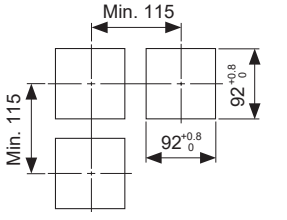
• **Panel cut-out**



• **KPN55□□**

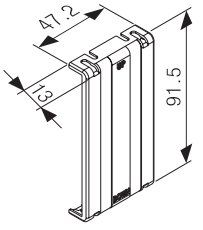


• **Panel cut-out**

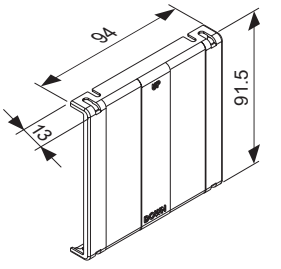


• **Terminal cover (sold separately)**

• **RHA-COVER (48×96 mm size)**



• **RLA-COVER (96×96 mm size)**



▣ Sold Separately

◎ Communication converter

• **SCM-WF48**
(Wi-Fi to RS485·USB wireless communication converter)

• **SCM-US48I**
(USB to RS485 converter)

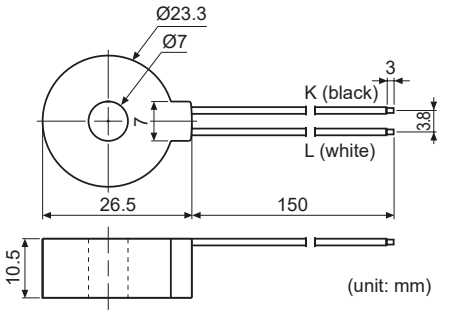
• **SCM-38I**
(RS232C to RS485 converter)

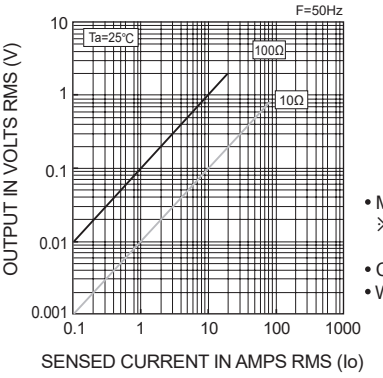
• **SCM-US**
(USB to Serial converter)

▣ Sold Separately

◎ Current transformer (CT)

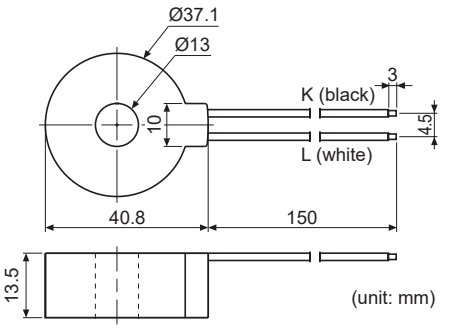
• CSTC-E80LN

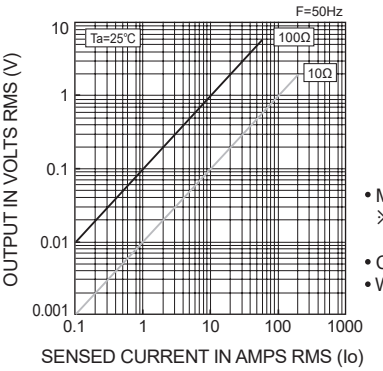




- Max. load current: 80A (50/60Hz)
  ※Max. load current for KPN Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance: 31Ω±10%

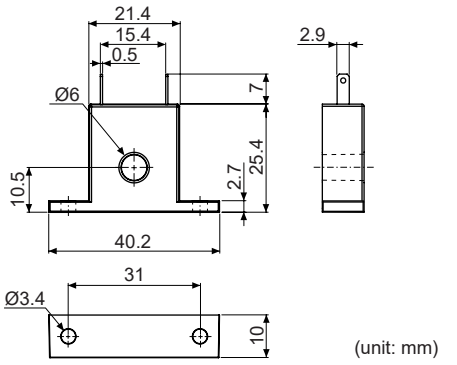
• CSTC-E200LN

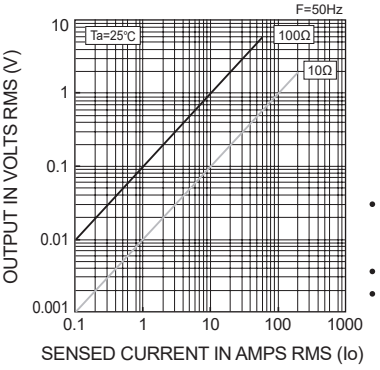




- Max. load current: 200A (50/60Hz)
  ※Max. load current for KPN Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance: 20Ω±10%

• CSTS-E80PP

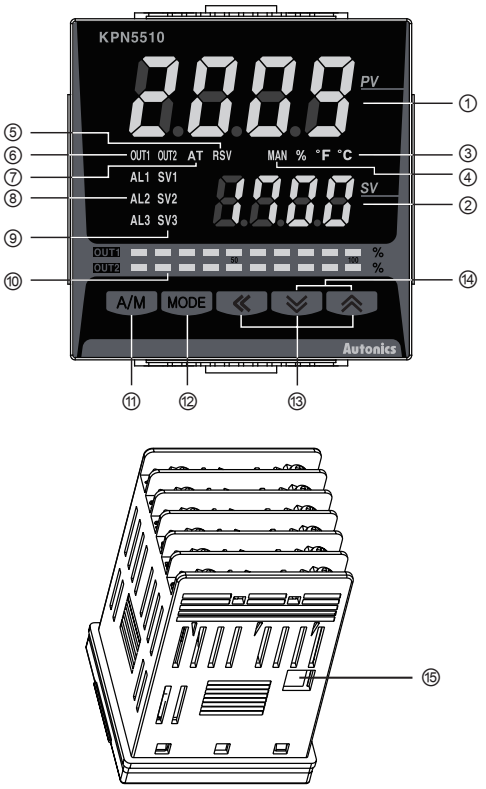




- Max. load current: 80A (50/60Hz)
  ※Max. load current for KPN Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance 31Ω±10%

※Do not supply primary current in case that CT output is open. High voltage will be generated in CT output.
※The current for above CTs is 50A same but inner hole sizes are different. Please use this for your environment.

■ Unit Description



① Present value (PV) display part
- RUN mode: Displays currently measured value (PV).
- Set mode: Displays the parameters.

② Set value (SV) display part
- RUN mode: Displays the set value (SV).
- Set mode: Displays the set value of the parameter.

③ Unit (℃/℉/%) indicator: Displays the unit set at display unit [d.Unt] in parameter 3 group.

④ Manual control indicator: Turns ON during manual controlling.

⑤ Remote SV control indicator: Turns ON during remote SV controlling.

⑥ Control output (OUT1, OUT2) indicator: Turns ON when the control output is ON.
※Using current output, in case that for manual control MV is 0.0%, the control output indicator turns OFF but the other cases it turns ON always. In case that for auto control MV is over 3.0%, it turns ON and the MV is below 2.0%, it turns OFF.

⑦ Auto tuning indicator: Flashes by 1 sec when executing auto tuning.

⑧ Alarm output (AL1, AL2, AL3) indicator: Turns ON when the alarm output is ON.

⑨ Multi SV indicator: The SV 1 to 3 indicator turns ON when using multi SV function.

⑩ Bar graph for control output: Displays control output MV as bar graph.
KPN5□00 as 1 output type has one bar graph (OUT1), and the KPN5□1□ as 2 output type has two bar graphs (OUT1, OUT2).

⑪ **A/M** key: Used when switching auto control to manual control.

⑫ **MODE** key: Used when entering parameter setting group, returning to RUN mode, moving parameter, saving the set value.

⑬ ≪, ≫, ∧ key: Used when entering the set value changing mode and moving or changing up/down digit.

⑭ Digital input key: When pressing the ≫ + ∧ keys for 3 sec at the same time, it operates the function (RUN/STOP, alarm clear, auto-tuning) set at digital input key [dI -P] in parameter 5 group.

⑮ PC loader port: It is the PC loader port for serial communication to set and monitor parameters by PC. Use this port for connection SCM-US (USB to serial convertor).

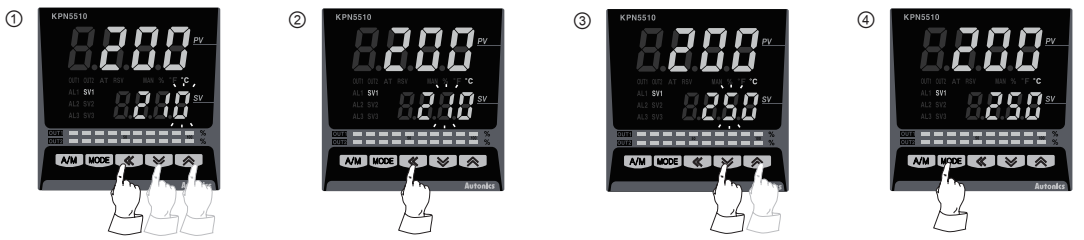
※ Display part is different by options.

■ Set Value (SV) Setting

You can set the temperature to control with the ≪ , ≫ , ∧ keys.

Setting range is within SV low-limit value [L -SV] to SV high-limit value [H -SV].

※ E.g.) In case of changing set temperature from 210 ℃ to 250 ℃



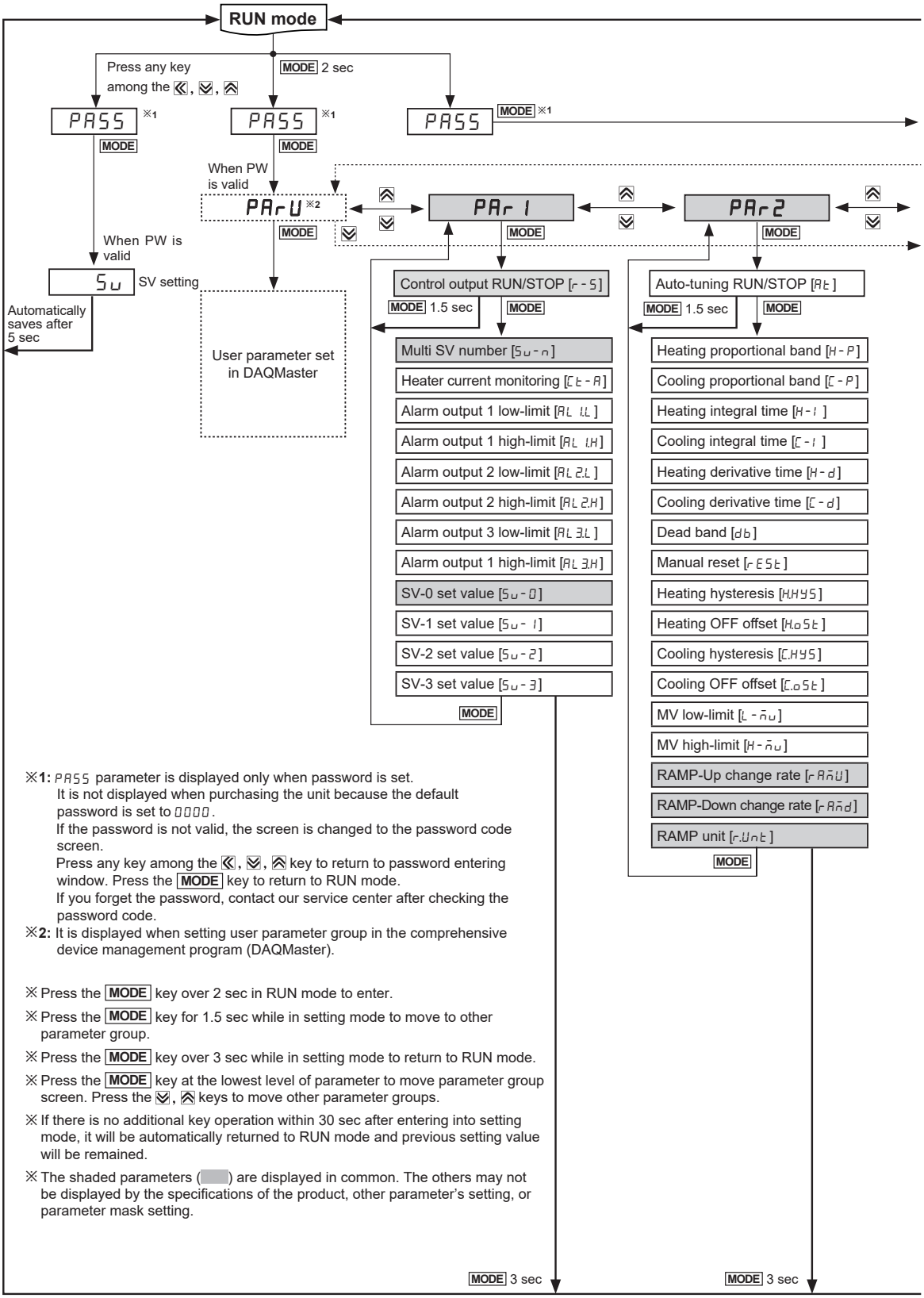
Press any key among the ≪, ≫, ∧ in RUN mode to enter into SV setting mode. Last digit (10^0-digit) on SV display part flashes.

Press the ≪ key to move digit. ($10^0 \rightarrow 10^1 \rightarrow 10^2 \rightarrow 10^3 \rightarrow 10^0$)

Press the ≫ or ∧ key to raise or lower the setting value. (1 → 5)

Press the **MODE** key to save the setting value. If there is no additional key operations in 3 sec, the changed SV is automatically saved.

▣ Parameter Groups



※**1:** PASS parameter is displayed only when password is set.
It is not displayed when purchasing the unit because the default password is set to 0000.
If the password is not valid, the screen is changed to the password code screen.
Press any key among the ◁, ▽, △ key to return to password entering window. Press the **MODE** key to return to RUN mode.
If you forget the password, contact our service center after checking the password code.

※**2:** It is displayed when setting user parameter group in the comprehensive device management program (DAQMaster).

※ Press the **MODE** key over 2 sec in RUN mode to enter.

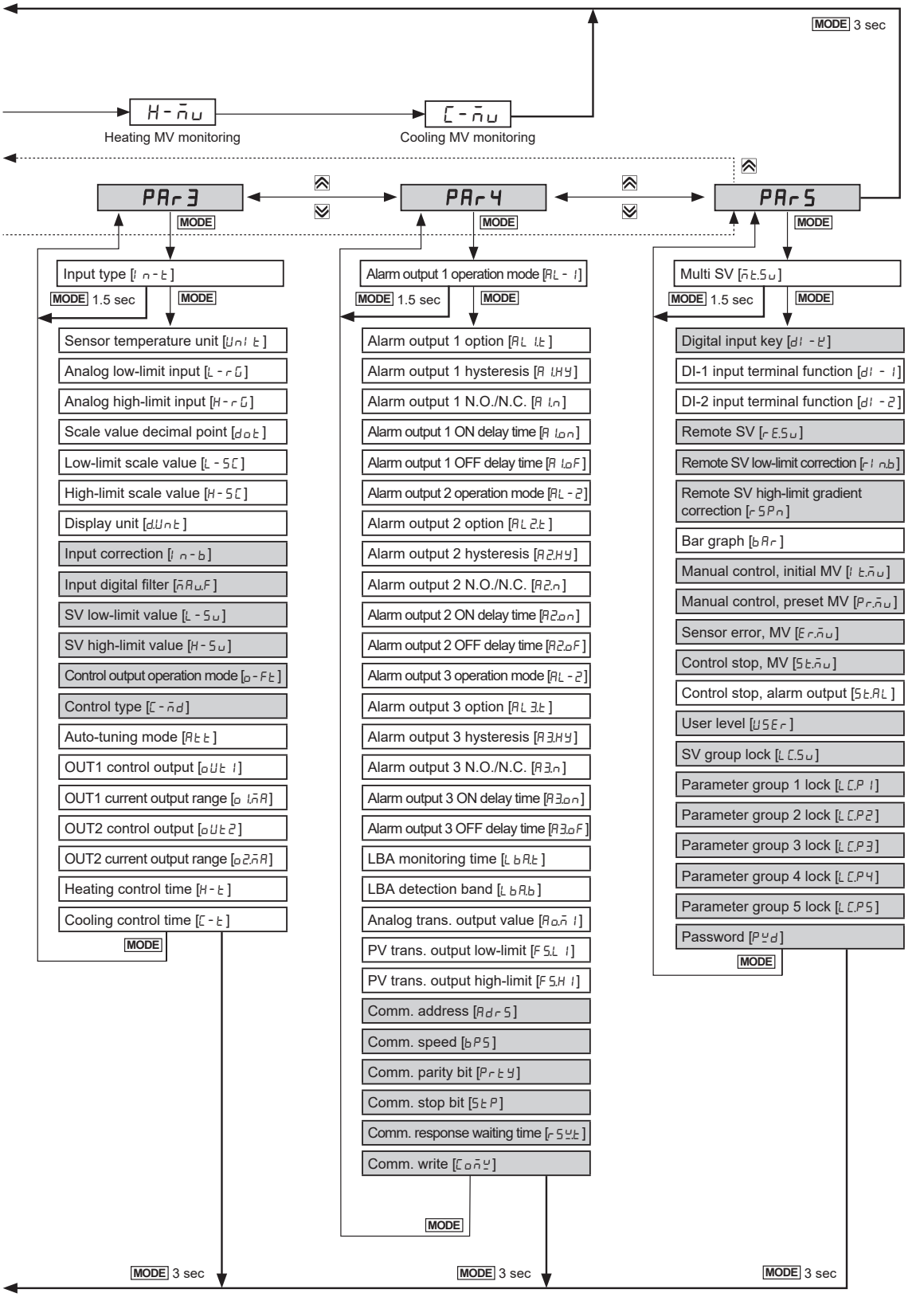
※ Press the **MODE** key for 1.5 sec while in setting mode to move to other parameter group.

※ Press the **MODE** key over 3 sec while in setting mode to return to RUN mode.

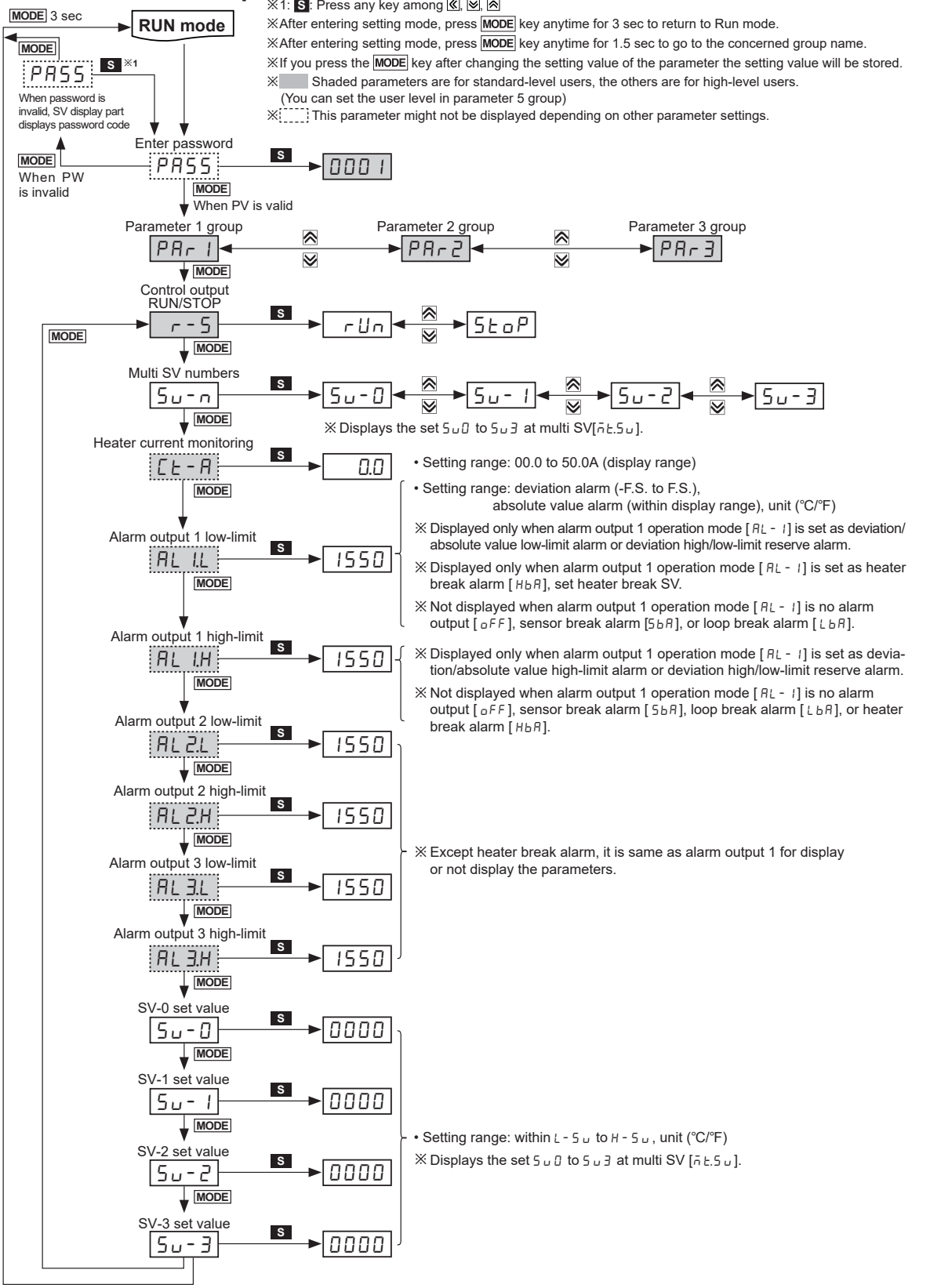
※ Press the **MODE** key at the lowest level of parameter to move parameter group screen. Press the ▽, △ keys to move other parameter groups.

※ If there is no additional key operation within 30 sec after entering into setting mode, it will be automatically returned to RUN mode and previous setting value will be remained.

※ The shaded parameters ( ) are displayed in common. The others may not be displayed by the specifications of the product, other parameter's setting, or parameter mask setting.


MODE 3 sec
H-ou
Heating MV monitoring
C-ou
Cooling MV monitoring
PAr3
PAr4
PAr5
MODE
Input type [in-t]
MODE 1.5 sec
Sensor temperature unit [Unit]
Analog low-limit input [L-rG]
Analog high-limit input [H-rG]
Scale value decimal point [dot]
Low-limit scale value [L-SC]
High-limit scale value [H-SC]
Display unit [dUnt]
Input correction [in-b]
Input digital filter [inAv.F]
SV low-limit value [L-Su]
SV high-limit value [H-Su]
Control output operation mode [o-Ft]
Control type [C-od]
Auto-tuning mode [Att]
OUT1 control output [oUt1]
OUT1 current output range [o1rA]
OUT2 control output [oUt2]
OUT2 current output range [o2rA]
Heating control time [H-t]
Cooling control time [C-t]
Alarm output 1 operation mode [AL-1]
Alarm output 1 option [AL1t]
Alarm output 1 hysteresis [A1HY]
Alarm output 1 N.O./N.C. [A1n]
Alarm output 1 ON delay time [A1on]
Alarm output 1 OFF delay time [A1oF]
Alarm output 2 operation mode [AL-2]
Alarm output 2 option [AL2t]
Alarm output 2 hysteresis [A2HY]
Alarm output 2 N.O./N.C. [A2n]
Alarm output 2 ON delay time [A2on]
Alarm output 2 OFF delay time [A2oF]
Alarm output 3 operation mode [AL-3]
Alarm output 3 option [AL3t]
Alarm output 3 hysteresis [A3HY]
Alarm output 3 N.O./N.C. [A3n]
Alarm output 3 ON delay time [A3on]
Alarm output 3 OFF delay time [A3oF]
LBA monitoring time [LbAt]
LBA detection band [LbAb]
Analog trans. output value [Aout1]
PV trans. output low-limit [FSL1]
PV trans. output high-limit [FSH1]
Comm. address [Adrs]
Comm. speed [bPS]
Comm. parity bit [Prty]
Comm. stop bit [StP]
Comm. response waiting time [rSdt]
Comm. write [Comd]
Multi SV [mt.Su]
Digital input key [di-K]
DI-1 input terminal function [di-1]
DI-2 input terminal function [di-2]
Remote SV [rE.Su]
Remote SV low-limit correction [r1nb]
Remote SV high-limit gradient correction [rSPn]
Bar graph [bAr]
Manual control, initial MV [it.ou]
Manual control, preset MV [Pr.ou]
Sensor error, MV [Er.ou]
Control stop, MV [St.ou]
Control stop, alarm output [St.AL]
User level [USEr]
SV group lock [LCSu]
Parameter group 1 lock [LCP1]
Parameter group 2 lock [LCP2]
Parameter group 3 lock [LCP3]
Parameter group 4 lock [LCP4]
Parameter group 5 lock [LCP5]
Password [PWd]
MODE 3 sec
MODE 3 sec
MODE 3 sec

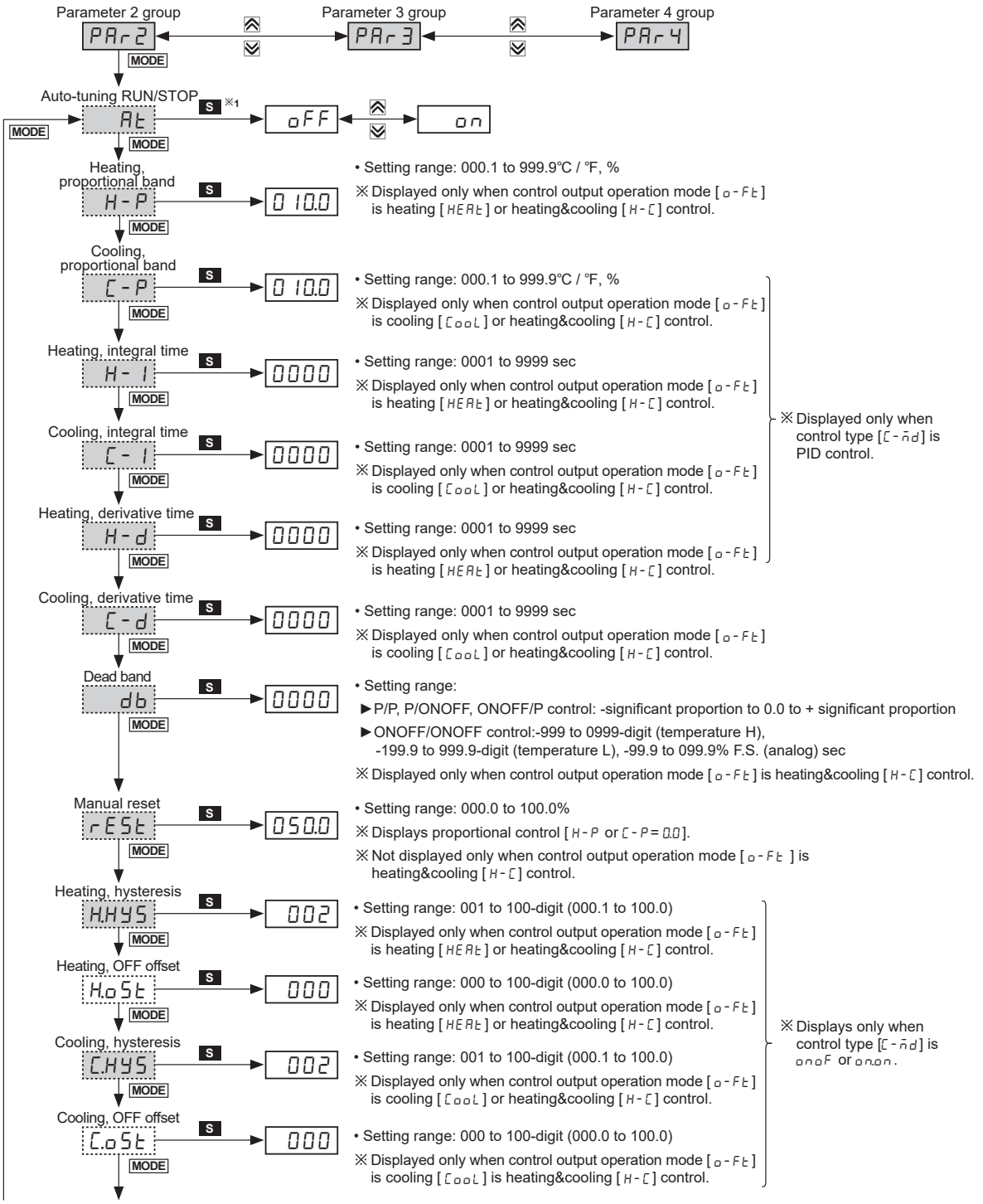
■ Parameter 1 Group

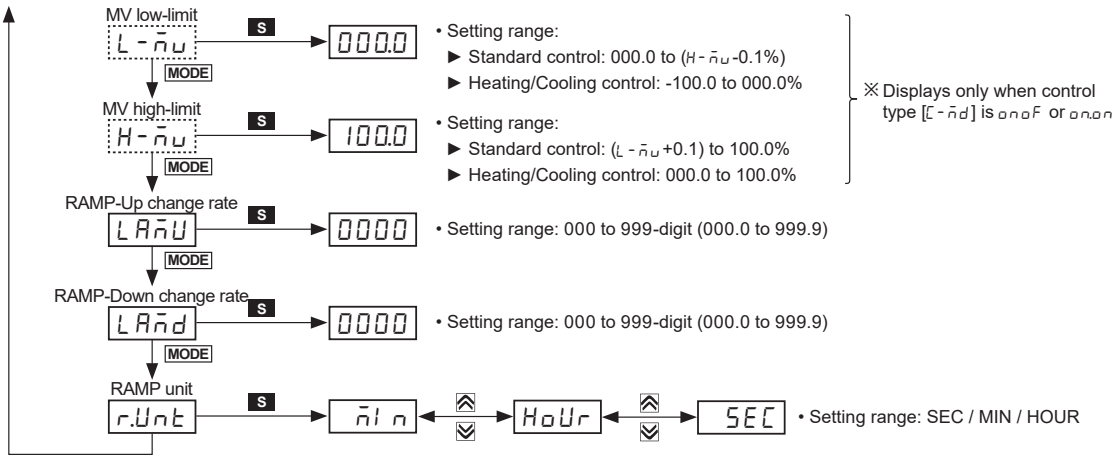


※1: S: Press any key among ◁, ▽, △
※After entering setting mode, press MODE key anytime for 3 sec to return to Run mode.
※After entering setting mode, press MODE key anytime for 1.5 sec to go to the concerned group name.
※If you press the MODE key after changing the setting value of the parameter the setting value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users. (You can set the user level in parameter 5 group)
※ This parameter might not be displayed depending on other parameter settings.

■ Parameter 2 Group

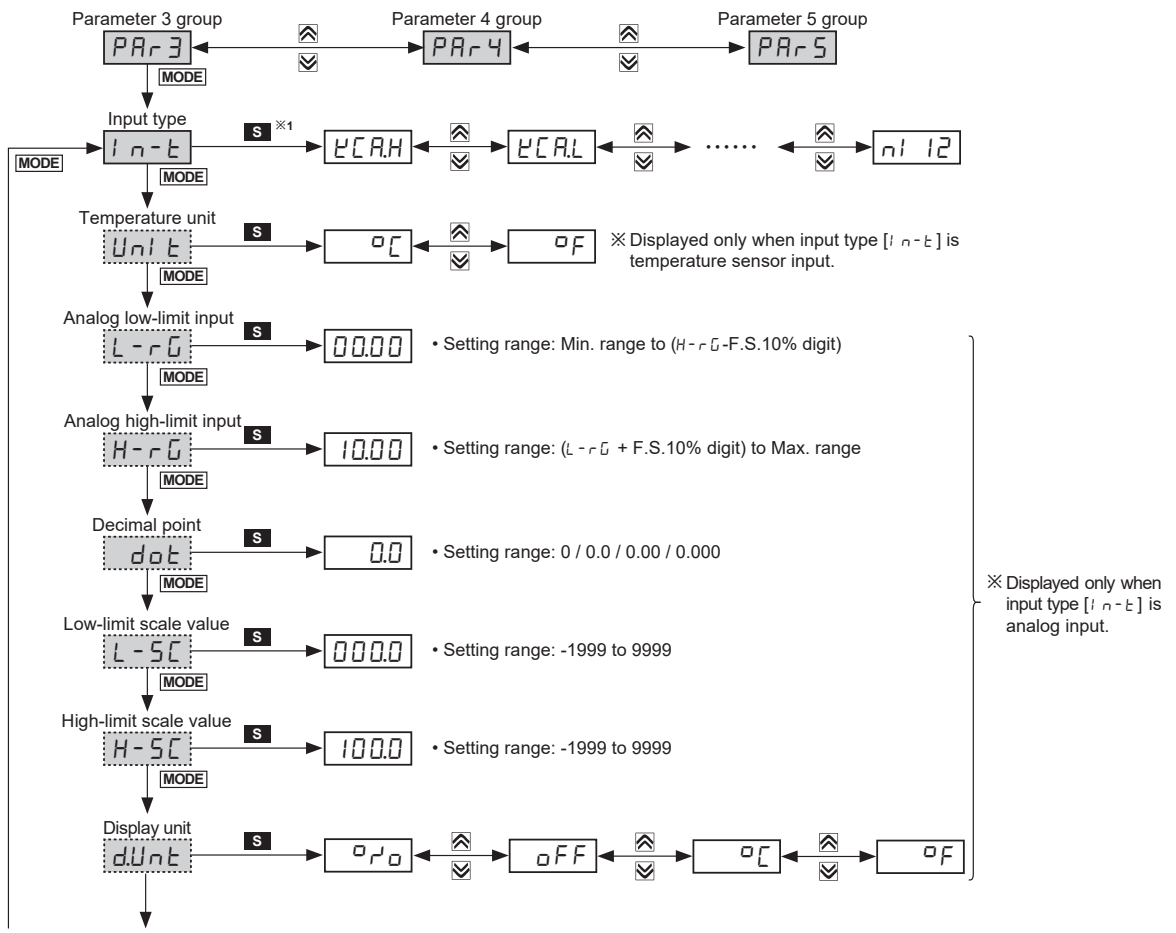
※1: S: Press any key among ◁, ▽, △
※After entering setting mode, press MODE key anytime for 3 sec to return to Run mode.
※After entering setting mode, press MODE key anytime for 1.5 sec to go to the concerned group name.
※If you press the MODE key after changing the setting value of the parameter the setting value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users.
(You can set the user level in parameter 5 group)
※ This parameter might not be displayed depending on other parameter settings.

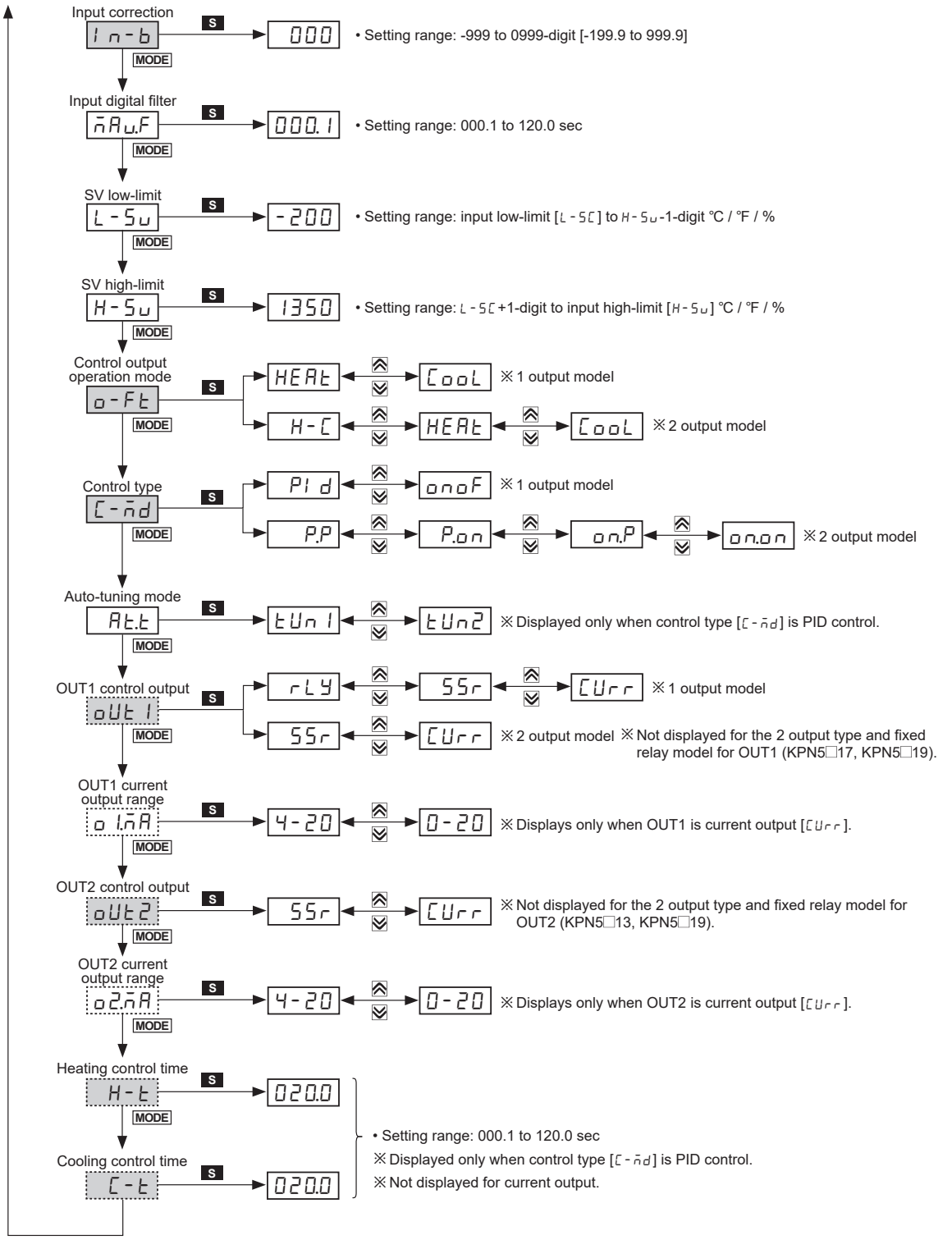




▣ Parameter 3 Group

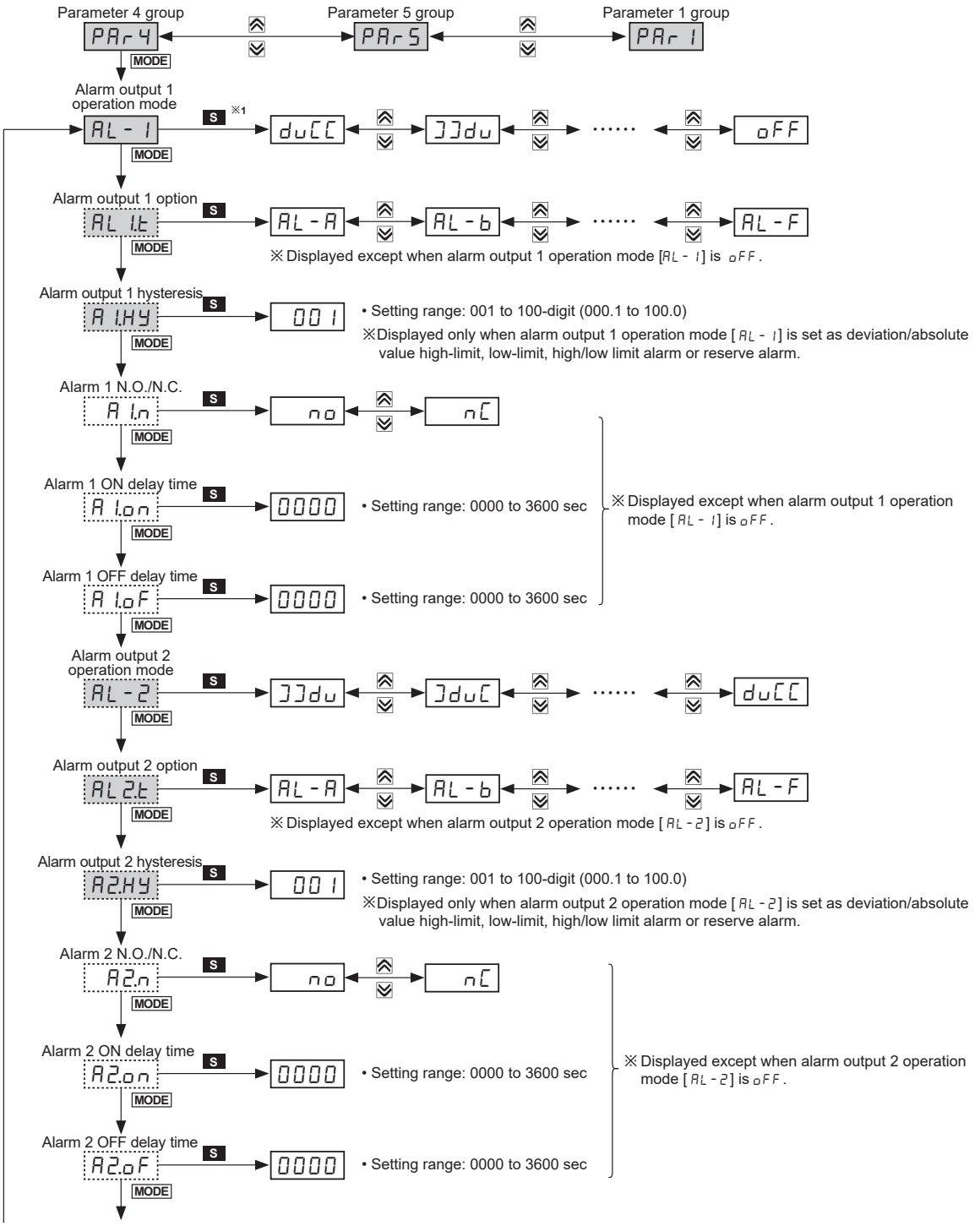
※1: **S**: Press any key among ⋘, ⋁, ⋀
※After entering setting mode, press MODE key anytime for 3 sec to return to Run mode.
※After entering setting mode, press MODE key anytime for 1.5 sec to go to the concerned group name.
※If you press the MODE key after changing the setting value of the parameter the setting value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users.
(You can set the user level in parameter 5 group)
※ This parameter might not be displayed depending on other parameter settings.

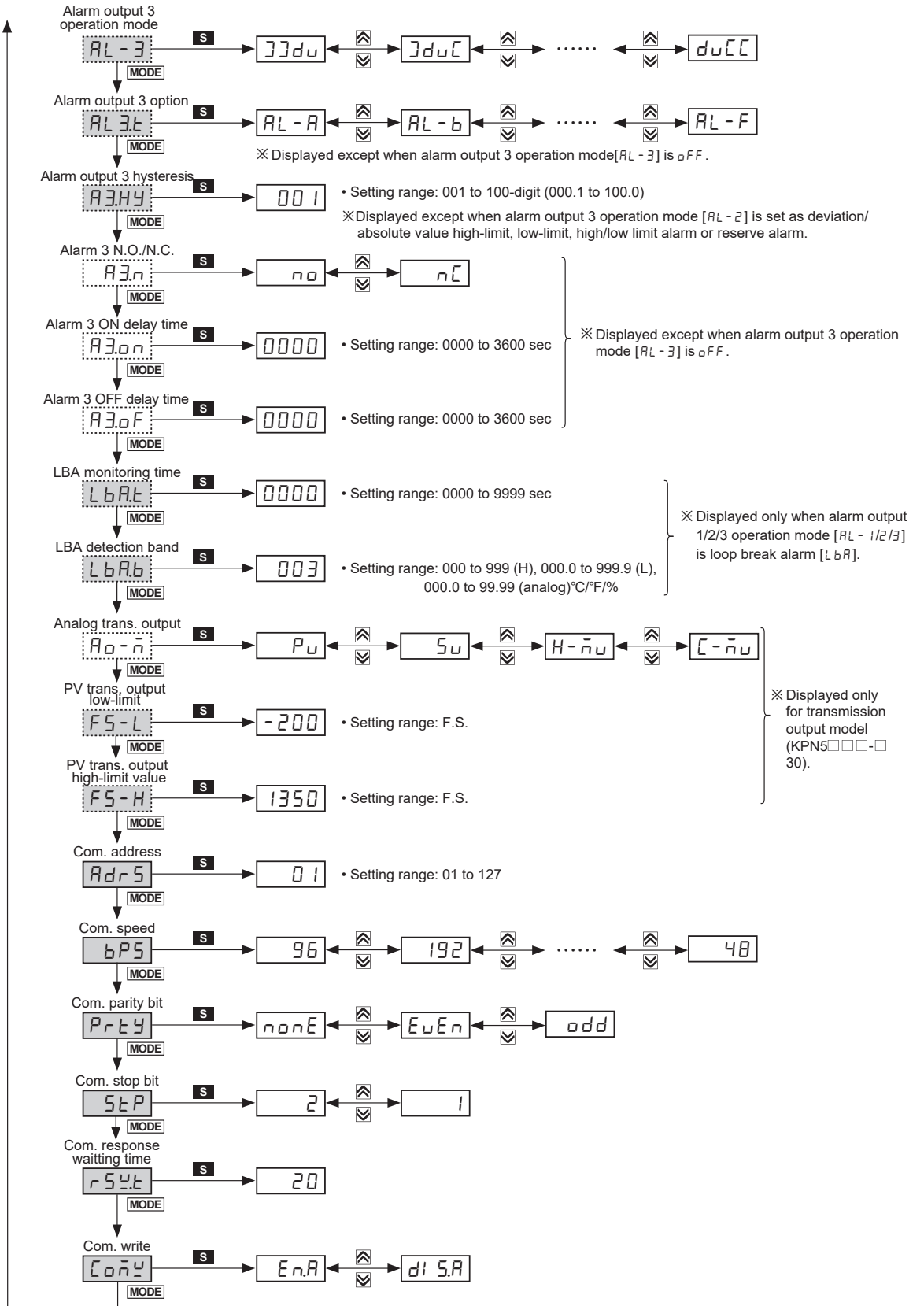



Input correction
In-b
S
000
• Setting range: -999 to 0999-digit [-199.9 to 999.9]
MODE
Input digital filter
InAu.F
S
000.1
• Setting range: 000.1 to 120.0 sec
MODE
SV low-limit
L-Su
S
-200
• Setting range: input low-limit [L-SL] to H-Su-1-digit ℃ / ℉ / %
MODE
SV high-limit
H-Su
S
1350
• Setting range: L-SL+1-digit to input high-limit [H-Su] ℃ / ℉ / %
MODE
Control output operation mode
o-Ft
S
HEAt
CooL
※1 output model
H-C
HEAt
CooL
※2 output model
MODE
Control type
C-Ad
S
PId
onoF
※1 output model
P.P
P.on
on.P
on.on
※2 output model
MODE
Auto-tuning mode
At.t
S
tUn1
tUn2
※Displayed only when control type [C-Ad] is PID control.
MODE
OUT1 control output
oUt1
S
rLY
SSr
CUrr
※1 output model
SSr
CUrr
※2 output model
※Not displayed for the 2 output type and fixed relay model for OUT1 (KPN5□17, KPN5□19).
MODE
OUT1 current output range
o1.nA
S
4-20
0-20
※Displays only when OUT1 is current output [CUrr].
MODE
OUT2 control output
oUt2
S
SSr
CUrr
※Not displayed for the 2 output type and fixed relay model for OUT2 (KPN5□13, KPN5□19).
MODE
OUT2 current output range
o2.nA
S
4-20
0-20
※Displays only when OUT2 is current output [CUrr].
MODE
Heating control time
H-t
S
020.0
• Setting range: 000.1 to 120.0 sec
※Displayed only when control type [C-Ad] is PID control.
※Not displayed for current output.
MODE
Cooling control time
C-t
S
020.0

▣ Parameter 4 Group

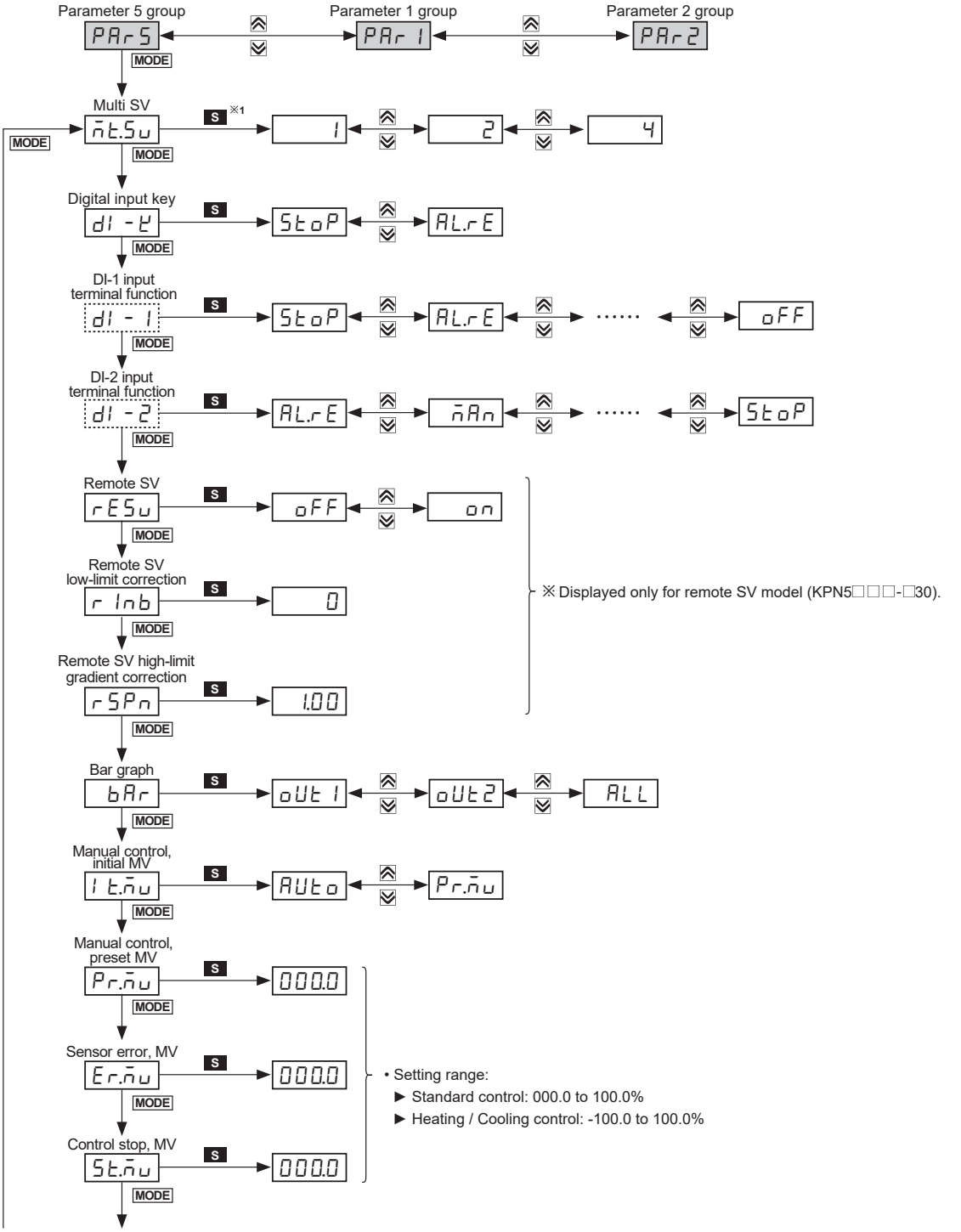
※1: S: Press any key among ≪, ≫, ≪
※After entering setting mode, press MODE key anytime for 3 sec to return to Run mode.
※After entering setting mode, press MODE key anytime for 1.5 sec to go to the concerned group name.
※If you press the MODE key after changing the setting value of the parameter the setting value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users.
(You can set the user level in parameter 5 group)
※ This parameter might not be displayed depending on other parameter settings.

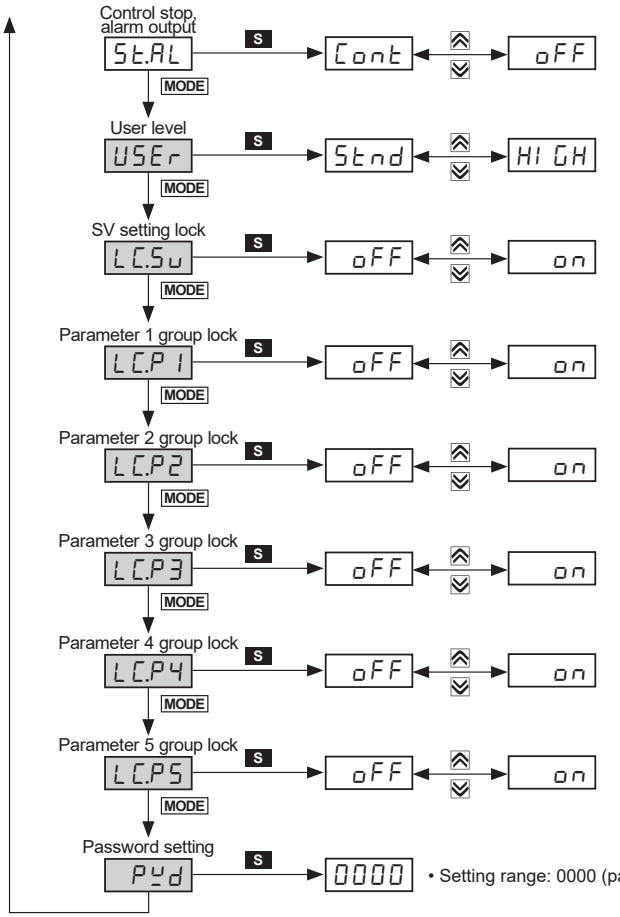



Alarm output 3 operation mode
AL-3
S
MODE
JJdu
JduC
duCC
Alarm output 3 option
AL3.t
AL-A
AL-b
AL-F
※Displayed except when alarm output 3 operation mode[AL-3] is oFF.
Alarm output 3 hysteresis
A3.HY
001
• Setting range: 001 to 100-digit (000.1 to 100.0)
※Displayed except when alarm output 3 operation mode [AL-2] is set as deviation/ absolute value high-limit, low-limit, high/low limit alarm or reserve alarm.
Alarm 3 N.O./N.C.
A3.n
no
nC
Alarm 3 ON delay time
A3.on
0000
• Setting range: 0000 to 3600 sec
※Displayed except when alarm output 3 operation mode [AL-3] is oFF.
Alarm 3 OFF delay time
A3.oF
0000
• Setting range: 0000 to 3600 sec
LBA monitoring time
LbA.t
0000
• Setting range: 0000 to 9999 sec
※Displayed only when alarm output 1/2/3 operation mode [AL-1/2/3] is loop break alarm [LbA].
LBA detection band
LbA.b
003
• Setting range: 000 to 999 (H), 000.0 to 999.9 (L), 000.0 to 99.99 (analog)℃/℉/%
Analog trans. output
Ao-n
Pu
Su
H-nu
C-nu
※Displayed only for transmission output model (KPN5□□□-□ 30).
PV trans. output low-limit
FS-L
-200
• Setting range: F.S.
PV trans. output high-limit value
FS-H
1350
• Setting range: F.S.
Com. address
AdrS
01
• Setting range: 01 to 127
Com. speed
bPS
96
192
48
Com. parity bit
PrtY
nonE
EuEn
odd
Com. stop bit
StP
2
1
Com. response waitting time
rSWt
20
Com. write
ConY
EnA
dISA

▣ Parameter 5 Group

※1: **S**: Press any key among ≪, ≫, ≪
※After entering setting mode, press MODE key anytime for 3 sec to return to Run mode.
※After entering setting mode, press MODE key anytime for 1.5 sec to go to the concerned group name.
※If you press the MODE key after changing the setting value of the parameter the setting value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users.
(You can set the user level in parameter 5 group)
※ This parameter might not be displayed depending on other parameter settings.





• Setting range: 0000 (password function Off), 0002 to 9999

▣ Factory Default

• SV setting [Su]

Parameter	Default
Su	0

• Password input parameter

Parameter	Default
PASS	0001

• Parameter 1 group [PAr 1]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
r-S	rUn	AL 1.L	1550	AL 3.L	0000	Su-2	0000
Su-n	Su-0	AL 1.H	1550	AL 3.H	0000	Su-3	0000
CE-A	0.0	AL2.L	1550	Su-0	0000		
AL 1.L	1550	AL2.H	1550	Su-1	0000		

• Parameter 2 group [PAr2]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
AE	oFF	H-d	0000	H.oSE	000	rAñU	000
H-P	0 10.0	C-d	0000	C.HYS	002	rAñd	000
C-P	0 10.0	db	0000	C.oSE	000	r.UnE	ñ1 n
H-1	0000	rESE	050.0	L-ñu	-100.0		
C-1	0000	H.HYS	002	H-ñu	100.0		

• Parameter 3 group [PAr3]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
In-E	ECAH	H-SC	100.0	o-FE	HEAE		SSr
UnIE	°C	dUnE	°ro		H-C	o 1ñA	4-20
L-rG	00.00	In-b	0000	C-ñd	PId	oUE2	SSr
H-rG	10.00	ñAu.F	000.1		P.P	o2.ñA	4-20
doE	0.0	L-Su	-200	AE.E	EUn1	H-E	020.0 (Relay)
L-SC	000.0	H-Su	1350	oUE1	rLY	C-E	000.0 (SSR drive)

• Parameter 4 group [PAr4]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
AL-1	duCC	AL-2	JJdu	AL-3	LbA	LbA.E	0000	bPS	96
AL 1.E	AL-A	AL2.E	AL-A	AL3.E	AL-A	LbA.b	002	PrEY	nonE
A 1.HY	001	A2.HY	001	A3.HY	001	Ao.ñ	Pu	SEP	2
A 1.n	no	A2.n	no	A3.n	no	FS.L	-200	rSYE	20
A 1.on	0000	A2.on	0000	A3.on	0000	FS.H	1350	CoñY	En.A
A 1.oF	0000	A2.oF	0000	A3.oF	0000	AdrS	01		

• Parameter 5 group [PAr5]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
ñE.Su	1	rSPn	1.000	SE.ñu	000.0	LC.P3	oFF
dI-E	StoP	bAr	oUE1	SE.AL	Cont	LC.P4	oFF
dI-1	oFF		ALL	USEr	Stnd	LC.P5	oFF
dI-2	oFF	1E.ñu	AUto	LC.Su	oFF	PYd	0000
rE.Su	oFF	Pr.ñu	000.0	LC.P1	oFF		
r In.b	0000	Er.ñu	000.0	LC.P2	oFF		

※ Shaded parameters are factory defaults for the heating & cooling model.

▣ Communication Output

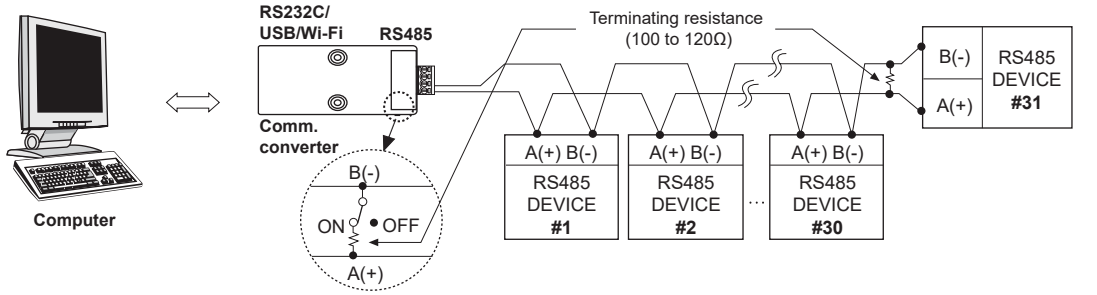
It is for parameter setting and monitoring via external devices (PC, PLC, etc.).

• Interface

Comm. protocol	Modbus RTU (Character = 11-bit fixed)	Comm. speed	2400, 4800, 9600, 19200, 38400 bps
Connection type	RS485	Comm. response wait time	5 to 99ms
Application standard	Compliance with EIA RS485	Start bit	1-bit (fixed)
Max. connections	31 units (address: 01 to 127)	Data bit	8-bit (fixed)
Synchronous method	Asynchronous	Parity bit	None, Even, Odd
Comm. method	Two-wire half duplex	Stop bit	1, 2-bit
Comm. distance	Within max. 800m		

※It is not allowed to set overlapping communication address at the same communication line.
Use twisted pair wire for RS485 communication.

• Application of system organization

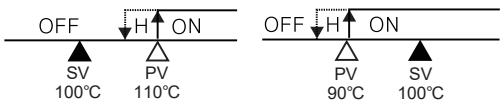
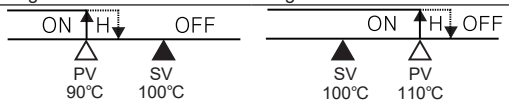
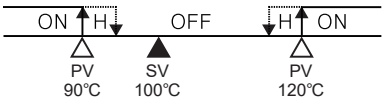
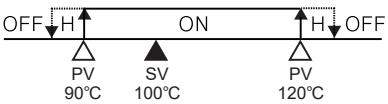
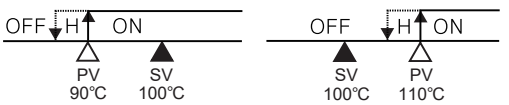
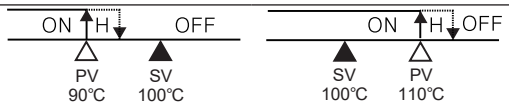


※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately), SCM-US (USB to Serial converter, sold separately).
Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

▣ Functions

◎ Alarm operation

※ H: alarm output □ hysteresis [A□HY]

Mode	Name	Operation	Description
oFF	—	—	No alarm output
duCC	Deviation high-limit alarm	 High deviation: Set as 10℃ High deviation: Set as -10℃	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
JJdu	Deviation low-limit alarm	 Low deviation: Set as 10℃ Low deviation: Set as -10℃	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
JduC	Deviation high/low-limit alarm	 Low deviation: Set as 10℃ , High deviation: Set as 20℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
CduJ	Deviation high/low-limit reserve alarm	 Low deviation: Set as 10℃ , High deviation: Set as 20℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF.
PuCC	Absolute value high limit alarm	 Absolute value alarm: Set as 90℃ Absolute value alarm: Set as 110℃	If PV is higher than the absolute value, the output will be ON.
JJPu	Absolute value low limit alarm	 Absolute value alarm: Set as 90℃ Absolute value alarm: Set as 110℃	If PV is lower than the absolute value, the output will be ON.
LbA	Loop break alarm	—	It will be ON when it detects loop break.
SbA	Sensor break alarm	—	It will be ON when it detects sensor disconnection.
HbA	Heater break alarm	—	It will be ON when CT detects heater break.

◎ Alarm option

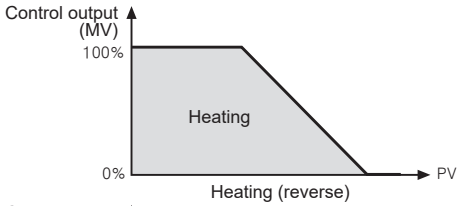
Mode	Name	Description
AL-A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AL-b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status.
AL-C	Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.
AL-d	Alarm latch and standby sequence 1	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.
AL-E	Standby sequence 2	First alarm condition is ignored and from second alarm condition, standard alarm operates. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, standard alarm operates.
AL-F	Alarm latch and standby sequence 2	Basic operation is same as alarm latch and standby sequence 1. If it operates not only by power ON/OFF, but also alarm setting value, or alarm option changing. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates.

※ Condition of re-applied standby sequence for standby sequence 1, alarm latch and standby sequence 1: Power ON
Condition of re-applied standby sequence for standby sequence 2, alarm latch and standby sequence 2: Power ON, changing set temperature, alarm temperature[AL 1, AL 2] or alarm operation [AL-1, AL-2] , switching STOP mode to RUN mode.

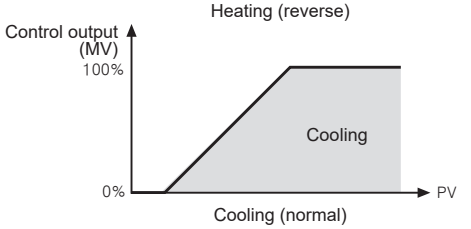
▣ Functions

◎ Control output mode [o-Ft]

- Control output modes for general temperature control include heating, cooling, and heating/cooling.
- Heating control (reverse operation) and cooling control (normal operation) are mutually opposing operations with inverse outputs.
- The PID time constant varies based on the controlled objects during PID control.



Heating (reverse)



Cooling (normal)

Group	Parameter	Setting range	Default	Unit
PAr3	o-Ft	Standard model HEAt/CooL	HEAt	—
		Heating & Cooling mode HEAt/CooL/ H-C	H-C	—

◎ Heating control [HEAt]

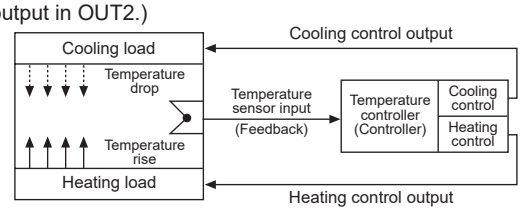
The output will be provided in order to supply power to the load (heater) if PV(present temperature) falls below SV(set temperature).

◎ Cooling control [CooL]

The output will be provided in order to supply power to the load (cooler) if PV(present temperature) rises above SV (set temperature)

◎ Heating/Cooling control [H-C]

Heating and Cooling with a controller when it is difficult to control subject temperature with only heating or cooling. Heating and cooling control mode controls the object using different PID time constants for each heating and cooling. It is also possible to set heating and cooling control in both PID control or ON/OFF control mode. Heating/cooling output can be selected among Relay output, SSR drive output and current output depending on model types chosen according to your application environment. (Note that only standard SSR control is available for SSR drive output in OUT2.)



※For heating and cooling control, OUT1 control output is dedicated to heating control and OUT2 control output to cooling control.

◎ Auto-tuning [At]

In PID control, auto-tuning processes the control subject's thermal characteristics and thermal response rate at the controller, and then determines the necessary PID time constant. Application of the PID time constant realizes fast response and high precision temperature control.

- Auto-tuning automatically stores PID time constants upon termination. These PID time constants can then be modified by the user to suit their usage environment.
- When auto-tuning is in progress, the AT lamp located on the front of the controller flashes in 1 second intervals. When auto-tuning finishes, the AT lamp automatically goes off and the auto-tuning parameter will return to OFF.

SV	Description
oFF	Auto-tuning stops
on	Auto-tuning starts

Group	Parameter	Setting range	Default	Unit
PAr2	At	oFF/on	oFF	—

※Manual interruption or a sensor break error when auto-tuning is in progress restores the PID time constant to the value used prior to the auto-tuning session.
※Auto-tuning continues to run even if the temperature reading exceeds or falls below the input range.
※When auto-turning is in progress, parameters can only be referenced and not altered.
※Auto-tuning is not available in manual control. (Manual Control).

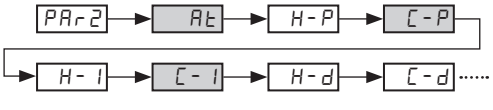
◎ Control output (OUT1/OUT2) selection [oUt1/oUt2]

- The 1 output type (OUT1) model supports relay output, current output, SSR drive output.
- The 2 output type (OUT1, OUT2) model supports relay output fixed or current output, SSR drive output.

◎ Parameter mask

This function is able to hide unnecessary parameters to user environment or less frequently used parameters in parameter setting group. You can set this in the comprehensive device management program (DAQMaster). Though masked parameters are not displayed in parameter setting group, the parameter setting values are applied. For more information, refer to the DAQMaster user manual. Visit our website (www.autonics.com) to download the DAQMaster program and the user manual.

<Before applying mask>



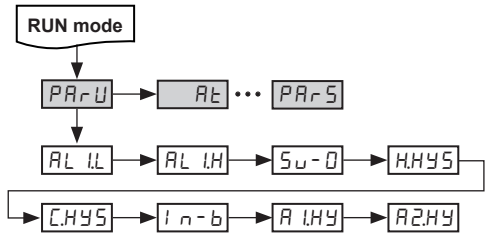
<After applying mask>

The above is masking auto tuning [At], cooling proportional band [C-P], cooling integral time [C-I], cooling derivative time [C-d] parameters in parameter 2 group.

▣ Functions

◎ User parameter group [PArU]

This function is able to set the frequently used parameters to the user parameter group.
You can quickly and easily set parameter settings.
User parameter group can have up to 30 parameters in the comprehensive device management program (DAQMaster.)Visit our website (www.autonics.com) to download the DAQMaster program and the user manual.



The above is setting user parameter group in the DAQMaster with alarm output 1 low-limit value [AL 1.L], alarm output 1 high-limit value [AL 1.H], SV-0 set value [Su-0] parameters of parameter 1 group, heating hysteresis [H.HYS], cooling hysteresis [C.HYS] parameters of parameter 2 group,
input correction [In-b], parameter of parameter 3 group, alarm output 1 hysteresis [A1.HY], alarm output 2 hysteresis [A2.HY] parameters of parameter 4 group.

◎ Bar graph

MV of control output (OUT1, OUT2) is displayed as the bar graph in real-time. According to bar graph setting [bAr] in parameter 5 group, it displays bar graph by control output or does not display it.

One LED is 10% (total 10 LEDs: 100%). If control output MV is 0.1 to 10%, one LED turns ON. If MV is 90.1 to 100%, 10 LEDs turn ON.
The 1 output type (heating or cooling control) model has one OUT1 bar graph (red).
The 2 output type (heating & cooling control) model has two bar graphs; OUT1 bar graph (red), OUT2 bar graph (green). OUT1 is for heating MV and OUT2 is for cooling MV.

◎ Remote SV setting

This function is to set SV by inputting analog (DC4-20 mA, 1-5 VDC) signal to no. 13 and 14 terminals. (Set that remote SV [rE.Su] is ON in parameter 5 group)
Input analog signal is changed to between SV low-limit value [L-Su] to SV high-limit value [H-Su].
※When using remote SV, you cannot select SV setting by front keys and multi SV setting by digital input.

◎ Parameter initialization

It initializes all parameters to factory default values. Press the front 1+4+3 keys for 5 sec at the same time and [Init] parameter is displayed. Select 'YES' to initialize all parameters.
If the password is set, you must enter the password. After initialing the parameters, the password parameter is also initialized.

※ **Refer to the KPN user manual for more functions.**

▣ Proper Usage

◎ Simple troubleshooting for process controller

- **When the load (Heater etc) is not operated**Please check operation of the out indicator located in front panel of the unit. If the indicator does not operate, please check the parameter of all programmed mode. If the indicator is operating, please check the output (Relay, SSR drive, DC4-20mA current) after separating output line from the unit.
- **When it displays oPEn during operation**
  This is a warning that external sensor is cut off (open). Please turn off power and check the state of sensor. If sensor is not cut off (open), disconnect sensor line from terminal block and +, - together. When you turn on power it can check room temperature. If this unit cannot indicate room temperature, this unit itself is faulty. Please remove this unit from equipment and service or replace.
  (When the input mode is thermocouple, it is available to indicate room temperature.)
- **In case of indicating "Error" in display**
  This Error message is indicated in case of damaging inner chip program data by outer strong noise. In this case, please send the unit to our after service center after removing the unit from system.
  Noise protection is designed in this unit, but it does not stand up strong noise continuously. If bigger noise than specified (Max. 2kV) flows in the unit, it can be damaged.

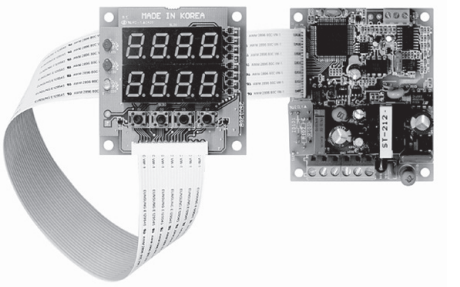
◎ Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Do not apply excessive power when connecting or disconnecting the connectors of the product.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- When changing the input sensor, turn off the power first before changing.
  After changing the input sensor, modify the value of the corresponding parameter.
- Do not overlapping communication line and power line. Use twisted pair wire for communication line and connect ferrite bead at each end of line to reduce the effect
  of external noise.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Board Type, Dual PID Control Temperature Controller

▣ Features

- High quality and economical product
- Convenient organization of panel to use
- Dual PID control
- Time reservation



Please read "Safety Considerations" in operation manual before using.

▣ Ordering Information

TB	4	2	—	1	4	R

Control output	R	Relay output
	S	SSR drive output
	C	Current output (DC4-20mA)
	N	PV Transmission output (DC4-20mA)※1
Power supply	4	100-240VAC 50/60Hz
Sub output	1	Event 1 output type
Display	2	2 Display
Digit	4	9999 (4-digit)
Item	TB	Temperature Controller Board

※1: PV transmission output type does not have Event 1 output.

▣ Specifications

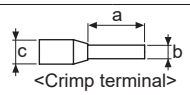
Model		TB42-14R	TB42-14S	TB42-14C	TB42-14N
Power supply		100-240VAC⁓ 50/60Hz			
Allowable voltage range		90 to 110 of rated voltage			
Power consumption		Max. 5VA			
Display method		7-segment (PV: green, SV: red) LED method			
Character size (W×H)		8×10mm			
Input type	RTD	DPt100Ω, JPt100Ω [Allowable line resistance is max. 5Ω per a wire]			
	Thermocouple	K(CA), J(IC) [Tolerance outer resistance is max. 100Ω]			
Control output	Relay	250VAC⁓ 3A, 12VDC⎓ 3A, 1a	—	—	—
	SSR	—	12VDC⎓±3V 30mA Max.	—	—
	Current	—	—	DC4-20mA (max. load 600Ω)	—
	Transmission	—	—	—	DC4-20mA (Max. load 600Ω)
Sub output		• Event 1 output: Relay output (250VAC⁓ 0.5A 1a) • Event 2 output: OK monitoring display by LED			
Control method		ON/OFF control, P, PI, PD, PIDF, PIDS control			
Setting type		Front push buttons			
Display accuracy		F.S ± 0.3% or 3℃, select the higher one			
Hysteresis		1 to 100℃ (0.1 to 100.0℃) variable (at ON/OFF control)			
Proportional band (P)		0.0 to 100.0%			
Integral time (I)		0 to 3600 sec			
Derivative time (D)		0 to 3600 sec			
Control cycle (T)		1 to 120 sec			
Sampling period		0.5 sec			
Dielectric strength		2,000VAC 50/60Hz for 1 minute (Between input and power terminal)			
Vibration		0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours			
Relay life cycle	Main output	Mechanical: Min. 10,000,000, Electrical: Min. 100,000 (250VAC 3A resistive load)			
	Sub output	Mechanical: Min. 20,000,000, Electrical: Min. 200,000 (250VAC 0.5A resistive load)			
Insulation resistance		Over 100MΩ (at 500VDC megger)			
Noise immunity		±2kV the square wave noise (pulse width: 1μs) by the noise simulator			
Memory retention		Approx. 10 years (when using non-volatile semiconductor memory type)			
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃			
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH			
Approval		c UL us			
Unit weight		Approx. 113.5g			

※Environment resistance is rated at no freezing or condensation.

▣ Connections

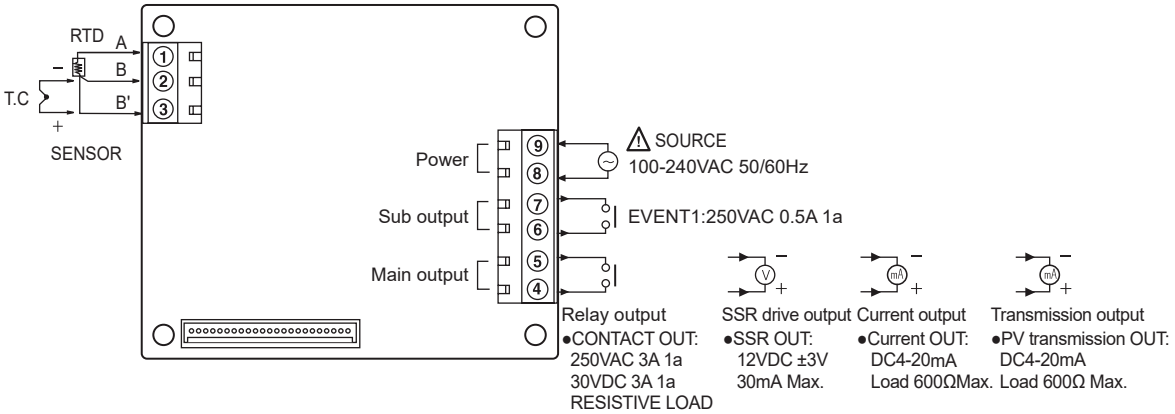
※RTD: DPt100Ω, JPt100Ω (3-wire type)　※Thermocouple: K(CA), J(IC)

※Use crimp terminals of size specified below.



<Crimp terminal>

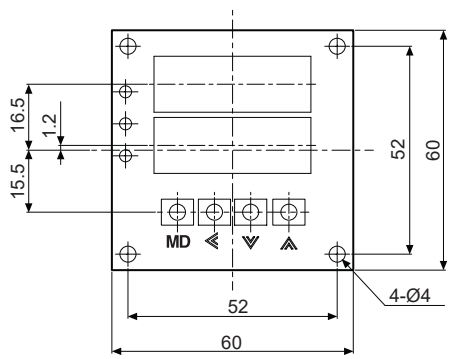
Terminal number	a	b	c
1 to 3	4 to 5mm	Max. 1.3mm	Max. 3.3mm
4 to 9	6mm	Max. 2.1mm	Max. 4.2mm



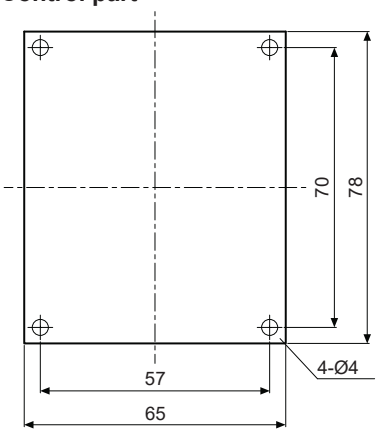
▣ Dimensions

(unit: mm)

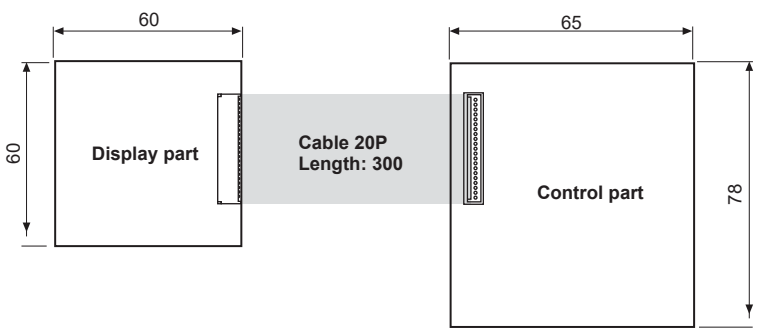
● **Display part**



● **Control part**



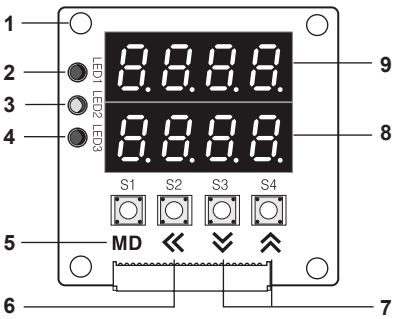
● **Layout**



※Cable length is 300mm.

※The size of board is based on user's application. (customizable)

▣ Unit Description



1. Mounting hole (Ø4.0mm)

2. Main output operation display LED (LED 1)
It indicates the operation status of control output and displayed on "LED 1".
But when it is current output or retransmission output "LED 1" does not operate. (LED indication is OFF)

3. Event 1 output operation display LED (LED 2)
It indicates the operating status of alarm output and displayed on "LED 2".

4. O.K monitor operation display LED (LED 3)
It indicates the operating status of alarm output and displayed on "LED 3".
After setting alarm output in Event 2, if execute Auto-tuning, O.K monitor operation will be displayed after AT function.
(it flashes during AT function, and turns OFF after completing AT function)

5. Mode key (S1)
It is used to enter into every parameter group or move to other parameters. It is "S1" on this PCB.

6. Shift key (S2)
It is used when change the setting value or move to digit at the parameter. It is "S2" on this PCB.

7. Up / Down key (S3/S4)
It is used when change the setting value or select setting function.
Up key is "S4" and Down key is "S3" on this PCB.

8. SV display part
The setting temperature is displayed in red LED.
But when timer function is used, the setting time will be displayed at t-SV.
If time function is OFF, it will return to the setting temperature.

9. PV display part
It displays measured temperature in green LED.

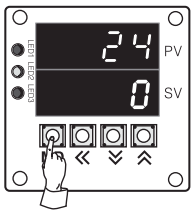
▣ Input Type and Range

Input sensor		Display	Temperature range (℃)	Temperature range (℉)
Thermocouple	K(CA)	K CA	-100 to 1300	-148 to 2372
	J(IC)	J IC	0 to 800	32 to 1472
RTD	JPt H	JPt.H	0 to 500	32 to 932
	JPt L	JPt.L	-199.9 to 199.9	-199.9 to 392.0
	DPt H	Pt .H	0 to 500	32 to 932
	DPt L	Pt .L	-199.9 to 199.9	-199.9 to 392.0

▣ SV Setting

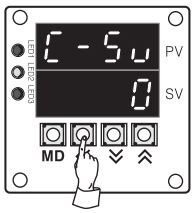
Example of setting 100℃

1.



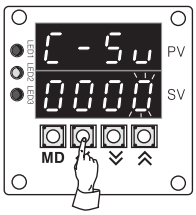
When PV and SV are displayed, press the MD key (S1).

2.



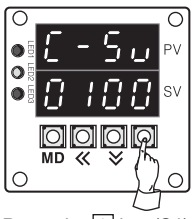
C-Su is displayed in the PV display part, 0 is displayed in the SV display part. Press the ≪ key (S2).

3.



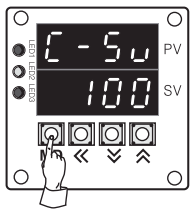
10^0 digit flashes in the SV display part. Move the digit by pressing ≪ key (S2) twice.

4.



Press the ≪ key (S4) and set 1 at 10^2 digit and press the MD key.

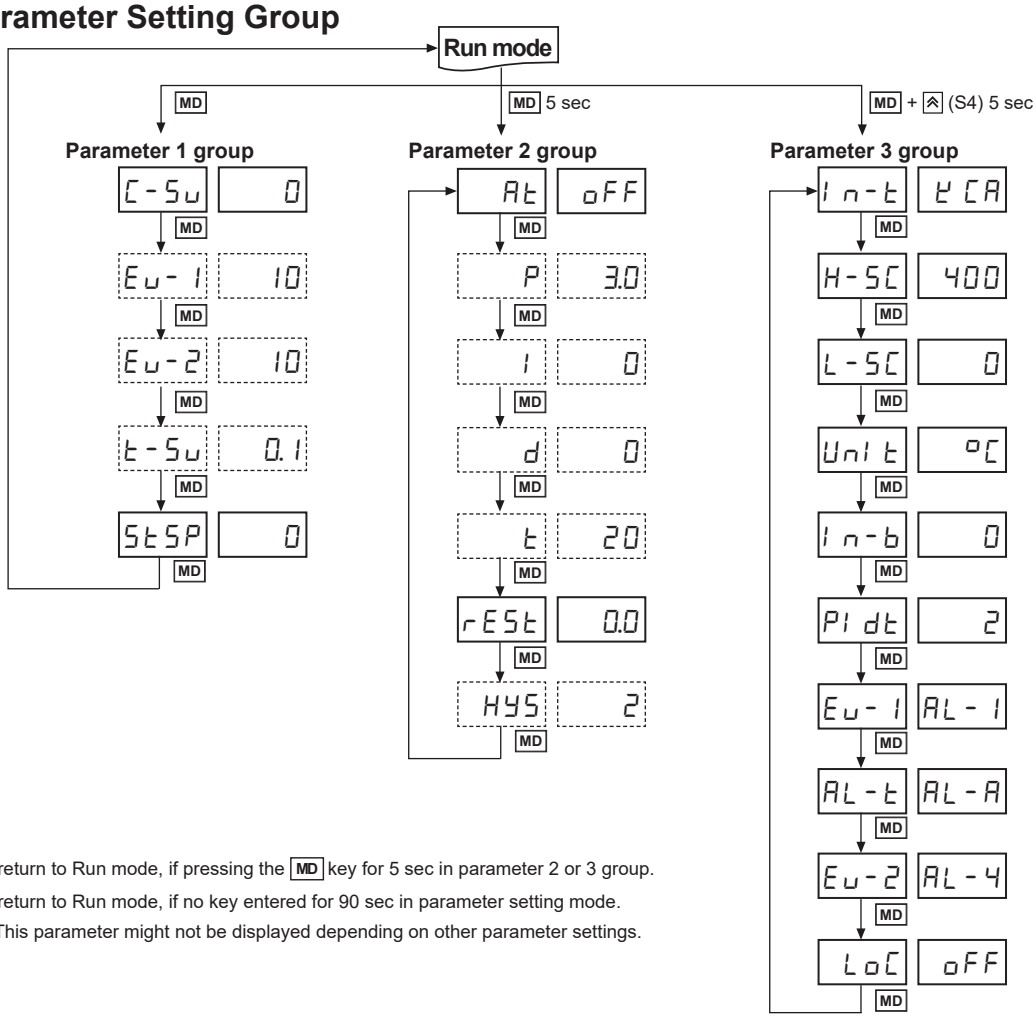
5.



Now SV value is set, then move to Eu-1 by pressing the MD key once.

※S1, S2, S3, S4 are on on this PCB Board.

▣ Parameter Setting Group



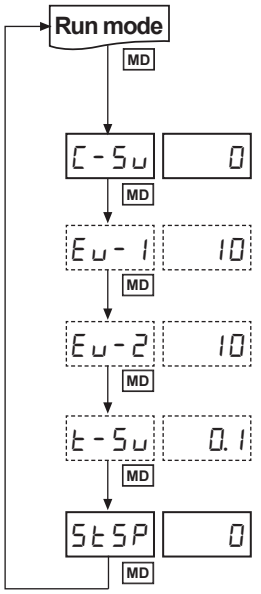
※It will return to Run mode, if pressing the MD key for 5 sec in parameter 2 or 3 group.

※It will return to Run mode, if no key entered for 90 sec in parameter setting mode.

※[ ] This parameter might not be displayed depending on other parameter settings.

▣ Parameter 1 Group

※To set SV, press the [≪] key and SV of the SV display part flashes. Press the [≪], [≫] keys and change SV and press the [MD] key to save the value and SV of the SV display part flashes.
※The value in every parameter is factory default.
※Entering parameter 1 group is not available in transmission output type. (TB42-14N)
※Some parameter is able to set decimal point by temperature sensor type.
※When pressing [MD] key for 5 sec at each parameter or there is no key operation for 90 sec it returns to RUN mode.
※[ ]: This parameter might not be displayed depending on other parameter settings.



Set SV (setting value).
Set range: Within the rated temperature range by input sensor

Set temperature of Alarm operation which has been set in Event 1 of parameter 3 group.
Set range: Within the rated temperature range by input sensor
※If setting Alarm operation as AL-0 in EV-1 of parameter 3 group, this parameter is not displayed.

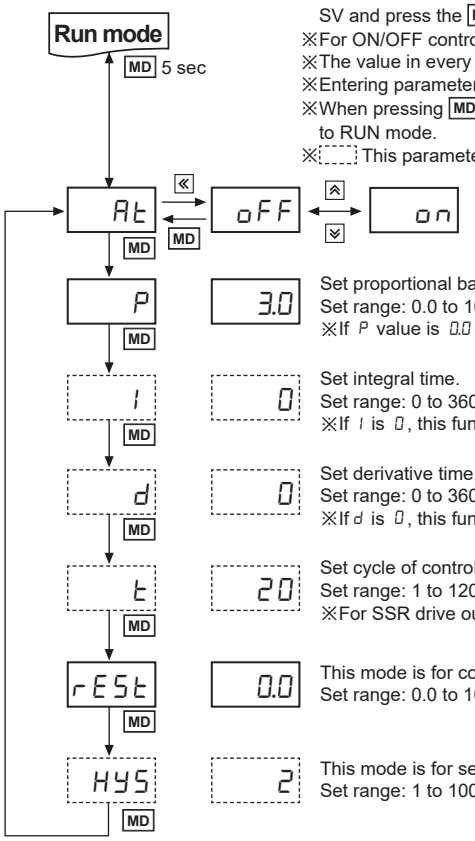
Set temperature of Alarm operation which has been set in Event 2 of parameter 3 group.
Set range: Within the rated temperature range by input sensor
※If setting Alarm operation as AL-0 in EV-2 of parameter 3 group, this parameter is not displayed.

When it is used as timer function, this parameter is for setting the time of using.
Set range: 0.1 to 999.9 hour
※If selecting as 0 in STSP, this parameter is not displayed.

Select timer function.
0: No Timer function
1: Cut off output after stop the time
2: Output operation after stop the time. (reservation function)

▣ Parameter 2 Group

※To set SV, press the [≪] key and SV of the SV display part flashes. Press the [≪], [≫] keys and change SV and press the [MD] key to save the value and SV of the SV display part flashes.
※For ON/OFF control, only P and HYS parameters are displayed.
※The value in every parameter is factory default.
※Entering parameter 2 group is not available in transmission output type (TB42-14N).
※When pressing [MD] key for 5 sec at each parameter or there is no key operation for 90 sec it returns to RUN mode.
※[ ]: This parameter might not be displayed depending on other parameter settings.



Select whether operates Auto-tuning or not.
After completing auto-tuning, SV returns to oFF.

Set proportional band.
Set range: 0.0 to 100.0%
※If P value is 0.0, it becomes ON/OFF control function.

Set integral time.
Set range: 0 to 3600 sec
※If I is 0, this function will be OFF.

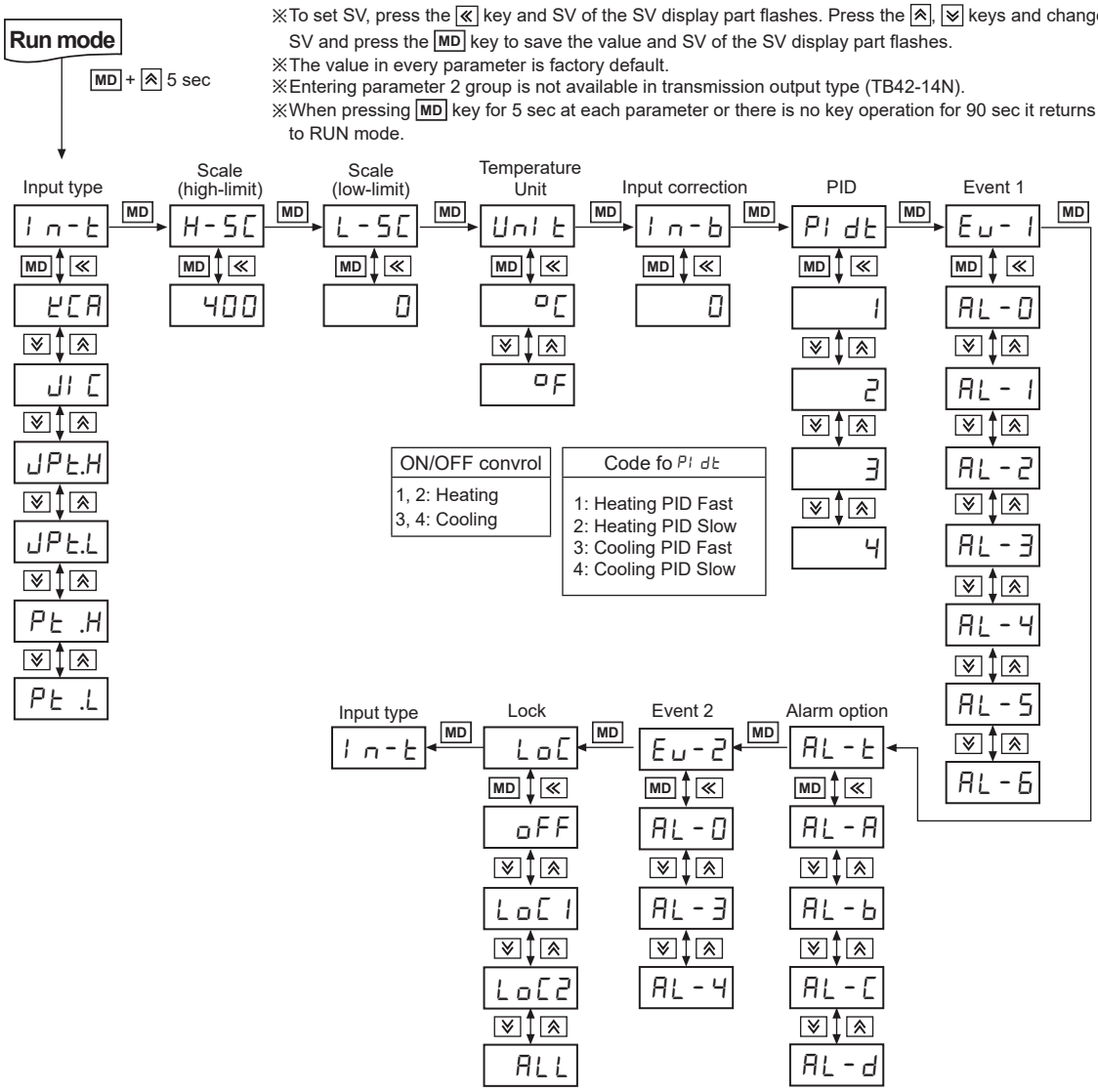
Set derivative time.
Set range: 0 to 3600 sec
※If d is 0, this function will be OFF.

Set cycle of control.
Set range: 1 to 120 sec
※For SSR drive output type (TB42-14S), control cycle for factory default is 2 sec.

This mode is for compensating deviation, which occurs when proportional control is used.
Set range: 0.0 to 100.0%

This mode is for setting hysteresis when it is used ON/OFF control.
Set range: 1 to 100℃ (0.1 to 100.0℃)

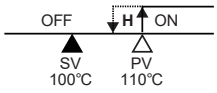
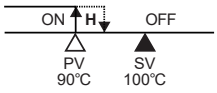
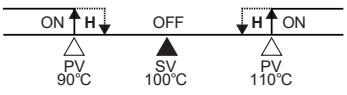
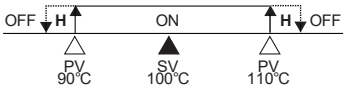
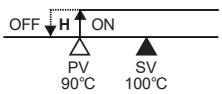
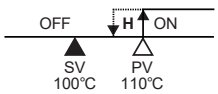
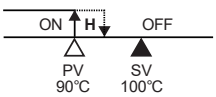
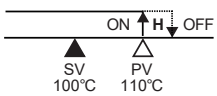
▣ Parameter 3 Group



In-t	K CA	Select one input sensor among 6 types.
H-SC	400	Set high-limit of temperature (20mA output value for transmission output). Set range: Within the rated range
L-SC	0	Set low-limit of temperature (4mA output value for transmission output). Set range: Within the rated range
Unit	°C	Set the unit of temperature between ℃ or ℉.
In-b	0	Set the correction value for error from input sensor. Set range: -50 to 50℃ (-50.0 to 50.0℃).
PIdt	1	Select PID control type among 4 kinds.
Eu-1	AL-1	Select Alarm output function of Event 1 among 7 kinds.
AL-t	LA-A	Select Alarm output option function among 4 kinds.
Eu-2	AL-4	Select Alarm output function of Event 2 among 3 kinds.
LoC	oFF	Set whether it is locked or not of setting value among 4 kinds.

▣ Alarm

◎ Alarm operation

Mode	Name	Alarm operation	Description
AL-0	—	—	No alarm output
AL-1	Deviation high-limit alarm	 High deviation: Set as 10℃	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
AL-2	Deviation low-limit alarm	 Low deviation: Set as 10℃	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AL-3	Deviation high/low-limit alarm	 High/Low deviation: Set as 10℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AL-4	Deviation high/low-limit reserve alarm	 High/Low deviation: Set as 10℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF.
AL-5	Absolute value high limit alarm	 Absolute-value Alarm: Set as 90℃  Absolute-value Alarm: Set as 110℃	If PV is higher than the absolute value, the output will be ON.
AL-6	Absolute value low limit alarm	 Absolute-value Alarm: Set as 90℃  Absolute-value Alarm: Set as 110℃	If PV is lower than the absolute value, the output will be ON.

※ **H**: means fixed 2℃ as interval between ON and OFF when alarm output is operating.

◎ Alarm option

Mode	Name	Description
AL-A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AL-b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status.
AL-C	Standby sequence	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.
AL-d	Alarm latch and standby sequence	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.

▣ Functions

◎ Event

This function can execute as main control output and sub function.

● Event 1 output

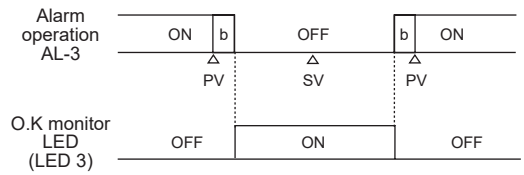
Event 1 output is relay contact and contact capacity is 250VAC 0.5A 1a. Event 1 output is alarm output and there are 7 modes including deviation and absolute alarm. The operation of Event 1 output is displayed on LED 2 at front.

● Event 2 output

There is no terminals for Event 2 output but front LED 3 lamp displays the input range as O.K monitor.

Event 2 output operates as O.K monitor by setting Event 2 [Eu-2] as AL-3 or AL-4 in Parameter 3 group and set the deviation temperature at Eu-2 in Parameter 1 group.

< Example of O.K monitor >



◎ Auto-tuning [AT]

PID Auto-tuning function is automatically to measure thermal characteristics and response of the control object and then execute its value under high response & stability after calculating the time constant of PID required to control optimum temperature.

When AT function is started, LED 3 will flash and when LED 3 is OFF this operation will stop.

(Note) For ON/OFF control, AT function does not operate.

◎ Dual PID function

One is that PV is reached at SV with fast response speed, but a little of overshoot occurs, the other is that PV is reached at SV with slow response speed, but overshoot will be minimized.

● PID Fast

This mode is applied at the machines or systems which requite stop fast response speed, and allowable a little overshoot which requite.

● PID Slow

This mode is applied at the machine which overshoot must not occur, because the fire can be and allowable low response time.

◎ Error

If error occurs while the controller is operating, it will be displayed as follow.

- LLLL flashes
when measured input temperature is lower than input range of the sensor.
- HHHH flashes
when measured input temperature is higher than input range of the sensor.
- oPEn flashes
when the input sensor is not connected or its wire is cut.

◎ Transmission output (PV)

This function is to transmit the current value (PV) to external equipment such as PC or recorder etc. the output is DC 4-20mA and cannot be used with control output at the same time.

It will output 20mA, when PV reaches to the temperature in H-SC and output 4mA, when PV reaches to the temperature in L-SC.

Min. resolutions are 16,000 divisions available. (TB42-14N)

◎ Manual reset [rESt]

Proportional control has an offset because rising time is not the same as falling time, even if the unit operates normally. This function is to correct offset.

◎ Lock

Setting value cannot be changed by unauthorized person. There are 4 types of lock mode in this unit.

- oFF : Unlocks for all parameters
- LoC1 : Locks parameter 2, 3 groups
- LoC2 : Locks parameter groups except C-Su parameter
- ALL : Locks all parameters

◎ Timer [StSP]

There is no output terminal in this function, it controls main output by setting of Timer function.

● Timer operation

- When StSP parameter is set as 0.
No timer function. t-Su parameter is not displayed.
- When StSP parameter is set as 1.
This unit controls temperature for the set time of t-Su.

E.g.)When t-Su is set as 5.0, this unit controls temperature for 5 hours and completes to control.

- When StSP parameter is set as 2.
This unit controls temperature after the set time of t-Su.

E.g.)When t-Su is set as 5.0, this unit controls temperature after 5 hours.

- To stop timer function, enter StSP parameter and set 0.
- During timer function, the set time at t-Su is displayed on the SV display part in RUN mode. If not using the timer function, it displays SV.

▣ Proper Usage

◎ Front part

Front part is able to customized for user's application.

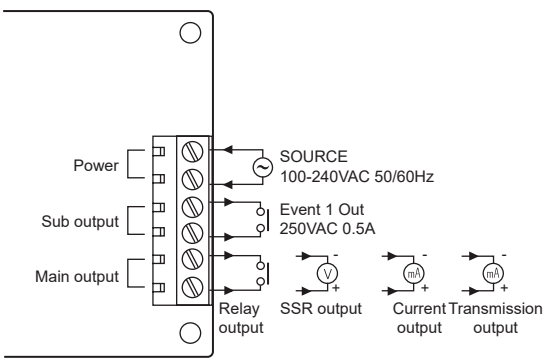
The length of connector cable connected the front part and control part is basically 300mm and also 100mm.

◎ Output

This unit has main output terminals and sub output terminals.

Main output terminals is for relay, SSR, current, transmission output and sub output terminals are fixed for Event 1 output.

Be sure that output terminals are as below.



※Relay output: 1a contact output. Contact capacity is 250VAC 3A.

※SSR drive output: It outputs Max. 12VDC ±3V 30mA max. voltage to drive SSR. For using SSR drive voltage to other applications, use this within the rated current.

※Current output: It outputs DC4-20mA within the hysteresis.

※Transmission output: It outputs DC4-20mA within the set range at H-SC and L-SC parameters. (resolutions: 16,000 divisions)

◎ When changing the sensor type

Be sure that when changing the sensor type during operation, the set SV is cleared.

◎ Caution for when mounting on Panel

This unit does not have an additional external case but has only a PCB. When mounting this unit on panel, maintain insulation between iron plates. If dust, oil, or water is enter to inside of panel, inner may be short.

Be sure that interval between terminals is narrow to wire cables. The cable (20P) connected control PCB and front PCB is sensitive signal line.

Be careful when wiring this cable not to enter noise or affect to high voltage line.

◎ Cautions during use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- This unit may be used in the following environments.
  ①Indoors
  (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Multi-Channel Modular Type High Performance Temperature Controller

▣ Feature

[Common]

- Easy maintenance with separated body/base parts
- No communication and power supply for expansion modules required using module connectors: Up to 32 modules
- PC parameter setting via PC (USB cable and RS485 communication):
  Supports comprehensive device management program (DAQMaster)

※ Communication converter, sold separately: SCM-US (USB/Serial converter), SCM-38I (RS232C/RS485 converter), SCM-US48I (USB/RS485 converter), SCM-WF48 (Wi-Fi/RS485·USB wireless communication converter), EXT-US (converter cable)

[TMH2/4 Series (control module)]

- One module supports multi channels (2 channels/4 channels) for input/output control : connecting TMH2/4, up to 32 modules (2 channels: 64 channels/4 channels: 128 channels)
- High-speed sampling with 50ms and ±0.3% measuring accuracy
- Simultaneous heating/cooling control and auto/manual control for high-performance control
- Selectable current output or SSR drive output
- Each channel insulated (dielectric strength 1,000VAC)

※CT input terminal for measuring load current
(※CT, sold separately: CSTC-E80LN, CSTC-E200LN, CSTS-E80PP)

- Multi input/Multi range

[TMHA (analog input/output option module)]

- 4 channels, multi input/multi range/transmission output (DC0-20mA or 4-20mA)
- Each channel insulated (dielectric strength 1,000VAC)
- High-speed sampling with 50ms and ±0.3% measuring accuracy

[TMHE (digital input/alarm output option module)]

- Digital input (8 types)/Alarm output (8 types)

[TMHCT (CT input option module)]

- 8 CT inputs
- CT input status indicators

[TMHC (communication module)]

- Connection expansion to master devices (PC, PLC, etc) with TMH2/4 (control module) and TMHA/E/CT (option module) (up to 16 modules)
- One module connects up to 32 control/option modules (16 control modules and 16 option modules)
- PLC ladderless (RS422/RS485), Ethernet communication supported

Please read "Safety Considerations" in the instruction manual before using.

▣ Manuals

- For the detail information and instructions, please refer to the user manual and the user manual for communication, and be sure to follow cautions written in the technical descriptions (catalog, website).
  Visit our website (www.autonics.com) to download manuals.
- User manual describes for specifications and function, and communication manual describes for RS485 communincation (protocol Modbus RTU) and parameter address map data.

▣ Ordering Information

◎ Control module

TMH **2** **-** **4** **2** **R** **B**

Module type	**B**		Basic module
	E		Expansion module※1
Control output	**R**		Relay output
	C		Selectable current or SSR drive output
Power supply	**2**		24VDC
Input/Output option	**2CH**	**2**	CT input, digital input (DI-1/2), alarm output 1/2, RS485 comm. output
		4	CT input, digital input (DI-1/2), alarm output 1/2/3/4, RS485 comm. output
	4CH	**N**	CT input, RS485 comm. output
Channels	**2**		2 channels
	4		4 channels
Item	**TMH**		Advanced Multi-Channel Modular Temperature Controller

※1: Since the expansion module is not supplied with power/comm. terminal. Order it with the basic module.

◎ Option module

Type	Analog input/output	Digital input, alarm output	CT input
Model	TMHA-42AE	TMHE-82RE	TMHCT-82NE
Input	Temperature sensor/ Analog input 1 to 4	Digital input 1 to 8	CT input 1 to 8
Output	Transmission output (0/4-20mA) 1 to 4	Alarm output 1 to 8	—

◎ Communication module

Type			PLC ladderless communication	Ethernet communication
Model			TMHC-22LE	TMH-22EE
Commu-nication	COM1 (Master, PLC)	Connection method	RS422, RS485	Ethernet
		Protocol	Modbus RTU, PLC ladderless comm.	Modbus TCP
	COM2 (Master, Group)	Connection method	RS422, RS485	Ethernet
		Protocol	Modbus RTU	Modbus TCP

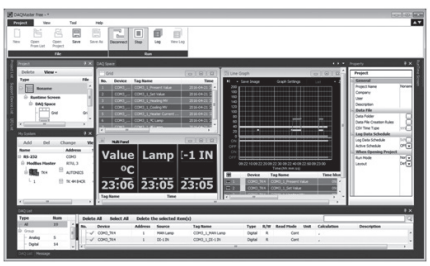
▣ Comprehensive Device Management Program (DAQMaster)

- DAQMaster is comprehensive device management program. It is available for parameter setting, monitoring.
- Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

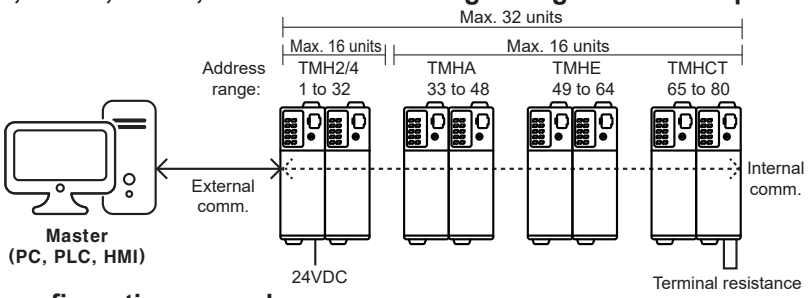
Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operating system	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB or more
Hard disk	More than 1GB of free hard disk space
VGA	1024×768 or higher resolution display
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



▣ Connection Examples

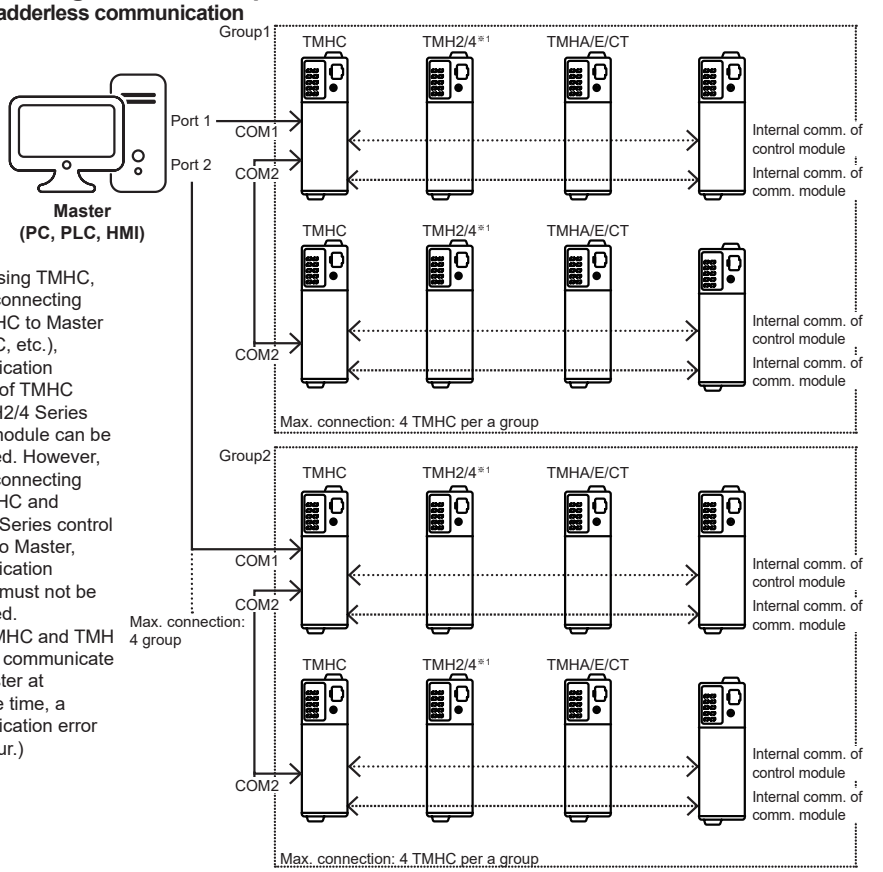
◎ TMH2/4, TMHA, TMHE, TMHCT inter-working configuration example



※ Internal communication: Receiving/Sending data between TMH2/4 and TMHA/E/CT
※ External communication: Communication with Master for controlling
※ Each module is available to monitoring at DAQMatser via PC loader

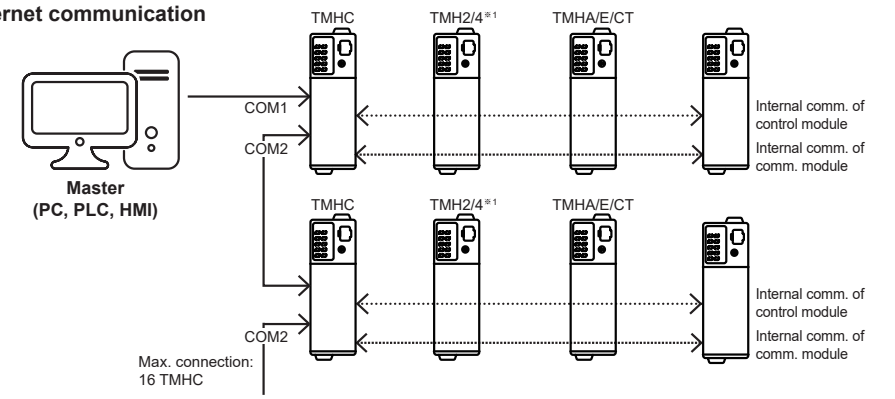
◎ TMHC configuration example

● **PLC ladderless communication**



※1. When using TMHC, in case connecting only TMHC to Master (PC, PLC, etc.), communication address of TMHC and TMH2/4 Series control module can be duplicated. However, in case connecting both TMHC and TMH2/4 Series control module to Master, communication address must not be duplicated.
(If the TMHC and TMH modules communicate with Master at the same time, a communication error may occur.)

● **Ethernet communication**



▣ Specifications

◎ Control module

Series		TMH2	TMH4
No. of channels		2 channels	4 channels
Power supply		24VDC⎓	
Permissible voltage range		90 to 110% of rated voltage	
Power consumption		Max. 5W (for max. load)	
Display method		None- parameter setting and monitoring is available at external devices (PC, PLC, etc.)	
Input type	Thermocouple	K(CA), J(IC), E(CR), T(CC), B(PR), R(PR), S(PR), N(NN), C(TT), G(TT), L(IC), U(CC), Platinel II	
	RTD	DPt100Ω, JPt100Ω, DPt50Ω, Cu100Ω, Cu50Ω, Nikel 120Ω 3-wire type (permissible line resistance max. 5Ω)	
	Analog	• Voltage: 0-100mVDC⎓, 0-5VDC⎓, 1-5VDC⎓, 0-10VDC⎓ • Current: 0-20mA, 4-20mA	
Sampling cycle		50ms (2 channel or 4 channel synchronous sampling)	
Measured accuracy	Thermocouple※1	• At room temperature (23℃±5℃): (PV ±0.3% or ±1℃, higher one) ±1-digit※2 • Out of room temperature range: (PV ±0.5% or ±2℃, higher one) ±1-digit	
	RTD		
	Analog	• At room temperature (23℃±5℃): ±0.3% F.S. ±1-digit • Out of room temperature range: ±0.5% F.S. ±1-digit	
Option input	CT input	0.0-50.0A (primary current measurement range) ※CT ratio=1/1000 Measured accuracy: ±5% F.S. ±1-digit	
	Digital input	• Connect input: ON - max. 1kΩ, OFF - min. 100kΩ • Solid-state input: ON - max. residual voltage 0.9V, OFF - max. leakage current 0.5mA • Outflow current : approx. 0.3mA per input	—
Control method	Heating, Cooling	ON/OFF control, P, PI, PD, PID control	
	Heating&Cooling		
Control output	Relay	250VAC~ 3A 1a	
	SSR	Max. 12VDC⎓ ±3V 20mA	
	Current※3	Selectable DC 4-20mA or DC 0-20mA (load resistance max. 500Ω)	
Option output	Alarm	250VAC~ 3A 1a	—
Communi-cation	Comm. terminal	RS485 (Modbus RTU protocol)	
	PC loader	TTL (Modbus RTU protocol)	
Hysteresis		RTD/Thermocouples: 1 to 100℃/℉ (0.1 to 100.0℃/℉), analog: 1 to 100 digit	
Proportional band (P)		RTD/Thermocouples: 1 to 999℃/℉ (0.1 to 999.9℃/℉), analog: 0.1 to 999.9 digit	
Integral time (I)		0 to 9999 sec	
Derivative time (D)		0 to 9999 sec	
Control period (T)		Relay output: 0.1 to 120.0 sec, SSR output: 1.0 to 120.0 sec	
Manual reset		0 to 100% (0.0 to 100.0%)	
Relay life cycle	Mechanical	Min. 10,000,000 operations	
	Electrical	Min. 100,000 operations (250VAC 3A resistance load)	
Memory retention		Approx. 10 years (non-volatile semiconductor memory type)	
Insulation resistance		100MΩ (at 500VDC megger)	
Insulation type		Double insulation or reinforced insulation (mark: ⧈, dielectric strength between the measuring input part and the power part: 1kV)	
Dielectric strength		1,000VAC 50/60Hz for 1 min (between input terminals and power terminals)	
Vibration		0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Noise immunity		±0.5kV the square wave noise (pulse width: 1μs) by the noise simulator	
Environ-ment	Ambient temp.	-10 to 50℃, storage: -20 to 60℃	
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH	
Protection structure		IP20 (IEC standard)	
Accessories		Expansion connector: 1, module lock connector: 2	
Approval		CE cULus	
Weight※4	Basic module	Approx. 250.8g (approx. 177.7g)	Approx. 250.4g (approx. 177.3g)
	Expansion module	Approx. 245.7(approx. 172.6g)	Approx. 245.1g(approx. 172.2g)

※1: Connecting 1 or more expansion module can vary measurement accuracy about ±1℃, regardless of the number of connected expansion module.

※2: **At room temperature (23℃±5℃)**
- Thermocouple K, J, N, E below -100℃, L, U, PLII and RTD Cu50Ω, DPt50Ω: (PV ±0.3% or ±2℃, higher one) ±1-digit
- Thermocouple C, G and R, S below 200℃: (PV ±0.3% or ±3℃, higher one) ±1-digit
- Thermocouple B below 400℃: there is no accuracy standards.

Out of room temperature range
- RTD Cu50Ω, DPt50Ω: (PV ±0.5% or ±3℃, higher one) ±1-digit
- Thermocouple R, S, B, C, G: (PV ±0.5% or ±5℃, higher one) ±1-digit
- Others blow -100℃: within ±5℃

※3: If the control output is set to current output, the heater current value monitoring function through the CT input terminal of the control module is not available.

※4: The weight includes packaging. The weight in parenthesis is for unit only.

※Environment resistance is rated at no freezing or condensation.

▣ Specifications

◎ Option module

Model		TMHA-42AE			TMHE-82RE	TMHCT-82NE
No. of channels		4 channels			8 points	8 points
Power supply※1		24VDC⎓				
Permissible voltage range		90 to 110% of rated voltage				
Power consumption		Max. 5W (for max. load)				
Display method		None- parameter setting and monitoring is available at external devices (PC, PLC, etc.)				
Input type		Thermocouple	RTD	Analog	Digital	CT
		K(CA), J(IC), E(CR), T(CC), B(PR), R(PR), S(PR), N(NN), C(TT), G(TT), L(IC), U(CC), Platinel II	DPt100Ω, JPt100Ω, DPt50Ω, Cu100Ω, Cu50Ω, Nikel 120Ω 3-wire type (permissible line resistance max. 5Ω per line)	• Voltage: 0-100mVDC⎓, 0-5VDC⎓, 1-5VDC⎓, 0-10VDC⎓ • Current: 0-20mA, 4-20mA	• Connect input: ON - max. 1kΩ, OFF - min. 100kΩ • Solid-state input: ON - max. residual voltage 0.9V, OFF - max. leakage current 0.5mA • Outflow current : approx. 0.3mA per input	0.0-50.0A (primary current measurement range) ※CT ratio=1/1000
Sampling cycle		50ms (4CH synchronous sampling)			—	
Measured accuracy※2		• At room temperature (23℃±5℃): (PV ±0.3% or ±1℃, higher one) ±1-digit※3 • Out of room temperature range: (PV ±0.5% or ±2℃, higher one) ±1-digit		• At room temperature (23℃±5℃): ±0.3% F.S. ±1-digit • Out of room temperature range: ±0.5% F.S. ±1-digit	—	±5% F.S. ±1-digit
Output	Alarm	—			250VAC~ 3A 1a	—
	Transmission	DC 4-20mA or DC 0-20mA (load resistance max. 500Ω)			—	
Comm.	Comm. terminal	RS485 (Modbus RTU protocol)				
	PC loader	TTL (Modbus RTU protocol)				
Relay life cycle	Mechanical	—			Min. 10,000,000 operations	—
	Electrical				Min. 100,000 operations (250VAC 3A resistance load)	
Memory retention		Approx. 10 years (non-volatile semiconductor memory type)				
Insulation resistance		Over 100MΩ (500VDC megger)				
Insulation type		Double insulation or reinforced insulation (mark: ⧈, dielectric strength between the measuring input part and the power part : 1kV)				—
Dielectric strength		1,000VAC 50/60Hz for 1 min (between power source terminal and input terminal)				
Vibration		0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours				
Noise immunity		Square shaped noise by noise simulator (pulse width 1μs) ±0.5kV R-phase, S-phase				
Environment	Ambient temp.	-10 to 50℃, storage: -20 to 60℃				
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH				
Protection structure		IP20 (IEC standard)				
Accessories		Expansion connector: 1, module lock connector: 2				
Approval		CE c UL us				
Weight※4		Approx. 233.8g (approx. 160.7g)			Approx. 239g (approx. 165.9g)	Approx. 220.6g (approx. 147.5g)

※1: Voltage of power supply/communication terminal placed in the backside of TMH2/4 Series (basic control module)
※2: In case of TMHA, connecting 1 or more expansion module can vary measurement accuracy about ±1℃, regardless of the number of connected expansion module.
※3: **At room temperature (23℃±5℃)**
- Thermocouple K, J, N, E below -100℃, L, U, PLII and RTD Cu50Ω, DPt50Ω: (PV ±0.3% or ±2℃, higher one) ±1-digit
- Thermocouple C, G and S below 200℃: (PV ±0.3% or ±3℃, higher one) ±1-digit
- Thermocouple B below 400℃: there is no accuracy standards.

Out of room temperature range
- RTD Cu50Ω, DPt50Ω: (PV ±0.5% or ±3℃, higher one) ±1-digit
- Thermocouple R, S, B, C, G: (PV ±0.5% or ±5℃, higher one) ±1-digit
- Others blow -100℃: within ±5℃

※4: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Specifications

◎ Communication module

Model			TMHC-22LE	TMHC-22EE
Communication port			COM1/2	
Power supply※1			24VDC⎓	
Permissible voltage range			90 to 110% of rated voltage	
Power consumption			Max. 5W (for max. load)	
Display method			None- parameter setting and monitoring is available at external devices (PC, PLC, etc.)	
Comm.	COM1 (Master, PLC)	Connection method	RS485/RS422	Ethernet
		Protocol	Modbus RTU, PLC ladderless comm.	Modbus TCP
	COM2 (Master, Group)	Connection method	RS485/RS422	Ethernet
		Protocol	Modbus RTU	Modbus TCP
	PC loader		TTL (Modbus RTU protocol)	
Memory retention			Approx. 10 years (non-volatile semiconductor memory type)	
Insulation resistance			Over 100MΩ (500VDC megger)	
Insulation type			Double insulation or reinforced insulation (mark: ▣, dielectric strength between the measuring input part and the power part : 1kV)	
Dielectric strength			1,000VAC 50/60Hz for 1 min (between power source terminal and input terminal)	
Vibration			0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Noise immunity			Square shaped noise by noise simulator (pulse width 1㎲) ±0.5kV R-phase, S-phase	
Environ-ment	Ambient temp.		-10 to 50℃, storage: -20 to 60℃	
	Ambient humi.		35 to 85%RH, storage: 35 to 85%RH	
Protection structure			IP20(IEC standard)	
Accessories			Expansion connector: 1, module lock connector: 2	
Approval			CE c UL us KC	
Weight※2			approx. 219g (approx. 147g)	approx. 200g (approx. 129g)

※1: Voltage of power supply/communication terminal placed in the backside of TMH2/4 Series (basic control module)
※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Error Display

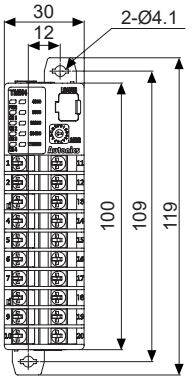
Status / Indicator	Input error※1	Remote SV error※2
PRW	ON (red)	ON (green)
CH※3	Flash (red)	Flash (red)

※1: Input error: input value is below the input range (LLLL) / input value exceeds input range (HHHH) / input sensor wire is down or input sensor is disconnected (OPEN).
※2: Remote SV error: communication error of Remote SV master and internal communication / input of master channel is LLLL/HHHH/OPEN when the channel is subjected to display PV.
※3: An indicator of relative channel flashes.
After main cause of the error is solved, error status is cleared and the device is returned to the normal operation automatically

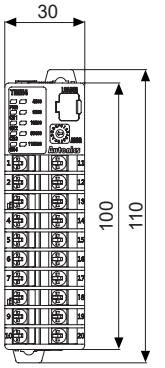
▣ Dimensions

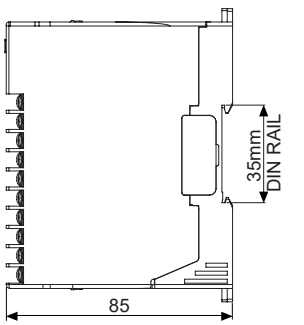
(unit: mm)

●**Rail Lock position: mounting with bolts**



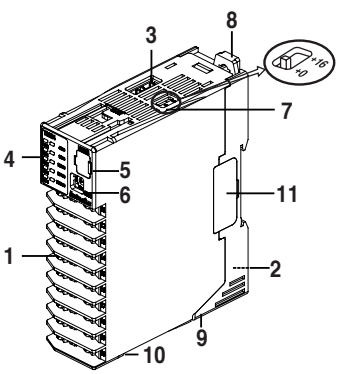
●**Rail Lock position: mounting on DIN Rail**



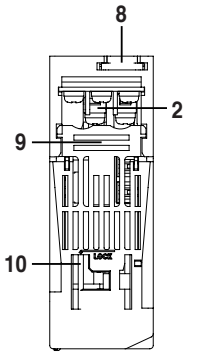


▣ Unit Description

◎ Control module



[Front/Side/Top]

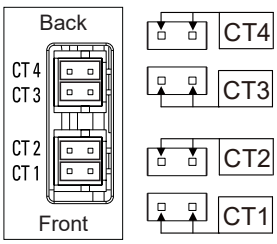


[Bottom]

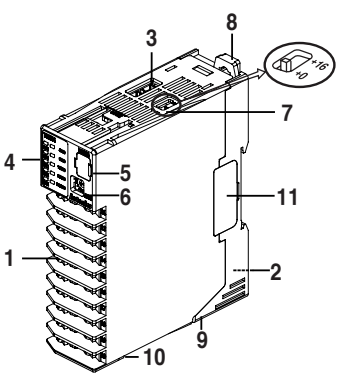
1. Input/Output terminal
For specific information about terminal formation, please refer to '▣ Connections and Isolated Block Diagram'.

2. Power/Comm. terminal [basic module only]
Supplies power to both basic control/expansion module and communicates with one or more module.

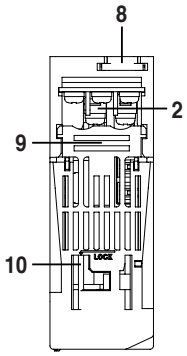
3. CT input terminal
When using the CT input terminal, remove the rubber cap and connect CT in the same direction with right image.
Connect CT with CICT4-□ (CT connector cable, sold separately).
※When connecting CT connector and CT input terminal, align the concave part (凹) and the convex part (凸).



◎ Control module



[Front/Side/Top]



[Bottom]

4. Indicator

●TMH2 Series

Indicator \ Status			Initial power ON※1	Control output	Auto tuning※2	Alarm output			
						N.O.(Normally Open)		N.C. (Normally Closed)	
						OFF (OPEN)	ON (CLOSE)	OFF (CLOSE)	ON (OPEN)
LED 1 LED 2 PWR CH 1 AL 1 CH 2 AL 2 AL 3 AL 4	LED 1	PWR (green)※3	—	ON	ON	—			
		CH1 (red)		ON	Flash				
		CH2 (red)		ON	Flash				
		(red)		ON※4	OFF				
		(red)		ON※5	OFF				
	LED 2	(yellow)	Flash (4,800bps)	Module comm. status※6					
		AL1 (yellow)	Flash (9,600bps)	—	—	OFF	ON	OFF	ON
		AL2 (yellow)	Flash (19,200bps)	—	—	OFF	ON	OFF	ON
		AL3 (yellow)	Flash (38,400bps)	—	—	OFF	ON	OFF	ON
		AL4 (yellow)	Flash (115,200bps)	—	—	OFF	ON	OFF	ON

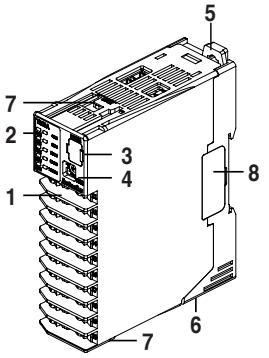
●TMH4 Series

Indicator \ Status			Initial power ON※1	Control output	Auto tuning※2
LED 1 LED 2 PWR CH 1 CH 2 CH 3 CH 4	LED 1	PWR (green)※3	—	ON	ON
		CH1 (red)		ON	Flash
		CH2 (red)		ON	Flash
		CH3 (red)		ON	Flash
		CH4 (red)		ON	Flash
	LED 2	(yellow)	Flash (4,800bps)	Module comm. status※6	
		(yellow)	Flash (9,600bps)	—	—
		(yellow)	Flash (19,200bps)	—	—
		(yellow)	Flash (38,400bps)	—	—
		(yellow)	Flash (115,200bps)	—	—

※1: At the moment when power is on, the indicator of set communication speed flashes for 5 sec.
※2: Indicator of the channel, which is in the process of auto-tuning, flashes at 1 sec interval.
※3: When communicating with external device, PWR indicator flashes.
※4: Turns on, when CH1 outputs cooling control in the heating&cooling control method.
※5: Turns on, when CH2 outputs cooling control in the heating&cooling control method.
※6: Displays communication status in control output, auto-tuning or operating RUN mode.
ON: normal / flash: abnormal / OFF: not communicating

5. PC loader port: PC loader port supports serial communication between single module and PC.
It needs EXT-US (converter cable)+SCM-US (USB/Serial converter, sold separately) for communicating.
6. Communication address setting switch (SW1): Set the communication address.
If changing the communication address by setting switch, use the flat head driver which is 2mm size or plastic driver. If not, it may cause product damage.
7. Communication address group switch (SW2): When setting the communication address over 16, select +16.
8. Rail lock: Rail lock helps installing the device to DIN rail or with bolts.
9. Lock lever: Lock lever holds module body and base tightly.
10. Module lock connecter hole: When connect modules, insert module lock connector in the hole in order to enhance coherence between modules.
11. END cover: When connect modules, remove END cover in order to connect expansion connector.

◎ Option module



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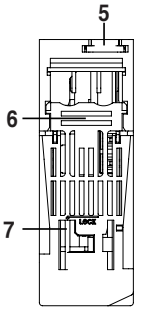


[Bottom]

1. Input/Output terminal
For specific information about terminal formation, please refer to '▣ Connections and Isolated Block Diagram'.

2. Indicator

●TMHA [analog input/output module]

Indicator \ Status			Initial power ON※1	Internal comm.	Transmission output
LED 1 LED 2 PWR CH 1 CH 2 CH 3 CH 4	LED 1	PWR (green)※2	—	ON	ON
		CH1 (red)		—	ON
		CH2 (red)		—	ON
		CH3 (red)		—	ON
		CH4 (red)		—	ON
	LED 2	(yellow)	Flash (4,800bps)	Module comm. status※3	
		(yellow)	Flash (9,600bps)	ON (CH1)	—
		(yellow)	Flash (19,200bps)	ON (CH2)	—
		(yellow)	Flash (38,400bps)	ON (CH3)	—
		(yellow)	Flash (115,200bps)	ON (CH4)	—

●TMHE [digital input, alarm output module]

Indicator \ Status			Initial power ON※1	Internal comm.	Alarm output			
					N.O.(Normally Open)		N.C. (Normally Closed)	
					OFF (OPEN)	ON (CLOSE)	OFF (CLOSE)	ON (OPEN)
LED 1 LED 2 PWR AL 1 AL 5 AL 2 AL 6 AL 3 AL 7 AL 4 AL 8	LED 1	PWR (green)※2	—	ON	ON			
		CH1 (red)		—	OFF	ON	OFF	ON
		CH2 (red)		—	OFF	ON	OFF	ON
		CH3 (red)		—	OFF	ON	OFF	ON
		CH4 (red)		—	OFF	ON	OFF	ON
	LED 2	(yellow)	Flash (4,800bps)	Module comm. status※3				
		AL5 (yellow)	Flash (9,600bps)	—	OFF	ON	OFF	ON
		AL6 (yellow)	Flash (19,200bps)	—	OFF	ON	OFF	ON
		AL7 (yellow)	Flash (38,400bps)	—	OFF	ON	OFF	ON
		AL8 (yellow)	Flash (115,200bps)	—	OFF	ON	OFF	ON

●TMHCT [CT input module]

Indicator \ Status			Initial power ON※1	CT input※4	Internal comm.
LED 1 LED 2 PWR	LED 1	PWR (green)※2	—	ON	ON
		(red)		ON (40.1 to 50.0A)	—
		(red)		ON (30.1 to 40.0A)	—
		(red)		ON (20.1 to 30.0A)	—
		(red)		ON (10.1 to 20.0A)	—
	LED 2	(yellow)	Flash (4,800bps)	Module comm. status※3	
		(yellow)	Flash (9,600bps)	ON (40.1 to 50.0A)	—
		(yellow)	Flash (19,200bps)	ON (30.1 to 40.0A)	—
		(yellow)	Flash (38,400bps)	ON (20.1 to 30.0A)	—
		(yellow)	Flash (115,200bps)	ON (10.1 to 20.0A)	—

※1: At the moment when power is on, the indicator of set communication speed flashes for 5 sec.
※2: When communicating with external device, PWR indicator flashes.
※3: Displays internal communication status between modules.
ON: normal / flash: abnormal / OFF: not communicating
※4: The indicator corresponding to the certain setting value of CT input flashes according to the parameter
[CT Input Value Indication Lamp □].
LED 1: CT Input Value Indication Lamp1 / LED 2: CT Input Value Indication Lamp2

3. PC loader port: PC loader port supports serial communication between single module and PC.
It needs EXT-US (converter cable)+SCM-US (USB/Serial converter, sold separately) for communicating.

4. Communication address setting switch (SW1): Set the communication address.
If changing the communication address by setting switch, use the flat head driver which is 2mm size or plastic driver. If not, it may cause product damage.

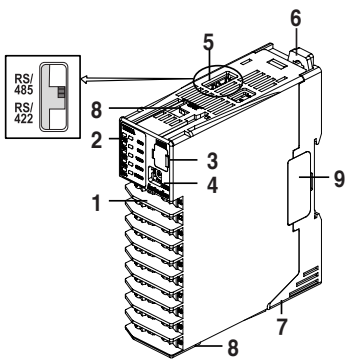
5. Rail lock: Rail lock helps installing the device to DIN rail or with bolts.

6. Lock lever: Lock lever holds module body and base tightly.

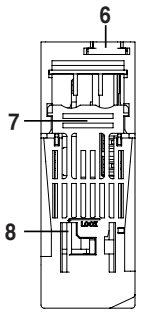
7. Module lock connecter hole: When connect modules, insert module lock connector in the hole in order to enhance coherence between modules.

8. END cover: When connect modules, remove END cover in order to connect expansion connector.

◎ Communication module



[Front/Side/Top]



[Bottom]

1. Communication port
Communication ports are varied by model specification.
Please refer to '▣ Connections and Isolated Block Diagram' for more detail information.

2. Indicator

●TMHC-22LE [RS422/RS485 ladderless communication module]

Indicator \ Status			Initial power ON※1	Internal comm.	Connection	PLC ladderless comm.
LED 1 LED 2 PWR	LED1	PWR	Flash (4,800bps)	Flash (green)	–	Flash (red, Reading)
		(red)	Flash (9,600bps)	Flash (TMH2/4)	–	–
		(red)	Flash (19,200bps)	Flash (TMHA)	–	–
		(red)	Flash (38,400bps)	Flash (TMHE)	–	–
		(red)	Flash (115,200bps)	Flash (TMHCT)	–	–
	LED2	(yellow)	Flash (4,800bps)	–	ON	Flash (Sending)
		(yellow)	Flash (9,600bps)	–	ON (TMH2/4)	–
		(yellow)	Flash (19,200bps)	–	ON (TMHA)	–
		(yellow)	Flash (38,400bps)	–	ON (TMHE)	–
		(yellow)	Flash (115,200bps)	–	ON (TMHCT)	–

※1: At the moment when power is on, the indicator of set communication speed flashes for 5 sec.

●TMHC-22EE [Ethernet communication module]

Indicator \ Status			Initial power ON	Internal comm.	Connection
LED 1 LED 2 PWR	LED1	PWR(green)	ON	Flash (external device)	–
		(red)	–	Flash (TMH2/4)	–
		(red)	–	Flash (TMHA)	–
		(red)	–	Flash (TMHE)	–
		(red)	–	Flash (TMHCT)	–
	LED2	(yellow)	–	ON	Flash (Ethernet comm.)
		(yellow)	Sequence-flashing vertically for 5 sec	–	ON (TMH2/4)
		(yellow)		–	ON (TMHA)
		(yellow)		–	ON (TMHE)
		(yellow)		–	ON (TMHCT)

3. PC loader port: PC loader port supports serial communication between single module and PC. It needs EXT-US (converter cable)+SCM-US (USB/Serial converter, sold separately) for communicating.
4. Communication address setting switch (SW1): Set the communication address.
If changing the communication address by setting switch, use the flat head driver which is 2mm size or plastic driver. If not, it may cause product damage.
5. Communication mode switch (SW2): Select communication mode between RS485 and RS422. (TMHC-22LE only)
6. Rail lock: Rail lock helps installing the device to DIN rail or with bolts.
7. Lock lever: Lock lever holds module body and base tightly.
8. Module lock connecter hole: When connect modules, insert module lock connector in the hole in order to enhance coherence between modules.
9. END cover: When connect modules, remove END cover in order to connect expansion connector.

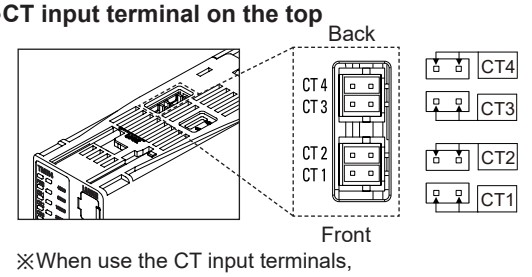
▣ Connections and Isolated Block Diagram

※Use terminals of size specified below.

	<Round>	<Forked>
a	Min. 3.0mm	Min. 3.0mm
b	Max. 5.8mm	Max. 5.8mm

◎ Control module

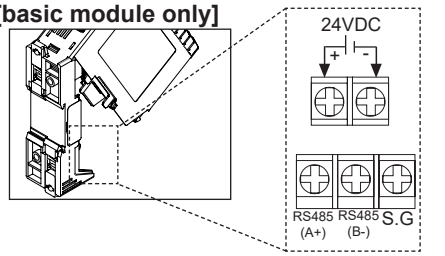
●CT input terminal on the top



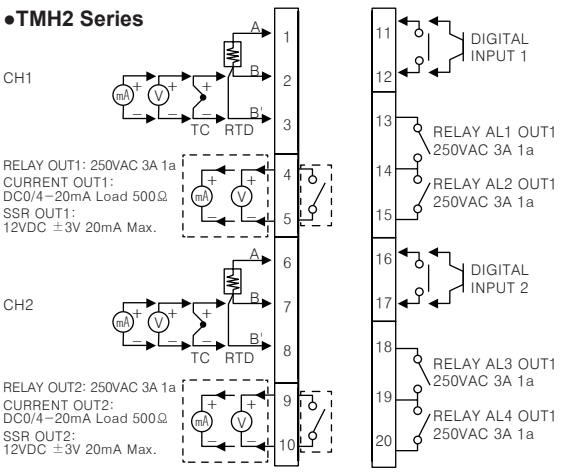
※When use the CT input terminals, remove the robber cap.

※Connect CT with CICT4-□(CT connector cable, sold separately).

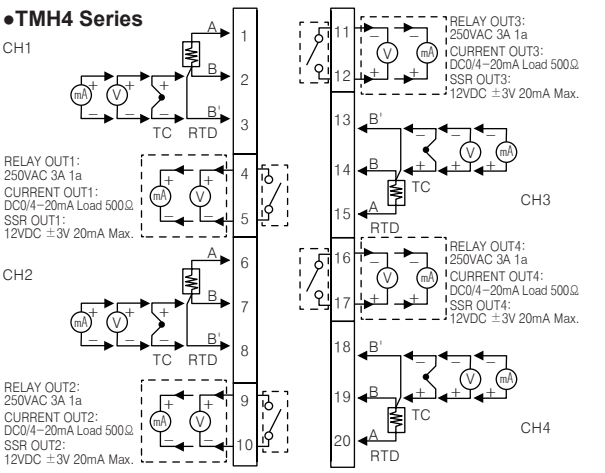
●Power/Comm. terminal on the back [basic module only]



●TMH2 Series

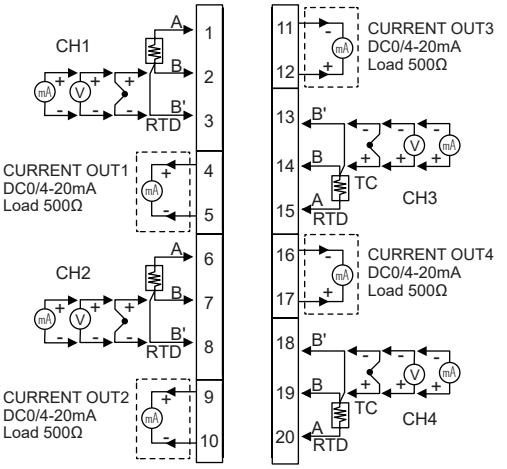


●TMH4 Series

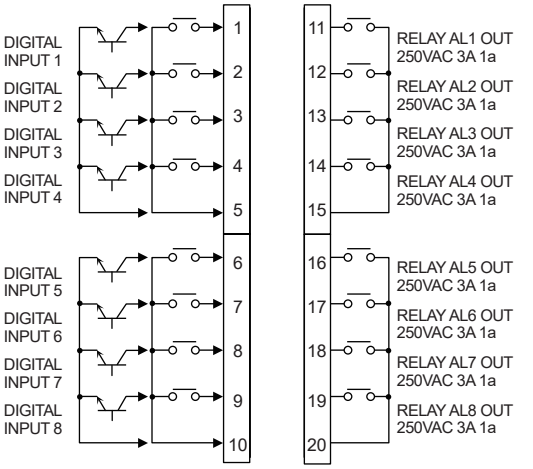


◎ Option module

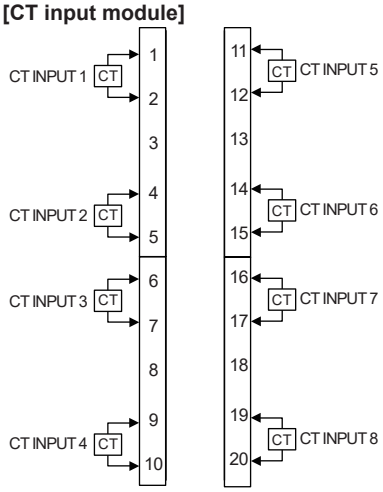
●TMHA [analog input/output module]



●TMHE [digital input, alarm output module]

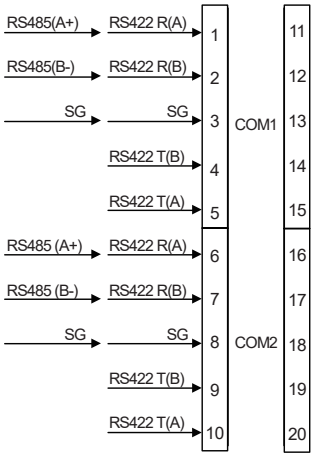


●TMHCT [CT input module]

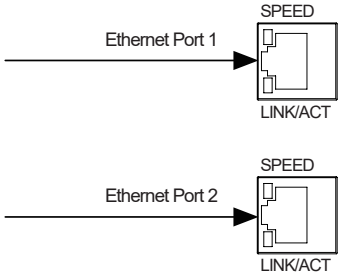


◎ Communication module

●TMHC-22LE [RS422/RS485 ladderless communication module]



●TMHC-22EE [Ethernet communication module]



▣ Sold Separately

◎ Communication converter

• SCM-WF48
(Wi-Fi to RS485·USB wireless communication converter)

• SCM-US48I
(USB to RS485 converter)

• SCM-38I
(RS232C to RS485 converter)

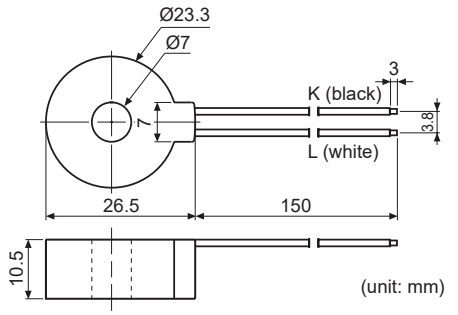
• SCM-US
(USB to Serial converter)

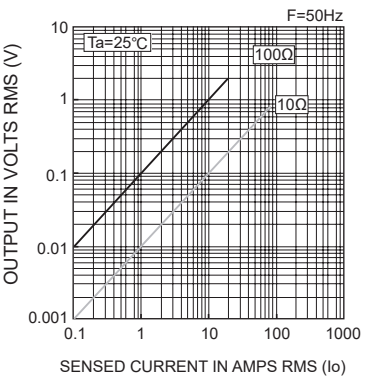
• EXT-US
(converter cable)

▣ Sold Separately

◎ Current transformer (CT)

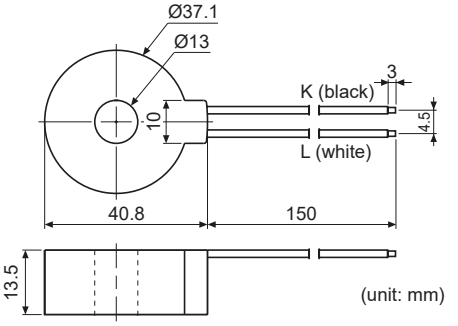
- **CSTC-E80LN**

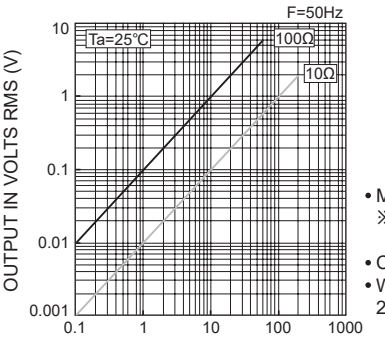




- Max. load current: 80A (50/60Hz)
  ※Max. load current for TMH Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance: 31Ω±10%

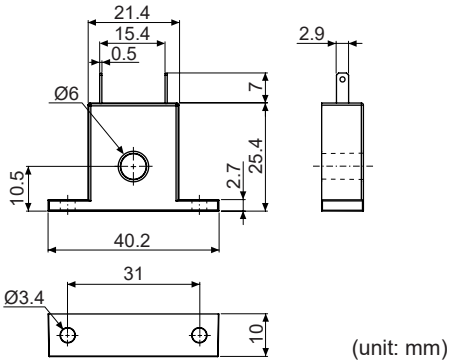
- **CSTC-E200LN**

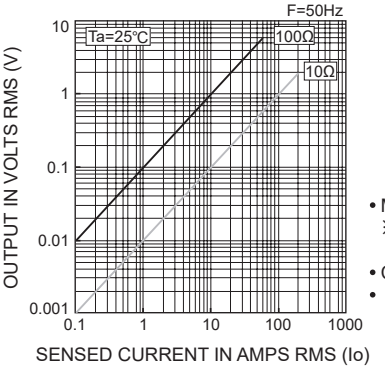




- Max. load current: 200A (50/60Hz)
  ※Max. load current for TMH Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance: 20Ω±10%

- **CSTS-E80PP**



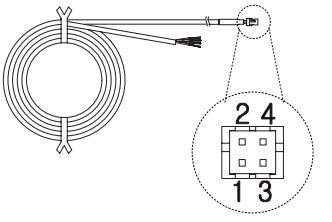


- Max. load current: 80A (50/60Hz)
  ※Max. load current for TMH Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance 31Ω±10%

※Do not supply primary current in case that CT output is open. High voltage will be generated in CT output.
※The current for above CTs is 50A same but inner hole sizes are different. Please use this for your environment.

◎ CT connector cable

- **CICT4-1 (cable length: 1m)**
- **CICT4-3 (cable length: 3m)**

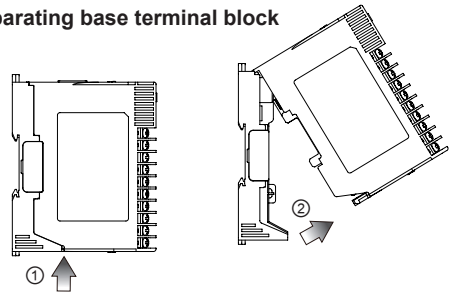


Pin number	Cable color	CT connection
1	Brown	CT1/3
2	Blue	CT1/3
3	White	CT2/4
4	Black	CT2/4

※When connecting CT connector and CT input terminal, align the concave part (凹) and the convex part (凸).

▣ Installation

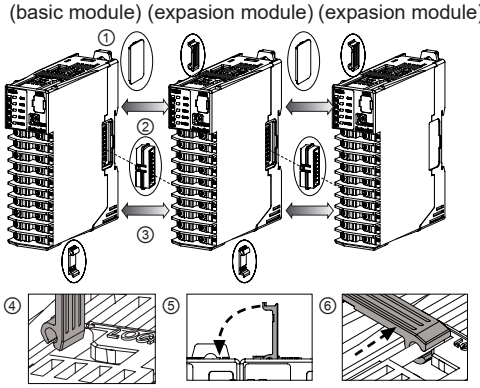
1. Separating base terminal block



① Push the lock lever at the bottom of the module.
② Pull the body of the module and open up.
※When connecting base terminal block, align the upper concave part (凹) of the body and the upper convex part (凸) of the base. If the upper parts are not align correctly, it may damage to the inner connector.

2. Connection between modules

TMH□-□2□B (basic module) TMH□-□2□E (expasion module) TMH□-□2□E (expasion module)

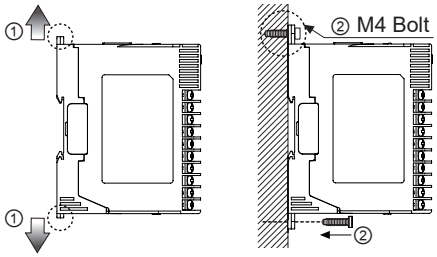


①Remove END cover of each module (except END cover of the first and last module).
②Insert expansion connector.
③Put all together tightly (max. 31 units).
④Insert module lock connector.
⑤Push module lock connector and insert in lock connector hole of another module on the side.
⑥Push module lock connector to the lock direction.
※Supply adequate power for power input specifications and overall capacity.
(Max. power when connecting 32 modules:32×5W=160W)

Expansion connector

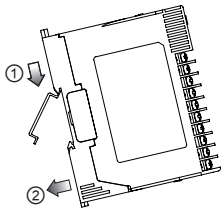
Module lock connector

3. Mounting with bolts



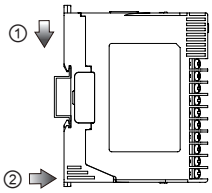
①Pull the rail lock at the top and bottom of the module.
②Insert bolts and fix it on rail lock.
(fixing torque is 0.5 to 0.9N·m.)

4. Mounting on DIN rail
4.1 Installing



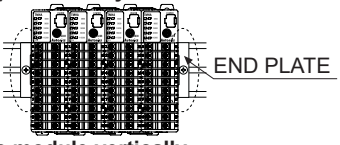
①Hang the top rail lock to DIN rail.
②Push and press the module to down direction.

4.2 Removing

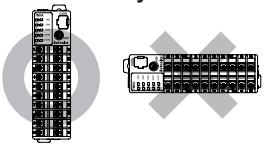


①Press the module down.
②Pull the module body forward.

※**Use end plates (sold separately, not available from Autonics) to fix firmly.**



※**Install the module vertically.**



▣ Input Type and Range

Input type			Decimal point	Display	Temperature range(℃)	Temperature range(℉)
Thermo-couple	K(CA)		1	K(CA).H	-200 to 1350	-328 to 2463
			0.1	K(CA).L	-200.0 to 1350.0	-328.0 to 2463.0
	J(IC)		1	J(IC).H	-200 to 800	-328 to 1472
			0.1	J(IC).L	-200.0 to 800.0	-328.0 to 1472.0
	E(CR)		1	E(CR).H	-200 to 800	-328 to 1472
			0.1	E(CR).L	-200.0 to 800.0	-328.0 to 1472.0
	T(CC)		1	T(CC).H	-200 to 400	-328 to 752
			0.1	T(CC).L	-200.0 to 400.0	-328.0 to 752.0
	B(PR)		1	B(PR)	0 to 1800	32 to 3272
	R(PR)		1	R(PR)	0 to 1750	32 to 3182
	S(PR)		1	S(PR)	0 to 1750	32 to 3182
	N(NN)		1	N(NN)	-200 to 1300	-328 to 2372
	C(TT)		1	C(TT)	0 to 2300	32 to 4172
	G(TT)		1	G(TT)	0 to 2300	32 to 4172
	L(IC)		1	L(IC).H	-200 to 900	-328 to 1652
			0.1	L(IC).L	-200.0 to 900.0	-328.0 to 1652.0
	U(CC)		1	U(CC).H	-200 to 400	-328 to 752
			0.1	U(CC).L	-200.0 to 400.0	-328.0 to 752.0
	Platinel II		1	PLII	0 to 1390	32 to 2534
RTD	Cu 50Ω		0.1	CU 50	-200.0 to 200.0	-200.0 to 392.0
	Cu 100Ω		0.1	CU 100	-200.0 to 200.0	-200.0 to 392.0
	JIS standard	JPt 100Ω	1	JPt100.H	-200 to 650	-328 to 1202
		JPt 100Ω	0.1	JPt100.L	-200.0 to 650.0	-328.0 to 1202.0
	DIN standard	DPt 50Ω	0.1	DPt50.L	-200.0 to 600.0	-328.0 to 1202.0
		DPt 100Ω	1	DPt100.H	-200 to 650	-328 to 1202
		DPt 100Ω	0.1	DPt100.L	-200.0 to 650.0	-328.0 to 1202.0
	Nickel 120Ω		1	NI12	-80 to 260	-112 to 500
Analog	Voltage	0 to 10V	—	AV1	0 to 1000	
		0 to 5V	—	AV2	0 to 5000	
		1 to 5V	—	AV3	1000 to 5000	
		0 to 100mV	—	AMV1	0 to 1000	
	Current	0 to 20mA	—	AMA1	0 to 2000	
		4 to 20mA	—	AMA2	400 to 2000	

▣ Functions

1. Analog input special function TMH2/4 TMHA

In case of analog input, it displays the applied measured value of the set special function.

1) Linear

It applies low-limit scale and high-limit scale to low-limit input value and high-limit input value and displays this values.

E.g.) In case of input type: 0-10V, low-limit input value: 0V, high-limit input value: 10V, low-limit scale: 0, high-limit scale: 1000, present input value is 2V and the display value is 200.

2) Root

In case of voltage, current (shunt) input, this mode is used when input value is calculated by Root(√) for the desired display value. Differential pressure signal of differential pressure flow meter is calculated Root(√) for the to-be measured flux. This function is used to measure flux by input value.

E.g.) In case of input type: 0-10V, low-limit input value: 0V, high-limit input value: 10V, low-limit scale: 0, high-limit scale: 1000, present input value is 2V and the display value is 447.

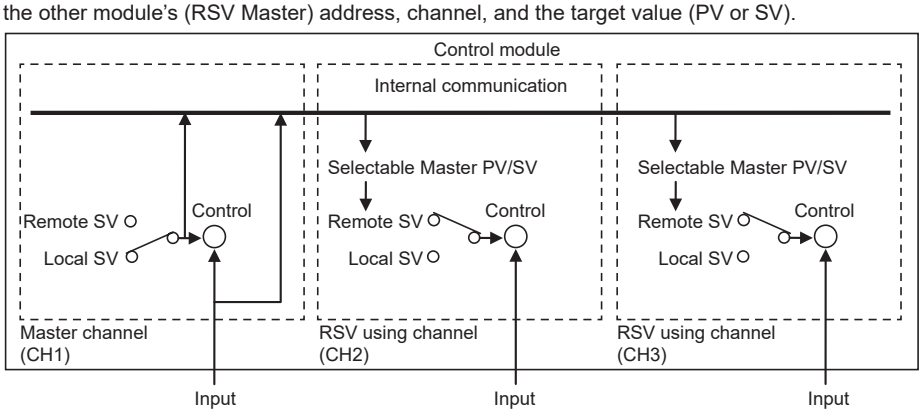
3) Square

In case of voltage, current (shunt) input, this mode is used when input value is calculated by square for the desired display value.

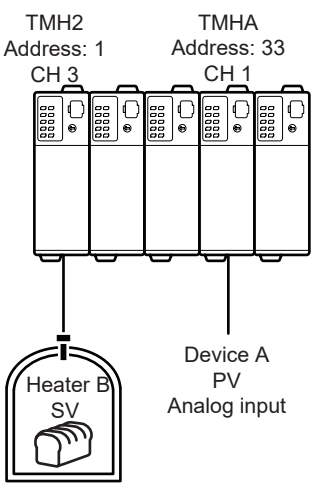
E.g.) In case of input type: 0-10V, low-limit input value: 0V, high-limit input value: 10V, low-limit scale: 0, high-limit scale: 1000, present input value is 2V and the display value is 40.

2. Remote SV TMH2/4

SV setting is available to set using PV or SV of the other module/channel not the direct setting of the module/channel. Set the other module's (RSV Master) address, channel, and the target value (PV or SV).



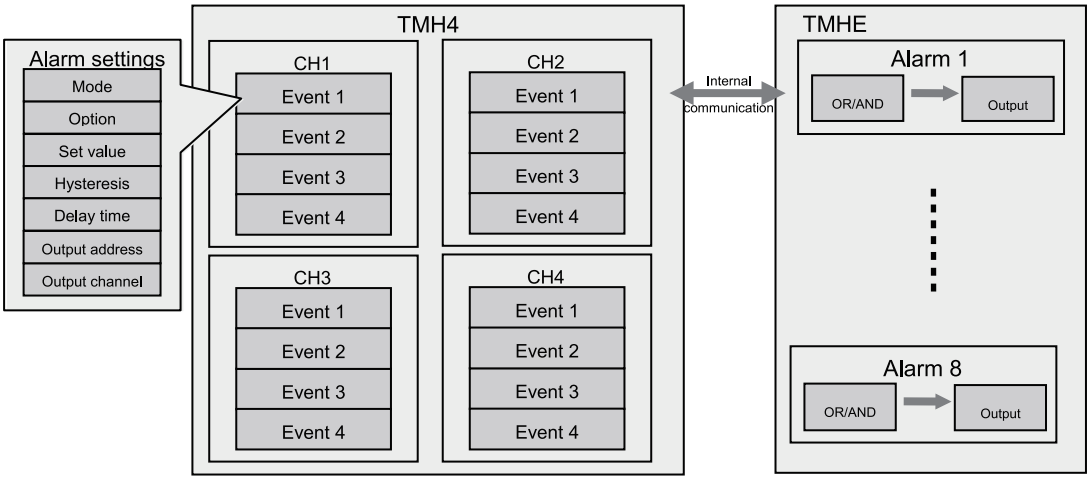
E.g.) RSV function is available when PV of TMHA (address 33, channel 1) is used for SV of TMH2(address 1, channel 3). Set RSV Master setting of TMH2. RSV Master address: 33, RSV Master channel: 1, RSV Master channel target: PV



3. Alarm TMH2/4 TMHE

Alarm output (Alarm) is output terminal and alarm (Event) is for alarm setting by each channel.
One channel is available to set total 4 alarms (Event 1 to 4).
One alarm consists of alarm mode, option, set value, hysteresis, delay time, output address, and channel settings, etc.

● Using TMHE Option module alarm output
TMH2/4 is connectable to TMHE option module. (according to address setting)
TMH4 does not have built-in alarm and TMHE option module outputs alarm when alarm condition occurs by internal communication.
Several alarm (Event 1 to 4) is selectable as one alarm output and AND/OR operation is selectable at TMHE.



4. CT input value indicators channel TMHCT

The indicator of TMHCT turns ON by the input value of CT.

Indicator \ Status			CT input
LED 1 LED 2 PWR	LED 1	PWR (green)	ON
		(red)	ON (40.1 to 50.0A)
		(red)	ON (30.1 to 40.0A)
		(red)	ON (20.1 to 30.0A)
		(red)	ON (10.1 to 20.0A)
	LED 2	(yellow)	—
		(yellow)	ON (40.1 to 50.0A)
		(yellow)	ON (30.1 to 40.0A)
		(yellow)	ON (20.1 to 30.0A)
		(yellow)	ON (10.1 to 20.0A)

Set at LED 1: CT Input Value Indication Lamp1 / LED 2: CT Input Value Indication Lamp2 of TMHC.

5. User parameter group TMH2/4 TMHA TMHE TMHCT TMHC

At DAQMaster, user parameter group of each module, TMH2/4/A/E/CT/C, is available to set.
This function is able to set the frequently used parameters to the user parameter group, so you can quickly and easily set the parameter settings.
In addition, the parameters set to the user group are configured sequentially and consecutively in TMHC, so it can improve efficiency of communication to the master device via batch read/write process.
For more information, refer to the user manual for communication.
Visit our website (www.autonics.com) to download the DAQMaster program and the manuals.

▣ Communication Setting

It is for parameter setting and monitoring via external devices (PC, PLC, etc.).
In case of TMHC, set COM1/2 both.

◎ Interface

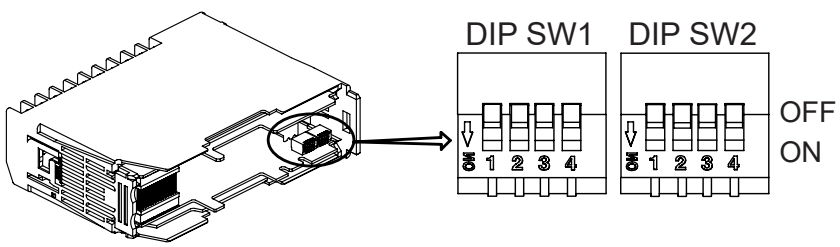
Protocol	TMH2/4/TMHA/TMHE/TMHCT/		Modbus RTU
	TMHC	-22LE	Modbus RTU, PLC ladderless comm.
		-22EE	Modbus TCP
Connection method	TMH2/4/TMHA/TMHE/TMHCT/		RS485
	TMHC	-22LE	RS422, 485
		-22EE	Ethernet
Maximum connection	TMH2/4		32unit (address: 01 to 32) (in case connecting TMHC module: 16 units (address: 01 to 16))
	TMHA/TMHE/TMHCT		Each module 16 units
	TMHC		16 control modules and 16 option modules per 1 TMHC module
Synchronization type			Asynchronous
Communication method			Two-wire half duplex
Communication effective range			Max. 800m
Communication speed			4800, 9600 (default), 19200, 38400, 115200 bps
Response time			5 to 99ms (default: 20ms)
Start bit			1-bit (fixed)
Data bit			8-bit (fixed)
Parity bit			None (default), Odd, Even
Stop bit			1bit, 2bit (default)

◎ Mac address [Ethernet comm. module: TMHC-22EE]

After connecting Ethernet module (TMHC-22EE), can check Mac address in 'Property - Mac address' item.
For more details as like method of module connection, refer to the user manual for TMH.
※Mac address is the network address for Ethernet communication.

◎ DIP switch configuration [PLC ladderless comm. module: TMHC-22LE]

After separating base terminal block, set communication speed, stop bit, PLC connection and protocol by using a internal DIP switch. (Default: All switches OFF(configure via PC))
※When connecting PLC, apply setting value to COM1 only.



- SW1

1	2	**Comm. speed**
OFF	OFF	Comm. parameter setting
OFF	ON	19200bps
ON	OFF	38400bps
ON	ON	115200bps

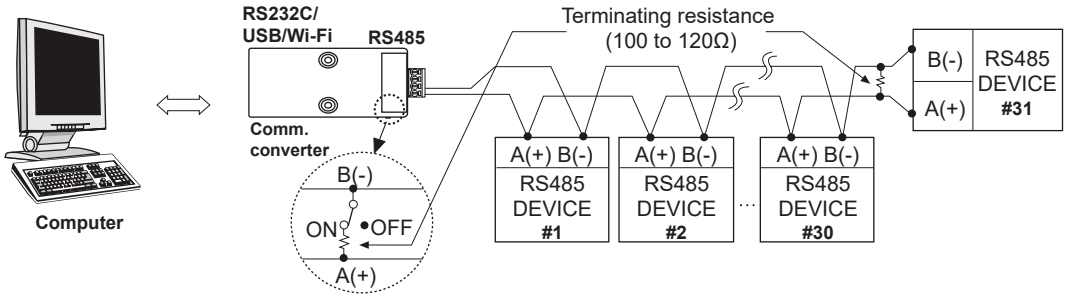
3	4	**Stop bit**
OFF	OFF	Comm. parameter setting
OFF	ON	Stop bit: 1bit
ON	OFF	Stop bit: 2bit
ON	ON	–

- SW2

1	2	3	4	**PLC connection and Protocol**
OFF	OFF	OFF	OFF	Comm. parameter setting
OFF	OFF	OFF	ON	MODBUS(RTU) protocol
OFF	OFF	ON	OFF	LS MASTER-K Series special protocol
OFF	OFF	ON	ON	LS GLOFA-GM Series special protocol
OFF	ON	OFF	OFF	LS XGT/XGB Series special protocol
OFF	ON	OFF	ON	MITSUBISHI MELSEC Series special protocol Q/QnACPU common command (1401/0401)
OFF	ON	ON	OFF	MITSUBISHI MELSEC Series special protocol ACPU common Command (WW/WR)
OFF	ON	ON	ON	OMRON SYSMAC Series special protocol

▣ Communication Setting

◎ Application of system organization



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately).
Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

◎ Communication address setting

Set the communication address with the communication address setting switch (SW1). (default: [SW1] 1)

Module \ SW		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
TMH4/2	+0	16	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
	+16	32	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
TMHC		16	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
TMHA		48	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
TMHE		64	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
TMHCT		80	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79

※When using TMHC, in case connecting only TMHC to Master (PC, PLC, etc.), communication address of TMHC and TMH2/4 Series control module can be duplicated. However, in case connecting both TMHC and TMH2/4 Series control module to Master, communication address must not be duplicated. (If the TMHC and TMH modules communicate to Master at the same time, a communication error may occur.)

◎ Caution for communication interface setting

When changing the setting value related to communication interface, reboot the device for normal operation.

▣ Proper Usage

◎ Cautions during use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Do not apply excessive power when connecting or disconnecting the connectors of the product.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- When changing the input sensor, turn off the power first before changing.
  After changing the input sensor, modify the value of the corresponding parameter.
- Power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Do not overlapping communication line and power line.
  Use twisted pair wire for communication line and connect ferrite bead at each end of line to reduce the effect of external noise.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Mounting multiple devices in any way other than the specified mounting method may cause heat to build up inside, which will shorten their service life. If there is a possibility of the ambient temperature rising to a temperature above the specified temperature range, take steps, such as installing fans, to cool the device. Be sure that the cooling method in not cooling just the terminal block. If only the terminal block is cooled, measurement errors may occur.
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- Install DIN rail vertically from the ground.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Analog And Non-Indicating Type, PID Control, Set Temperature By Dial

▣ Features

- Improved control performance with built-in microcomputer
- Adopting new Auto-tuning PID control algorithm
  : Selectable ON/OFF, PID control
  (with the external slide SW)
- Easy to check controlling status with deviation indicators
  : Deviation LED (red, green), output LED (red) indicators
- Dial setting output OFF function
- Sensor broken display function

⚠ **Please read "Caution for your safety" in operation manual before using.**

▣ Ordering Information

TA S – B 4 R P 4 C

Unit

C	Celsius ℃
F	Fahrenheit ℉

Temperature range for each sensor

	℃	℉	Temperature sensor		
0	-50 to 100	-58 to 212	DPt	–	–
1	0 to 100	32 to 212	DPt	–	K (CA)
2	0 to 200	32 to 392	DPt	J (IC)	K (CA)
3	0 to 300	32 to 572	–	J (IC)	–
4	0 to 400	32 to 752	DPt	J (IC)	K (CA)
6	0 to 600	32 to 1,112	–	–	K (CA)
8	0 to 800	32 to 1,472	–	–	K (CA)
C	0 to 1,200	32 to 2,192	–	–	K (CA)

Sensor input type

P	DPt100Ω
J	J (IC)
K	K (CA)

Control output

R	Relay output
S	SSR drive output

Power supply

4	100-240VAC 50/60Hz

Control method

B	ON/OFF control & PID control combined

Size

S	DIN W48 x H48mm (8-pin plug type)※1
M	DIN W72 x H72mm
L	DIN W96 x H96mm

Item

TA	Analog setting type temperature controller

※1: 8-pin socket (PG-08, PS-08(N)) is sold separately.

▣ Specifications

Series		TAS	TAM	TAL
Power supply		100-240VAC 50/60Hz		
Allowable voltage range		90 to 110% of rated voltage		
Power consumption		Max. 4VA		
Size		DIN W48×H48mm	DIN W72×H72mm	DIN W96×H96mm
Display method		Deviation LED (red, green), Output LED (red)		
Setting type		Dial setting		
Setting accuracy ※1		F.S. ±2% (room temperature 23℃±5℃)		
Input type	RTD	DPt100Ω (allowable line resistance max. 5Ω per a wire)		
	Thermocouples	K (CA), J (IC)		
Control	ON/OFF Control	Hysteresis: 2℃ fixed		
	PID Control	Control period: Relay output - 20 sec. / SSR drive output - 2 sec.		
Control output	Relay	250VAC 3A 1c		
	SSR	12VDC±2V 20mA Max.		
Functions		PV deviation indicatable, Error indicatable		
Dielectric strength		2,000VAC 50/60Hz for 1min. (between input terminal and power terminal)		
Vibration		0.75mm amplitude at frequency of 5 to 55Hz (for 1 min.) in each X, Y, Z direction for 2 hours		
Relay life cycle	Mechanical	Min. 10,000,000 operations (18,000 operations/hr)		
	Electrical	Min. 100,000 operations (900 operations/hr)		
Insulation resistance		Min. 100MΩ (at 500VDC megger)		
Noise resistance		±2kV R-phase, S-phase the square wave noise (pulse width: 1us) by the noise simulator		
Memory retention		Approx. 10 years (when using non-volatile semiconductor memory type)		
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃		
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH		
Insulation type		Double insulation or reinforced insulation (mark: ⧈, dielectric strength between the measuring input part and the power part: 2kV)		
Approval		CE cULus		
Weight※2		Approx. 112g (approx. 74g)	Approx. 176g (approx. 114g)	Approx. 237g (approx. 152g)

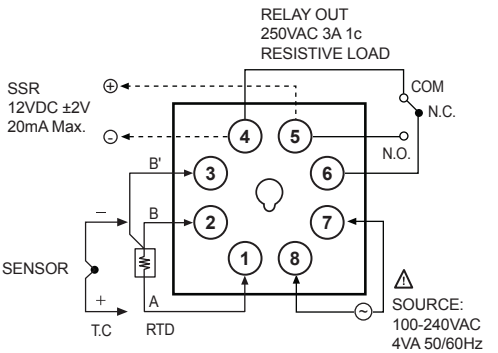
※1: Out of room temperature range: Below 100℃ model is F.S. ±4% , Over 100℃ model is F.S. ±3%
※2: The weight includes packaging. The weight in parentheses is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Connections

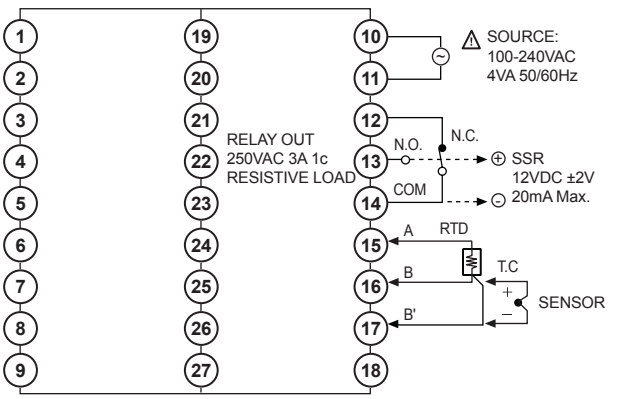
※RTD: DPt100Ω (3-wire type) ※Thermocouple: K (CA), J (IC)

● TAS

(※Socket (PG-08, PS-08 (N)) is sold separately)



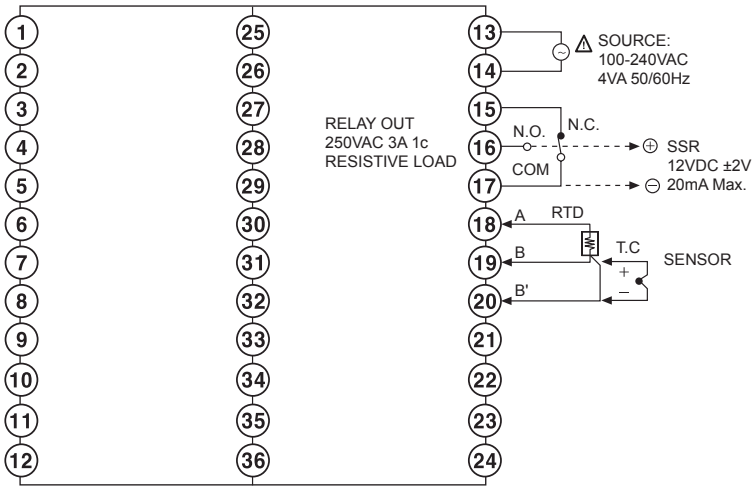
● TAM



▣ Connections

※RTD: DPt100Ω (3-wire type) ※Thermocouple: K (CA), J (IC)

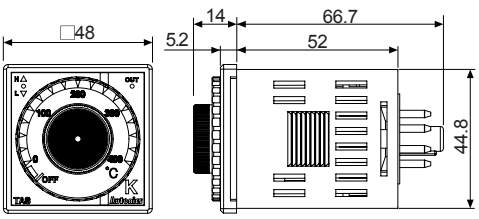
● TAL



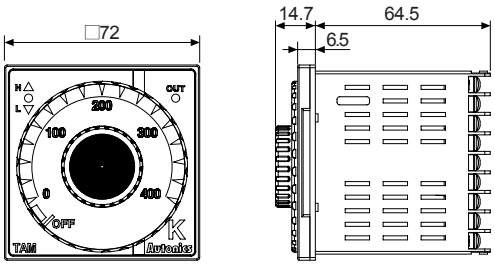
▣ Dimensions

(unit: mm)

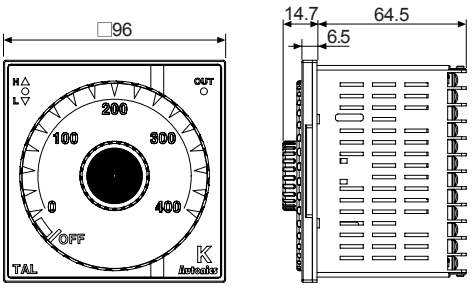
● TAS



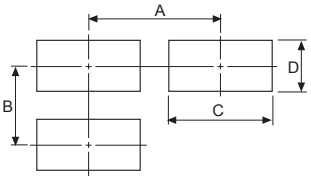
● TAM



● TAL



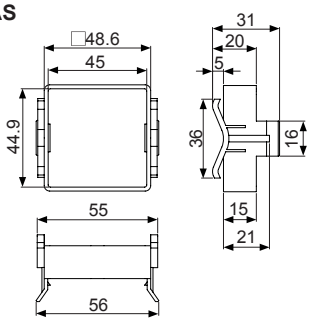
● Panel cut-out



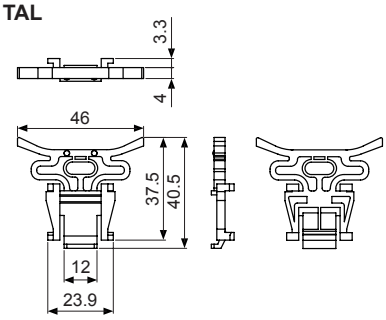
Size / Series	A	B	C	D
TAS	Min. 65	Min. 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
TAM	Min. 90	Min. 90	$68^{+0.7}_{0}$	$68^{+0.7}_{0}$
TAL	Min. 115	Min. 115	$92^{+0.8}_{0}$	$92^{+0.8}_{0}$

● Bracket

• TAS



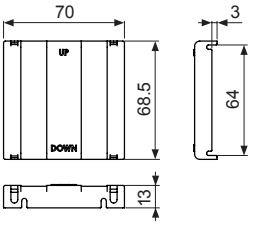
• TAM, TAL



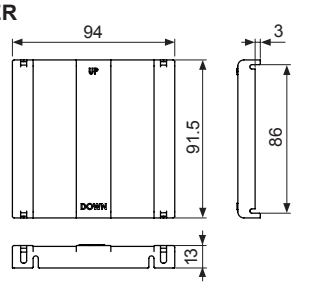
● **Terminal cover (sold separately)**

(unit: mm)

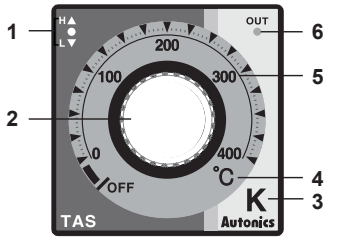
● **RMA-COVER**
(72×72mm)

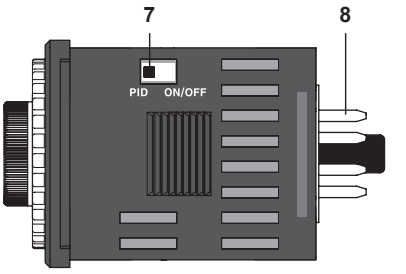


● **RLA-COVER**
(96×96mm)



▣ Unit Description





1. Deviation indicator: It shows deviation of present temperature (PV) based on set temperature (SV) by LED.

Input deviation indicator [Deviation indicator: ● (green), ▲/▼ (red)]

PV deviation temperature	Deviation indicator	PV deviation temperature	Deviation indicator
Input sensor OPEN	▲+●+▼ indicators flash (every 0.5 sec.)	Less than or equal to ±2℃	● indicator turns ON
Exceed max. input value	▲ indicator flashes (every 0.5 sec.)	More than -2℃ to less than or equal to -10℃	●+▼ indicators turn ON
More than 10℃	▲ indicator turns ON	More than -10℃	▼ indicator turns ON
More than 2℃ to less than or equal to 10℃	▲+● indicators turn ON	Less than min. input value	▼ indicator flashes (every 0.5 sec.)

※This is the same as Fahrenheit (℉).

※**When power is on, all indicators light for 2 sec., then all indicators turn off and control operation starts.**

2. Set temperature (SV) dial:
Dial to change set temperature (SV). When changing set temperature, it is applied after 2 sec. for the stable input.

3. Input sensor type:
Indicates sensor type of present value. Input sensor type or input range each product is shown in the below table.

Input sensor		Range No.	Temperature range (℃)	Temperature range (℉)
Thermocouple	K (CA)	1	0 to 100	32 to 212
		2	0 to 200	32 to 392
		4	0 to 400	32 to 752
		6	0 to 600	32 to 1,112
		8	0 to 800	32 to 1,472
		C	0 to 1,200	32 to 2,192
	J (IC)	2	0 to 200	32 to 392
		3	0 to 300	32 to 572
		4	0 to 400	32 to 752
RTD	DPt100Ω	0	-50 to 100	-58 to 212
		1	0 to 100	32 to 212
		2	0 to 200	32 to 392
		4	0 to 400	32 to 752

※Set temperature within input range each sensor.

4. Temperature unit: Indicates temperature unit (℃, ℉) of set temperature (SV) and present value (PV).

5. Temperature range: Indicates temperature range of set temperature (SV).

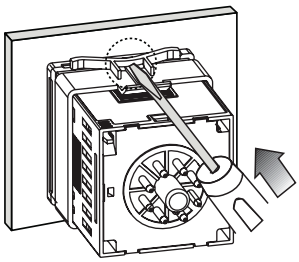
6. Control output indicator: Turns ON when control output (Relay output/SSR drive output).

7. Control mode selector switch: Select PID control or ON/OFF control using switch.

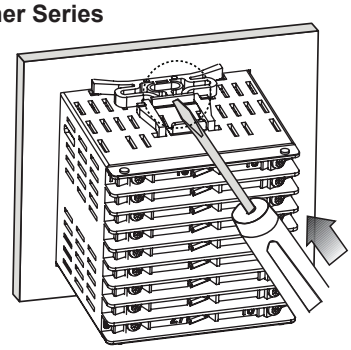
8. Terminal: Terminals for external connections. For detail, refer to ▣ Connections.

▣ Mounting

● **TAS (48×48mm) Series**



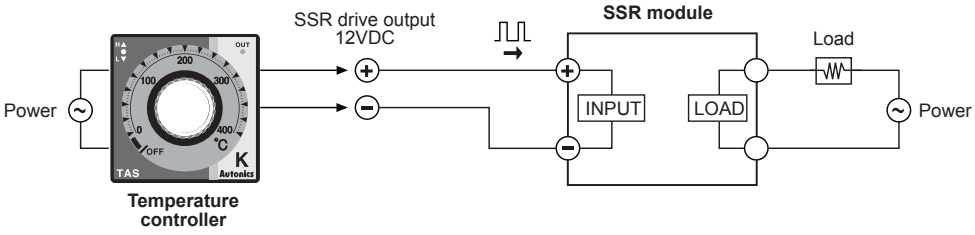
● **Other Series**



※Mount the product on the panel, fasten bracket by pushing with tools as shown above.

▣ Functions

● **SSR drive output**

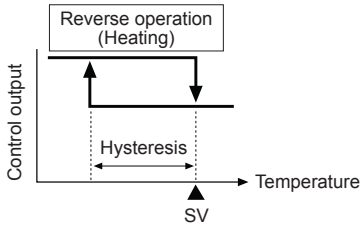


● **ON/OFF control**

ON/OFF control function is for controlling temperature by comparing present temperature (PV) to setting temperature (SV). ON/OFF control is fixed on reverse operation (Heating).

Output turns on to supply power to heater when present temperature (PV) falls lower than setting temperature (SV) and the output turns off to turn off heater when present temperature (PV) is higher then setting temperature (SV).

※Hysteresis is fixed 2℃ during ON/OFF control.



● **PID control**

PID constants are suggested and implemented based on self tuning from supply power until reaching set temperature (SV), then self tuning is over after reaching set temperature (SV).

When power supply, in case that set temperature (SV) dial points at OFF or self tuning can not be started because present temperature (PV) is higher than set temperature (SV) or hunting occurs during self tuning, output control is switched to proportion band (P) because that is considered to error. At that time, proportion band is fixed at 10℃.

※Control cycle of PID control and proportion control is 20 sec. in relay output model and 2 sec. in SSR drive output model.

● **STOP**

Control output could stop without power off by setting the front setting volume to below min. setting range.
If control output stops by STOP function, Green indicator in deviation indicator (●) will flash every 1 sec.

● **Error**

Error mark will flash (every 1 sec.) in PV indicator when error occurs during the control operation.
It will operate normally, if input sensor is connected or returned to normal range.

No	Display		Description
1	▲+●+▼	indicators flash	If input sensor line is broken or sensor is not connected.
2	▲	indicator flashes	If measured sensor input is higher than temperature range.
3	▼	indicator flashes	If measured sensor input is lower than temperature range.

2/4-CH Modular Type, PID Control Temperature Controller

▣ Features

- Multi-channel (4-channel: TM4 / 2-channel: TM2) input and output control
- High-speed sampling cycle (4-channel: 100 ms / 2-channel: 50 ms)
- **Module connection and expansion with expansion connectors**
  - **Communication between modules**
  - **No additional power supply wiring**
  - **Expandable up to 31 units (124-channel / 62-channel)**
- Simultaneous heating and cooling control function
- Isolated input channels (dielectric strength: 1000 VAC)
- Switch between current output and SSR drive output (TM2-□2C□ models)
- SSR drive output (SSRP function) control options: ON/OFF control, cycle control, phase control
- Parameter configuration via PC (USB and RS485 communication)
  - DAQMaster software included (comprehensive device management software)
  - Communication converter sold separately: SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter), SCM-US48I (USB to RS485 converter), SCM-38I (RS232C to RS485 converter), SCM-US (USB to serial converter)
- Easy wiring and maintenance with various connectors:
  sensor input connector, control output connector, power/communication connector
- Heater disconnect alarm function (CT input)
  - Current transformer (CT) sold separately: CSTC-E80LN, CSTC-E200LN, CSTS-E80PP
- Various input types and temperature ranges

Please read "Safety Considerations" in the instruction manual before using.

▣ Manual

- Visit our website (www.autonics.com) to download user manual and communication manual.
- User manual describes for specifications and function, and communication manual describes for RS485 communication (Modbus RTU protocol) and parameter address map data.

▣ Comprehensive Device Management Program (DAQMaster)

- DAQMaster is comprehensive device management program for convenient management of parameters and multiple device data monitoring.
- Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >

▣ Ordering Information

TM 4 − N 2 R B

Module type	B		Basic module
	E		Expansion module ※1
Control output	2CH	R	Relay output
		C	Current or SSR drive output selectable
	4CH	R	Relay output
		S	SSR drive output
Power supply	2		24VDC
Option I/O	2CH	2	CT input, Digital input (DI-1, DI-2), Alarm output 1+2, RS485 comm. output
		4	CT input, Digital input (DI-1, DI-2), Alarm output 1+2+3+4, RS485 comm. output
	4CH	N	RS485 comm. output
Channels	2		2-channel
	4		4-channel
Item	TM		Multi-channel modular temperature controller

※The expansion module does not supply power/comm. terminal. Order it with the basic module.

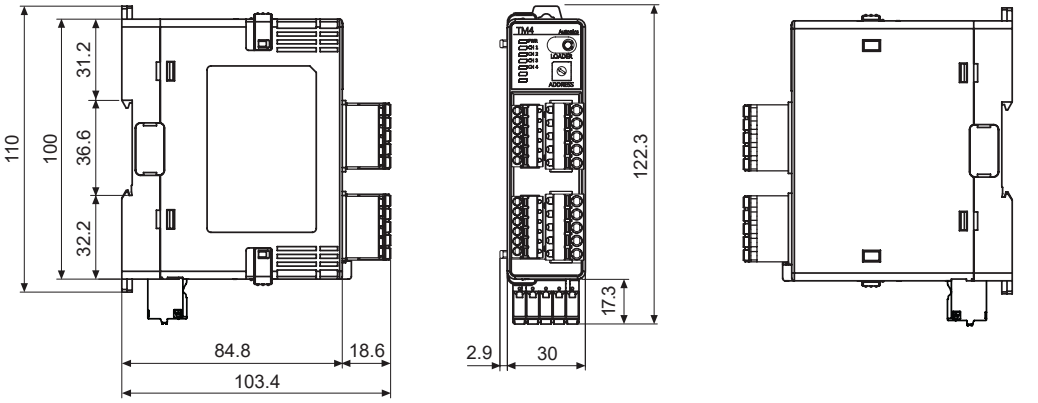
▣ Specifications

Series		TM2	TM4
No. of channels		2-channel (insulated each channel-dielectric strength 1,000VAC)	4-channel (insulated each channel-dielectric strength 1,000VAC)
Power supply		24VDC⎓	
Permissible voltage range		90 to 110% of rated voltage	
Power consumption		Max. 5W (for max. load)	
Display method		None- parameter setting and monitoring is available at external devices (PC, PLC, etc.)	
Input type	Thermocouple	K(CA), J(IC), E(CR), T(CC), B(PR), R(PR), S(PR), N(NN), C(TT), G, (TT), L(IC), U(CC), Platinel II	
	RTD	JPt100Ω, DPt100Ω (permissible line resistance max. 5Ω)	
Sampling period		50ms (2 channel synchronous sampling)	100ms (4 channel synchronous sampling)
Measured accuracy	Thermocouple※1	(PV ±0.5% or ±1℃, select the highter one) ±1-digit max.	
	RTD		
	CT input	±5% F.S. ±1-digit max.	—
	Current output	±1.5% F.S. ±1-digit max.	—
Influence of temp.※2	Thermocouple	(PV ±0.5% or ±2℃, select the highter one) ±1-digit max. (TC input max. -100℃ is within ±5℃)	
	RTD	• TC B, R, S, C, G, L, U: (PV ±0.5% or ±5℃, select the highter one) ±1-digit max.	
Control output	Relay	250VAC～ 3A, 30VDC⎓ 3A, 1a	
	SSR	Max. 12VDC⎓ ±3V 30mA	Max. 22VDC⎓ ±3V 30mA
	Current	Selectable DC 4-20mA or DC 0-20mA (load resistance max. 500Ω)	—
Control method	Heating, Cooling	ON/OFF control, P, PI, PD, PID control	
	Heating&Cooling		
Option output	Alarm	250VAC～ 3A 1a	—
	Communication	RS485 communication output (Modbus RTU method)	
Option input	CT input	0.0-50.0A (primary current measurement range) ※CT ratio=1/1000	—
	Digital input	• Contact input: ON max. 1kΩ, OFF min. 100kΩ • Solid-state input: ON residual voltage max. 1.5VDC⎓, OFF leakage current max. 0.1mA • Outflow current: Approx. 0.5mA per input	—
Hysteresis		1 to 100℃/℉ (0.1 to 100℃/℉) variable	
Proportional band (P)		0.1 to 999.9℃/℉	
Integral time (I)		0 to 9999 sec	
Derivative time (D)		0 to 9999 sec	
Control period (T)		0.1 to 120.0 sec (only for relay output, SSR drive output)	
Manual reset		0.0 to 100.0%	
Relay life cycle	Mechanical	Min. 10,000,000 operations	
	Electrical	Min. 100,000 operations (250VAC 3A resistance load)	
Insulation resistance		Over 100MΩ (at 500VDC megger)	
Insulation type		Double insulation or reinforced insulation (mark: ⧈, dielectric strength between the measuring input part and the power part: 1kV)	
Dielectric strength		1,000VAC 50/60Hz for 1 min (between input terminals and power terminals)	
Vibration		0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Noise immunity		±0.5kV the square wave noise (pulse width: 1μs) by the noise simulator	
Environment	Ambient temp.	-10 to 50℃, storage: -20 to 60℃	
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH	
Accessories		Expansion connector: 1, Power/Comm. connector: 1 (only for basic module)	
Approval		CE c UL us	
Weight※3	Basic module	Approx. 217g (approx. 152g)	Approx. 239g (approx. 174g)
	Expansion module	Approx. 208g (approx. 143g)	Approx. 231g (approx. 166g)

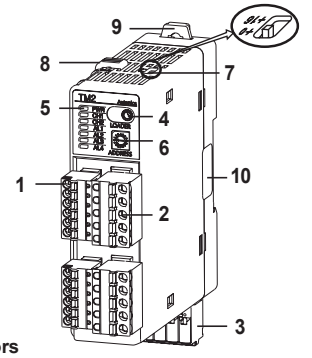
※1: In case of thermocouple K, J, E, T, N, it is below -100℃ and L, U, Platinel II, it is below ±2℃ ±1-digit.
In case of thermocouple B, display accuracy cannot be ensured under 400℃.
In case of thermocouple R, S, it is below 200℃ and C, G, it is max. 3℃ ±1-digit.
※2: Applied when it is for out of room temperature (23±5℃) range.
※3: The weight includes packaging. The weight in parentheses is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Dimensions

(unit: mm)



▣ Unit Description

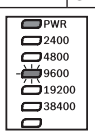


1. Sensor input connector
2. Control output connector
3. Power/Comm. terminal
[only for basic module (TM□-□2□B)]
Suppling power to basic/expansion modules and communicating with over 1 module(s).
4. PC loader port
It is the PC loader port for serial communication between one module and PC to set parameter and monitoring by DAQMaster. Use this for connecting SCM-US (USB to serial converter, sold separately).
※When using PC loader port (connecting SCM-US), communication via power/comm. terminal is blocked and monitoring is not available.

5. Indicators
●TM2 Series

Status / Indicator	Initial power ON※1	Control output	Alarm output				Auto-tuning※2
			N.O. (Normally Open)		N.C. (Normally Closed)		
			OFF (OPEN)	ON (CLOSE)	OFF (CLOSE)	ON (OPEN)	
PWR (green)※3	ON	ON	—	—	—	—	ON
CH1 (red)	Flash (2,400bps)	ON	—	—	—	—	Flash
CH2 (red)	Flash (4,800bps)	ON	—	—	—	—	Flash
AL1 (yellow)	Flash (9,600bps)	ON※4	OFF	ON	OFF	ON	OFF
AL2 (yellow)	Flash (19,200bps)	ON※5	OFF	ON	OFF	ON	OFF
AL3	Flash (38,400bps)	—	OFF	ON	OFF	ON	OFF
AL4	—	—	OFF	ON	OFF	ON	OFF

※1: When power is supplied initially, the set communication speed LED flashes for 5 sec.



●TM4 Series

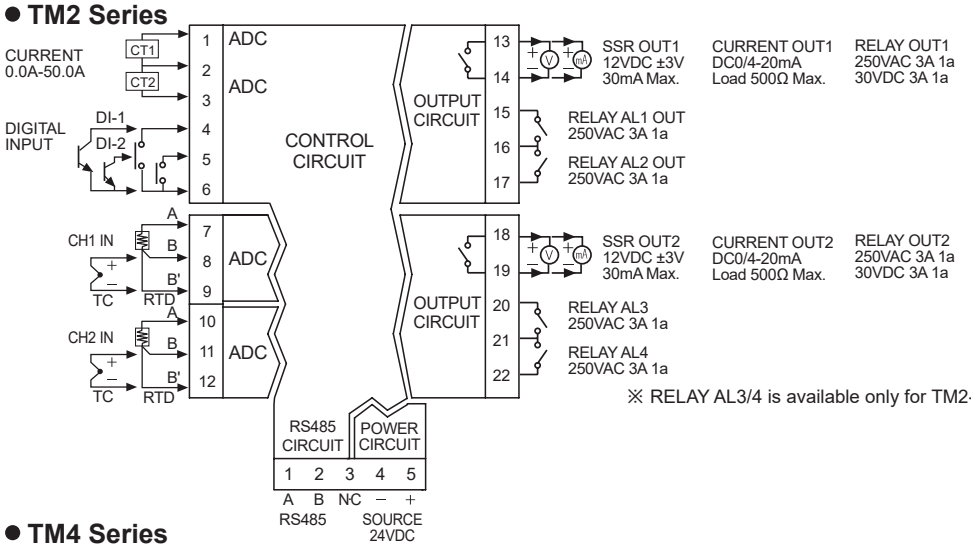
Status / Indicator	Initial power ON※1	Control output	Auto-tuning※2
PWR (green)※3	ON	ON	ON
CH1 (red)	Flash (2,400bps)	ON	Flash
CH2 (red)	Flash (4,800bps)	ON	Flash
CH3 (red)	Flash (9,600bps)	ON	Flash
CH4 (red)	Flash (19,200bps)	ON	Flash
	Flash (38,400bps)	—	—

※2: The auto-tuning CH LED flashes for 1 sec in turn.
※3: The PWR LED flashes during communication for 1 sec in turn.
※4: Turns ON when CH1 control method is heating & cooling control and cooling output occurs.
(disable AL1 setting)
※5: Turns ON when CH2 control method is heating & cooling control and cooling output occurs.
(disable AL2 setting)

6. Communication address setting switch (SW1): Set the communication address.
7. Communication address group switch (SW2): When setting the communication address over 16, select +16.
8. Lock switch: Used for fixing modules at top and bottom.
9. Rail Lock: Used for installing at DIN rail or using bolts.
10. END cover: Remove it when connecting each module to connect an expansion connector.

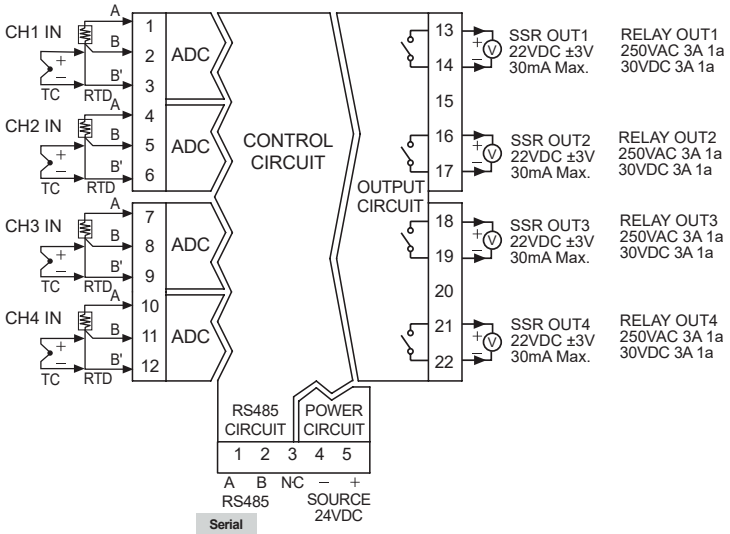
▣ Connections and Block Diagram

● TM2 Series

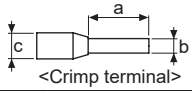


※ RELAY AL3/4 is available only for TM2-42 □□ model.

● TM4 Series

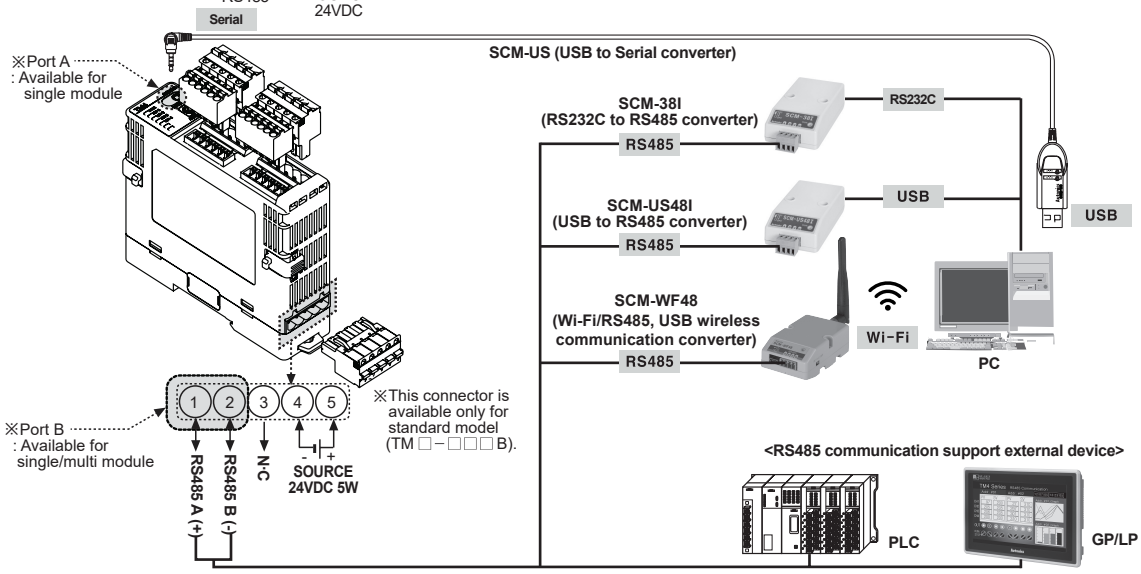


※Use crimp terminals of size specified below.



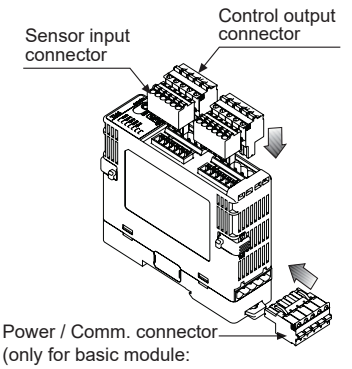
<Crimp terminal> (unit: mm)

Terminal number	a	b	c
1 to 12	10	Max. 1.7	Max. 3.7
13 to 22	10	Max. 2.1	Max. 4.2

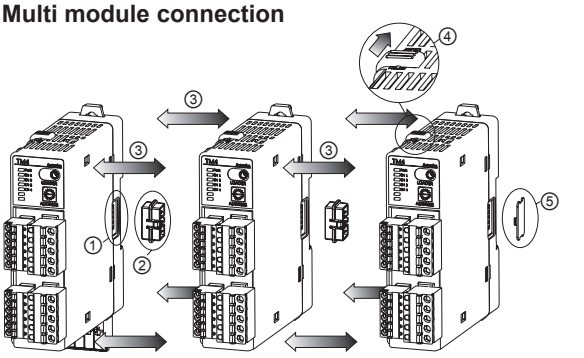


▣ Installation

● Connector connection



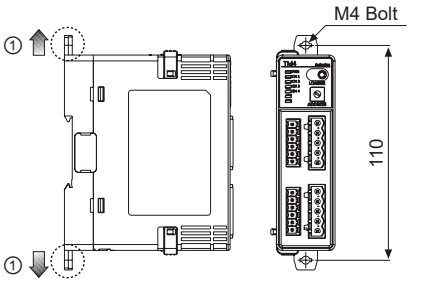
● Multi module connection



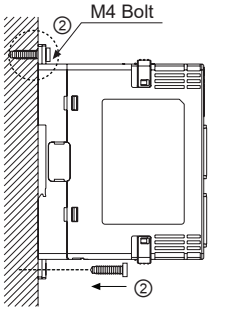
TM□-□2□B (basic module) **TM□-□2□E (expansion module)** **TM□-□2□E (expansion module)**

①Remove each module's END covers.
(do not remove at the ends of END covers)
②Connect expansion connectors between modules.
③Push each modules. (max. 30 units)
④Push the lock switch to lock direction.
※Supply adequate power for power input specifications and overall capacity.
(Max. power when connecting 31 modules:
31 units×5W=155W)

● Bolt inserting



① Pull each Rail Lock switch up and down.



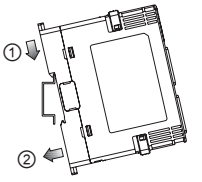
② Insert the bolts to fix.
(Tightening torque is 0.5N·m to 0.9N·m.)

● DIN rail Installation

[Installation method]

① Put the top edge of the rail Lock on the top edge or the DIN rail.

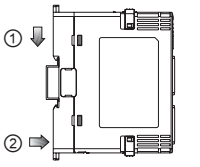
② Push the module body in while pressing down.



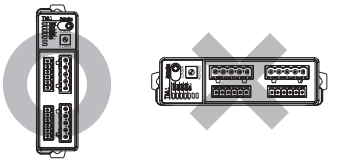
[Removal method]

① Press down the module body.

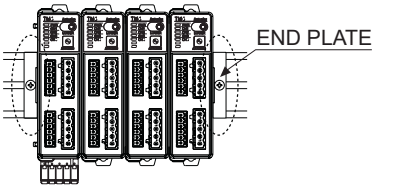
② Pull the module body forward.



※Install the units vertically.



※Use end plates (sold separately, not available from Autonics) to fix firmly.



■ Input Sensor Type and Temperature Range

Input sensor		No.	Dot	Display	Input range (℃)	Input range (℉)
Thermocouple	K(CA)	0	1	K(CA).H	-200 to 1350	-328 to 2462
		1	0.1	K(CA).L	-200.0 to 1350.0	-328.0 to 2462.0
	J(IC)	2	1	J(IC).H	-200 to 800	-328 to 1472
		3	0.1	J(IC).L	-200.0 to 800.0	-328.0 to 1472.0
	E(CR)	4	1	E(CR).H	-200 to 800	-328.0 to 1472
		5	0.1	E(CR).L	-200.0 to 800.0	-328.0 to 1472.0
	T(CC)	6	1	T(CC).H	-200 to 400	-328 to 752
		7	0.1	T(CC).L	-200.0 to 400.0	-328.0 to 752.0
	B(PR)	8	1	B(PR)	0 to 1800	32 to 3272
	R(PR)	9	1	R(PR)	0 to 1750	32 to 3182
	S(PR)	10	1	S(PR)	0 to 1750	32 to 3182
	N(NN)	11	1	N(NN)	-200 to 1300	-328 to 2372
	C(TT)※1	12	1	C(TT)	0 to 2300	32 to 4172
	G(TT)※2	13	1	G(TT)	0 to 2300	32 to 4172
	L(IC)	14	1	L(IC).H	-200 to 900	-328 to 1652
		15	0.1	L(IC).L	-200.0 to 900.0	-328.0 to 1652.0
	U(CC)	16	1	U(CC).H	-200 to 400	-328 to 752
		17	0.1	U(CC).L	-200.0 to 400.0	-328.0 to 752.0
	Platinel II	18	1	PLII	0 to 1400	32 to 2552
RTD	JPt 100Ω	19	1	JPt100.H	-200 to 600	-328 to 1112
		20	0.1	JPt100.L	-200.0 to 600.0	-328.0 to 1112.0
	DPt 100Ω	21	1	DPt100.H	-200 to 600	-328 to 1112
		22	0.1	DPt100.L	-200.0 to 600.0	-328.0 to 1112.0

※1: C(TT): Same as existing W5(TT).
※2: G(TT): Same as existing W(TT).
※Default: K(CA).H

■ Error Display

Status / Indicators	Disconnected input sensors	Out of temperature range
PWR (red)	ON	
CH□ (red)※1	Flash (for 0.5 sec in turn)	
Comm. output (decimal)	Outputs '31000'	Outputs '30000 (high-limit)', '-30000 (low-limit)'
DAQMaster	Displays 'OPEN'	Displays 'HHHH (high-limit)', 'LLLL (low-limit)'

※1: The applied CH LED indicator flashes.

▣ Communication Setting

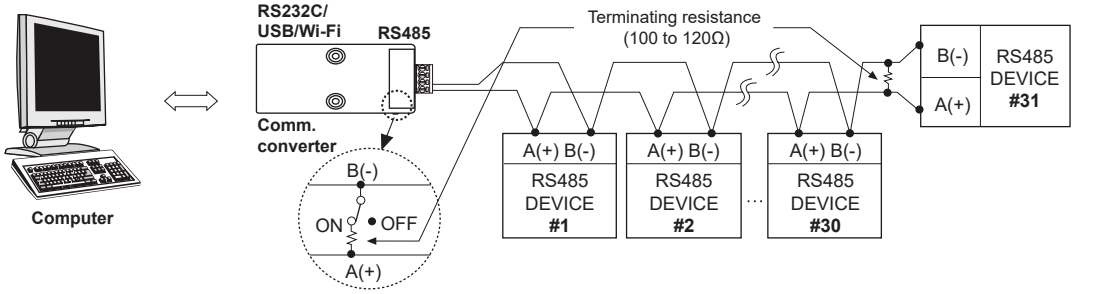
It is for parameter setting and monitoring via external devices (PC, PLC, etc.).

• **Interface**

Comm. protocol	Modbus RTU	Comm. distance	Max. 800m
Connection type	RS485	Comm. speed	2400, 4800, 9600 (default), 19200, 38400 bps
Application standard	Compliance with EIA RS485	Start bit	1-bit (fixed)
Max. connection	31 units (address: 01 to 31)	Data bit	8-bit (fixed)
Synchronous method	Asynchronous	Parity bit	None (default), Odd, Even
Comm. method	Two-wire half duplex	Stop bit	1-bit, 2-bit (default)

※It is not allowed to set overlapping communication address at the same communication line.
Use twisted pair wire for RS485 communication.

• **Application of system organization**



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately).
Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

• **Communication Address Setting**

Set the communication address by the communication address setting switch (SW1) and Communication address group switch (SW2).
When setting as 0, it does not operate communication.
(setting range: 01 to 31, factory default: [SW1] 1, [SW2] +0)

SW2 \ SW1	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
+0	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
+16	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

• **Caution for Communication Address Setting**

When changing communication address via the Power/Comm. terminal, resupply the power.

▣ Sold Separately

◎ Communication converter

• **SCM-WF48**
(Wi-Fi to RS485·USB wireless communication converter)

• **SCM-US48I**
(USB to RS485 converter)

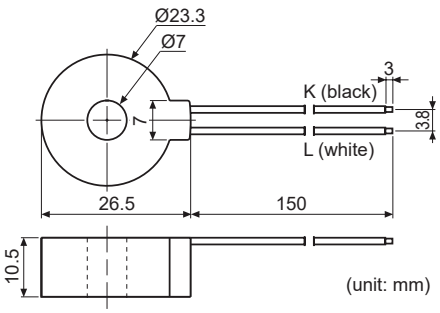
• **SCM-38I**
(RS232C to RS485 converter)

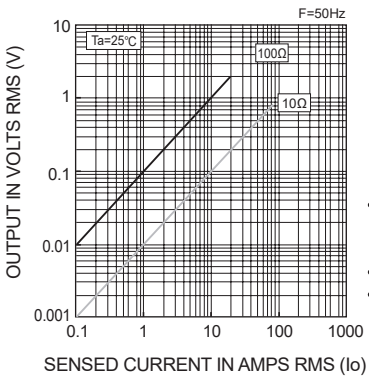
• **SCM-US**
(USB to Serial converter)

▣ Sold Separately

◎ Current transformer (CT)

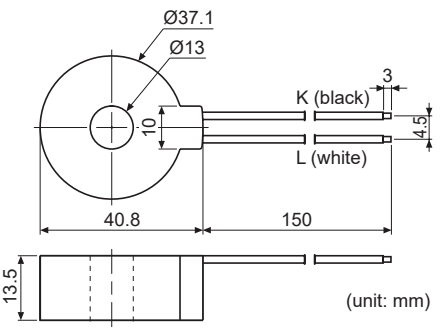
• CSTC-E80LN

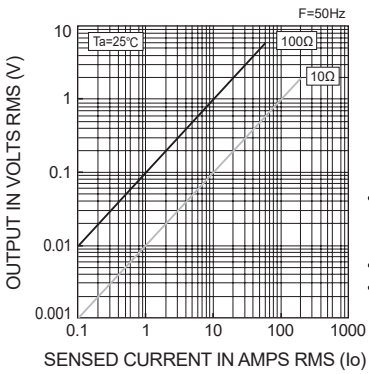




- Max. load current: 80A (50/60Hz)
  ※Max. load current for TM Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance: 31Ω±10%

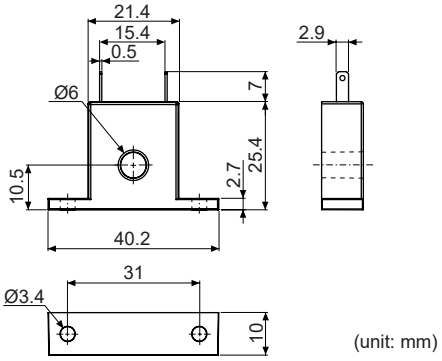
• CSTC-E200LN

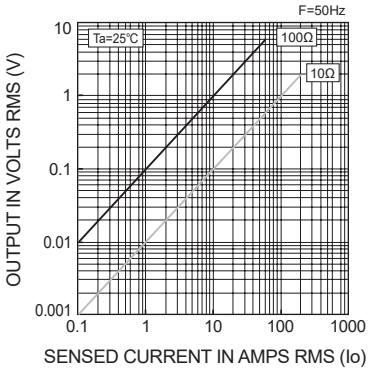




- Max. load current: 200A (50/60Hz)
  ※Max. load current for TM Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance: 20Ω±10%

• CSTS-E80PP





- Max. load current: 80A (50/60Hz)
  ※Max. load current for TM Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance 31Ω±10%

※Do not supply primary current in case that CT output is open. High voltage will be generated in CT output.
※The current for above CTs is 50A same but inner hole sizes are different. Please use this for your environment.

◎ Display units (DS/DA-T Series)

• DS/DA-T Series
(RS485 communication input type display unit) CE

DS16-□T

DS22/DA22-□T

DS40/DA40-□T

DS60/DA60-□T

※Connect RS485 communication input type display unit (DS/DA-T Series) and TM Series, the display unit displays present value of the device without PC/PLC.

▣ Proper Usage

◎ Simple failure diagnosis

- **LED indicators flash (for 0.5 sec in turn), or external device displays OPEN.**
  - Check input sensor setting.
  - Disconnect the power and check the input connection.
  - If input is connected, disconnect the input wiring from the temperature controller and short the + and - terminals. Power the temperature controller and check if the external device displays the room temperature. If it does not display the room temperature and continues to display HHHH or LLLL, the controller is broken. Please contact our technical support. (input type is thermocouple)
- **Output does not operate normally.**
  - Check that CH indicators for control output operates normally.
  - If CH indicators for control output does not operates, check the parameter settings.
  - If CH indicators for control output operates, remove the control output connector and check the output.
- **External device receives no-response or abnormal data.**
  - Check the communication converter (SCM-WF48 or SCM-US48I, SCM-38I, SCM-US, sold separately).
  - Do not install communication converter line and AC power supply lines.
  - Use different communication converter power and temperature controller power.
  - Indicates damage to internal chip by strong noise. Please contact our technical support. Locate the source of the noise device countermeasures.
- **Communication does not work between TM and external device**
  - Check the communication converter power and connections.
  - Check the communication settings.
  - Check the temperature controller and external device connections.

◎ Cautions during use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Do not apply excessive power when connecting or disconnecting the connectors of the product.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- When changing the input sensor, turn off the power first before changing.
  After changing the input sensor, modify the value of the corresponding parameter.
- 24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Do not overlapping communication line and power line. Use twisted pair wire for communication line and connect ferrite bead at each end of line to reduce the effect of external noise.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- Install DIN rail vertically from the ground.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

DIN W72×H36mm Simple operation type of Temperature controller

▣Features

- ●Simple and economical type
- ●ON/OFF and Proportional control
- ●Control output : Relay(250VAC 3A 1c or 250VAC 16A 1c)
- ●Input sensor : Thermocouple(J, K), RTD(Pt100Ω)
- ●Input correction function
- ●Finger protection type of terminal

⚠ **Please read "Caution for your safety" in operation manual before using.**

c UL us

▣Ordering information

TC	3	Y	T	–	B	4	R	3

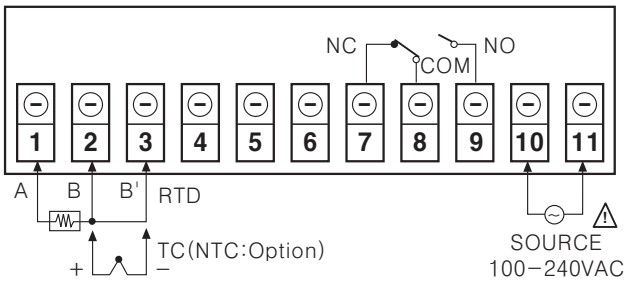
Relay output	3	250VAC 3A 1c
	16	250VAC 16A 1c
Control output	R	Relay output
Power supply	4	100–240VAC 50/60Hz
Control mode	B	ON/OFF and Proportional control(common use)
Setting type	T	Touch S/W single setting type
Size	Y	DIN W72×H36mm
Digit	3	3Digit
Item	TC	Temperature Controller

▣Specifications

Model		TC3YT-B4R3	TC3YT-B4R16
Power supply		100–240VAC 50/60Hz	
Allowable voltage range		90 ~ 110% of rated voltage	
Power consumption		4VA	
Display method		7 Segment LED Display(Red) [Deviation "■" signal(Green), unit display(Yellow)]	
Display accuracy		[PV ±0.5% or ±1℃ Max.] rdg ±1digit	
Sampling period		500ms	
Input type		(★1) • T.C(Thermocouples) : K(CA), J(IC) • RTD : Pt100Ω(DIN)	
Control method		ON/OFF and proportional control(common use)	
Control output		Relay output 250VAC 3A 1c	Relay output 250VAC 16A 1c
Hysteresis		1 ~ 100℃	
Proportional band		0 ~ 100%	
Offset correction		0 ~ 100%	
Control period		1 ~ 120sec	
Memory protection		Approx. 10 years(When using non-volatile semiconductor memory)	
Insulation resistance		Min. 100MΩ(at 500VDC)	
Dielectric strength		2000VAC 60Hz for 1 minute(between all external terminal and case)	
Noise strength		±2kV R-phase and S-phase(pulse width 1μs)	
Relay life cycle	Mechanical	Min.10,000,000 times	
	Malfunction	Min.10,000,000 times (250VAC 3A resistive load)	Min.10,000,000 times (250VAC 16A resistive load)
Vibration		0.75mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 1 hours	
Ambient temperature		-10 ~ 50℃(at non-freezing status)	
Storage temperature		-20 ~ 60℃(at non-freezing status)	
Ambient humidity		35 ~ 85%RH	
Protection		IP65	

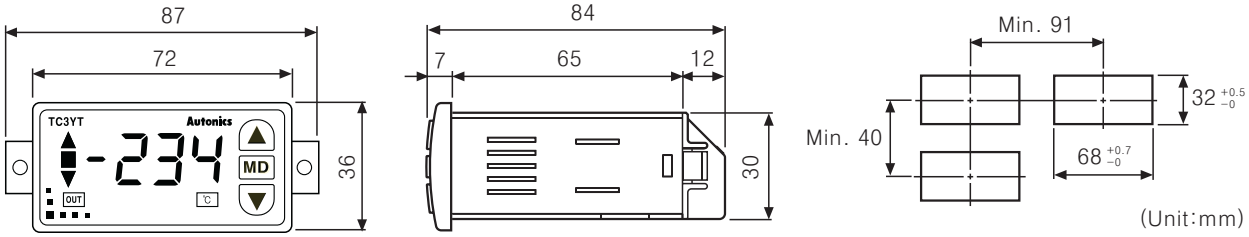
※(★1) NTC sensor input is optional.

▣Connections

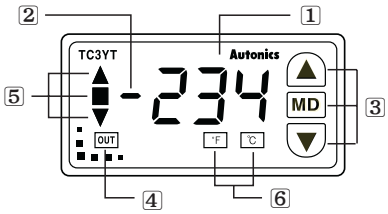


※TC3YT−B4R3 : 250VAC 3A
※TC3YT−B4R16 : 250VAC 16A

▣Dimensions



▣Front panel identification

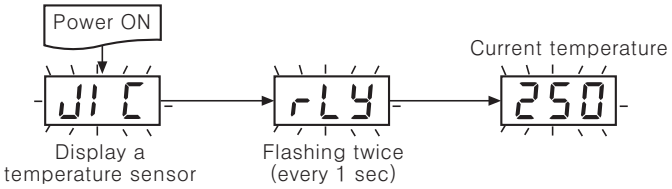


1 PV(Process value) display(Red)
2 Minus display(Red)
3 Controlling a set value(MD, UP, DOWN)
4 Display an operation of control output(Red)
5 Display a deviation between PV(Process value) and SV(Setting value) : ▲, ▼(Red) / ■(Green)
6 PV(Process value) ℃/°F unit display(Yellow)

▣How to set and change setting value

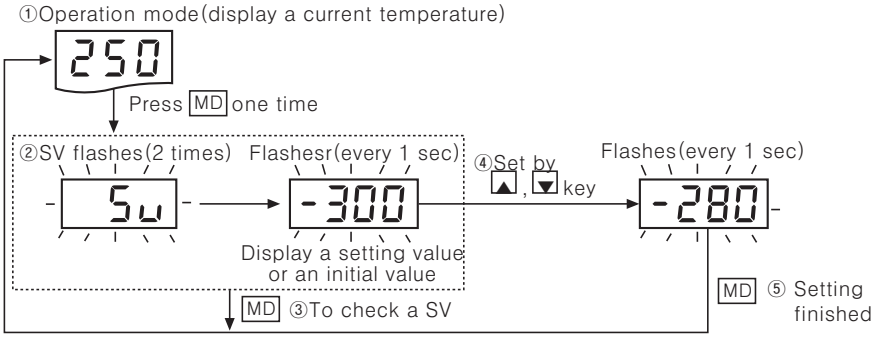
◎Display for power ON

When power ON, it displays current temperature after temperature sensor and the type of control output flash twice(every 1 sec). In case of error, Error signal flashes instead of current temperature.



◎Check and set a Setting Value

●Setting value can be checked and set on operation mode.
● Press MD key on operation mode.



①Process value is displayed on operation mode,
②Press MD key, the setting value is indicated after "Sv" is flashing 2 times.
③After check current value if press MD key, then it returned to the drive mode.
④To change setting value, use ▲, ▼ keys. If you press ▲, ▼ keys continuously, the setting value is increases/decreases fast.
⑤If press MD key after setting, the setting value is saved and the mode returns to operation.
※When there is no input for 1 min. for setting operation, it returns to operation mode and the setting value of parameter is not changed the prior value is saved.

Simple operation type of Temperature Controller

▣Input specification and range

Input		Input temperature range	
Sensor	Parameter	℃	℉
K	K	0 ~ 999	32 ~ 999
J	J	0 ~ 400	32 ~ 752
Pt H	Pt.H	0 ~ 400	32 ~ 752
Pt L	Pt.L	−99 ~ 199	−146 ~ 390

※A temperature sensor converts temperature into electrical signal so that a controller can do ON/OFF the control output.
※The setting is available~range : It is able to set in the temp. range shown above.
※The setting range~temperature range : If it exceeds the range, it does not count.
※Unit : It can be set as ℃ or ℉ and the unit is displayed.

▣Factory default

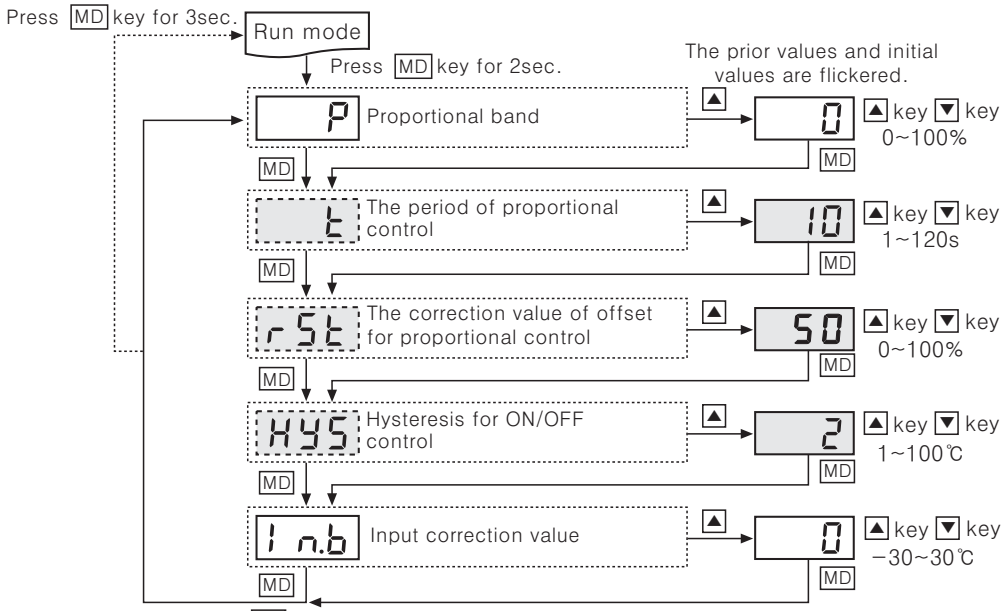
●Setting group 1

Parameter	Description	Setting range	Unit	Factory default
P	Proportional band	0 ~ 100	%	0
t	The period of proportional control	1 ~ 120	sec	10
rSt	The correction value of offset for proportional control	0 ~ 100	%	50
HYS	Hysteresis for ON/OFF control	2 ~ 100	℃	2
In.b	Input correction value	−30 ~ 30	℃	0

●Setting group 2

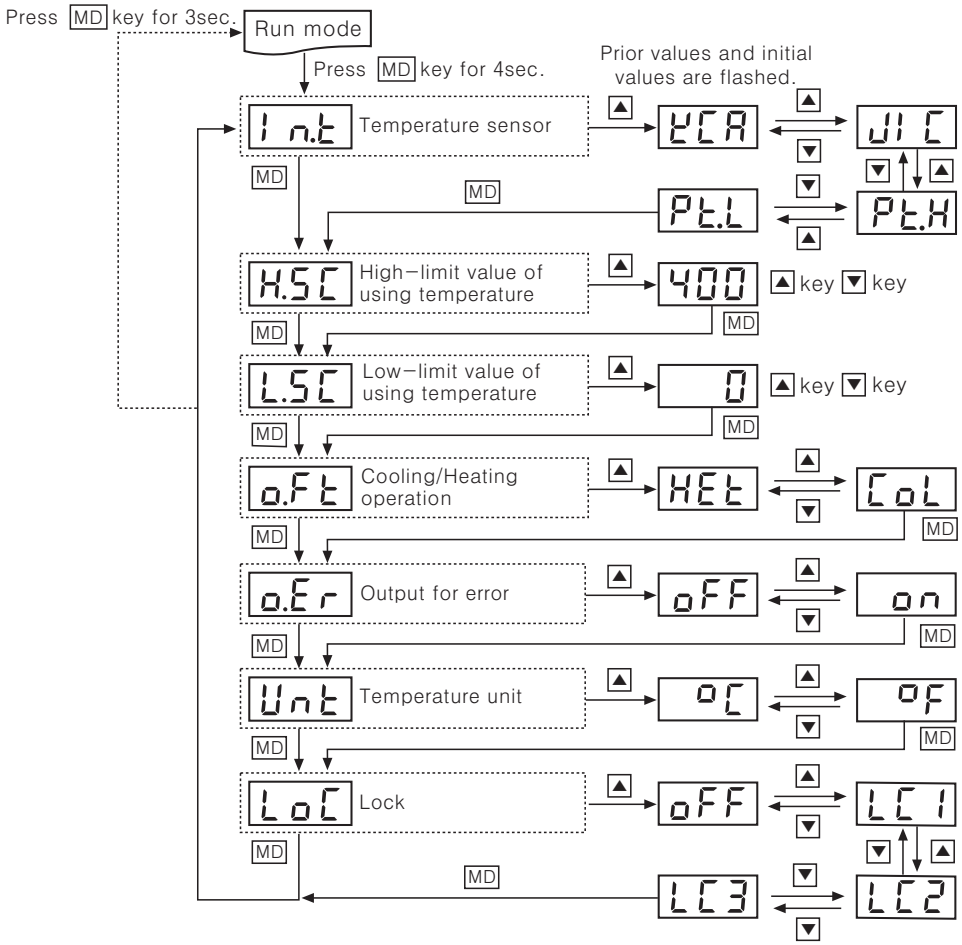
Parameter	Description	Setting range	Unit	Factory default
In.t	Temperature sensor	K, J, Pt.H, Pt.L	–	J
H.SC	High−limit value of using temperature	See "▣Input specifications and range"	℃	400
L.SC	Low−limit value of using temperature		℃	0
o.Ft	Cooling/Heating operation	HEt ↔ CoL	–	HEt
o.Er	Output for error	on ↔ oFF	–	oFF
Unt	Temperature unit	℃ ↔ ℉	–	℃
LoC	Lock	oFF, LC1, LC2, LC3	–	oFF

▣Flow chart for setting group 1



●In operation mode, if MD key is pressed for 2 sec., it enters into setting group 1.
Pressing MD key, the initial mode of setting group 1, P is displayed for 2~3sec after displaying Su and it enters into the initial mode of setting group 1 when releasing the MD key.
●Parameter of setting group 1 will be displayed.
●Pressing MD key, it moves to the next parameter and press ▲, ▼ key to change setting value.
●Press MD key in a changeable status or after changing the setting value, the changed value is saved and it moves to the next parameter.
●MD key is pressed for 3sec during the setting, the prior value is saved and it returns to the RUN mode.
●If there is no input for 1sec, it returns to RUN mode automatically and it holds the prior value.
●When P is not "0", [HYS] is not displayed.
●When P is "0", ON/OFF control, [t] and [rSt] are not displayed.
※When it is entered to the setting mode, applicable parameters will be displayed.

▣Flow chart for setting group 2



- In operation mode, if MD key is pressed for 4 sec., it enters setting group 2.
  Pressing MD key, the initial mode of setting group 1, P is displayed for 2~3sec after displaying Su and In.t, the initia mode of setting group 2 is displayed at 4sec and it enters into the initial mode of setting group 2 when releasing the MD key.(Set value is flickering every one sec.)
- Parameter of setting group 2 will be displayed.
- Pressing MD key, it moves to the next parameter and press ▲,▼key to change setting value.
- Press MD key in a changeable status or after changing the setting value, the changed value is saved and it moves to the next parameter.
- MD key is pressed for 3 sec during the setting, the prior value is saved and it returns to the RUN mode.
- If there is no input for 1 min, it returns to RUN mode automatically and it holds the prior value.

※When it is entered to the setting mode, applicable parameters are displayed.
※The unit LED is on after setting with MD key.

▣Function and operation

◎Input correction [In.b]

- It corrects deviation occurred from temperature sensor such as thermocouple, RTD etc.
- It is able to measure temperature precisely measuring and correcting the deviation.
- To use this function efficiently, the deviation occrring at the input sensor should be accurate to avoid additional variation.

◎Hysteresis [HYS]

- In ON/OFF control, hysteresis is required to avoid hunting such as chattering by external noise.
- In order to minimize regular hunting occurred by setting value of HYS, response of control object and sensor position, set it with proper HYS value, capacity of heater, sensor response and position etc.
- Setting range : 1 ~ 100℃(Factory default : 2℃)

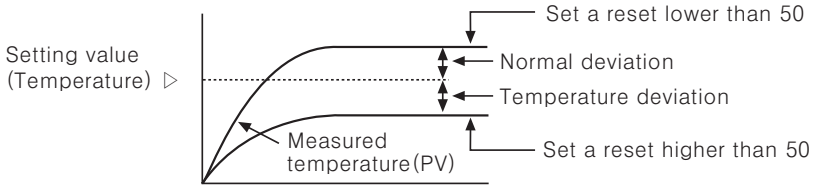
Simple operation type of Temperature Controller

◎Proportional band[P]
- ●It is the proportional control interval for setting value when controlling during proportional interval.
- ●Setting range : 0 ~ 100%(Factory default : 0%)

◎Control interval (Proportional control)[t]
- ●When output the control value by using relay and SSR on the proportional control, it repeats ON/OFF for set time.
- ●The time interval set previously is proportional control interval.
- ●Setting range : 1 ~ 120s(Factory default: 10s)

◎Setting range
- ●Hysteresis / proportional band / proportional interval is set on parameter
- ●Setting range of hysteresis [HYS] : 1 ~ 100℃
- ●Setting range of proportional band [P] : 0 ~ 100%
- ●Setting range of control interval [t] : 1 ~ 120sec
- ●ON/OFF control↔Proportional control conversion : When P is 0%, it is ON/OFF control and if any value is set, it is proportional control. The parameter of hysteresis [HYS] appears when [P], proportional band, is 0%.

◎Offset correction / Manual reset [rSt]
- ●When use the proportional control, even it is in a stable statue, deviation can occur because of heat and heater capacity, it is offset.
- ●Offset is set on the parameter of inner manual reset [rSt].
- ●Offset correction is used only for proportional control. (Not for [P]=0%). Therefore if proportional band [P] is set as 0%, manual reset parameter [rSt] is not displayed.
- ●Setting range : 0~100% (Factory default : 50%)
- ●Set a value as 50% when process value is equal to setting value. After control is stable, if measured temperature is lower than setting value, set value is over than 50%, otherwise lower than 50%.
- ●Controlling a manual reset[rSt] by control result



◎Control mode switch
- ●User can choose ON/OFF and proportional control.
- ●**ON/OFF control** – Proportional control conversion:
  When P is 0%, it is ON/OFF control and if there is a value for P, is proportional control.
- ●Factory default : ON/OFF control(P : 0%)

◎The conversion of temperature unit(℃ / ℉)[Unt]
- ●By choosing °C or °F on temperature unit in setting parameter, [Unt] conversion is available.
- ●After choosing a temperature unit, LED is ON.
- ●Factory default : °C

◎Cooling / Heating operation
- ●Generally there are two ways to control temperature, one(heat–function) is to heat when process value is getting down(heater). The other(cool–function) is to cool when process is getting high refrigerator).
- ●Setting range: HEt(Heat) / CoI(Cool) (factory default : HEt)

◎Display a process value deviation
- ●It displays the deviation between the process value and the setting value.
- ●When the process value is higher than the setting value(Process value > Setting value+2℃), △ is lighted.
- ●When the process value is lower than the setting value(Process value < Setting value–2℃), ▽ is lighted.
- ●When the deviation of the process value is within ±2℃, □ is lighted.

◎High/low limit setting for using temperature
- ●Set a high/low limit of temperature and the set range is within using range.
- ●If setting a high–limit of temperature on [H.SC], it is a high–limit setting value.
- ●If setting a low–limit of temperature on [L.SC], it is a low–limit setting value.
- ●L.SC ≤ Setting value ≤ H.SC. In case of L.SC= Setting value = H.SC, the output is OFF.
- ●If change L.SC and H.SC, the using range and proportional band also are changed.

◎Error display

●If Error occurs during the operation, error signal flickers every one sec.

Display	Description
oPn	When the input sensor is not connected or its wire is cut. (Normal operation after connecting a sensor)
LLL	When the measured input temperature is lower than input range of the sensor.
HHH	When the measured input temperature is higher than input range of the sensor.

●When error [oPn] / [LLL] / [HHH] occur
When it is returned to the connection / using range, it operates normally.

●The priority of 'Error' display : oPn → HHH, LLL

◎Output setting for error[o.Er]

For error, the statue of output is set by [o.Er] of setting group 2.

●For setting OFF: Output is always OFF for error.

●For setting ON: Output is always ON for error.

●Factory default : OFF

◎Lock setting[LoC]

●This function limits the change of parameters on each setting group.
It can be set setting group 2.

●For setting[LC1], changing the parameter, "Setting group 2", is not available.

●For setting[LC2], changing the parameter, "Setting group 1 + Setting group 2", is not available.

● For setting[LC3], changing the parameter, "Setting group 1 + Setting group 2 + SV setting parameter", is not available.

●For setting [oFF], Lock off for all setting group

▣Proper usage

1. Installation environment
   ①It shall be used indoor. ③Pollution Degree 2.
   ②Altitude Max. 2000m. ④Installation CategoryⅡ.
2. Please install power switch or circuit−breaker in order to supply or cut the power.
3. The switch or circuit−breaker should be installed near by users.
4. Do not use this product as Volt−meter or Ampere−meter.
5. Please seperate with power/high−voltage line avoid from inductive noise.
6. In case of using RTD sensor, 3wire type must be used. and if it is required to extend the line, 3wires must be used with the same thickness as the line. It might cause the deviation of temperature.
7. In case of making power line and input signal line closely, line filter for noise protection should be installed at power line and input signal line should be shielded.
8. Do not use in a place with the high frequency machinery. (High frequency welding machine & sewing machine, large capacity SCR controller)

Refrigeration Temperature Controller

▣ Features

- Standard installation size for refrigeration and air-cooling panels (W70.3×H28.2mm)
- Various compressor load current capacity: 5A, 16A, 20A
- Various user-friendly functions:
  - Defrost sync function:
    simultaneous defrost operation of multiple controllers (up to 6 units)
  - RTC (Real Time Clock) function:
    night mode operation and real-time defrost control
  - Built-in alarm function
- Remote monitoring of real-time temperature and output control (using TFD series remote display unit, sold separately)
- Communication output models available: RS485 (Modbus RTU)
- Parameter configuration via PC (RS485 communication)
  - DAQMaster software included (comprehensive device management software)
- IP65 protection structure (IEC standard): front panel only

Please read "Safety Considerations" in the instruction manual before using.

▣ Manual

- Visit our website (www.autonics.com) to download user manual and communication manual.
- User manual describes for specifications and function, and communication manual describes for RS485 communication (Modbus RTU protocol) and parameter address map data.

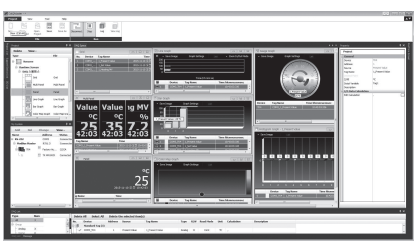
▣ Comprehensive Device Management Program (DAQMaster)

- DAQMaster is comprehensive device management program. It is available for parameter setting, monitoring, and user parameter group setting, parameter mask setting for only TF3 Series.
- Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operating system	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB or more
Hard disk	More than 1GB of free hard disk space
VGA	1024×768 or higher resolution display
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



▣ Ordering Information

TF 3 3 – 3 4 H – T

Option function※2	No-mark		No option
	S		Synchronize defrost
	T		RS485 communication
	R※3		RTC (real time clock)
	A※3		RS485 communication+RTC (real time clock)
Compressor load capacity	G※1		Compressor 20A 1a contact
	A		Compressor 5A 1a contact
	H		Compressor 16A 1c contact
Power supply	1		24VAC 50/60Hz, 12-24VDC
	4		100-240VAC 50/60Hz
Output	1CH	1	Compressor output
	1CH, 3CH	2	Compressor+Defrost or Auxiliary (alarm/evaporator-fan) output
		3	Compressor+Defrost+Auxiliary (alarm/evaporator-fan) output
Number of input channels	1		1CH input (NTC or RTD) [temperature+digital input (DI)]
	3		3CH input (NTC) [inlet temperature+defrost temperature+ outlet temperature or digital input (DI)]
Digits	3		999 (3-digit)
Item	TF		Refrigeration Temperature Controller

※1: Only for 1CH input, compressor output model (TF31-1□G).
※2: Only for 3CH input model (TF33-□□□-□). Option function is varied by compressor load capacity and contact.

Compressor load capacity & contact \ Option function	Synchronize defrost function	RS485 communication	RTC function	RS485 communication+ RTC function	No option
Compressor 5A 1a contact	● (TF33-□□A-S)	● (TF33-□□A-T)	—	● (TF33-3□A-A)	—
Compressor 16A 1c contact	—	—	● (TF33-3□H-R)	—	● (TF33-□□H)

※3: Except compressor+defrost or auxiliary (alarm/evaporator-fan) output model (TF33-2□□-□)
※Only for 3CH input, compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF33-3□□-□) supports buzzer.

▣ Remote Display Unit (TFD Series, Sold Separately)

Remote display unit (TFD) displays current temperature or output status of TF3 at remote place.
TFD cable is TFD-3: 3m, TFD-5: 5m.
Connect the phone-jack of remote display unit (TFD) to the data loader port of TF3.
This unit is dedicated for TF3 Series and it does not directly communicate with upper devices (PC, PLC, etc.)
If TFD communication with TF3 error occurs, TFD flashes display component for 1 sec. Check the connection with TF3.

※When connecting TFD to the data loader port of TF3, you cannot connect Autonics SCM-US (USB to Serial converter, sold separately). for communication. Use SCM-US48I(USB to RS485 converter, sold separately), SCM-38I(RS232C to RS485 converter, sold separately).

▣ Specifications

◎ TF3 Series

Model			TF31-□□□	TF33-□□□-□
Number of channels			1CH	3CH
Power supply	AC power		100-240VAC⎓ 50/60Hz	
	AC/DC power		24VAC⎓ 50/60Hz, 12-24VDC⎓	
Allowable voltage range			90 to 110% of rated voltage	
Power consumption	AC power		Max. 8VA (100-240VAC⎓ 50/60Hz)	
	AC/DC power		Max. 5VA (24VAC⎓ 50/60Hz), Max. 3W (12-24VDC⎓)	
Display method			7 Segment LED method (red)	
Character size (W×H)			9.4×19.3mm	
Input type	NTC		5kΩ/10kΩ	
	RTD		DPt100Ω	—
Sampling period			500ms	
Display accuracy			・At room temp. (23℃±5℃): ±1℃±1 digit ・Out of room temp. range: ±2℃±1 digit	
Control output	Compressor (COMP)		250VAC⎓ 5A , 30VDC⎓ 5A, 1a / 250VAC⎓ 16A, 24VDC⎓ 16A, 1c / 250VAC⎓ 20A 1a	
	Defrost (DEF)		250VAC⎓ 10A, 24VDC⎓ 10A, 1a	
	Auxiliary (AUX)		250VAC⎓ 5A, 30VDC⎓ 5A, 1a	
Communication output			—	RS485 communication output (Modbus RTU)
Digital input			Contact input: ON max. 1kΩ, OFF min. 100kΩ No contact input: ON residual voltage: max. 1V, OFF leakage current: max. 1mA, outflow current: 4μA	
Control method			ON/OFF control	
Hysteresis			0.5 to 5.0℃, 2 to 10℉ variable	
Relay life cycle	Compressor (COMP)	5A 1a	Mechanical: 5,000,000 operations, Electrical: 50,000 operations (250VAC 5A)	
		16A 1c	Mechanical: 20,000,000 operations, Electrical: 30,000 operations (250VAC 16A)	
		20A 1a	Mechanical: 10,000,000 operations, Electrical: 100,000 operations (250VAC 20A)	
	Defrost (DEF)		Mechanical: 20,000,000 operations, Electrical: 100,000 operations (250VAC 10A)	
	Auxiliary (AUX)		Mechanical: 5,000,000 operations, Electrical: 50,000 operations (250VAC 5A)	
Memory retention			Approx. 10 years (non-volatile memory method)	
Insulation resistance			Min. 100MΩ (at 500VDC megger)	
Dielectric strength	AC power		3000VAC 50/60Hz for 1 min (between all terminals and case, power and input circuit)	
	AC/DC power		1000VAC 50/60Hz for 1 min (between all terminals and case, power and input circuit)	
Noise resistance			Square-wave noise by the noise simulator (pulse width: 1μs) ±2kV R-phase and S-phase	
Vibration			1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Environment	Ambient temperature		-10 to 50℃, storage: -20 to 60℃	
	Ambient humidity		35 to 85%RH, storage: 35 to 85%RH	
Accessories			Bracket: 2, NTC sensor (5kΩ): 1	
Protection structure			IP65 (front case)	
Approval			CE cULus LISTED KC	
Weight※1			Approx. 207g (approx. 105g)	

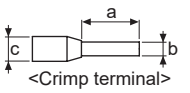
◎ Remote display unit [TFD]

Model		**TFD-3**	**TFD-5**
Power supply		3.3VDC⎓	
Power consumption		Max. 1W	
Display method		7 Segment LED method (red)	
Communication method		Serial (TTL Level), Half duplex	
Communication cycle		100ms	
Cable		Ø2.5mm, 3m	Ø2.5mm, 5m
Vibration		1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Enviornment	Ambient temp.	-10 to 50℃, storage: -20 to 60℃	
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH	
Protection structure		IP67	
Approval		CE KC	
Weight※1		Approx. 77g (approx. 48g)	

※1: The weight includes packaging. The weight in parentheses is for unit only.
The weight is varied by model option.
※Environment resistance is rated at no freezing or condensation.

▣ Connections

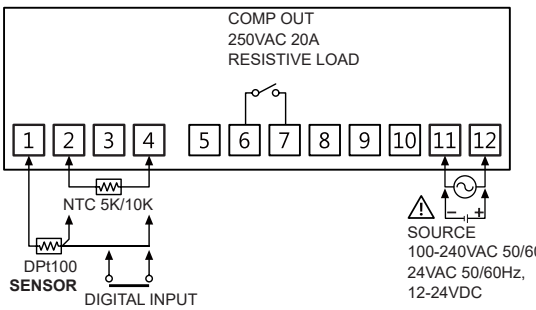
※Use crimp terminals of size specified below.



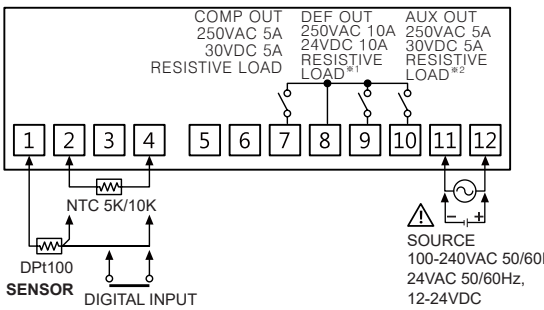
<Crimp terminal>

Terminal number		a	b	c
General	1 to 4	4 to 6mm	Max. 1.7mm	Max. 3.7mm
TF3□-□ □H	5 to 10	6 to 8mm	Max. 2.3mm	Max. 4.5mm
TF3□-□ □A	5 to 6	6mm	Max. 1.9mm	Max. 4.0mm
	7 to 10	6 to 8mm	Max. 2.3mm	Max. 4.5mm
TF3□-□ □G	6 to 7	6 to 8mm	Max. 2.3mm	Max. 4.5mm
General	11 to 12	6mm	Max. 1.9mm	Max. 4.0mm

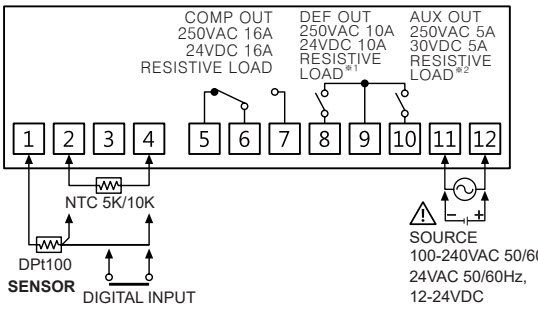
● **TF31-1□G**



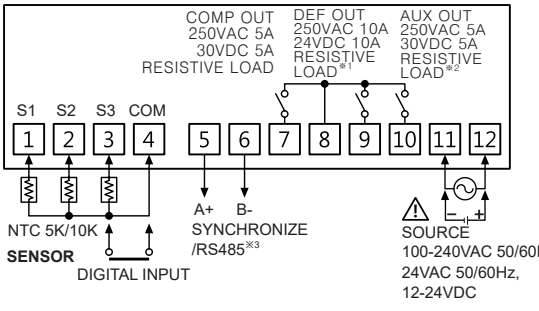
● **TF31-□□A**



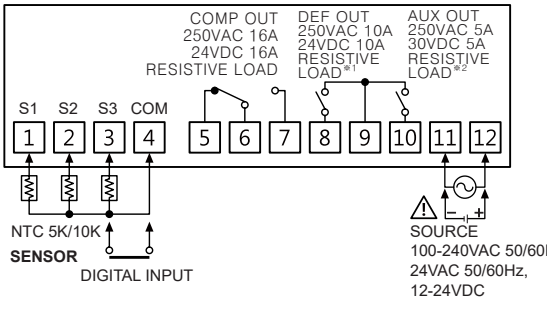
● **TF31-□□H**



● **TF33-□□A-□**



● **TF33-□□H-□**

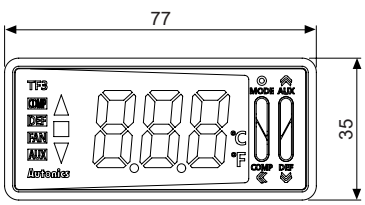


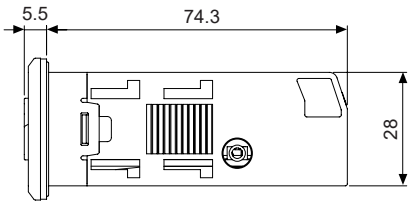
※1: Only for compressor+defrost or auxiliary (alarm/evaporator-fan) output model (TF3□-2□□-□), compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF3□-3□□-□).
※2: Only for compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF3□-3□□-□).
※3: Only for synchronize defrost function model (TF33-□□A-S), or RS485 communication model (TF33-□□A-T/A).

▣ Dimensions

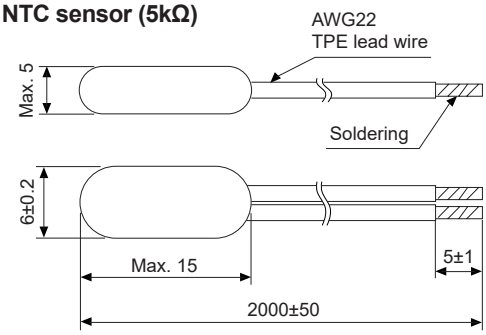
(unit: mm)

◎ TF3 Series

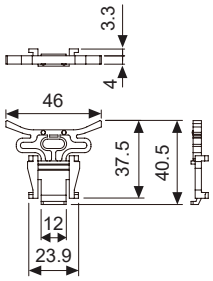




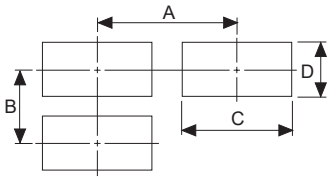
● **NTC sensor (5kΩ)**



● **Bracket**



● **Panel cut-out**



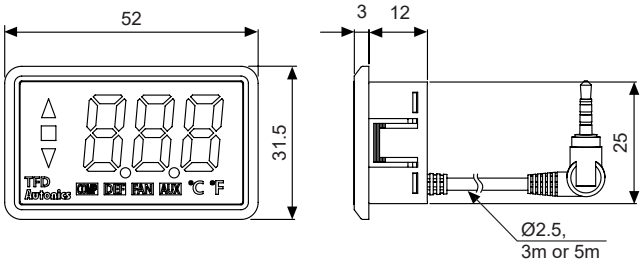
(unit: mm)

Series \ Size	A	B	C	D
TF3	Min. 100 ※1	Min. 55	$70.3^{+0.7}_{0}$	$28.2^{+0.5}_{0}$
TFD	Min. 65	Min. 40	$45.7^{+0.6}_{0}$	$25.4^{+0.3}_{0}$

※1. When connecting remote display unit (TFD), or SCM-US, Min. 120

▣ Sold Separately

◎ TFD



◎ Communication converter

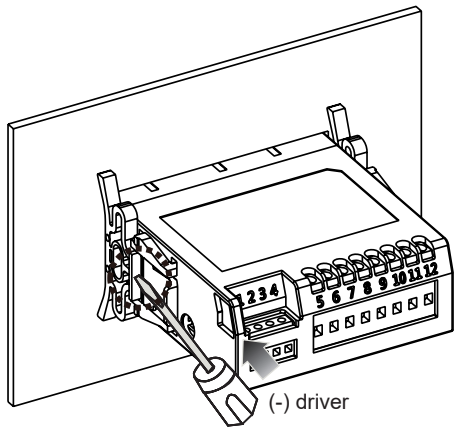
● **SCM-WF48**
(Wi-Fi to RS485·USB wireless communication converter)

● **SCM-US48I**
(USB to RS485 converter)

● **SCM-38I**
(RS232C to RS485 converter)

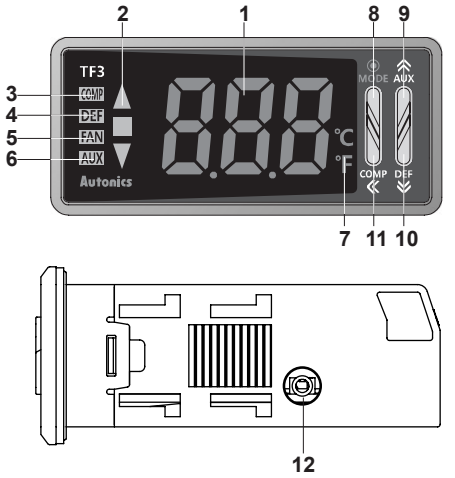
● **SCM-US**
(USB to Serial converter)

▣ Product Mounting



Insert the unit into a panel, fasten the bracket by pushing with tools with a (-) driver.

▣ Unit Description



1. Present value (PV) display component (red):
- RUN mode: Displays present value (PV).
- Setting mode: Displays parameter and setting value.

2. Deviation indicator (■: green, ▼/▲: red):
Displays deviation of present value (PV) based on setting value (SV).

PV deviation temperature	Deviation display
More than 1.8℃	▲ indicator turns ON
Within ±1.8℃	■ indicator turns ON
Less than -1.8℃	▼ indicator turns ON

3. Compressor (COMP) output indicator (green):
Turns ON for compressor output. In case of compressor protection operation and output does not turn ON, it flashes. When operating compressor continuously, it turns ON for 2 sec, and turns OFF for 1 sec.

4. Defrost (DEF) output indicator (green):
Turns ON for defrost output. Flashes for defrost delay operation.
Turns ON for 2 sec and OFF for 1 sec for manual defrost or Power ON defrost.

5. Evaporator-fan (FAN) output indicator (green):
Turns ON for evaporator-fan output. Flashes for delay operation of evaporator-fan output.

6. Auxiliary (AUX) output indicator (green): Turns ON for alarm output. Flashes for delay operation of alarm output.

7. Unit indicator (red): Displays temperature unit set at temperature unit [Unit] of parameter 1 group.

8. ◎ (MODE) key: Used for entering parameter setting group, returning RUN mode, moving parameter or saving SV.

9. ▲ (AUX) key:
Used for entering SV setting group or changing setting value.
Hold the key over 3 sec to select active/inactive auxiliary output in RUN mode.

10. ▼ (DEF) key:
Used for entering SV setting group or changing setting value.
Hold the key over 3 sec to execute/stop manual defrost in RUN mode.

11. ◀ (COMP) key:
Used for entering SV setting group, changing setting value, moving digits.
Hold the key over 3 sec to active/inactive compressor output in RUN mode.
When buzzer alarm occurs, press the key once to stop the sound. (Only for 3CH input, compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF33-3□□-□) supports buzzer.
Buzzer [buZ] of parameter 1 group is set as [on])

12. Data loader port:
It is for displaying TF3 data at remote display unit (TFD) by connecting phone-jack.
In other case, for connecting Autonics SCM-US (USB/Serial converter, sold separately), it is a PC loader port of serial communication for parameter setting or monitoring by PC.

■ Front Panel Display When Power Is On

When power supplies to the unit, whole display part flashes approx. 1 sec. The display part displays model specification (no. of input CHs, output, power supply, compressor load capacity, option function), flashes input type twice and the unit returns to RUN mode to operate.
Model specification display is same as the unit model name. (E.g.: TF33-34A-A model)

1. Whole display part

2. Series

3. No. of input CHs/Output/Power supply

4. Compressor load capacity/ Option function

5. Run mode

Sensor input error

Normal operation

■ SV Setting

You can set the temperature to control with the ≪, ≫, ≪ keys.
Set range is within SV low-limit value [LSL] to SV high-limit value [HSL].

E.g.) In case of changing SV from 19℃ to 10℃

1

Press any key among the ≪, ≫, ≪ in RUN mode to enter into SV setting mode. Last digit (10^0 digit) on SV display part flashes.

2

Press the ≪ key to move digit.
($10^0 \rightarrow 10^1 \rightarrow 10^2 \rightarrow 10^3 \rightarrow 10^0$)

3

Press the ≫, ≪ key to raise or lower the set value. (9 → 0)

4

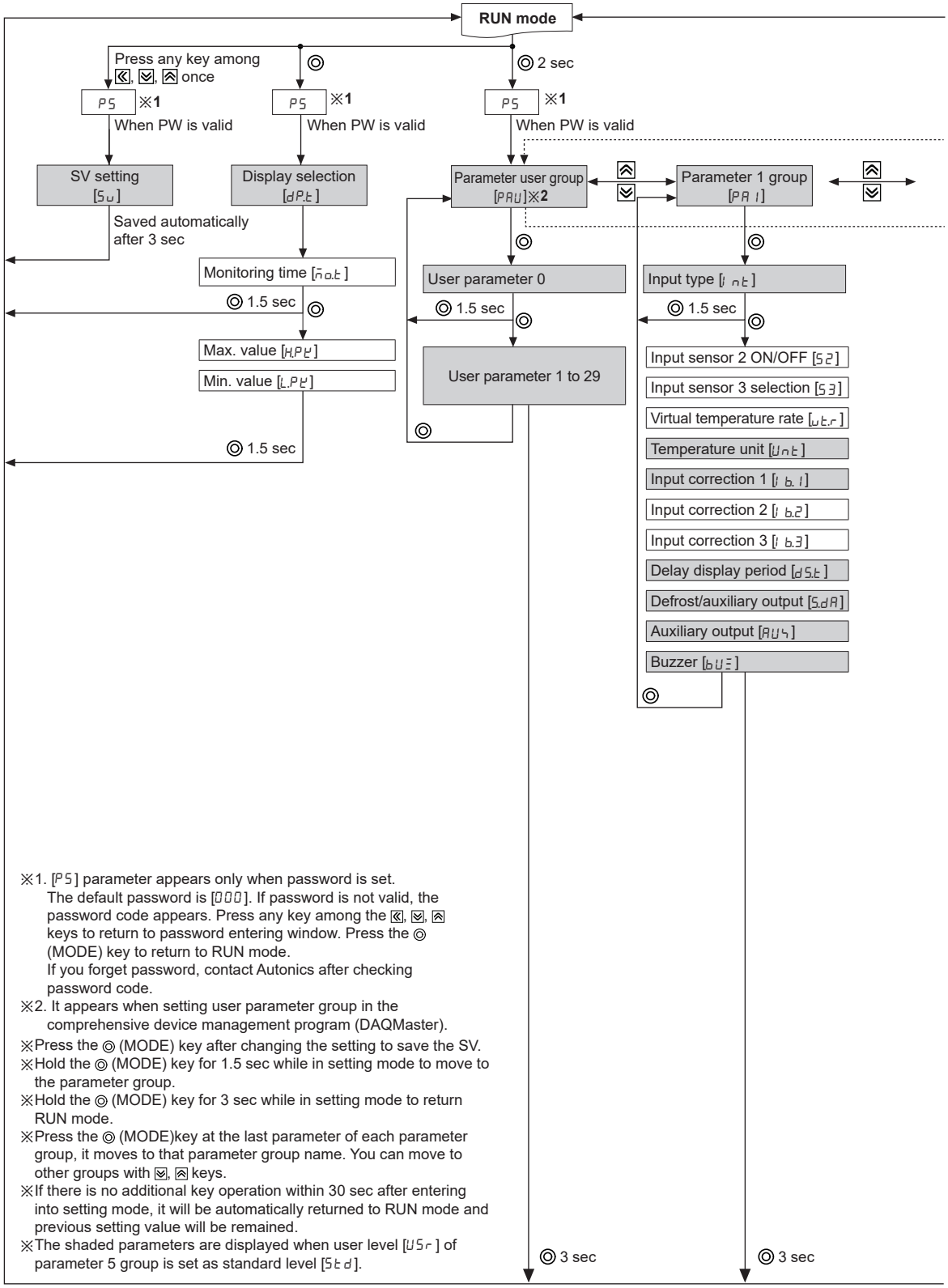
Press the ◎ (MODE) key to save the set value.
(If there is no additional key operations in 3 sec, the changed SV is automatically saved.)

■ Input Type and Range

Input type		Decimal point	Display method	Temperature range (℃)	Temperature range (℉)
Thermistor (NTC)	NTC 5kΩ	1	n5.H	-40 to 99	-40 to 212
		0.1	n5.L	-40 to -20 -19.9 to 99.9	-40 to -20 -19.9 to 99.9 100 to 212
	NTC 10kΩ	1	n 1.H	-40 to 99	-40 to 212
		0.1	n 1.L	-40 to -20 -19.9 to 99.9	-40 to -20 -19.9 to 99.9 100 to 212
RTD※1	DPt 100Ω	1	dP.H	-99 to 99	-148 to 212
		0.1	dP.L	-99 to -20 -19.9 to 99.9※2	-148 to 212

※TF3 Series displays only 3 digits. If PV decimal number of shaded temperature range is out of 3 digit, TF3 does not display the numbers below decimal point. You can check it at the comprehensive device management program (DAQMaster) by communicating via PC.
※1: Only for 1CH input model (TF31-□□□).
※2: If PV with "-" sign is over 3 digits (e.g.: -99.9), the numbers below decimal point does not display. You can check it at the comprehensive device management program (DAQMaster) by communicating via PC.

▣ Parameter Group



※1. [PS] parameter appears only when password is set.
The default password is [000]. If password is not valid, the password code appears. Press any key among the ◁, ▽, △ keys to return to password entering window. Press the ◎ (MODE) key to return to RUN mode.
If you forget password, contact Autonics after checking password code.

※2. It appears when setting user parameter group in the comprehensive device management program (DAQMaster).

※Press the ◎ (MODE) key after changing the setting to save the SV.

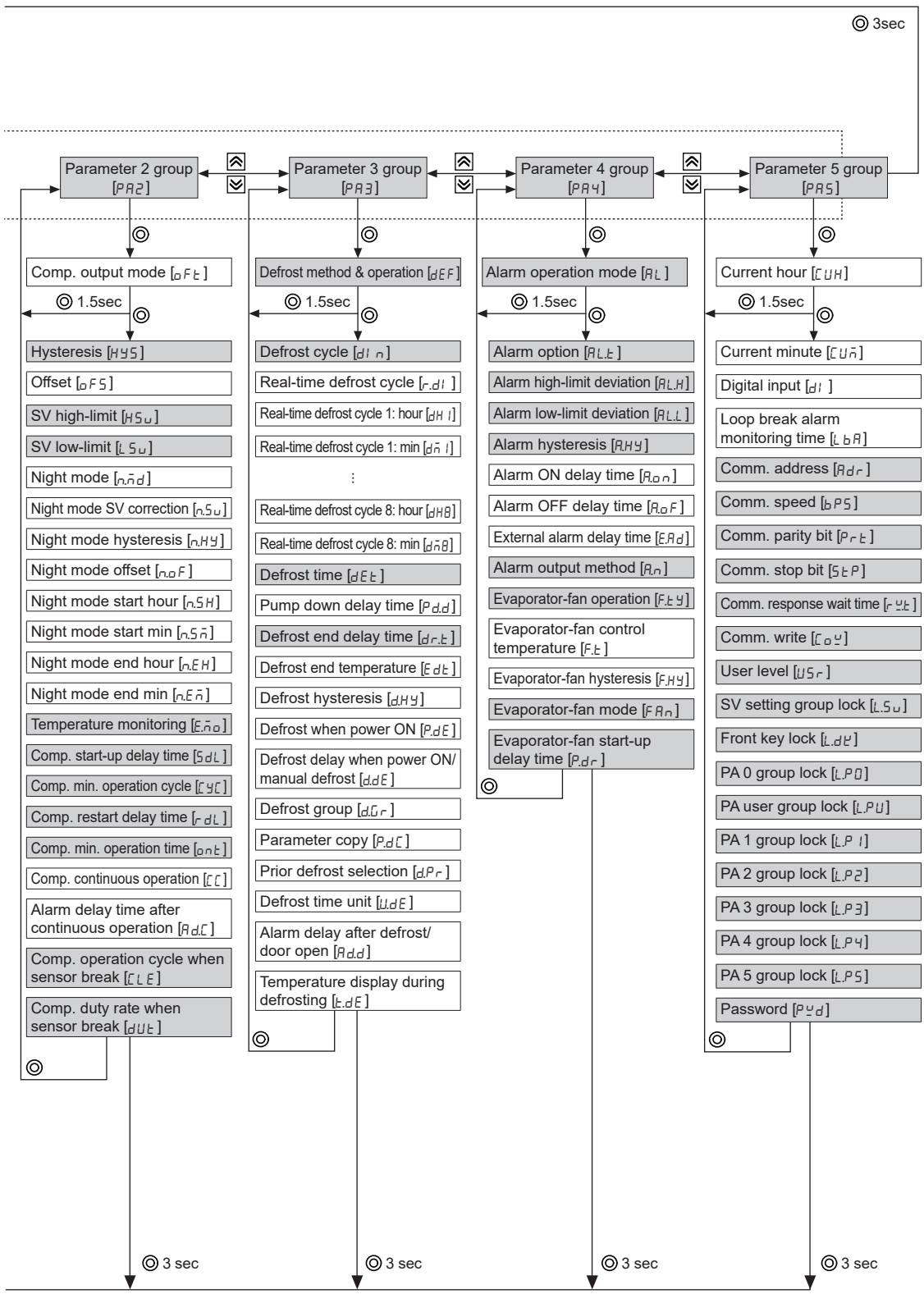
※Hold the ◎ (MODE) key for 1.5 sec while in setting mode to move to the parameter group.

※Hold the ◎ (MODE) key for 3 sec while in setting mode to return RUN mode.

※Press the ◎ (MODE)key at the last parameter of each parameter group, it moves to that parameter group name. You can move to other groups with ▽, △ keys.

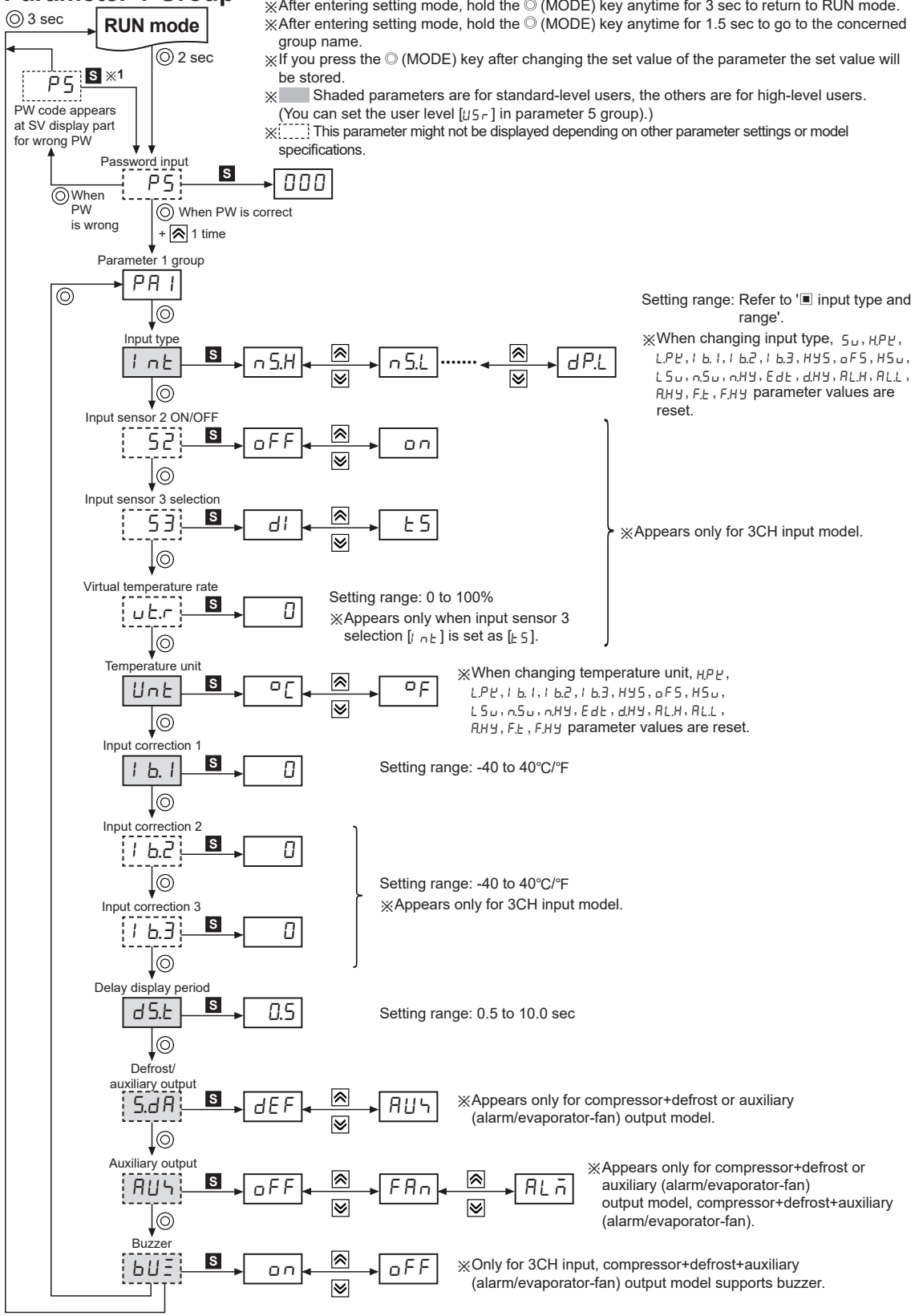
※If there is no additional key operation within 30 sec after entering into setting mode, it will be automatically returned to RUN mode and previous setting value will be remained.

※The shaded parameters are displayed when user level [USr] of parameter 5 group is set as standard level [Std].

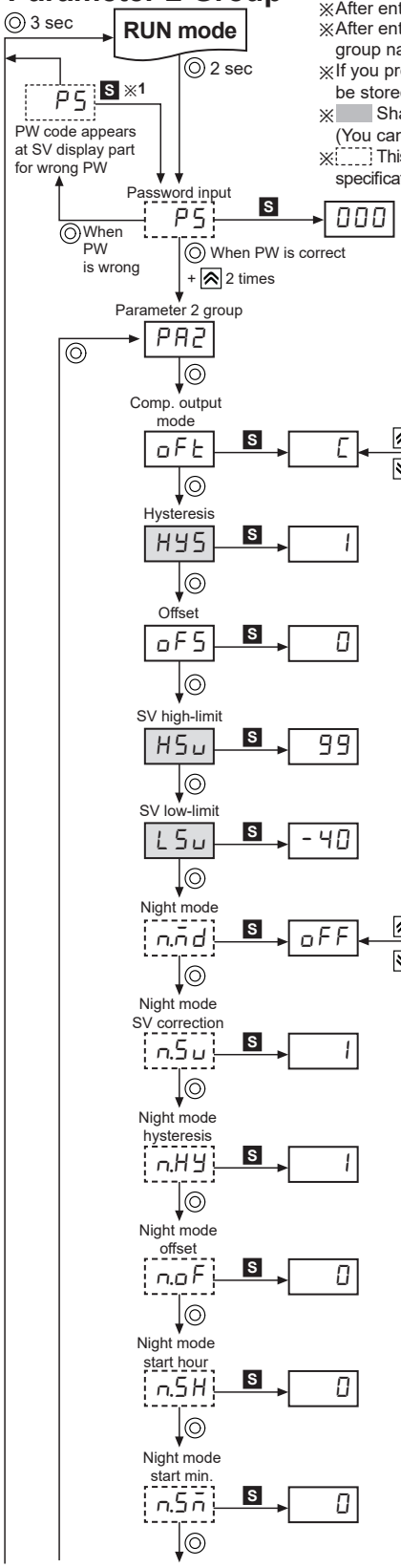

3sec
Parameter 2 group [PA2]
Parameter 3 group [PA3]
Parameter 4 group [PA4]
Parameter 5 group [PA5]
Comp. output mode [oFt]
Defrost method & operation [dEF]
Alarm operation mode [AL]
Current hour [CUH]
1.5sec
Hysteresis [HYS]
Offset [oFS]
SV high-limit [HSu]
SV low-limit [LSu]
Night mode [n.nd]
Night mode SV correction [n.Su]
Night mode hysteresis [n.HY]
Night mode offset [n.oF]
Night mode start hour [n.SH]
Night mode start min [n.Sn]
Night mode end hour [n.EH]
Night mode end min [n.En]
Temperature monitoring [E.no]
Comp. start-up delay time [Sdt]
Comp. min. operation cycle [CYC]
Comp. restart delay time [rdt]
Comp. min. operation time [ont]
Comp. continuous operation [CC]
Alarm delay time after continuous operation [Ad.C]
Comp. operation cycle when sensor break [CtE]
Comp. duty rate when sensor break [dUt]
Defrost cycle [dIn]
Real-time defrost cycle [r.dI]
Real-time defrost cycle 1: hour [dH1]
Real-time defrost cycle 1: min [dn1]
Real-time defrost cycle 8: hour [dH8]
Real-time defrost cycle 8: min [dn8]
Defrost time [dEt]
Pump down delay time [Pdd]
Defrost end delay time [dr.t]
Defrost end temperature [Edt]
Defrost hysteresis [dHY]
Defrost when power ON [P.dE]
Defrost delay when power ON/ manual defrost [ddE]
Defrost group [d.Gr]
Parameter copy [P.dC]
Prior defrost selection [d.Pr]
Defrost time unit [U.dE]
Alarm delay after defrost/ door open [Add]
Temperature display during defrosting [t.dE]
Alarm option [ALt]
Alarm high-limit deviation [AL.H]
Alarm low-limit deviation [AL.L]
Alarm hysteresis [AHY]
Alarm ON delay time [Aon]
Alarm OFF delay time [AoF]
External alarm delay time [EAd]
Alarm output method [An]
Evaporator-fan operation [Fty]
Evaporator-fan control temperature [Ft]
Evaporator-fan hysteresis [FHY]
Evaporator-fan mode [FAn]
Evaporator-fan start-up delay time [Pdr]
Current minute [CUn]
Digital input [dI]
Loop break alarm monitoring time [LbA]
Comm. address [Adr]
Comm. speed [bPS]
Comm. parity bit [Prt]
Comm. stop bit [StP]
Comm. response wait time [rSt]
Comm. write [CoM]
User level [USr]
SV setting group lock [L.Su]
Front key lock [L.dE]
PA 0 group lock [L.P0]
PA user group lock [L.PU]
PA 1 group lock [L.P1]
PA 2 group lock [L.P2]
PA 3 group lock [L.P3]
PA 4 group lock [L.P4]
PA 5 group lock [L.P5]
Password [PWd]
3 sec

▣ Parameter 1 Group

※1. S: Press any key among ◁, ▽, △ keys.
※After entering setting mode, hold the ◎ (MODE) key anytime for 3 sec to return to RUN mode.
※After entering setting mode, hold the ◎ (MODE) key anytime for 1.5 sec to go to the concerned group name.
※If you press the ◎ (MODE) key after changing the set value of the parameter the set value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users. (You can set the user level [USr] in parameter 5 group).)
※ This parameter might not be displayed depending on other parameter settings or model specifications.



▣ Parameter 2 Group



※1. S: Press any key among ⩤, ⩔, ⩓ keys.
※After entering setting mode, hold the ◎ (MODE) key anytime for 3 sec to return to RUN mode.
※After entering setting mode, hold the ◎ (MODE) key anytime for 1.5 sec to go to the concerned group name.
※If you press the ◎ (MODE) key after changing the set value of the parameter the set value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users. (You can set the user level [USr] in parameter 5 group).)
※ This parameter might not be displayed depending on other parameter settings or model specifications.

※When changing compressor output mode, CLE, dUt parameter values are reset.

Setting range: 1 to 5℃ (0.5 to 5.0℃), 2 to 10℉ (2.0 to 10.0℉)

Setting range: 0 to 5℃ (0.0 to 5.0℃), 0 to 10℉ (0.0 to 10.0℉)

Setting range: (LSu+1digit) to high-limit value of input type
※When changing SV high-limit value and SV > HSu, Su is reset as HSu.

Setting range: low-limit value of input type to (HSu-1digit)
※When changing SV low-limit value and SV < LSu, Su is reset as LSu.

Setting range: -20 to 20℃ (-20 to 20.0℃)/ -50 to 50℉ (-50 to 50.0℉)

Setting range: 1 to 5℃ (0.5 to 5.0℃), 2 to 10℉ (2.0 to 10.0℉)

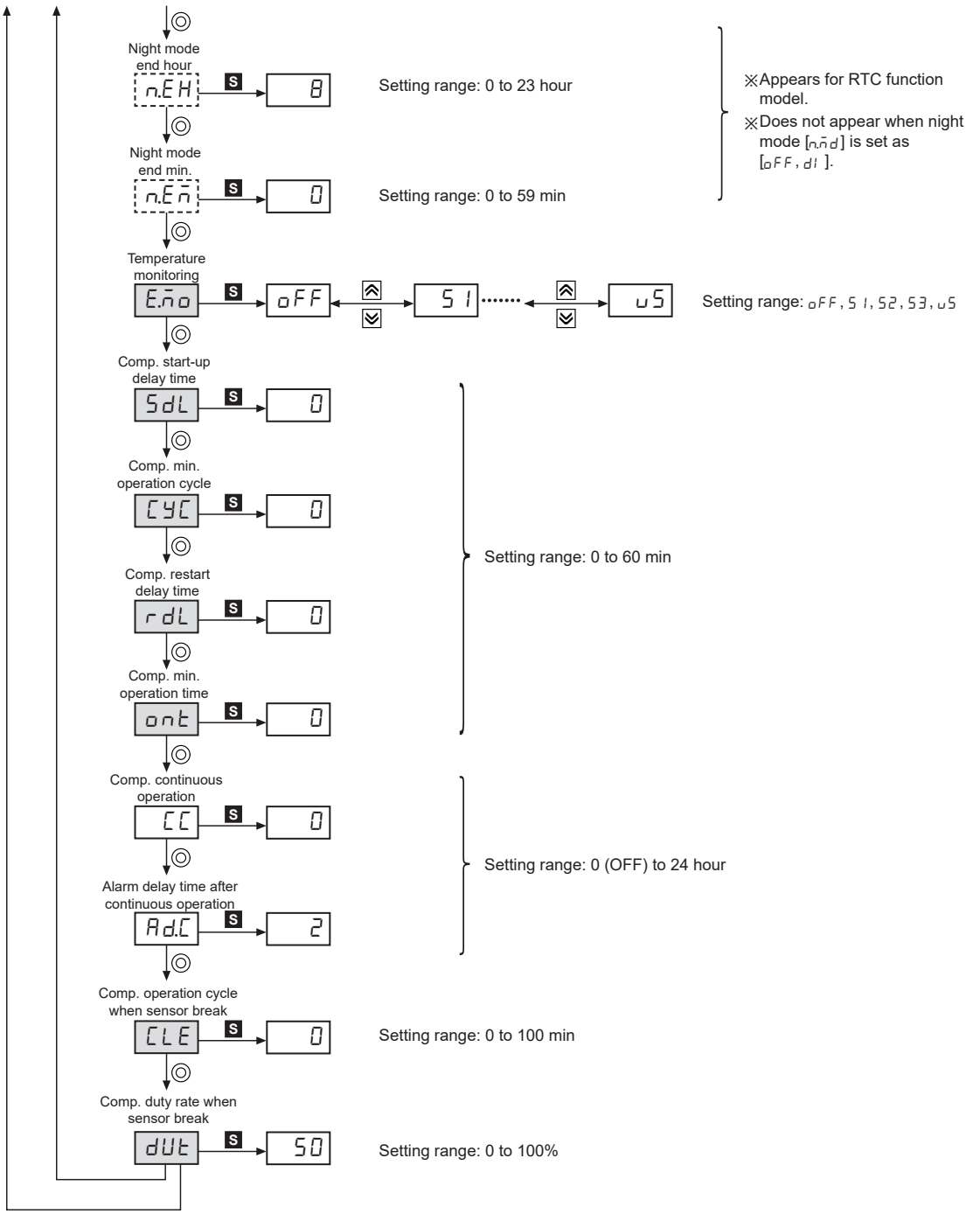
Setting range: 0 to 5℃ (0.0 to 5.0℃), 0 to 10℉ (0.0 to 10.0℉)

※Appears for RTC function model or when digital input [dI] is set as [n.nd]in parameter 5 group.
※Does not appear when night mode [n.nd] is set as [oFF].

Setting range: 0 to 23 hour

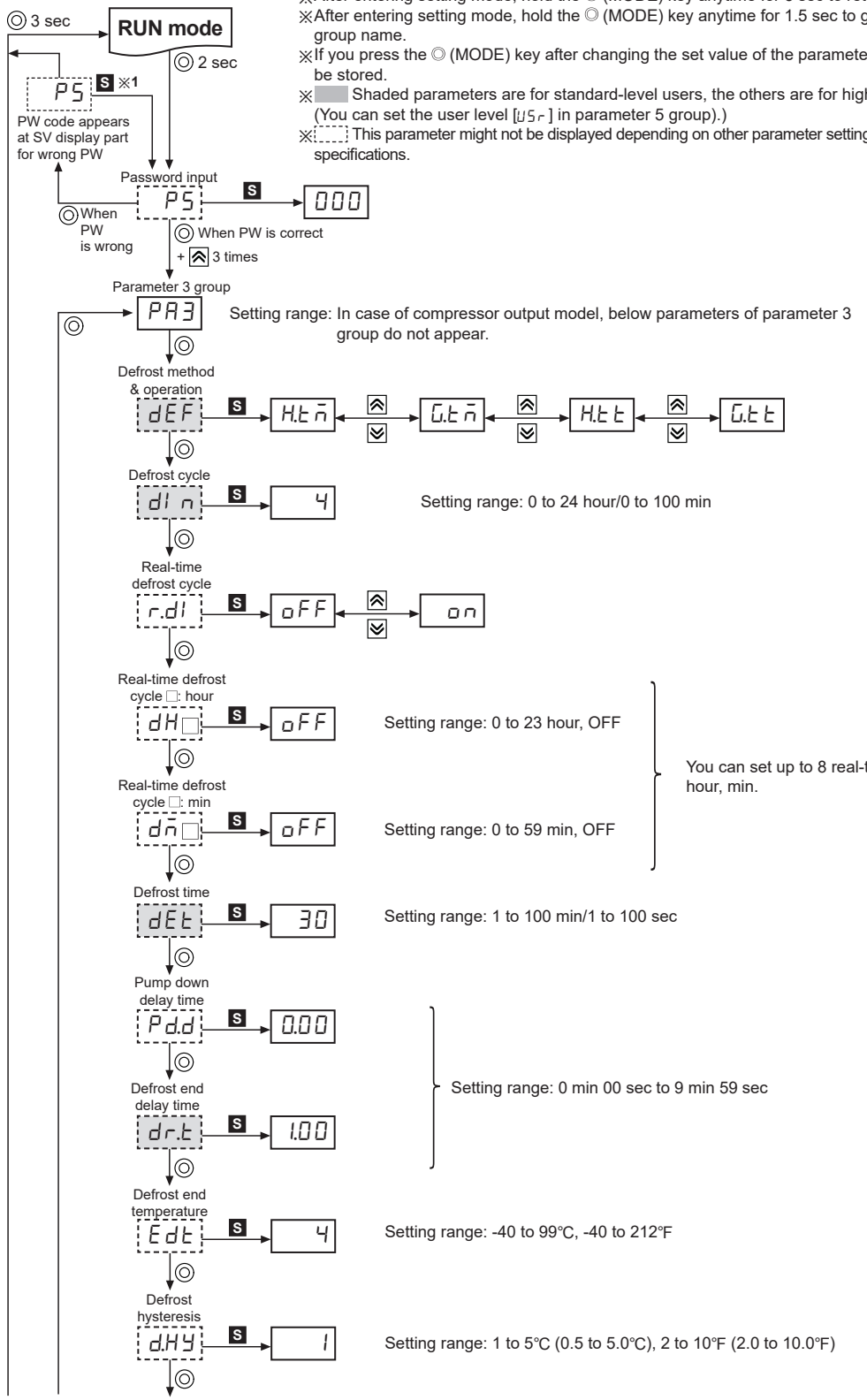
Setting range: 0 to 59 min

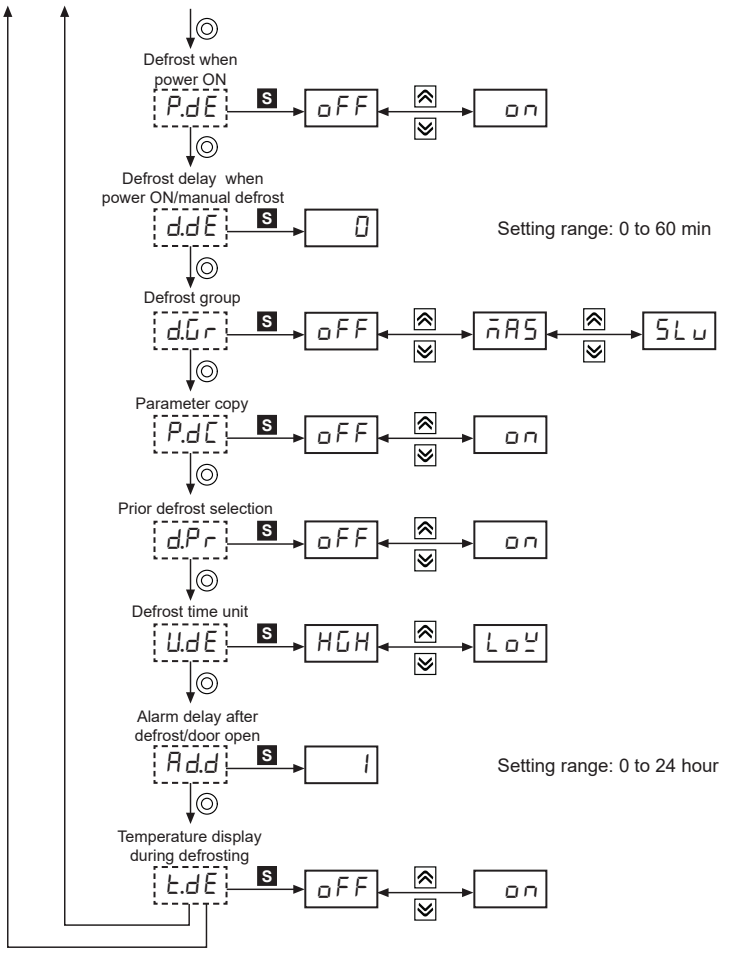
※Appears for RTC function model.
※Does not appear when night mode [n.nd] is set as [oFF, dI].


Night mode end hour
n.EH
S
8
Setting range: 0 to 23 hour
※Appears for RTC function model.
※Does not appear when night mode [n.nd] is set as [oFF, d1].
Night mode end min.
n.En
S
0
Setting range: 0 to 59 min
Temperature monitoring
E.no
S
oFF
S1
u5
Setting range: oFF, S1, S2, S3, u5
Comp. start-up delay time
SdL
S
0
Comp. min. operation cycle
CYC
S
0
Comp. restart delay time
rdL
S
0
Comp. min. operation time
ont
S
0
Setting range: 0 to 60 min
Comp. continuous operation
CC
S
0
Alarm delay time after continuous operation
Ad.C
S
2
Setting range: 0 (OFF) to 24 hour
Comp. operation cycle when sensor break
CLE
S
0
Setting range: 0 to 100 min
Comp. duty rate when sensor break
dUt
S
50
Setting range: 0 to 100%

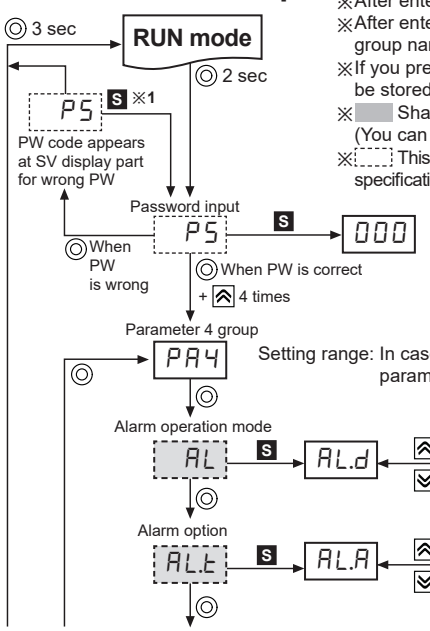
▣ Parameter 3 Group

※1. S: Press any key among ≪, ≫, ≫ keys.
※After entering setting mode, hold the ◎ (MODE) key anytime for 3 sec to return to RUN mode.
※After entering setting mode, hold the ◎ (MODE) key anytime for 1.5 sec to go to the concerned group name.
※If you press the ◎ (MODE) key after changing the set value of the parameter the set value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users. (You can set the user level [USr] in parameter 5 group).)
※ This parameter might not be displayed depending on other parameter settings or model specifications.



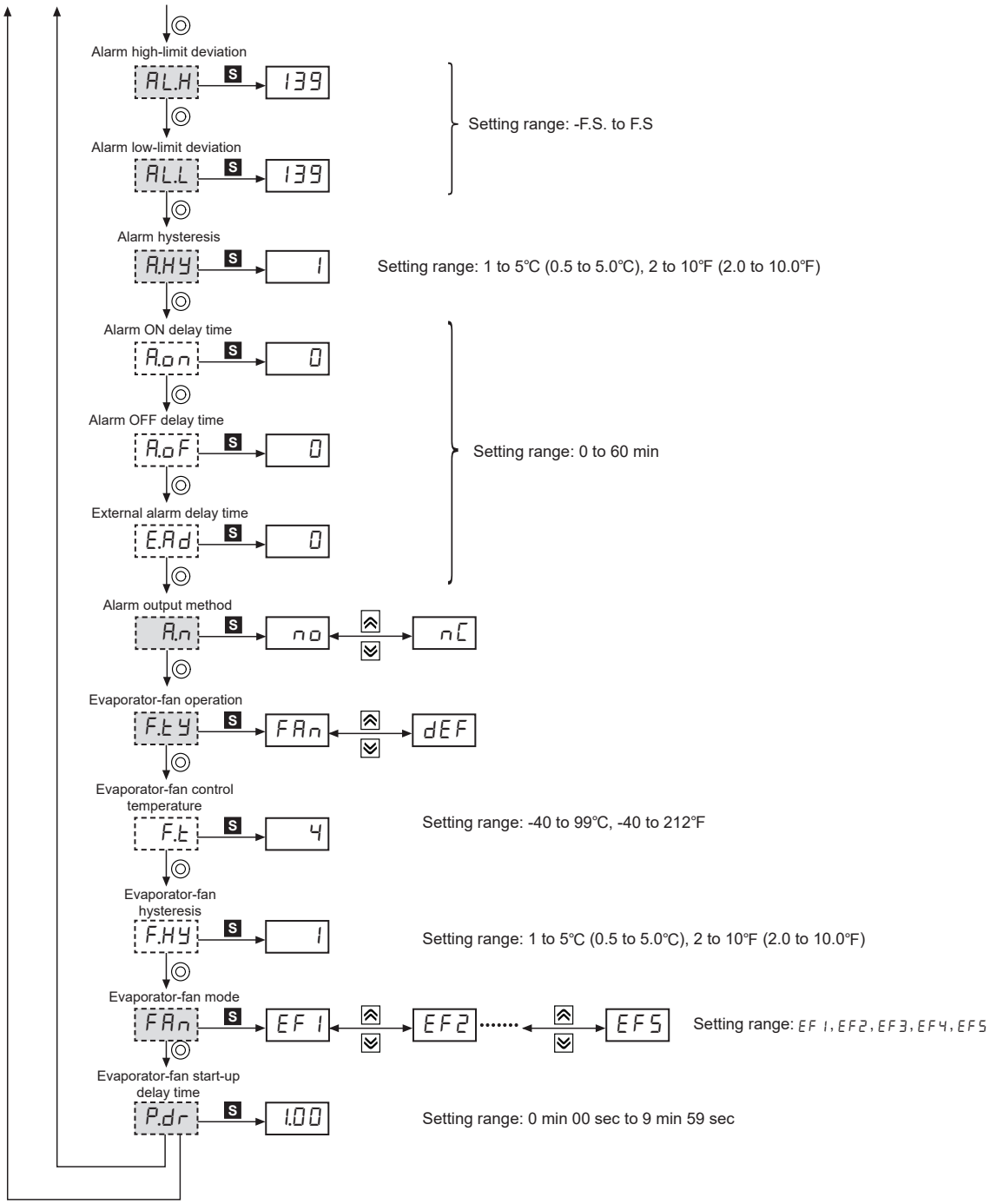


■ Parameter 4 Group



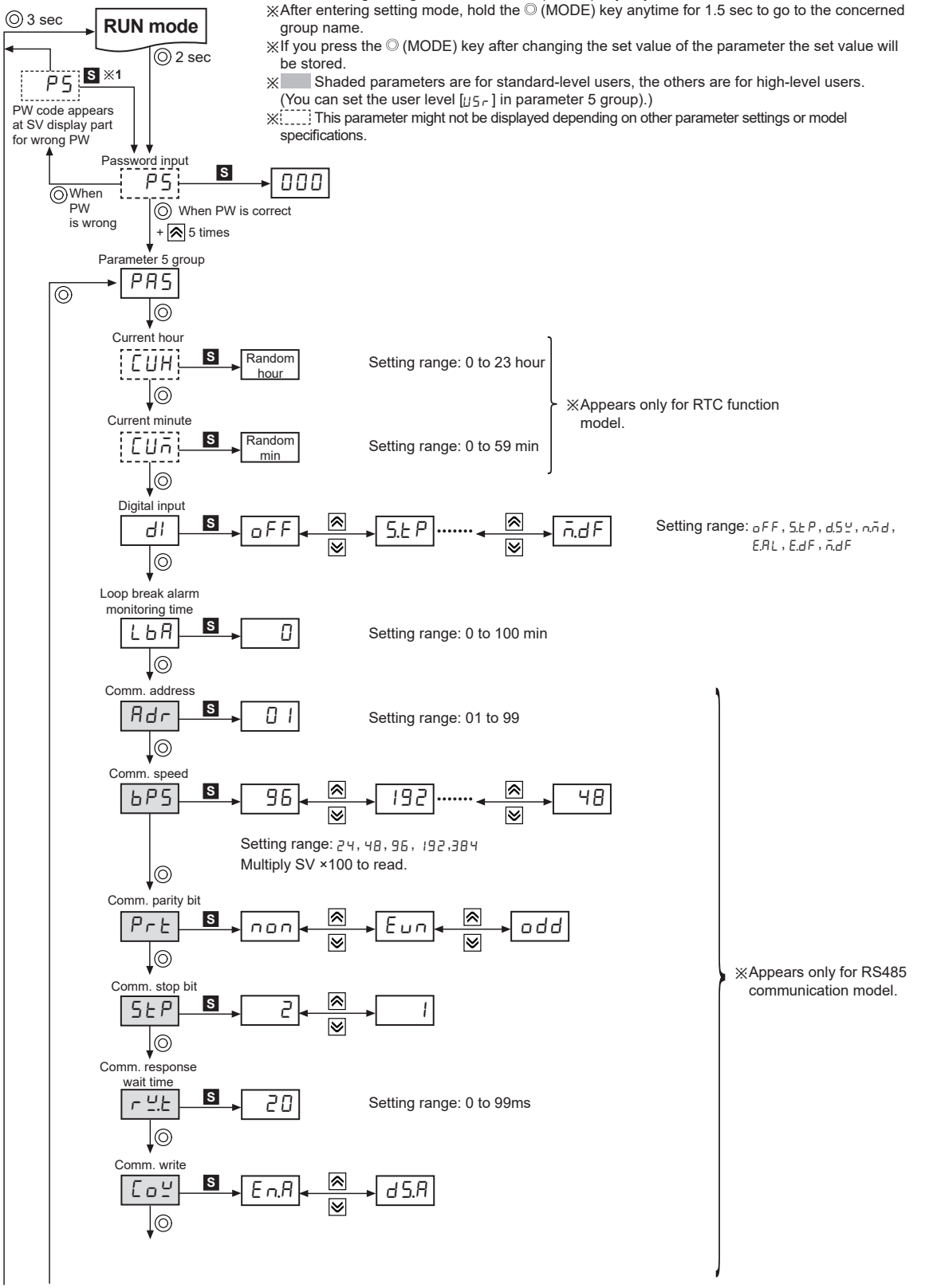
※1. S: Press any key among ◁, ▽, △ keys.
※After entering setting mode, hold the ◎ (MODE) key anytime for 3 sec to return to RUN mode.
※After entering setting mode, hold the ◎ (MODE) key anytime for 1.5 sec to go to the concerned group name.
※If you press the ◎ (MODE) key after changing the set value of the parameter the set value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users. (You can set the user level [USr] in parameter 5 group).)
※ This parameter might not be displayed depending on other parameter settings or model specifications.

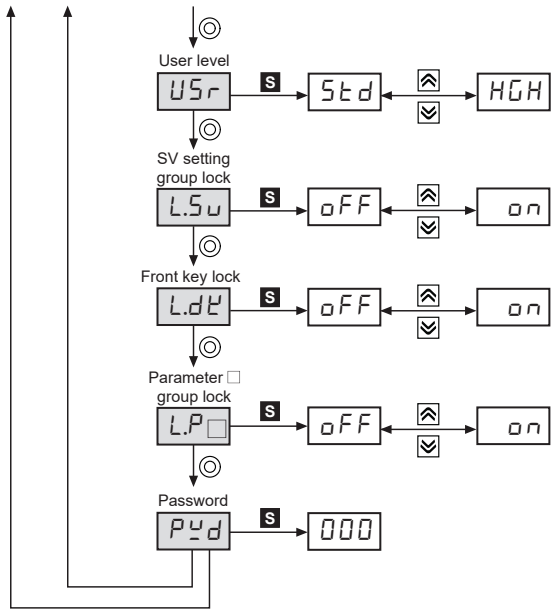
Setting range: AL.A, AL.b, AL.C, AL.d, AL.E, AL.F
※When changing alarm option, AL.H, AL.L, AHY parameter values are reset.


Alarm high-limit deviation
AL.H
S
139
Alarm low-limit deviation
AL.L
S
139
Setting range: -F.S. to F.S
Alarm hysteresis
A.HY
S
1
Setting range: 1 to 5℃ (0.5 to 5.0℃), 2 to 10℉ (2.0 to 10.0℉)
Alarm ON delay time
A.on
S
0
Alarm OFF delay time
A.oF
S
0
Setting range: 0 to 60 min
External alarm delay time
E.Ad
S
0
Alarm output method
A.n
S
no
nC
Evaporator-fan operation
F.tY
S
FAn
dEF
Evaporator-fan control temperature
F.t
S
4
Setting range: -40 to 99℃, -40 to 212℉
Evaporator-fan hysteresis
F.HY
S
1
Setting range: 1 to 5℃ (0.5 to 5.0℃), 2 to 10℉ (2.0 to 10.0℉)
Evaporator-fan mode
FAn
S
EF 1
EF2
EF5
Setting range: EF 1, EF2, EF3, EF4, EF5
Evaporator-fan start-up delay time
P.dr
S
1.00
Setting range: 0 min 00 sec to 9 min 59 sec

▣ Parameter 5 Group

※1. S: Press any key among ≪, ≫, ≪ keys.
※After entering setting mode, hold the ◎ (MODE) key anytime for 3 sec to return to RUN mode.
※After entering setting mode, hold the ◎ (MODE) key anytime for 1.5 sec to go to the concerned group name.
※If you press the ◎ (MODE) key after changing the set value of the parameter the set value will be stored.
※ Shaded parameters are for standard-level users, the others are for high-level users. (You can set the user level [USr] in parameter 5 group).)
※ This parameter might not be displayed depending on other parameter settings or model specifications.





▣ Parameter Reset

Hold ≪+▽+△ keys for 5 sec to reset all parameters in memory to default value.
Set [inI] parameter to [YES] to reset all parameters.
In case password function is ON, it is required to enter valid password to reset parameters.
Password is also reset.

▣ Factory Default

● SV setting [Su]

Parameter	Factory default
Su	0

● Parameter 0 group

Parameter	Factory default
dP.t	5.1
no.t	—

● Parameter 1 group [PAr 1]

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
In.t	n5.H	Unt	°C	AU4	oFF
S2	oFF	1b.□	0	bUZ	on
S3	dI	dS.t	0.5		
ut.r	0	S.dA	dEF		

● Parameter 2 group [PAr 2]

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
oFt	C	n.Su	1	n.En	0	CC	0
HYS	1	n.HY	1	E.no	oFF	Ad.C	2
oFS	0	n.oF	0	SdL	0	CLE	0
HSu	99	n.SH	0	CYC	0	dUt	50
LSu	-40	n.tn	0	rdL	0		
n.nd	oFF	n.EH	8	ont	0		

● Parameter 3 group [PAr 3]

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
dEF	H.tn	dEt	30	P.dE	oFF	U.dE	HGH
dI n	4	Pdd	0.00	d.dE	0	Add	1
r.dI	oFF	dr.t	1.00	d.Gr	oFF	t.dE	oFF
dH□	oFF	Edt	4	P.dC	oFF		
dn□	oFF	d.HY	1	dPr	oFF		

● Parameter 4 group [PAr 4]

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
AL	AL.d	A.HY	1	An	no	FAn	EF1
AL.t	AL.A	Aon	0	F.tY	FAn	P.dr	1.00
AL.H	139	AoF	0	F.t	4		
AL.L	139	E.Ad	0	F.HY	1		

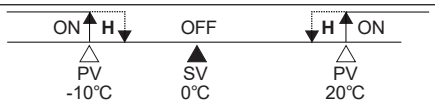
● Parameter 5 group [PAr 5]

Parameter	Factory default	Parameter	Factory default	Parameter	Factory default	Parameter	Factory default
CUH	Random hour	Adr	01	r.Yt	20	L.dE	oFF
CUn	Random min	bPS	96	Coy	EnA	L.P□	oFF
dI	oFF	Prt	non	USr	Std	PYd	000
LbA	0	StP	2	L.Su	oFF		

▣ Alarm (Except 1CH, Compressor Output Model: TF31-1□□)

Set both alarm operation and alarm option by combining. Alarm function is available for compressor+defrost or auxiliary (alarm/evaporator-fan) output model (TF3□-2□□-□). Also defrost/auxiliary output [5dA] of parameter 1 group should be set as auxiliary [AUX], and auxiliary output [AUX] should be set as alarm [ALM].
In case of compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF3□-3□□-□), auxiliary output [AUX] of parameter 1 group should be set as alarm [ALM].

◎ Alarm operation [AL]

Mode	Name	Alarm operation	Description
oFF	—	—	No alarm output.
AL.d	Deviation high, low-limit alarm	 High-limit deviation [AL.H]: Set as 20, Low-limit deviation [AL.L]: Set as 10	If deviation between present value (PV) and setting value (SV) is higher than high-limit or low-limit deviation SV, alarm output turns ON.

※ H: alarm output hysteresis [A.HY]

◎ Alarm option [AL.t]

Mode	Name	Description
AL.A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AL.b	Alarm latch※1	If it is an alarm condition, alarm output is ON and maintains ON status.
AL.C	Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.
AL.d	Alarm latch and standby sequence 1	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.
AL.E	Standby sequence 2	First alarm condition is ignored and from second alarm condition, standard alarm operates. When re-applied standby sequence※2 and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, standard alarm operates.
AL.F	Alarm latch and standby sequence 2	Basic operation is same as alarm latch and standby sequence 1. It operates not only by power ON/OFF, but also alarm set value, or alarm option changing. When re-applied standby sequence※2 and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates.

※1: To clear alarm, turn OFF the power (also digital input [dI] is set as RUN/STOP [StP] and input is ON for pausing compressor output) or press the front ≪ key once. (press twice when buzzer is set)
※2: Condition of re-applied standby sequence for standby sequence: Power ON, changing temperature, alarm settings, switching STOP mode to RUN mode (also digital input [dI] is set as RUN/STOP [StP] and input turns OFF from ON for operation mode by releasing pause compressor output)

▣ Functions

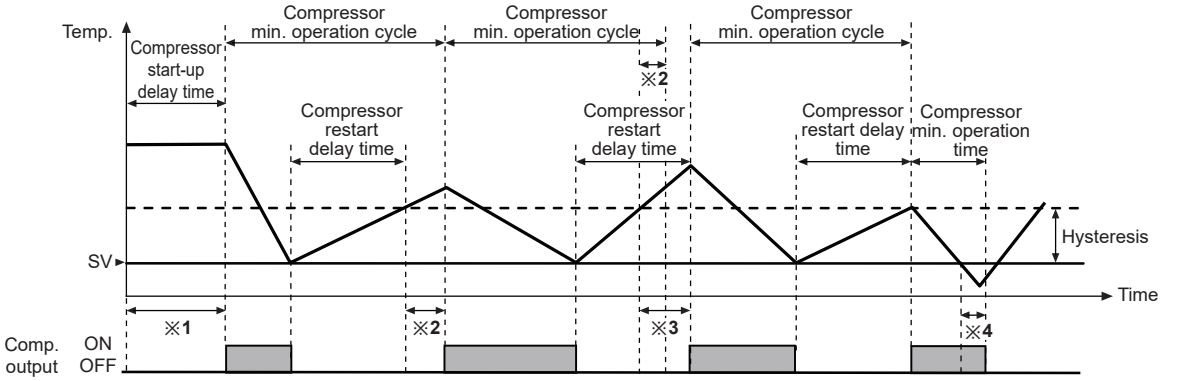
◎ Compressor protection

This function is for preventing compressor from life cycle shortening or malfunction by overload and frequent ON/OFF of compressor. As compressor protection settings, when compressor output does not ON, the front compressor (COMP) output indicator (green) is flashing.

● Compressor start-up delay time [5dL]
If power turns ON instantly from break-down or power OFF, it delays start-up during the set time of compressor.
Setting range: 0 to 60 (min)

● Compressor restart delay time [rdL]
To prevent frequent compressor ON/OFF, set compressor ON time after compressor turns OFF.
Setting range: 0 to 60 (min)

● Compressor min. operation time [ont], compressor min. operation cycle [CYC]
To prevent frequent compressor ON/OFF, set min. operation time and min. operation cycle.
Setting range of compressor min. operation time: 0 to 60 (min),
Setting range of compressor min. operation cycle: 0 to 60 (min)



※1: When starting compressor, if present value (PV) is out of hysteresis range, compressor output does not turn ON and the compressor (COMP) output indicator is flashing during compressor start-up delay time.
※2: When compressor delay is completed and it is within compressor min. operation cycle, compressor output does not turn ON and the compressor (COMP) output indicator is flashing. (The latest one has priority between compressor restart delay time and compressor min. operation cycle.)
※3: When present value (PV) is out of hysteresis, compressor output does not turn ON and the compressor (COMP) output indicator is flashing during compressor restart delay time.
※4: If present value (PV) is below the SV, compressor output maintains ON status during compressor min. operation time. After compressor min. operation time, it turns OFF.
※If compressor output does not turn ON due to compressor output condition or parameter settings for compressor protection, the compressor (COMP) output indicator is flashing.

★For more information about parameters for compressor prevention, refer to user manual.

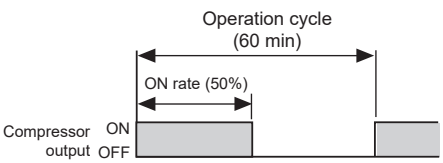
◎ Compressor control when sensor break

If normal temperature control is impossible due to sensor break, it controls compressor output by the set operation cycle and duty ratio to protect control object. Until error is cleared, operation cycle and duty ratio are applied repeatedly. When error is cleared, the compressor operates after completing the currently applied operation cycle and compressor restart delay time.

● Compressor operation cycle when sensor break [CLE]
Set compressor operation cycle when sensor break.
Set as [0] and compressor output turns OFF when sensor break.
Setting range: 0 to 100 (min)

● Compressor duty ratio when sensor break [dUt]
Set compressor ON duty ratio when sensor break.
Setting range: 0 to 100 (%)

E.g.) When compressor operation cycle when sensor break [CLE] is set as 60 min and compressor duty ratio when sensor break [dUt] is set as 50%, compressor output has 60 min cycle and turns ON for 30 min and turns OFF for 30 min.



◎ Defrost control (except 1CH, compressor output model: TF31-1□□)

When operating a compressor for a long time, an evaporator and a freezer are freezing and thermal efficiency of compressor is decreased. For increasing thermal efficiency, defrost operation helps to remove frost or ice around of evaporator.
Set defrost cycle, time, and end temperature, etc to operate defrost (heater/hot-gas defrost).
The front defrost (DEF) output indicator (green) turns ON during defrost output and it flashes during defrost delay operation.
In case of compressor+defrost or auxiliary (alarm/evaporator-fan) output model (TF3□-2□□-□), defrost operation is available when defrost/auxiliary output [5.dA] of parameter 1 group is set as defrost [dEF].

● Defrost method and operation [dEF]

Parameter	Defrost method	Defrost operation
H.Et	Heater defrost	Operates during the set defrost cycle/time
G.Et	Hot-gas defrost	
H.Et	heater defrost	Operates when PV is lower than defrost end temperature during the set defrost cycle/time (only for 3CH input model (TF33-□□□-□))
G.Et	Hot-gas defrost	

● Defrost cycle [dI n], defrost time [dEt]

Set defrost cycle and time to operate defrost at every set cycle and during the set time.
Defrost cycle setting range: 0 to 24 (hour)/0 to 100 (min)
Defrost time setting range: 1 to 100 (min/sec)
※Compressor operation during defrost is varied by defrost method. In case of heater defrost, compressor output turns OFF, and in case of hot-gas defrost, compressor output turns ON. Evaporator-fan operation is varied by evaporator-fan operation mode setting.
※In case of RTC function model (TF33-3□□-R/A), defrost operates at every specific time. Set real-time defrost cycle [r.dI] of parameter 3 group as [on] and 8 real-time defrost times are available to set.

● Defrost end temperature [Edt], Defrost hysteresis [dHy] (only for 3CH input model: TF33-□□□-□)

Set defrost end temperature and defrost hysteresis from input sensor 2 (defrost temperature). When the measured temperature of defrost sensor is same as the set defrost end temperature, defrost operation is stopped. It is available when input sensor 2 ON/OFF [S2] is set as [on] and defrost method and operation [dEF] is set as [H.Et] or [G.Et].
Defrost end temperature setting range: -40 to 99 (℃) / -40 to 212 (℉)
Defrost hysteresis setting range: 1 to 5 (1.0 to 5.0) (℃) / 2 to 10 (℉)

● Manual defrost

Execute defrost manually regardless of the set defrost cycle which consists of defrost method and operation setting. Hold the front ⩛ key over 3 sec or, turn ON the digital input when digital input [dI] of parameter 5 group is set as [n.dF] to operate defrost during the set defrost time.
The front defrost (DEF) output indicator turns ON for 2 sec and turns OFF for 1 sec during manual defrost. Hold the front ⩛ key over 3 sec or turn OFF the digital input during manual defrost, and the set defrost cycle re-starts.

● Defrost synchronization
(only for synchronize defrost function model: TF33-□□A-S, RS485 communication model: TF33-□□A-T/A)

When connecting over 2 units of TF3, defrost and compressor operation is able to synchronize via synchronize terminal/ RS485 communication.
It is available for synchronize defrost function model (TF33-□□A-S), or RS485 communication model (TF33-□□A-T/A).
[Setting Order]
1. Connect each other synchronize terminals or RS485 communication terminals of the units which are synchronized for defrost.
2. Set defrost cycle [dI n] same as among the units. (if error occurs, defrost cycle is the setting of each unit)
3. Set defrost group [d.Gr] as 1 master unit [nAS] and slave unit (s) (up to 5 units) [SLA].
4. According to defrost operation of Master, the defrost operation of slave (s) executes. (when changing the defrost parameters of master, defrost operations of slave (s) are also changed forcibly as same as the defrost operation of master via connected terminals. The defrost parameters of slave (s) are not changed.)

※Defrost operation by real-time defrost cycle is not able to synchronize.
※Defrost operation of master is prior to the compressor operation of slave.

★For more information about parameters for defrost operations, refer to user manual.

◎ Evaporator-fan control (except 1CH, compressor output model: TF31-1□□)

To improve the efficiency of cooling, install and control evaporator-fan at evaporator.
It is available for compressor+defrost or auxiliary (alarm/evaporator-fan) output model (TF3□-2□□-□). Also defrost/ auxiliary output [5.dA] of parameter 1 group should be set as auxiliary [AUX], and auxiliary output [AUX] should be set evaporator-fan [FAn].
It is available for compressor+defrost+auxiliary (alarm/evaporator-fan) output model (TF3□-3□□-□). Also, auxiliary output [AUX] of parameter 1 group should be set as evaporator-fan [FAn].

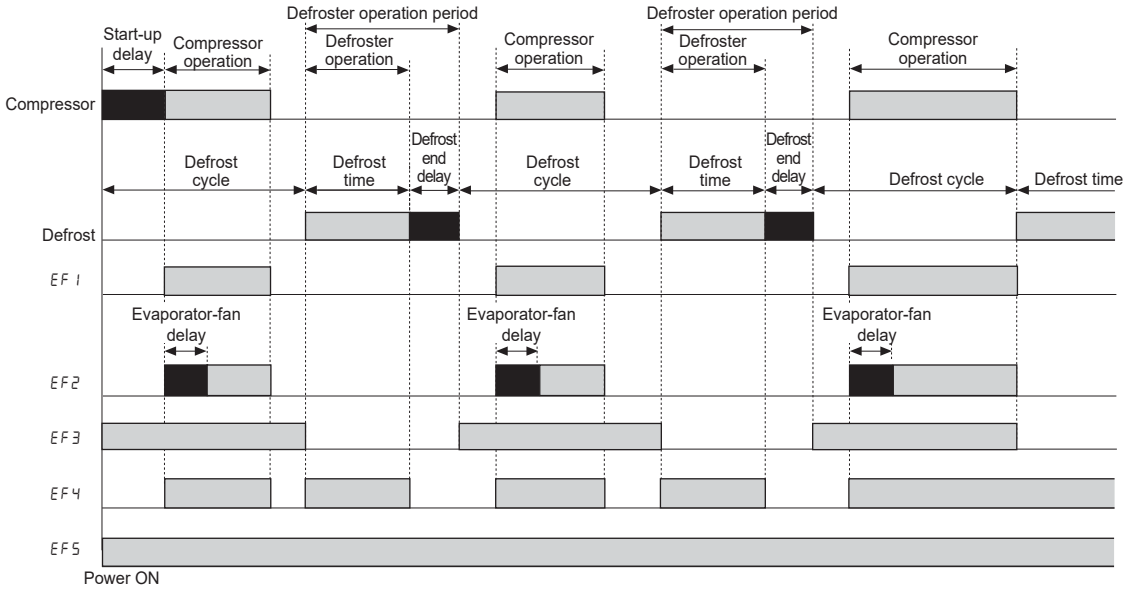
●Evaporator-fan operation [F.tY]
Evaporator-fan operates by two control methods; [dEF] controls evaporator-fan by measured temperature from defrost sensor or [FAn] controls evaporator-fan by compressor/defrost operation.

●Evaporator-fan control temperature [F.t] and hysteresis [F.HY]
When evaporator-fan operation [F.tY] is set as [dEF] controls (evaporator-fan is controlled by measured temperature from defrost sensor), and the temperature of defrost sensor is same as evaporator-fan control temperature [F.t], evaporator-fan output turns OFF. Set evaporator-fan control temperature [F.t] and evaporator-fan control hysteresis [F.HY].
Evaporator-fan control temperature setting range: -40 to 99 (℃), -40 to 212 (℉)
Evaporator-fan control hysteresis setting range: 1 to 5 (0.5 to 5.0) (℃), 2 to 10 (℉)

●Evaporator-fan operation mode [FAn] and evaporator-fan start-up delay time [P.dr]
When evaporator-fan operation [F.tY] is set as [FAn] for control by compressor/defrost operation, it is available to set [FAn] for evaporator-fan operation mode for compressor/defrost operation.

Parameter	Operation method
EF1	When compressor operates, evaporator-fan also operates. When compressor operation is finished, evaporator-fan also operation turns OFF. (except compressor operation for hot gas defrost)
EF2	When compressor operates, evaporator-fan operates after the set evaporator-fan start-up delay time. When compressor operation is finished, evaporator-fan operation turns OFF. (regardless of defroster operation)
EF3	When power turns ON, evaporator-fan operates. When defroster operates, evaporator-fan stops. (regardless of compressor operation)
EF4	Evaporator-fan operates only when operating compressor or defrost. Evaporator-fan stops when compressor and defroster stops. (for above zero temperature control)
EF5	Evaporator-fan operates from power ON to power OFF. (regardless of defroster operation of freezer. When door is open (digital input [dI] is set as RUN/STOP [StP] or door switch [d.5Y]), evaporator-fan stops.

If evaporator temperature is increased by defrost operation, warm air may flow into cooling system by evaporator-fan operation. Set evaporator-fan start-up delay time [P.dr] to prevent warm air inflow, and it may increase cooling efficiency.
Evaporator-fan start-up delay time setting range: 0.00 to 9.59 (0 min 00 sec to 9 min 59 sec)



※■: Output does not turn ON but the dedicated indicator flashes at the delay period (compressor, defrost, evaporator-fan).

★For more information about parameters for evaporator-fan control, refer to user manual.

◎ Digital input [dI]

※Digital input is available only for 3CH input model (TF33-□□□-□). Also input sensor 3 selection [S3] should be set as digital input [dI].

Parameter		Function
OFF	oFF	No digital input
RUN/STOP	StP	Pauses compressor output. All output indicators turn OFF. When digital input is OFF, it controls normally after compressor restart delay time.
Door switch	doSu	By connecting freezer door switch and digital input contact, it controls compressor/defrost/evaporator-fan according the door status. - Digital input ON (door open): Compressor, defrost, evaporator-fan output turns OFF - Digital input OFF (door close): After 1 min, it returns the previous status of door open. (not applied compressor protection operations) Alarm occurs after the time of alarm delay after defrost/door open [Add] of parameter 3 group. When operating compressor continuously, compressor start-up time is extended as long as the door open time.
Night mode ON/OFF	n.nd	When digital input turns ON, night mode is active.
External alarm※1	E.AL	When digital input turns ON, alarm output turns ON forcibly. (except alarm is ON) When external alarm delay time [E.Ad] of parameter 4 group is set, alarm turns ON after the set time.
Defrost ON/OFF※1	E.dF	When digital input turns ON and it is defrost operation condition, defrost output turns ON. Even though it is defrost operation condition, if digital input turns OFF, defrost output turns OFF also.
Manual defrost※1	n.dF	When digital input turns ON, it executes manual defrost.

※1: Except 1CH, compressor output model (TF31-1□□).

◎ Virtual temperature rate [ut.r] (only for 3CH input model: TF33-□□□-□)

In case of 3CH input model (TF33-□□□-□), input sensor 3 selection [S3] of parameter 1 group is set as outlet temperature [tS]. You can set virtual temperature rate.
If the temperature of inlet and outlet is significantly different at freezer, virtual temperature helps to control temperature efficiently.
Virtual temperature is designated by the rate of input sensor 1 (inlet temperature) and input sensor 3 (outlet temperature).
There is virtual temperature calculation formula.

$$\text{Virtual temperature (PV)} = \frac{\text{[\{100-virtual temperature rate\} × input sensor 1 temperature]} + \text{[virtual temperature rate × input sensor 2 temperature]}}{100}$$

If virtual temperature rate [ut.r] is set as [0], virtual temperature (PV)= input sensor 1.
If virtual temperature rate [ut.r] is set as [100], virtual temperature (PV)= input sensor 3

E.g.) If inlet temperature of input sensor 1 is 0℃, and outlet temperature of input sensor 3 is 10℃, set virtual temperature rate [ut.r] as [50] and virtual temperature is 5℃ to control temperature.

$$5 = \frac{\text{[\{100-50\}×0]+ [50×10]}}{100}$$

Setting range of virtual temperature rate: 0 to 100 (%)

◎ Display selection [dP.t] (only for 3CH input model: TF33-□□□-□)

You can select input sensor to display at present value (PV) display component in RUN mode.

Parameter	Description
S1	Displays PV of input sensor 1 (inlet temperature).
S2	Displays PV of input sensor 2 (defrost temperature).
S3	Displays PV of input sensor 3 (outlet temperature).
uS	Displays virtual temperature.

◎ Parameter mask

This function is able to hide unnecessary parameters to user environment or less frequently used parameters in parameter group. You can set this in the comprehensive device management program (DAQmaster).
Masked parameters are only not displayed. The setting value of masked parameters are applied.
For more information, refer to DAQMaster user manual.
Visit our web site (www.autonics.com) to download DAQmaster program and the user manual.

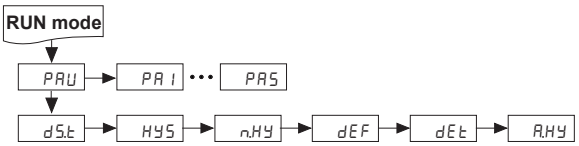
Before applying mask: PA1 → Int → S2 → S3 → ut.r → Unt •••

After applying mask: PA1 → Int → S2 → ut.r •••

The above is masking input sensor 3 selection [S3], temperature unit [Unt] of parameter 1 group for 3CH input model (TF33-□□□-□).

◎ Parameter user group [PAU]

This function is able to set the frequently used parameters to the user parameter group. You can quickly and easily set parameter settings. User parameter group can have up to 30 parameters in the comprehensive device management program (DAQMaster).
For more information, refer to the DAQMaster user manual.
Visit our web site (www.autonics.com) to download the DAQMaster program and the user manual.



The above is setting user parameter group in the DAQMaster with delay display period [dSt] of parameter 1 group, hysteresis [HYS], night mode hysteresis [nHY] of parameter 2 group, defrost method [dEF], defrost time [dEt] of parameter 3 group, alarm output hysteresis [AHY] of parameter 4 group.

◎ Communication output

It is for parameter setting and monitoring via external devices (PC, PLC, etc.).

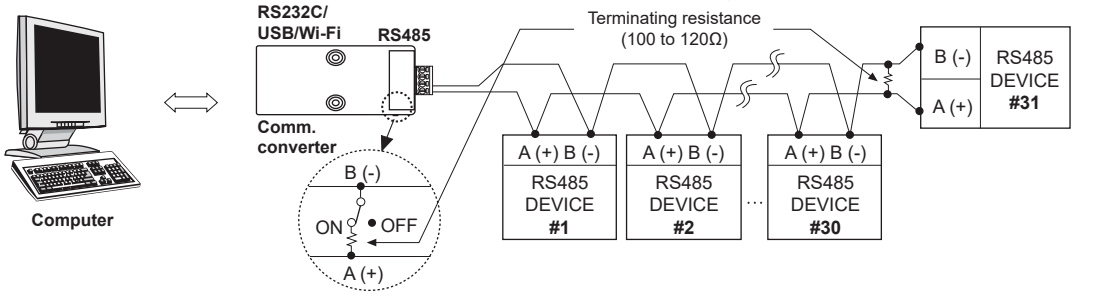
● Interface

Comm. protocol	Modbus RTU	Comm. speed	2400, 4800, 9600, 19200, 38400 bps
Connection type	RS485	Comm. response wait time	5 to 99 ms
Application standard	Compliance with EIA RS485	Start bit	1-bit (fixed)
Max. connection	31 units (address: 01 to 99)	Data bit	8-bit (fixed)
Synchronous method	Asynchronous	Parity bit	None, Odd, Even
Comm. method	Two-wire half duplex	Stop bit	1-bit, 2-bit
Comm. distance	Max. 800m		

※It is not allowed to set overlapping communication address at the same communication line.
Use twisted pair wire for RS485 communication.

● Application of system organization

※Only for RS485 communication output model.



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately).
Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

▣ Error Display

Flashing in turn	Description	Troubleshooting
Er □[※1][※2]↔oPn	When input sensor is break or sensor is disconnected.	Check input sensor status.
Er □[※1]↔LLL	If the measured temperature of the dedicated sensor is lower than low-limit temperature among temperature setting range.	It clears when input is within the display range.
Er □[※1]↔HHH	If the measured temperature of the dedicated sensor is higher than high-limit temperature among temperature setting range.	
Err↔LbA	Even though input sensor is normal, freezer temperature does not change over 1.0℃ (1.8℉) during loop break alarm monitoring time [LbA].	Check the compressor and hold the ▲+▼ key at the same time for 3 sec. It clears when input is within the adequate range.

※1: □ indicates input sensor number of error display priority which occurs error.
Error display priority: Er1 (input sensor 1) → Er2 (input sensor 2)→ Er3 (input sensor 3)→ Eru (virtual temperature) → Err
※2: Eru (virtual temperature) is not applicable.

▣ Proper Usage

◎ Cautions during use

- Follow instructions in 'Cautions during use'. Otherwise, It may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Do not apply excessive power when connecting or disconnecting the connectors of the product.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- 24VAC, 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Install a surge absorber at each end of inductive load coil when controlling high-capacity power relay or inductive load (e.g. magnet).
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Refrigeration Temperature Controller

▣ Features

- ON/OFF Control
- Input specification - Basic specification: NTC (Thermistor), Option: RTD (DPt100Ω)
- Temperature display range
  NTC sensor type: -40.0 to 99.9℃ (-40 to 212℉)
  RTD sensor type: -99.9 to 99.9℃ (-148 to 212℉)
- Supports various delay functions for utilize freezing
  Auto/Manual Defrost selection function, Start-up delay of compressor, Restart delay time, Minimum ON time, Defrost end delay, Operation delay of evaporation-fan
- Input correction function
- Enable to set operation period for protecting compressor in error.

⚠ **Please read "Safety considerations" in operation manual before using.**

▣ Ordering Information

TC 3 Y F — 1 4 R

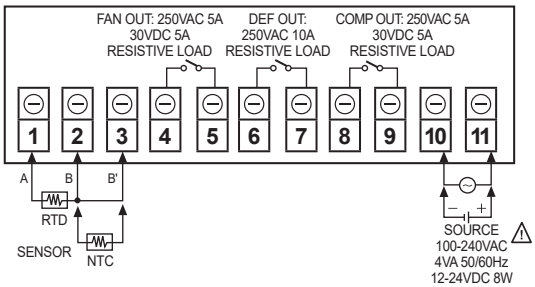
Control output	R	Relay output
Power supply	1	12-24VDC
	4	100-240VAC 50/60Hz
Control output for refrigeration	1	Compressor output
	2	Compressor+Defrost output
	3	Compressor+Defrost+Evaporation-fan output
Control mode	F	Freezing
Size	Y	DIN W72×H36mm
Digit	3	999 (3-digit)
Item	TC	Temperature Controller

▣ Specifications

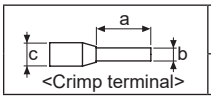
Model		TC3YF-1□R	TC3YF-2□R	TC3YF-3□R
Power supply	AC power	100-240VAC~ 50/60Hz		
	DC power	12-24VDC⎓		
Allowable voltage range		90 to 110% of rated voltage		
Power consumption	AC power	Max. 4VA (100-240VAC 50/60Hz)		
	DC power	Max. 8W (12-24VDC)		
Display method		7 Segment LED method (red)		
Character size (W×H)		7.4×15.0mm		
Input type		NTC: 5kΩ, RTD※1: DPt 100Ω		
Input line resistance		Allowable line resistance is max. 5Ω per a wire		
Sampling period		500ms		
Display accuracy		• At room temp. (23 ±5℃): (PV ±0.5% or 1℃, select the higher one) rdg ±1digit • Out of room temp. range: (PV ±0.5% or 1℃, select the higher one) rdg ±1℃		
Control output	Compressor (COMP)	250VAC~ 5A, 30VDC⎓ 5A, 1a		
	Defrost (DEF)	—	250VAC~ 10A 1a	
	Evaporator-fan (FAN)	—	—	250VAC~ 5A, 30VDC⎓ 5A, 1a
Control method		ON/OFF control		
Hysteresis		0.5 to 5.0℃, 2 to 50℉ variable		
Relay life cycle	Compressor (COMP)	Mechanical: Min. 20,000,000 operations, Electrical: Min. 50,000 operations (250VAC 5A resistive load)		
	Defrost (DEF)	Mechanical: Min. 20,000,000 operations, Electrical: Min. 100,000 operations (250VAC 10A resistive load)		
	Evaporator-fan (FAN)	Mechanical: Min. 20,000,000 operations, Electrical: Min. 50,000 operations (250VAC 5A resistive load)		
Memory retention		Approx. 10 years (non-volatile memory method)		
Insulation resistance		100MΩ (at 500VDC megger)		
Dielectric strength		2000VAC 60Hz for 1 min (between all external terminals and case)		
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours		
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min		
Noise immunity	AC power	Square-wave noise by the noise simulator (pulse width: 1μs) ±2kV R-phase and S-phase		
	DC power	Square-wave noise by the noise simulator (pulse width: 1μs) ±500V R-phase and S-phase		
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃		
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH		
Protection structure		IP65 (front part, IEC Standards)		
Approval	AC power	c UL us, KC (except RTD option models)		
	DC power	—		
Weight※2		Approx. 229g (approx. 143g)		

※1: RTD input type is option.
※2: The weight includes packaging. The weight in parenthesis is for unit only. The weight may be varied bymodel specification and option.
※Environment resistance is rated at no freezing or condensation.

■ Connections



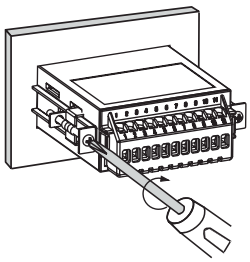
※Use crimp terminals of size specified below. (unit: mm)



<Crimp terminal>

Terminal number	a	b	c
1 to Nmm	6mm	Max. 1.9	Max. 4.0

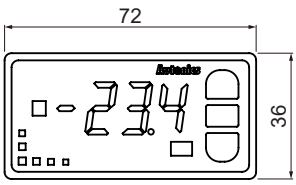
■ Installation

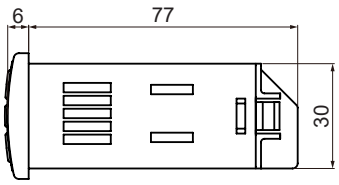


※Insert this unit into a panel, fasten bracket by pushing with tools as shown.

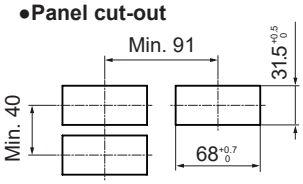
■ Dimensions

(unit: mm)

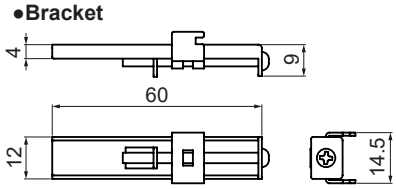




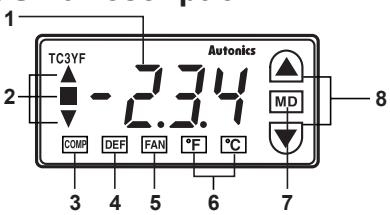
●Panel cut-out



●Bracket



■ Unit Description



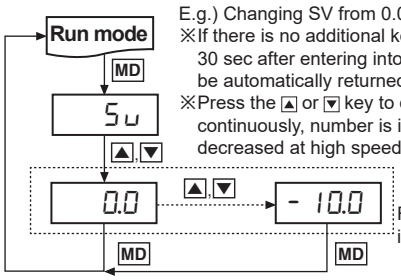
1. **Measured value (PV) display component (red):**
   RUN mode: Displays currently measured value (PV).
   Setting mode: Displays parameter and setting value.
2. **Deviation indicator [▲, ▼ (red)/■ (green)]:**
   Displays deviation of present value (PV) based on setting value (SV).
3. **Compressor (COMP) output indicator:**
   Turns ON for compressor output. Flashes for protection operation, not compressor output.
4. **Defrost (DEF) output indicator:** Turns ON for defrost output. Flashes for defrost delay operation.
5. **Evaporator-fan (FAN) output indicator:**
   Turns ON for Evaporator-fan output. Flashes for delay operation of Evaporator-fan output.
6. **Unit indicator (**℃, ℉**):** Displays temperature unit
7. **MD key:** Used for entering parameter setting group, returning RUN mode, moving parameter or saving SV.
8. **▲, ▼ key:** Used for changing SV of parameter setting.
   Hold the ▲ key for 3 sec in RUN mode to execute/stop manual defrost.

■ Input Type and Range

※1: RTD input type is option.

Input sensor	Temperature range (℃)	Temperature range (℉)
Thermistor (5kΩ)	-40.0 to 99.9	-40 to 212
RTD (DPt100Ω)	-99.9 to 99.9	-148 to 212

■ SV Setting

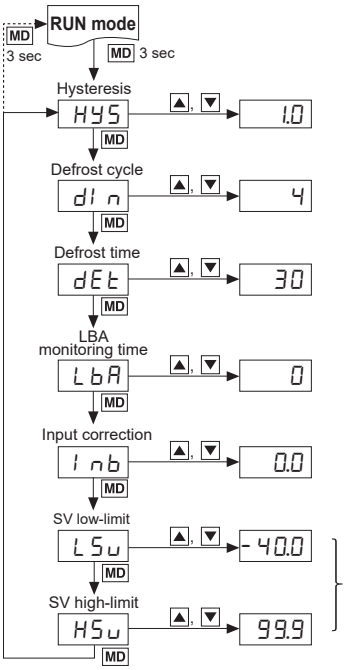


E.g.) Changing SV from 0.0 to -10.0
※If there is no additional key operation within 30 sec after entering into setting mode, it will be automatically returned to RUN mode.
※Press the ▲ or ▼ key to change SV continuously, number is increased/decreased at high speed.

Flashes 0.5 sec in turn

■ Parameter 1 Group

※Press the MD key after checking/changing each parameter to save the SV and it moves to the next parameter.
※Hold the MD key for 3 sec while in setting mode to return RUN mode.



Setting range: 0.5 to 5.0℃, 2 to 50℉

Setting range: 0 to 24 hour
※Setting as [0], only manual defrost is available.

Setting range: 0 to 59 min
※Setting as [0], defrost output does not operate.

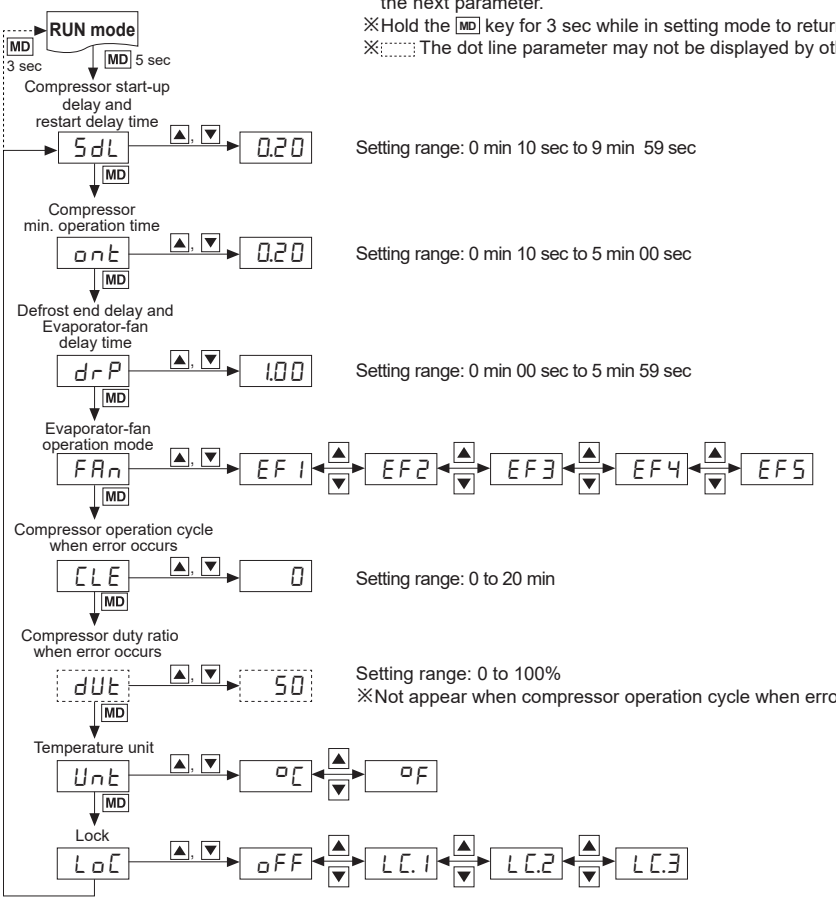
Setting range: 0 to 999 sec
※Setting as [0], LBA function does not operate.

Setting range: -10.0 to 10.0℃, -18 to 18℉

Setting range: Refer to '■ Input Type and Temperature Range '.

■ Parameter 2 Group

※Press the MD key after checking/changing each parameter to save the SV and it moves to the next parameter.
※Hold the MD key for 3 sec while in setting mode to return RUN mode.
※ The dot line parameter may not be displayed by other parameter setting.



Setting range: 0 min 10 sec to 9 min 59 sec

Setting range: 0 min 10 sec to 5 min 00 sec

Setting range: 0 min 00 sec to 5 min 59 sec

Setting range: 0 to 20 min

Setting range: 0 to 100%
※Not appear when compressor operation cycle when error occurs [CLE] is set as [0].

▣ Factory Default

● SV Setting

Parameter	Default
SU	0.0

● Parameter 1 group

Parameter	Default	Parameter	Default
HYS	1.0	Inb	0.0
dIn	4	LSU	40.0
dEt	30	HSU	999
LbA	0		

● Parameter 2 group

Parameter	Default	Parameter	Default
SdL	0.20	CLE	0
ont	0.20	dUt	50
drP	1.00	Unt	°C
FAn	EF1	LoC	oFF

▣ Function

◎ Compressor Protection

This function is for preventing compressor from life cycle shortening or malfunction by overload and frequent ON/OFF of compressor. As compressor protection settings, when compressor output does not ON, the front compressor (COMP) output indicator is flashing.

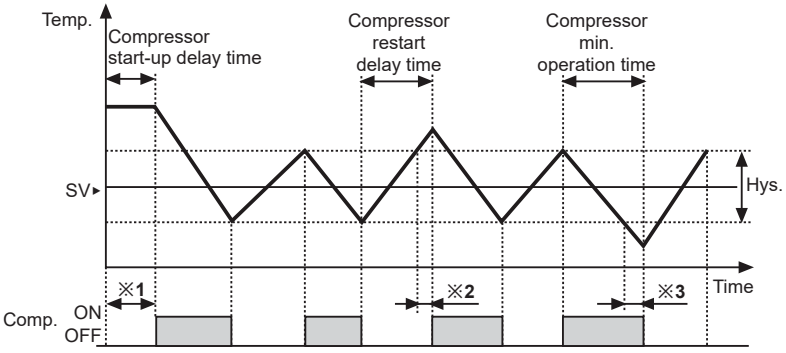
● Compressor start-up delay and restart delay time [SdL]

If power turns ON instantly from break-down or power OFF, it delays start-up during the set time of compressor. To prevent frequent compressor ON/OFF, set compressor ON time after compressor turns OFF.

Setting range: 0 min 10 sec to 9 min 59 sec

● Compressor min. operation time [ont]

To prevent frequent compressor ON/OFF, set min. operation time. Setting range:0 min 10 sec to 5 min 00 sec



※1. When starting compressor, if present value (PV) is out of hysteresis range, compressor output does not turn ON and the compressor (COMP) output indicator is flashing during compressor start-up delay time.

※2. When present value (PV) is out of hysteresis, compressor output does not turn ON and the compressor (COMP) output indicator is flashing during compressor restart delay time.

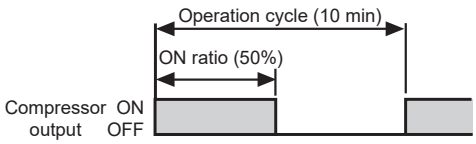
※3. If present value (PV) is below the SV, compressor output maintains ON status during compressor min. operation time. After compressor min. operation time, it turns OFF.

◎ Compressor Control When Error Occur

If normal temperature control is impossible due to error, it controls compressor output by the set operation cycle and duty ratio to protect control object. Until error is cleared, operation cycle and duty ratio are applied repeatedly.

● Compressor operation cycle [CLE], duty ratio [dUt] when error occur

Set Compressor operation cycle and ON duty ration when error occur.
Set operation cycle as [0], and compressor output turns OFF.
Set duty ratio as [100], and compressor output turns ON continuously.
Setting range of compressor operation cycle when error occur: 0 to 20 min
Setting range of compressor duty ratio when error occur: 0 to 100%



E.g.) When compressor operation cycle when error occur [CLE] is set as 10 min and compressor duty ratio when error occur [dUt] is set as 50%, compressor output has 10 min cycle and turns ON for 5 min and turns OFF for 5 min.

◎ Defrost Control

When operating a compressor for a long time, an evaporator and a freezer are freezing and thermal efficiency of compressor is decreased. For increasing thermal efficiency, defrost operation helps to remove frost or ice around of evaporator.
Set defrost cycle, time, etc. to operate defrost (heater defrost).
The front defrost (DEF) output indicator turns ON during defrost output and it flashes during defrost delay operation.

● Defrost cycle [dIn], Defrost time [dEt]

Set defrost cycle and time to operate defrost at every set cycle and during the set time.
Set defrost cycle as [0], only manual defrost is available.
Setting range of defrost cycle: 0 to 24 hour Defrost time Setting range: 0 to 59 min

● Manual defrost

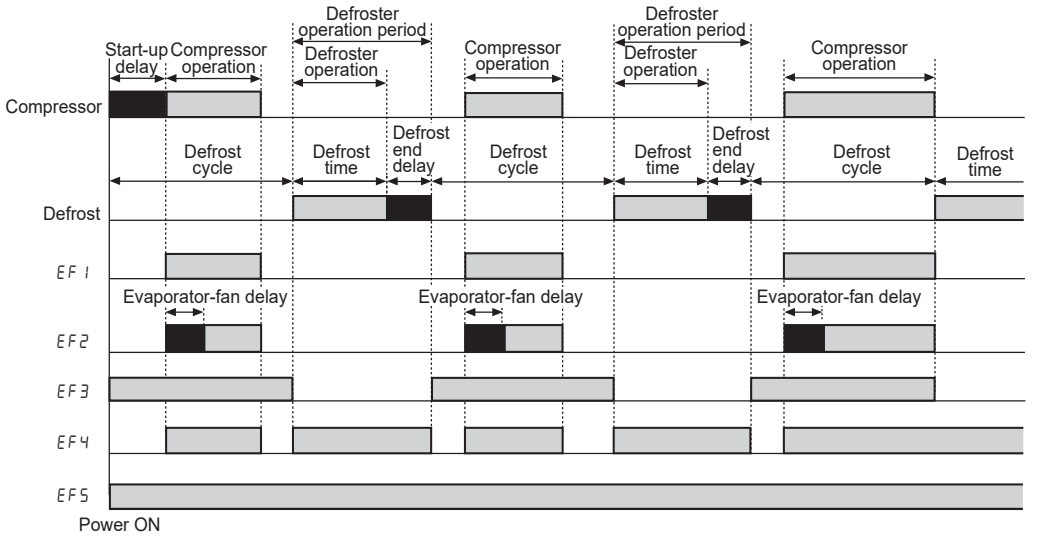
Execute defrost manually regardless of the set defrost cycle. Hold the ▲ key for 3 sec to operate defrost during the set defrost time. When defrost output turns ON, operating compressor output, Evaporator-fan output turn OFF. Hold the ▼ key for 3 sec during manual defrost, applied manual defrost is complete and pre-set defrost cycle restarts.

● Defrost end delay and Evaporator-fan start-up delay time [drP]

Defrost end delay time and Evaporator-fan start-up delay time operate individually bye one setting.
Setting range: 0 min 00 sec to 5 min 59 sec

- Defrost end delay time: During defrost operation, drops may exist at evaporator. Set the time to drain remained drops after completing defrost.
- Evaporator-fan start-up delay time: If evaporator temperature is increased by defrost operation, warm air may flow into cooling system by Evaporator-fan operation. Set Evaporator-fan start-up delay time to prevent warm air inflow, and it may increase cooling efficiency.

◎ Evaporator-fan operation mode



※■: Output does not turn ON but the dedicated indicator flashes at the delay period (compressor, defrost, evaporator-fan).

Parameter	Operation method
EF1	When compressor operates, evaporator-fan also operates. When compressor operation is finished, evaporator-fan also operation turns OFF.
EF2	When compressor operates, evaporator-fan operates after the set evaporator-fan start-up delay time. When compressor operation is finished, evaporator-fan operation turns OFF. (regardless of defroster operation)
EF3	When power turns ON, evaporator-fan operates. When defroster operates, evaporator-fan stops. (regardless of compressor operation)
EF4	Evaporator-fan operates only when operating compressor or defrost. Evaporator-fan stops when compressor and defroster stops. (for above zero temperature control)
EF5	Evaporator-fan operates from power ON to power OFF. (regardless of compressor, defroster operation)

◎ Loop Break Alarm (LBA) [LbA]

When freezer temperature is not changed over 1.0 (2℉) during set LBA monitoring time [LbA] of parameter 1 group, it regards as abnormal compressor and it displays error. (Err↔LbA, flashings in turn) When error occur, compressor is controlled according to the set compressor operation cycle [CLE]and duty ratio [dUt] when error occur. Check the compressor and hold the ▲+▼ keys for 3 sec and error clears and it operates normally.
Setting range: 0 to 999 sec (Setting as [0], LBA function does not operate)

◎ Lock

For preventing changing SV and parameters of each parameter group.

Display	Description
oFF	Unlock
LC.1	Parameter 2 group
LC.2	Locks parameter 1, 2 groups
LC.3	Locks parameter 1, 2 groups, SV setting

◎ Error Display

Flashing in turn	Description	Troubleshooting
Err↔oPn	When input sensor is break or sensor is disconnected.	Check input sensor status.
Err↔HHH	If the measured temperature is higher than high-limit temperature among temperature setting range.	It clears when input is within the display range.
Err↔LLL	If the measured temperature is lower than low-limit temperature among temperature setting range.	
Err↔LbA	Even though input sensor is normal, freezer temperature does not change over 1.0℃ (2℉) during LBA monitoring time [LbA].	Check the compressor and hold the ▲+▼ key at the same time for 3 sec. It clears when input is within the adequate range.

■ Proper Usage

◎ Cautions during use

- Follow instructions in 'Cautions during use'. Otherwise, It may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Install a surge absorber at each end of inductive load coil when controlling high-capacity power relay or inductive load (e.g. magnet).
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- This unit may be used in the following environments.
  ①Indoors
  (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Thumbwheel Switch Setting Type Temperature Controller

■ Features

- Various size as DIN specifications
  (W48×H48, W48×H96, W72×H72, W96×H96mm)
- Various control output (Relay/SSR drive/current)
- Dual setting for simultaneous control for heater and cooler (T4LP)

Please read "Safety Considerations" in operation manual before using.

■ Ordering Information

T 3 S □ - B 4 R P 4 C - N

New※1	**N**	New type
Temperature unit	**C**	℃
	F	℉
Temperature range※4	**0**	-99 to 199℃, -99.9 to 199.9℃
	1	0 to 99.9℃
	2	0 to 200℃, 0 to 200.0℃
	4	0 to 400℃
	8	0 to 800℃/℉
	A	0 to 999℃
	C	0 to 1200℃
	F	600 to 1600℃
Input type※4	**P**	DPt100Ω
	J	J(IC)
	K	K(CA)
	R	R(PR)
Control output※3	**R**	Relay output
	S	SSR drive output
	C	Current output
Power supply	**4**	100-240VAC 50/60Hz
Control method	**B**	ON/OFF control, Proportional control
Alarm/Sub output※3	**No-mark**	None
	A	Alarm output
	S	Sub output
	P	Dual setting output
Size	**S**	DIN W48×H48mm (8-pin plug type)※2
	M	DIN W72×H72mm
	H	DIN W48×H96mm
	L	DIN W96×H96mm
Digit	**3**	999 (3-digit)
	4	9999 (4-digit)
Item	**T**	Temperature Controller

※1: Name plate and connections are different from previous T3/T4 Series.
※2: Sockets (PG-08, PS-08(N)) are sold separately.
※3: Output by Series

Series	T3S	T3H	T3HA	T3HS	T4M	T4MA	T4L	T4LA	T4LP
Control output	●	●	-	-	●	-	●	-	-
Control output+Alarm/Sub output	-	-	●	●	-	●	-	●	-
Dual setting output	-	-	-	-	-	-	-	-	●

※4: Input type and temperature range by Series

Input type			Series / Model	T3S	T3H	T3HA	T3HS	T4M T4MA	T4L T4LA	T4LP
Thermocouples	K(CA)	0 to 400℃	4	●	●	●	●	●	●	●
		0 to 800℃	8	●	●	●	-	●	●	●
		0 to 999℃	A	-	●	●	-	-	-	-
		0 to 1200℃	C	-	-	-	-	●	●	●
	J(IC)	0 to 200℃	2	●	-	-	-	-	-	-
		0 to 400℃	4	●	●	●	●	●	●	●
		0 to 800℉	8	-	●	-	-	-	-	-
	R(PR)	600 to 1600℃	F	-	-	-	-	●	●	●
RTD	DPt 100Ω	-99.9 to 199.9℃	0	-	-	-	-	●	●	-
		-99 to 199℃	0	-	●	●	-	-	-	-
		0 to 99.9℃	1	●	●	-	-	-	-	-
		0 to 200.0℃	2	-	-	-	-	-	-	●
		0 to 200℃	2	●	-	-	-	-	-	-
		0 to 400℃	4	●	●	●	●	●	●	●

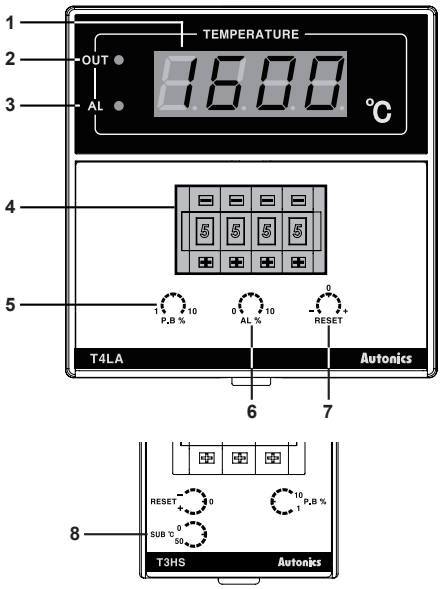
※Please contact us for temperature unit ℉ model.

■ Specifications

Series		T3S	T3H	T3HA	T3HS	T4M	T4MA	T4L	T4LA	T4LP
Power supply		100-240VAC∼ 50/60Hz								
Allowable voltage range		90 to 110% of rated voltage								
Power consumption		Max. 5VA								
Display method		7-segment (red) LED method								
Character size (W×H)		3.8×7.6mm	6.0×10.0mm					8.0×14.2mm		
Input type	RTD	DPt100Ω (Allowable line resistance max.5Ω per a wire)								
	TC	K(CA), J(IC)				K(CA), J(IC), R(PR)				
Display accuracy※1	RTD	●At room temperature (23ºC ± 5ºC): (PV ± 0.5% or ±1ºC, select the higher one) ± 1-digit								
	TC	●Out of room temperature range: (PV± 0.5% or ±2ºC, select the higher one)± 1-digit								
Control output	Relay	OUT1: 250VAC∼ 5A, 30VDC⎓ 5A, 1c, OUT2: 250VAC∼ 2A, 30VDC⎓ 2A, 1c※2								
	SSR	Max. 12VDC⎓±2V 20mA								
	Current	DC4-20mA (resistive load max. 500Ω)								
Alarm/Sub/ Dual setting output		—		250VAC∼ 2A 1c		—	250VAC∼ 2A 1a	—	250VAC∼ 2A 1c	
Sampling period		100ms								
Control method		ON/OFF, Proportional control								
Hysteresis		F.S. 0.5%	F.S. 0.2 to 3% variable							
Proportional band		F.S. 3%	F.S. 1 to 10% variable							
Proportional cycle		20 sec								
RESET range		F.S. -3 to 3% variable								
Relay life cycle	Mechanical	Over 5,000,000 times								
	Electrical	OUT1: Over 100,000 times, OUT2: Over 200,000 times								
Dielectric strength		2,000VAC 50/60Hz for 1min (between input terminal and power terminal)								
Vibration		0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours								
Insulation resistance		Over 100MΩ (at 500VDC megger)								
Noise immunity		Square-wave noise by noise simulator (pulse width 1μs) ±2kV R-phase and S-phase								
Memory retention		Approx. 10 years (when using non-volatile semiconductor memory type)								
Environ-ment	Ambient temperature	-10 to 50℃, Storage: -20 to 60℃								
	Ambient humidity	35 to 85% RH, Storage: 35 to 85% RH								
Weight※3		Approx. 135g (approx. 95g)	Approx. 239g (approx. 176g)			Approx. 246g (approx. 180g)		Approx. 310g (approx. 222g)		

※1: In case of the T3S Series and the decimal point display models
At room temperature (23ºC±5ºC): (PV ±0.5% or ±2℃, select the higher one)±1-digit
Out of room temperature range: (PV ±0.5% or ±3℃, select the higher one)±1-digit
※2: Dual setting output of the T4LP is fixed as relay output and, it is also available as alarm output.
※3: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Unit Description



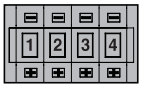
1. Present temperature (PV) display
It displays present temperature.

2. Control output (OUT) indicator
It turns ON when control output is ON.
※In case of the T3S, the upper DOT of last digit flashes.

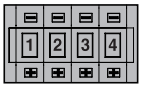
3. Alarm output (AL) indicator
It turns ON when alarm output is ON. (only for alarm output model)
In case of the sub output model (T3HS), the sub (SUB) indicator turns ON when sub output is ON.

4. Set value (SV) thumbwheel switch
Switch for setting temperature.
(-) button: Decreases number, (+) button: Increases number
If the setting is out of the temperature range of temperature sensor, the present temperature (PV) display part flashes 5u.Er and the present value in turn.
※The models which temperature range is 0 (-99.9 to 199.9℃, -99 to 199℃) of temperature sensor DPt100Ω are only set 1↔0↔ (-).
※The dual setting output model (T4LP) has two thumbwheel switches.

LO SET (low set output)



HI SET (high set output)



LO SET (low set output) heating control, HI SET (high set output): cooling control

5. Hysteresis/Proportional width volume switch (except T3S)
ON/OFF control: Setting for hysteresis. [Setting range] F.S. 0.2 to 3% (For T3S, F.S. 0.5% fixed)
Proportional control: Setting for proportional width. [Setting range] F.S. 1 to 10% (For T3S, F.S. 3% fixed)
Proportional cycle: 20 sec fixed

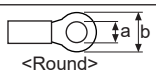
6. Alarm output value volume switch (only for alarm output model)
It sets alarm output value. [Setting range] F.S. 0 to 10%

7. RESET volume switch
In case of proportional control, it sets offset. [Setting range] F.S. -3 to 3%

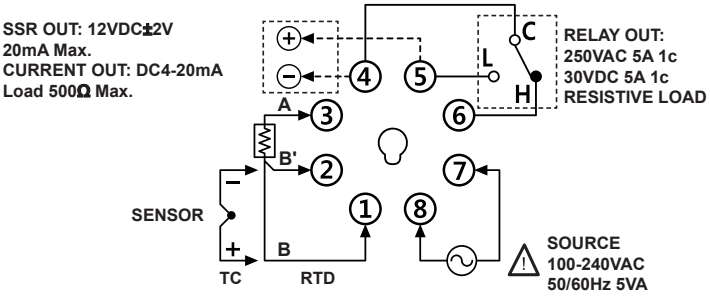
8. Temperature setting of sub output volume switch (only for T3HS)
It sets temperature of the sub output. This output operates as deviation low-limit alarm based on the set sub-output temperature (SV). Setting range: 0 to 50℃

▣ Connections

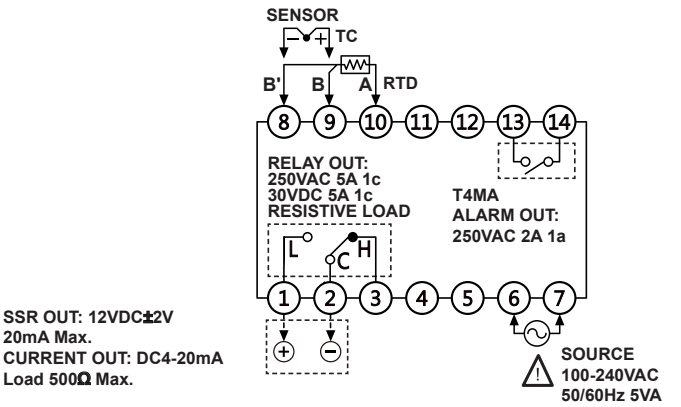
※Use teminals of size specified below.

	 <Round>	 <Forked>
a	Min. 3.5mm	Min. 3.5mm
b	Max. 7.2mm	Max. 7.2mm

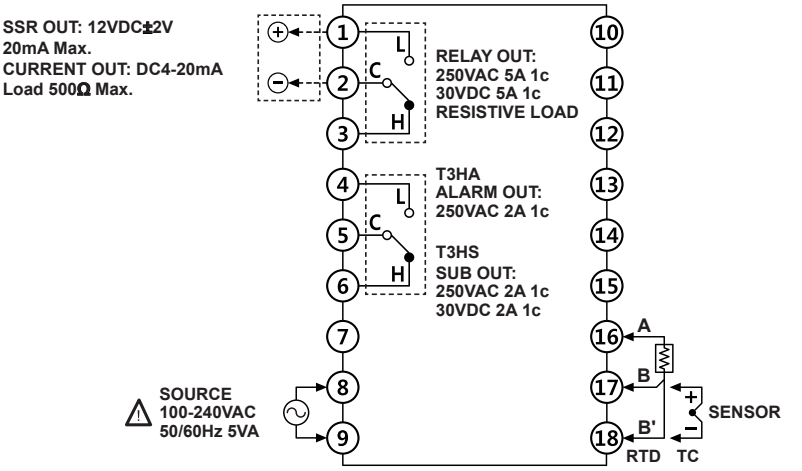
● T3S



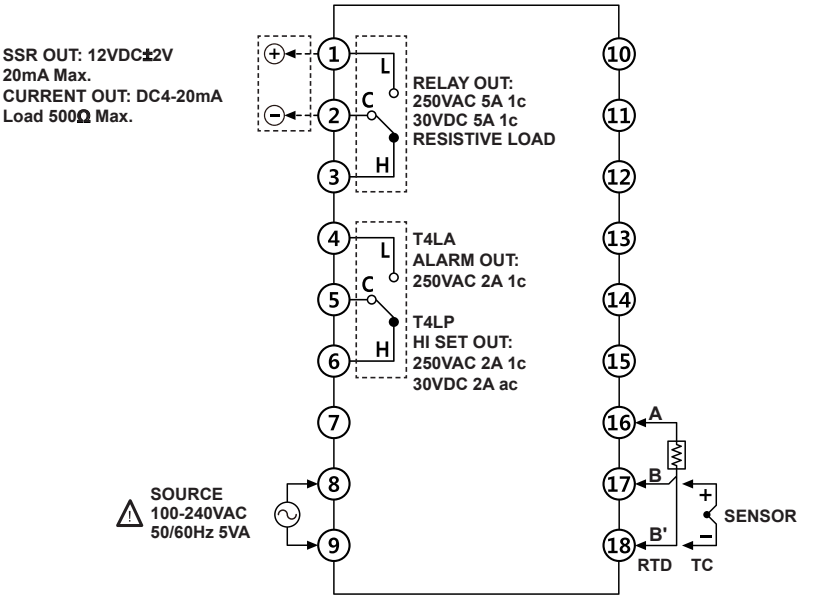
● T4M/T4MA



● T3H/T3HA/T3HS



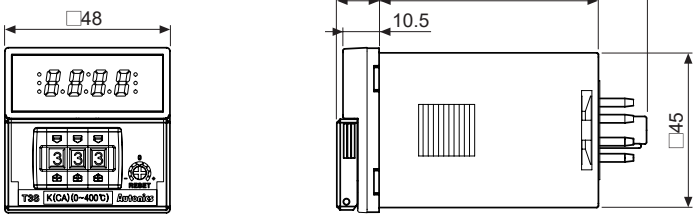
● T4L/T4LA/T4LP



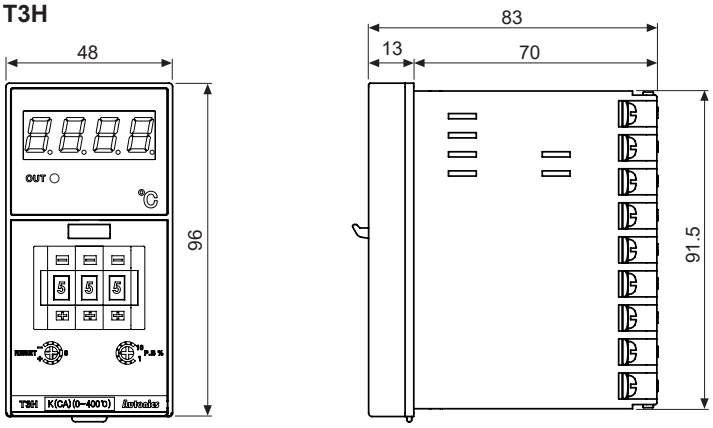
▣ Dimensions

(unit: mm)

● T3S

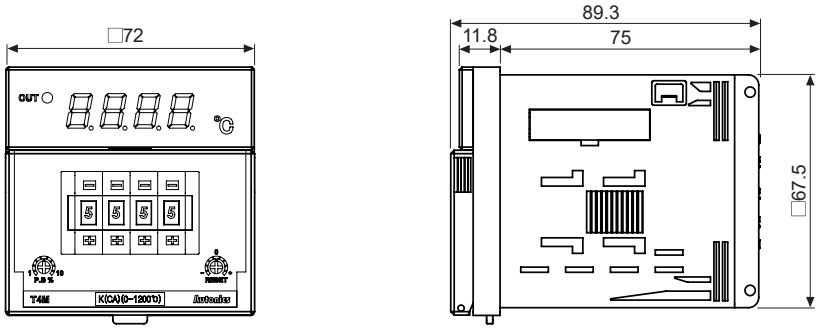


● T3H



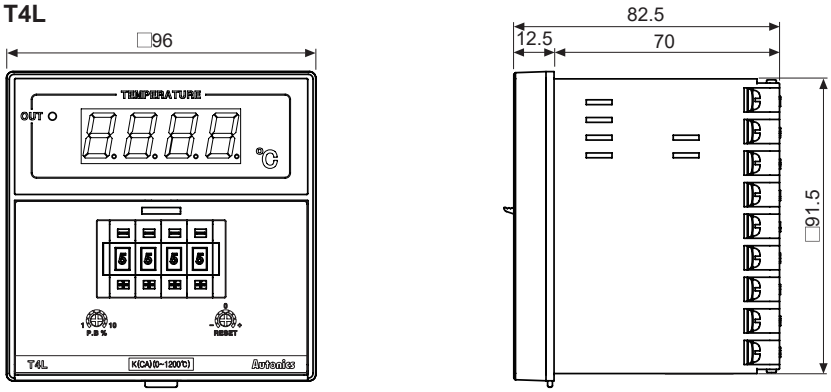
※T3HA, alarm output model, has the alarm output value volume switch.
※T3HS, sub output model, has the temperature setting of sub output volume switch.

● T4M



※T4MA, alarm output model, has the alarm output value volume switch.

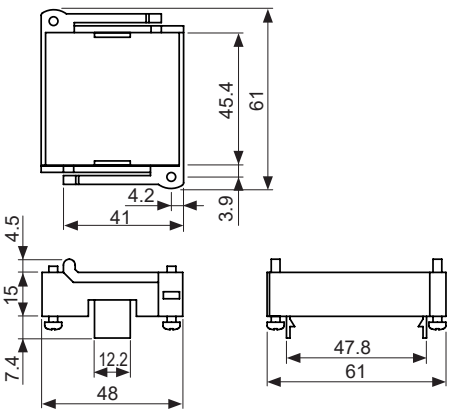
● T4L



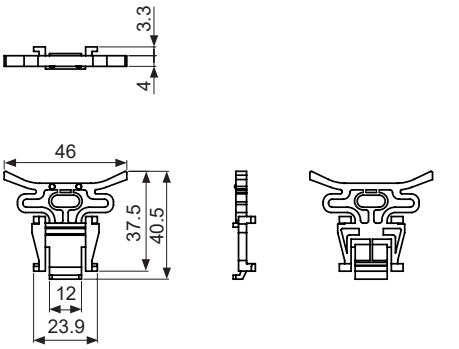
※T4LA, alarm output model, has the alarm output value volume switch.
※T4LP, dual setting output model, has the two thumbwheel switches.

● Bracket

●T3S

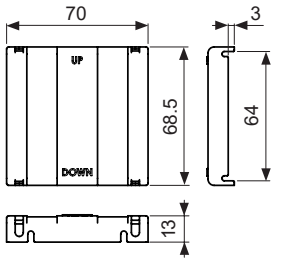


●T3H/T4M/T4L

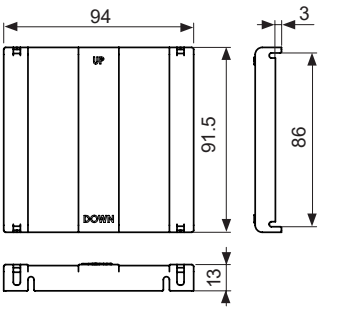


● Terminal cover (sold separately)

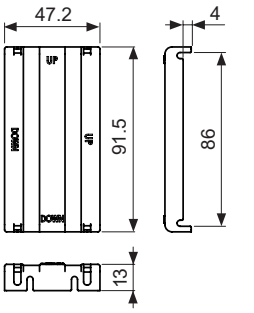
●RMA-COVER (72×72mm)



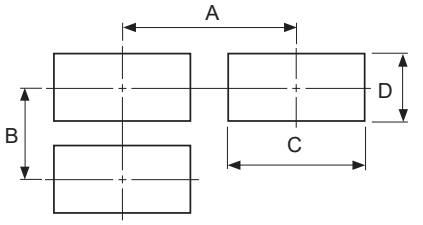
●RLA-COVER (96×96mm)



●RHA-COVER (48×96mm)



●Panel cut-out



Series \ Size	A	B	C	D
T3S	Min. 65	Min. 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
T3H	Min. 65	Min. 115	$45^{+0.6}_{0}$	$92^{+0.8}_{0}$
T4M	Min. 90	Min. 90	$68^{+0.7}_{0}$	$68^{+0.7}_{0}$
T4L	Min. 115	Min. 115	$92^{+0.8}_{0}$	$92^{+0.8}_{0}$

▣ Function

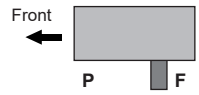
1. Control method

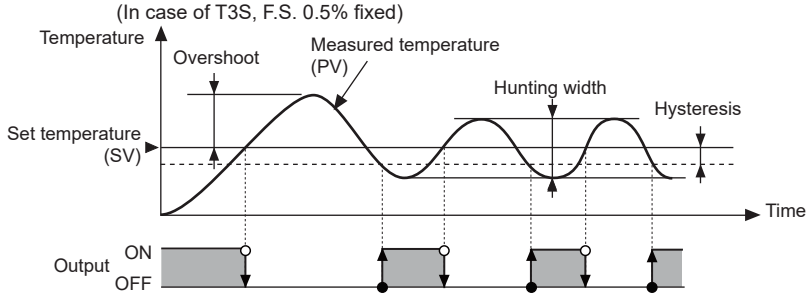
1)ON/OFF control

Comparing the present measured temperature and the set temperature, the temperature controller turns ON/OFF of the load power. Interval between ON and OFF of control output is set by the set hysteresis. When hysteresis of control output is too narrow, hunting (overshoot, chattering) may occur by external noise.

[Setting range of Hysteresis] F.S. 0.2 to 3%
(In case of T3S, F.S. 0.5% fixed)

※Control method setting switch

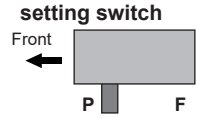


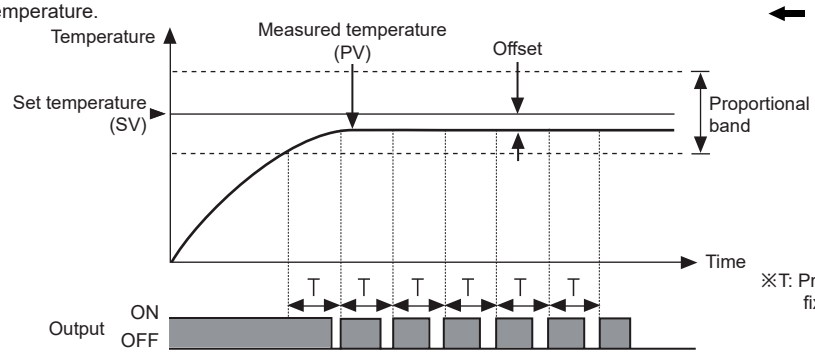


2)Proportional control

Proportional control has control output which is proportional to deviation from the present temperature to the set temperature in the proportional band to the set temperature.

※Control method setting switch





※T: Proportional band is fixed as 20 sec.

It is available to control without overshoot or hunting comparing ON/OFF control but it may cause offset. Correct the offset with the RESET volume switch.

[Setting range of Proportional band] F.S. 1 to 10% (In case of T3S, F.S. 3% fixed)

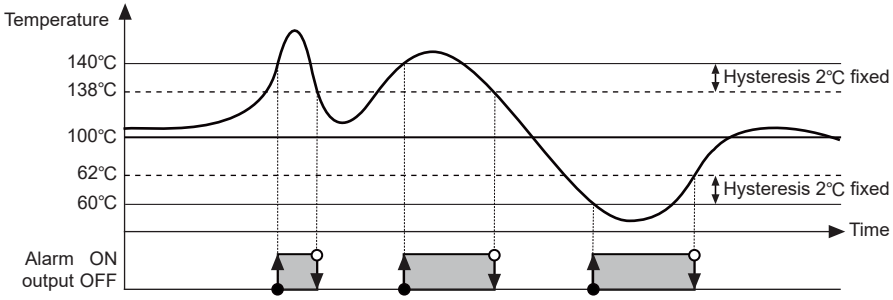
[Setting range of RESET] F.S. -3 to 3%

2. Alarm output

Alarm temperature is applied to the high/low-limit based on the set temperature. Alarm output operates deviation high/low-limit.

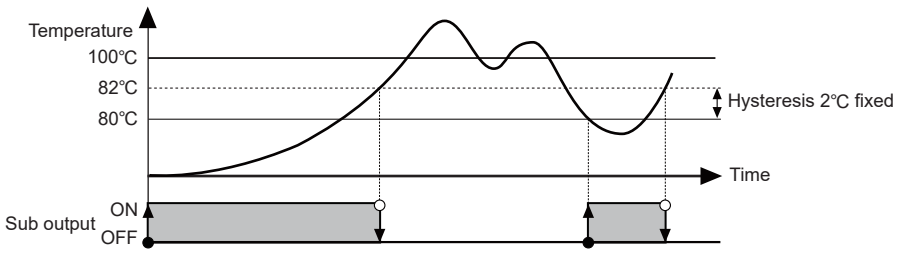
Setting range of Alarm temperature: F.S. 0 to 10%

E.g.) When F.S. is 400℃ and max. alarm temperature (F.S. 10%) is 40℃.
When the set temperature is set as 100℃, alarm output operation range is 140℃ to 60℃.



3. Sub output (Only for T3HS)

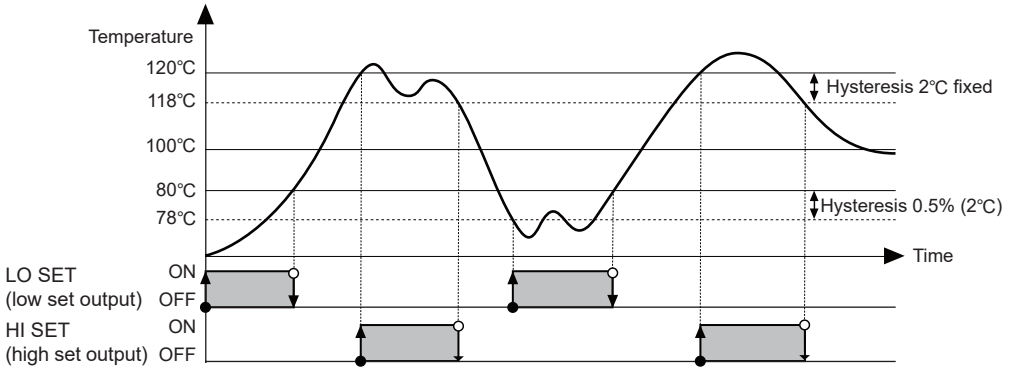
Only the T3HS model has sub output. This output operates as deviation low-limit alarm.
[Setting range of Sub output]: 0 to 50℃
E.g.)Set temperature is set as 100℃ and sub-output is set as 20℃



4. Dual setting output (Only for T4LP)

Only the T4LP model has dual setting output.
-LO SET (low set output: ON/OFF control (Hysteresis: F.S. 0.2 to 3%),
Proportional control (Proportional band: F.S. 1 to 10%)
-HI SET (high set output): Absolute value high-limit alarm output (Hysteresis: 2℃ fixed)
E.g.)T4LP, temperature sensor: DPt100, temperature range: 0 to 400℃

Type	Set temperature	Output	Hysteresis
LO SET (low set output)	80℃	ON/OFF control	0.5% (400×0.5%=2℃)
HI SET (High set output)	120℃	Absolute value high-limit alarm output	2℃ (fixed)



▣ Display When Power Is ON

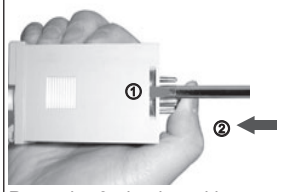
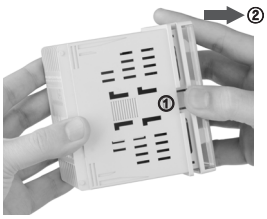
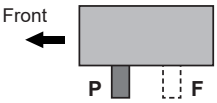
When power is supplied, whole display parts turn ON for 1 sec. It displays model type (digits, size, alarm/sub output and control output, sensor, temp. range, unit). Afterward, it returns to RUN mode.

Whole parts turn ON	→	Displays digits, size, alarm/sub output	→	Displays control output, sensor, temp. range, unit	→	RUN mode	
8.8.8.8.		t.35.8.		r.P4C.		oPEn When input sensor break/sensor is not connected	0.200 Normal operation

When input sensor break/sensor is not connected, it displays [oPEn]. In case of normal operation, it displays the present input temperature and controls temperature.
※**During displaying model type, control output does not operate.**

■ Control Method (ON/OFF, Proportional Control) Setting

Before supplying power, remove the case and set the control method by the control method setting switch.

T3S	Other Series	Control method setting switch
 Press the 8-pin plug with your thumb. Insert a flat head driver to the ① groove and uplift the case (same as the other side). Push it to the ② direction and the case is removed.	 Press the ① with your thumb. Pull the case to the ② direction and it is removed.	 P: Proportional control (default) F: ON/OFF control

■ Error Display and Output Operation

●: ON
○: OFF

Display	Description	Control output※1	Alarm output	Sub output	Dual output	Troubleshooting
oPEn	Flashes when a temperature sensor is broken or not connected.	○	●	○	●	Check the status of the temperature sensor. When the sensor is connected correctly, it is clear.
HHHH	Flashes when the measured input value is higher than the temperature range of the sensor.	○	●	○	●	When the measured temperature is within the temperature range of the sensor, it is clear.
LLLL	Flashes when the measured input value is lower than the temperature range of the sensor.	●	●	●	○	
Su.Er※2	Flashes with the present value when the set value is out of the temperature range of the sensor.	○	○	○	○	The set value should be within the temperature range of the sensor.

※1: T4LP (Dual setting output) is the single output.
※2: When Su.Er and oPEn / HHHH/LLLL occur at the same time, Su.Er and oPEn / HHHH/LLLL flash in turn and all output turns OFF.

5-CH Temperature Indicator

▣ Features

- Indication type only
- High accuracy measurement: F.S. ±0.5%
- 5-Point temperature measurement
- Automatic or manual display of temperature in each point

⚠ **Please read "Caution for your safety" in operation manual before using.**

▣ Ordering Information

T	4	W	M	—	N	3	N	P	4	C

Item	T	Temperature Controller
Digit	4	9999 (4-digit)
Size	W	DIN W96×H48mm
Input	M	5-Point Indicator
Control method	N	No control
Power supply	3	110/220VAC 50/60Hz
Control output	N	No output
Sensor input type	P	DPt100Ω
	J	J(IC)
	K	K(CA)
Temperature range	0	-99.9 to 199.9
	4	0 to 399
	5	0 to 500
	C	0 to 1200
Unit	C	℃

※ **Please check the range of temperature when select model.**

▣ Temperature Range For Each Sensor

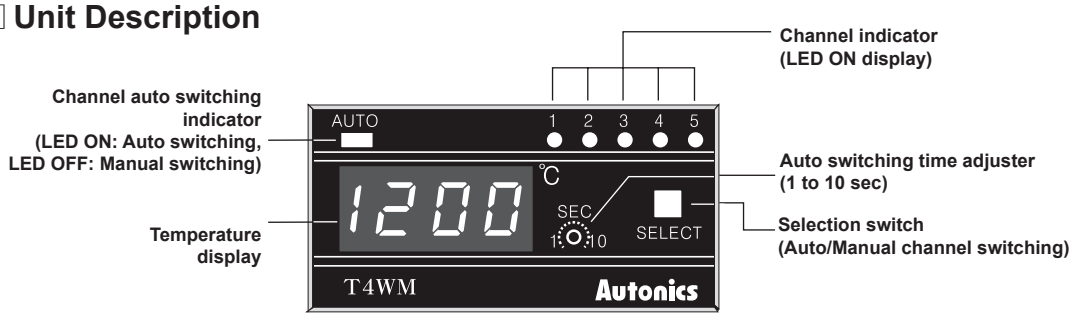
Model	T4WM		
Sensor input type	Thermocouples		RTD
	J(IC)	K(CA)	DPt100Ω
Standard scale range	(℃) 1600, 1200, 1000, 800, 600, 400, 200, 100, 0, -100		
	500℃	1200℃	399℃, 199.9℃, -99.9℃

■ Specifications

Series		**T4WM**
Power supply		110/220VAC 50/60Hz
Allowable voltage range		90 to 110% of rated voltage
Power consumption		Max. 3VA
Display method		7-segment LED method
Character size (W×H)		9.8×14.2mm
Display accuracy		F.S. ±0.5% rdg ±1-digit
Input sensor		Thermocouples: K(CA), J(IC) / RTD: DPt100Ω
Input line resistance		Thermocouples: Max. 100Ω / RTD: Allowable line resistance max. 5Ω per a wire
Connectable sensors		5 (thermocouple, RTD are not used as mixed)
Channel switch		Selectable Auto/Manual switching
Auto switching time		Variable 1 to 10 sec (by built-in adjuster)
Insulation resistance		Over 100MΩ (at 500VDC megger)
Dielectric strength		2,000VAC 50/60Hz for 1 min
Noise immunity		±1kV the square wave noise (pulse width: 1μs) by the noise simulator
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times
Environment	Ambient temperature	-10 to 50℃, storage:-25 to 65℃
	Ambient humidity	35 to 85%RH
Unit weight		Approx. 322g

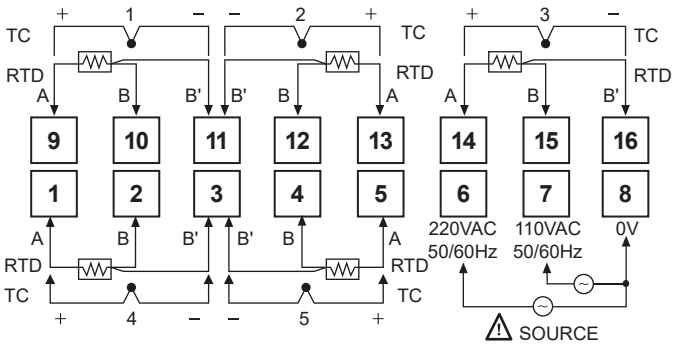
※Environment resistance is rated at no freezing or condensation.

■ Unit Description



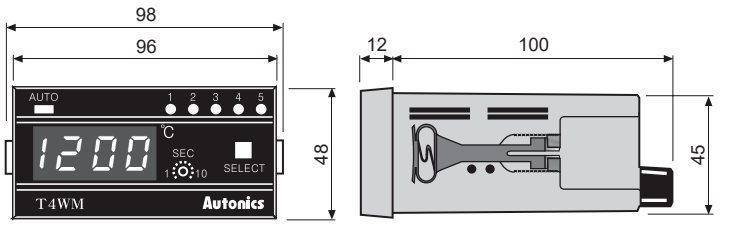
■ Connections

※RTD: DPt100Ω (3-wire type) ※Thermocouple: K(CA), J(IC)

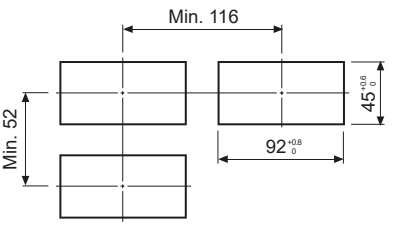


▣ Dimensions

(unit: mm)



● **Panel cut-out**



▣ Channel Switching

◎ Auto/Manual channel switching

Auto switching	Select switch	Manual swithcing
When pressing this for 3 sec and the channel auto switching indicator turns ON and channels switch automatically. (AUTO LED: ON)		When press this once, the channel indicator turns ON and channels switch manually (AUTO LED: OFF)

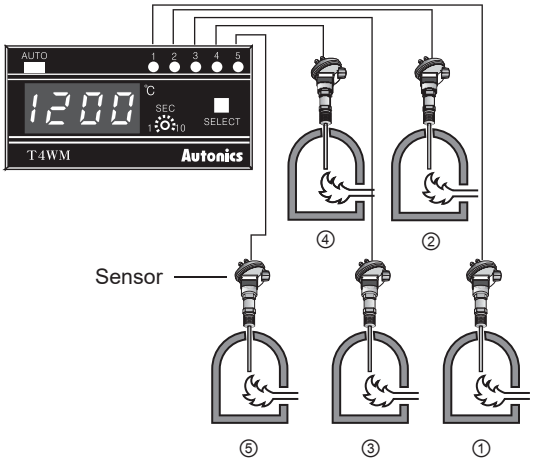
◎ Auto channel switching

- The temperature of each channel is displayed during auto switching time and switching to the next channel automatically.
- Auto switching time is variable up to 10 sec by the front adjuster.
- When it is auto channel switching, the channel auto switching indicator turns ON.

◎ Manual channel switching

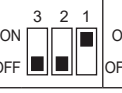
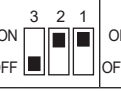
Whenever touching selection switch (SELECT), channel switches.

When a channel indicator turns ON, the temperature of the channel is displayed and whenever touching the switch, it moves to next channel.



▣ Selection Of Input Sensor Number By Internal DIP Switch

Max. 5 different sensors can be connected but do not use thermocouple and RTD together.

Sensor	2	3	4	5
DIP switch				

▣ Memory Protection

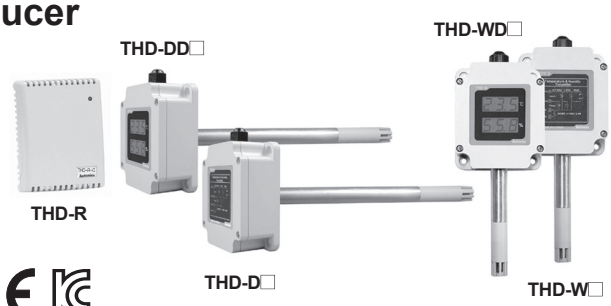
When the power fails, the data value will be protected for 3 months. (The battery must be charged fully.)

Room/Wall Mount/Duct Mount Type Temperature/HumidityTransducer

▣ Features

- Compact design
- Built-in temp./humidity sensor
- 7 Segment LED Display (THD-DD/THD-WD)
- Various output modes
  DC4-20mA, 1-5VDC, RS485 (Modbus RTU)
- Wide range of temp./humidity measurement
  -19.9 to 60.0℃ / 0.0 to 99.9%RH
- Communication speed: 115200bps

Please read "Safety Considerations" in operation manual before using.



(only for THD-□-T model)

▣ Ordering Information

THD — D D 1 — C

Output	PT※	DPt100Ω resistance value (Temp.)
	PT/C※	DPt100Ω resistance value (Temp.) / Current output (Humidity)
	C	Current output (Temp./Humidity)
	V	Voltage output (Temp./Humidity)
	T	RS485 communication output (Temp./Humidity)
Length of sensor pole	No mark※	Built-in
	1	100mm
	2	200mm
Display	No mark	Non-Display type
	D	Display type
Mounting	R	Room type (for indoor)
	D	Duct mounting type
	W	Wall mounting type
Item	THD	Temperature Humidity Double

※It is only for THD-R.

▣ Specifications

Model		THD-R-PT	THD-R-PT/C	THD-R-C THD-R-V THD-R-T	THD-D□-□ THD-W□-□	THD-DD□-□ THD-WD□-□
Power supply		—	24VDC⎓			
Allowable voltage range		—	90 to 110% of rated voltage			
Power consumption		—	Max. 2.4W			
Sensor type		Temperature sensor	Temperature/Humidity sensor			
Display type		Non-indicating type				7-segment LED display
Display digit		—				Each 3 digits for temp./humidity
Character size		—				W6.2×H10.0mm
Measurement range	Temp.	-19.9 to 60.0℃				
	Humidity	—	0.0 to 99.9%RH (THD-R is required to attend for using over 90%RH.)			
Accuracy※1	Temp.	Max. ±0.8℃	±1.0℃ (at room temperature)			
	Humidity	—	±3%RH (30 to 70%RH, at room temp.), ±4%RH (10 to 90%RH)		Typ. ±2%RH (10 to 90%RH, at room temp.) ※Max. ±2.5%RH	
Output	Temp.	DPt100Ω resistance value (TCR: 3850ppm/℃)		DC4-20mA(allowable impedance: max. 600Ω), 1-5VDC⎓, RS485 communication (Modbus RTU)		
	Humidity	—	DC4-20mA (allowable impedance: max. 600Ω)			
Resolution		—	1/1000			
Sampling cycle		—	0.5 sec			
Insulation resistance		—	Over 100MΩ (at 500VDC megger)			
Dielectric strength		—	500VAC 50/60Hz for 1 minute			
Noise immunity		—	±0.3kV the square wave noise (pulse width: 1μs) by the noise simulator			

※1: •Room temperature is 23℃±5℃.
•It may cause degree of degradation when this unit is exposed to organic chemicals such as alcohol gas or sulfuric acid.
•It may cause degree of degradation for humidity when using this unit at high temperature/humidity environment for a long time.
•It may cause error of humidity value when this unit is exposed to high humidity environment (over 80%RH) for a long time.

▣ Specifications

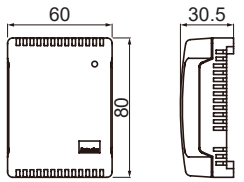
Model		THD-R-PT	THD-R-PT/C	THD-R-C THD-R-V THD-R-T	THD-D□-□ THD-W□-□	THD-DD□-□ THD-WD□-□
Vibration	Mechanical	—	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour			
	Malfunction	—	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min			
Shock	Mechanical	—	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times			
	Malfunction	—	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times			
Protection structure		IP10			IP65 (except sensing part)	
Ambient temperature		-20 to 60℃, storage: -20 to 60℃				
Cable		—			Ø4mm, 4-wire, Length: 2m (AWG22, Core diameter: 0.08mm, number of cores: 60, insulation out diameter: Ø1.25mm)	
Approval		CE, KC (only for THD-□-T model)				
Weight※2		Approx. 98g (approx. 55g)			Approx. 415g (approx. 160g)	

※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

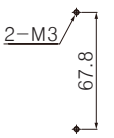
▣ Dimensions

(unit: mm)

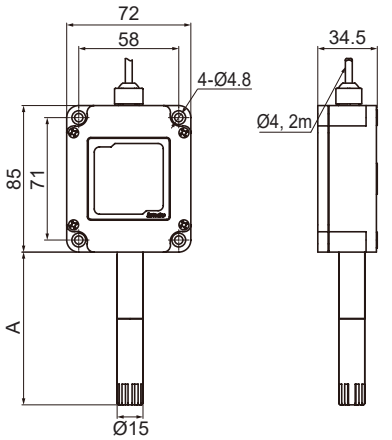
● **THD-R**



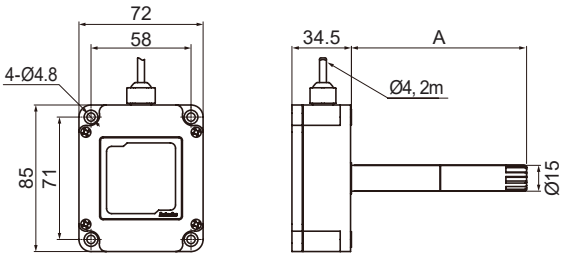
●**Panel cut-out**



● **THD-W**

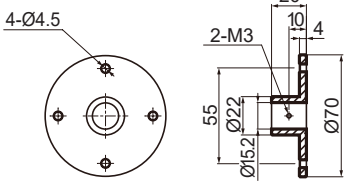


● **THD-D**

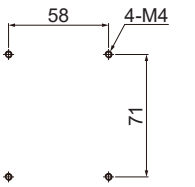


Model	Length of sensor pole (A)
THD-□1-□	100mm
THD-□2-□	200mm

● **Bracket**

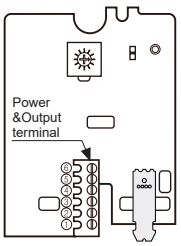


●**Panel cut-out**



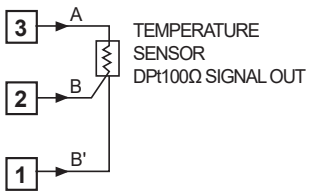
▣ Connections

◎ THD-R

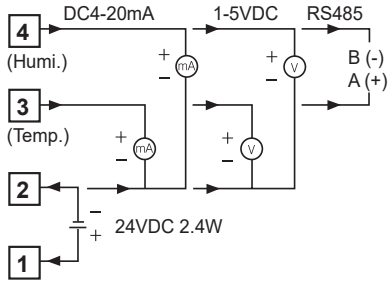


※Check the terminal connection diagram and be sure that when connecting the power.

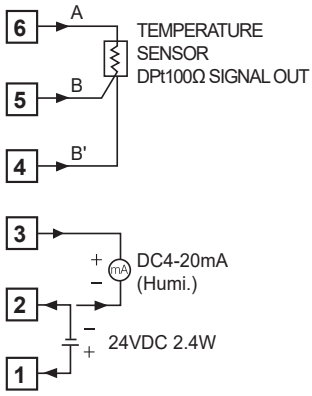
● THD-R-PT



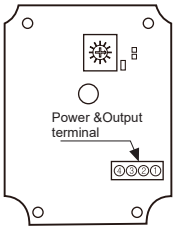
● THD-R-C, V, T



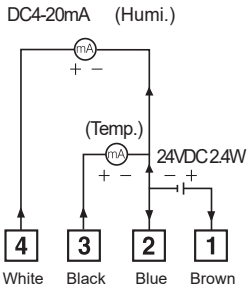
● THD-R-PT/C



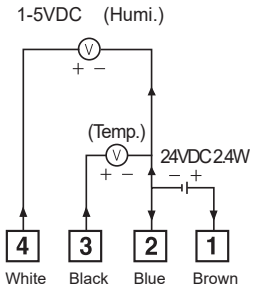
◎ THD-D / THD-W



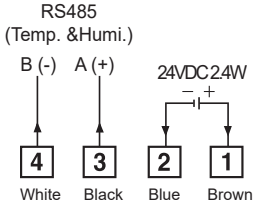
● THD-D-C / THD-W-C



● THD-D-V / THD-W-V



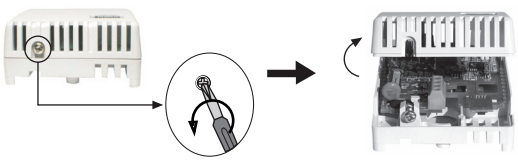
● THD-D-T / THD-W-T



▣ Case Detachment

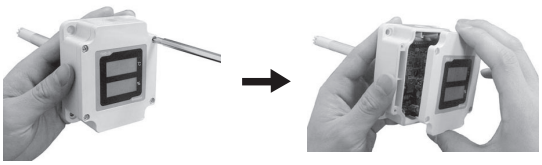
● THD-R

Unfasten the bolt on the bottom of the product, separate the case from it.



● THD-D / THD-W

Unfasten 4 bolts on the top of the product, separate the case cover from it.



▣ Functions

◎ Voltage output

It transmits current temperature/humidity to other devices (PC, recorder, etc.) and outputs 1-5VDC.
It outputs 1VDC at -19.9℃ of temperature and 0%RH of humidity, 5VDC at 60℃ of temperature and 99.9%RH of humidity.
The temperature and humidity output are separated and the resolution is divisible by 1,000.

◎ Current output

It transmits current temperature/humidity to other devices (PC, recorder, etc.) and outputs DC4-20mA.
It outputs DC4mA at -19.9℃ of temperature and 0%RH of humidity, DC20mA at 60℃ of temperature and 99.9%RH of humidity. The temperature and humidity output are separated and the resolution is divisible by 1,000.

◎ DPt 100Ω resistance value output

It transmits current temperature to other devices (recorder, thermometer, etc.). It outputs 100Ω at 0℃ and 119.40Ω at 50℃. (Temperature coefficient(TCR)=3850 ppm/℃)

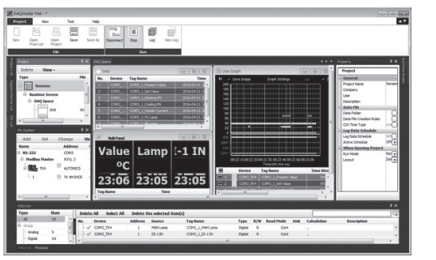
▣ Comprehensive Device Management Program [DAQMaster]

- DAQMaster is comprehensive device management program for convenient management of multiple device data monitoring.
- Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



▣ Sold Separately

◎ Communication converter

- **SCM-WF48**
  (Wi-Fi to RS485·USB wireless communication converter)

- **SCM-US48I**
  (USB to RS485 converter)

- **SCM-38I**
  (RS232C to RS485 converter)

◎ Display units (DS/DA-T Series)

- **DS/DA-T Series**
  (RS485 communication input type display unit)

DS16-□T

DS22/DA22-□T

DS40/DA40-□T

DS60/DA60-□T

※Connect RS485 communication input type display unit (DS/DA-T Series) and RS485 communication output model of THD Series, the display unit displays present value of the device without PC/PLC.

▣ RS485 Communication Output

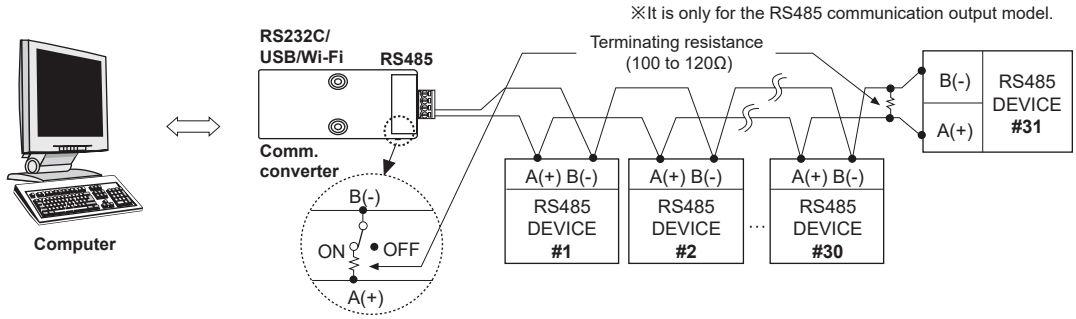
It is output transmit current temperature and humidity to other devices by communication.

◎ Interface

Comm. protocol	Modbus RTU
Connection type	RS485
Application standard	Compliance with EIA RS485
Max. connection	31units (address: 01 to 31)
Synchronous method	Asynchronous
Comm. method	Two-wire half duplex
Comm. distance	Max. 800m
Comm. speed	1200 to 115200bps (selectable)
Start bit	1-bit (fixed)
Data bit	8-bit (fixed)
Parity bit	None (fixed)
Stop bit	1-bit (fixed)

※It is not possible to change parameter related to communication of THD under the communication with high order system.
(At communication status, THD and upper system are available to change the address.)
※Match the parameter of THD communication to be same as the high order system.
※It is not allowed to set overlapping communication address at the same communication line.

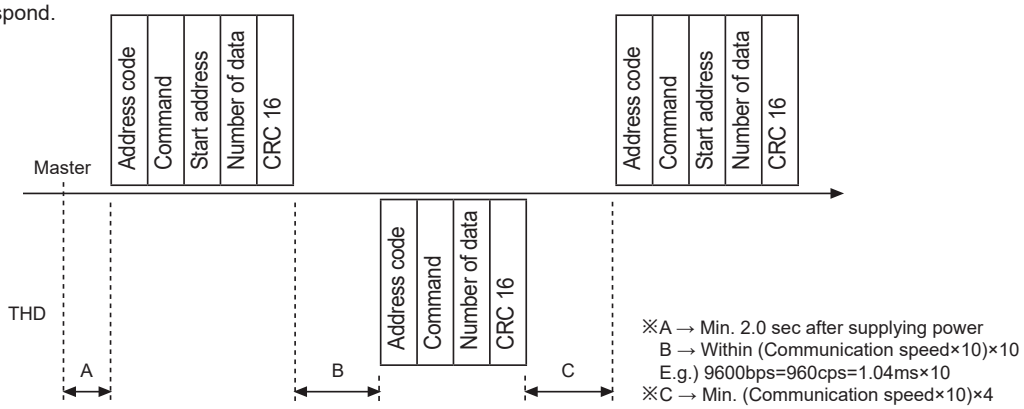
◎ Application of system organization



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately).
Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

◎ Ordering of communication control

- The communication method is Modbus RTU.
- After 2.0 sec being supplied the power into master system, it is able to start communication.
- The initial communication is started by master system. When a command comes out from the master system, THD will respond.



※A → Min. 2.0 sec after supplying power
B → Within (Communication speed×10)×10
E.g.) 9600bps=960cps=1.04ms×10
※C → Min. (Communication speed×10)×4

● Communication command and block

The format of query and response.

Query

Address code	Command	Start address	Number of data	CRC16

Calculation range of CRC16

①Address code: This address code is for identifying THD by master system and able to set within range of 01 to 31.
②Command: Read command for input register
③Start address: The start address of input register to read (Start address). It is available to select 0000 and 0001 for start address. 16bit data in the address 0000 indicates temperature value, 16bit data in the address 0001 indicates humidity value. (Refer to Modbus Mapping table.)
④Number of data: The number of 16bit data from start address (No. of Points). When start address is 0000, it is available to read 2 of 16 bit data, or when start address is 0001, it is available to read 1 of 16 bit data.
⑤CRC16: Checksum for checking the whole frame and it is used for more reliable transmit/receive to check the error between transmitter and receiver.

Response

Address code	Command	Number of data	Temperature data	Humidity data	CRC16

Calculation range of CRC16

①Address code: This address code is for identifying THD by master system and able to set within range of 01 to 31.
②Command: A response for read command of input register
③Number of data: The number of 8 bit data to send from start address (No. of bytes). When start address is 0000, it is available to read 4 of 8 bit data, or when start address is 0001, it is available to read 2 of 8 bit data.
④Temperature data: This is the value of 16bit. To get a current temperature value, divide read value by 100.
E.g.)When read data is 0×09B0, decimal value is 2480, the current value is 2480/100=24.80℃.
⑤Humidity data: This is the value of 16bit. To get a current humidity value, divide read value by 100.
E.g.)When read data is 0×0B68, decimal value is 2920, the current value is 2920/100=29.20%RH.
⑥CRC16: Checksum for checking the whole frame.

● Application for communication command

(Query): Address code (01), Start address (0000), The number of 16 bit data to read (2) CRC16 (0x71CB)

01	04	00	00	00	02	71	CB
Address code	Command	Start address		Amount of data		CRC16	
		High	Low	High	Low	High	Low

(Response): Address code (01), The number of 8 Bit data to read (4), Temperature (0x09B0), Humidity (0x0B68) CRC (0x94DE)

01	04	04	09	B0	0B	68	94	DE
Address code	Response command	Amount of data	Temperature data		Humidity data		CRC16	
			High	Low	High	Low	High	Low

● Error processing (slave → master)

1. Not supported command

01	8X	01	XX	XX
Address code	Response command	Exception code	CRC16	

※Set a received highest bit and send it to response command and exception code 01.

2. The start address of queried data is inconsistent with the transmittable address or the requested number of data is bigger than the transmittable address.

01	84	02	C2	C1
Address code	Response command	Exception code	CRC16	

※Set a received highest bit and send it to response command and exception code 02.

◎ Setting communication speed

1) Turn off the power of the unit.
2) Set SW1 to 0 and apply the power.
3) Operation indicator LED is flashing.
4) Set a communication speed after choose SW1 within the range 1 to 8 and hold it for 3 sec.
5) After setting a communication speed, the LED will be ON. At the moment turn OFF the power.

※Factory default communication speed is 9600bps.

<Setting table for communication speed (bps)>

SW1	Communication speed (bps)
1	1200
2	2400
3	4800
4	9600
5	19200
6	38400
7	57600
8	115200

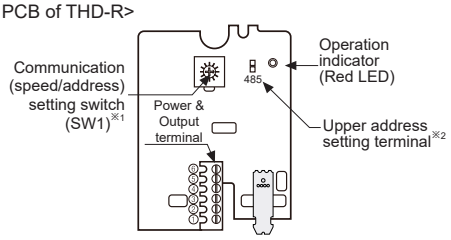
◎ Change the communication address

1) Set Upper address setting terminal and SW1 at new address, apply the power.
2) The communication address is changed automatically.

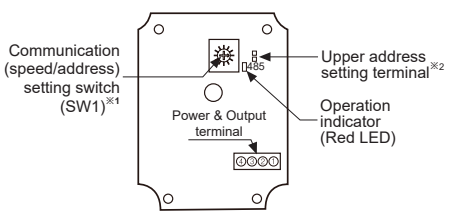
※Factory default communication address is 01. (SW1: 1, Upper address setting terminal: Open)
※Setting table of communication address

Upper address setting terminal	SW1	Add no.	Upper address setting terminal	SW1	Add no.
OPEN	1	01	SHORT	0	16
OPEN	2	02	SHORT	1	17
OPEN	3	03	SHORT	2	18
OPEN	4	04	SHORT	3	19
OPEN	5	05	SHORT	4	20
OPEN	6	06	SHORT	5	21
OPEN	7	07	SHORT	6	22
OPEN	8	08	SHORT	7	23
OPEN	9	09	SHORT	8	24
OPEN	A	10	SHORT	9	25
OPEN	B	11	SHORT	A	26
OPEN	C	12	SHORT	B	27
OPEN	D	13	SHORT	C	28
OPEN	E	14	SHORT	D	29
OPEN	F	15	SHORT	E	30
—	—	—	SHORT	F	31

<Inner PCB of THD-R>



<Inner PCB of THD-D/THD-W>



※1. Only when communication setting, remove the case cover and adjust the communication setting switch to set address and communication speed.
※2. Short terminal as upper address setting terminal, the lower address setting is available.

◎ Modbus mapping table

Address	Item	Remark
300001 (0000)	Temperature value	Temperature value × 0.01
300002 (0001)	Humidity value	Humidity value × 0.01

※Visit our website (www.autonics.com) to download monitoring program for RS485 communication output.

▣ Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- 24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Do not overlapping communication line and power line. Use twisted pair wire for communication line and connect ferrite bead at each end of line to reduce the effect of external noise.
- Do not touch TDH-W/D sensor part at the bottom of the sensor pole by hands.
  It may cause malfunction.
- THD-R must be installed on the wall.
  It may cause malfunction.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- This unit may be used in the following environments.
  ①Indoors
  (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Temperature Transmitters with HART Protocol

▣ Features

- HART protocol
- Display rotation in 330 ° range
- Better visibility with supporting backlight function
- Various inputs (to order, select one from 22 kinds)
  - RTD 8 types
  - Thermocouple 8 types
  - mV 8 types
  - Resistor 2 types
- Explosion-proof specification: Ex D IIC T6
- Protection structure: IP67 (IEC standard)

Please read "Safety Considerations" in the instruction manual before using.

HART® FIELD COMMUNICATIONS PROTOCOL

▣ Ordering Information

KT — 502H 0 (-270 to 1372, K)※1

① ②

Item	Description			
①Mounting bracket	0	Without bracket	1	With bracket
②User temperature range	※1: To order this unit, write the temperature sensor type and the temperature range.			

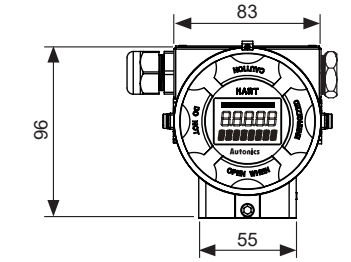
▣ Specifications

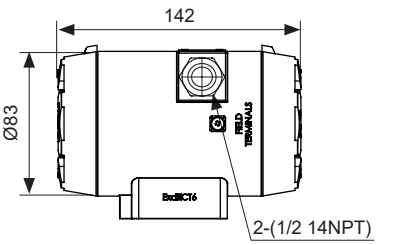
Model		KT-502H
Power supply		10.5-45VDC⎓ (with backlight LCD)
Display method		PV display part: 7-segment 5-digit (character size: W4×H8mm), Parameter display part: 14-segment 8-digit (character size: W2.6×H4.8mm), 52-bar meter
Display range		-19999 to 99999
Setting method		HART-protocol (no setting key)
Response time		1 sec
Input type	RTD	DPt100Ω, DPt500Ω, DPt1000Ω, Ni100Ω, Ni500Ω, Ni1000Ω, Cu50Ω, Cu100Ω
	Thermocouple	K, J, T, E, N, S, B, R
	Resistance transmission (Ω)	0 - 400Ω, 0 - 2000Ω
	Voltage transmission (mV)	−10 - 75mV, −100 - 100mV, −100 - 500mV, −100 - 2000mV
Output		DC4-20mA (2-wire)
Accuracy		±0.3%
Alarm		Below 3.8mA, Over 20.5mA/Sensor break 3.6mA
Load		Max.(V power supply - 7.5V)/0.22A
Galvanic insulation		2,000VAC (input/output)
Environment	Ambient temperature	-20 to 70℃, storage: 20 to 80℃
	Ambient humidity	0 to 85%RH, storage: 0 to 85%RH
Explosion class※1		Ex d IIC T6
Protection structure		IP67 (IEC standard)
Material		Body: Aluminum (AlDc.8S), Cover O-Ring: Buna N
Weight※2		Approx. 1.4kg (approx. 1.2kg)

※1: The explosion class specification is acquired and managed by KONICS.
※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

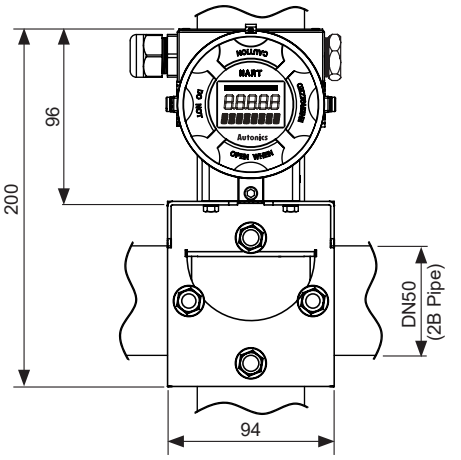
▣ Dimensions

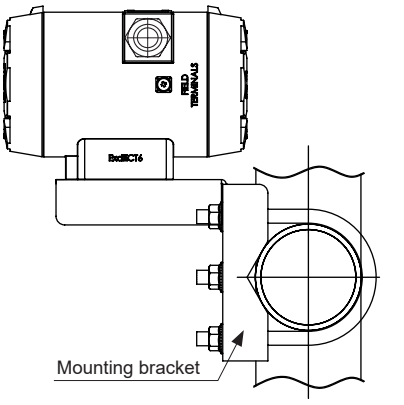
(unit: mm)





● **Mounting bracket**

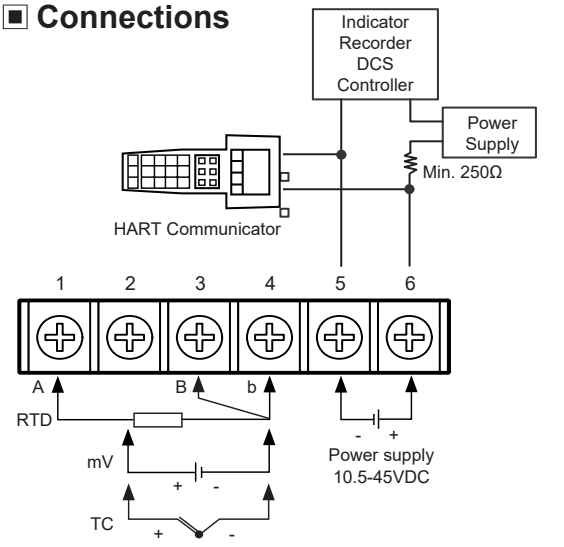




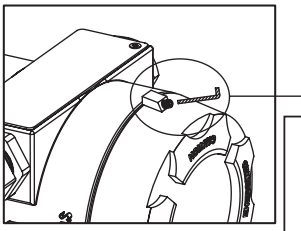
▣ Input Type and Range

Input type		Input range(℃)	Input range(℉)
RTD	DPt100Ω	−200 to 850	−328 to 1562
	DPt500Ω	−200 to 250	−328 to 482
	DPt1000Ω	−200 to 250	−328 to 482
	Cu50Ω	−50 to 150	−58 to 302
	Cu100Ω	−50 to 150	−58 to 302
	Ni100Ω	−60 to 180	−76 to 356
	Ni500Ω	−60 to 180	−76 to 356
	Ni1000Ω	−60 to 150	−76 to 302
Resistance transmitter	Resistance (Ω)	0 to400Ω	—
		0 to2000Ω	
Thermocouple	B (PtRh30-PtRh6)	0 to 1820	32 to 3308
	E(NiCr-CuNi)	−270 to 1000	−454 to 1832
	J(Fe-CuNi)	−210 to 1200	−346 to 2192
	K(NiCr-Ni)	−270 to 1372	−454 to 2501.6
	N(NiCrSi-NiSi)	−270 to 1300	−454 to 2372
	R(PtRh13-Pt)	−50 to 1768	−58 to 3214.4
	S(PtRh10-Pt)	−50 to 1768	−58 to 3214.4
	T(Cu-CuNi)	−270 to 400	−454 to 752
Analog	Voltage	−10 - 75mV	—
		−100 - 100mV	
		−100 - 500mV	
		−100 - 2000mV	

▣ Connections



● **Opening cover**



To open the cover, unscrew the M3×6L headless bolt using a 1.5 hexagon wrench and rotate the cover.

■ Current Trim Adjustment

Connect a HART communicator and adjust current trim as below by a HART communicator.

① Select the **'1. Device Setup'** by ↑, ↓ keys and press the → key.

1. Device Setup
2. PV
3. PV Ao
4. PV LRV
5. URV

② Select the **'2. Diag/Service'** by ↑, ↓ keys and press the → key.

1. Process Variables
2. Diag/Service
3. Basic Setup
4. Detailed Setup
5. Review

③ Select the **'4. D/A trim'** by ↑, ↓ keys and press the → key.

1. Test device
2. Loop test
3. Calibration
4. D/A trim

④ Press the O K (F4) key.

WARN-Loop should be removed from automatic control

ABORT | O K

⑤ Press the O K (F4) key.

Connect reference meter

ABORT | O K

⑥ Press the O K (F4) key.

Setting fid dev output to 4mA

ABORT | O K

⑦ Press the ENTER (F4) key to set 4 mA display value.

Enter meter Value
4.000

HELP | DEL | ABORT | ENTER

⑧ If output display value is correct, select **'1. Yes'** and press the ENTER (F4) key. If not, select **'2. No'** and press the ENTER (F4) key and re-set the display value.

Ex)If output display value is 3.89mA, select 3.89 and press the ENTER (F4) key.

Fid dev output 4.000 mA equal to reference meter ?
1. Yes
2. No

ABORT | ENTER

⑨ Press the O K (F4) key.

Setting fid dev. output to 20mA

ABORT | O K

⑩ Press the ENTER (F4) key to set 20 mA display value.

Enter meter Value
20.000

HELP | DEL | ABORT | ENTER

⑪ If output display value is correct, select **'1. Yes'** and press the ENTER (F4) key. If not, select **'2. No'** and press the ENTER (F4) key and re-set the display value.

Fid dev output 20.000 mA equal to reference meter ?
1. Yes
2. No

ABORT | ENTER

⑫ Press the O K (F4) key.

NOTE-Loop may be returned to automatic control

ABORT | O K

⑬ Press the HOME (F3) key.

Diag/Service
1. Test device
2. Loop test
3. Calibration
4. D/A trim

HELP | SAVE | HOME

⑭ Press the QUIT (F3) key.

Device Disconnected

RETRY | QUIT

⑮ Press the ⁄ (F3) key to complete the adjustment.

1. Offline
2. Online
3. Frequency Device
4. Utility

■ Error Display and Troubleshootings

Display	Error	Troubleshooting
Err05	Temperature sensor A, B or all sensors are disconnected.	Check the temperature sensor.
Err06	Temperature sensor B is disconnected.	
Err07	When PV is lower than the low-limit value of set temperature range.	Check low-limit value of the set temperature range.
Err08	When PV is higher than the high-limit value of set temperature range.	Check high-limit value of the set temperature range.

▣ Temperature Range Setting

Connect a HART communicator and set temperature range as below by a HART communicator.

① Press the [1/0] key for 3 sec. Select the **'4. PV LRV'** by [↑], [↓] keys and press the [→] key.

```
Online (Generic)
1. Device Setup
2. PV
3. PV Ao
4. PV LRV
5. URV                SAVE
```

② Select **'1. PV LRV'**(Low temperature range) and press the [→] key.

```
1. PV LRV
2. URV
HELP | HOME
```

③ Set Low temperature range and press the [ENTER] (F4) key.

```
PV LRV
0.000 deg C
0.000
HELP | DEL | ESC | ENTER
```

④ Select **'2. URV'**(High temperature range) and press the [→] key.

```
1. PV LRV
2. URV
HELP | HOME
```

⑤ Set High temperature range and press the [ENTER] (F4) key.

```
PV URV
100.000 deg C
100.000
HELP | DEL | ESC | ENTER
```

⑥ When the set temperature range is correct, press the [SEND] (F2) key.

```
1. PV LRV 0.000 deg C
2. URV 100.000 deg C
HELP | SEND | HOME
```

⑦ Press the [O K] (F4) key.

```
- WARNING -
Pressing ' OK ' will
change device output
put 100P in manual
```

⑧ Press the [O K] (F4) key.

```
- WARNING -
Return control 100P
To automatic control
O K
```

⑨ Check the set temperature range. Press the [HOME] (F3) key. HART communication is OFF.

```
1. PV LRV 0.000 deg C
2. URV 100.000 deg C
HELP | HOME
```

▣ Proper Usage

◎ Cautions During Use

- Follow instructions in 'Cautions during Use'.
  Otherwise, it may cause unexpected accidents.
- Power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- The explosion-proof standard of this unit is Ex d IIC T6, protection structure of this unit is IP67 and the range of max. surface temperature is below 85℃.
  Use the verified explosion-proof electric connection (cable gland or sealing fitting)
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④installation Category II

※ **The explosion-proof unit is certified and the same specifications which is reported to Korea Gas Safety Corporation. (This unit is manufactured following by the announcement 2013-54 of Ministry of Employment and Labor of Korea.)**

2-CH USB Temperature Data Logger

▣ Features

NEW

- Multi-channel (4 channel/ 2 channel) simultaneous controlling possible
- Transmit 2-channels of real-time temperature data to PCs
- Record and monitor temperature using DAQ Master (comprehensive device management software)
- USB-powered device with USB communication interface (Modbus RTU)
- Supports various types of input (thermocouple, RTD, mA, V) and different sensors can be assigned to each channel.
- Easy wiring with plug/socket type terminal
- Compact, space-saving design
- DIN rail or screw mount

Please read "Safety Considerations" in operation manual before using.

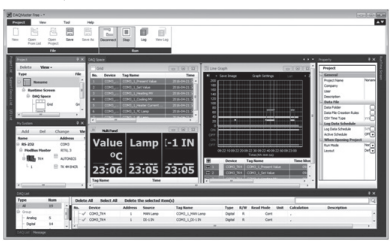
▣ Comprehensive Device Management Program (DAQMaster)

- DAQMaster is comprehensive device management program for convenient management of parameters and multiple device data monitoring.
- Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



■ Specifications

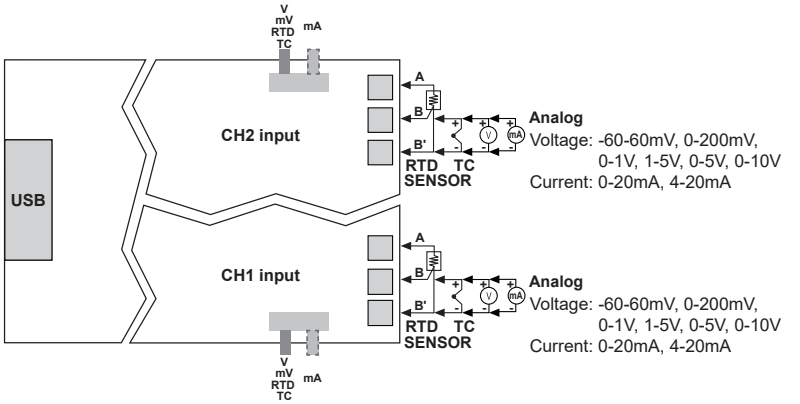
Model		SCM-USU2I
Power supply		USB BUS POWER (5VDC)
Permissible voltage range		90 to 110% of rated voltage
Communication method		USB
Protocol		Modbus RTU
Display method		Check via PC Software (DAQMaster)
Input type	RTD	DPt100Ω, DPt50Ω, JPt100Ω, Cu100Ω, Cu50Ω, Nickel120Ω
	Thermocouple	K(CA), J(IC), E(CR), T(CC), B(PR), R(PR), S(PR), N(NN), C(TT), G(TT), L(IC), U(CC), Platinel II
	Analog	Voltage: -60-60mV, 0-200mV, 0-1V, 1-5V, 0-5V, 0-10V Current: 0-20mA, 4-20mA
Display accuracy※1	RTD	●At room temperature range (23℃±5℃) : (PV ±0.3% or ±1℃, select the higher one) ±1-digit ●Out of room temperature range : (PV ±0.5% or ±2℃, select the higher one) ±1-digit
	Thermocouple	
	Analog	●At room temperature range (23℃±5℃): ±0.3% F.S. ±1-digit ●Out of room temperature range: ±0.5% F.S. ±1-digit
Sampling period		50ms (2-CH simultaneous sampling)
Dielectric strength		500VAC 50/60Hz for 1 min (between input terminal and power terminal)
Vibration		0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock		500m/s^2 (approx. 50G) in each X, Y, Z direction for 3 times
Insulation resistance		Over 100MΩ (at 500VDC megger)
Memory retention		Approx. 10 years (when using non-volatile semiconductor memory type)
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH
Protection structure		IP20 (IEC standard)
Insulation type		Double insulation or reinforced insulation
Installation		DIN rail or panel mounting
Accessory		USB 2.0 AB type cable: 1 (length: 1m)
Approval		CE
Weight※2		Approx. 195g (approx. 140g)

※1: ◎ At room temperature range (23℃±5℃)
- ●Below -100℃ of thermocouple K, J, T, N, E, and L, U, PLII, RTD Cu50Ω, DPt50Ω : (PV ±0.3% or ±2℃, select the higher one)±1-digit
- ●Below 200℃ of thermocouple C, G and R, S : (PV ±0.3% or ±3℃, select the higher one)±1-digit
- ●Below 400℃ of thermocouple B does not have accuracy standard.

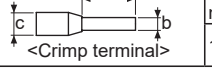
◎ Out of room temperature range
- ●RTD Cu50Ω, DPt50Ω: (PV 0.5% or ±3℃, select the higher one)±1-digit
- ●Thermocouple R, S, B, C, G, L, U: (PV ±0.5% or ±5℃, select the higher one)±1-digit
- ●Below -100℃ of other sensors: within ±5℃

※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

■ Connections and Block Diagram



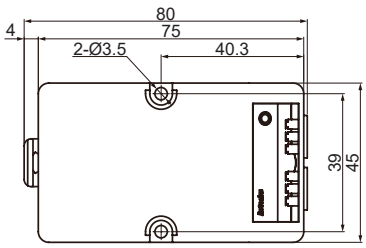
※Input parts and USB cable connection part are insulated each other.
※Use crimp terminals of size specified below.



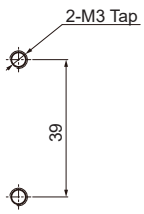
Terminal number	a	b	c
1 to N	6 to 8mm	Max. 1.5mm	Max. 3.5mm

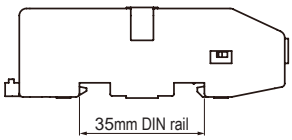
▣ Dimensions

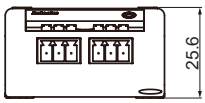
(unit: mm)



◎Mounting hole



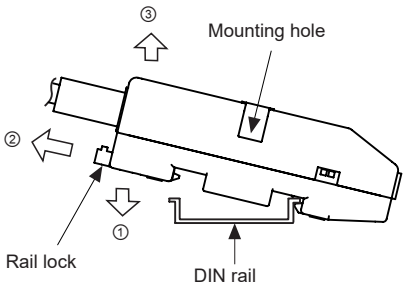




▣ Installation

◎ Mounting & Removing the unit on DIN rail

- Mounting
  1) Hook DIN rail connector on to DIN rail.
  2) Push the unit down to the direction "①".
- Removing
  1) Pull the rail lock of the unit to the direction "②".
  2) Remove the unit by pulling to the direction "③".

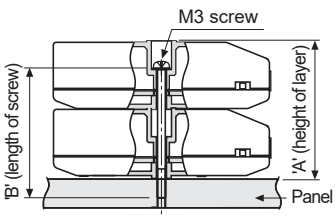


◎ Mounting the unit to panel

1) The unit is able to mount on the panel with two mounting holes.
2) For mounting this unit to panel, use M3 screws. Tightening torque is 0.4N.m.

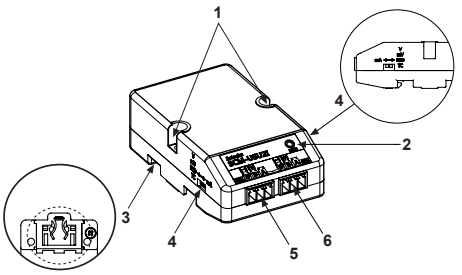
※Multi-layer

Use long fixing screws and several units are fixed by stacking as multi-layer.



Number of layers(N)	'A' (23N+0.5)	'B' (23N-3)
1	23.5mm	20mm
2	46.5mm	43mm
3	69.5mm	66mm
4	92.5mm	89mm

▣ Unit Description



1. Mounting hole:

Used when the unit mounts to the panel.

2. Power indicator (red):

Turns ON the power indicator (red) when supplying the power.

3. Rail Lock:

Used when the unit mounts on DIN rail.

4. Input type selector:

Input type selector by each CH.
The left selector is for CH1 and
the right one is for CH2 in the face.

V, mV, RTD, TC ◀▬▶ mA
(default) ▬

5. CH1 connector

6. CH2 connector

▣ Input Sensor Type and Temperature Range

Input type			Display	Temperature range (℃)	Temperature range (℉)
Thermocouple	K(CA)		K(CA).H	-200 to 1350	-328 to 2462
			K(CA).L	-200.0 to 1350.0	-328.0 to 2462.0
	J(IC)		J(IC).H	-200 to 800	-328 to 1472
			J(IC).L	-200.0 to 800.0	-328.0 to 1472.0
	E(CR)		E(CR).H	-200 to 800	-328 to 1472
			E(CR).L	-200.0 to 800.0	-328.0 to 1472.0
	T(CC)		T(CC).H	-200 to 400	-328 to 752
			T(CC).L	-200.0 to 400.0	-328.0 to 752.0
	B(PR)		B(PR)	0 to 1800	32 to 3272
	R(PR)		R(PR)	0 to 1750	32 to 3182
	S(PR)		S(PR)	0 to 1750	32 to 3182
	N(NN)		N(NN)	-200 to 1300	-328 to 2372
	C(TT)※1		C(TT)	0 to 2300	32 to 4172
	G(TT)※2		G(TT)	0 to 2300	32 to 4172
	L(IC)		L(IC).H	-200 to 900	-328 to 1652
			L(IC).L	-200.0 to 900.0	-328.0 to 1652.0
	U(CC)		U(CC).H	-200 to 400	-328 to 752
			U(CC).L	-200.0 to 400.0	-328.0 to 752.0
	Platinel II		PLII	0 to 1390	32 to 2534
RTD	Cu50Ω		CU50 .L	-200.0 to 200.0	-200.0 to 392.0
	Cu100Ω		CU100 .L	-200.0 to 200.0	-200.0 to 392.0
	JPt100Ω		JPt100.H	-200 to 600	-328 to 1112
			JPt100 .L	-200 to 600.0	-328.0 to 1112.0
	DPt50Ω		DPt50 .L	-200 to 600.0	-328.0 to 1112.0
	DPt100Ω		DPt100.H	-200 to 600	-328 to 1112
			DPt100. L	-200.0 to 600.0	-328 to 1112.0
	Nickel120Ω		NI120.H	-80 to 200	-112 to 392
Analog	Voltage	0-10V	AV1	-9999 to 9999 (the display range varies depending on the decimal point setting.)	
		0-5V	AV2		
		1-5V	AV3		
		0-1V	AV4		
		0-200mV	AmV1		
		-60-60mV	AmV2		
	Current	0-20mA	AmA1		
		4-20mA	AmA2		

※1: C (TT): Same as existing W5 (TT).

※2: G (TT): Same as existing W (TT).

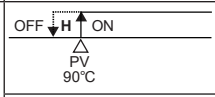
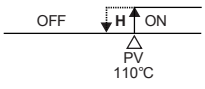
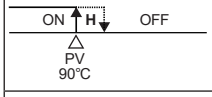
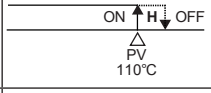
▣ Parameter Groups

1. Parameter 1 group

※Alarm□ : Alarm1, Alarm2, Alarm3, Alarm4 ※CH□ : CH1, CH2

Parameter	Display	Descriptions
Alarm output□ target CH	Alarm□ Target CH	Set the CH for monitoring by alarm. Setting range : CH1, CH2, CH1 or CH2, CH1 and CH2
Alarm output□ mode※1	Alarm□ Mode	Setting range : OFF, AL-1, AL-2
Alarm output□ low-limit SV CH□	Alarm□ Low_CH□	Setting range : Refer to the '▣ Input type and Temperature Range' ※When changing alarm operation mode, alarm output high/low-limit SV is automatically reset as min./max. value which has no alarm.
Alarm output□ high-limit SV CH□	Alarm□ High_CH□	
Alarm output□ hysteresis CH□	Alarm□ Hysteresis_CH□	Set the hysteresis of alarm output. Setting range : 1 to 100 (000.1 to 100.0)

※1: Alarm output mode

Mode	Name	Operations		Descriptions
OFF	—	—		No alarm output
AL-1	Absolute value high-limit alarm			Alarm output turns ON when PV is more than alarm absolute value.
		Alarm absolute value: Sets 90℃	Alarm absolute value: Sets 110℃	
AL-2	Absolute value low-limit alarm			Alarm output turns ON when PV is lower than alarm absolute value.
		Alarm absolute value: Sets 90℃	Alarm absolute value: Sets 110℃	

※H: Alarm output hysteresis

2. Parameter 2 group

Parameter	Display	Descriptions
CH□ input type	CH□ Input Type	Setting range: Refer to the '▣ Input type and temperature range'.
CH□ sensor temperature unit	CH□ Unit	℃↔℉ ※Does not set in analog input.
CH□ low-limit input value	CH□ Low Range	Set the low-limit input value within analog input range. Setting range: Min. range to {high-limit input value (CH□ High Range)-F.S. 10% digit}
CH□ high-limit input value	CH□ High Range	Set the high-limit input value within analog input range. Setting range: {low-limit input value (CH□ Low Range)+F.S. 10% digit}] to Max. range
CH□ decimal point place of scale value	CH□ Scale Dot	Within high/low-limit scale value, set the decimal point place for display value (PV). Setting range: 0, 0.0, 0.00, 0.000
CH□ low-limit scale value	CH□ Low Scale	Set display scale for analog low-limit input value (CH□ Low Range). Setting range : -9999 to 9999
CH□ high-limit scale value	CH□ High Scale	Set display scale for analog high-limit input value (CH□ High Range). Setting range : -9999 to 9999
CH□ analog display unit	CH□ Digital Unit	For analog input, set the display unit. Setting range : ℃, ℉, % , OFF
CH□ input correction	CH□ Input Bias	Input correction is to correct deviation occurred from temperature sensor. ※After input correcting, when present value (PV) is over the temperature range of the sensor, HHHH or LLLL is displayed. Setting range: -999 to 999 (-999.9 to 999.9)
CH□ input digital filter	CH□ Digital Filter	If the present value (PV) is fluctuating repeatedly by rapid change of input signal, stable recording is difficult. Input digital filter makes the present value stable. When input digital filter is set as 0.4 sec., input digital filter is applied for the input values for 0.4 sec. and the present value is may be different with the actual input value. Setting range: 0.1 to 120.0 (sec)

※☐ : Enables to set in analog input.

3. Parameter 3 group

Parameter	Display	Descriptions
Communication write enable/disable	Communications Write	Parameter setting is enable or disable by software (DAQMaster) setting. (reading parameter set value (Read) is always possible.) Enable : Enables changing and writing by parameters Disable : Disables changing and writing by parameters
Parameter reset	Parameter Initialize	Setting range : NO, YES

※Parameters reset by changing the parameter

Group	Parameter	Display	Reset parameters
Parameter 1 group	Alarm output□ mode	Alarm□ Mode	Alarm□ High/Low_CH□
Parameter 2 group	CH□ input type	CH□ Input type	Alarm□ High/Low_CH□, CH□ Low/High Range, CH□ Scale Dot, CH□ Low/High Scale, CH□ Digital Unit, CH□ Input Bias
	CH□ sensor temperature unit	CH□ Unit	Alarm□ High/Low_CH□, CH□ Input Bias

▣ Troubleshooting

Displays at software (DAQMaster).

Display	Description	Troubleshooting
OPEN	Flashes if input is broken or disconnected.	Check input sensor status.
HHHH	Flashes if present value is higher than the temperature range of the sensor.	When input is within the rated temperature range of the sensor, this display disappears.
LLLL	Flashes if present value is lower than the temperature range of the sensor.	

※When error displays and input is connected or within the rated temperature range of the sensor, the error display disappears and the unit operates normally.

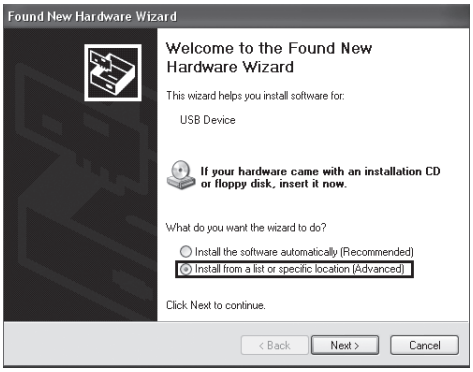
▣ Factory Default

Group	Parameter display	Factory default	Parameter display	Factory default
Parameter 1 group	Alarm□ Target CH	Alarm1/2 : CH1 Alarm3/4 : CH2	Alarm□ High_CH□	1350
	Alarm□ Mode	Alarm1/3 : AL-1 Alarm2/4 : AL-2	Alarm□ Hysteresis_CH□	1
	Alarm□ Low_CH□	-200	—	—
Parameter 2 group	CH□ Input Type	K (CA).H	CH□ Low Scale	000.0
	CH□ Unit	℃	CH□ High Scale	100.0
	CH□ Low Range	000.0	CH□ Digital Unit	%
	CH□ High Range	100.0	CH□ Input Bias	0
	CH□ Scale Dot	0	CH□ Digital Filter	0.1
Parameter 3 group	Communications Write	Enable	Parameter Initialize	NO

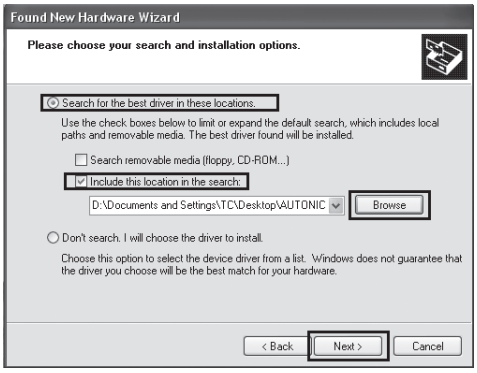
▣ Driver Installation

◎ USB Driver Installation

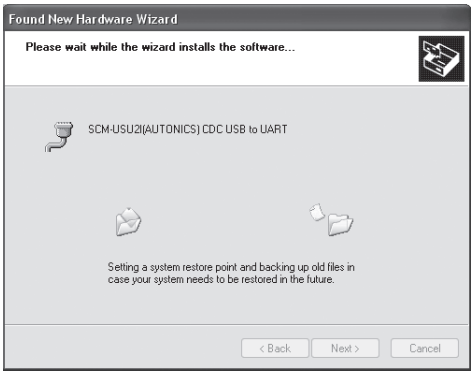
1) Visit our website (http://www.autonics.com) and download 'SCM-USU2I Driver'.
2) Unzip the downloaded file to the desired directory.
3) When connecting this product with an USB port, the 'Found New Hardware Wizard' appears automatically.
At 'Do you want to search software by connecting 'Window Update'?', click 'No' and the following dialog box appears to start Driver installation.
Select 'Install from a list or specific location (Advanced)' and click 'Next'.



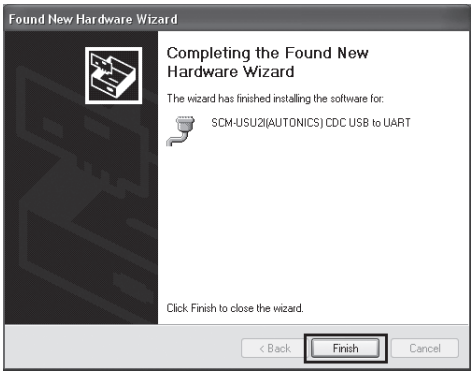
4) Select 'Search for the best driver in these locations' and 'Include this location in the search'.
Click 'Browse'.
5) The 'Browse Folder' dialog box appears. Select 'SCM-USU2I(AUTONICS) CDC USB to UART' and click 'Finish'.
Click 'Next' to start the USB Driver installation.

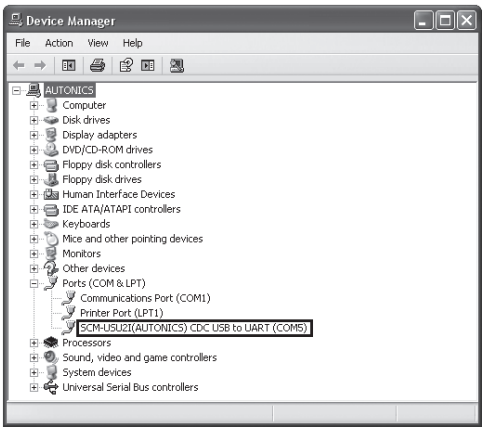


6) The 'Hardware Installation' dialog box appears.
Click 'Continue Anyway' to proceed with installation.



7) The following dialog box appears when the USB Driver is installed properly.
Click 'Finish'.





※Check that drivers are installed properly at 'Device Manager' after installing USB Driver and Serial Port Driver.

Select My Computer > Properties > Hardware tab > Device Manager.

Or select Start > Control Panel > System > Hardware tab > Device Manager.

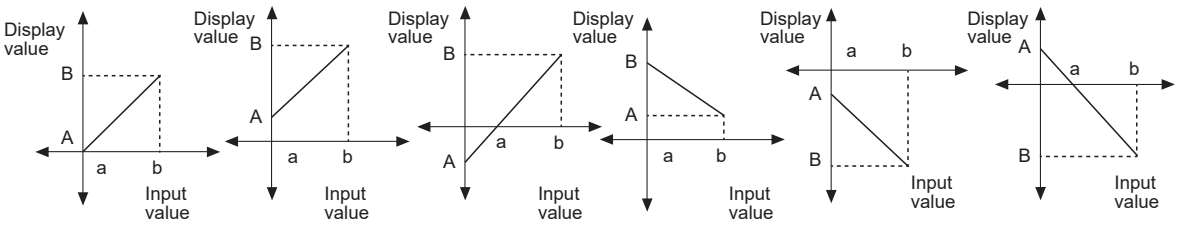
Make sure that 'SCM-WF48 Driver(Autonics Corp)' is found and in 'Universal Serial Bus Controller' category and 'SCM-USU2I(AUTONICS) CDC USB to UART(COM5)' is found in 'Ports (COM and LPT)'.

※This Driver Installation shows the procedure for Windows XP. There might be some differences in the specification above depending on OS.

▣ Functions

◎ High/Low Scale [CH□ Low Scale/CH□ High Scale]

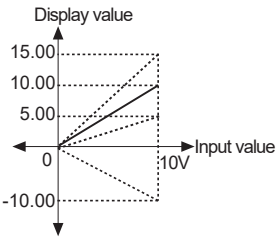
For analog input, this function is to set (–9999 to 9999)for particular high/low limit value in order to display high/low limit value of measurement input. If measurement inputs are 'a' and 'b' and particular values are 'A' and 'B', it will display a=A, b=B as below graphs.



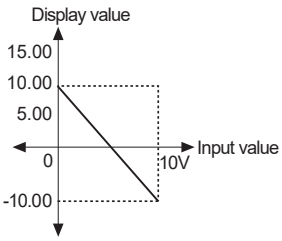
Display scale function is able to change display value for max./min. measured input by setting high limit scale[H-SC] and low limit scale [L-SC] in program mode.

※E.g.) Set high/low scale value (input range is 0 to 10V)

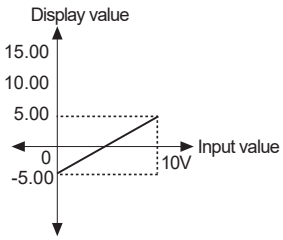
Low Scale=0.00
High Scale=5.00,10.00,15.00, 0.00



Low Scale=10.00
High Scale=-10.00



Low Scale=-5.00
High Scale=5.00



※ When changing input type, high/low scale is changed as factory default.

▣ Proper Usage

◎ Cautions during use

- Follow instructions in 'Cautions during use'. Otherwise, It may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Do not apply excessive power when connecting or disconnecting the connectors of the product.
- When changing the input sensor, turn off the power first before changing.
  After changing the input sensor, modify the value of the corresponding parameter.
- Do not overlapping communication line and power line.
  Use twisted pair wire for communication line and connect ferrite bead at each end of line to reduce the effect of external noise.
- Use USB cable of designated standard, and do not use extension cable.
  Using cable over 3m requires noise countermeasures.
- Use USB hub with the external power supply.
- When connecting multiple SCM-USU2I units to a PC, number of COM port goes up in sequential order and it takes some time to identify and assign number of COM port.
- Make a required space around the unit for radiation of heat.
  For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- Do not connect or disconnect USB cable quickly and repeatedly while communicating.
  It may cause damage or malfunction of the product and PC.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category I

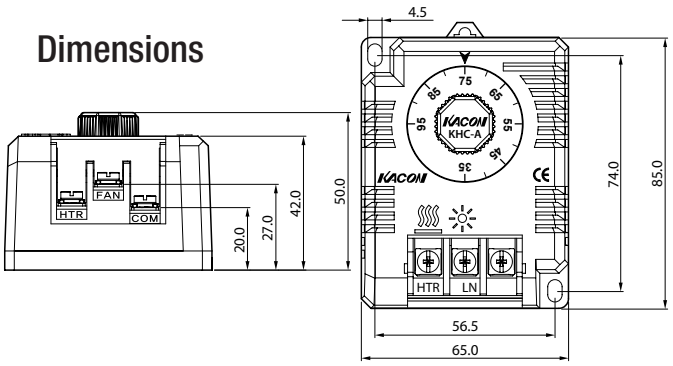
KHC Series

Humidity Controller

Specifacations

Model	KHC-A
Rated Voltage	220VAC ±10% 50/60Hz
Load Current	16A 220VAC
Contact Configuration	1a (SPST)
Contact Resistance	Max. 30mΩ
Contact Life Cycle	Min. 100,000 hrs
Operational Range	35%~95% rH
Setting Error	±5%
Dielectric Strength	AC, 2,500V 50/60Hz for 1 minute
Insulation Resistance	50MΩ min.(at 500VDC)
Mounting Methods	35mm dinrail and surface mounting
Wiring Range	14~28AWG
Terminal	M3.5×7/0.8N.m (8.16kgf.cm)
Storage Temperature	-25°C~80°C
Ambient Humidity	35%~95% RH

Dimensions



KTC / KTS Series

Thermostat

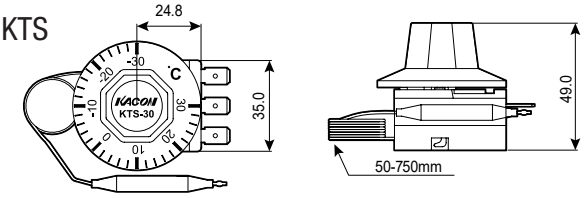
Specifacations

Model		Range	Tolerance	On/Off Difference
KTS-30	KTC-30	-30°C~30°C	±2.5K	0°C~7°C
KTS-50	KTC-50	0°C~50°C	±3K	2°C~9°C
KTS-90	KTC-90	30°C~90°C	±3K	2°C~9°C
KTS-120		0°C~120°C	±4K	2°C~10°C
KTS-200		0°C~200°C	±4K	2°C~10°C
KTS-300		50°C~300°C	±10K	5°C~30°C

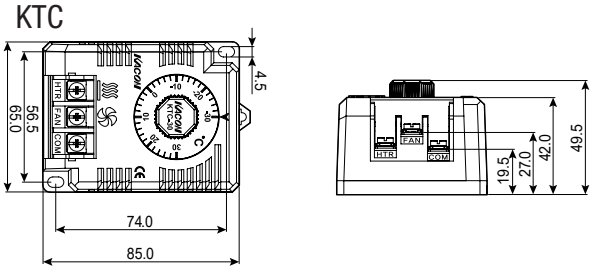
Rated Current	16A 250VAC
Control Temperature Range	-30°C ~ +320°C
Life Cycle	Min. 100,000 hrs
Dielectric Strength	2,500V/1min.
Insulation Resistance	Min. 50MΩ
Contact Resistance	Max. 30mΩ

Dimensions

KTS



KTC



KSH Series

Space Heater

Specifications

Material	Aluminium, Anodize
Connection Casing	Ceramic + Terminal
Mount	Panel Mounting
Insulation Resistance	100MΩ 500VDC
Dielectric Strength	2,000VAC 1 minute
Ambient Temperature	-45 to +70°C (With no icing)
Ambient Humidity	50 ~ 95% RH

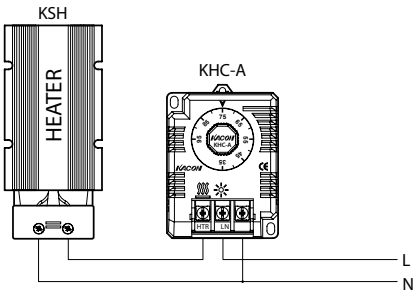
Ordering Information

KSH - ① - ②

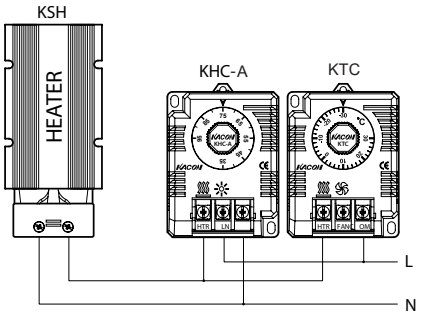
① Power	**1**	110/125VAC	**2**	220/240VAC
	3	380VAC		
② Sound Type	**03**	30W	**05**	50W
	08	80W	**10**	100W
	15	150W	**20**	200W
	30	300W	**40**	400W

KHC Diagram

Humidity Control Diagram

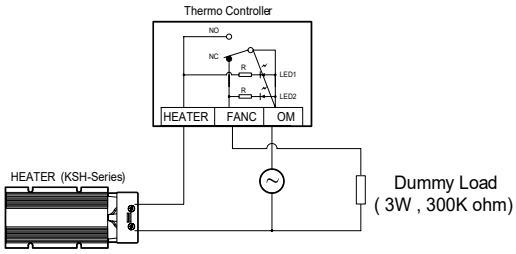


Heating, Humidity Control Diagram

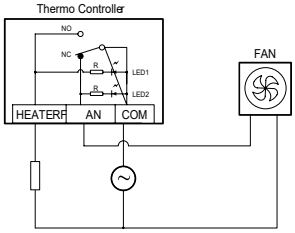


KTC / KTS Diagram

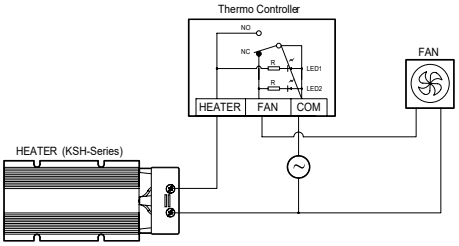
Heater



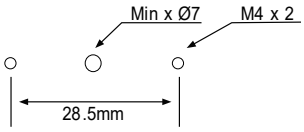
Fan



Heater + Fan

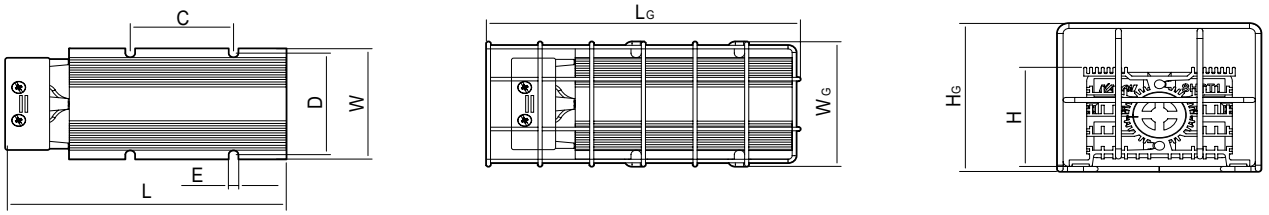


Panel Cut-Out



KSH Dimensions

Unit:mm



Model	Guard*	Output Power	Body	Guard	Mounting Hole
			L W H	LG WG HG	C D E
KSH-①03/05	KSH-G3	30W	140 62 42	150 70 65	50 57 Ø5
		50W			
KSH-① 08/10/15/20	KSH-G2	80W	190 62 42	200 70 65	75 57 Ø5
		100W			
		150W			
		200W			
KSH-①30/40	KSH-G1	300W	340 62 42	350 70 65	150 57 Ø5
		400W			

*Guards are an optional accessaries.

LCD Touchscreen Paperless Recorder

▣ Features

- 5.6-inch color TFT LCD (640×480) touchscreen display with excellent readability and intuitive control interface
- Supports 27 input types (thermocouple, RTD, analog voltage and current[shunt])
- 4 / 8 / 12 / 16 input channel models available
- Various communication methods (RS422/485, Ethernet, USB) standard
- 25 to 250 ms high-speed sampling, 1 to 3600 s recording cycle
- 200 MB internal memory and external memory support (SD/USB up to 32 GB)
- Store and backup internal data to external memory (SD/USB)
- 9 different graph types available
- Various option input/output available: digital input (contact/non-contact), alarm output, transmitter power output
- Compact, space-saving design (rear length: 69.2 mm)

Please read "Safety Considerations" in the instruction manual before using.

▣ Manuals

- For more information and instructions, refer to the user manual and the user manual for communication. Visit our website (www.autonics.com) to download the manuals.
- The user manual includes product specifications, functions, and operations.
- The user manual for communication includes information about Modbus RTU protocol, Modbus TCP protocol, and Modbus mapping table.

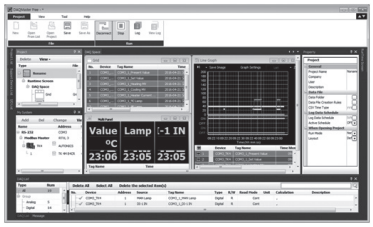
▣ Comprehensive Device Management Program (DAQMaster)

● DAQMaster is comprehensive device management program for convenient management of parameters and multiple device data monitoring.
● Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



▣ Ordering Information

KRN1000 — **04** **0** **1** — **0** **S**

Case	S	Standard panel installation type
Power supply	0	100-240VAC 50/60Hz
Communication output	1	RS422/485+Ethernet+USB Device
Option input/output	0	None
	1	Alarm relay output 8 channels
	2	Alarm relay output 6 channels + Digital input 2 channels
	3	Alarm relay output 6 channels + 24VDC power output for transmitter
	4	Alarm relay output 4 channels + Digital input 2 channels + 24VDC power output for transmitter
Input channels	04	4 channels
	08	8 channels
	12	12 channels
	16	16 channels
Item	KRN1000	Paperless recorder

▣ Specifications

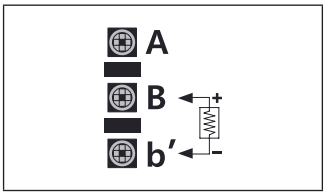
Series		**KRN1000**
Power supply		100-240VAC∼ 50/60Hz
Allowable voltage range		85 to 110% of rated voltage
Power consumption		Max. 23VA
Screen	Display method	5.6 inch TFT Color LCD
	Resolution	640×480 pixels
	Adjusting brightness	3-level (Min/Standard/Max)
	Input method	Touch screen (pressure sensitive type)
Number of input channels		4 / 8 / 12 / 16 channels
Universal input※1		Temperature sensors (thermocouple, RTD), Analog (voltage, current (shunt))
Sampling period		1 to 4-CH: 25ms/125ms/250ms, 5 to 16-CH: 125ms/250ms (internal sampling period is average movement filter and alarm output operation unit time)
Recording period		1 to 3600 sec
Internal memory		Approx. 200MB
External memory※2		SD / USB memory max. 32GB
Dielectric strength		2300VAC 50/60Hz for 1 min (between power terminals and case) ※Except Ethernet and USB device
Vibration	Mechanical	10 to 60Hz 4.9m/s^2 in each X, Y, Z direction for 1 hour
	Malfunction	10 to 60Hz 1m/s^2 in each X, Y, Z direction for 10 min
Insulation resistance		Over 20MΩ (at 500VDC megger)
Noise immunity		±2kV the square wave noise (pulse width 1μs) by the noise simulator
Time accuracy		Within ±2 min/year (available up to 2099)
Protection structure		IP50 (front part)
Environment	Ambient temperature	0 to 50℃, storage: -20 to 60℃
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH
Approval		CE
Weight※3		Approx. 1290 to 1400g (approx. 590 to 700g)

※1. For more information of universal input, please refer to 「Input/Output」.
※2. This is included in the product. In case of using the USB flash drive that the user purchased, the device may not be supported.
※3. The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

■ Input/Output

Type	Input/Output type		Description
Universal input	Input type	RTD	JPt100Ω, DPt100Ω, DPt50Ω, Cu100Ω, Cu50Ω (supplied current: approx. 190μA)
		Thermocouple	B, C (W5), E, G, J, K, L, L (Russia), N, P, R, S, T, U
		Analog	Voltage: ±60mV, ±200mV, ±2V, 1-5V, ±5V, -1V-10V Current: 0-20mA, 4-20mA (measurable when using 250Ω shunt resistance)※1
	Input impedance		Voltage (V): approx. 205kΩ RTD, Thermocouple, Voltage (mV): min. 200kΩ
	Display accuracy※2	RTD	Warm-up time: Max. 30 min At room temperature (25℃±5℃): ±0.1% F.S.±1-digit Out of room temperature: ±0.2% F.S.±1-digit
		Thermocouple	
		Analog	
	Resolution		16-bit
Option input/output※3	Digital input	No-contact input	ON: residual voltage max. 1VDC, OFF: leakage current max. 0.1mA
		Contact input	ON: max. 1kΩ, OFF: min. 100kΩ, Short-circuit: approx. 4mA
	Alarm relay output	Capacity	250VAC~ 3A, 30VDC⎓ 3A, 1 Form A (resistive load)
		Life cycle	Mechanical: min. 20,000,000 operations Electrical: 100,000 operations (250VAC~ 3A, 30VDC⎓ 3A)
	Power output for transmitter※4		24±2VDC⎓, max. 60mA ※Built-in over current protection circuit
Communication output※5	RS422/485		Modbus RTU ※It is recommended to use shielded cable over AWG 24.
	Ethernet		IEEE802.3 10 BASE-T / IEEE802.3U 100 BASE-TX (Modbus TCP)
	USB Device		USB V2.0 Full Speed (Modbus RTU)

※1. Current measurement and connection examples
Connect 250Ω shunt resistance and set analog input type 0-20mA (shunt) / 4-20mA (shunt).
It is available to measure 0-20mA / 4-20mA current.



※2. ◎ At room temperature (23℃ ± 5℃)
- RTD Cu50Ω (-200≤T≤200): (±0.1% F.S. or ±1.5℃, select the higher one) ±1 digit
- RTD DPt50Ω (-200≤T≤500): (±0.1% F.S. or ±1.5℃, select the higher one) ±1 digit
- Thermocouple R, S, C, G type (0≤T≤100): (±0.1% F.S. or ±4.0℃, select the higher one) ±1 digit
- Thermocouple U, T type (-100≤T≤400): (±0.1% F.S. or ±2.0℃, select the higher one) ±1 digit
- Thermocouple B type, below 400℃: there is no accuracy standards.
- All thermocouples, below -100℃: (±0.3% F.S. or ±4.0℃, select the higher one) ±1 digit

◎ Out of room temperature range
- RTD Cu50Ω (-200≤T≤200): (±0.2% F.S. or ±3.0℃, select the higher one) ±1 digit
- RTD DPt50Ω (-200≤T≤500): (±0.2% F.S. or ±3.0℃, select the higher one) ±1 digit

※3. Input/Output is different by option. Please refer to 「Ordering information.
※4. For supplying power for transmitter, it is recommended to use shield cable to reduce noise.
※5. RS422/485, Ethernet, USB device communication outputs are not used at the same time.
※If sensor input line is longer, it is recommended to use shield cable to reduce noise.

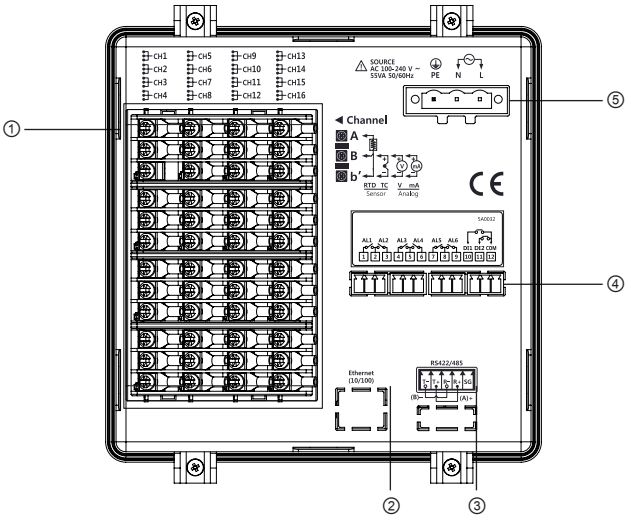
▣ Input Type and Range

Input type			Display	Input range		
				℃	℉	K
Thermocouple	K(CA)		TC-K	-200.0 to 1350.0	-328.0 to 2462.0	73.2 to 1623.2
	J(IC)		TC-J	-200.0 to 800.0	-328.0 to 1472.0	73.2 to 1073.2
	E(CR)		TC-E	-200.0 to 800.0	-328.0 to 1472.0	73.2 to 1073.2
	T(CC)		TC-T	-200.0 to 400.0	-328.0 to 752.0	73.2 to 673.2
	B(PR)		TC-B	100.0 to 1800.0	212.0 to 3272.0	373.2 to 2073.2
	R(PR)		TC-R	0.0 to 1750.0	32.0 to 3182.0	273.2 to 2023.2
	S(PR)		TC-S	0.0 to 1750.0	32.0 to 3182.0	273.2 to 2023.2
	N(NN)		TC-N	-200.0 to 1300.0	-328.0 to 2372.0	73.2 to 2023.2
	C(TT)※1		TC-C	0.0 to 2300.0	32.0 to 4172.0	273.2 to 2573.2
	G(TT)※2		TC-G	0.0 to 2300.0	32.0 to 4172.0	273.2 to 2573.2
	L(IC)		TC-L	-200.0 to 900.0	-328.0 to 1652.0	73.2 to 1173.2
	L(Russian type)※3		TC-L_R	0 to 600.0	32.0 to 1112.0	273.2 to 873.2
	U(CC)		TC-U	-200.0 to 400.0	-328.0 to 752.0	73.2 to 673.2
	Platinel II		TC-P	0.0 to 1350.0	32.0 to 2462.0	273.2 to 1623.2
RTD	Cu50Ω		CU50	-200.0 to 200.0	-328.0 to 392.0	73.2 to 473.2
	Cu100Ω		CU100	-200.0 to 200.0	-328.0 to 392.0	73.2 to 473.2
	JPt100Ω		JPT100	-200.0 to 600.0	-328.0 to 1112.0	73.2 to 873.2
	DPt50Ω		DPT50	-200.0 to 600.0	-328.0 to 1112.0	73.2 to 873.2
	DPt100Ω		DPT100	-200.0 to 850.0	-328.0 to 1562.0	73.2 to 1123.2
Analog	Voltage	-60.00 - 60.00mV	±60mV	Resolution : 10μV	-99999 to 99999 (display range depends on the decimal point position)	
		-200.00 - 200.00mV	±200mV	Resolution : 10μV		
		-2.000 - 2.000V	±2V	Resolution : 1mV		
		1.000 - 5.000V	1-5V	Resolution : 1mV		
		-5.000 - 5.000V	±5V	Resolution : 1mV		
		-1.00 - 10.00V	-1V-10V	Resolution : 10mV		
	Current (shunt)	0 - 20mA	0-20mA (shunt)	—		
		4 - 20mA	4-20mA (shunt)	—		

※1. C (TT): Same as existing W5 (TT) type sensor
※2. G (TT): Same as existing W (TT) type sensor
※3. Russian type L type temperature sensor is divided from general purpose L type.

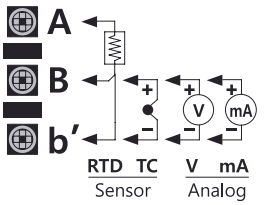
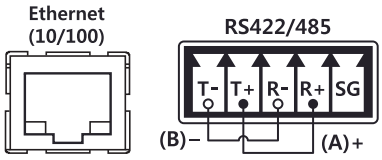
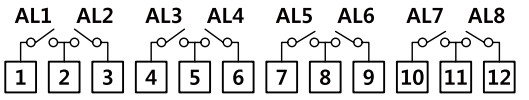
▣ Connections

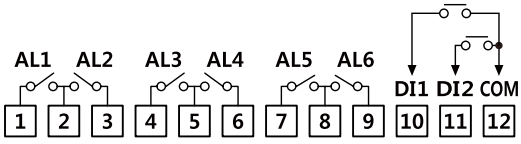
■ KRN1000 Rear part

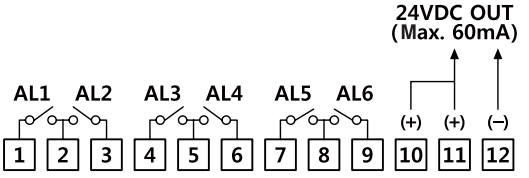


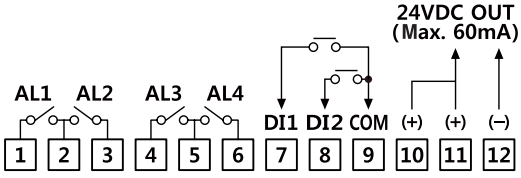
① Sensor input terminal: Connects universal input.
② Ethernet port
: Connector for Ethernet cable.
It communicates Modbus TCP.
③ RS422/485 port
: Connects RS422/485 for Modbus RTU comm.
④ Option input/output port
: Connects for option input/output .
⑤ Power input
: Power connection (100-240VAC 50/60Hz)

■ Input/Output Circuit

<table>
<tr><th>Universal input※</th><th>Communication output</th></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><th>Option input/output 1</th><th>Option input/output 2</th></tr>
<tr><td> 

Alarm output 8 channels</td><td> 

Alarm output 6 channels + Digital input 2 channels</td></tr>
<tr><th>Option input/output 3</th><th>Option input/output 4</th></tr>
<tr><td> 

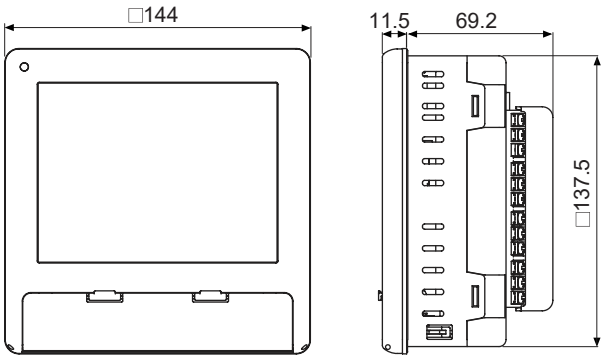
Alarm output 6 channels + Power for transmitter output</td><td> 

Alarm output 4 channels + Digital input 2 channels
+ Power for transmitter output</td></tr>
</table>

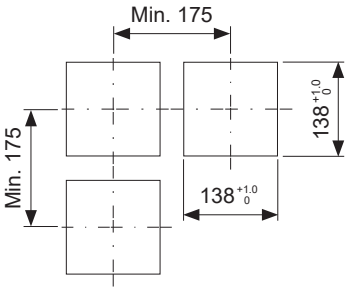
※ In case of current input, connect 250Ω resistance at external part.

▣ Dimensions

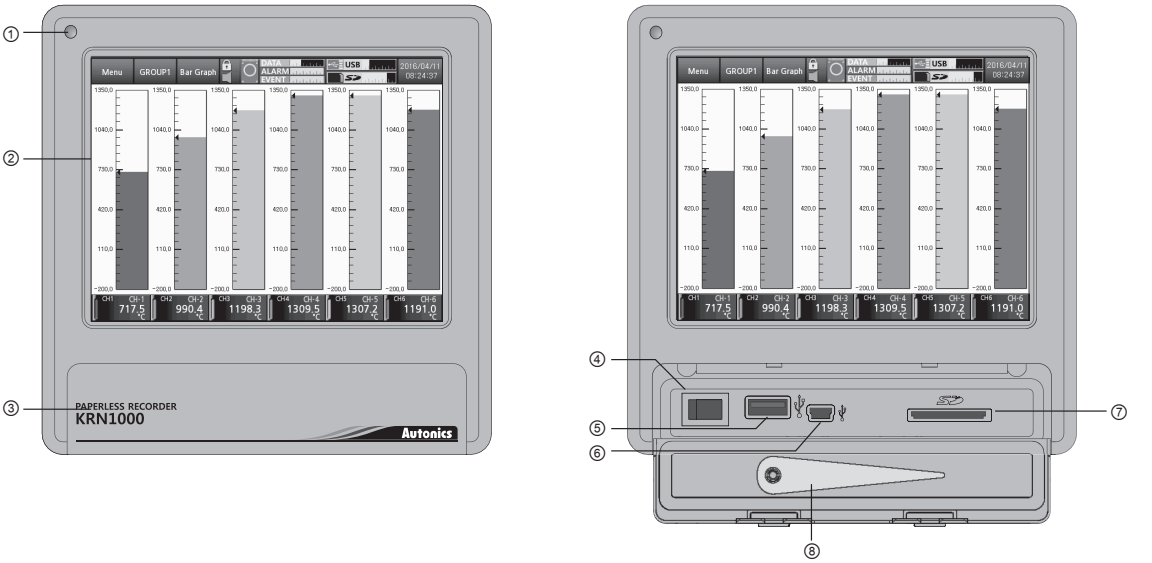
(unit: mm)



• **Panel cut-out**



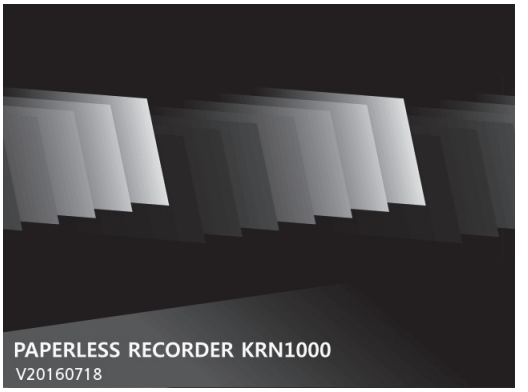
▣ Unit Descriptions



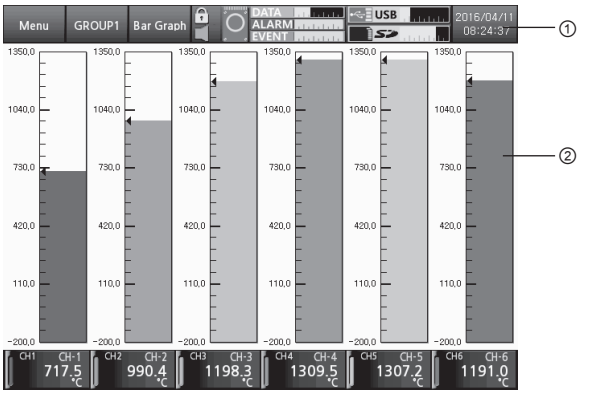
① Power indicator: Power turns ON and the red LED turns ON.
② Screen (touch panel): Measured value is displayed as trend graph, bar graph, digital figures.
③ Front cover: Open the front cover. There are power switch and, USB Host/Device, SD card slot.
④ Power switch: Turn ON/OFF the power of KRN1000.
⑤ USB host port: Connect the USB memory.
It recognizes up to 32GB. When using extension cable, cable length should be up to 1.5m.
Connect only USB device.
⑥ USB device port: Used for connecting PC via Modbus RTU communication.
⑦ SD card slot: SD card memory slot. It supports up to 32GB.
⑧ Stylus pen: Used for touching screen.

▣ Screen Description

■ Booting screen



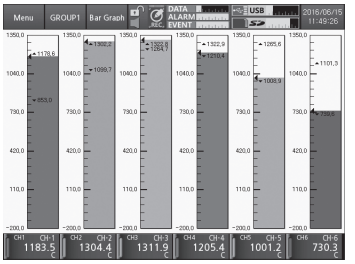
■ Run screen



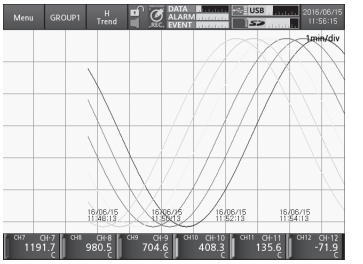
① Status display part
: Status display part appears at top screen. Touch each icon and it enters the menu.

② Measurement value display part
: Displays the measured value of each channel as graph.
Set one graph among 9 graphs: bar graph, (Vertical/Horizontal) Trend graph, (Vertical/Horizontal) Mixed graph, Divided (Vertical/Horizontal) Trend Graph, (Group/All) Digital.

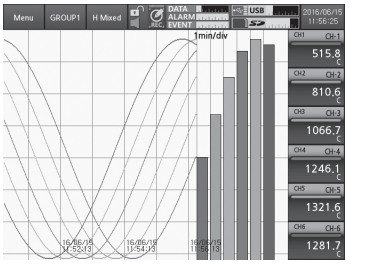
Bar graph



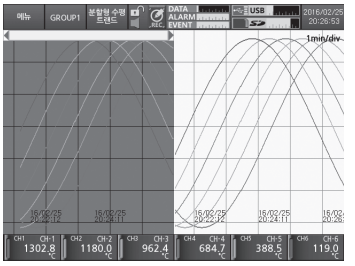
(Vertical/Horizontal) Trend graph



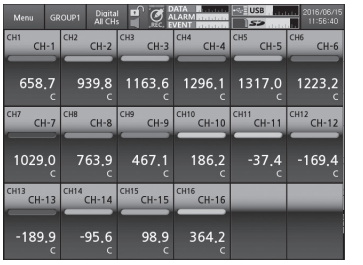
(Vertical/Horizontal) Mixed graph



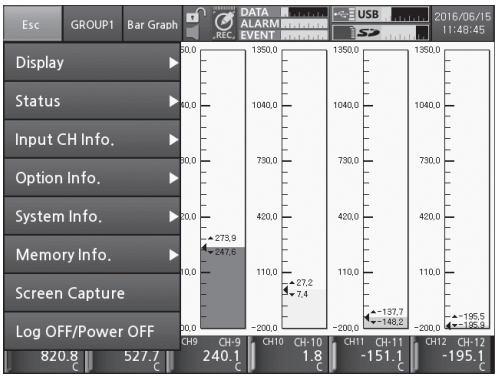
Divided (Vertical/Horizontal) Trend Graph



(Group/All) Digital



▣ Menu



Touch the status display part at the upper screen and menu appears as right screen.
Menu is as below.

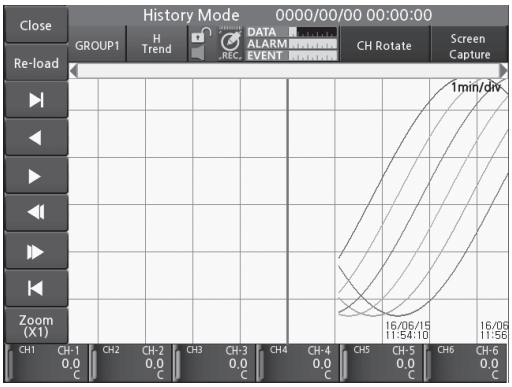
- Display
  - History
  - File History
  - Group Setting
  - Touch Calibration
- Status
  - Alarm List
  - Event List
  - AO/DI Status
- Input CH Info.
  - Input/Display
  - Input Option
  - Alarm
  - User Unit
- Option Info.
  - Alarm Output
  - Digital Input
  - RS422/485
  - Ethernet/USB
- System Info.
  - Date/Time
  - Reservation
  - Device
  - File
  - Log In
  - System Info.
- Memory Info.
  - Memory Management
  - Internal Memory
- Screen Capture
- Log OFF/Power OFF

▣ Functions

■ History

It checks data history which is recording at [Menu]-[Display]-[History]. When recording is stop, it displays warning message.

- Checks data history by each group, channel.
- Data history displays as horizontal/vertical trend, divided horizontal/vertical trend.
- Saves the screen as *.bmp file.

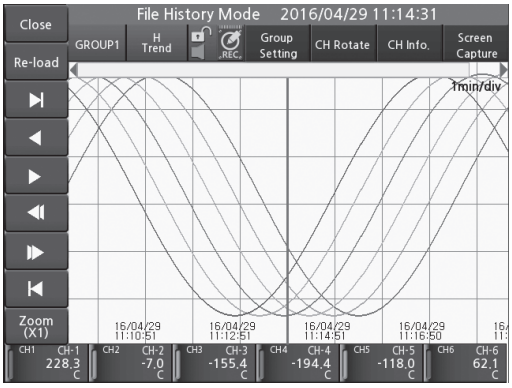


■ File History

It checks the saved data history at internal/external memory.

Touch [Menu]-[Display]-[File History].

- Set the information of display group or channel.
- Data history displays as horizontal/vertical trend, divided horizontal/vertical trend.



■ Special Function

It displays the applied measuring value of the set special function. Depending on Input type, applied special function is different.

- Setting range :
  - When input type is temperature sensor (thermocouple, RTD): None ↔ Difference
  - When input type is analog (voltage, current (shunt)): Linear ↔ Root ↔ Square ↔ Two Unit
    Two Unit is displayed when input type is set as 4-20mA (shunt).

◎ Difference (deviation)

It is available to set when input type is temperature sensor (thermocouple, RTD). It displays the deviation of reference channel measuring value.
(Display value = standard channel measuring value - reference channel measuring value)

- The set channel as analog (voltage, current (shunt)) of Input type is not able to set as reference channel.
- If there is no set reference channel, it displays standard channel measuring value.
- If any one of reference channel, or standard channel is break (BURN), high-limit value (HHHH), low-limit value (LLLL) status, it displays as correspond value. If you select the channel which is used Difference function as reference channel, it displays the value based on calculating actual measuring value, not display value of reference channel.

◎ Linear

It applies low-limit scale and high-limit scale to low-limit input value and high-limit input value and displays this values.

E.g.)In case low-limit input value: -5V, high-limit input value: +5V and in case low-limit scale: -1000, high-limit scale: 1000, if input value is 2V, display value is 400.

◎ Root

In case voltage, current (shunt) input type, this mode is used when input value is calculated by Root ($\sqrt{\ }$) for the desired display value. Differential pressure signal of differential pressure flow meter is calculated Root ($\sqrt{\ }$) for the to-be measured flux. This function is used to measure flux by input value.

E.g.)In case low-limit input value: -5V, high-limit input value: +5V and in case low-limit scale: -1000, high-limit scale: 1000, if input value is 2V, display value is approx. 673.32.

◎ Square

In case of voltage, current (shunt) input type, this mode is used when input value is calculated by square for the desired display value. Reverse of Root, flux signal is calculated by square for differential pressure signal.

E.g.)In case low-limit range: -5V, high-limit range: +5V and in case low-limit scale: -1000, high-limit scale: 1000, if input value is 2V, display value is -20.

◎ Two Unit

For compound pressure, if input pressure is lower than atmospheric pressure (0), it displays the degree of a vacuum with mmHg unit. If input pressure is higher than or same as atmospheric pressure (0), it displays positive pressure with kg/cm^2 unit.

When using Two Unit function, low-limit value is fixed as -760mmHg and kg/cm^2 value is able to set within Setting range 1 to 35.

Two Unit limits scale point as 0 ↔ 0.0 ↔ 0.00 . When using Two Unit, display unit is automatically changed as mmHg or kg/cm^2.

This function has two different unit values and it is impossible to calculate by recording method and digital filter and ignore it.

E.g.) If pressure range is -760mmHg to 3kg/cm^2, and pressure transmitter outputs 4-20mA, for 4mA input it displays -760mmHg, 8mA input is unit changing point. For 20mA input, it displays 3kg/cm^2.

▣ Functions

■ Reservation

It sets reservation recording time to start and finish recording.
Touch [Menu]-[System Info.]-[Reservation].
Set reservation recording type; repeat, single.

◎ **Repeat**

Records from the start time to end time at every day during start date to end date. If start time is later of end time, it records and saves until end of next day.

◎ **Single**

Records from the start date and time to end date and time.

■ Digital Input

It sets digital input operation mode and status to operate for DI-1/2 input.
Touch [Menu]-[Option Info.]-[Digital Input].
The operation mode and status are as below.

◎ **DI-□ Type**

Set the operation type for digital input.
(None, Rec/Stop, Alarm Reset, Alarm ON, Capture)

◎ **DI-□ Status**

Set digital input operation status.
(only when DI type is set as 'Record/Stop')

- Edge: When supplying digital input over 0.3 sec, the recording starts. When resupplying it, the recording stops.
- Level: When shorting digital input over 0.3 sec, the recording starts. When opening it, the recording stops.

◎ **Alarm Reset/ON**

- Alarm Reset
  When DI type is set as 'Alarm Reset', select the desired relay to reset the alarm.
- Alarm ON
  When DI type is set as 'Alarm ON', select the desired relay to turn ON the alarm.

■ Summer Time

Set the summer time duration.
Set enable to summer time and designate start date and end date of summer time at [Menu]-[System Info.]-[Date/Time].

■ Screen Capture

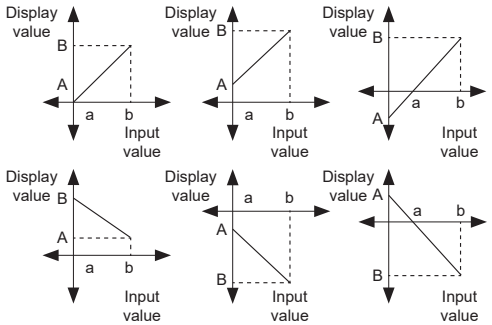
It saves current screen as *.bmp file. Set file storage location and file name.
Storage setting range: Internal, SD/USB memory
Internal memory saves the set number of screen captures at [Menu]-[Memory Info.]-[Internal Memory].

■ High/Low-Limit Graph Scale Value

In case of temperature sensor input (thermocouple, RTD), set the graph scale value to set the desired record range. Therefore, it helps to record as curve at the desired range.

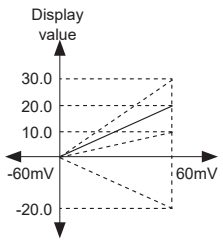
■ Display Scale

For analog input, this function is to set (-9999.9 to 9999.9) for particular high/low-limit value in order to display high/low-limit value of measurement input. If measurement inputs are 'a' and 'b' and particular values are 'A' and 'B', it will display a=A, b=B as below graphs.

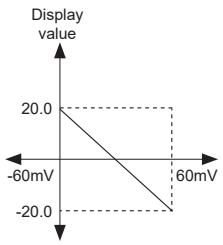


Display scale function is able to change display value for max./min. measured input by setting high-limit scale and low-limit scale.
Set high/low-limit scale at [Menu]-[Input CH Info.]-[Input/Display].
E.g.) Setting high/low-limit scale value
(In case of input type, -60 to +60mV)

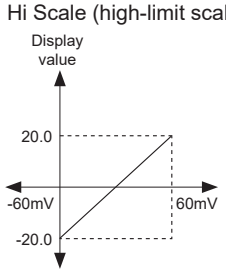
- Low Scale (low-limit scale value) = 0.0
- Hi Scale (high-limit scale value) = 10.0, 20.0, 30.0, -20.0



- Low Scale (low-limit scale value) = 20.0
- Hi Scale (high-limit scale value) = -20.0



- Low Scale (low-limit scale value) = -20.0
- Hi Scale (high-limit scale value) = 20.0



※When changing input type, high/low-limit scale is changed as factory default display range of the set input type.

▣ Functions

■ Internal Memory Info.

It sets number of events, alarms, screen captures, and storage options at internal memory.

It sets also internal memory storage options. When internal memory uses all, it operates overwrite (deletes oldest data) or stop (stops saving).

■ Firmware update

Update firmware.

Download the firmware at our web site (www.autonics.com). Save the downloaded firmware at the top-level folder on USB/SD memory and touch [Menu]-[System Info.]-[System Info.].

When completes firmware update, re-boot the unit.

Do not turn OFF the power during firmware update.

■ Ethernet Communication setting

It sets about Ethernet communications.

Set IP address, subnet mask, default gateway, communication write, Ethernet port, USB communication write, USB device usage.

■ RS422/485 Communication setting

Setting items are only available to check by communication.

RS422/485 communication makes set or monitor parameters at external upper system (PC or graphic panel, etc.) and uses transfer data. It is recommended to use our dedicated software program DAQMaster for monitoring.

If you want to develop monitoring program not using our DAQMaster program or to use the related Modbus program, please refer to user manual for communication.

Visit our homepage (www.autonics.com) to download DAQMaster program, and user manual for communication.

◎ **Interface**

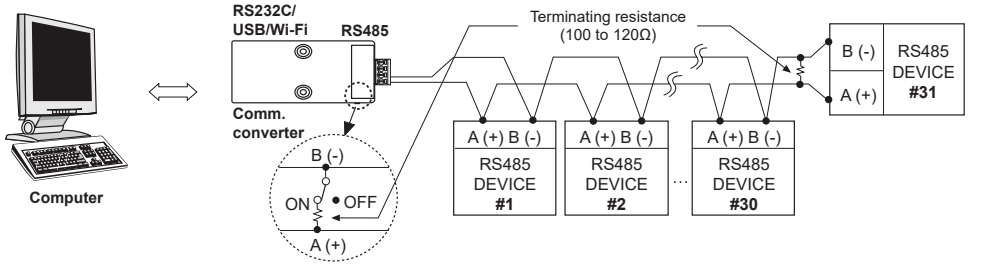
Item	RS485	Ethernet	USB
Application standard	Compliance with EIA RS485	—	Compliance with USB V2.0
Max. connections	31 units (address: 1 to 127)	1 unit (number of occupations per a unit)	1 unit
Com. distance※1	Within max. 1km (below 9600bps)	Single cable within 100m (recommended over CAT5E)	Single cable within 1.5m
Com. method	Full duplex / Half duplex	Full duplex	—
Com. synchronization method	Asynchronous	Asynchronous	Asynchronous
Com. speed	2400/4800/9600/19200/38400bps	10/100Mbps	12Mbps (full Speed)
Com. response wait time	5 to 99ms	—	—
Start Bit	1-bit (fixed)	—	—
Data Bit	8-bit (fixed)	—	—
Parity Bit	None, Odd, Even	—	—
Stop Bit	1, 2-bit	—	—
Protocol	Modbus RTU	Modbus TCP	Modbus RTU

※1. In case of Ethernet connection, and connecting through the network such as network hub (HUB) and gateway, etc, there is no distance limit, but it is recommended to use min. network. Please use communication cables which is satisfied the below conditions.

- RS422/485 communication: Shield Twist Pair over AWG24, characteristic impedance 100Ω, capacity component 50 pF/m cable length max. 1km
- Ethernet communication: Over CAT5E, cable max. length: 100m
- USB communication: Single cable built-in ferrite core within 1.5m

※USB device is recognized as USB to Serial device and communication speed: 115200bps, start bit: 1-bit, data bit: 8-bit, parity bit: none, stop bit: 1-bit are fixed.

◎ **Application of system organization**



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately).
Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48 and SCM-US48I.

▣ Functions

■ Error

Displays error messages on screen and print data when error occurs.

Message	Description
HHHH	When input type is temperature sensor (Thermocouple, RTD) and the measurement value is higher than high-limit value of input range, it flashes HHHH. It is cleared when the measurement value is within the high-limit range. When input type is analog (voltage, current (shunt)) and the measurement value is over 10% of high-limit input range, it flashes HHHH. It is cleared when the measurement value is within 10% of high-limit input range.
LLLL	When input type is temperature sensor (Thermocouple, RTD) and the measurement value is lower than low-limit value of input range, it flashes LLLL. It is cleared when the measurement value is within the low-limit range. When input type is analog (voltage, current (shunt)) and the measurement value is over 10% of low-limit input range, it flashes LLLL. It is cleared when the measurement value is within 10% of low-limit input range.
BURN	When input type is temperature sensor (Thermocouple, RTD) and input is break, it flashes BURN. It is cleared when input is connected.
ASKey	When forgetting and entering invalid password 3 times, “ASKey” appears with error message. Contact our service center with ASKey.

▣ Factory Default

■ Display

◎ File History

Menu	Default
History Mode Graph	H Trend
Memory	Internal Memory
File Name	—

◎ Group Setting

Parameter	Default	Parameter	Default
CH Rotation Time	5s	Display CH Color	Auto set
Name	GROUP1	Line Thickness	2Pt
No. of CHs	Auto set	Min. Value	-200.0
Background	21 (White)	Max. Value	1350.0
Display CH	Auto set		

■ Input CH Info.

◎ Input/Display

Parameter	Default	Parameter	Default
Copy	None	High-Limit Input	Auto set
Tag Name	CH-1	Point	0.0
Input Type	TC-K	Low-Limit Scale	—
Low-Limit Graph Scale	-200.0	Low-Limit Scale	—
High-Limit Graph Scale	1350.0	Display Unit	℃
Low-Limit Input	Auto set		

◎ Input Option

Parameter	Default	Parameter	Default
Special Func.	None	Record Method	Instant
Ref. CH	—	Digital Filter	None
Two Unit	—	No. of Digital Filters	1
Input Bias	0.0	Burn-out Mark	None
Span	1.000		

◎ Alarm

Parameter	Default	Parameter	Default
Type	PV.Hi	ON Delay	0s
Ref. CH	—	OFF Delay	0s
Option	Normal	Alarm No.	None
Setting Value	1350.0	Save Event	ON
Hys	0.0		

▣ Factory Default

■ Option Info.

◎ Alarm Output

Parameter	Default	Parameter	Default
Alarm Mark	ON	Alarm Color	(Alarm 1) Red (Alarm 2) Orange (Alarm 3) Light green (Alarm 4) Green
Alarm Mark Type	Flash	Relay output method	(Relay-1 to 6) N.O. (Relay-7 to 8) —

◎ Digital Input

Parameter	Default	Parameter	Default
DI-1 Type	None	DI-2 Status	—
DI-2 Type	None	Alarm Reset	(Relay-1 to 8) —
DI-1 Status	—	Alarm ON	(Relay-1 to 8) —

◎ RS422/485

Parameter	Default	Parameter	Default
Comm. Address	1	Response Wait Time	20ms
Baud Rate	9600	Protocol	RTU
Parity Bit	None	Comm. Write	Enable
Stop Bit	2 bit	RS422/485 Port	Disable

◎ Ethernet/USB

Parameter	Default	Parameter	Default
IP Address	10.0.2.15	Ethernet Port	Disable
Subnet Mask	255.255.255.0	USB Comm. Write	Enable
Default Gateway	10.0.2.2	USB Device	Enable
Comm. Write	Enable		

■ System Info.

◎ Date/Time

Parameter	Default	Parameter	Default
Date Setting	Auto set	Summer Time	Disable
Time Setting		Summer Time Duration	1month 1day to 1month 1day
Date Type	yyyy/mm/dd	Time	1 hour

◎ Reservation

Parameter	Default	Parameter	Default
Reservation Recording Date	—	Reservation Type	Disable
Reservation Recording Time			

◎ Device

Parameter	Default	Parameter	Default
Device Name	KRN1000 Recorder	Backlight	Standard
Language	English	Screen Save	Disable
PWR ON Record	Hold	Alarm Sound	OFF
Sampling	125ms	Touch Sound	Standard
Log Record Speed	1s	Graph Speed	1s

◎ File

Parameter	Default	Parameter	Default
Parameter Setting File	None	Screen Simulation (Demo)	Start

◎ Log In

Parameter	Default	Parameter	Default
Log In Function	Disable	Input CH Info.	Unlock
Activate Administer Mode	0000	Option Info.	Unlock
Change Password	—	System Info.	Unlock
Display	Unlock	Memory Info.	Unlock
Status	Unlock		

■ Memory Info.

◎ Memory Management

Parameter	Default	Parameter	Default
Clear	—	Storage	Internal

◎ Internal Memory

Parameter	Default	Parameter	Default
No. of Events	100	No. of Screen Captures	10
No. of Alarms	100	Internal Memory Storage Options	Overwrite

※Shaded parameters are depending on other parameters' SV. Refer to the more information of the parameter.

▣ Proper Usage

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Install a surge absorber at each end of inductive load coil when controlling high-capacity power relay or inductive load (e.g. magnet).
- 24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Install the unit straightly at the well-ventilated environment with 30mm of separation distance from the wall.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications') ②Altitude max. 2,000m
  ③Pollution degree 2 ④Installation category II

100mm Hybrid Recorder

▣ Features

- 100mm paper recorder
- Writable data logger function without paper (supports internal memory and external USB memory data backup)
- 25 to 250ms high speed sampling, 10 to 240mm/H high graph mode recording
- 6 kinds of recording color
- Easy parameter setting with quick menu
- Internal parameter setting and monitoring via USB, RS485, Ethernet communication
- High visibility and convenient setting with graphic LCD
- Various inputs of up to 12 channels with slot type input card
- Total 27 types of input specifications (weight, voltage, current, frequency, potentiometer, and various input card can be ordered)
- Reduced installation space with small size (rear length: 168mm)

Please read "Safety Considerations" in the instruction manual before using.

▣ Manuals

- For more information and instructions, refer to the user manual and the user manual for communication. Visit our website (www.autonics.com) to download the manuals.
- The user manual includes product specifications, functions, and operations.
- The user manual for communication includes information about Modbus RTU protocol, Modbus TCP protocol, and Modbus mapping table.

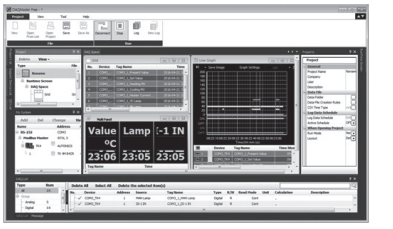
▣ Comprehensive Device Management Program (DAQMaster)

● DAQMaster is comprehensive device management program for convenient management of parameters and multiple device data monitoring.
● Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



▣ Ordering Information

■ Ordering information for recorder model

KRN100	–	12	0	0	0	–	0	0	–	0	S
①		②	③	④	⑤		⑥	⑦		⑧	⑨

Item	Description	
① Item	KRN100	100mm Paper Type Recorder
② Input channel	02	2-channel (KRN-UI2 × 1)
	04	4-channel (KRN-UI2 × 2)
	06	6-channel (KRN-UI2 × 3)
	08	8-channel (KRN-UI2 × 4)
	10	10-channel (KRN-UI2 × 5)
	12	12-channel (KRN-UI2 × 6)
③ Digital inputs	0	None
	1	6 (KRN-DI6 × 1)
	2	12 (KRN-DI6 × 2)
④ Alarm transistor outputs	0	None
	1	6 (KRN-AT6 × 1)
	2	12 (KRN-AT6 × 2)
⑤ Alarm relay outputs	0	None
	1	4 (KRN-AR4 × 1)
	2	8 (KRN-AR4 × 2)
	3	12 (KRN-AR4 × 3)
⑥ Transmitter power outputs	0	None
	1	3 (KRN-24V3 × 1)
	2	6 (KRN-24V3 × 2)
	3	9 (KRN-24V3 × 3)
	4	12 (KRN-24V3 × 4)
⑦ Communication output	0	None
	1	RS485/Ethernet/USB (KRN-COM × 1)
⑧ Power voltage	0	100-240VAC 50/60Hz
⑨ Case	S	Standard panel mounting type

■ Ordering information for input/output card

Type	Model	Function and number of channels	Max. mountable cards	Slot number
Universal input card	KRN-UI2	Universal input 2-channel	6	1 to 6
Digital input card	KRN-DI6	Digital input 6-channel	2	7 to 10※1
Alarm output card	KRN-AR4	Alarm relay output 4-channel	3	
	KRN-AT6	Alarm transistor output 6-channel	2	
Transmitter power output card	KRN-24V3	Transmitter 24VDC power output 3-channel	4	
Communication output card	KRN-COM	RS485 + USB + Ethernet communication output	1	C

※1. The digital input card, alarm output card, transmitter power output card are connectable up to 4 cards as mixed.

■ Example of ordering

To use universal input 10-channel, digital input 4-channel, alarm relay output 5-channel, and RS485 communication output, it is ordered as KRN100-10102-01-0S and the connected I/O card is as below.

- KRN100 (recorder): 1
- KRN-UI2 (universal input card): 5 (One universal input card is 2-channel and 5 cards × 2-channel = 10-channel.)
- KRN-DI6 (digital input card): 1
- KRN-AR4 (alarm relay output card): 2
- KRN-COM (communication output card): 1

▣ Specifications

Series		KRN100
Power voltage		100-240VAC～ 50/60Hz
Allowable voltage range		85 to 110% of rated voltage
Power consumption		Max. 55VA
Screen	LCD type	STN Graphic LCD
	Resolution	320 × 120Pixel
	Adjusting brightness	4-level (OFF/Min/Standard/Max)
	Backlight	White LED, 2-level (Temp/Always)
Input channels		2 / 4 / 6 / 8 / 10 / 12-channel (2-channel/card)
Universal input※1		Temperature sensor (RTD, thermocouple), analog (voltage, current)
Sampling period		1 to 4-channel: 25ms/125ms/250ms, 5 to 12-channel: 125ms/250ms (inner sampling period is operation unit time for average movement filter and alarm output function.) ※Min. sampling period for TC-R, U, S, T sensor is 50ms.
Recording speed in graph mode		10, 20, 40, 60, 120, 240mm/H
Recording speed accuracy		F.S. ±0.5%
Storage cycle		1 to 3600 sec (storage interval time to inner log file is 1 sec)
Inner memory		512MB
USB memory※2		Recognizes max. 32GB, enables to use cable up to 1.5m
Dielectric voltage		2500VAC 50/60Hz for 1 min (power terminal and case) ※Excepts USB Device and Ethernet
Vibration strength (for convey and storage) and operating vibration		Vibration strength: 10 to 60Hz 4.9m/s^2 (each X, Y, Z axis for 1 hour) Operating vibration: 10 to 60Hz 1m/s^2 (each X, Y, Z axis for 10 min)
Insulated resistance		Over 20MΩ (at 500VDC megger)
Noise immunity		±2kV the square wave noise (pulse width 1μs) by the noise simulator
Time accuracy		Within ±2 min/year (enables to use up to 2100 year)
Mech-anism	Ink cartridge	Enables to normal print with going and returning printing max. 5 times within 7 days after opening the unit
	Ink dry time	Max. 15 minutes
Protection		IP40 (for front panel)
Recording paper		113mm × 9m
Environ-ment	Ambient temperature	0 to 50℃, storage: -20 to 60℃ (without ink cartridge)
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH
Approval		CE
Weight※3		Approx. 2.4 to 2.7kg (approx. 1.7 to 2.0kg)

※1. For more information of universal input, please refer to 「I/O card」.
※2. This is included in the product. In case of using the USB flash drive that the user purchased, the device may not be supported.
※3. The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

■ I/O card

Type	Model	I/O specifications		Descriptions
Universal input card	KRN-UI2	Input type※1	RTD	JPt100Ω, DPt100Ω, DPt50Ω, Cu100Ω,Cu50Ω (supply current 420μA)
			Thermocouple	B, C (W5), E, G, J, K, L, L (Russia), N, P, R, S, T, U
			Analog	Voltage: ±60mV ±200mV ±2V, 1-5V, ±5V, -1V-10V Current: 0.00-20.00mA, 4.00-20.00mA
		Input impedance		Voltage (V): min. 150kΩ RTD, Thermocouple, Voltage (mV): min. 2MΩ Current: 51Ω
		Display accuracy※2	RTD	Warm-up time: min. 30 min Room temperature (25℃±5℃): ±0.1%F.S ±1digit Out of room temperature range: ±0.2%F.S ±1digit For RTD, 500 to 800℃ is ±0.5%±1digit of PV value, For Thermocouple, below -100℃ is ±0.3%F.S.±1digit.
			Thermocouple	
			Analog	
		Resolution		16bit
Digital input card	KRN-DI6	Non-contact input		ON: max. 1V of residual voltage, OFF: max. 0.1mA of leakage current
		Contact input		ON: max. 1kΩ, OFF: min. 100kΩ, Outflow current for short: approx. 4mA
Alarm output card	KRN-AR4	Alarm relay output	Capacity	250VAC～ 3A, 30VDC⎓ 3A, 1 Form A (resistance load)
			Life	Mechanical: min. 50,000,000 operations Electrical: min. 100,000 operations (250VAC～ 3A, 30VDC⎓ 3A)
	KRN-AT6	Alarm transistor output		NPN open collector, 12-24VDC/30mA Max.
Transmitter power output card	KRN-24V3	Transmitter power output		24±2VDC⎓, total 3 channels, max. 30mA per 1 channel built-in over-current protection circuit
Communication output card※3	KRN-COM	Com. output	RS485	Modbus RTU ※Recommended to use shield cable over AWG24
			EtherNet	IEEE802.3 (U), 10/100 BASE-T (Modbus TCP)
			USB Device※4	USB V2.0 Full Speed (Device Control)

※1. To change input specification, you must turn OFF the power of KRN100, remove universal input cards, set inner jumper pins (please refer to '■ I/O card') and re-connect it.

※2. Exception range for measuring accuracy by each sensor (accuracy after 30 min warm-up time)

- R,S,C,G: 0≤T≤100±4.0℃
- B: No regulation accuracy below 400℃
- U,T: -200≤T≤-100±3.0℃, -100≤T≤400±2.0℃
- Cu50: -200≤T≤200±1.0℃
- DPt50: -200≤T≤600±1.5℃

※3. RS485, Ethernet communication output are not available at the same time.

※4. The front USB device is only for data backup and rear USB device is available only for parameter setting.

※It is recommended to use shield cable to decrease noise when sensor input cable is longer.

※**If connecting or disconnecting input/output card when power is ON, it may cause malfunction.**
To connect or disconnect input/output card, you must turn OFF the power.

▣ Input Type and Range

Input type			Display	Input range		
				℃	℉	K
Thermocouple	K (CA)		TC-K	-200.0 to 1350.0	-328.0 to 2462.0	73.2 to 1623.2
	J (IC)		TC-J	-200.0 to 800.0	-328.0 to 1472.0	73.2 to 1073.2
	E (CR)		TC-E	-200.0 to 800.0	-328.0 to 1472.0	73.2 to 1073.2
	T (CC)		TC-T	-200.0 to 400.0	-328.0 to 752.0	73.2 to 673.2
	B (PR)		TC-B	100.0 to 1800.0	212.0 to 3272.0	373.2 to 2073.2
	R (PR)		TC-R	0.0 to 1750.0	32.0 to 3182.0	273.2 to 2023.2
	S (PR)		TC-S	0.0 to 1750.0	32.0 to 3182.0	273.2 to 2023.2
	N (NN)		TC-N	-200.0 to 1300.0	-328.0 to 2372.0	73.2 to 2023.2
	C (TT)※1		TC-C	0.0 to 2300.0	32.0 to 4172.0	273.2 to 2573.2
	G (TT)※2		TC-G	0.0 to 2300.0	32.0 to 4172.0	273.2 to 2573.2
	L (IC)		TC-L	-200.0 to 900.0	-328.0 to 1652.0	73.2 to 1173.2
	L (Russian type)※3		TC-L_R	0 to 600.0	32.0 to 1112.0	273.2 to 873.2
	U (CC)		TC-U	-200.0 to 400.0	-328.0 to 752.0	73.2 to 673.2
	Platinel II		TC-P	0.0 to 1350.0	32.0 to 2462.0	273.2 to 1623.2
RTD	Cu50Ω		CU50	-200.0 to 200.0	-328.0 to 392.0	73.2 to 473.2
	Cu100Ω		CU100	-200.0 to 200.0	-328.0 to 392.0	73.2 to 473.2
	JPt100Ω		JPT100	-200.0 to 600.0	-328.0 to 1112.0	73.2 to 873.2
	DPt50Ω		DPT50	-200.0 to 600.0	-328.0 to 1112.0	73.2 to 873.2
	DPt100Ω		DPT100	-200.0 to 850.0	-328.0 to 1562.0	73.2 to 1123.2
Analog	Voltage	-60.00 - 60.00mV	±60mV	Resolution: 10μV	-99999 to 99999 (display range depends on the decimal point position)	
		-200.00 - 200.00mV	±200mV	Resolution: 10μV		
		-2.000 - 2.000V	±2V	Resolution: 1mV		
		1.000 - 5.000V	1-5V	Resolution: 1mV		
		-5.000 - 5.000V	±5V	Resolution: 1mV		
		-1.00 - 10.00V	-1V-10V	Resolution: 10mV		
	Current	0.00 - 20.00mA	0-20mA	Resolution: 10μA		
		4.00 - 20.00mA	4-20mA	Resolution: 10μA		

※1. C (TT): Same as existing W5 (TT) type sensor

※2. G (TT): Same as existing W (TT) type sensor

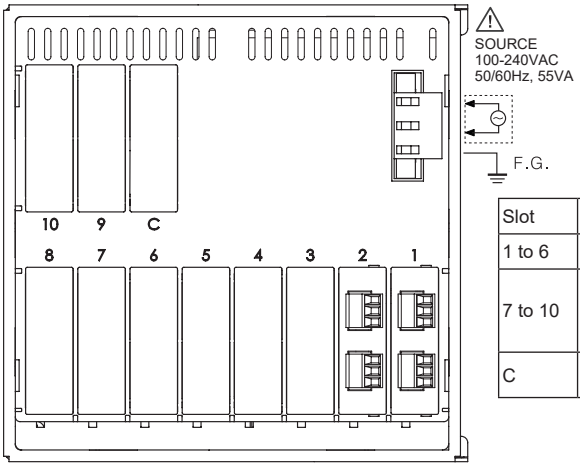
※3. Russian type L type temperature sensor is divided from general purpose L type.

※**When changing input type to voltage (over ±2V) or current, set the jumper pin of KRN-UI2 (universal input card). Its factory default is temperature sensor input.**

▣ Connections

■ Rear side of KRN100 standard model

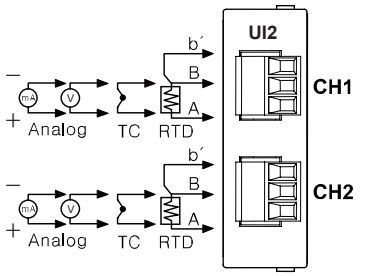
This figure is the rear side of KRN100-04000-00-0S.



Slot	Description
1 to 6	Connects universal input card (KRN-UI2).
7 to 10	Connects digital input card (KRN-DI6), alarm output card (KRN-AR4, KRN-AT6), transmitter power output card (KRN-24V3).
C	Connects communication output card (KRN-COM).

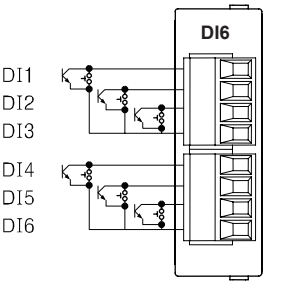
■ I/O card

Universal input card [KRN-UI2]

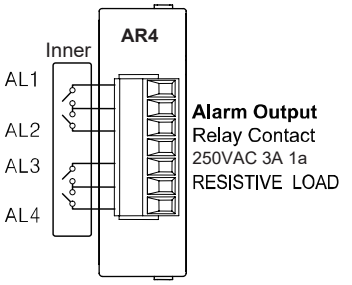


※Each channel is isolated and dielectric strength is 500V.

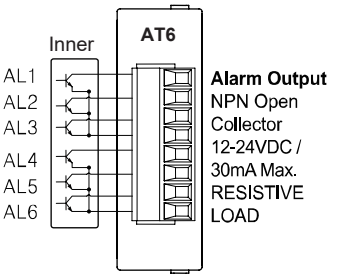
Digital input card [KRN-DI6]



Alarm output card [KRN-AR4 (relay output)]

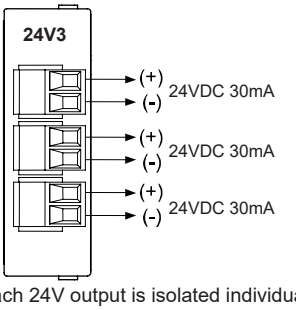


Alarm output card [KRN-AT6 (transistor output)]



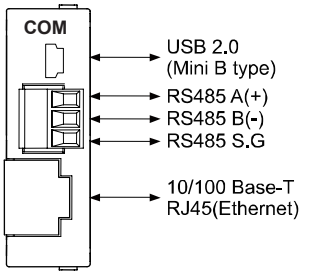
※AL1,2,3 and AL4,5,6 are isolated.

Transmitter power output card [KRN-24V3]



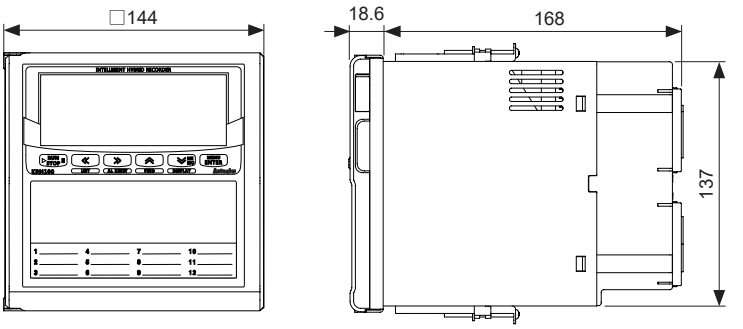
※Each 24V output is isolated individually.

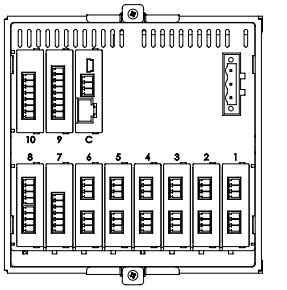
Communication output card [KRN-COM]



▣ Dimensions

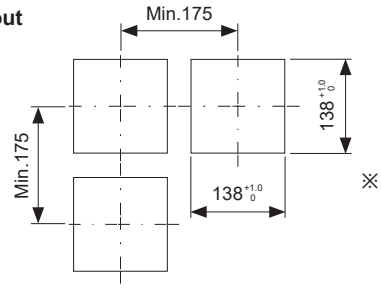
(unit: mm)





※ This rear side dimension is with installed I/O cards to every slot.

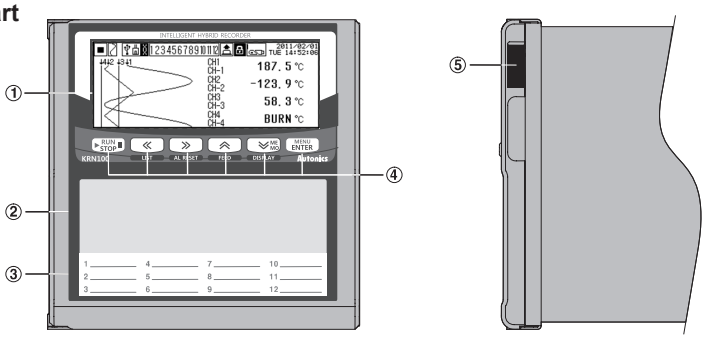
● **Panel cut-out**



※ Use a steel plate which is 2 to 8mm thickness.

▣ Unit Descriptions

■ Front and side part



① Display part: Displays measurement values as trend graph, bar graph, or digital number (1/8/12-channel). Please refer to「Display changing」.

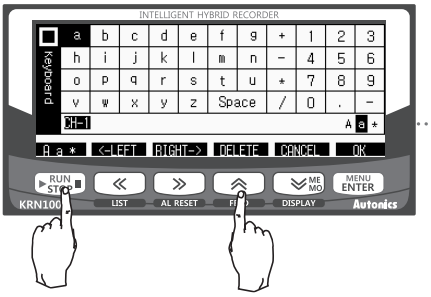
② Recording print part: Records measuring value of data by each channel with designated color.

③ Channel information part: Write the information by each channel.

④ Control key/Function key: Executes parameter setting and recording, and special function.

Key	Function
RUN STOP	Used for starting/stopping recording, changing input characters on virtual keyboard status, and displaying Function key. Press this key for 3 sec in stop state, the ink cartridge moves to the center. (Use this key to replace the ink cartridge.)
LIST	Used for going out from parameter setting group or setting manual channel switch mode. It also executes to release auto channel switch mode and printer list output (3 sec) function.
AL RESET	Used for moving parameter in setting mode, setting manual channel switch mode and forced alarm reset (3 sec).
FEED	Used for moving parameter in setting mode, increasing digit value, setting auto channel switch mode, and manual feed function (by pressing over 3 sec) in stop state.
ME MO DISPLAY	Used for moving parameter in setting mode, decreasing digit value, changing display mode and executing manual digital memo (3 sec) in recording state.
MENU ENTER	Used for entering setting mode (3 sec) and set value change mode.

⑤ USB port :Connects an USB memory. It recognizes max. 32GB and if using cable, it is available up to 1.5m.

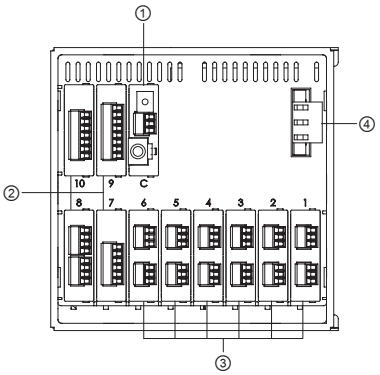


※Function key:

Use this key to enter virtual keyboard in parameter setting.

Press the RUN STOP key and Function key appears on lower screen as below figure. Press the LIST, AL RESET, FEED, DISPLAY, MENU ENTER key as below Function key, it operates the appropriate Function key's operation.

■ Rear part



① Slot (C) for connecting communication output card (KRN-COM)

② Slot (7to10) for connecting digital input card (KRN-DI6), alarm relay output card (KRN-AR4), alarm transistor output card (KRN-AT6), transmitter power output card (KRN-24V3).

You can connect total 4 cards by combining digital input card, alarm output card, and transmitter power output card, as below combination example.

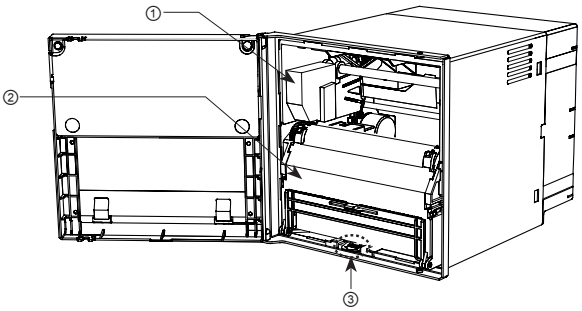
KRN-DI6 : 1	+	KRN-AR4 : 1	+	KRN-AT6 : 1	+	KRN-24V3 : 1	=	Total: 4
KRN-DI6 : 2	+	KRN-AR4 : 1	+	KRN-AT6 : 1	=	Total: 4		
KRN-DI6 : 1	+	KRN-24V3 : 3	=	Total: 4				

③ Slot (1 to 6) for connecting universal input card (KRN-UI2)

④ Power connecting part (100-240VAC 50/60Hz)

※Above the rear side image is connected every output card to help your understand.

■ Inside



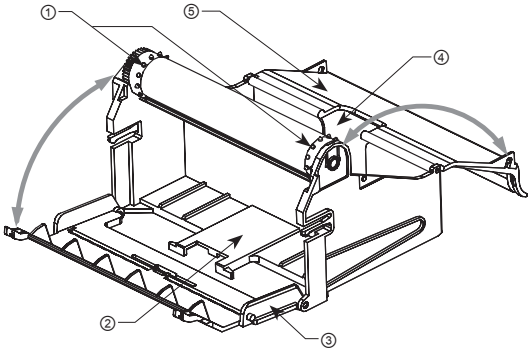
① Ink cartridge (model: D33006B-66X-01)

② Recording paper cassette
Cassette saves the recording paper.

③ Recording paper cassette lever
Press the lever down and this recording paper cassette is removed from KRN100.

※Remove the recording paper cassette for recording paper replacement, ink cartridge replacement.

■ Paper cassette



① Recording paper holder
Movement holder of recording paper when recording

② Recording paper storage part
Storage part for recorded recording paper

③ Front cover of recording paper storage
Open recording paper guide for recording paper replacement

④ New recording paper storage: Storage part for new recording paper (1 recording paper is storable.)

⑤ Rear cover of recording paper storage

▣ Functions

■ Special function [Special Function]

It displays the applied measuring value of the set special function. Depending on Input Type (Input specification), applied special function is different.

- Setting range:
  - When input type (input specification) is temperature sensor (thermocouple, RTD): None ↔ Difference
  - When input type (input specification) is analog (voltage, current): Linear ↔ Root ↔ Square ↔ Two Unit
  (Two Unit is displayed when Input Type (input specification) is set as 0-20mA, 4-20mA.)
- Factory default: None

◎ **Difference (deviation)**

It is available to set when Input Type (input specification) is temperature sensor (thermocouple, RTD). It displays the deviation of Reference Channel (Reference channel) measuring value.

(Display value = standard channel measuring value - reference channel measuring value)

- The set channel as analog (current, voltage) of Input Type (Input specification) is not able to set as Reference Channel (reference channel).
- If there is no set reference channel, it displays standard channel measuring value.
- If any one of reference channel, or standard channel is break (BURN), upper limit value (HHHH), lower limit value (LLLL) status, it displays as correspond value. If you select the channel which is used Difference function as reference channel, it displays the value based on calculating actual measuring value, not display value of reference channel.

◎ **Linear**

It applies lower limit scale and upper limit scale to lower limit input value and upper limit input value and displays this values.

E.g.) In case low limit input value: -5V, high limit input value: +5V and in case lower limit scale: -1000, upper limit scale: 1000, if current input value is 2V, display value is 400.

◎ **Root**

In case voltage, current input type, this mode is used when input value is calculated by Root ($\sqrt{\ }$) for the desired display value. Differential pressure signal of differential pressure flow meter is calculated Root ($\sqrt{\ }$) for the to-be measured flux. This function is used to measure flux by input value.

E.g.) In case lower limit input value: -5V, upper limit input value: +5V and in case lower limit scale: -1000, upper limit scale: 1000, if current input value is 2V, display value is approx. 673.32.

◎ **Square**

In case of voltage, current input type, this mode is used when input value is calculated by square for the desired display value. Reverse of Root, flux signal is calculated by square for differential pressure signal.

E.g.) In case lower limit range: -5V, upper limit range: +5V and in case lower limit scale: -1000, upper limit scale: 1000, if current input value is 2V, display value is -20.

◎ **Two Unit**

For compound pressure, if input pressure is lower than atmospheric pressure (0), it displays the degree of a vacuum with mmHg unit. If input pressure is higher than or same as atmospheric pressure (0), it displays positive pressure with kg/cm^2 unit.

When using Two Unit function, lower limit value is fixed as -760mmHg and kg/cm^2 value is able to set within setting range 1 to 35.

Two Unit limits scale point as 0 ↔ 0.0 ↔ 0.00 . When using Two Unit, display unit is automatically changed as mmHg or kg/cm^2.

The calculation with Record Method (Data storage method) and Filter type (Input digital filter) is impossible and ignored due to different type of two unit value.

- Setting range: 1 to 35
- Factory default: -

E.g.) If pressure range is -760mmHg to 3kg/cm^2, and pressure transmitter outputs 4-20mA, for 4mA input it displays -760mmHg, 8mA input is unit changing point. For 20mA input, it displays 3kg/cm^2.

■ Record zone division [Divide Zone]

Divides record zone for measuring value by channel.

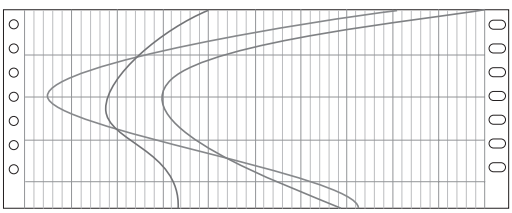
It divides equally max. 12 zones as equal value. User needs to set record zone by channel in Record Zone setting at Input Setup.

It is easy to check measuring value due not to duplicated record zone with divided record zone by channel which is set in Record Zone setting at Input Setup.

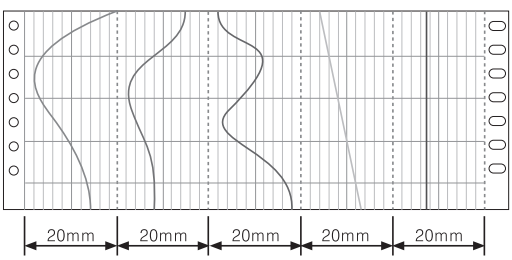
If there is too many division for record zone, record value check accuracy is low.

- Setting range: None, 2 to 12
- Factory default: None

E.g.) SV of record zone division: None



E.g.) SV of record zone division: 5



▣ Functions

■ Summer time [Summer Time]

This function is for applying summer time (daylight saving time) in specific countries and regions.

When you set Summer Time, it adds current time and 1 hour and displays the 「 (S)」 mark in front of the date and time on LCD screen or in front of the date on recording paper.

- Setting range: Disable ↔ Enable
- Factory default: Disable

■ Standard record period [Standard Period]

Set record period to record current time, display value by channel as digital number on recording paper.

It is activated when Record Mode (Record mode) is Digital.

- Setting range: 00m 01s to 99m 59s

  Depending on the number of recording channels, min. setting range is limited as below.

Record channel	Setting range
1 to 2	01m 00s to 99m 59s
3 to 4	02m 00s to 99m 59s
5 to 6	03m 00s to 99m 59s
7 to 8	04m 00s to 99m 59s
9 to 10	05m 00s to 99m 59s
11 to 12	06m 00s to 99m 59s

- Factory default: -

■ Reservation record [RESERVATION SETUP]

This function is to set reservation time. At the set time, it starts/stops recording automatically.

You can select reservation record either Repeat (repeat ON/OFF) or Single (single ON/OFF).

When selecting reservation record, 'Reservation Period (Reservation record period)' and 'Reservation Time (Reservation record time)' are activated. When reservation record is set, the RE icon flashes with the ▶ (recording) or the ■ (stop recording) icon.

The RE icon tuns OFF when reservation setting is 'Disable'.

- Setting range: Disable ↔ Repeat ↔ Single
- Factory default: Disable

◎ **Repeat (repeat ON/OFF)**

From start recording date to end recording date, it records data at from the set start time to the set end time.

◎ **Single (single ON/OFF)**

Starts recording at the start set time on start date and finishes recording at the end set time on end date.

■ File/Memory setup [FILE/MEMORY SETUP]

You can set the parameter about parameter set file and storage data. Move to FILE/MEMORY SETUP with the FEED, MEMO DISPLAY keys, press the MENU ENTER key to enter FILE/MEMORY SETUP.

◎ **Open parameter set file [Load Set File]**

Applies set value of saved parameter set file.

When applying this set, backup data, user unit and booting logo are not changed.

None, Default.pms file is activated and if there is User1.pms to User5.pms, User1.pms (USB) to User5.pms (USB) file (parameter set save file), it is activated.

- Setting range:

  None ↔ Default.pms ↔ User1.pms to User5.pms ↔ User1.pms (USB) to User5.pms (USB)
- Factory default: None

※Be sure that if selecting 'Default.pms' file, every set value is initialized as factory default. Save the current set parameter as Save Set File (parameter setting file storage) at first and initialize it for the provision.

※One file from User1.pms to User5.pms, User1.pms (USB) to User5.pms (USB) is selected, all parameter setting information of KRN100 is changed as the set value of the selected parameter save file.

※Set value changing may be also affected to every setting of KRN100's overall operations. Check possible problems occurring on system and change the desired set value.

◎ **Save parameter set file [Save Set File]**

Saves current set parameter set value to inner memory or an external USB memory.

When saving it to inner memory, it is saved in User1.pms to User5.pms files or to an external USB memory, it is saved in User1.pms (USB) to User5.pms (USB) files. (Activated only when an external USB memory is connected.)

- Setting range:

  None ↔ User1.pms to User5.pms, User1.pms (USB) to User5.pms (USB)
- Factory default: Select...

▣ Functions

◎ **USB storage function [USB LogData Save]**

Set whether to save backup data which is saved at system on an USB memory.

When selecting Enable to saving data to USB memory, it also saves data to system memory at the same time. Connected an USB memory at left side USB Slot, KRN100 starts to save. It takes check time for storage free space approx. 10 to 60 sec depending on memory capacity.

The data is saved as 'KRN100_20100815 (year month day)_091050 (hour min sec).KRD' file name and if main set is changed or backup data capacity is over 100MByte, it creates a new file.

- Setting range: Disable ↔ Enable
- Factory default: Disable

※ Supporting file system is FAT16, FAT32 when using an USB memory. Microsoft's file system, NTFS, and Linux's file system, EXT2, EXT3, etc., are not supportable.

※ When connecting an USB memory, KRN100 pauses backup data download by Modbus function, and backup data printer function to recognize memory for a while (depending on the capacity, max. 30 sec).

※ If an USB memory's LED flashes, do not remove an USB memory, or it may damage to the data. If the damage of USB memory data occurs, you can find the saved data from KRN100 inner memory and save the desired file to an USB memory.

■ Firmware upgrade

Upgrades KRN100 firmware.

When upgrading firmware, parameters' set values are initialized.

- Setting range: -
- Factory default: Auto set

※ During firmware upgrade, alarm output, digital input and log file save, etc functions does not operate normally. Therefore, please take proper measures to prevent malfunction of KRN100 system before starting firmware upgrade. After completing firmware upgrade, you must turn OFF and ON the power of KRN100 to operate normally.

※ During firmware upgrading, when power turns OFF, firmware upgrade is not complete. When power turns ON again, KRN100 operates with previous firmware version. Try firmware upgrade again.

※ After completing firmware upgrade and OFF/ON the power, if KRN100 displays booting screen and does not operate normally, it may have damage to the inner firmware during firmware upgrade. It is required to repair

■ Backup data record setting [RECORD BACKUP SETUP]

Record Backup creates file when power ON regardless of starting/stopping record and saves the data to inner system memory (USB memory storage is available (Enable) by the set.) according the set record mode.

This parameter is useful to print the desired time data with backup data or check data by computer with DAQ Master (dedicated software).

Therefore, backup data set function is for printing the saved backup data at inner system memory and USB memory.

Move to RECORD BACKUP SETUP with the FEED, MEMO DISPLAY keys and press the MENU ENTER key to enter RECORD BACKUP SETUP.

※ For printing backup data, KRN100 reads saved backup data in memory from beginning to end at first and starts printing. If backup data section is long or backup data is saved as low speed record mode, reading takes a lot of time. Therefore, print only for the desired section.

※ In graph mode, record speed is changed by Standard speed, Alarm, or Option Speed. Backup data is printed with Standard speed. Therefore, original printout and backup printout in graph mode may be different.

◎ **Backup data record for clearing no recording paper [P.END Backup Print]**

If there is no recording paper, the P.END icon flashes.

After replacing recording paper, 「P.END BACKUP PRINT」 screen as below is activated.

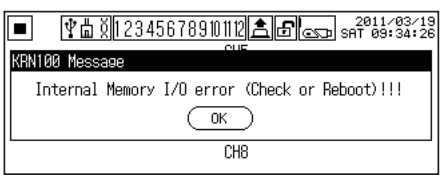
Backup data recording function by P.END is same as RECORD BACKUP. Backup Data List cannot be changed.

Starting print by P.END Backup, it prints the data but backup data file date, file name, and backup record starting line.

▣ Functions

■ Error

Displays error messages on screen and print data when error occurs.

Message	Description	Message	Description
HHHH	In case Input Type is temperature sensor(thermocouple, RTD), if input value is higher than upper limit range, this error message flashes. If input value is within upper limit range, it is removed automatically. In case Input Type is analog (current, voltage), if input value is higher than over 10% of upper limit input range, this error message flashes. If input value is within 10% of upper limit input range, it is removed automatically. Prints HH.	LLLL	In case Input Type is temperature sensor (thermocouple, RTD), if input value is lower than lower limit range, this error message flashes. If input value is within lower limit range, it is removed automatically. In case Input Type is analog (current, voltage), if input value is lower than over 10% of lower limit input range, this error message flashes. If input value is within 10% of lower limit input range, it is removed automatically. Prints LL.
_H	In case Input Type is analog (current, voltage), if input value is higher than below 10% of upper limit input range, 「_H」 is displayed with current value to notify that current value is higher than upper limit input range. E.g.) When upper limit input range is 100 and current value is 102, it displays as 102_H.	_L	In case Input Type is analog (current, voltage), if input value is lower than below 10% of lower limit input range, 「_L」 is displayed with current value to notify that current value is lower than lower limit input range. E.g.) When lower limit input range is 0 and current value is -1, it displays as -1_L.
BURN	If input is break, this error message flashes. When input is connected, it is removed automatically. Prints BH (display value by break is High) or BL (display value by break is Low).	Inner Memory Access	 As above screen, if excess error message for inner system memory Read/Write occurs frequently, please contact our service center.
NONE	If universal input card is not connected, this error message flashes.		
ERR	When there is parameter setting error, card recognition error, etc, this error message flashes twice and KRN100 returns to previous screen.		

※ **For more functions, refer to the user manual of KRN100.**

▣ Functions

■ Communication setting [COMMUNICATION SETUP]

Set the related parameters with communication output card (KRN-COM).

You can only check the item of COMMUNICATION SETUP by communication but cannot change the set.

This parameter is for setting and monitoring parameters from external upper system (PC and graph panel, etc) or transmitting the data to external devices by RS485, Ethernet, or USB Device communication.

It is recommended to use our dedicated software program DAQMaster for monitoring. If you want to develop monitoring program not using our DAQMaster program or to use the related Modbus program, please refer to user manual for communication.

Visit our website (www.autonics.com) to download DAQMaster program, and user manual for communication.

Move to COMMUNICATION SETUP with the FEED, DISPLAY keys, press the MENU ENTER key to enter COMMUNICATION SETUP.

KRN100 does not supports RS485 port, Ethernet port at the same time for preventing system overload. If you change one as「Enable」, the other is changed「Disable」automatically.

In case USB Device, it is able to set 「Enable」,「Disable」regardless of RS485 or Ethernet setting.

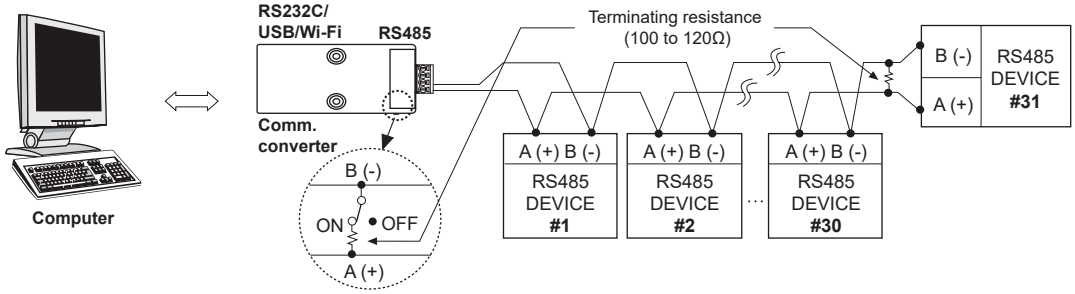
◎ **Interface**

Item	RS485	Ethernet	USB
Application standard	Compliance with EIA RS485	—	Compliance with USB V2.0
Max. connections	31 units (address: 1 to 127)	1 unit (number of occupations per a unit)	1 unit
Com. distance※1	Within max. 1km (below 9600bps)	Single cable within 100m (recommended over CAT5E)	Single cable within 1.5m
Com. method	Half duplex	Full duplex	—
Com. synchronization method	Asynchronous	Asynchronous	Asynchronous
Com. speed	2400/4800/9600/19200/38400bps	10/100Mbps	12Mbps (Full Speed)
Com. response wait time	5 to 99ms	—	—
Start Bit	1bit (fixed)	—	—
Data Bit	8bit (fixed)	—	—
Parity Bit	None, Odd, Even	—	—
Stop Bit	1, 2bit	—	—
Protocol	Modbus RTU	Modbus TCP	Modbus RTU

※1. When connecting through the network such as network hub (HUB) and gateway, etc, there is no distance limit, but it is recommended to use min. network. Please use communication cables which is satisfied the below conditions.

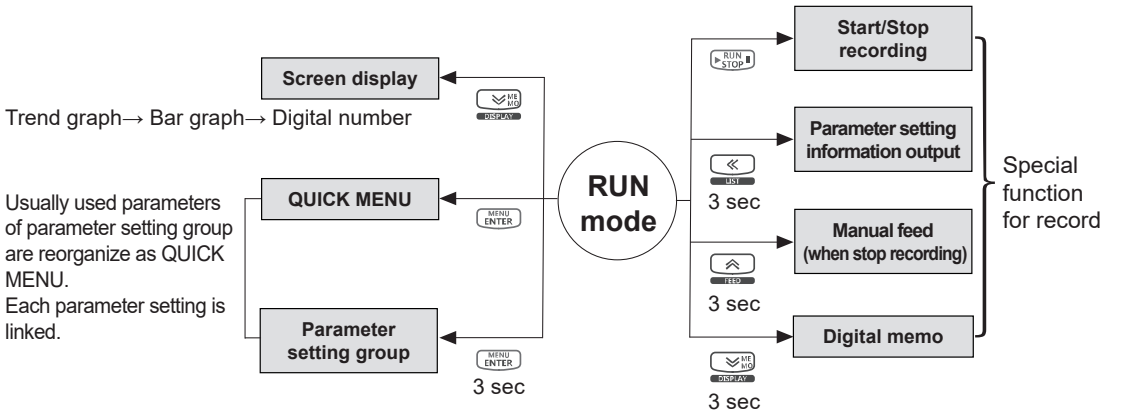
- · RS485 communication: Shield Twist Pair over AWG24, characteristic impedance 100Ω, capacity component 50 pF/m cable length max. 1km
- · Ethernet communication: Over CAT5E, cable max. length: 100m
- · USB communication: Single cable built-in ferrite core within 1.5m

◎ **Application of system organization**



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately). Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48 and SCM-US48I.

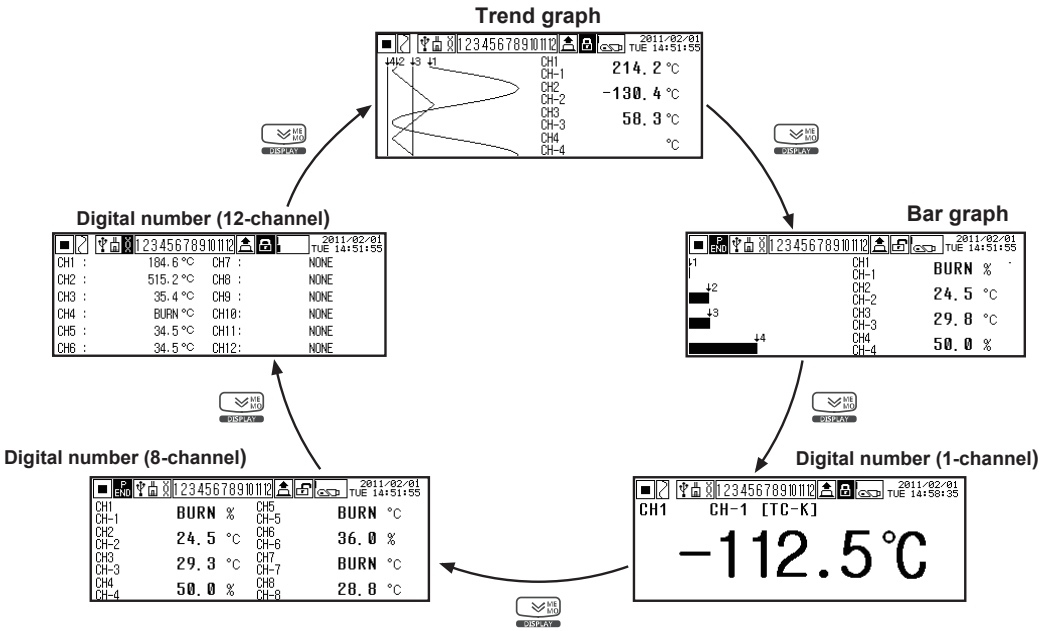
▣ Adjustment



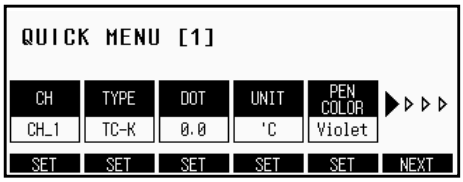
▣ Display Changing

KRN100 displays measuring value as trend graph, bar graph, and digital number display (1-channel, 8-channel, 12-channel).

You can select one by the MODE/DISPLAY key.



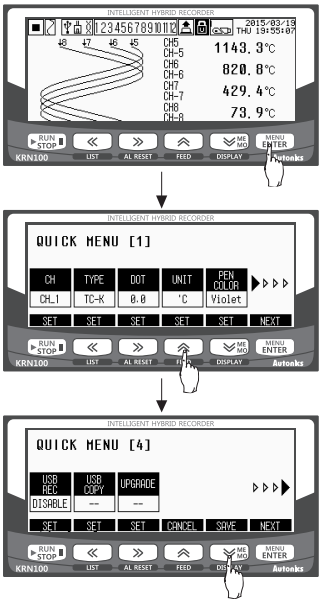
■ QUICK MENU



QUICK MENU consists of usually used parameters for quickly parameter setting.

Page	Parameter	Description	Linked parameters
QUICK MENU [1]	CH	Select channel for the QUICK MENU [1] setting	
	TYPE	Input type	[INPUT SETUP]-[Input Type]
	DOT	Decimal point	[INPUT SETUP]-[Range/Scale Point]
	UNIT	Display/Temperature unit	[INPUT SETUP]-[Display/Temp Unit]
	PEN COLOR	Pen color	[INPUT SETUP]-[Pen Color]
QUICK MENU [2]	CH	Select channel for the QUICK MENU [2] setting	
	LOW RANGE	Low-limit input value or graph scale value	[INPUT SETUP]-[Low Range] or [INPUT SETUP]-[Low Graph Scale]
	HIGH RANGE	High-limit input value or graph scale value	[INPUT SETUP]-[High Range] or [INPUT SETUP]-[High Graph Scale]
	LOW SCALE	Low-limit scale value	[INPUT SETUP]-[Low Scale]
	HIGH SCALE	High-limit scale value	[INPUT SETUP]-[High Scale]
QUICK MENU [3]	PRINT MODE	Record mode	[RECORD SETUP]-[Record Mode]
	PRINT SPEED	Standard record speed	[RECORD SETUP]-[Standard Speed]
	PRINT MEMO	Digital memo period	[RECORD SETUP]-[Memo Period]
	BACK LIGHT	LCD backlight	[SYSTEM SETUP]-[Backlight]
	LCD ON/OFF	LCD backlight ON/OFF	[SYSTEM SETUP]-[Backlight On/Off]
QUICK MENU [4]	USB REC	Memory save	[FILE/MEMORY SETUP]-[USB LogData Save]
	USB COPY	Call USB COPY window	[FILE/MEMORY SETUP]-[USB Memory Copy/Move]
	UPGRADE	Call upgrade window	[USER/INFORMATION SETUP]-[Firmware Upgrade]
	CANCEL	Cancel the settings	
	SAVE	Save the setting of QUICK MENU [1] to [4]	

■ QUICK MENU Setting



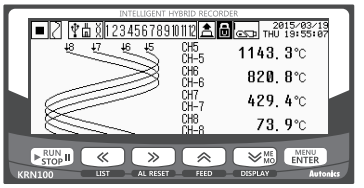
Press the (MENU ENTER) key once in RUN mode and it enters to QUICK MENU.
QUICK MENU consists of usually used parameters for quickly parameter setting.

Set the keys following the each parameter.
Press the NEXT ((MENU ENTER)) key and it moves to next page.
E.g.)When changing the temperature unit (℃→℉), press the SET ((FEED)) key.

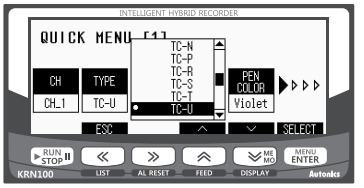
After completing the setting, press the SAVE ((ME MO DISPLAY)) key at QUICK MENU [4] and save the settings. It returns to RUN mode.

▣ Example of QUICK MENU Setting

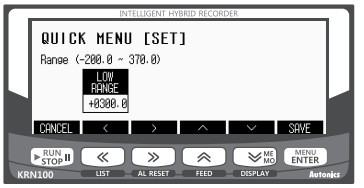
In case of CH1, recording as input type=TC-U, low-limit input value=300, standard record speed=240mm/h.



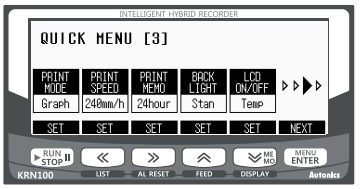
Press the MENU ENTER key in RUN mode to enter QUICK MENU.



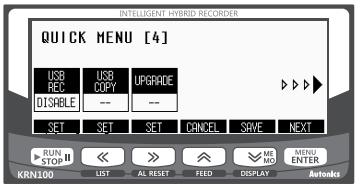
Press the SET (LIST) key at QUICK MENU[1] and below screen is displayed. Set input type[TYPE] as TC-U by pressing SET (FEED, DISPLAY) keys and press the MENU ENTER key.



Press the NEXT (MENU ENTER) key once and it moves to QUICK MENU [2]. Press the SET (LIST) key using LIST, AL RESET, FEED, DISPLAY keys to set low-limit input range[LOW RANGE] as 300. Press the MENU ENTER key.

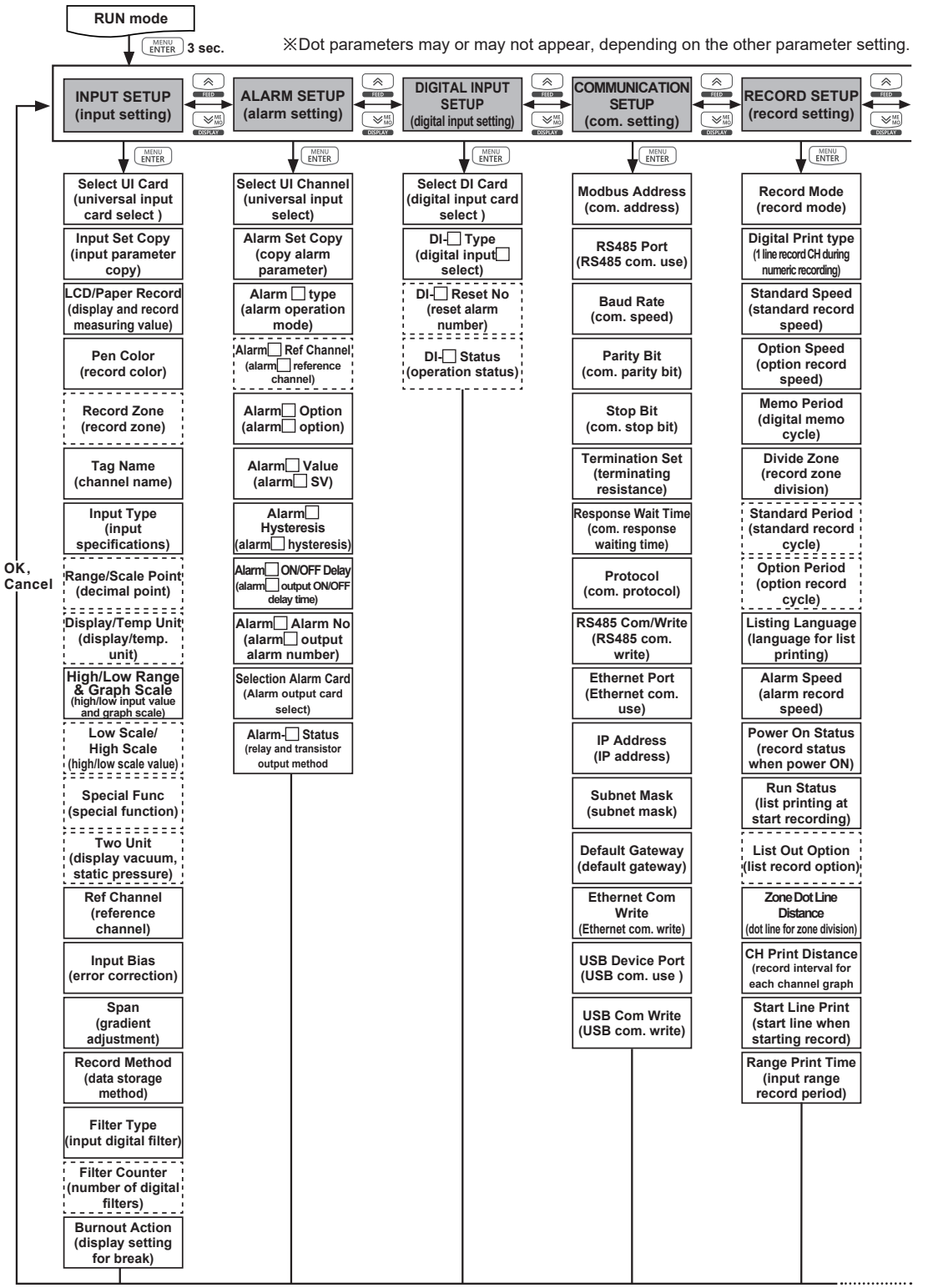


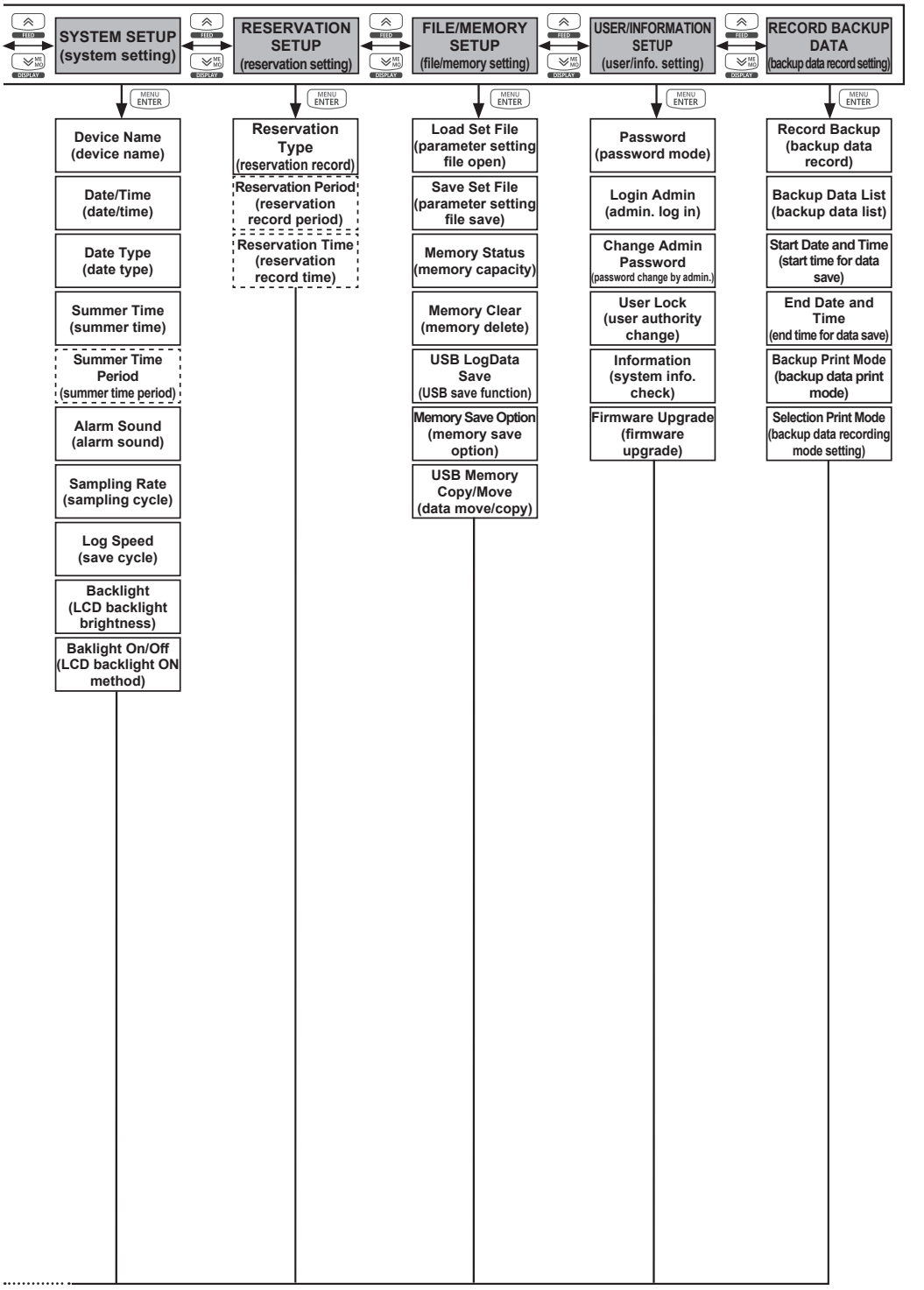
Press the NEXT (MENU ENTER) key once and it moves to QUICK MENU [3]. Press the SET (LIST) key and set standard record speed [PRINT SPEED] as 240mm/h. Press the MENU ENTER key.



Press the NEXT (MENU ENTER) key once and it moves to QUICK MENU [4]. Press the SAVE (DISPLAY) key to save the settings of QUICK MENU [1] to [4] and it returns to RUN mode.

▣ Parameters


RUN mode
MENU ENTER 3 sec.
※Dot parameters may or may not appear, depending on the other parameter setting.
INPUT SETUP (input setting)
ALARM SETUP (alarm setting)
DIGITAL INPUT SETUP (digital input setting)
COMMUNICATION SETUP (com. setting)
RECORD SETUP (record setting)
OK, Cancel
Select UI Card (universal input card select)
Input Set Copy (input parameter copy)
LCD/Paper Record (display and record measuring value)
Pen Color (record color)
Record Zone (record zone)
Tag Name (channel name)
Input Type (input specifications)
Range/Scale Point (decimal point)
Display/Temp Unit (display/temp. unit)
High/Low Range & Graph Scale (high/low input value and graph scale)
Low Scale/ High Scale (high/low scale value)
Special Func (special function)
Two Unit (display vacuum, static pressure)
Ref Channel (reference channel)
Input Bias (error correction)
Span (gradient adjustment)
Record Method (data storage method)
Filter Type (input digital filter)
Filter Counter (number of digital filters)
Burnout Action (display setting for break)
Select UI Channel (universal input select)
Alarm Set Copy (copy alarm parameter)
Alarm □ type (alarm operation mode)
Alarm□ Ref Channel (alarm□ reference channel)
Alarm□ Option (alarm□ option)
Alarm□ Value (alarm□ SV)
Alarm□ Hysteresis (alarm□ hysteresis)
Alarm□ ON/OFF Delay (alarm□ output ON/OFF delay time)
Alarm□ Alarm No (alarm□ output alarm number)
Selection Alarm Card (Alarm output card select)
Alarm-□ Status (relay and transistor output method
Select DI Card (digital input card select)
DI-□ Type (digital input□ select)
DI-□ Reset No (reset alarm number)
DI-□ Status (operation status)
Modbus Address (com. address)
RS485 Port (RS485 com. use)
Baud Rate (com. speed)
Parity Bit (com. parity bit)
Stop Bit (com. stop bit)
Termination Set (terminating resistance)
Response Wait Time (com. response waiting time)
Protocol (com. protocol)
RS485 Com/Write (RS485 com. write)
Ethernet Port (Ethernet com. use)
IP Address (IP address)
Subnet Mask (subnet mask)
Default Gateway (default gateway)
Ethernet Com Write (Ethernet com. write)
USB Device Port (USB com. use)
USB Com Write (USB com. write)
Record Mode (record mode)
Digital Print type (1 line record CH during numeric recording)
Standard Speed (standard record speed)
Option Speed (option record speed)
Memo Period (digital memo cycle)
Divide Zone (record zone division)
Standard Period (standard record cycle)
Option Period (option record cycle)
Listing Language (language for list printing)
Alarm Speed (alarm record speed)
Power On Status (record status when power ON)
Run Status (list printing at start recording)
List Out Option (list record option)
Zone Dot Line Distance (dot line for zone division)
CH Print Distance (record interval for each channel graph
Start Line Print (start line when starting record)
Range Print Time (input range record period)


SYSTEM SETUP (system setting)
RESERVATION SETUP (reservation setting)
FILE/MEMORY SETUP (file/memory setting)
USER/INFORMATION SETUP (user/info. setting)
RECORD BACKUP DATA (backup data record setting)
MENU ENTER
Device Name (device name)
Date/Time (date/time)
Date Type (date type)
Summer Time (summer time)
Summer Time Period (summer time period)
Alarm Sound (alarm sound)
Sampling Rate (sampling cycle)
Log Speed (save cycle)
Backlight (LCD backlight brightness)
Baklight On/Off (LCD backlight ON method)
Reservation Type (reservation record)
Reservation Period (reservation record period)
Reservation Time (reservation record time)
Load Set File (parameter setting file open)
Save Set File (parameter setting file save)
Memory Status (memory capacity)
Memory Clear (memory delete)
USB LogData Save (USB save function)
Memory Save Option (memory save option)
USB Memory Copy/Move (data move/copy)
Password (password mode)
Login Admin (admin. log in)
Change Admin Password (password change by admin.)
User Lock (user authority change)
Information (system info. check)
Firmware Upgrade (firmware upgrade)
Record Backup (backup data record)
Backup Data List (backup data list)
Start Date and Time (start time for data save)
End Date and Time (end time for data save)
Backup Print Mode (backup data print mode)
Selection Print Mode (backup data recording mode setting)

▣ Factory Default

■ Input setting group [INPUT SETUP]

Parameter	Default	Parameter		Default	Parameter	Default	Parameter	Default
Select UI Card	Auto set	Input Type		TC-K	Low Scale/High Scale	—	Record Method	Instant
Input Set Copy	CH Select	Range/Scale Point		0.0	Special Function	None	Filter Type	None
LCD/Paper Record	ON	Display/Temp Unit	TC, RTD	℃	Two Unit	—	Filter Counter	—
Pen Color	Auto set		Analog	%	Reference Channel	—	Burnout Action	OFF
Record Zone	None	High/Low Range & Graph Scale	Low	-200.0	Input Bias	0.0		
Tag Name	CH-1 to 12		High	1350.0	Span	—		

■ Alarm setting group [ALARM SETUP]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
Select UI Card	Auto set	Alarm□ Ref Channel	—	Alarm□ Hysteresis ※1	0.0	Alarm-□ Status ※1	NO
Alarm Set Copy	CH Select	Alarm□ Option ※1	None	Alarm□ ON/OFF Delay ※1	0s		
Alarm1 Type ※1	PV.Hi	Alarm1 Value ※1	1350.0	Alarm□ Alarm No ※1	None		
Alarm 2 to 4 Type ※1	None	Alarm 2 to 4 Value ※1	—	Select Alarm Card	Auto set		

■ Digital input setting group [DIGITAL INPUT SETUP]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
Select DI Card	Auto set	DI-□ Type	None	DI-□ Reset No	—	DI-□ Status	—

■ Communication setting group [COMMUNICATION SETUP]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
Modbus Address	1	Stop Bit	2	RS485 Com Write	Enable	Default Gateway	—
RS485 Port	Enable	Termination Set	Disable	Ethernet Port	Disable	Ethernet Com Write	—
Baud Rate	9600	Response Wait Time	20ms	IP Address	—	USB Device Port	Enable
Parity Bit	None	Protocol	Modbus RTU	Subnet Mask	—	USB Com Write	Enable

■ Record setting group [RECORD SETUP]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
Record Mode	Graph	Divide Zone	None	Power On Status	Hold	Start Line Print	ON
Digital Print type	TwoCH	Standard Period	—	Run Status	OFF	Range Print Time	Disable
Standard Speed	20mm/h	Option Period	—	List Out Option	Standard		
Option Speed	20mm/h	Listing Language	English	Zone Dot Line Distance	4.0mm		
Memo Period	2hour	Alarm Speed	20mm/h	CH Print Distance	20.0mm		

■ System setting group [SYSTEM SETUP]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
Device Name	KRN100 Recorder	Summer Time	Disable	Sampling Rate	125ms	Backlight On/Off	Temp
Date/Time	Default set	Summer Time Period	—	Log Speed	None (0s)		
Date Type	yyyy/mm/dd	Alarm Sound	OFF	Backlight	Standard		

■ Reservation setting group [RESERVATION SETUP]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
Reservation Type	Disable	Reservation Period	—	Reservation Time	—		

■ File/Memory setting group [FILE/MEMORY SETUP]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
Load Set File	None	Memory Status	0%	USB LogData Save	Disable	USB Memory Copy/Move	USB Copy/ Move..
Save Set File	Select...	Memory Clear	Clear...	Memory Save Option	Stop		

■ User/Information setting group [USER INFORMATION SETUP]

Parameter	Default	Parameter	Default	Parameter	Default
Password	Disable	Change Admin Password	—	Information	Display...
Login Admin	—	User Lock	OFF	Firmware Upgrade	Auto set

■ Backup data record setting group [RECORD BACKUP SETUP]

Parameter	Default	Parameter	Default	Parameter	Default
Record Backup	Stop	Start Date and Time	0000/00/00 00:00:00	Backup Print Mode	Graph
Backup Data List	File Not Found!!	End Date and Time	0000/00/00 00:00:00	Select Print Mode	Graph

※1. Alarm □ Type to Alarm □ No are displayed by the number of connected alarm cards.

※ Shaded parameters are depending on other parameters' SV. Refer to the more information of the parameter.

▣ Proper Usage

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Install a surge absorber at each end of inductive load coil when controlling high-capacity power relay or inductive load (e.g. magnet).
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

50mm Compact Hybrid Recorders

▣ Features

- 50mm thermal transfer method of paper recorder
- Data logger function for recording without paper
- 2-channel simultaneous recording
  - graphic mode, digital mode
- RS485 communication and dedicated communication port to set or monitor parameters in real-time by PC/ PLC
- Multi-input with high accuracy 0.2% level (TC, RTD, Voltage, Current(shunt))
- Various option I/O function
- Small size (W96×H96×L100mm), light weight

Please read "Safety Considerations" in the instruction manual before using.

CE

▣ Manuals

- For more information and instructions, refer to the user manual. Visit our website (www.autonics.com) to download the manuals.
- The user manual includes product specifications, functions, and operations.

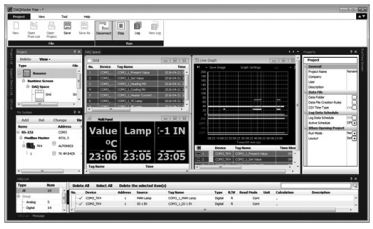
▣ Comprehensive Device Management Program (DAQMaster)

● DAQMaster is comprehensive device management program for convenient management of parameters and multiple device data monitoring.
● Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



▣ Ordering Information

KRN50 — 2 0 0 4 — 4 0

Power supply	0	100-240VAC 50/60Hz
	1	24VDC
Option output	0	None
	4	RS485 communication output
Alarm output	0	None
	2	Alarm output: 2※1
	4	Alarm output: 4※2
CH2 control output	0	None
CH1 control output	0	None
Number of input channels	1	1-channel
	2	2-channel
Item	KRN50	Thermal Line Recorder (50mm)

※ 1. When selecting this for 2 CH model, two alarm outputs for CH1 are available. In other words, you cannot set one for CH1 and one for CH2.
※ 2. It is selectable only for 2 CH model.

■ Specifications

Series		KRN50
Power supply	AC voltage	100-240VAC～ 50/60Hz
	DC voltage	24VDC⎓
Allowable voltage range	AC voltage	85 to 110% of rated voltage
	DC voltage	90 to 110% of rated voltage
Power consumption	AC voltage	Max. 34VA
	DC voltage	Max. 79W
Display method		LCD Dot matrix Display (resolution 128×32 Dot)
Input type	RTD	JPt100Ω, DPt100Ω, DPt50Ω, Cu100Ω, Cu50Ω (5 types)
	TC	K, J, E, T, B, R, S, N, C, G, L, U, PLII (13 types)
	Analog	· Voltage: -50.0-50.0mV, -199.0-200.0mV, -1.000-1.000V, -1.00-10.00V (4 types) · Current: 0.00-20.00mA, 4.00-20.00mA (2 types) ※ For current input, connect external 50Ω B class (0.1%) high-accuracy resistor
Event input	Contact	Input ON: max. 1kΩ, OFF: min. 100kΩ
	Non-contact	Input ON: residual voltage max. 1V, OFF: leakage current max. 0.05mA
	Outflow current	Approx. 0.3mA
Display accuracy※1	RTD	At room temperature (25℃±5℃): ±0.2% F.S. ±1-digit Out of room temperature: ±0.3% F.S. ±1-digit (TC-K2 has same accuracy within -200 to 1350℃ of TC-K1.)
	TC	
	Analog	
Record accuracy		±0.5%F.S.
Alarm output		CH1 (AL1, AL2), CH2 (AL1, AL2) Relay output (250VAC～/30VDC⎓ 3A 1a)
Alarm output hysteresis		ON/OFF interval setting for alarm output: 1 to 999-digit variable
Communication output		RS485 communication output (Modbus RTU protocol)
Set method		Setting by front keys
Sampling cycle		500ms/channel×2 channels = 1000ms
Dielectric strength		2300VAC 50/60Hz for 1 min (charging terminal of the other polarity)
Vibration		0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour
Relay life cycle		Mechanical: over 5,000,000 operations, Electrical: over 100,000 operations
Insulation resistance		Over 100MΩ (at 500VDC megger)
Noise immunity		±2kV the square wave noise (pulse width 1μs) by the noise simulator
Print	Method	Direct thermal line print
	Resolution	8-dot/mm
	Dots	384-dot/Line
	Life cycle	50km
Record	Graphic mode	· Record speed (recording paper speed): 10, 30, 60, 120, 240, 480, 960mm/hour · Memo cycle: 30s, 1m, 5m, 10m, 15m, 30m, 1h, 2h, 3h, 4h, 8h, 16h, 24h
	Digital mode	TEXT mode record cycle: 00m 05s to 99m 59s
	Paper	Thermal Direct Receipt Paper (57mm×16m)
	Paper supply method	Clamshell type
	Language	Korean, English
Environment	Ambient temperature	0 to 50℃, storage: -20 to 60℃
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH
Approval		CE
Weight※2		Approx. 700g (approx. 470g)

※1. ◎ At room temperature (25℃±5℃)

- Thermocouple J (-200≤T≤-100): (±0.2% F.S. or ±2.7℃, select the higher one) ±1-digit
- Thermocouple R, S, C, G (0≤T≤100): (±0.2% F.S. or ±5.2℃, select the higher one) ±1-digit
- Thermocouple U, T (-200≤T≤-100): (±0.2% F.S. or ±3.5℃, select the higher one) ±1-digit
- Thermocouple U, T (-100≤T≤400): (±0.2% F.S. or ±2.5℃, select the higher one) ±1-digit
- Thermocouple B type, below 400℃: there is no accuracy standards.
- All thermocouples, below -100℃: (±0.4% F.S.) ±1-digit

※2. The weight includes packaging. The weight in parenthesis is for unit only.

※Environment resistance is rated at no freezing or condensation.

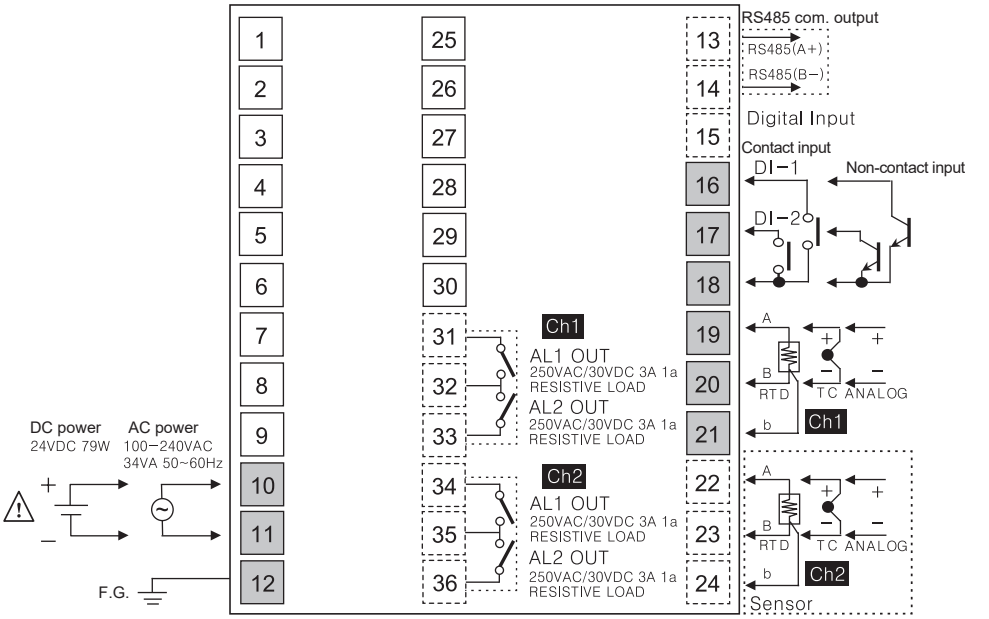
▣ Input Type and Range

Input type			Dot	Display	Input range (℃)	Input range (℉)
Thermocouple	K(CA)		1	TC-K1	-200 to 1350	-328 to 2462
			0.1	TC-K2	-199.9 to 999.9	-199.9 to 999.9
	J(IC)		1	TC-J1	-200 to 800	-328 to 1472
			0.1	TC-J2	-199.9 to 800.0	-199.9 to 999.9
	E(CR)		1	TC-E1	-200 to 800	-328 to 1472
			0.1	TC-E2	-199.9 to 800.0	-199.9 to 999.9
	T(CC)		1	TC-T1	-200 to 400	-328 to 752
			0.1	TC-T2	-199.9 to 400.0	-199.9 to 752.0
	B(PR)		1	TC-B	100 to 1800	212 to 3272
	R(PR)		1	TC-R	0 to 1750	32 to 3182
	S(PR)		1	TC-S	0 to 1750	32 to 3182
	N(NN)		1	TC-N	-200 to 1300	-328 to 2372
	C(TT)※1		1	TC-C	0 to 2300	32 to 4172
	G(TT)※2		1	TC-G	0 to 2300	32 to 4172
	L(IC)		1	TC-L1	-200 to 900	-328 to 1652
			0.1	TC-L2	-199.9 to 900.0	-199.9 to 999.9
	U(CC)		1	TC-U1	-200 to 400	-328 to 752
			0.1	TC-U2	-199.9 to 400.0	-199.9 to 752.0
	Platinel II		1	TC-P	0 to 1390	32 to 2534
RTD	Cu50Ω		0.1	CU50	-199.9 to 200.0	-199.9 to 392.0
	Cu100Ω		0.1	CU100	-199.9 to 200.0	-199.9 to 392.0
	JPt100Ω		1	JPT1	-200 to 600	-328 to 1112
			0.1	JPT2	-199.9 to 600.0	-199.9 to 999.9
	DPt50Ω		0.1	DPT50	-199.9 to 600.0	-199.9 to 999.9
	DPt100Ω		1	DPT1	-200 to 600	-328 to 1112
			0.1	DPT2	-199.9 to 600.0	-199.9 to 999.9
Analog	Voltage	-50.0 - 50.0mV		50mV	-1999 to 9999 (display range depends on the decimal point position)	
		-199.9 - 200.0mV		200mV		
		-1.000 - 1.000V		1V		
		-1.00 - 10.00V		10V		
	Current (shunt)	0 - 20mA		0-20		
		4 - 20mA		4-20		

※1. C(TT): Same as existing W5(TT) type sensor.

※2. G(TT): Same as existing W(TT) type sensor.

▣ Connections



※Shaded terminals are for the standard model. (power terminal, CH1 input terminal, DI input terminal)

※Dot line terminals are for the option model. (CH2 input terminal, alarm output terminal, communication output terminal)

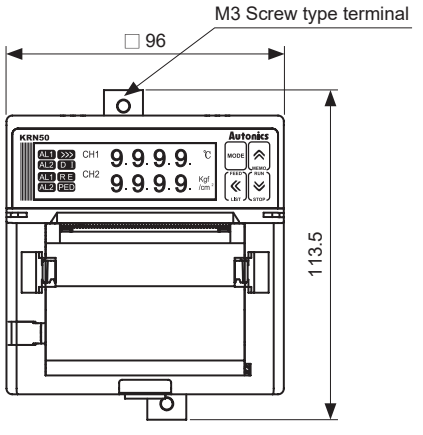
※The DC power model does not have F.G.

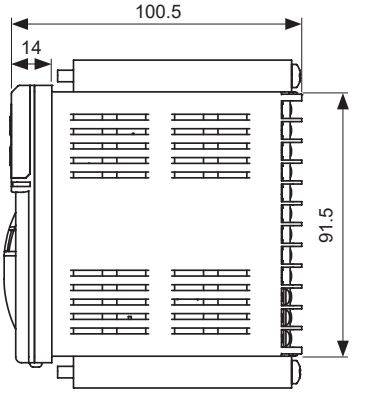
※When using 2-wire RTD, short B and b terminals.

※For current input, connect external 50Ω B class (0.1%) high-accuracy resistor.

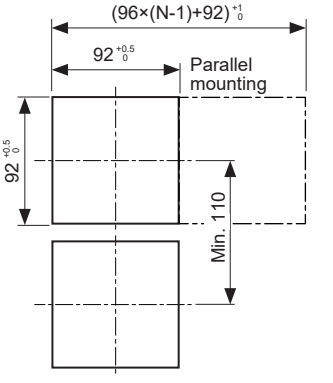
▣ Dimensions

(unit:mm)





● **Panel cut-out**



·N = Quantity

·Panel thickness: 1 to 4 mm

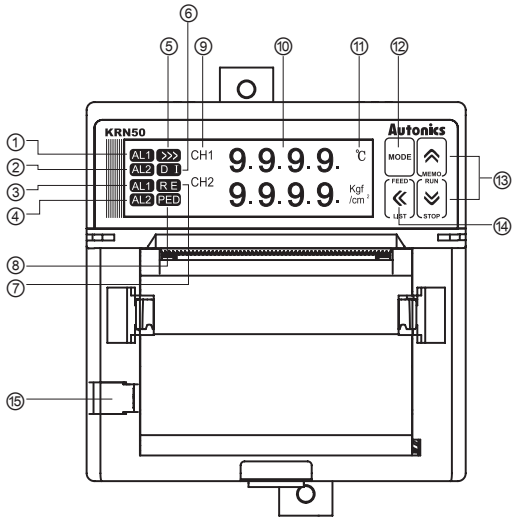
▣ Sold Separately

◎ Communication converter

- **SCM-WF48** (Wi-Fi to RS485·USB wireless communication converter)
- **SCM-US48I** (USB to RS485 converter)
- **SCM-38I** (RS232C to RS485 converter)
- **SCM-US** (USB to Serial converter)




▣ Unit Descriptions



① CH 1 alarm (AL1) output indicator: Turns ON when AL1 of input channel 1 operates.

② CH 1 alarm (AL2) output indicator: Turns ON when AL2 of input channel 1 operates.

③ CH 2 alarm (AL1) output indicator: Turns ON when AL1 of input channel 2 operates.

④ CH 2 alarm (AL2) output indicator: Turns ON when AL2 of input channel 2 operates.

⑤ Recording start (>>>)/Recording stop (■) indicator: >>> turns ON when start recording (RUN). ■ turns ON when stopping recording (STOP).

⑥ Digital input indicator: Turns ON when setting digital input.

⑦ Recording reservation (**RE**) indicator: **RE** turns ON when recording reservation operates.

⑧ Recording paper status (PED)indicator: PED turns ON if running out of recording paper during recording (RUN).

⑨ Channel (**CH**) display part: Displays input channel of currently displayed PV on the PV display part.

⑩ PV display part: In RUN mode, displays PV of the current channel.
In setting mode, displays parameters and mode setting values.

⑪ Unit display part: Unit of relevant channel is indicated.

⑫ MODE key: Used to enter setting mode and changing SV mode.

⑬ ≪, ≫ key: Used to move parameters or increase/decrease digits.
- ≪ key: Digital memo key, ≫ key: Recording Run/Stop key

⑭ ≪ key: Used to move parameters to upper group or move digits
- Paper feeding key (STOP), printing parameter setting information key (RUN)

⑮ PC loader port: It is a PC loader port for serial communication to set or monitor parameters by PC.
Used to connect SCM-US (USB to Serial converter, sold separately).

▣ Functions

■ Input unit and Scale of temperature sensor

◎ **Temperature unit setting by input type [CH□ Temp Unit]**

You can set the temperature unit as Celsius (℃), or Fahrenheit (℉) for each input temperature sensor.

When changing temperature unit for temperature sensor input (Celsius[℃] ↔ Fahrenheit[℉]) current PV is also changed by the conversion calculation.

For analog input type, this parameter [CH□ Temp Unit] is not displayed.

When changing temperature unit, the related bias value is initialized as 0. The other parameter values except bias maintains the existing values.

- Set range: ℃ / ℉
- Factory default: ℃ (unit: -)

◎ **Graph high/low-limit scale value**

For temperature sensor input type (TC, RTD), this function is to set the scale value of the recorded graph on recording paper. You can set the recording range to record the specified section detailed with curve of graph.

When the input exceeds the graph high/low limit scale range, it is recorded on the empty space of recording paper of at the left/right side of graph (approx. 1mm).

At the starting point of digital memo recording, even though input exceeds graph high/low limit scale range, the input within high/low limit input range is recorded as its actual value.

◎ **Graph low-limit scale value [CH□ Lo Graph]**

This function is to set low limit scale value of graph within input range of each input type.

- Set range:

  Min. range by each sensor input type to Graph high limit scale value [CH□ Hi Graph]- F.S. 5%
- Factory default: -200 (unit: digit)

※For analog input type, this parameter is not displayed.

◎ **Graph high-limit scale value [CH□ Hi Graph]**

This function is to set high limit scale value of graph within input range of each input type.

- Set range:

  Graph low limit scale value [CH□ Lo Graph] + F.S. 5% to Max. range by each sensor input type
- Factory default: 1350 (unit: digit)

※For analog input type, this parameter is not displayed.

■ User input range

For analog input type, this function is to set input range.

Set low limit input value [CH□ Lo Range] and high limit input value [CH□ Hi Range] to limit the input range.

- Set range

  Low limit input value: Min. input range to High limit input value -5% F.S.

  High limit input value: Low limit input +5% F.S. to Max. input range
- Factory default

  Low limit input value: Min. input range

  High limit input value: Max. input range

■ Input correction [CH□ In Bias]

This function is to correct the error occurring from TC, RTD or analog input out of allowable error range of this unit.

This is also available to correct error when a sensor cannot contact the subject position by calculating the error temperature.

Variable temperature sensors have accuracy level. Because high accuracy type is expansive, standard thermocouples are generally used. By executing this function, you can get more accurate temperature from standard thermocouples.

When executing input correction function, you should measure the error from a sensor accurately. If the measured error is not correct, error may be greater.

Set input correction value to each channel. [CH1 In Bias, CH2 In Bias]

When changing temperature unit (℃ ↔ ℉) for temperature sensor input type (TC or RTD), or input type, correction value is initialized as 0.

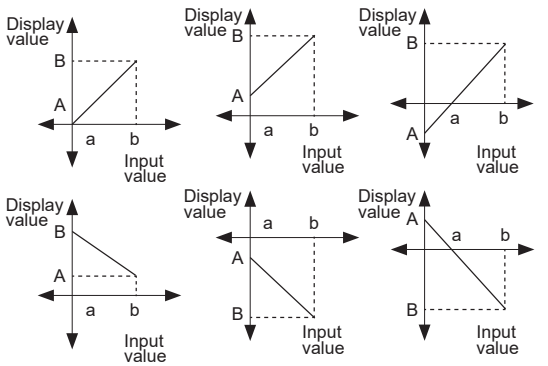
- Set range: -999 to 999
- Factory default: 0000 (unit: digit)

▣ Functions

■ Display scale

For analog input, this function is to set (-1999 to 9999) for particular high/low limit value in order to display high/low limit value of measurement input. If measurement inputs are ‘a’ and ‘b’ and particular values are ‘A’ and ‘B’, it will display a=A, b=B as below graphs.

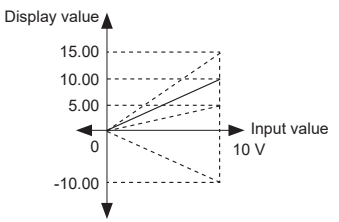
- Set range:
  Low limit scale, High limit scale: within F.S. range
- Factory default:
  Low limit scale: 0.0, High limit scale: 100.0



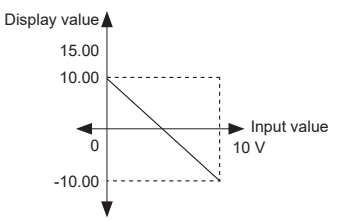
Display scale function is able to change display value for max./min. measured input by setting high limit scale [Hi Scale] and low limit scale [Lo Scale].

Ex) Set high/low scale value (input range is 0 to 10V)

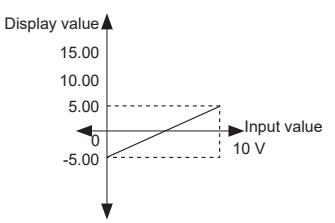
- Lo Scale = 0.00
- Hi Scale = 5.00, 10.00, 15.00, -10.00



- Lo Scale = 10.00, Hi Scale = -10.00



- Lo Scale = -5.00, Hi Scale = 5.00



※ When changing input type, high/low scale is changed as factory default.

◎ **Scale decimal point [** CH□ Sc Point **]**

It is able to change decimal point position for high/low limit scale value. It changes decimal point position of display value (PV and SV, etc).

- Set range: 0 / 0.0 / 0.00 / 0.000
- Factory default: 0.0 (unit: -)

◎ **Display unit [** CH□ Dp Unit **]**

This function is to set unit for recording and displaying. This parameter is displayed only for analog input type at [CH□ In Type] parameter.

Even though changing analog input unit, PV is not converted different with temperature unit changing.

- Set range:
  ℃, ℉, %, ppm, V, mV, mA, Pa, kPa, pH, psi, kgf/cm^2, m^3/h, mmHg, mmH_2O, us0 to us9
- Factory default: % (unit: -)

▣ Functions

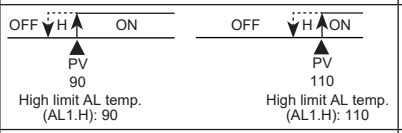
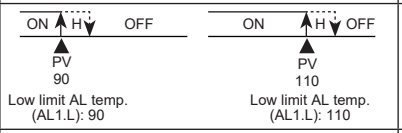
■ Alarm output [Alarm Setup]

Alarm output operates too high or low temperature/scale value of the subject during displaying temperature/scale value. When occurring alarm output by each channel, the related alarm indicators (CH1 = AL1, AL2 CH2 = AL1, AL2) turn ON.

If alarm output occurs during recording, it records that time, PV, and alarm information (AL HI =↑, AL LO =↓, SBA = B, P.End = P) on recording paper.

To divide HI and LO marks of AL1 and AL2, AL1 marks (↑↓) and AL2 marks (↥↧).

◎ **Alarm operation [** CH □AL□ Type **]**

Mode	Name	Record	Operation	Description
Off	No alarm	—	—	—
PV.Hi	High limit alarm	AL1= ↑ AL2= ↥		PV ≥ high limit alarm temperature (AL1.H) , alarm output is ON
PV.Lo	Low limit alarm	AL1= ↓ AL2= ↧		PV ≤ low limit alarm temperature (AL1.L) , alarm is ON
SBA	Sensor break alarm	AL1=B AL2=B	—	When input is not connected or disconnected during recording, alarm output is ON. You can check the input break using external alarm output contact by buzzer or others.
P.End	Paper end alarm	AL1=P AL2=P	—	If running out of recording paper during recording, alarm output is ON. (measured value is saved at system memory) When recording paper is replaced, alarm is cleared automatically (standard alarm) and P is printed on recording paper when printing back up data.

● Factory default: CH AL1 Type(PV.Hi), CH AL2 Type(PV.Lo)

◎ **Alarm option [** CH □AL□ Opt **]**

Option	Name	Description
None	Standard alarm	If it is an alarm condition, alarm output is ON. Unless an alarm condition, alarm output is OFF.
Latch	Alarm latch	If it is an alarm condition, alarm output is ON. An ON condition is latched. (Holding the alarm output)
StBy	Standby sequence	First alarm condition is ignored. From the second alarm condition, standard alarm operates. When power is ON and it is not an alarm condition, standard alarm operates.
La+St	Alarm latch and standby sequence	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is ON and it is an alarm condition, it is ignored. From the second alarm condition, alarm latch operates.

● Factory default: None (unit: -)

◎ **Alarm temperature setting [** CH □AL□ Lo **], [** CH □AL□ Hi **]**

Set alarm value for each alarm output operation, if current value is the alarm value, alarm output is ON.

According to the alarm output operation mode [CH □AL□Type] setting, [CH □AL □Lo], [CH □AL □Hi] parameters of the channel is displayed.

※When selecting high limit alarm [PV.Hi], only [CH □AL □High] is displayed.

※When selecting low limit alarm [PV.Lo], only [CH □AL □Low] is displayed.

※When changing Input Type Setup[CH□In Type], [CH □AL □High] or [CH □AL □Low] value is changed within the input range of [CH □In Type].

※For temperature input type (TC or RTD), if burn occurs by sensor open when alarm temperature is set as [CH □AL □Low], the alarm operates.

- Set range: Within input type and range
- Factory default: [CH □AL □Lo]: Low limit scale value / [CH □AL □Hi]: High limit scale value (unit: ℃/℉)

▣ Functions

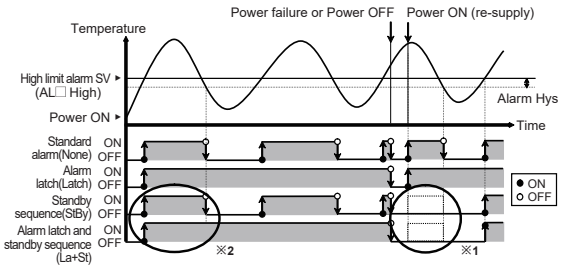
◎ Alarm output hysteresis [CH□ Alarm Hys]

"H" of alarm output operation mode is hysteresis.
Set ON and OFF interval of alarm output.

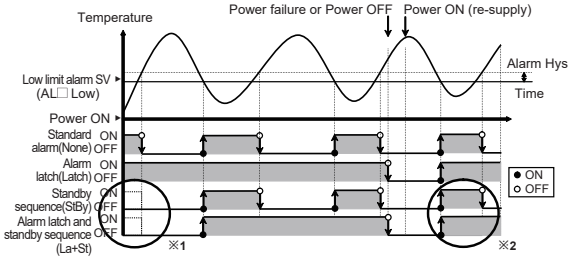
- Set range: 001 to 999
  (decimal point position is same with that of input decimal point)
- Factory default: 001 (unit: digit)

◎ Example of alarm output

● High limit alarm [PV.Hi]



● Low limit alarm [PV.Lo]



※Standby sequence

When power is ON and it is alarm condition, this condition is ignored. From the second alarm condition, standard alarm operates. (Refer to ※1. of the above graph.)

When power is ON and it is not an alarm condition, standard alarm operates from the first condition. (Refer to ※2. of the above graph.)

- Conditions of re-applied standby sequence after occurring standby sequence:

  Power ON, changing alarm value, or alarm clear forced

※Alarm latch

If it is an alarm condition, alarm output is ON even though it is out of alarm range. (Holding the alarm output)

- Conditions of clear alarm latch:

  To clear alarm latch, press the ▲ + ▼ keys for 3 sec when PV is below alarm value. For alarm latch by sensor break alarm (SBA) and no paper alarm (P.End), press the ▲ + ▼ keys for 3 sec to clear the alarm.

※When changing alarm output operation mode [CH□ AL□Type], alarm values [CH□AL□High, Low] are initialized as max./min. value automatically.

※When changing alarm output option, the alarm value maintains the existing value.

■ Record mode [Rec Mode]

There are two modes; graph mode and digital mode to record current PV on recording paper.

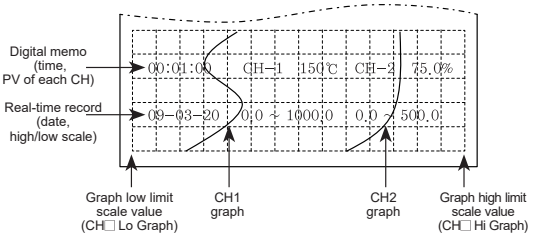
- Set range: Graph / Digital
- Factory default: Graph (unit: -)

◎ Graph mode [Graph Mode]

Graph mode records PV with graph of curve on recording paper.

It records current date (year-month-day), high/low limit scale value of each channel by every 1 hour.

Depending on the set digital memo period [Memo Period], it records current time (hh:mm:ss) and PV of each channel periodically.



◎ Digital mode [Digital Mode]

Digital mode records PV with numerical value on recording paper. It records current time (hh:mm:ss) and PV of each channel periodically by the set print/record period [Rec Period].

For digital model, it records current date (year-month-day), high/low limit scale value of each channel by every 24 hours.

It records current PV by digital memo function through the front key(▲ key for 3 sec), DI input terminal (DI-2, 1sec) or communication.

```
00:02:00   CH-1   110℃   CH-2   75.0%
00:03:00   CH-1   110℃   CH-2   75.0%
00:01:00   CH-1   150℃   CH-2   75.0%
09-03-20   0 ~ 1000   0 ~ 500
23:59:00   CH-1   150℃   CH-2   72.0%
23:58:00   CH-1   120℃   CH-2   70.0%
23:57:00   CH-1    80℃   CH-2   58.0%
```

▣ Functions

■ Reservation record [Reservation]

Set the reservation record time in advance and it starts to record at the set record start time (RUN) and stops to record at the set record stop time (STOP).

•Ex) Record Setup — Record Mode: Digital
Record Speed: 5sec
Reservation Setup — Start Time: 12:00
Stop Time: 12:02

(Record Start) 12:00:00 → 12:00:05 ……
12:01:55 → 12:02:00 (Record Stop)

To using reservation record function, set [Reservation] as 「On」and record start time (Start time) and record stop time (Stop time) parameters are displayed. It records during the set time.

When returning to RUN mode after setting reservation record, it stops recording and the Recording reservation (**RE**) indicator turns ON in display part.

When power is re-supplied by power failure during recording by reservation, if the time is within the reservation, it records continuously. Or not, it stops recording.

When setting [Reservation] as 「Off」and record start time (Start time) and record stop time (Stop time) parameters are not displayed.

- Set range: Off (not using reservation record function)
  On (using reservation record function)
- Factory default: Off

■ External digital input terminal

◎ DI-1 function [Digital Input 1]: Record start (RUN)

This function is to operate record start (RUN) by external digital input terminals (16, 18).

When setting [Digital Input1] as 「Run」, it operates recording at the set time of print/record period [Rec Period] on recording paper while external digital input terminal is short.

When starting DI-1 function at first, it records the current date and time as below.

- Korean: 현재시간 2009년03월19일 12시30분00초
- English: DATE 03-19-2009 12:30:00

When setting [Digital Input1] as「Off」, it does not operate any other function.

- Set range: Off / Run
- Factory default: Off (unit: -)

◎ DI-2 function [Digital Input 2]: Digital memo

This function is to operate digital memo by external digital input terminals (17, 18).

When setting [Digital Input2] as 「Memo」, it operates recording. It records current PV of each channel and current time (hh:mm:ss) when one signal is input to the external digital input terminal.

It is same memo function with by the front key (key, 3sec).

When setting [Digital Input2] as「Off」, it does not operate any other function.

- Set range: Off / Memo
- Factory default: Off (unit: -)

■ Data save and re-recording when running out of recording paper

This recorder saves the measured data in inner memory and records it at recording paper after supplying the power. When running out of recording paper (P.End), this recorder cannot record the data but saves it.

After replacing recording paper, the message for whether record the un-recorded data at the display part.

Select All or Part and the recorder records the un-recorded data which is from the time of running out of recording paper. After recording this, normal recording continues.

```
Record previous data
in memory ?
All   Part   Cancel
```

- All (all of unrecorded data): Records/Prints the whole range data from the time of paper end to current time
- Part (part of unrecorded data): Records/Prints the set part (start time/stop time) data of the after time of paper end.
- Cancel (ignores not recording): Not record/print the saved data in memory and returns to RUN mode.
- Set range: All / Part / Cancel (unit: -)
- Factory default: Cancel

When running out of recording paper during recording (RUN) state, recording (RUN) state changes stop recording (STOP) state automatically.

■ Parameter setting information print [List Print]

This function is to record the parameter setting information on recording paper.

Press the key for over 3 sec during recording, and it stops recording PV. After recording setting information of each menu, it records PV again.

- Recorded parameter:
  tag name, input type, display unit, input range, display range, alarm operation mode, alarm value, communication

When starting record, depending on the setting of [RUN On State] parameter, it records parameter setting information.

현재시간 09년03월10일 12시10분10초

※ 파 라 메 타 설 정 ※

	채널 1	채널 2
채널명칭	TEMP	HUMI
입력사양	TC-K1	mA
표시단위	℃	%
입력범위	-200~1350	4~20
기록범위	0~400	0~1000
경보1모드	HIGH	HIGH
경보설정값	300	900
경보2모드	LOW	LOW
경보설정값	150	700
통신기능	RS485	Modbus RTU

소형기록계 KRN50 www.autonics.com
A/S : 032-820-2356~7

<Korean>

DATE 03-10-2009 12:10:10

※ SETUP PARAMETER ※

	CH 1	CH 2
TAG NAME	TEMP	HUMI
INPUT	TC-K1	mA
UNIT	℃	%
RANGE	-200~1350	4~20
SCALE	0~400	0~1000
ALARM 1	HIGH	HIGH
VALUE	300	900
ALARM 2	LOW	LOW
VALUE	150	700
INTERFACE	RS485	Modbus RTU

Recorder KRN50 www.autonics.com
A/S : 82-32-820-2356~7

<English>

▣ Functions

■ Backup data recording [Rec Backup]

It is similar with data logger and it saves record data in inner memory.

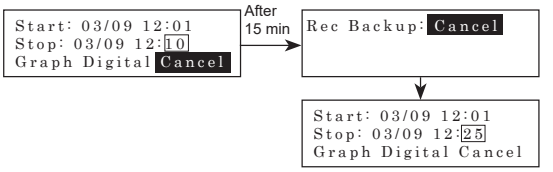
Based on the saved back up data in inner memory, you can select whole range or part range of data to print.

When entering [Rec BackUp] parameter, it displays the fixed backup start time (Start) and current save time (Stop) to select the desired time within the saved time range as below.

```
Start: 03/09 12:01
Stop: 03/09 12:10
Graph Digital Cancel
```

In the screen, the current save time (Stop) is displayed as fixed to select the desired time range within the saved time range but in the product, this time is updated continuously.

After entering the parameter, change (Stop) to current time or re-entering the parameter and (Stop) displays the current time to print backup data of current time.



Data storage space of this product is 18138EA (for 1CH) and the save time is different by record mode as the below tables .

Backup data record supports graph mode and digital mode. To print the backup data which is the different mode from the saved record mode (ex: saved record mode: digital mode, to-be-printed record mode: graph mode), it prints the data by the record time (for digital mode) or cycle (for graph mode).

When the saved record mode of backup data is digital mode, the backup data save time is different by record time. (ex: record time of digital mode: 5 min, backup data save interval: 5 min, time changing of stop time: every 5min)

If the total record backup time is not over as below table, start time is fixed and only stop time is updated.

If the total record backup time is over as below table, from that time, both start time and stop time are updated.

- Set range: Cancel / Yes (unit: -)
- Factory default: Cancel

Graph Mode Rec Speed	Interval of saving time for 1 data	Total record backup time	
		2CH mode	1CH mode
960mm/h	0.5 sec	11542×0.5 sec = Approx. 1 hour 30 min	18138×0.5 sec = Approx. 2 hours 30 min
480mm/h	1 sec	Approx. 3 hours	Approx. 5 hours
240mm/h	2 sec	Approx. 6 hours	Approx. 10 hours
120mm/h	4 sec	Approx. 12 hours	Approx. 20 hours
60mm/h	8 sec	Approx. 24 hours	Approx. 40 hours
30mm/h	16 sec	Approx. 48 hours	Approx. 80 hours
10mm/h	48 sec	Approx. 6 days (153 hours)	Approx. 10 days (241 hours)

Digital Mode Rec Speed	Interval of saving time for 1 data	Total record backup time	
		2CH mode	1CH mode
5 sec	5 sec	11542×5 sec = Approx. 16 hours	18138×5 sec = Approx. 25 hours
1 min	60 sec	Approx. 8 days	Approx. 12 days
to	to	to	to
60 min	3600 sec	Approx. 480 days	Approx. 755 days
to	to	to	to
99 min 59 sec	6000 sec	Approx. 800 days	Approx. 1259 days

■ Lock [Setting Lock]

It limits to check parameter set value and to change it.

Parameter	OFF	Loc1	Loc2	Loc3
Alarm Setup Reservation Setup	●	●	●	◐
Input Setup Record Setup Option Setup RS485 Setup	●	●	◐	○
Date/Time Setup Record Backup_Data Environment Setup	●	◐	○	○

●: Enable to check/set, ◐: Enable to check, disable to set,
○: Disable to check

Even though setting as 「Loc1」, 「Loc2」, 「Loc3」, [Setting Lock] parameter is displayed and you can change the setting.

- Factory default: Off (unit: -)

▣ Functions

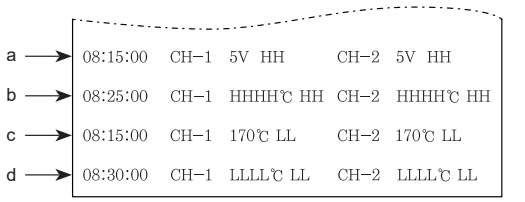
■ Error

This product displays error messages when error occurs.

Message	Description
HHHH	When input value is higher than the rated range, flashes in 0.5 sec. (automatically cleared when input value is within the rated range) • **Analog input** Within ±10% of input range F.S., LCD screen displays only PV and it records PV and HH or LL at the same time on recording paper as the 'a' of below figure. Over ±10% of input range F.S., LCD screen and recording paper display HHHH, HH or LLLL, LL as the 'b' of below figure. For scale value, when Hi, Lo scale value is Hi < Lo, it displays in reverse. For 0-20mA input, when Hi scale is set as 0, Lo scale is set 100 and input value is out of 20mA, it displays LLLL, not HHHH. **(HHHH, LLLL are not displayed in analog input 1V.)** • **TC, RTD input** Set Hi, Lo Graph values within the temperature range of each temperature sensor. When PV is over Hi, Lo Graph value, LCD screen displays only PV and it records PV and HH or LL at the same time on recording paper as the 'c' of below figure. Set Hi, Lo Graph values same as the temperature range of each temperature sensor. When PV is over Hi, Lo Graph value, LCD screen and recording paper display HHHH or LLLL as the 'd' of below figure.
LLLL	When input value is lower than the rated range, flashes in 0.5 sec. (automatically cleared when input value is within the rated range) In case of analog input, it flashes over 10%. **(HHHH, LLLL are not displayed in analog input 1V.)**
BURN	Flashes when input is disconnected except 10V input. When input is connected, it cleared automatically.
Time Set!!	Displayed by wrong time setting for record backup and re-record of P.End or same start and stop time for reservation record. Press the MODE key to clear it and it returns to existing settings.
Over range!!	Displayed when setting value is over high/ low limit value during setting Hi, Lo Graph and range in Input Type Setup. Press the MODE key to clear it and it returns to existing settings.
Hi < Lo!!	Displayed if setting value is Hi<Lo or it is not within the rated range during setting Hi, Lo Graph and range in Input Type Setup. (ex: For TC-K1 of -200 to 1350℃, the range of high limit scale value is low limit scale value+F.S. 5% to max. input range of each input sensor 1350 to -122.5℃. In this case, SV is -123℃ and Hi < Lo!! error displays.) Press the MODE key to clear it and it returns to existing settings.

When the related channel generates error operation, the corresponding message is recorded at the recording time of the channel.

As the below figure, HH and LL message displays when alarm does not occurs.



■ Communication

This function is to set or monitor parameters from external upper system (PC, PLC, etc) or transmit data to external devices by communication.

Communication is available by terminals or the front PC loading port. (refer to the connections for connecting terminals.)

You cannot use communications by terminals and the front front PC loading port at the same time. When connecting the front PC loading port with communication device, communication by terminals (transmission function of master) is blocked automatically.

◎ Interface

Comm. protocol	Modbus RTU
Connection type	RS485
Application standard	Compliance with EIA RS485
Max. connections	31units (address: 01 to 99)
Comm. synchronous method	Asynchronous
Comm. method	Two-wire half duplex
Comm. distance	Within max. 1 Km
Comm. speed	1200, 2400, 4800, 9600, 19200, 38400, 57600 bps
Comm. respond wait time	0.05 to 0.99sec
Start bit	1-bit (fixed)
Data bit	8-bit (fixed)
Parity bit	None, Odd, Even
Stop bit	1 or 2-bit

◎ Communication address [Address]

- Set range: 01 to 99
- Factory default: 01 (unit: -)

◎ Communication speed (Bit Per Second) [Baud Rate]

- Set range: 1200, 2400, 4800, 9600, 19200, 38400, 57600
- Factory default: 9600 (unit: bps)

◎ Parity Bit [Parity Bit]

- Set range: None, Even, Odd
- Factory default: None

◎ Stop Bit [Stop Bit]

- Set range: 1, 2
- Factory default: 2 (unit: Bit)

◎ Communication response wait time [Resp Time]

- Set range: 0.05 to 0.99
- Factory default: 0.05 (unit: sec)

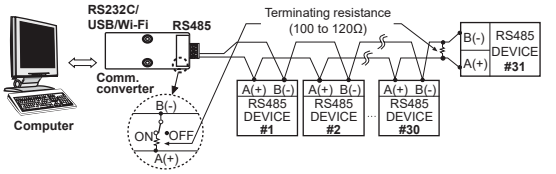
▣ Functions

◎ Communication write enable/disable[Com Write]

This function is to enable or disable to change/write SV of the saved parameter by communication (PC/PLC). Reading of parameters is available.

- Enable: Enables to change/write SV of each parameter
- Disable: Disables to change/write SV of each parameter
- Set range: Enable / Disable
- Factory default: Enable (unit: -)

◎ Application of system organization



※Only for RS485 communication output model.

※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately), SCM-US (USB to Serial converter, sold separately). Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

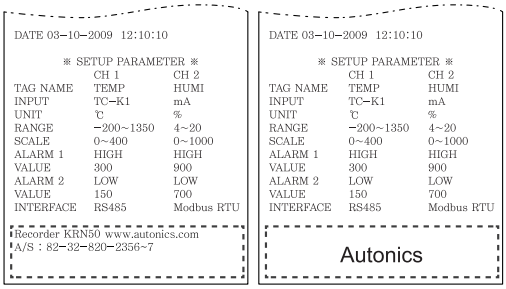
■ Image download

◎ User unit download

You can download the desired unit as 16×16 size image (through DAQMaster, the integrated device management program). Select the user unit in setting mode.

◎ User logo download

User logo is recorded at the dotted box (384×80 size) of the below figure. You can download the desired logo as 384×80 size image (through DAQMaster, the integrated device management program) and check this when printing the list.

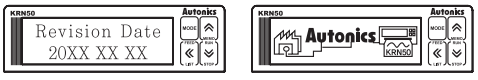


<Before input> <After input>

※Be sure that downloading the user logo of 384×80 size may cause the problem due to increased current consumption and this image may not be printed normally. Please refrain from the image which has lots of dots. It is recommended to download the image which consists of characters as above.

◎ LCD booting image download

You can download the desired booing image to display on LCD screen (approx. 3 sec) when supplying the power.

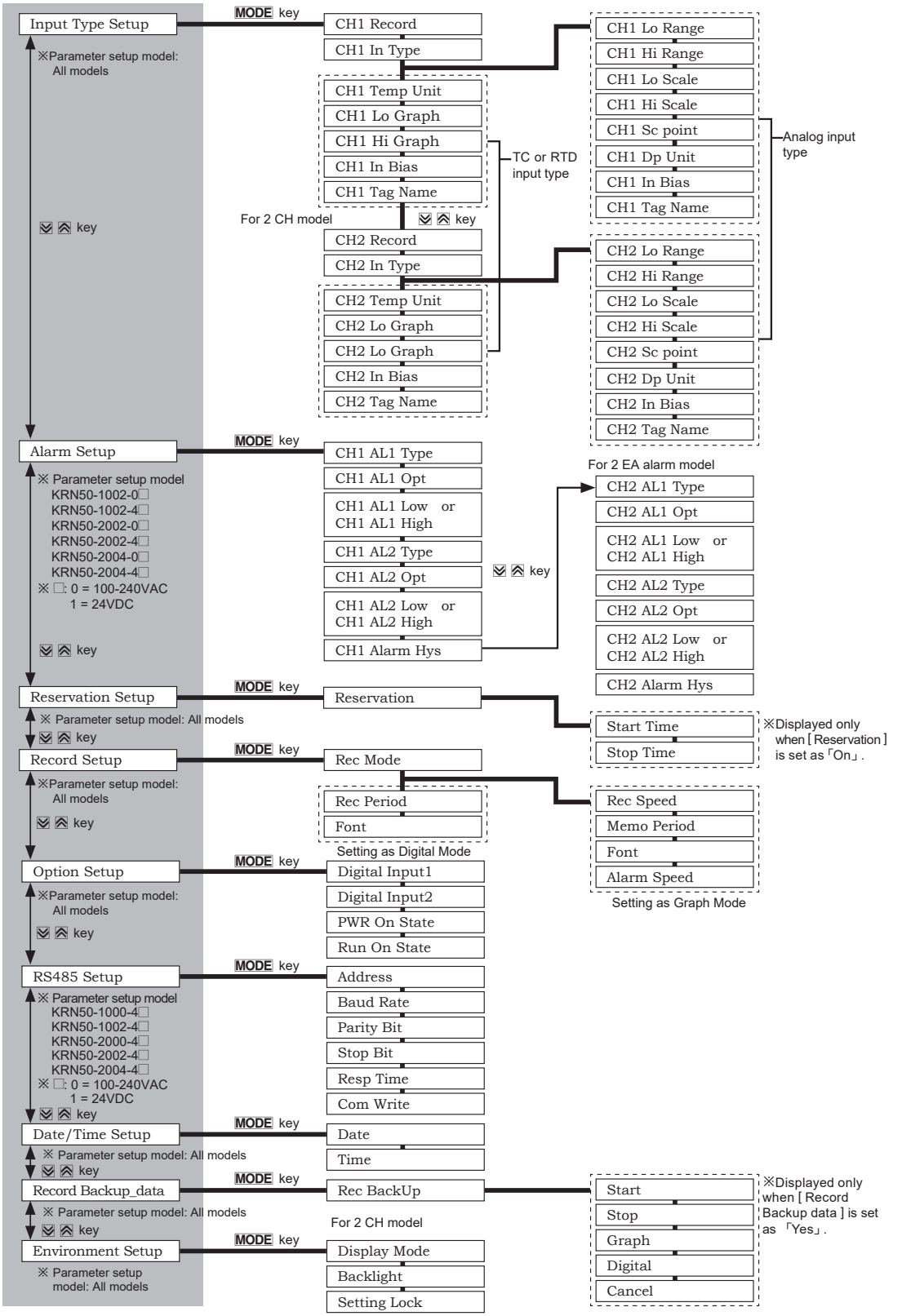


<Basic image> <User-made image>

- To download the image, use DAQMaster, the integrated device management program. (When initializing boot image download function of DAQMaster, the booting logo image changes as the left basic image.)
- Basic boot image displays program revision date as fixed.
- Image size should be 128×32 size.

※ **For more functions, refer to the user manual of KRN50.**

▣ Parameters


Input Type Setup
※Parameter setup model: All models
MODE key
CH1 Record
CH1 In Type
CH1 Temp Unit
CH1 Lo Graph
CH1 Hi Graph
CH1 In Bias
CH1 Tag Name
TC or RTD input type
CH1 Lo Range
CH1 Hi Range
CH1 Lo Scale
CH1 Hi Scale
CH1 Sc point
CH1 Dp Unit
CH1 In Bias
CH1 Tag Name
Analog input type
For 2 CH model
key
CH2 Record
CH2 In Type
CH2 Temp Unit
CH2 Lo Graph
CH2 Lo Graph
CH2 In Bias
CH2 Tag Name
CH2 Lo Range
CH2 Hi Range
CH2 Lo Scale
CH2 Hi Scale
CH2 Sc point
CH2 Dp Unit
CH2 In Bias
CH2 Tag Name
Alarm Setup
※ Parameter setup model
KRN50-1002-0□
KRN50-1002-4□
KRN50-2002-0□
KRN50-2002-4□
KRN50-2004-0□
KRN50-2004-4□
※ □: 0 = 100-240VAC
1 = 24VDC
CH1 AL1 Type
CH1 AL1 Opt
CH1 AL1 Low or CH1 AL1 High
CH1 AL2 Type
CH1 AL2 Opt
CH1 AL2 Low or CH1 AL2 High
CH1 Alarm Hys
For 2 EA alarm model
CH2 AL1 Type
CH2 AL1 Opt
CH2 AL1 Low or CH2 AL1 High
CH2 AL2 Type
CH2 AL2 Opt
CH2 AL2 Low or CH2 AL2 High
CH2 Alarm Hys
Reservation Setup
※ Parameter setup model: All models
Reservation
Start Time
Stop Time
※Displayed only when [Reservation] is set as 「On」.
Record Setup
※Parameter setup model: All models
Rec Mode
Rec Period
Font
Setting as Digital Mode
Rec Speed
Memo Period
Font
Alarm Speed
Setting as Graph Mode
Option Setup
※Parameter setup model: All models
Digital Input1
Digital Input2
PWR On State
Run On State
RS485 Setup
※ Parameter setup model
KRN50-1000-4□
KRN50-1002-4□
KRN50-2000-4□
KRN50-2002-4□
KRN50-2004-4□
※ □: 0 = 100-240VAC
1 = 24VDC
Address
Baud Rate
Parity Bit
Stop Bit
Resp Time
Com Write
Date/Time Setup
※ Parameter setup model: All models
Date
Time
Record Backup_data
※ Parameter setup model: All models
Rec BackUp
Start
Stop
Graph
Digital
Cancel
※Displayed only when [Record Backup data] is set as 「Yes」.
Environment Setup
※ Parameter setup model: All models
For 2 CH model
Display Mode
Backlight
Setting Lock

▣ Factory Default

■ Input type setup group [Input Type Setup]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
CH1 Record	On	CH1 Lo Scale ※2	000.0	CH2 Record ※3	On	CH2 Lo Scale ※3	000.0
CH1 In Type	TC.K1	CH1 Hi Scale ※2	100.0	CH2 In Type ※3	TC.K1	CH2 Hi Scale ※3	100.0
CH1 Temp Unit ※1	℃	CH1 Hi Scale Decimal Point ※2	0.0	CH2 Temp Unit ※3	℃	CH2 Hi Scale Decimal Point ※3	0.0
CH1 Lo Graph ※1	-200	CH1 DP Unit ※2	%	CH2 Lo Graph ※3	-200	CH2 DP Unit ※3	%
CH1 Hi Graph ※1	1350	CH1 In Bias	0000	CH2 Hi Graph ※3	1350	CH2 In Bias ※3	0000
CH1 Lo Range ※2	—	CH1 Tag Name	CH-1	CH2 Lo Range ※3	—	CH2 Tag Name ※3	CH-2
CH1 Hi Range ※2	—			CH2 Hi Range ※3	—		

※1. Displayed only when input type (In Type) is temperature sensor (TC or RTD).
※2. Displayed only when input type (In Type) is analog (voltage/current).
※3. Displayed only for 2-channel model

■ Alarm output setup group [Alarm Setup]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
CH1 AL1 Type	PV.Hi	CH1 AL2 Opt	None	CH2 AL1 Type ※2	PV.Hi	CH2 AL2 Opt ※2	None
CH1 AL1 Opt	None	CH1 AL2 Low ※1	-200	CH2 AL1 Opt ※2	None	CH2 AL2 Low ※1,※2	-200
CH1 AL1 Low ※1	-200	CH1 AL2 High ※1	1350	CH2 AL1 Low ※1,※2	-200	CH2 AL2 High ※1,※2	1350
CH1 AL1 High ※1	1350	CH1 Alarm Hys	001	CH2 AL1 High	1350	CH2 Alarm Hys ※2	001
CH1 AL2 Type	PV.Lo			CH2 AL2 Type ※2	PV.Lo		

※These parameters are displayed only for alarm output model.
※1. These are related with the setting of alarm output operation mode (AL□ Type) .
· CH□AL□ Type (Off, SBA or P.End): CH□AL□Low, CH□AL□High parameters are not displayed.
· CH□AL□Type (PV.Hi): CH□AL□High parameter is not displayed.
· CH□AL□Type (PV.Lo): CH□AL□Low parameter is not displayed.
※2. Displayed only for 2-channel model.

■ Reservation record setup group [Reservation Setup]

Parameter	Default	Parameter	Default	Parameter	Default
Reservation ※1	Off	Start Time	00:00	Stop Time ※1	00:01

※1. Displayed only when (Reservation) is set as 「On」.

■ Record mode setup group [Record Setup]

Parameter	Default	Parameter	Default	Parameter	Default
Rec Mode	Graph	Memo Period ※1	30min	Font	English
Rec Speed ※1	10mm/h	Rec Period ※2	01m00s	Alarm Speed	10mm/h

※1. Displayed only when (Rec Mode) is set as「Graph」.
※2. Displayed only when (Rec Mode) is set as「Digital」.

■ Option setup group [Option Setup]

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
Digital Input 1	Off	Digital Input 2	Off	PWR On State	Run	Run On State	List

■ RS485 communication setup group [RS485 Setup] (Read Only)

Parameter	Default	Parameter	Default	Parameter	Default
Address	01	Parity bit	None	Response Time	0.05s
Baud Rate	9600bps	Stop Bit	2	Com Write	Enable

■ Environment setup group [Environment Setup]

Parameter	Default	Parameter	Default	Parameter	Default
Display Mode	2CH	Backlight	Temp	Setting Lock	Off

▣ Proper Usage

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Install a surge absorber at each end of inductive load coil when controlling high-capacity power relay or inductive load (e.g. magnet).
- 24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Check the polarity of the terminals before wiring the temperature sensor.
  For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
  For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications') ②Altitude max. 2,000m
  ③Pollution degree 2 ④Installation category II

DIN W48×H24mm, Indication Only, LCD Counter

▣ Features

- No additional power due to internal battery
- Signal input method: No-voltage input, voltage input, free voltage input
- Screw terminal type (attaching terminal cover)
- LCD display, backlight model
- IP66 protection structure

⚠ **Please read "Safety Considerations" in the instruction manual before using.**

▣ Ordering Information

LA 8 N – B N – L

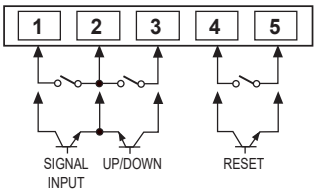
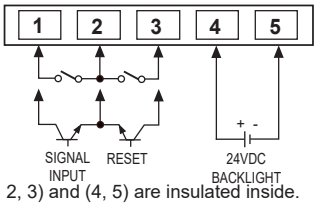
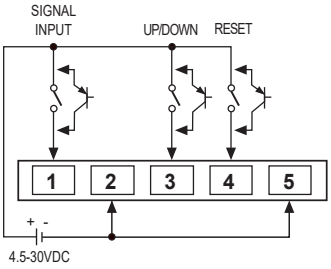
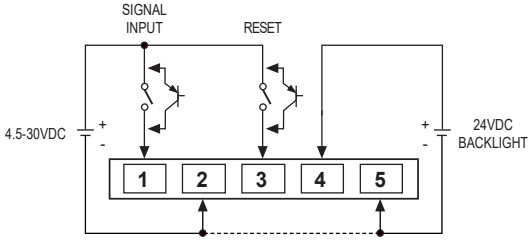
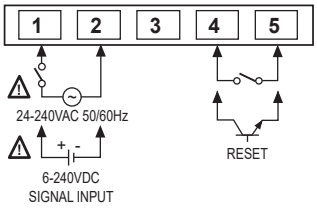
Backlight	No mark	None
	L	Backlight function
Input type	N	No-voltage (small signal) input
	V	Voltage input
	F	Free voltage input
Power supply	B	Internal lithium battery
Size	N	DIN W48×H24mm
Digit	8	99999999 (8-digit)
Item	LA	LCD Counter

▣ Specifications

Model		LA8N-BN	LA8N-BN-L	LA8N-BV	LA8N-BV-L	LA8N-BF
Digit		8-digit (count up, count down, count up/down: -9999999 to 99999999 / count up: 0 to 99999999)				
Digit size		W3.4×H8.7mm				
Display method		LCD Zero Blanking type (character height size: 8.7mm)				
Operation method		Count up, Count down, Count up/down	Count up	Count up, Count down, Count up/down	Count up	Count up
Power supply		Built-in battery				
Battery life cycle		Approx. over 7 years at 20℃				
Backlight power supply		—	24VDC⎓ ±10%	—	24VDC⎓ ±10%	—
Input method		No-voltage input		Voltage input		Free voltage input
Count input		Residual voltage: Max. 0.5VDC⎓ Short-circuit impedance: Max. 10kΩ Open-circuit impedance: Min. 750kΩ		[H]: 4.5-30VDC⎓ [L]: 0-2VDC		[H]: 24-240VAC∼/6-240VDC⎓ [L]: 0-2VAC/0-2.4VDC
RESET input		No-voltage input		Voltage input		No-voltage input
Min. input signal width		UP/DOWN, RESET: approx. 20ms	RESET: approx. 20ms	UP/DOWN, RESET: approx. 20ms	RESET: approx. 20ms	RESET: approx. 20ms
Max. counting speed		1cps / 30cps / 1kcps				20cps
External setting switch		SW1※1, SW2※2, SW3※3				SW1※1, SW3※3
Insulation resistance		Over 100MΩ (at 500VDC megger)				
Dielectric strength※4		2,000VAC 60Hz for 1min				
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour				
	Malfunction	0.3mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min				
Shock	Mechanical	300m/s^2 (approx. 30G) in each X, Y, Z direction for 3 times				
	Malfunction	100m/s^2 (approx. 10G) in each X, Y, Z direction for 3 times				
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃				
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH				
Protection structure		IP66 (when using waterproof rubber for front panel, IEC standard)				
Accessory		Mounting bracket, Rubber waterproof ring				
Approval		CE cULus				
Weight※5		Approx. 96g (approx. 50g)				

※1: SW1 is the front panel RESET key enable/disable setting switch.
※2: SW2 is the max. counting speed setting switch.
※3: SW3 is the decimal point setting switch.
※4: No-voltage input, voltage input: between terminals and the case / Free voltage input: between the free voltage input terminal and the RESET input terminal, between terminals and the case.
※5: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

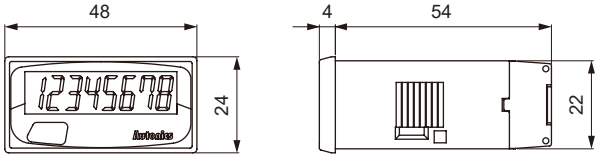
▣ Connections

Input type	No-backlight	Backlight
No-voltage input type	●LA8N-BN※1 	●LA8N-BN-L  ※Terminal (1, 2, 3) and (4, 5) are insulated inside.
Voltage input type	●LA8N-BV※1 	●LA8N-BV-L  ※Terminal (1, 2, 3) and (4, 5) are insulated inside. ※Backlight power is available as signal input and reset.
Free voltage input type	●LA8N-BF  ※Terminal (1, 2) and (4, 5) are insulated inside.	—

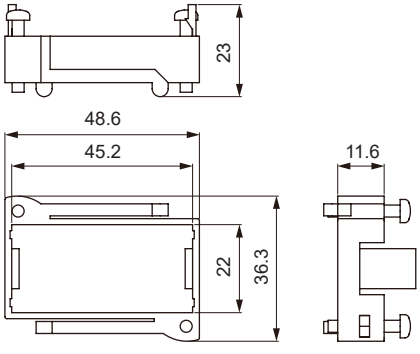
※1: Terminal 2 and 5 are connected inside. (non-isolated)
※Use reliable contacts enough to flow 3VDC 5μA current.

▣ Dimensions

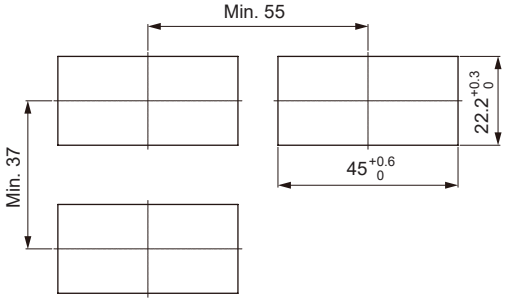
(unit: mm)



◎ Bracket



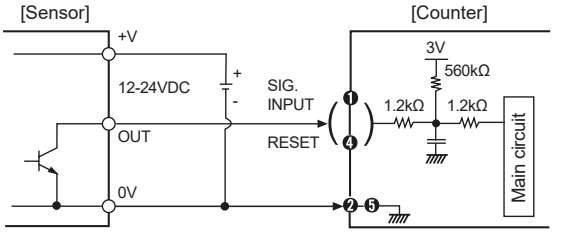
◎ Panel cut-out



▣ Input Connections

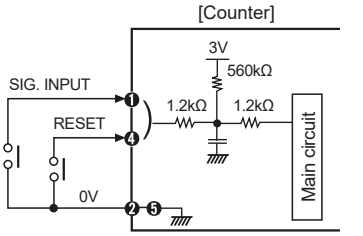
◎ No-voltage input (standard sensor: NPN open collector output type sensor)

● Solid-state input



※When power is applied to terminal No ❶ and ❹, input terminal circuit can be broken and a malfunction can occur.
(NPN output, PNP output, PNP open collector output type sensor cannot be used.)

● Contact input



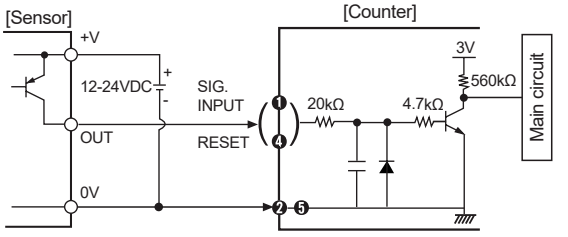
※Please use reliable contacts enough to flow 3VDC 5μA of current.

※❷ and ❺ are connected inside.

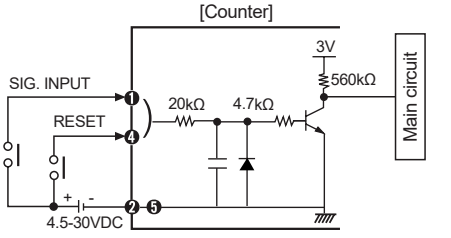
※For backlight function model, the input terminals are no. ❶, ❸ and the GND terminal is no. ❷ .

◎ Voltage input (standard sensor: PNP open collector output type sensor)

● Solid-state input



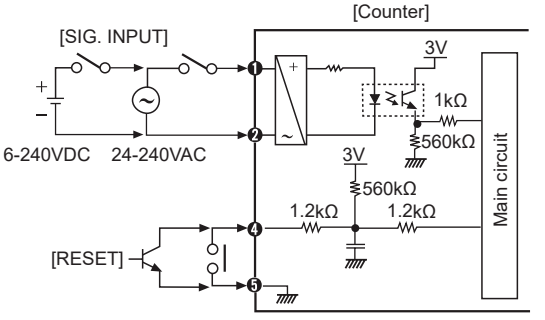
● Contact input



※Please use reliable contacts enough to flow 3VDC 5μA of current.

※For backlight function model, the input terminals are no. ❶, ❸ and the GND terminal is no. ❷ .

◎ Free voltage input

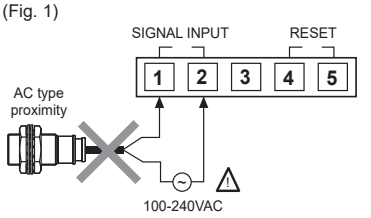


※AC type proximity sensor cannot be used as the source of count input signals.
※Input terminal (❶, ❷)and reset terminal (❹, ❺)are insulated inside.
※It is not possible to reset with AC power or DC power.
※When relay contact is used as the source of RESET signal, please use reliable contacts enough to flow 3VDC 5μA of current.

◎ Input from AC type proximity sensor

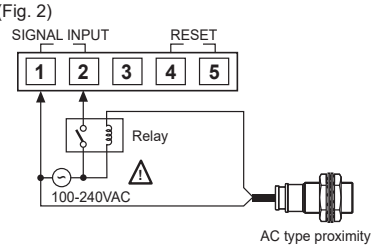
In case of free voltage input type, do not connect AC proximity sensors instead of a switch as shown in the figure 1.
It may cause malfunction due to sensor's leakage current. Connect a relay as shown in the figure 2.

(Fig. 1)



<Example of wrong connection>

(Fig. 2)

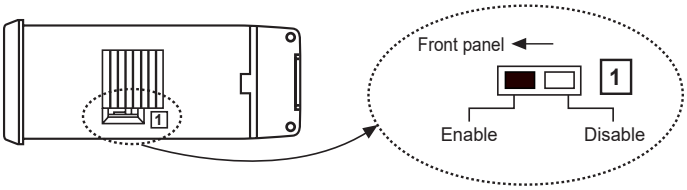


<Example of correct connection>

▣ Setting Switch

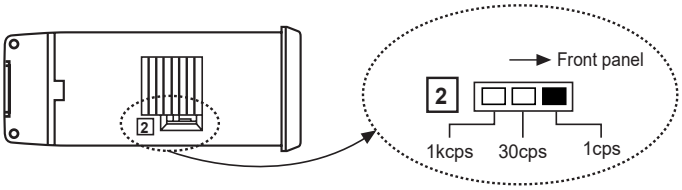
◎ SW1 (1 switch)

SW1 is a switch to Enable/Disable the front panel RESET key.
※Factory default: Enable



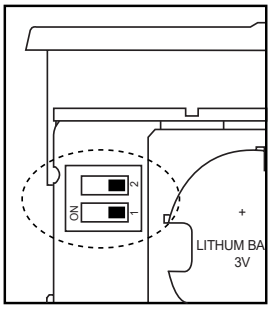
◎ SW2 (2 switch)

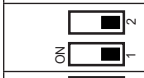
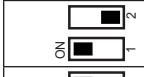
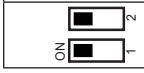
SW2 is a switch for setting max. counting speed.
※Factory default: 1cps
(Free voltage input type : 20cps is fixed)



◎ SW3

SW3 is a switch for decimal point position. (※factory default: no decimal point)

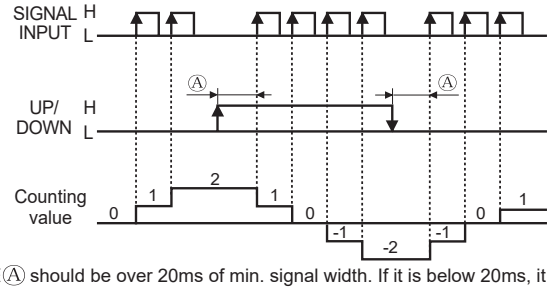


SW3	Decimal point
	Not use decimal point
	0.0
	0.00
	0.000

※Change SW3 setting after removing the case.
※Supply RESET signal (front panel or terminal RESET) after setting SW2, SW3 during operation.
※How to change settings
Power OFF → change settings → power ON → press RESET key or input signal (min. 20ms)

▣ Counter Operation Mode

◎ LA8N-BN/LA8N-BV model

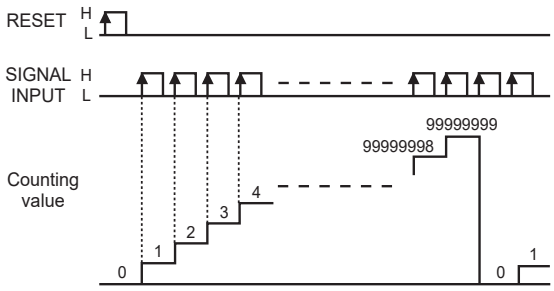


※SIGNAL INPUT: Counting input,
UP/DOWN: Counting instruction input
※UP/DOWN as "L" is count up (UP)
UP/DOWN as "H" is count down (DOWN)
※The meaning of "H" and "L"

	Voltage input	No-voltage input	Free voltage input
H	4.5-30VDC	Short	6-240VAC, 24-240VDC
L	0-2VDC	Open	0-2VAC, 0-2.4VDC

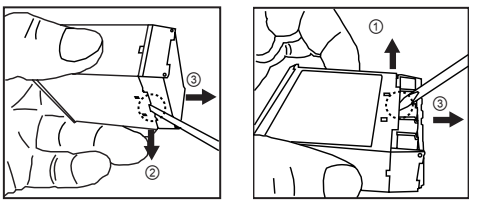
※Ⓐ should be over 20ms of min. signal width. If it is below 20ms, it may cause counting error.

◎ LA8N-BN-L/LA8N-BV-L/LA8N-BF model



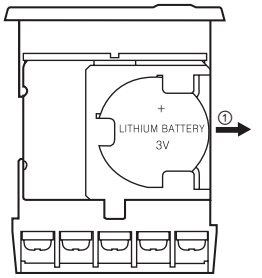
▣ Case Detachment and Battery Replacement

◎ Case detachment



※Hold up Lock part toward ①, ② of the product with the tool and pull toward ③ to detach the case.
⚠When using the tools, be careful not to be wounded.

◎ Battery replacement



1. Detach the case.
2. Push the battery and detach it toward ①.
3. Insert a new battery with correct alignment of polarity pushing it toward opposite of ①.

※Since lithium battery is embedded in the product, follow instructions below for safety.
①Do not charge, short, disassemble, subject it to shock, heat.
②Check the polarity.
③Use CR2477 battery.
④Do not solder on a battery directly.
⑤Insulate a battery with tape to dispose .
⑥Do not store this unit in the place with the direct sunlight, high temperature and humidity.
※The battery is sold separately.
Please replace a battery by yourself. (sold separately)
※Do not burn up or disassemble the lithium battery.

DIN W48×H48mm, W72×H72mm LCD Display Counter/Timer

▣ Features

- Improved visibility with LCD display
- Input method: voltage input (PNP)/no-voltage input (NPN) selectable model (by parameter setting), Free voltage input model
- Setting range of one-shot output time: 0.01 sec to 99.99 sec by 0.01 sec unit
- Mounting space saving with compact design (back length: 64.5mm)

[Counter]
- Setting range of prescale value: 0.00001 to 99999.9
- Various input/output mode (input: 11 types, output: 11 types)
- Start point (counting value reset) setting
- TOTAL counter display mode
  : Displays the present value and the integrated value simultaneously.

[Timer]
- Various output mode (15 types)
- Wide time setting range: 0.001 sec to 99999.9 hour
- '0' time setting function

Please read "Safety Considerations" in the instruction manual before using.

▣ Manual

For the detail information, please refer to user manual, and be sure to follow cautions written in the technical descriptions (catalog, website).
Visit our website (www.autonics.com) to download manuals.

▣ Ordering Information

CX	6	S	–	1P	4	F

Signal input method	**No mark**	Voltage input (PNP)/no-voltage input (NPN) selectable type
	F	Free voltage input
Power supply	**2**	24VAC 50/60Hz, 24-48VDC
	4	100-240VAC 50/60Hz
Output	**1P**	1-stage setting
	2P	2-stage setting
Size	**S**	DIN W48×H48mm
	M	DIN W72×H72mm
Display digit	**6**	999999 (6-digit)
Item	**CX**	LCD Display counter/Timer

▣ Specifications

Model			CX6S-1P□□	CX6S-2P□□	CX6M-1P□□	CX6M-2P□□
Display digits			6-digit			
Display method			7-segment (1st, 2nd digits of counting value display: white, setting value display: green) LCD method, 11-segment (the other digits of counting value display: white) LCD method, Operation display part: yellow LCD method			
Character size (W×H)	Counting value		4.1×10.1mm		6.2×15.2mm	
	Setting value		3.3×8.1mm		5×12.3mm	
Power supply	AC voltage		100-240VAC~ 50/60Hz			
	AC/DC voltage		24VAC~ 50/60Hz, 24-48VDC⎓			
Permissible voltage range			90 to 110% of rated voltage			
Power consumption	AC voltage	CX6□-□□	Max. 6.4VA	Max. 6.7VA	Max. 7.1VA	Max. 7.5VA
		CX6□-□□F	Max. 4.2VA	Max. 4.9VA	Max. 4.7VA	Max. 5.4VA
	AC/DC voltage	CX6□-□□	AC: max. 5.5VA DC: max. 3.5W	AC: max. 5.6VA DC: max. 3.6W	AC: max. 6.2VA DC: max. 4W	AC: max. 6.3VA DC: max. 4.1W
		CX6□-□□F	AC: max. 3.6VA DC: max. 2.5W	AC: max. 4.0VA DC: max. 2.8W	AC: max. 3.9VA DC: max. 2.9W	AC: max. 4.5VA DC: max. 3.3W
Counter	Max. INA/INB counting speed	CX6□-□□	Selectable among 1cps/30cps/300cps/1kcps/5kcps			
		CX6□-□□F	20cps			
	Counting range		-99999 to 999999			
	Scale		Decimal point up to fifth digit			
	Min. signal width	CX6□-□□	RESET, TOTAL RESET signal: selectable among 1ms/20ms			
		CX6□-□□F	RESET signal: 25ms			
Timer	Time range		999.999s, 9999.99s, 99999.9s, 999999s, 99m 59.99s, 999m 59.9s, 9999m 59s, 99999.9m, 999999m, 99h 59m 59s, 9999h 59m, 99999.9h			
	Operation mode		Up, Down			
	Min. signal width	CX6□-□□	INA, INHIBIT, RESET, TOTAL RESET signal: selectable among 1ms/20ms			
		CX6□-□□F	INA, INH, RESET signal: 25ms			
	Repeat error Set error Voltage error Temp. error		[CX6□-□□]-In case of power ON start: max. ±0.01% ±0.05s In case of signal ON start: max. ±0.01% ±0.03s [CX6□-□□F]-In case of power ON start: max. ±0.01% ±0.08s In case of signal ON start: max. ±0.01% ±0.06s			
Input method		CX6□-□□	Selectable among voltage input (PNP)/no-voltage input (NPN) [Voltage input (PNP)]-input impedance: 10.8kΩ, [H]: 5-30VDC⎓, [L]: 0-2VDC [No-voltage input (NPN)]-short-circuit impedance: max. 1kΩ, short-circuit residual voltage: max. 2VDC			
		CX6□-□□F	[Free voltage input]-INA (START) , INB (INHIBIT) input [H]: 24-240VDC⎓/24-240VAC~ 50/60Hz, [L]: 0-10VDC/VAC [No-voltage input]-RESET input, short-circuit impedance: max. 1kΩ, short-circuit residual voltage: max. 2V			
One-shot output time			0.01 to 99.99s setting			
Control output	Contact	Type	SPDT (1c): 1	SPST (1a): 2	SPDT (1c): 1	SPDT (1c): 2
		Capacity	Max. 250VAC~ 3A, 30VDC⎓ 3A resistive load			
	Solid state	Type	—		NPN open collector: 1	NPN open collector: 2
		Capacity			Max. 30VDC⎓ 100mA	
External power supply※1			Max. 12VDC⎓ ±10%, 100mA			
Memory retention			Approx. 10 years (non-volatile memory)			
Insulation resistance			Over 100MΩ (at 500VDC megger)			
Dielectric strength			3,000VAC 50/60Hz for 1 min			
Noise immunity	AC voltage		Square-wave noise by noise simulator (pulse width 1μs) ±2kV			
	AC/DC voltage		Square-wave noise by noise simulator (pulse width 1μs) ±500V			
Vibration	Mechanical		0.75mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour			
	Malfunction		0.5mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min			
Shock	Mechanical		300m/s² (approx. 30G) in each X, Y, Z direction for 3 times			
	Malfunction		100m/s² (approx. 10G) in each X, Y, Z direction for 3 times			
Relay life cycle	Mechanical		Min. 5,000,000 operations			
	Malfunction		Min. 100,000 operations			
Protection structure			Front part: IP50 (IEC standard)			
Environment	Ambient temp.		-10 to 55℃, storage: -25 to 65℃			
	Ambient humi.		35 to 85%RH, storage: 35 to 85%RH			
Approval			CE			
Weight※2	AC voltage	CX6□-□□	Approx. 157g (approx. 112g)	Approx. 162g (approx. 117g)	Approx. 235g (approx. 170g)	Approx. 240g (approx. 175g)
		CX6□-□□F	Approx. 155g (approx. 110g)	Approx. 160g (approx. 115g)	Approx. 233g (approx. 168g)	Approx. 238g (approx. 173g)
	AC/DC voltage	CX6□-□□	Approx. 156g (approx. 111g)	Approx. 161g (approx. 116g)	Approx. 234g (approx. 169g)	Approx. 239g (approx. 174g)
		CX6□-□□F	Approx. 154g (approx. 109g)	Approx. 159g (approx. 114g)	Approx. 232g (approx. 167g)	Approx. 237g (approx. 172g)

※1: This is for the voltage input (PNP)/no-voltage input (NPN) selectable model (CX6□-□□).
※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

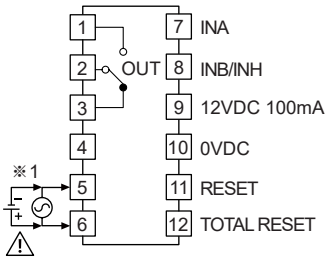
▣ Connections

◎ CX6S Series

1. Voltage input (PNP), no-voltage input (NPN) selectable model

● **CX6S-1P□**

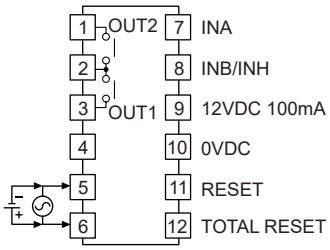
CONTACT OUT:
250VAC 3A, 30VDC 3A
RESISTIVE LOAD



SOURCE:
100-240VAC 50/60Hz 6.4VA
24VAC 50/60Hz 5.5VA
24-48VDC 3.5W

● **CX6S-2P2**

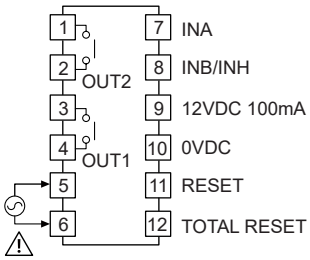
CONTACT OUT1/OUT2:
250VAC 3A, 30VDC 3A
RESISTIVE LOAD



SOURCE:
24VAC 50/60Hz 5.6VA
24-48VDC 3.6W

● **CX6S-2P4**

CONTACT OUT1/OUT2:
250VAC 3A, 30VDC 3A
RESISTIVE LOAD

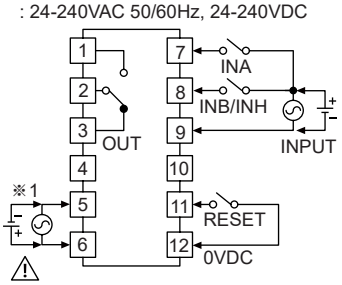


SOURCE:
100-240VAC 50/60Hz 6.7VA

2. Free voltage input model

● **CX6S-1P□F**

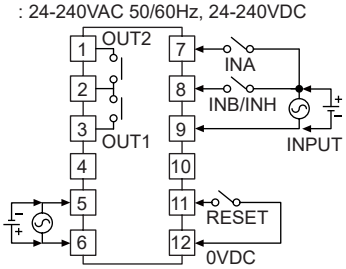
CONTACT OUT
: 250VAC 3A, 30VDC 3A
RESISTIVE LOAD
SIGNAL INPUT
: 24-240VAC 50/60Hz, 24-240VDC



SOURCE: 100-240VAC 50/60Hz 4.2VA
24VAC 50/60Hz 3.6VA
24-48VDC 2.5W

● **CX6S-2P2F**

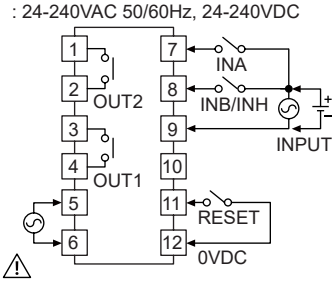
CONTACT OUT1/OUT2
: 250VAC 3A, 30VDC 3A
RESISTIVE LOAD
SIGNAL INPUT
: 24-240VAC 50/60Hz, 24-240VDC



SOURCE: 24VAC 50/60Hz 4.0VA
24-48VDC 2.8W

● **CX6S-2P4F**

CONTACT OUT1/OUT2
: 250VAC 3A, 30VDC 3A
RESISTIVE LOAD
SIGNAL INPUT
: 24-240VAC 50/60Hz, 24-240VDC



SOURCE: 100-240VAC 50/60Hz 4.9VA

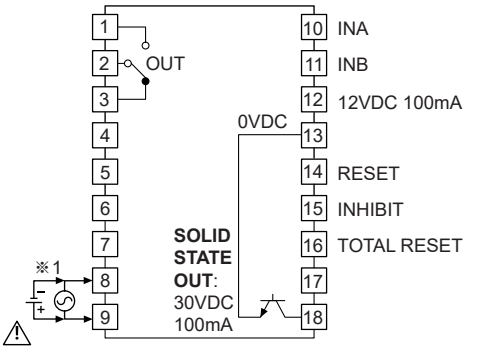
▣ Connections

◎ CX6M Series

1. Voltage input (PNP), no-voltage input (NPN) selectable model

● **CX6M-1P□**

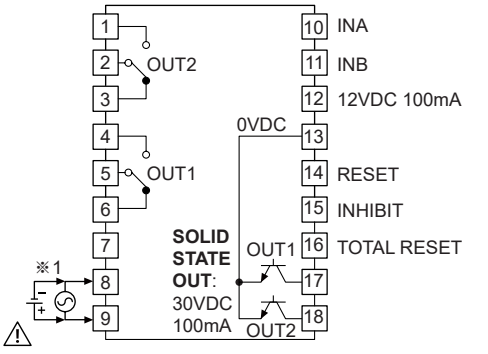
CONTACT OUT: 250VAC 3A, 30VDC 3A
RESISTIVE LOAD



SOURCE: 100-240VAC 50/60Hz 7.1VA
24VAC 50/60Hz 6.2VA
24-48VDC 4W

● **CX6M-2P□**

CONTACT OUT1/OUT2: 250VAC 3A, 30VDC 3A
RESISTIVE LOAD

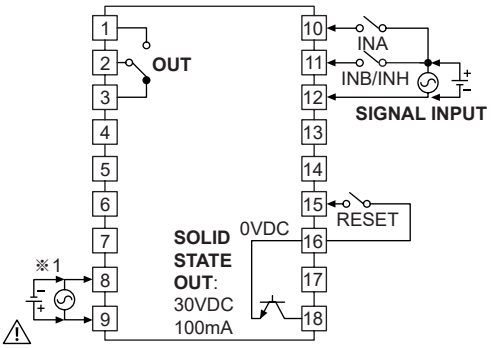


SOURCE: 100-240VAC 50/60Hz 7.5VA
24VAC 50/60Hz 6.3VA
24-48VDC 4.1W

2. Free voltage input model

● **CX6M-1P□F**

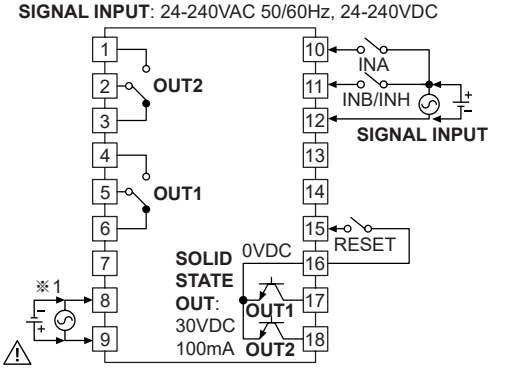
CONTACT OUT: 250VAC 3A, 30VDC 3A
RESISTIVE LOAD
SIGNAL INPUT: 24-240VAC 50/60Hz, 24-240VDC



SOURCE: 100-240VAC 50/60Hz 4.7VA
24VAC 50/60Hz 3.9VA
24-48VDC 2.9W

● **CX6M-2P□F**

CONTACT OUT1/OUT2: 250VAC 3A, 30VDC 3A
RESISTIVE LOAD
SIGNAL INPUT: 24-240VAC 50/60Hz, 24-240VDC



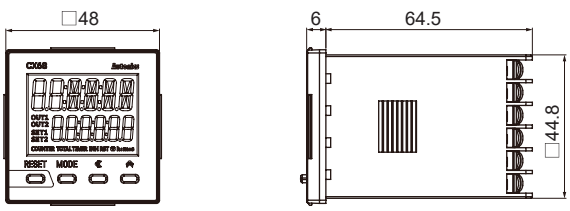
SOURCE: 100-240VAC 50/60Hz 5.4VA
24VAC 50/60Hz 4.5VA
24-48VDC 3.3W

※1: AC voltage type: 100-240VAC 50/60Hz
AC/DC voltage type: 24VAC 50/60Hz, 24-48VDC

▣ Dimensions

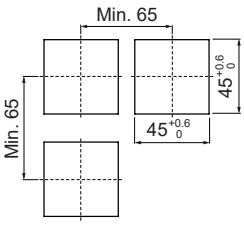
(unit: mm)

◎ CX6S Series

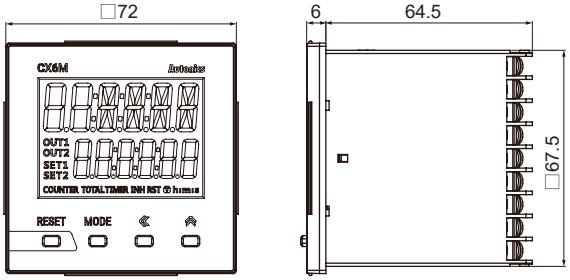


◎ Panel cut-out

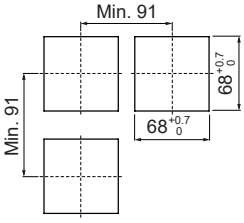
● CX6S Series



◎ CX6M Series

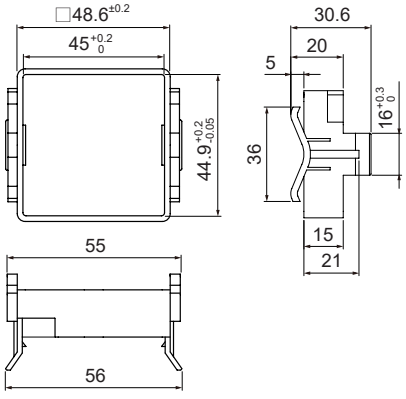


● CX6M Series

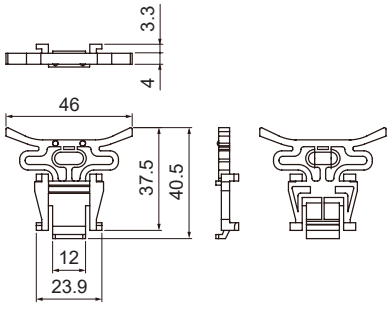


◎ Bracket

● CX6S Series



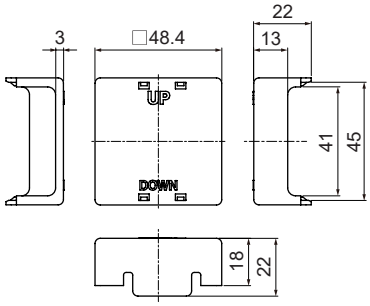
● CX6M Series



◎ Terminal cover (sold separately)

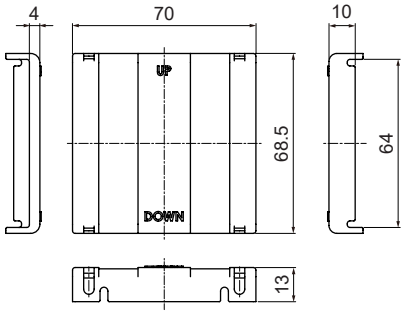
● CX6S Series

(RSA-COVER, 48×48mm)



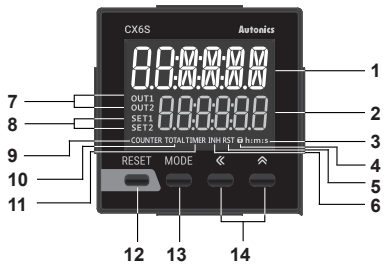
● CX6M Series

(RMA-COVER, 72×72mm)

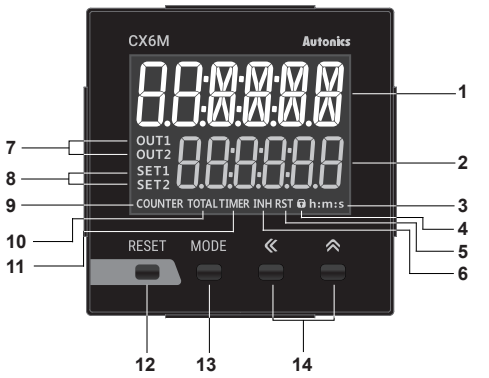


▣ Unit Description

◎ CX6S Series



◎ CX6M Series



1. Counting value display component (white)
RUN mode: Displays counting value for counter operation or time progress value for timer operation.
Function setting mode: Displays parameter.

2. Setting value display component (green)
RUN mode: Displays setting value.
Function setting mode: Displays parameter setting value.

3. Time unit indicator (h:m:s): Turns ON for time unit for timer.

4. Key lock indicator (🔒): Turns ON for key lock setting.

5. Reset input indicator (RST): Turns ON for reset key input or reset signal input.

6. INH indicator (INH)
For the voltage input (PNP)/no-voltage input (NPN) selectable model (CX6□-□□), it turns ON for INHIBIT signal input.
(In case of CX6S Series and timer mode, it turns ON for INB/INH signal input.)
For free voltage input model (CX6□-□ □F), it turns ON for INB/INH signal input for timer.

7. Output indicator (OUT1, OUT2): Turns ON for the dedicated control output ON.

8. SV checking and changing indicator (SET, SET1, SET2) (green): Turns ON when checking and changing SV.

9. COUNTER indicator (COUNTER): Turns ON for counter operation.

10. TOTAL indicator※1 (TOTAL): In case of TOTAL counter display mode, it turns ON with the COUNTER indicator.

11. TIMER indicator (TIMER): Flashes (progressing time) or Turns ON (stopping time) for timer operation.

12. RESET key
RUN mode, Function setting mode: Press the RESET key to reset the counting value and turn OFF the output.
TOTAL counter display mode※1: Press the RESET key to reset the counting value of TOTAL counter.

13. MODE key
RUN mode: Hold the MODE key over 3 sec to enter function setting mode.
Press the MODE key to select SV2 (SET2)/SV1 (SET1)/TOTAL counter※1 display for counter operation.
Function setting mode: Hold the MODE key over 3 sec to return RUN mode.
Press the MODE key to save the SV and enter the next setting.
Function setting check mode: Hold the MODE key over 1 sec to return RUN mode.
Changing SV mode: Press the MODE key to save SV and return RUN mode.

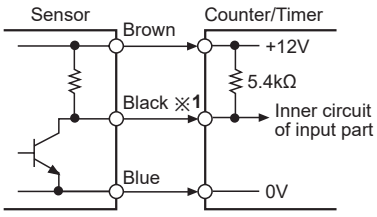
14. ≪, ≫ key
1) ≪ key
RUN mode: Press the ≪ key to change SV and move SV (SET, SET1, SET2) digits.
Changing SV mode: Press the ≪ key to change digits.
2) ≫ key
Changing SV mode: Increases SV.
Function setting mode: Changes the settings.

※1: This is for the voltage input (PNP)/no-voltage input (NPN) selectable model (CX6□-□□).

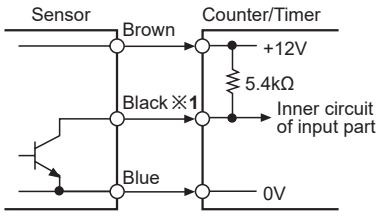
▣ Input Connections

◎ No-voltage input (NPN)

● Solid-state input (standard sensor: NPN output type sensor)

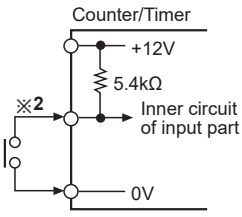


(NPN output)



(NPN open collector output)

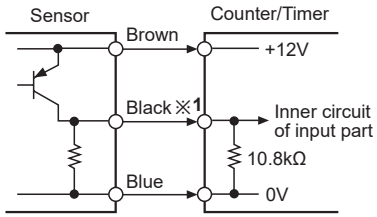
● Contact input



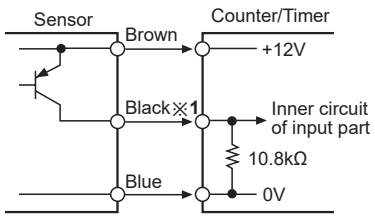
※1: CP1, CP2 (INHIBIT), SET input part
※2: Set counting speed as 1 or 30cps.

◎ Voltage input (PNP)

● Solid-state input (standard sensor: PNP output type sensor)

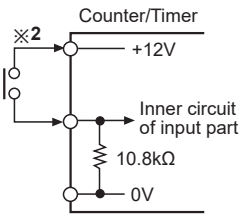


(PNP output)



(PNP open collector output)

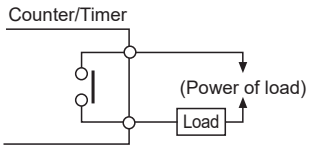
● Contact input



※1: CP1, CP2 (INHIBIT), SET input part
※2: Set counting speed as 1 or 30cps.

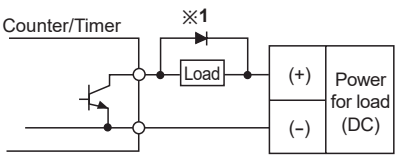
▣ Output Connections

◎ Contact output



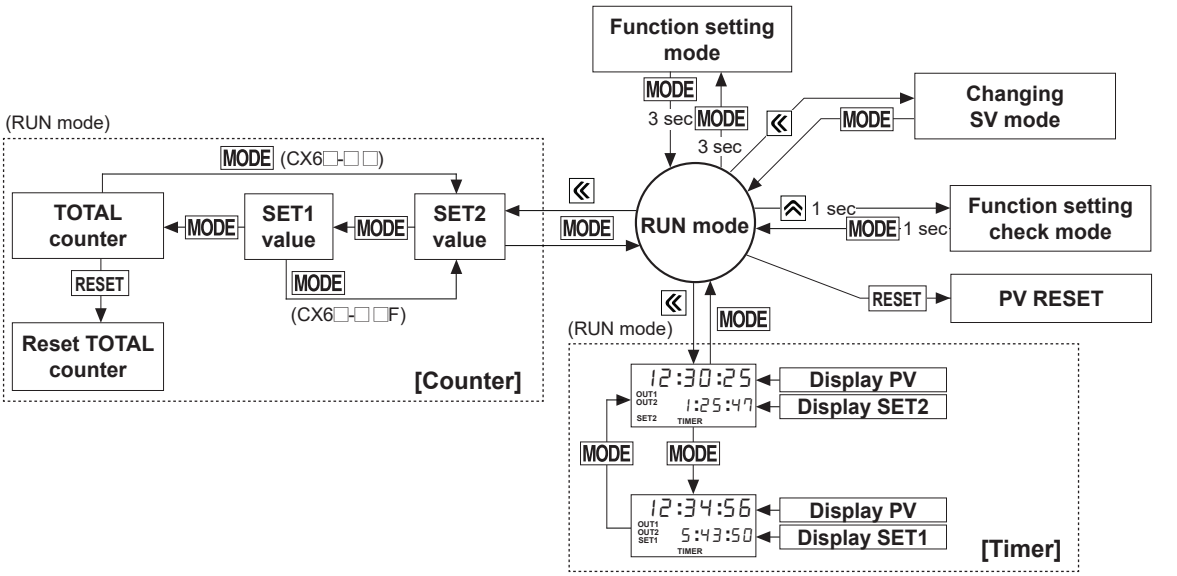
※Select the load which capacity is not over contact capacity.

◎ Solid-state output



※For solid state output, select load power and load not to be over (max. 30VDC, 100mA), swithching capacity.
※Do not supply reverse polarity voltage.
※1: For using inductive load (relay, etc.), connect surge absorber (diode, varistor etc.) at the both ends of load.

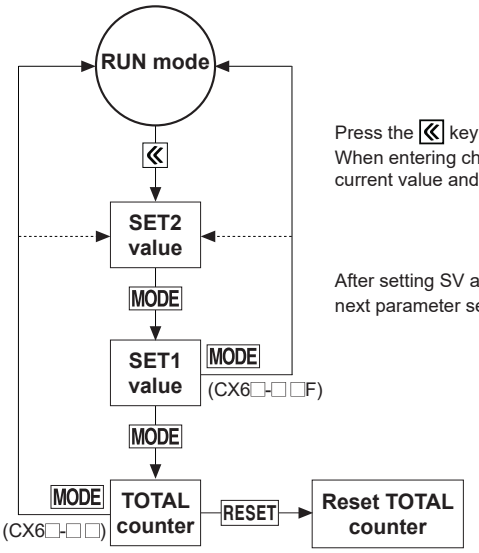
▣ Operations and Functions (counter/timer)



▣ Counter mode

• Changing SV mode

When input signal is ON during changing SV, it operates counting and output control.
It is available to set SV as '0' and the dedicated output for SV '0' occurs.
There are output mode which cannot set SV as '0'. (the setting value display component flashes three times when SV is set as '0')

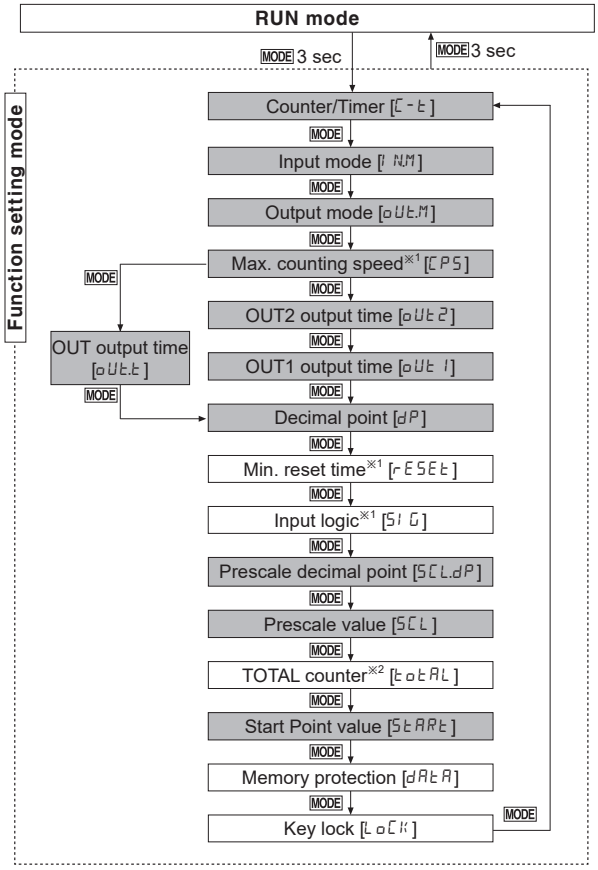


Press the « key to enter changing SV mode in RUN mode.
When entering changing SV mode, the counting value display component displays the current value and the setting value display component displays SV.

After setting SV at each parameter, press the MODE key to save SV and it moves next parameter setting or returns to RUN mode.

● Function setting mode

※1: In case of free voltage input model (CX6□-□□F), these parameters do not appear due to fixed setting.
※2: This parameter is for the voltage input(PNP)/no-voltage input(NPN) selectable model (CX6□-□□).
※▭: When changing the setting of shaded parameters, all output turn OFF.



-Hold the **MODE** key over 3 sec in RUN mode and it enters function setting mode.
-Hold the **MODE** key over 3 sec in function setting mode and it returns to RUN mode.

● Function setting check mode (only for free voltage input model (CX6□-□□F))

-When checking the saved parameters, press the **MODE**, ⩓ key to check next item.
-At function setting check mode, the counting value display component displays the parameters and the setting value display component displays the SV of the parameters.

● Checking SV of TOTAL counter

-At TOTAL counter operation, the counting value display component displays the current value and the setting value display component displays TOTAL counter counting value.
※When TOTAL counter counting value is over 999999, it counts from 0 again.

● Switching display of the setting value display component

(only for voltage input (PNP)/no-voltage input (NPN) selectable model (CX6□-□□)

-In case of 2-stage setting model(CX6□-2P□□), whenever pressing the **MODE** key, each SET2, SET1, TOTAL COUNTER value displays consecutively.

● Display HOLD output mode for counter

-It displays the over value of prescale value.
-When SV is n multiplied by prescale value and the display value after HOLD output mode and SV are different, the prescale value is not the 1/n time of SV.

● RESET

-In RUN mode, function setting mode, press the **RESET** key to reset the current value and the output turns OFF.
-At TOTAL counter display mode, press the **RESET** key to reset TOTAL counter counting value and the current counting value.

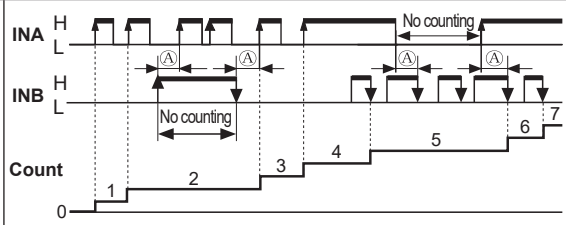
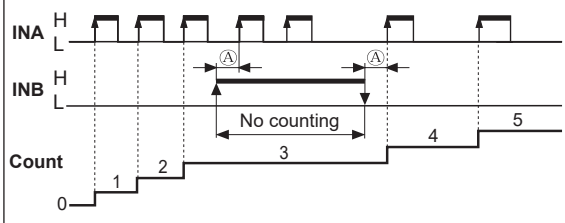
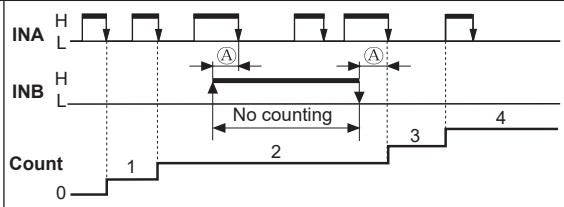
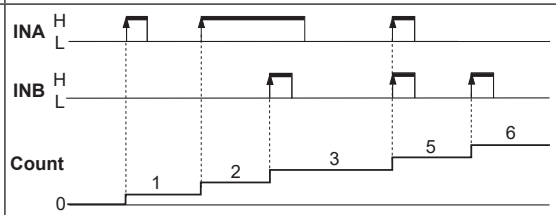
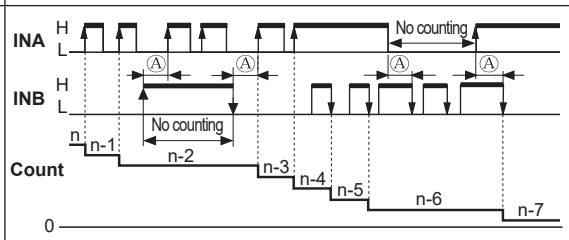
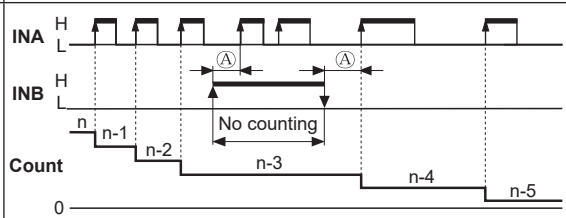
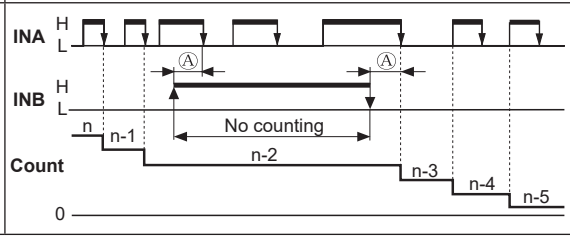
▣ Parameter Setting (Counter)

(MODE key: moves parameters, ▲ key: changes parameter setting value)

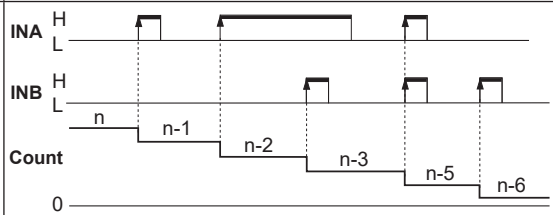
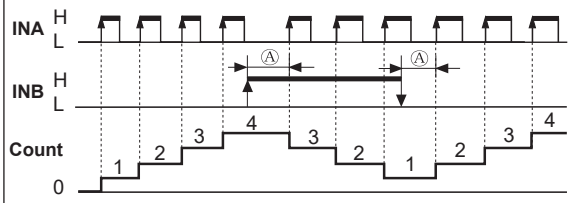
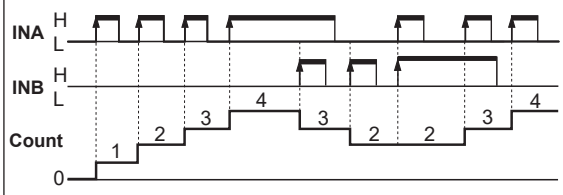
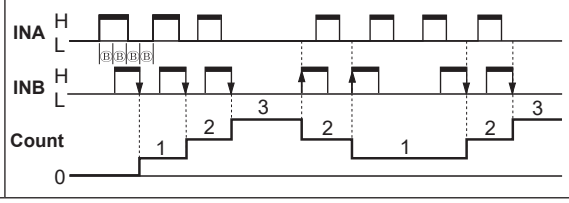
Parameter	Parameter setting value
Counter/Timer [C-t]	CoUnt ⟷ tIME ※CoUnt: Counter, tIME: Timer
Input mode [INPM]	UP → UP-1 → UP-2 → UP-3 → dn → dn-1 → dn-2 → dn-3 → Ud-A → Ud-b※1 → Ud-C※1 → UP
Output mode [oUtM]	• Input mode is UP, UP-1, UP-2, UP-3 or dn, dn-1, dn-2, dn-3, F → n → C → r → U → P → 9 → A • Input mode is Ud-A, Ud-b※1, Ud-C※1 F → n → C → r → U → P → 9 → A → S → t → d ※If max. counting speed is 5kcps, and output mode is d, max. counting speed is automatically changed as 30cps, factory default.
Max. counting speed※2 [CPS]	30 → 300 → 1K → 5K → 1 ※Max. counting speed is when duty ratio of INA or INB input signal is 1:1. It is applied for INA, or INB input as same. ※When output mode is d, set max. counting speed one among 1cps, 30cps, 300cps, or 1kcps.
OUT 2 output time※3 [oUt2]	※Set one-shot output time of OUT 2. ※Setting range: 00.01 to 99.99 sec ※When output mode is F, n, S, t, d, this parameter does not appear. (fixed as HOLD)
OUT 1 output time※3 [oUt1]	※Set one-shot output time of OUT 1. ※Setting range: 00.01 to 99.99 sec, Hold ※When number of tens digit is flashing, press the ◀ key once and HoLd appears. ※When output mode is S, t, d, this parameter does not appear. (fixed as HOLD)
OUT output time※3 [oUtt]	※Setting range: 00.01 to 99.99 sec ※When output mode is F, n, S, t, d, this parameter does not appear. (fixed as HOLD)
Decimal point※4 [dP]	------ → -----.- → ----.-- → ---.--- → --.---- → -.----- ※Decimal point is applied to PV and SV.
Min. reset time※2 [rESEt]	1 ⟷ 20, unit: ms ※Set min. width of external reset signal input.
Input logic※2 [SIG]	nPn: No-voltage input, PnP: Voltage input
Prescale decimal point※4 [SCL.dP]	-.----- → ----.- → ---.-- → --.--- → -.---- ※Decimal point of prescale should not set smaller than decimal point [dP].
Prescale value [SCL]	※Setting range: 0.00001 to 99999.9 ※Setting range of prescale is linked with prescale decimal point [SCL.dP] setting.
TOTAL counter※1 [totAL]	on ⟷ oFF
Start point value [StArt]	※Setting range of start point value is linked with decimal point [dP] setting. (0.00000 to 999999) ※When input mode is dn, dn-1, dn-2, this parameter does not appear. ※When total count function is ON, this parameter does not appear.※1
Memory protection [dAtA]	CLr ⟷ rEC ※CLr: Resets the counting value when power OFF. rEC: Maintains the counting value when power OFF. (memory protection)
Key lock [LocK]	L.oFF → LoC.1 → LoC.2 → LoC.3 → L.oFF ※L.oFF: Unlock keys, key lock indicator turns OFF LoC.1: Locks RESET key, key lock indicator turns ON LoC.2: Locks ◀, ▲ keys, key lock indicator turns ON LoC.3: Locks RESET, ◀, ▲ keys, key lock indicator turns ON

※1: For voltage input (PNP), no-voltage input (NPN) model (CX6□-□□).
※2: For free voltage input model(CX6□-□□F), these parameters do not appear due to fixed setting.
※3: For 1-stage setting model (CX6□-1P□□), oUt1 does not appear.
The oUt2 output time is displayed as oUtt.
※4: Decimal point and prescale decimal point
-Decimal point: Set the decimal point for display value regardless of prescale value.
-Prescale decimal point: Set the decimal point for prescale value of counting value regardless of display value.

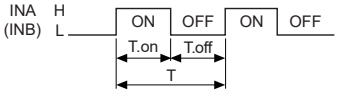
▣ Input Operation Mode (Counter)

Input mode	Counting chart	Operation
UP [UP]		※When INA is counting input, INB is no counting input. When INB is counting input, INA is no counting input.
UP-1 [UP-1]		※When INA input signal is rising ( ), it counts. ※INA: Counting input ※INB: No counting input
UP-2 [UP-2]		※When INA input signal is falling ( ), it counts. ※INA: Counting input ※INB: No counting input
UP-3 [UP-3]		※When INA or INB input signal is rising ( ), it counts. ※INA: Counting input ※INB: Counting input
Down [dn]		※When INA is counting input, INB is no counting input. When INB is counting input, INA is no counting input.
Down-1 [dn-1]		※When INA input signal is rising ( ), it counts. ※INA: Counting input ※INB: No counting input
Down-2 [dn-2]		※When INA input signal is falling ( ), it counts. ※INA: Counting input ※INB: No counting input

▣ Input Operation Mode (Counter)

Input mode	Counting chart	Operation
Down-3 [dn-3]		※When INA or INB input signal is rising (⌐) , it counts. ※INA: Counting input ※INB: Counting input
Up/ Down-A [Ud-A]		※INA: Counting input INB: Counting command input ※When INB is "L", counting command is up. When INB is "H", counting command is down.
Up/ Down-B [Ud-b]		※INA: Up counting input INB: Down counting input ※When INA and INB input signals are rising (⌐) at the same time, it maintains previous value.
Up/ Down-C [Ud-C]		※When connecting encoder output A, B phase with counter input, INA, INB, set input mode [In.mo] as phase different input [Ud-C] for counter operation.

※A: over min. signal width, B: over than 1/2 of min. signal width. If the signal is smaller than these width, it may cause counting error (±1).



※T.on, T.off: Min. signal width

※The meaning of "H", "L"

Character \ Input method	Voltage input (PNP)	No-voltage input (NPN)
H	5-30VDC	Short
L	0-2VDC	Open

※Min. signal width by counting speed

[CX6□-□ □]

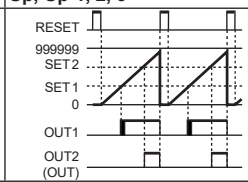
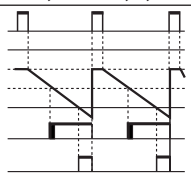
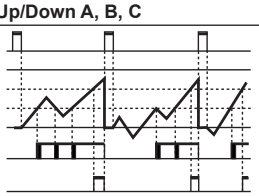
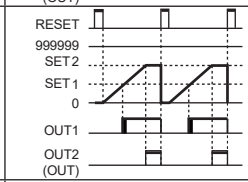
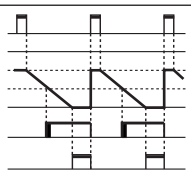
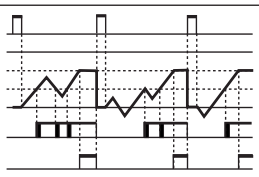
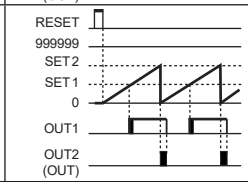
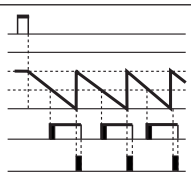
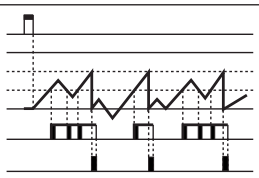
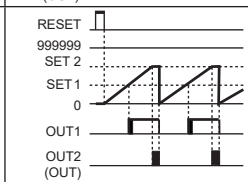
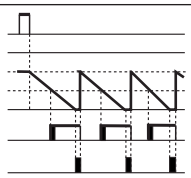
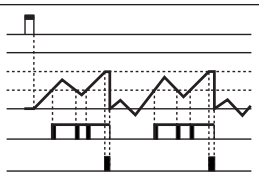
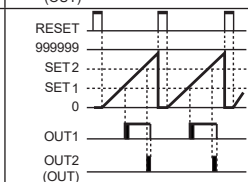
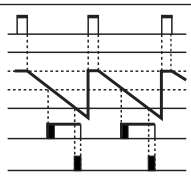
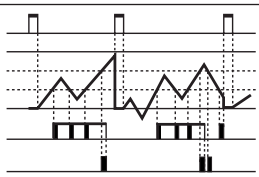
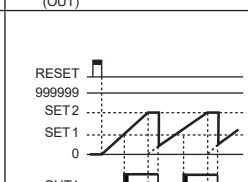
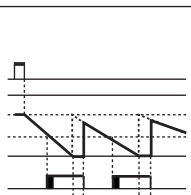
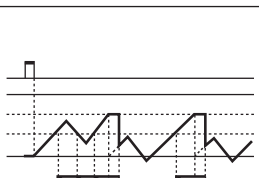
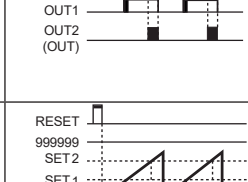
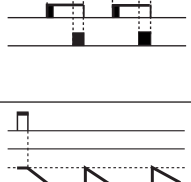
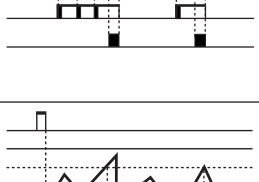
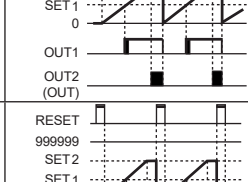
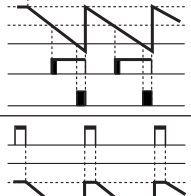
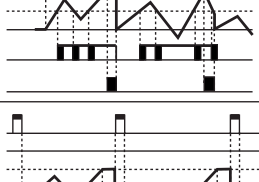
Counting speed	Min. signal width
1cps	500ms
30cps	16.7ms
300cps	1.67ms
1kcps	0.5ms
5kcps	0.1ms

[CX6□-□ □F]

Counting speed	Min. signal width
20cps	25ms

▣ Output Operation Mode (Counter)

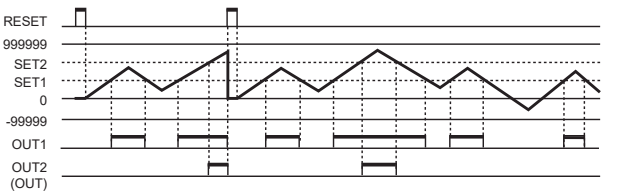
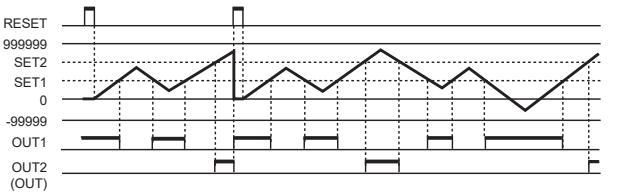
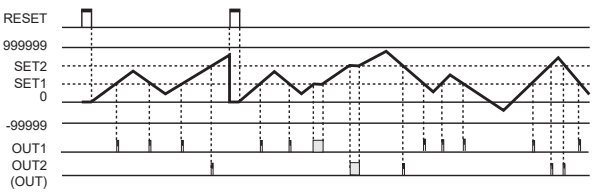
One-shot output (0.01 to 99.99 sec)
Retained output
One-shot output
Retained output

Output mode	Input mode			Operation
	Up, Up-1, 2, 3	Down, Down-1, 2, 3	Up/Down A, B, C	
F [F]				※After count-up, counting display value increases or decreases until reset signal is applied and retained output is maintained.
N [n]				※After count- up, counting display value and retained output are maintained until reset signal is applied.
C [C]				※When count-up, counting display value will be reset and count simultaneously. ※OUT1 retained output will be off after OUT2 one- shot time. ※The one-shot output time of OUT1 one-shot output time is operated regardless of OUT2 output.
R [r]				※After count-up, counting value display is reset after one-shot output time of OUT2 and it counts simultaneously. ※OUT1 retained output will be off after OUT2 one-shot time. ※OUT1 one-shot output time is operated regardless of OUT2 output.
K [K]				※After count-up, counting display value increases or decreases until RESET input is applied. ※OUT1 retained output is off after OUT2 one-shot time. ※OUT1 one-shot output time is operated regardless of OUT2 output.
P [P]				※After count-up, counting display value is maintained while OUT2 output is on. Counting value is internally reset and counts simultaneously. ※When OUT2 output is off, displays counting value while OUT2 is ON, and it increases or decreases. ※OUT1 retained output is off after OUT2 one-shot time. ※OUT1 one-shot output time is operated regardless of OUT2 output.
Q [q]				※After count-up, counting display value increases or decreases during OUT2 one-shot time. ※OUT1 retained output is off after OUT2 one-shot time. ※OUT1 one-shot output time is operated regardless of OUT2 output.
A [A]				※After count-up, counting display value and OUT1 retained output are maintained until RESET input is applied. ※OUT1 one-shot output time is operated regardless of OUT2 output.

※oUt 1 is available to set as '0' regardless of output mode. The output for '0' setting executes.
※In case of C , r , P , q output mode for oUt2, setting '0' is not available.

▣ Output Operation Mode (Counter)

Retained output　　Coincidence output

Output mode	Input mode Up/Down A, B, C	Operation
S [S]		※OUT1 keeps ON status in following condition : Counting display value ≥ SET1 ※OUT2 keeps ON status in following condition : Counting display value ≥ SET2
T [t]		※OUT1 output is off : Counting display value ≥ SET1 (when SET1 is 0, OUT1 output maintains ON state.) ※OUT2 keeps ON status in following condition : Counting display value ≥ SET2
D [d]		※When counting display value is equal to setting value (SET1, SET2) only, OUT1 or OUT2 output keeps ON status. ※When setting 1kcps for counting speed, solid state contact output should be used. (when using contact output, it is difficult to execute normal output operation due to contact reaction time.)

※oUt1 is available to set as '0' regardless of output mode. The output for '0' setting executes.
※In case of C, r, P, 9 output mode for oUt2, setting '0' is not available.

▣ Output Operation for Other Conditions

◎ When Start Point is larger or equal than setting value (UP, UP-1, UP-2, UP-3, Ud-A, Ud-b, Ud-C mode)

- **When setting SET2>Start Point>SET1**
  -UP, UP-1, UP-2, UP-3 mode: Output of oUt1 does not execute. When PV is same as SET2, output of oUt2 turns ON.
  -Ud-A, Ud-b※1, Ud-C※1 mode: When PV counts down and is same as SET1, output of oUt1 turns ON.
- **When setting SET2>Start Point=SET1**
  -In case of UP, UP-1, UP-2, UP-3, Ud-A, Ud-b※1, Ud-C※1 mode, output of OUT1 turns ON when RESET ON to OFF.

※1: This is for the voltage input(PNP)/no-voltage input(NPN) selectable model (CX6□-□□).

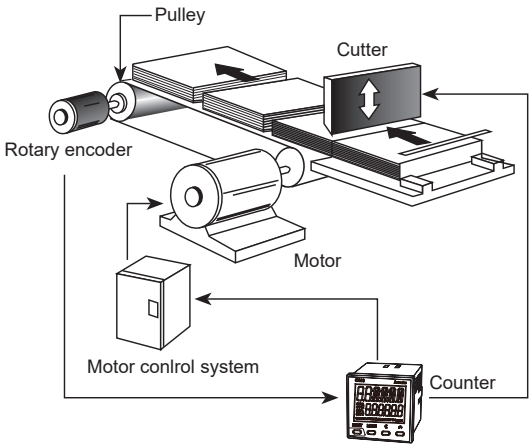
◎ When SET1 is larger or equal than SET2 at down mode

- **When SET2>SET1**
  -Output of oUt1 does not execute.
- **When SET2=SET1**
  -Output of oUt1 turns ON for RESET OFF.

▣ Prescale Function (Counter)

This function is to set and display calculated unit for actual length, liquid, position, etc. It is called “prescale value” for measured length, liquid, or position, etc per 1 pulse. For example, when moving L, the desired length to be measured, and P, the number of pulses per 1 revolution of a rotary encoder, occurs, prescale value is L/P.

E.g.) Positioning control by counter and encoder



[Diameter (D) of pulley connected with encoder= 22mm,
the number of pulses by 1 rotation of encoder=1,000]

$$\text{●Prescale value} = \frac{\pi \times \text{Diameter (D) of pulley}}{\text{The number of pulses by 1 rotation of encoder}}$$

$$= \frac{3.1416 \times 22}{1000}$$

$$= 0.069\text{mm/pulse}$$

Set decimal point[dP] as [-----.-], prescale decimal point [SCL.dP] as [---.---], prescale value [SCL] as [0.069] at function setting mode.
It is available to control conveyer position by 0.1mm unit.

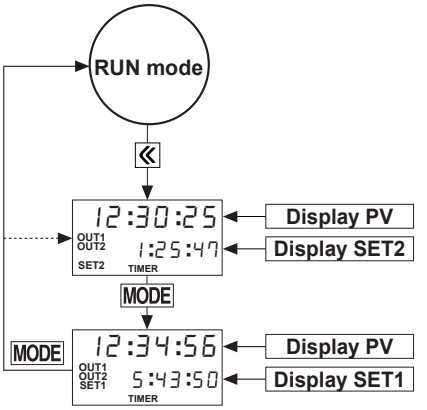
▣ Start Point Function (Counter)

In case of counter operation, set the start value for counting at Start point [StArt].
- It is not available for dn, dn-1, dn-2, dn-3 input mode.
- When pressing the RESET key, PV is reset as the start point value.
- In case of C, r, P, q output mode, it counts up and PV starts from the start point value.

▣ Timer mode

• Changing SV mode

When input signal is ON during changing SV, it operates counting and output control.
It is available to set SV as '0' and the dedicated output for SV '0' occurs.
There are output mode which cannot set SV as '0'. (the setting value display component flashes three times when SV is set as '0')

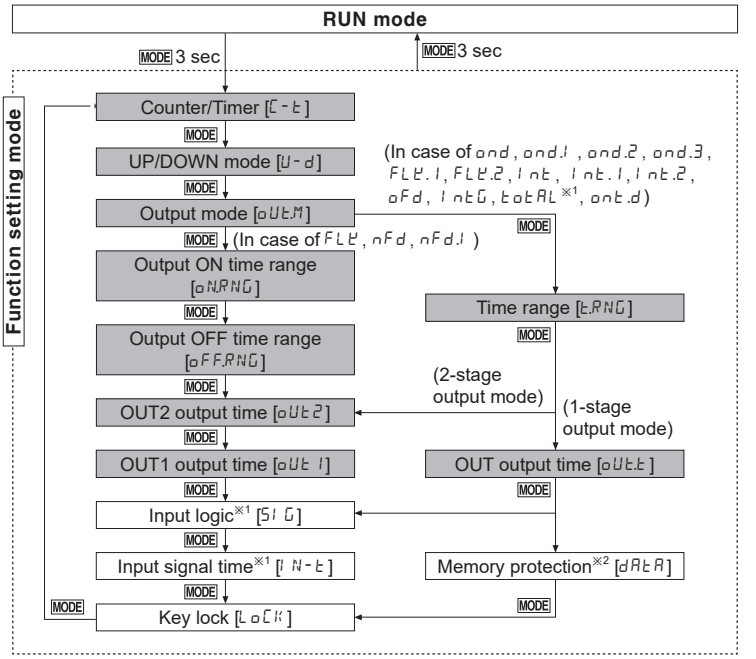


Press the « key to enter changing SV mode in RUN mode.
When entering changing SV mode, the counting value display component displays the current value and the setting value display component displays SV.

After setting SV at each parameter, press the MODE key to save SV and it moves next parameter setting or returns to RUN mode.

• Function setting mode

※1: In case of free voltage input model (CX6□-□□F), these parameters do not appear due to fixed setting.
※2: This parameter is for the voltage input(PNP)/no-voltage input(NPN) selectable model (CX6□-□□).
※ : When changing the setting of shaded parameters, all output turn OFF.



-Hold the MODE key over 3 sec in RUN mode and it enters function setting mode.
-Hold the MODE key over 3 sec in function setting mode and it returns to RUN mode.

● Switching display of the setting value display component

Select the display value at the setting value display component.
Depends on output mode, there are manual display switching and auto display switching.
-Manual display switching
1) In case of 2-stage setting model (CX6□-2P□□) and oNd, oNd.1, oNd.2, oNd.3 output mode, it is available.
2) In run mode, whenever pressing the **MODE** key, the setting value display component displays SET1, SET2 SV in turn.
In case of 1-stage setting model (CX6□-1P□□), it is not available.
-Auto display switching
1) When output mode is FLK, NFd, NFd.1 for 1-stage or 2-stage setting model (CX6□-1/2P□□) and INt.2 mode for 2-stage setting model (CX6□-2P□□), the setting value display component automatically displays the set times depends on the operation status.

● RESET

-In RUN mode, function setting mode, press the **RESET** key to reset the current value and the output is also reset.

● Display type of the setting value display component by output mode

-In case of 2-stage setting model (CX6□-2P□□) and oNd, oNd.1, oNd.2, oNd.3, INt.2 output mode, there are SET1 and SET2 setting.
It displays the each SV and the SET1, SET2 indicator turns ON when displaying or setting the each SV.
-In case of 1-stage setting model (CX6□-1P□□) , SET is available and there is one setting value.
-In case of 1-stage setting model (CX6□-1P□□), INt.2 output mode is not available.
-FLK output mode has t.oFF , t.oN setting values. In case of 2-stage setting model (CX6□-2P□□) and 1-stage setting model (CX6□-1P□□), each SET2, SET display is available.
(t.oFF , t.oN setting value is for OUT2 output. It displays SET2 or SET.)
-The other output modes display SET2 or SET and have one setting value.
(only for 1-stage setting model (CX6□-1P□□))

● Zero blanking display

PV is displayed with zero blanking for the highest unit.
E.g.)When time range is 99m59.99s and PV is 00m04.05s, zero blanking is applied to minute which is the highest unit.
At the below digits of decimal point, it is not applied.
It displays as "0:04.05".

▣ Parameter Setting (Timer)

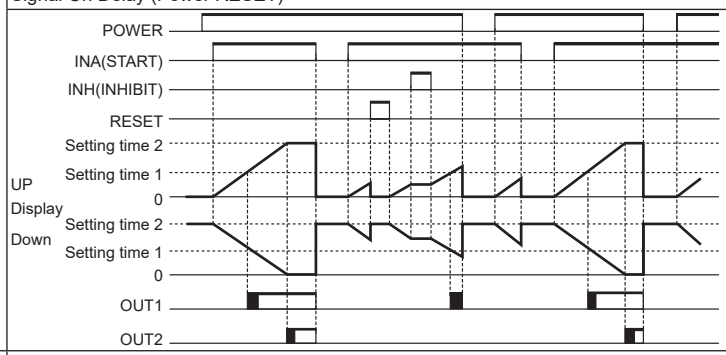
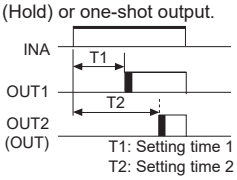
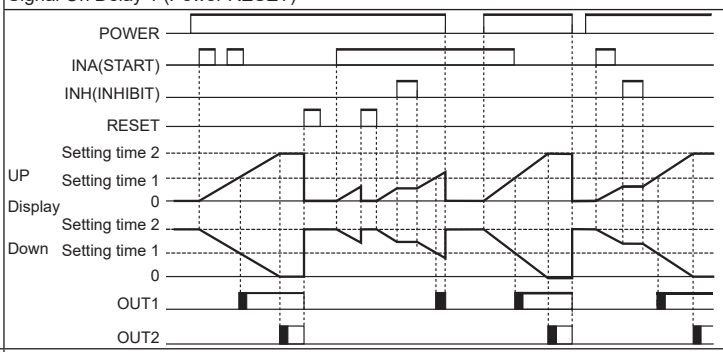
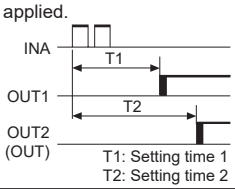
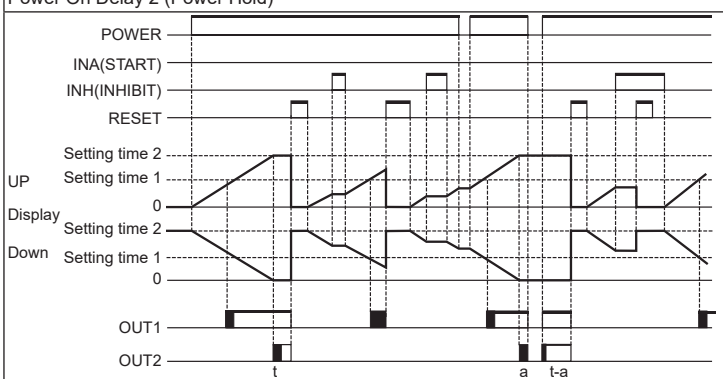
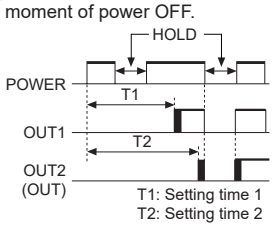
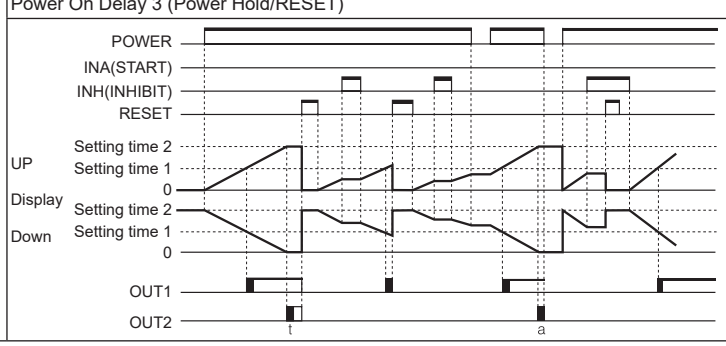
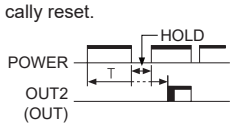
(MODE key: moves parameters, ▲ key: changes parameter setting value)

Parameter	Parameter setting value
Counter/Timer [C-t]	CoUnt ⟷ tIME ※CoUnt: Counter tIME: Timer
Up/Down mode [U-d]	UP ⟷ dn ※UP: Time progresses from '0' to the setting time. dn: Time progresses from the setting time to '0'.
Output mode [oUt.M]	ond → ond.1 → ond.2 → ond.3 → FLK → FLK.1 → FLK.2 → Int ontd ← totAL ※1 ← Int G ← nFd.1 ← nFd ← oFd ← Int.2 ※2 ← Int.1
Time range [t.RNG] ※3 output ON TIME range [on.RNG] ※4, output OFF TIME range [oFF.RNG] ※4	999.999 (TIMER s) → 9999.99 (TIMER s) → 99999.9 (TIMER s) → 999999 (TIMER s) → 99:59.99 (TIMER m:s) → 999:59.9 (TIMER m:s) 99999.9 (TIMER h) ← 9999:59 (TIMER h:m) ← 99:59:59 (TIMER h:m:s) ← 999999 (TIMER m) ← 99999.9 (TIMER m) ← 9999:59 (TIMER m:s)
OUT 2 output time ※5 [oUt2]	※Set one-shot output time of OUT 2. ※Setting range: 00.01 to 99.99 sec, Hold ※When number of tens digit is flashing, press the ◀◀ key once and Hold appears.
OUT 1 output time ※5 [oUt1]	※Set one-shot output time of OUT 1. ※Setting range: 00.01 to 99.99 sec, Hold ※When number of tens digit is flashing, press the ◀◀ key once and Hold appears.
OUT output time ※5 [oUt.t]	※Setting range: 00.01 to 99.99 sec, Hold ※When number of tens digit is flashing, press the ◀◀ key once and Hold appears.
Input logic ※6 [SIG]	nPn: No-voltage input, PnP: Voltage input
Input signal time ※6 [IN-t]	1 ⟷ 20, unit: ms ※Set min. width of INA, INHIBIT, RESET, TOTAL RESET signal
Memory protection [dAtA]	CLr ⟷ rEC ※CLr: Resets the counting value when power OFF. rEC: Maintains the counting value when power OFF. (memory protection)
Key lock [LoCK]	LoFF → LoC.1 → LoC.2 → LoC.3 → LoFF ※LoFF: Unlock keys, key lock indicator turns OFF LoC.1: Locks RESET key, key lock indicator turns ON LoC.2: Locks ◀◀, ▲ keys, key lock indicator turns ON LoC.3: Locks RESET, ◀◀, ▲ keys, key lock indicator turns ON

※1: This is for the voltage input (PNP)/no-voltage input (NPN) selectable model (CX6□-□□).
※2: Int.2 mode is available only for 2-stage setting model(CX6□-2P□□).
※3: When output mode is OND, ONd1, ONd2, ONd3, FLk1, FLk2, INT, INt1, INt2, OFD, INTG, TOTAL, ONtD, set time range [t.RNG].
※4: When output mode is FLK, NFD, NFD.1, set output ON TIME range [on.RNG] and output OFF TIME range [oFF.RNG].
※5: In case of 1-stage setting model (CX6□-1P□□), oUt1 output time does not appear.
oUt2 output time is displayed as oUt.t.
※6: In case of free voltage input model (CX6□-□□F), this parameter does not appear due to fixed setting.

▣ Output Operation Mode (Timer)

One-shot output (0.01 to 99.99 sec) / Retained output　One-shot output　Retained output

Output mode	Time chart	Operation
OND [ond]	Signal On Delay (Power RESET) 	1)Time starts when INA signal turns ON. 2)When INA signal turns OFF, time resets. 3)When INA signal is ON : Power ON Time Start is operated. RESET OFF Time Start is operated. 4)Control output operates as retained (Hold) or one-shot output. 
OND.1 [ond.1]	Signal On Delay 1 (Power RESET) 	1)Time starts when INA signal turns ON. 2)When INA signal is ON : Power ON Time Start is operated. RESET OFF Time Start is operated. 3)Control output operates as retained (Hold) or one-shot output. 4)Only first INA input signal is valid in case INA input signal is repeatedly applied. 
OND.2 [ond.2]	Power On Delay 2 (Power Hold) 	1)Power ON Time Start (there is no INA function) 2)RESET ON: Time RESET RESET ON→OFF: Time Start 3)Control output operates as retained (Hold) or one-shot output. 4)It memorizes display value at the moment of power OFF. 
OND.3 [ond.3]	Power On Delay 3 (Power Hold/RESET) 	1)Power ON Time Start (there is no INA function) 2)RESET ON: Time RESET RESET ON→OFF: Time Start 3)Control output operates as retained (Hold) or one-shot output. 4)If time reached setting time at the moment of power ON, it is automatically reset. 

※Power RESET: There is no memory protection. (resets the display value when power is off)
※Power Hold: There is memory protection.
(memorizes the display value at the moment of power off, indicates the memorized display value when power is resupplied.)

▣ Output Operation Mode (Timer)

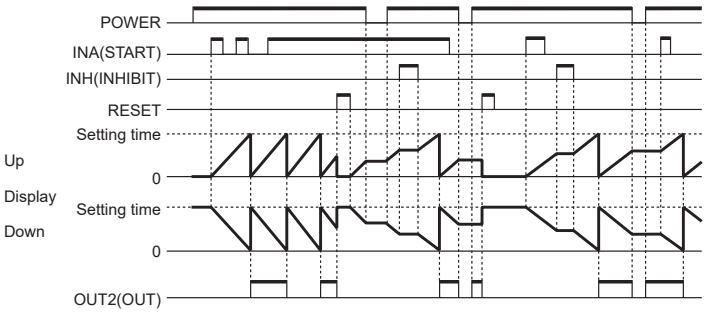
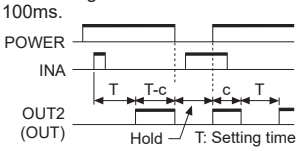
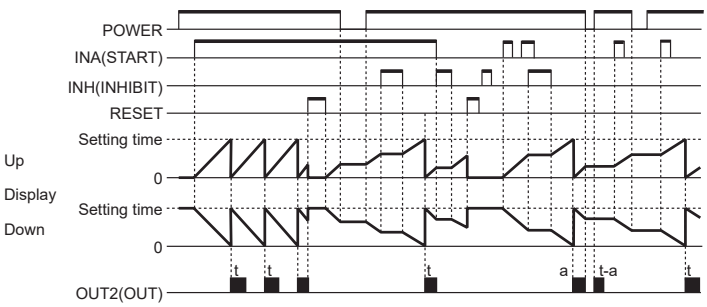
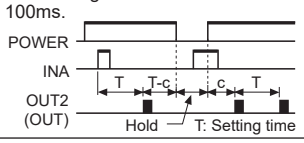
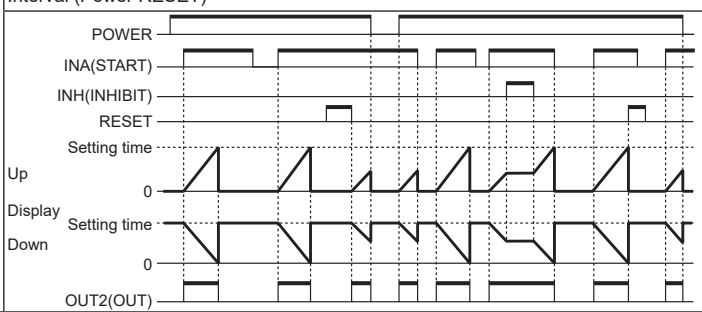
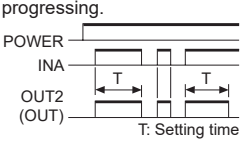
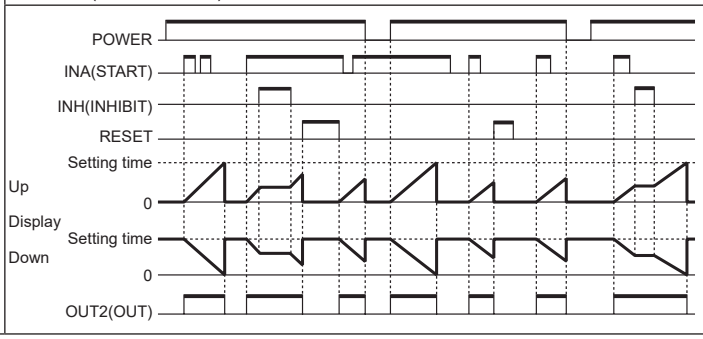
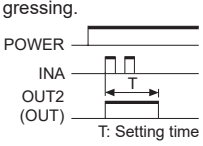
One-shot output (0.01 to 99.99 sec) / Retained output | One-shot output | Retained output

Output mode	Time chart	Operation
FLK [FLK]	Flicker (Power RESET)	1)Time starts when INA signal turns ON. 2)When INA signal is ON : Power ON Time Start is operated. RESET OFF Time Start is operated. 3)Control output operates as retained output, output turns off for the T.off time and turns off for the T.off time and turns on for the T.on time repeatedly. Ta+Tb = T.off 4)The T.on time and T.off time must be set individually. 5)In case of using the contact output, min. setting time must be set over 100ms.
FLK.1 [FLK.1]	Flicker 1 (Power Reset)	1)Time starts when INA signal turns ON. 2)When INA signal is ON : Power ON Time Start is operated. RESET OFF Time Start is operated. 3)Control output operates as retained (Hold) output. 4)In case of using the contact output, min. setting time must be set over 100ms.
	Retained (Hold) output	
	One-shot output	1)Time starts when INA signal turns ON. 2)When INA signal is ON : Power ON Time Start is operated. RESET OFF Time Start is operated. 3)Control output operates as one-shot output. 4)In case of using the contact output, min. setting time must be set over 100ms.

※Power RESET: There is no memory protection. (resets the display value when power is off)
※Power Hold: There is memory protection.
(memorizes the display value at the moment of power off, indicates the memorized display value when power is resupplied.)

▣ Output Operation Mode (Timer)

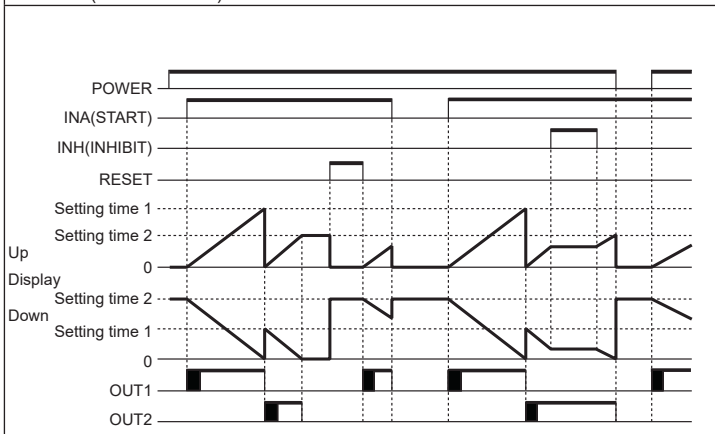
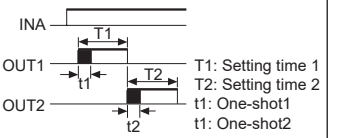
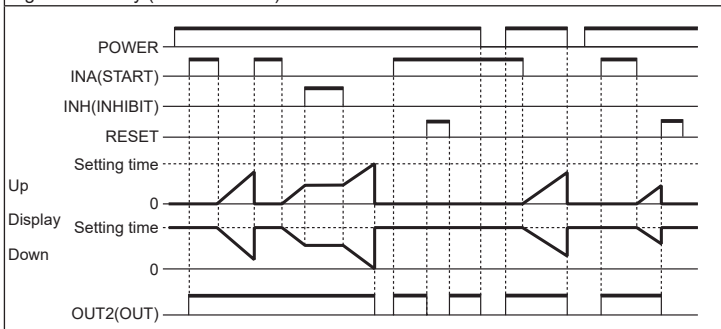
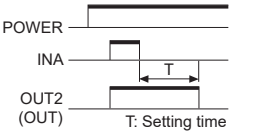
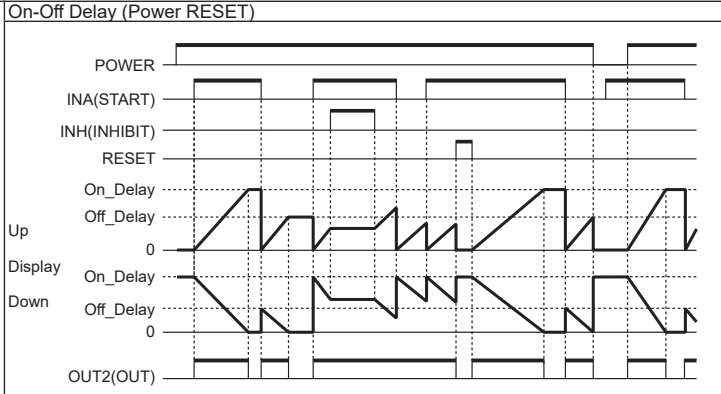
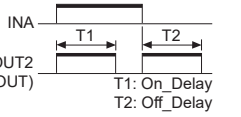
One-shot output (0.01 to 99.99 sec) / Retained output — One-shot output — Retained output

Output mode	Time chart	Operation
FLK.2 [FLK.2]	Flicker 2 (Power Hold)	
	Retained (Hold) output 	1)Time starts when INA signal turns ON and the display value at the moment when power is off is memorized. 2)When INA signal is ON : Power ON Time Start is operated. RESET OFF Time Start is operated. 3)Control output operates as retained (Hold) output. 4)Control output will be reversed when it reaches to setting time. (at the initial start, OUT2 control output is OFF). 5)In case of using the contact output, min. setting time must be set over 100ms. 
	One-shot output 	1)Time starts when INA signal turns ON and the display value at the moment when power is off is memorized. 2)When INA signal is ON : Power ON Time Start is operated. RESET OFF Time Start is operated. 3)Control output operates as one-shot output. 4)In case of using the contact output, min. setting time must be set over 100ms. 
INT [INT]	Interval (Power RESET) 	1)Control output turns ON and time starts when INA signal turns ON. 2)When INA signal is OFF, time is reset. 3)When INA signal is ON : Power ON Time Start is operated. RESET OFF Time Start is operated. 4)When it reaches setting time, it is auto reset. 5)Control output is ON when the time is progressing. 
INT.1 [INT.1]	Interval 1 (Power RESET) 	1)Control output turns ON and time starts when INA signal turns ON. 2)When INA signal is ON : Power ON Time Start is operated. RESET OFF Time Start is operated. 3)When it reaches setting time, it is auto reset. 4)Control output is ON when the time is progressing. 5)Time is ignored while time is progressing. 

※Power RESET: There is no memory protection. (resets the display value when power is off)
※Power Hold: There is memory protection.
(memorizes the display value at the moment of power off, indicates the memorized display value when power is resupplied.)

▣ Output Operation Mode (Timer)

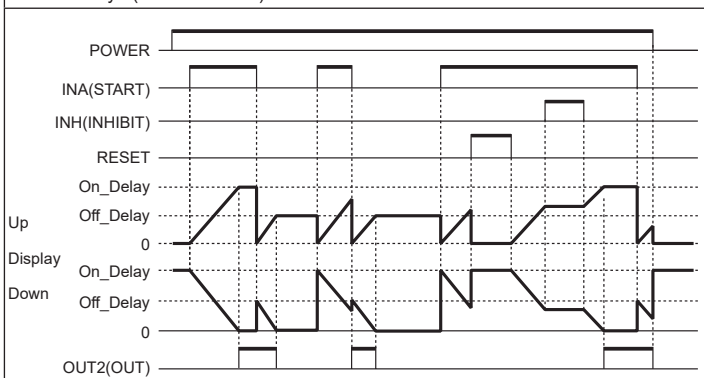
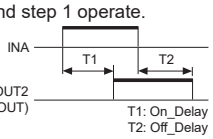
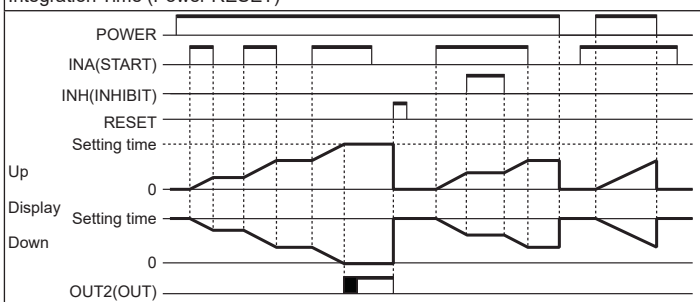
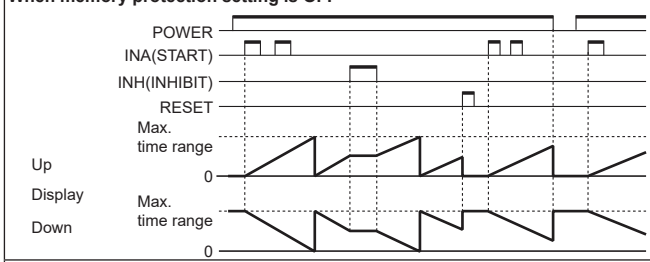
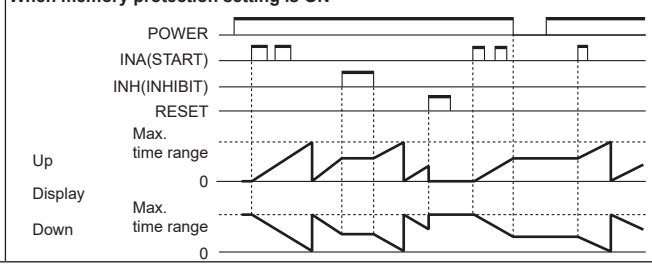
One-shot output (0.01 to 99.99 sec) / Retained output — One-shot output — Retained output

Output mode	Time chart	Operation
INT.2 [I nt.2]	Interval 2 (Power RESET) 	1)Time starts when INA signal is ON, and resets when INA signal is OFF. 2)INA signal is ON, OUT1 output is ON during T1 (HOLD) or t1. 3)When it reaches setting time 1, display value resets and OUT2 output is ON during T2 (HOLD) or t2 output time. ※Output turns OFF when reaching the setting time even if one-shot is longer than setting time.  (1-stage SET model has no I nt.2 mode)
OFD [oFd]	Signal Off Delay (Power RESET) 	1)If INA is ON, control output remains ON. (except when power is off and reset is on) 2)When INA signal is OFF, time processes. When it reaches setting time, indication value and control output are auto reset automatically. 
NFD [nFd]	On-Off Delay (Power RESET) 	1)When INA input is ON, output is ON and time is progressing, then output is OFF after On_Delay time. 2)When INA input is OFF, output is ON and time is progressing, then output is OFF after Off_Delay time. 3)If INA input is OFF within On_Delay time, step 2 starts. 4)If INA input is ON within Off_Delay time, step 1 starts. 

※Power RESET: There is no memory protection. (resets the display value when power is off)
※Power Hold: There is memory protection.
(memorizes the display value at the moment of power off, indicates the memorized display value when power is resupplied.)

▣ Output Operation Mode (Timer)

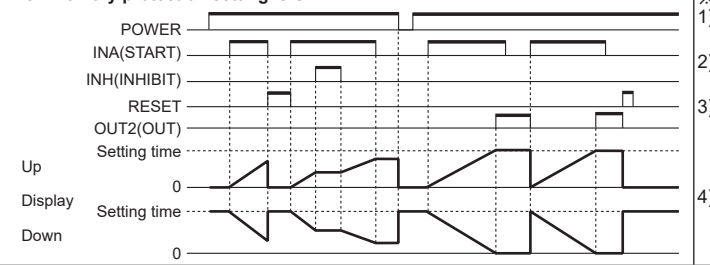
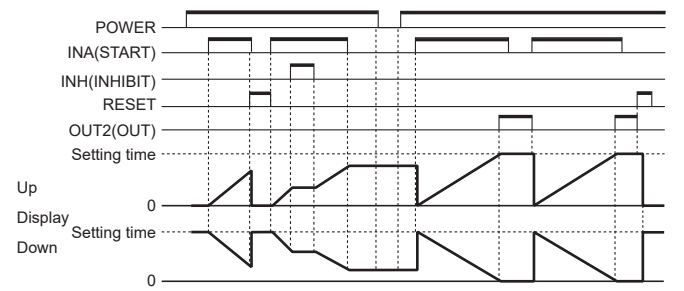
One-shot output (0.01 to 99.99 sec) / Retained output　One-shot output　Retained output

Output mode	Time chart	Operation
NFD.1 [nFd.1]	On-Off Delay1 (Power RESET) 	1)When INA input turns ON, time progresses and output turns ON after On_Delay time. 2)When INA input turns OFF, time progresses and output turns OFF after Off_Delay time. 3)If INA input turns OFF within On_Delay time, output will turn ON and step 2 operate. 4)If INA input turns ON within Off_Delay time, output will turn OFF and step 1 operate. 
INTG [InTG]	Integration Time (Power RESET) 	1)Time is progressing while INA input is ON. 2)Time progress stops while INA input is OFF. 3)When it reaches the setting time, output is ON.
TOTAL [totAL]	**When memory protection setting is OFF** 	1)Time starts when INA input is ON. 2)When RESET signal is ON, the display value is reset. 3)Time progress stops when INHIBIT signal is ON. 4)The progressed time is reset when power OFF.
	When memory protection setting is ON 	1)Time starts when INA input is ON. 2)When RESET signal is ON, the display value is reset. 3)Time progress stops when INHIBIT signal is ON. 4)The progressed time at the moment of power OFF is memorized.

※Power RESET: There is no memory protection. (resets the display value when power is off)
※Power Hold: There is memory protection.
(memorizes the display value at the moment of power off, indicates the memorized display value when power is resupplied.)
※When memory protection setting is OFF, it does not memorize the display value when power turns OFF.
(the display value is reset when power turns OFF)
※When memory protection setting is ON, it memorizes the display value when power turns OFF.
When re-suppling the power, it displays the memorized value.

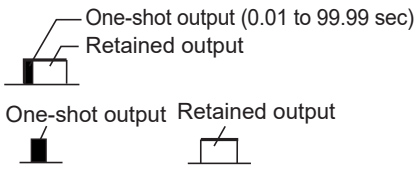
▣ Output Operation Mode (Timer)

One-shot output (0.01 to 99.99 sec) / Retained output
One-shot output
Retained output

Output mode	Time chart	Operation
On Time Display [ont.d]	**When memory protection setting is OFF** 	※ON time indicate mode of INA signal. 1)Time reset start operates when INA signal turns ON. 2)Time progress stops while INA signal is OFF. 3)When INA signal is OFF, if INA input time is greater than the setting time, the display value flashes and the operation stops until RESET signal ON.※1 4)When time progress stops and power turns OFF, the progressed time is reset.
	When memory protection setting is ON 	※ON time indicate mode of INA signal. 1)Time reset start operates when INA signal turns ON. 2)Time progress stops while INA signal is OFF. 3)When time progress stops and power turns OFF, the progressed time at the moment of power OFF is memorized.

※1: For free voltage input model (CX6□-□□F).
※Power RESET: There is no memory protection. (resets the display value when power is off)
※Power Hold: There is memory protection.
(memorizes the display value at the moment of power off, indicates the memorized display value when power is resupplied.)
※When memory protection setting is OFF, it does not memorize the display value when power turns OFF.
(the display value is reset when power turns OFF)
※When memory protection setting is ON, it memorizes the display value when power turns OFF.
When re-suppling the power, it displays the memorized value.

▣ Timer '0' Time Setting



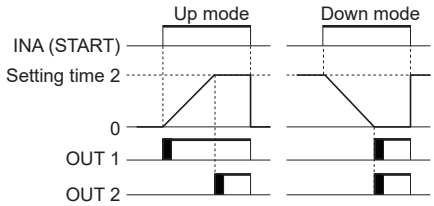
◎ Available output operation mode to set '0' time setting

ond, ond.1, ond.2, ond.3, nFd, nFd.1

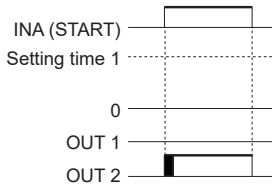
◎ Operation according to output mode (at 0 time setting)

1) OND (Signal ON Delay) mode [ond]

- **Set '0' for setting time1 .**

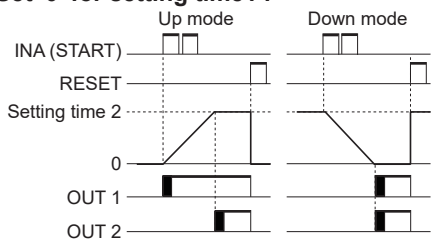


- **Set '0' for setting time2 .**

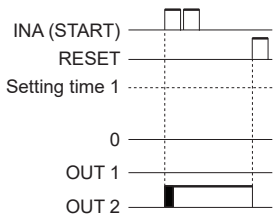


2) OND.1 (Signal ON Delay 1) mode [ond.1]

- **Set '0' for setting time1 .**

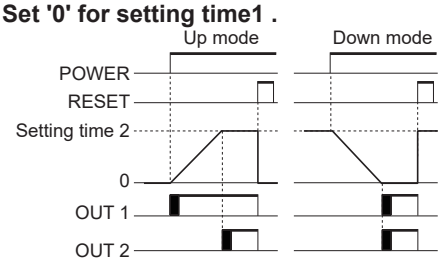


- **Set '0' for setting time2 .**

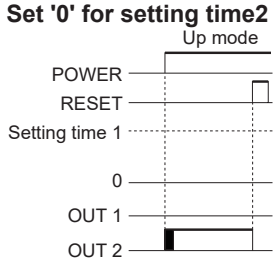


3) OND.2 (Power ON Delay 2) mode [ond.2]

- **Set '0' for setting time1 .**

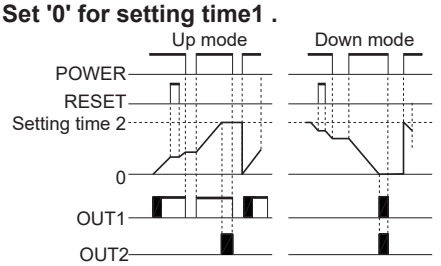


- **Set '0' for setting time2 .**

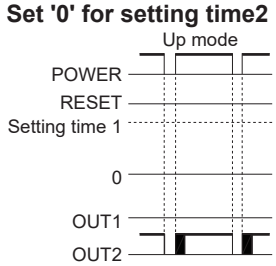


4) OND.3 (Power ON Delay 3) mode [ond.3]

- **Set '0' for setting time1 .**

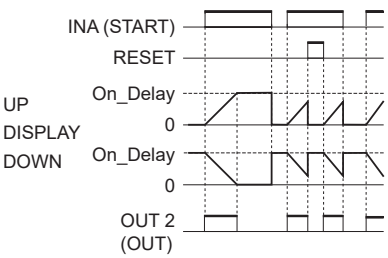


- **Set '0' for setting time2 .**

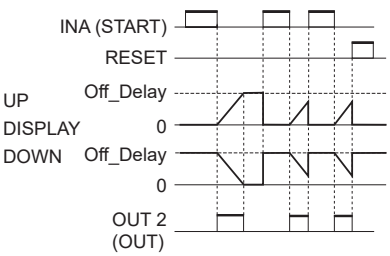


5) NFD (ON-OFF Delay) mode [nFd]

- **Set '0' for Off_Delay setting time.**

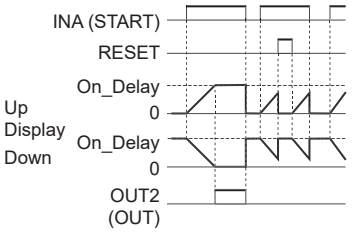


- **Set '0' for On_Delay setting time.**

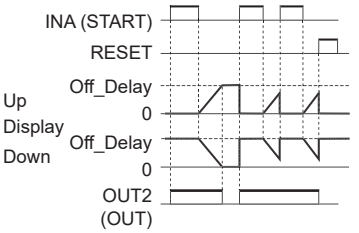


6) NFD.1 (ON-OFF Delay1) mode [nFd.1]

● **Set '0' for Off_Delay setting time.**



● **Set '0' for On_Delay setting time.**



◎ When SET1 is greater than SET2

In case of OND[ond], OND.1[ond.1], OND.2[ond.2] , or OND.3[ond.3] output mode,

- UP mode: When timer setting value 1 (SET1) is greater than setting value 2 (SET2), oUt 1 output does not turn ON.
- DOWN mode: When timer setting value 1 (SET1) is greater than setting value 2 (SET2), oUt 1 output does not turn ON.
  When timer setting value 1 (SET1) and setting value 2 (SET2) are same, oUt 1 output turns ON when applied the start signal.

▣ Factory Default

—	Parameter	Factory default	
		CX6□-□□	CX6□-□□F
Counter	1N.M	Ud-C	Ud-A
	oUt.M	F	F
	CPS	30	—
	oUt2 (oUt.t※1)	HoLd (fixed)	HoLd (fixed)
	oUt 1※1	00.10	00.10
	dP	------	------
	rESEt	20ms	—
	SIG	nPn	—
	SCL.dP	-.-----⁻	-.-----⁻
	SCL	1.00000	1.00000
	totAL※2	oFF	—
	StARt	000000	000000
	dAtA	CLr	CLr
Timer	U-d	UP	UP
	oUt.M	ond	ond
	oUt2 (oUt.t※1)	HoLd	HoLd
	oUt 1※1	00.10	00.10
	t.RNG	999.999s	999.999s
	SIG※2	nPn	—
	1N-t	20ms	—
LoCK		L.oFF	L.oFF
SET1		1000	1000
SET2		5000	5000

※1: For 1-stage setting model (CX6□-1P□□), oUt 1 does not appear.
The output time of oUt2 is displayed as oUt.t .
※2: This is for the voltage input (PNP)/no-voltage input (NPN) selectable model (CX6□-□□).

▣ Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- In case of 24-48VDC, 24VAC model, power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Use the product, 0.1 sec after supplying power.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

DIN W48×H48mm, W72×H36mm, W72×H72mm Counter/Timer

▣ Features

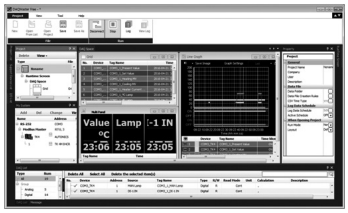
- Communication function supported (communication model): RS485 (Modbus RTU)
- One-shot output time setting range - 0.01 sec to 99.99 sec by setting per 10ms
- [Counter]
  Prescale value setting range – 6-digit model: 0.00001 to 99999.9 /
  4-digit model: 0.001 to 999.9
  9 input modes/11 output modes
  BATCH counter,
  Count Start Point (counting initial value) setting function
- [Timer]
  13 output modes
  Various time setting range – 6-digit model: 0.001 sec to 99999.9 hour / 4-digit model: 0.001 sec to 9999 hour
  '0' time setting function
  Selectable timer memory retention function for indicator model.

Please read "Safety Considerations" in the instruction manual before using.

▣ DAQMaster (Comprehensive Device Management Program)

- DAQMaster is comprehensive device management program for convenient management of parameters and multiple device data monitoring.
- Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< DAQMaster screen >



Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS-232 serial port (9-pin), USB port

▣ Ordering Information

CT	6	M	-	2P	4	T

Communication	**No-mark**	None
	T	RS 485 communication output
Power supply	**2**	24VAC 50/60Hz, 24-48VDC
	4	100-240VAC 50/60Hz
Output	**1P**	1-stage preset
	2P	2-stage preset
	I※1	Indicator
Size	**S**	DIN W48×H48mm
	Y	DIN W72×H36mm
	M	DIN W72×H72mm
Display digits	**4**	9999 (4-digit)
	6	999999 (6-digit)
Item	**CT**	Counter/Timer

※1: CT4S model does not support indicator type.

▣ Communication Specification

Comm. protocol	Modbus RTU with 16-bit CRC
Connection type	RS485
Application standard	Compliance with EIA RS485
Max. connection	31 units (address: 1 to 127)
Synchronous method	Asynchronous
Comm. type	Two-wire half duplex
Comm. distance	Max. 800m
Comm. speed	2400, 4800, 9600 (factory default), 19200, 38400bps
Comm. response time	5 to 99ms (factory default: 20ms)
Start bit	1-bit (fixed)
Data bit	8-bit (fixed)
Parity bit	None (factory default), Even, Odd
Stop bit	1, 2-bit (factory default: 2-bit)

※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately), SCM-US (USB to Serial converter, sold separately). Please use twisted pair wire for RS485 communication.

▣ Specifications

Series			CTS		CTY		CTM	
Model	1-stage preset		CT4S-1P□□	CT6S-1P□□	CT6Y-1P□□		CT6M-1P□□	
	2-stage preset		CT4S-2P□□	CT6S-2P□□	CT6Y-2P□□		CT6M-2P□□	
	Indicator		—	CT6S-I□□	CT6Y-I□□		CT6M-I□□	
Display digits			4-digit	6-digit	6-digit		6-digit	
Display method			7 segment (counting value: red, setting value: yellow-green) LED method					
Character size(W×H)	Counting value		6.5×10mm	4.5×10mm	4.2×9.5mm		6.6×13mm	
	Setting value		4.5×8mm	3.5×7mm	3.5×7mm		5×9mm	
Power supply	AC voltage		100-240VAC⎓ 50/60Hz					
	AC/DC voltage		24VAC⎓ 50/60Hz, 24-48VDC⎓					
Permissible voltage range			90 to 110% of rated voltage					
Power consumption	AC voltage		Max. 12VA					
	AC/DC voltage		AC: Max. 10VA, DC: Max. 8W					
Counter	INA/INB Max. counting speed		Selectable 1cps / 30cps / 1kcps / 5kcps / 10kcps					
	Counting range		-999 to 9999	-99999 to 999999				
	Scale		Decimal point up to third digit	Decimal point up to fifth digit				
	Min. input signal width		RESET: Selectable 1ms/20ms					
Timer	Time range	4-digit	9.999s, 99.99s, 999.9s, 9999s, 99m 59s, 999.9m, 9999m, 99h 59m, 9999h					
		6-digit	999.999s, 9999.99s, 99999.9s, 999999s, 99m 59.99s, 999m 59.9s, 9999m 59s, 99999.9m, 999999m, 99h 59m 59s, 9999h 59m, 99999.9h					
	Operation method		Count up, Count down, Count Up/Down					
	Min. input signal width		INA, INH, RESET: Selectable 1ms/20ms				INA, RESET, INHIBIT, BATCH RESET: Selectable 1ms/20ms	
	Repeat error		In case of power ON start: Max. ±0.01% ±0.05s In case of signal start: Max. ±0.01% ±0.03s					
	Set error							
	Voltage error							
	Temp. error							
Input method			Selectable voltage input or no-voltage input [Voltage input]-input impedance: 5.4kΩ, [H]: 5-30VDC⎓, [L]: 0-2VDC [No-voltage input]-short-circuit impedance: Max. 1kΩ, short-circuit residual voltage: Max. 2VDC⎓					
One-shot output time			0.01s to 99.99s setting					
			Standard	Comm.	Standard	Comm.	Standard	Comm.
Control output	Contact output	Type 1-stage	SPDT(1c): 1		SPDT(1c): 1		SPDT(1c): 1	
		Type 2-stage	SPST(1a): 2		SPST(1a): 1, SPDT(1c): 1	SPST(1a): 2	SPST(1a): 1, SPDT(1c): 1	
		Capacity	250VAC⎓ 5A, 30VDC⎓ 5A resistive load		250VAC⎓ 3A, 30VDC⎓ 3A resistive load		250VAC⎓ 5A, 30VDC⎓ 5A resistive load	
	Solid state output (NPN open collector)	Type 1-stage	1	—	1	1	2	2
		Type 2-stage				—	3	
		Capacity	Max. 30VDC⎓, 100mA					
External power supply			Max. 12VDC⎓ ±10%, 100mA					
Memory retention			Approx. 10 years (non-volatile memory)					
Insulation resistance			Over 100MΩ (at 500VDC megger)					
Dielectric strength			2,000VAC 50/60Hz for 1 min					
Noise immunity			Square-wave noise by noise simulator (pulse width 1μs) ±2kV					
Vibration	Mechanical		0.75mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour					
	Malfunction		0.5mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min					
Shock	Mechanical		300m/s² (approx. 30G) in each X, Y, Z direction for 3 times					
	Malfunction		100m/s² (approx. 10G) in each X, Y, Z direction for 3 times					
Relay life cycle	Mechanical		Min. 10,000,000 operations					
	Malfunction		Min. 100,000 operations					
Protection structure			IP65 (front part, IEC standard)					
Environmental	Ambient temp.		-10 to 55℃, storage: -25 to 65℃					
	Ambient humi.		35 to 85%RH, storage: 35 to 85%RH					
Approval			CE c UL us					
Weight※1			Approx. 212g (approx. 159g)		Approx. 228g (approx. 140g)		Approx. 322g (approx. 252g)	

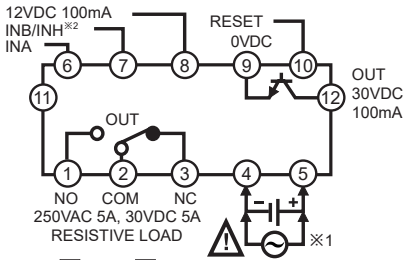
※1: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Connections

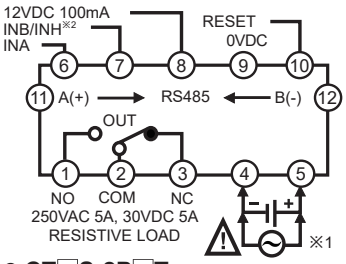
⚠ **Be sure that connection is varied by supporting RS485 communication.**

◎ CTS Series

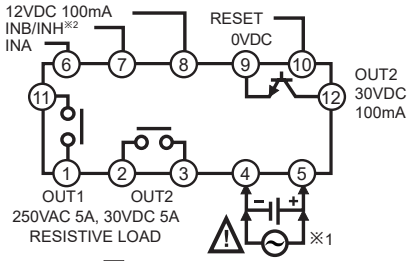
● CT□S-1P□



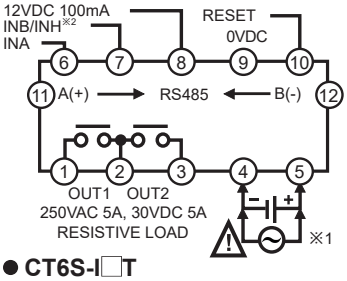
● CT□S-1P□T



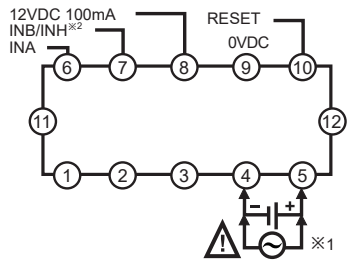
● CT□S-2P□



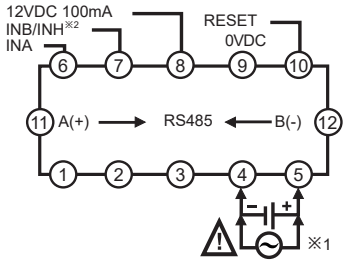
● CT□S-2P□T



● CT6S-I□

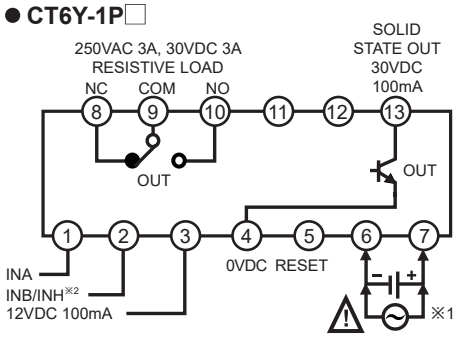


● CT6S-I□T

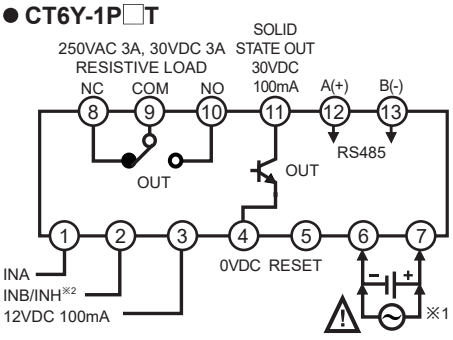


◎ CTY Series

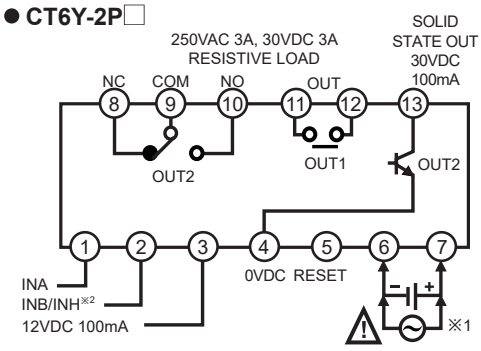
● CT6Y-1P□



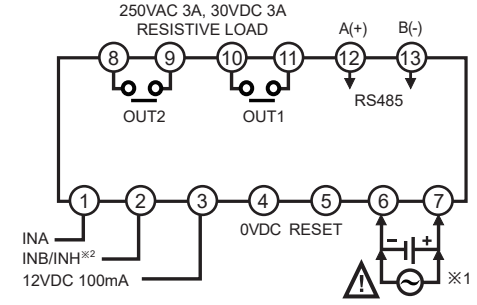
● CT6Y-1P□T



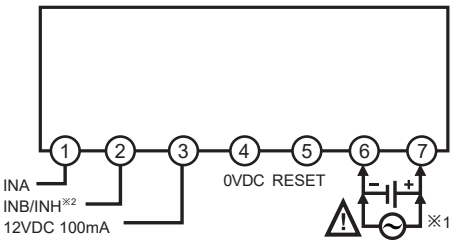
● CT6Y-2P□



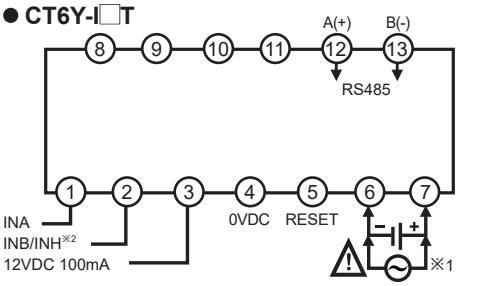
● CT6Y-2P□T



● **CT6Y-I□**

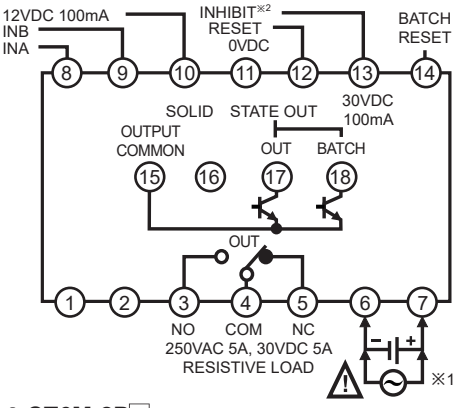


● **CT6Y-I□T**

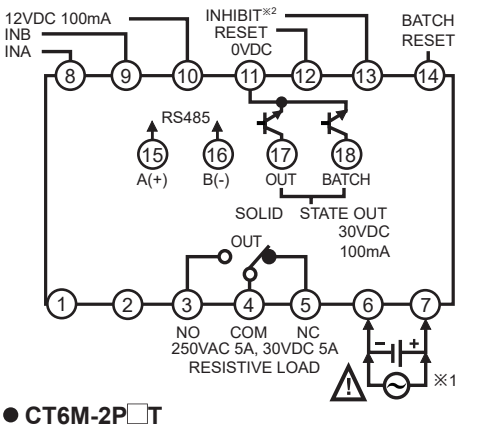


◎ **CTM Series**

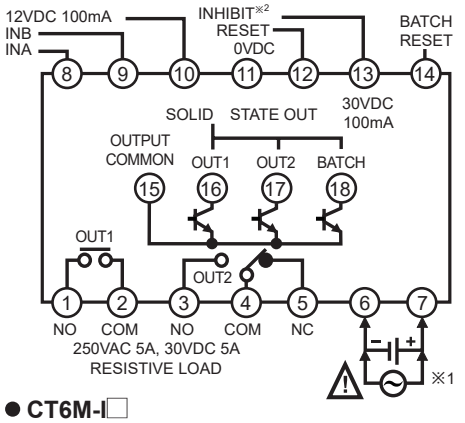
● **CT6M-1P□**



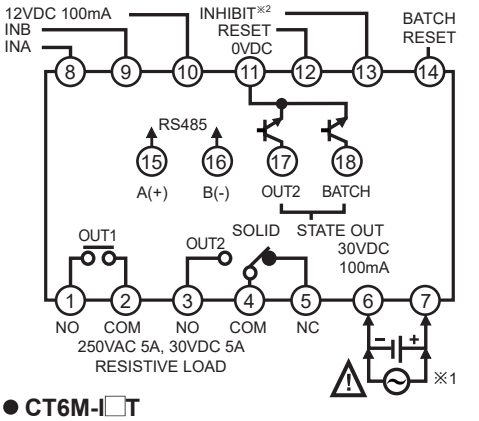
● **CT6M-1P□T**



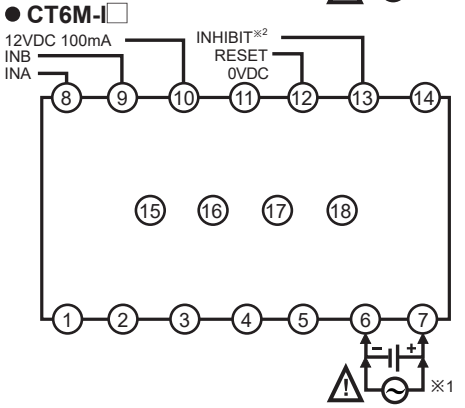
● **CT6M-2P□**



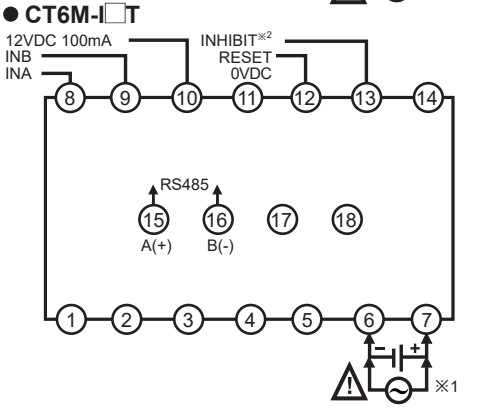
● **CT6M-2P□T**



● **CT6M-I□**



● **CT6M-I□T**

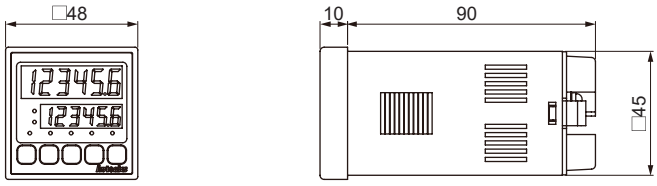


※1: AC Voltage: 100-240VAC 50/60Hz
AC/DC Voltage: 24VAC 50/60Hz, 24-48VDC
※2: Counter operation: If INHIBIT signal is applied, count input will be prohibited.
Timer operation: If INHIBIT signal is applied, time progressing will stop. (HOLD)

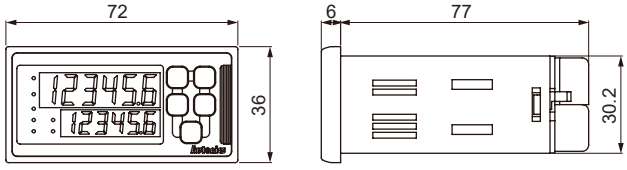
▣ Dimensions

(unit: mm)

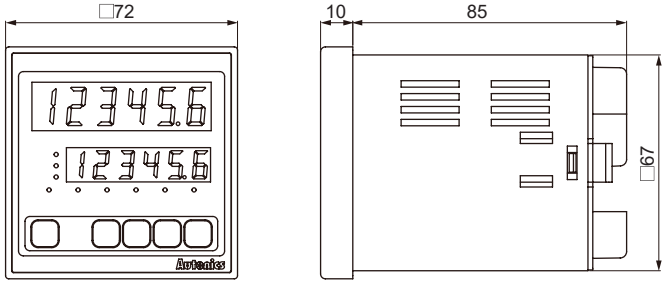
◎ CTS Series



◎ CTY Series

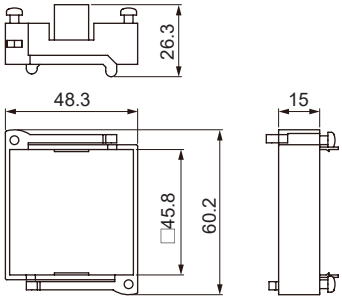


◎ CTM Series

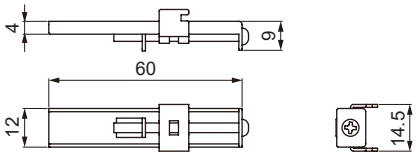


◎ Bracket

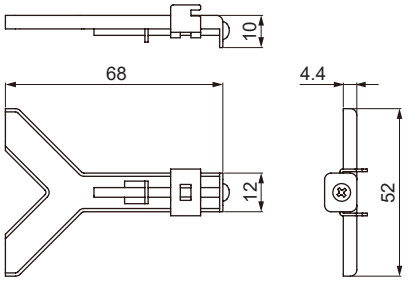
- **CTS Series**



- **CTY Series**

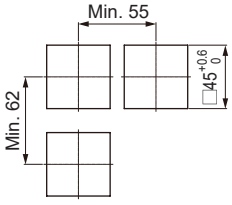


- **CTM Series**

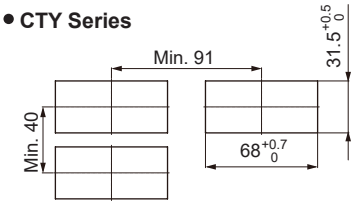


◎ Panel cut-out

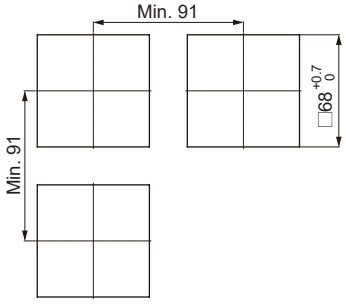
- **CTS Series**



- **CTY Series**



- **CTM Series**



▣ Sold Separately

◎ Communication converter

- **SCM-WF48**
  (Wi-Fi to RS485·USB wireless communication converter)

- **SCM-US48I**
  (USB to RS485 converter)

- **SCM-38I**
  (RS232C to RS485 converter)

◎ Display Units (DS/DA-T Series)

- **DS/DA-T Series**
  (RS485 communication input type display unit)

DS16-□T

DS22/DA22-□T

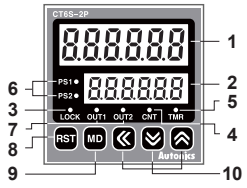
DS40/DA40-□T

DS60/DA60-□T

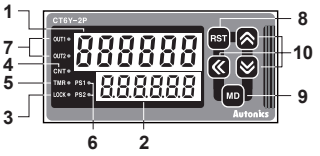
※Connect RS485 communication input type display unit (DS/DA-T Series) and RS485 communication output model of CT Series, the display unit displays present value of the device without PC/PLC.

▣ Unit Description

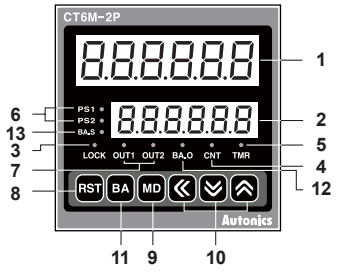
◎ CTS Series



◎ CTY Series



◎ CTM Series



Model	Changed	Notice
CT4S-1P	PS2→PS OUT2→OUT	There are no PS1, OUT1 LEDs.
CT6S-1P		
CT6Y-1P		
CT6M-1P		
CT6S-I	PS2→PS	There are no PS1, OUT1, OUT2 LEDS.
CT6Y-I		There are no PS1, OUT1, OUT2, BA.S, BA.O LEDs, BA key.
CT6M-I		

1. Counting value display component (red)
RUN mode: Displays counting value for counter operation or time progress value for timer operation.
Function setting mode: Displays setting item.

2. Setting value display component (yellow-green)
RUN mode: Displays setting value.
Function setting mode: Displays setting content.

3. Key lock indicator (LOCK): Turns ON for key lock setting.

4. Counter indicator (CNT): Turns ON for counter operation.

5. Timer indicator (TMR): Flashes (progressing time) or Turns ON (stopping time) for timer operation.

6. Preset value checking and changing indicator (PS1, PS2)
: Turns ON when checking and changing preset value.

7. Output indicator (OUT1, OUT2): Turns ON for the dedicated control output ON.

8. RST key
RUN mode: Press the RST key to reset the counting value.
BATCH counter mode: Press the RST key to reset the batch counting value.

9. MD key
RUN mode: Hold the MD key over 3 sec to enter function setting mode(parameter setting).
Hold the MD key over 5 sec to enter function setting mode(communication setting).
Function setting mode: Press the MD key to select function setting mode parameter.
Hold the MD key over 3 sec to return RUN mode.

10. ≪, ▽, △ key
1) ≪ key
RUN mode: Press the ≪ key to enter preset mode.
Preset mode: Press the ≪ key to move preset digits.
2) ▽, △ key
RUN mode: Hold the △ key over 1 sec to enter Function setting check mode.
Preset mode: Used for increasing or decreasing preset value.
Function setting mode: Changes the settings.
Function setting check mode: Press the ▽ key to move the previous parameter.
Press the △ key to the next parameter.

11. BA key
RUN mode: Press the RST key to enter BATCH counter indication mode.

12. BATCH output indicator (BA.O) (red)

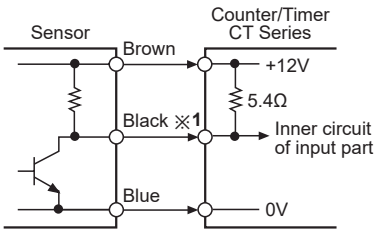
13. BATCH preset value checking and changing indicator (BA.S) (yellow-green)
: Turns ON when checking and changing BATCH preset value.

※The indicator type does not exist in CT4S model.

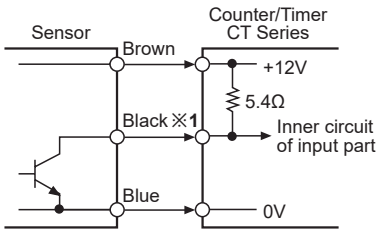
▣ Input Connections

◎ No-voltage input (NPN)

● Solid-state input (standard sensor: NPN output type sensor)

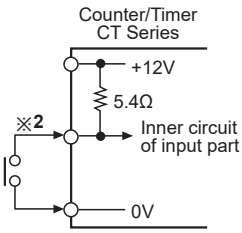


(NPN output)



(NPN open collector output)

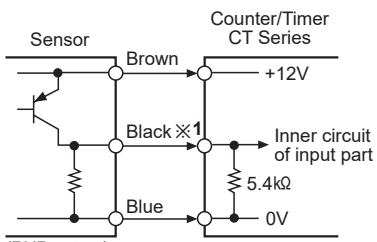
● Contact input



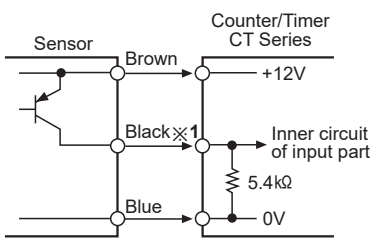
※1: INA, INB/INH, RESET, INHIBIT, BATCH RESET input part
※2: Counting speed: 1 or 30cps setting (counter)

◎ Voltage input (PNP)

● Solid-state input (standard sensor: PNP output type sensor)

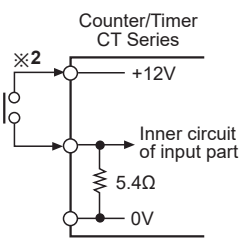


(PNP output)



(PNP open collector output)

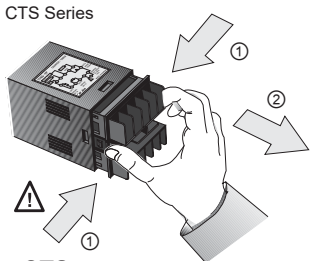
● Contact input



※1: INA, INB/INH, RESET, INHIBIT, BATCH RESET input part
※2: Counting speed: 1 or 30cps setting (counter)

▣ Input Logic Selection [No-Voltage Input (NPN)/Voltage Input (PNP)]

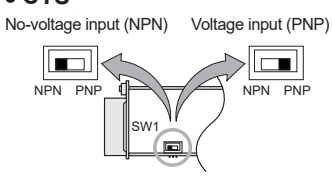
CTS Series



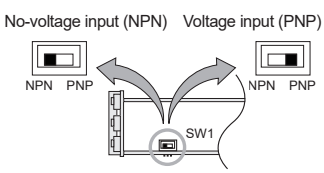
1. The power must be cut off.
2. Squeeze toward ① and pull toward ② as the figure. (CTS/CTY Series)
3. Select input logic by using input logic switch (SW1) inside Counter/Timer.
4. Push a case in the opposite direction of ②.
5. Then supply the power to counter/timer.

⚠ **Turn OFF the power before changing input logic (PNP/NPN)**

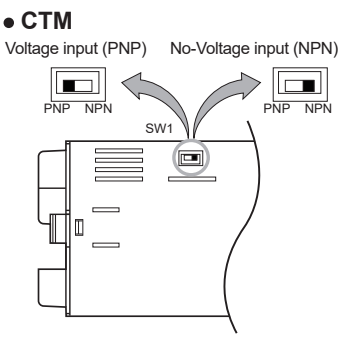
● CTS



● CTY



● CTM



※How to change settings
Power OFF → change settings → power ON → press RST key or input signal (min. 20ms)

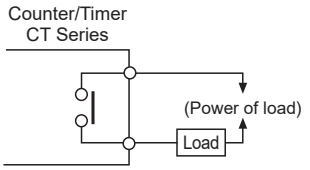
▣ Error Display and Output Operation

Error Display	Error description	Troubleshooting
Err0	Setting value is 0.	Change the setting value anything but 0.

※When error occurs, the output turns OFF.
※When 1st setting value is set as 0 (zero), OUT1 maintains OFF.
When 2nd setting value is smaller than 1st setting value, 1st setting value is ignored and only OUT2 output operates.
※Indicator model does not have error display function.

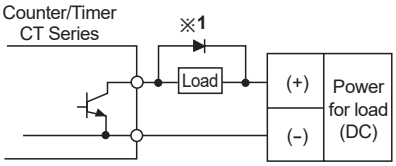
▣ Output Connections

◎ Contact output



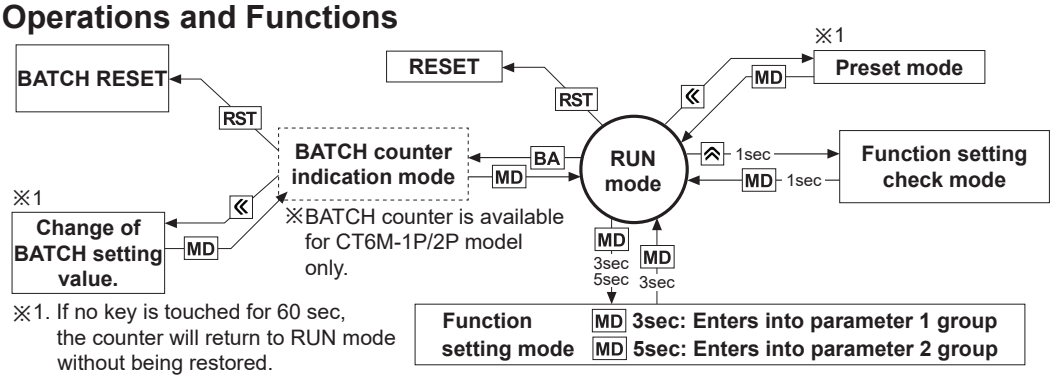
※Use proper load not to exceed the capacity.

◎ Solid-state output



※Use proper load and power for load not to excess ON/OFF capacity (Max. 30VDC, 100mA) of solid state output.
※Be sure not to apply reverse polarity of power.
※1: When using inductive load (relay etc.), surge absorber (diode, varistor etc.) must be connected between both sides of the load.

▣ Operations and Functions

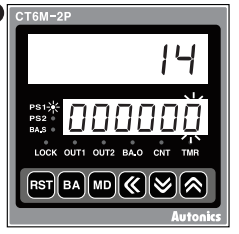


※1. If no key is touched for 60 sec, the counter will return to RUN mode without being restored.

◎ Change of preset (counter/timer)

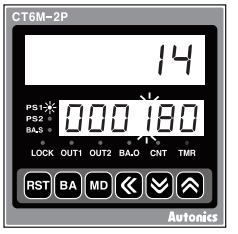
- Even if changing the preset value, input operation and output control will continue. In addition, the preset value could be set to 0 and the output of 0 preset value turns ON. According to output mode, preset value could not be set to 0. (When setting to 0, preset value "0" will flash 3 times.)

❶



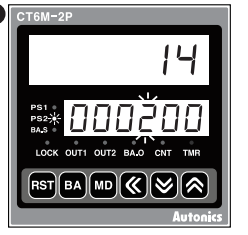
In RUN mode, press the ≪ key to enter preset mode.
'PS1' indicator turns ON and first digit of preset value flashes.

❷



Press the ≪ , ≫ and ≫ keys to set the desired value (example, 180). Press the MD key to enter the PS2 setting mode.

❸



Press the ≪ , ≫ and ≫ keys to set the desired value (example, 200). Press the MD key to return RUN mode.

◎ Function setting check mode

Setting value of function setting mode can be confirmed using the ≫ and ≫ keys.

◎ Switching display function in preset indicator

Setting value1 (PS1) and setting value2 (PS2) are displayed each time pressing MD key in PRESET2 model.
(in timer, it is available for ond, ond.1 or ond.2 output mode.)

◎ Reset

In RUN mode or function setting mode, if pressing RST key or applying the signal to the RESET terminal on the back side, present value will be reset and output will maintain off status.
-CT□S: Short no. 8 and 10 terminals for voltage input (PNP), short no. 9 and 10 terminals for non-voltage input (NPN).
-CT6Y: Short no. 3 and 5 terminals for voltage input (PNP), short no. 4 and 5 terminals for non-voltage input (NPN).
-CT6M: Short no. 10 and 12 terminals for voltage input (PNP), short no. 11 and 12 terminals for non-voltage input (NPN).

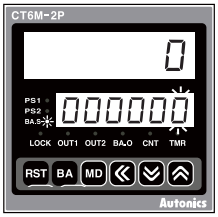
▣ BATCH Counter (for CT6M-1P□□/CT6M-2P□□ Model Only)

In BATCH counter indication mode, 'BATCH counter value' is displayed in count indicator and 'BATCH counter setting value' is displayed in preset indicator.

◎ Change of BATCH setting value

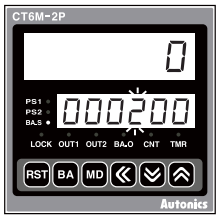
If pressing [BA] key in Run mode, it will enter into BATCH counter indication mode.

1.



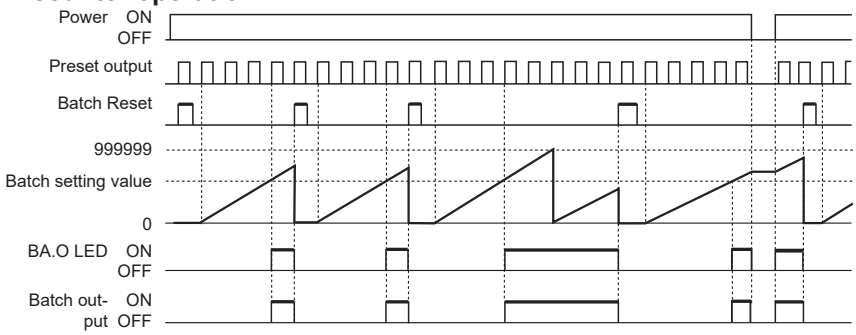
It enters into setting value change mode using [≪] key. (BA. S lights, first digit of setting value flashes.)

2.



BATCH value is set to '200' using [≪], [≪] and [≫] keys, then press [MD] key to complete BATCH setting value and move to BATCH counter indication mode.

◎ BATCH counter operation



◎ BATCH counting operation

- BATCH counting value is increasing until BATCH reset signal applied. BATCH counting value will be circulated when it is over 999999.
  1) BATCH counting operation in Counter: Counts the number of reaching setting value of CT6M-1P or reaching dual setting value of CT6M-2P□□
  2) BATCH counting operation in Timer: Counts the number of reaching setting time. (In case of "FLK" output mode, count the number of reaching T.off setting time and T.on setting time.)

◎ BATCH output

- If input signal is applied while changing BATCH setting value, counting operation and output control will be performed.
- If BATCH count value equals to BATCH setting value, BATCH output will be ON and maintain ON status until BATCH reset signal is applied.
- When the power is cut off then resupplied in status of BATCH output is ON, BATCH output maintains ON status until BATCH reset signal is applied.

◎ BATCH reset input

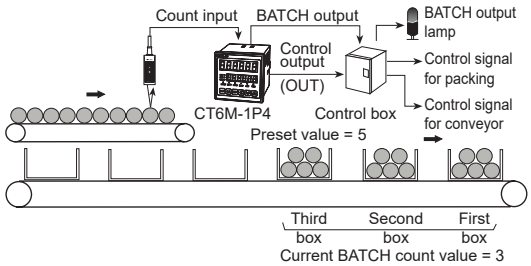
- If pressing [RST] key or applying the signal to BATCH reset terminal on the back side panel, BATCH counting value will be reset. When selecting voltage input (PNP), short terminals 10 and 14, or when selecting no-voltage input (NPN), short terminals 11 and 14 to reset.
- When BATCH reset is applied, BATCH counting value maintains at 0 and BATCH output maintains in the OFF status.

◎ Application of BATCH counter function

● Counter

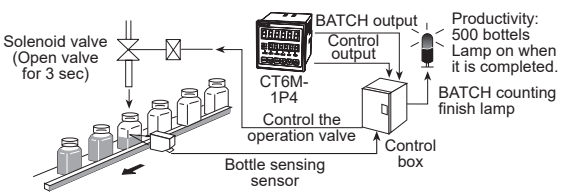
In case, put 5 products in a box then pack the boxes when they reaches to 200.

- Counter preset setting value="5", BATCH setting value="200"
- When the count value of counter reaches to the preset value "5", the control output (OUT) will be on, and at this time the count value of the BATCH counter will be increased by "1". The control box which is received the control output (OUT) repeatedly controls conveyor to move the full box and to place the next empty box for standby. When the BATCH count value reaches to "200", BATCH output will be ON. Then the control box stops conveyor and provides a control signal for packing.

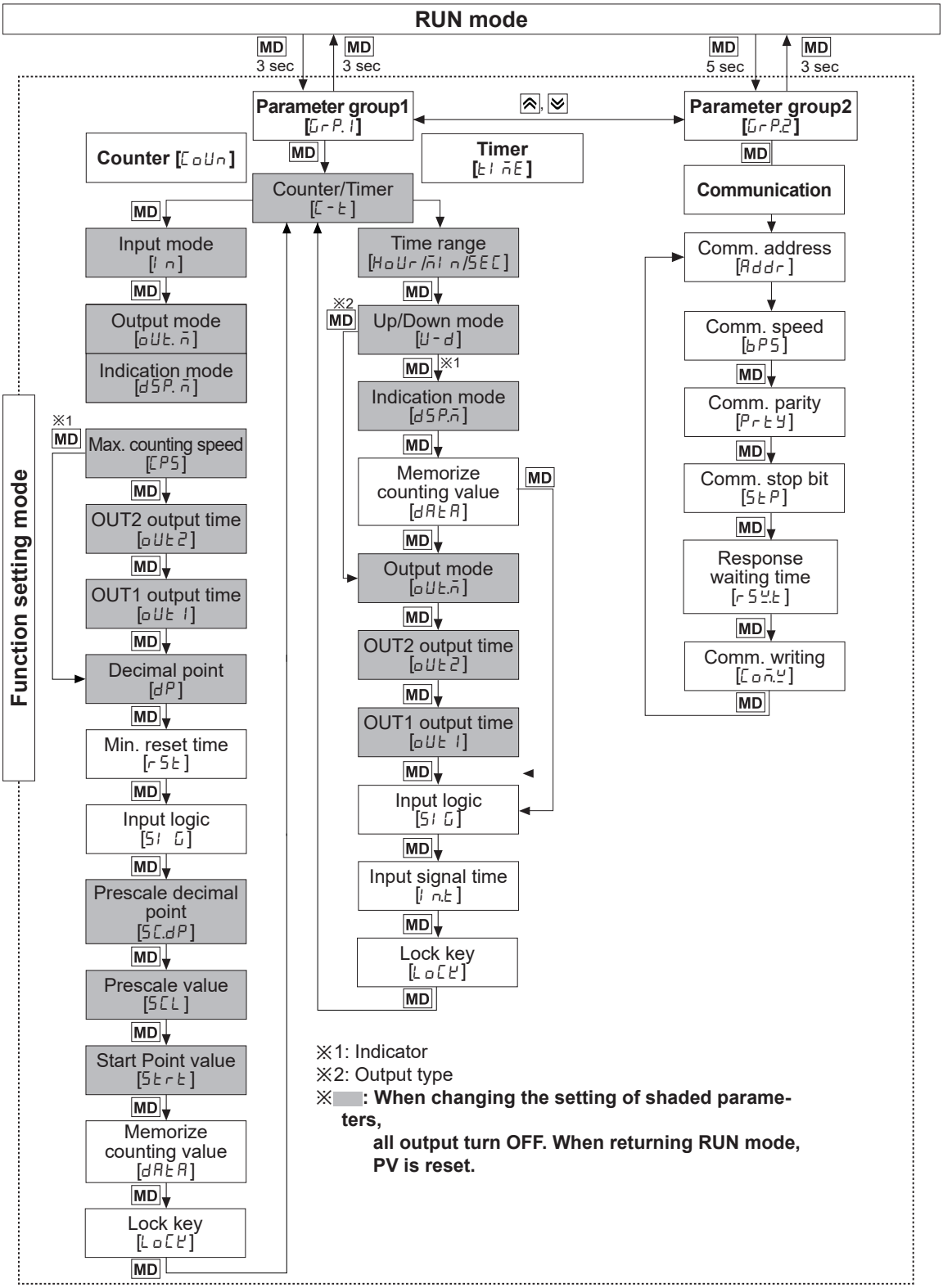


● Timer

Fills milk into the bottle for 3 sec (setting time) When 500 bottles are filled, BATCH counting finish lamp is turned on. (Setting time: 3 sec, BATCH setting value: 500)



▣ Flow Chart for Function Setting Mode



※1: Indicator
※2: Output type
※ : **When changing the setting of shaded parameters, all output turn OFF. When returning RUN mode, PV is reset.**

※If changing Parameter group1 setting value, display value and output are reset.
※Parameter group2 is not available to non-communication models.

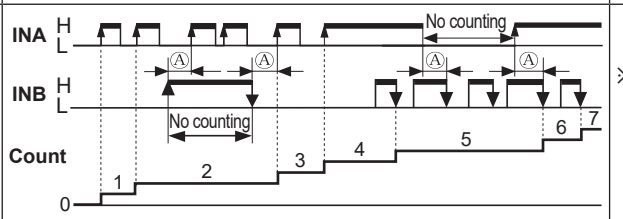
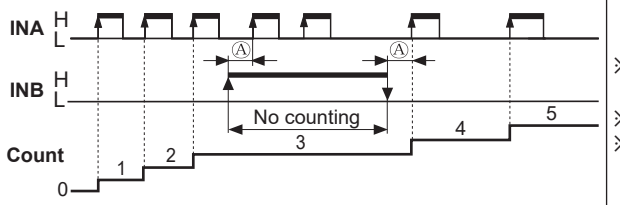
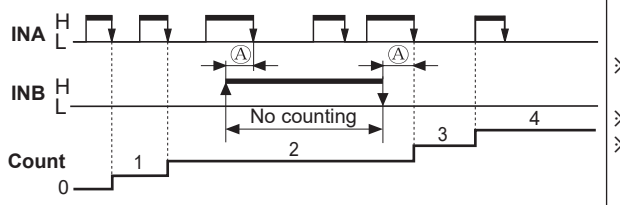
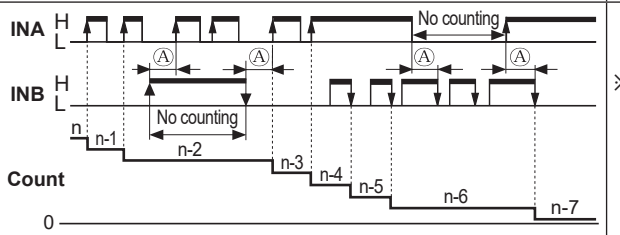
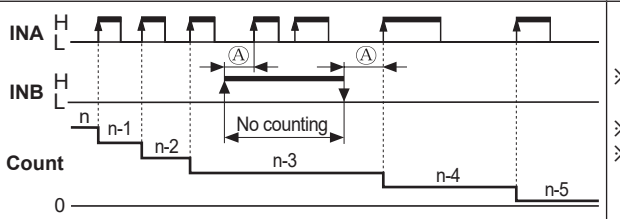
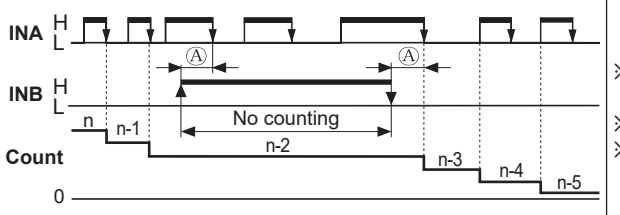
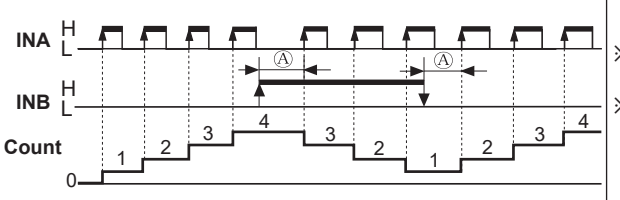
▣ Parameter Setting (Counter)

(MD key: Moves the settings, ⩒, ⩓ key: Changes the settings)

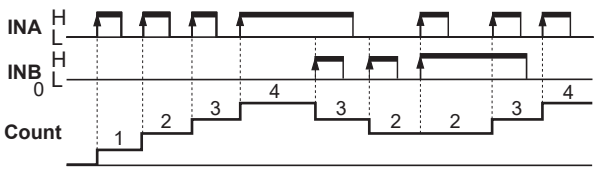
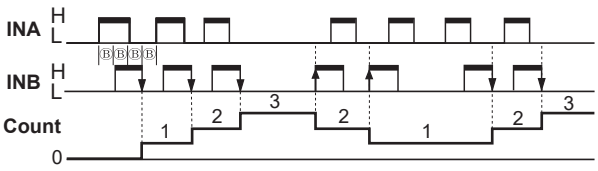
Parameter	Setting
Counter/Timer [C-t]	CoUn ◀▶ tIME ※CoUn: Counter tIME: Timer
Input mode [In]	Ud-C ◀▶ UP ◀▶ UP-1 ◀▶ UP-2 ◀▶ dn ◀▶ dn-1 ◀▶ dn-2 ◀▶ Ud-A ◀▶ Ud-b
Output mode [oUt.M]	• Input mode is UP, UP-1, UP-2 or dn, dn-1, dn-2, F ◀▶ n ◀▶ C ◀▶ r ◀▶ L ◀▶ P ◀▶ 9 ◀▶ A • Input mode is Ud-A, Ud-b, Ud-C, F ◀▶ n ◀▶ C ◀▶ r ◀▶ L ◀▶ P ◀▶ 9 ◀▶ A ◀▶ S ◀▶ t ◀▶ d ※If max. counting speed is 5kcps or 10kcps, and output mode is d, max. counting speed is automatically changed as 30cps, factory default.
Indication mode [dSP.M]	• In case of the indicator type HoLd ◀▶ totAL ※In case of the indicator type, indicate mode selection [dSP.M] is displayed. ※It is the added function to set the preset value when selecting HoLd.
Max. counting speed [CPS]	30 ◀▶ 1L ◀▶ 5L ◀▶ 10L ◀▶ 1 ※Max. counting speed is when duty ratio of INA or INB input signal is 1:1. It is applied for INA, or INB input as same. ※When output mode is d, set max. counting speed one among 1cps, 30cps, or 1kcps.
OUT2 output time※1 [oUt2]	※Set one-shot output time of OUT2. ※Setting range: 00.01 to 99.99 sec ※When input mode is F, n, S, t, d, oUt2 does not appear. (fixed as HOLD)
OUT1 output time※1 [oUt1]	※Set one-shot output time of OUT1. ※Setting range: 00.01 to 99.99 sec, Hold. ※When 1st digit is flashing, press the ⩤ key once and HoLd appears. ※When input mode is S, t, d, oUt1 does not appear. (fixed as HOLD)
OUT output time※1 [oUt.t]	※Setting range: 00.01 to 99.99 sec ※When input mode is F, n, S, t, d, oUt.t does not appear. (fixed as HOLD)
Decimal point※2 [dP]	• **6-digit type** ------ ◀▶ -----.- ◀▶ ----.-- ◀▶ ---.--- ◀▶ --.---- ◀▶ -.----- • **4-digit type** ---- ◀▶ ---.- ◀▶ --.-- ◀▶ -.--- ※Decimal point is applied to counting value and setting value.
Min. reset time [rSt]	1 ◀▶ 20, unit: ms ※Set min. width of external reset signal input.
Input logic [SIG]	nPn: No-voltage input, PnP: Voltage input ※Check input logic value (PNP, NPN).
Prescale decimal point※2 [SC.dP]	• **6-digit type** -----.- ◀▶ ----.-- ◀▶ ---.--- ◀▶ --.---- ◀▶ -.----- • **4-digit type** ---.- ◀▶ --.-- ◀▶ -.--- ※Decimal point of prescale should not set smaller than decimal point [dP].
Prescale value [SCL]	※Setting range of prescale value 6-digit type: 0.00001 to 99999.9, 4-digit type: 0.001 to 999.9
Start point value [Strt]	※Setting range (linked with decimal point [dP]): 6-digit type: 0.00001 to 999999, 4-digit type: 0.001 to 9999 ※When input mode is dn, dn-1, dn-2, start point value does not appear.
Memory protection [dAtA]	CLr ◀▶ rEC ※CLr: Resets the counting value when power OFF. rEC: Maintains the counting value when power OFF. (memory protection)
Key lock [LoCK]	LoFF ◀▶ LoC.1 LoC.3 ◀▶ LoC.2 ※LoFF: Unlock keys, key lock indicator turns OFF LoC.1: Locks RST key, key lock indicator turns ON LoC.2: Locks ⩤, ⩒, ⩓ keys, key lock indicator turns ON LoC.3: Locks RST, ⩤, ⩒, ⩓ keys, key lock indicator turns ON

※1: For PRESET1 model, oUt1 does not appear. The output time of oUt2 is displayed as oUt.t.
※2: Decimal point and prescale decimal point
Decimal point: Set the decimal point for display value regardless of prescale value.
Prescale decimal point: Set the decimal point for prescale value of counting value regardless of decimal point of display value.

▣ Input Operation Mode (Counter)

Input mode	Counting chart	Operation
UP [UP]		※When INA is counting input, INB is no counting input. When INB is counting input, INA is no counting input.
UP-1 [UP-1]		※When INA input signal is rising (_┌), it counts. ※INA: Counting input ※INB: No counting input
UP-2 [UP-2]		※When INA input signal is falling (┐_), it counts. ※INA: Counting input ※INB: No counting input
Down [dn]		※When INA is counting input, INB is no counting input. When INB is counting input, INA is no counting input.
Down-1 [dn-1]		※When INA input signal is rising (_┌), it counts. ※INA: Counting input ※INB: No counting input
Down-2 [dn-2]		※When INA input signal is falling (┐_), it counts. ※INA: Counting input ※INB: No counting input
Up/ Down-A [Ud-A]		※INA: Counting input INB: Counting command input ※When INB is "L", counting command is up. When INB is "H", it is counting command is down .

▣ Input Operation Mode (Counter)

Input mode	Counting chart	Operation
Up/ Down-B [Ud-b]		※INA: Up counting input INB: Down counting input ※When INA and INB input signals are rising (⎍) at the same time, it maintains previous counting value.
Up/ Down-C [Ud-C]		※When connecting encoder output A, B phase with counter input, INA, INB, set input mode [In.Cn] as phase different input [Ud-C] for counter operation.

※1: For selectable no-voltage input (PNP) , voltage input (NPN) model.
※A: over min. signal width, B: over than 1/2 of min. signal width. If the signal is smaller than these width, it may cause counting error (±1) .

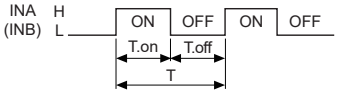
※The meaning of "H", "L"

Input method / Character	Voltage input (PNP)	No-voltage input (NPN)
H	5-30VDC	Short
L	0-2VDC	Open

※Min. signal width by counting speed

Counting speed	Min. signal width
1cps	500ms
30cps	16.7ms
1kcps	0.5ms
5kcps	0.1ms
10kcps	0.05ms

1cps=1Hz

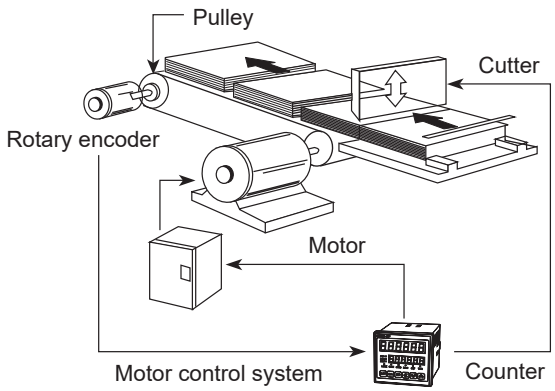


※T.on, T.off: Min. signal width

▣ Prescale Function (Counter)

This function is to set and display calculated unit for actual length, liquid, position, etc. It is called “prescale value” for measured length, liquid, or position, etc per 1 pulse. For example, when moving L, the desired length to be measured, and P, the number of pulses per 1 revolution of a rotary encoder, occurs, prescale value is L/P.

E.g.) Positioning control by counter and encoder



[Diameter (D) of pulley connected with encoder= 22mm, the number of pulses by 1 rotation of encoder=1,000]

$$\text{●Prescale value} = \frac{\pi \times \text{Diameter (D) of pulley}}{\text{The number of pulses by 1 rotation of encoder}}$$

$$= \frac{3.1416 \times 22}{1000}$$

$$= 0.069\text{mm/pulse}$$

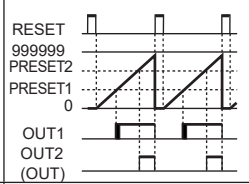
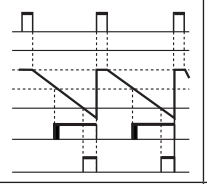
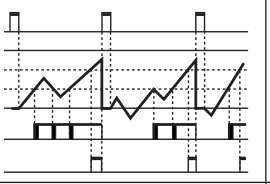
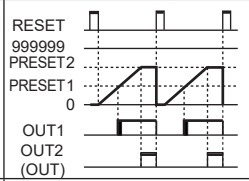
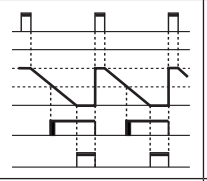
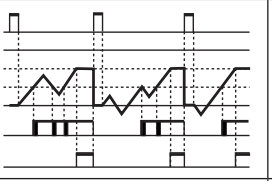
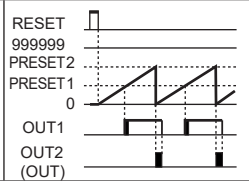
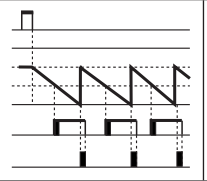
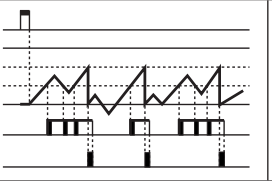
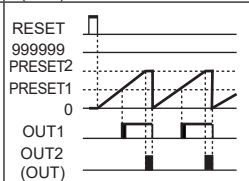
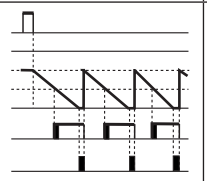
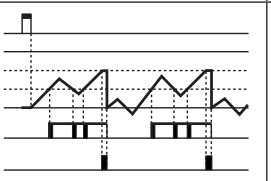
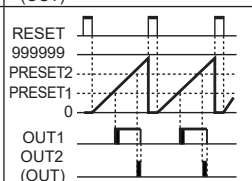
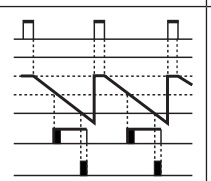
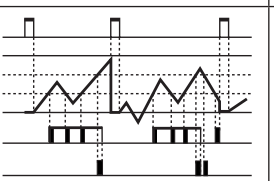
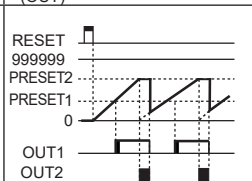
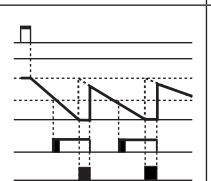
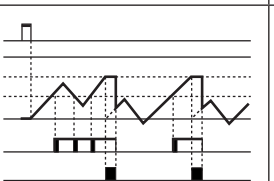
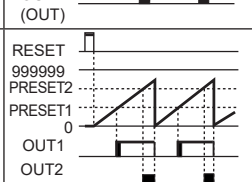
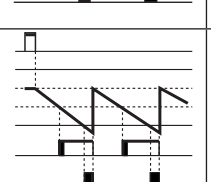
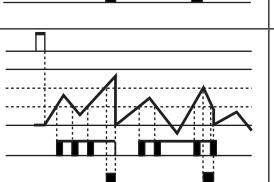
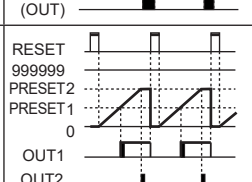
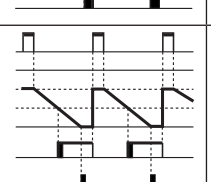
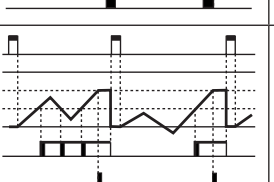
Set decimal point[dP] as [- - - - .-], prescale decimal point [SC.dP] as [- - - .- - -], prescale value [SCL] as [0.069] at function setting mode. It is available to control conveyer position by 0.1mm unit.

▣ Start Point Function (Counter)

This function is that start at initial value set at Start Point [Strt] when on counting mode.
- In case of dn, dn-1 or dn-2 in timer input mode, it is not available.
- When reset is applied, the present value is initialized to start point.
- In case of C, r, P, q output operation mode, the present value starts at START POINT value after counting up.

▣ Output Operation Mode (Counter)

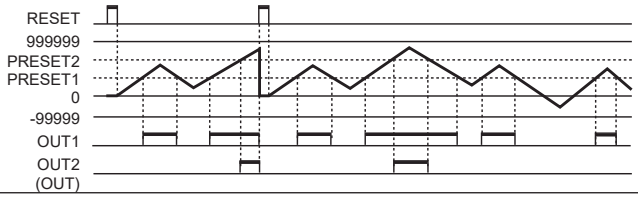
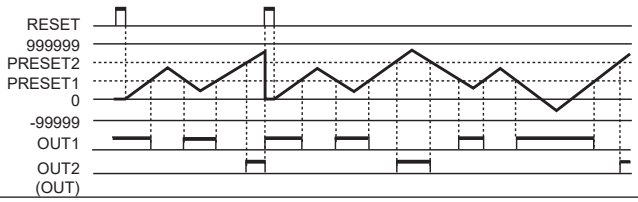
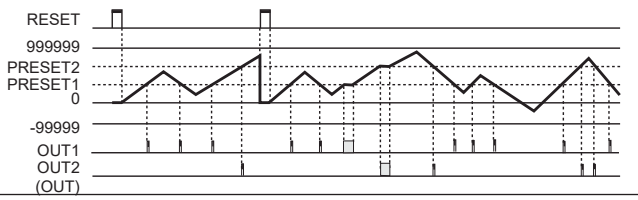
One-shot output (0.01 to 99.99 sec)
Retained output
One-shot output
Retained output

Output mode	Input mode			Operation
	Up, Up-1, 2	Down, Down-1, 2	Up/Down A, B, C	
F [F]				※After count-up, counting display value increases or decreases until reset signal is applied and retained output is maintained.
N [n]				※After count- up, counting display value and retained output are maintained until reset signal is applied.
C [C]				※When count-up, counting display value will be reset and count simultaneously. ※OUT1 retained output will be off after OUT2 one- shot time. ※The one-shot output time of OUT1 one-shot output time is operated regardless of OUT2 output.
R [r]				※After count-up, counting value display is reset after one-shot output time of OUT2 and it counts simultaneously. ※OUT1 retained output will be off after OUT2 one-shot time. ※OUT1 one-shot output time is operated regardless of OUT2 output.
K [K]				※After count-up, counting display value increases or decreases until RESET input is applied. ※OUT1 retained output is off after OUT2 one-shot time. ※OUT1 one-shot output time is operated regardless of OUT2 output.
P [P]				※After count-up, counting display value is maintained while OUT2 output is on. Counting value is internally reset and counts simultaneously. ※When OUT2 output is off, displays counting value while OUT2 is ON, and it increases or decreases. ※OUT1 retained output is off after OUT2 one-shot time. ※OUT1 one-shot output time is operated regardless of OUT2 output.
Q [q]				※After count-up, counting display value increases or decreases during OUT2 one-shot time. ※OUT1 retained output is off after OUT2 one-shot time. ※OUT1 one-shot output time is operated regardless of OUT2 output.
A [A]				※After count-up, counting display value and OUT1 retained output are maintained until RESET input is applied. ※OUT1 one-shot output time is operated regardless of OUT2 output.

※The PRESET1 type output (OUT) is operated as OUT2 of PRESET2 type.
※OUT1 output could be set to 0 in all modes and 0 value output turns ON.
※OUT2 output could not set to 0 in C[C], R[r], P[P] or Q[q] output mode.

▣ Output Operation Mode (Counter)

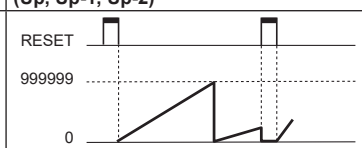
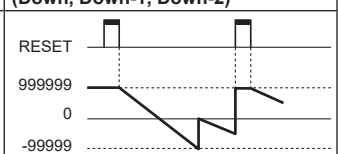
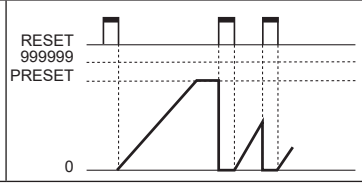
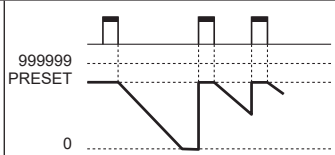
Retained output　Coincidence output

Output mode	Up/Down - A, B, C	Operation
S [S]		※OUT1 and OUT2 keep ON status in following condition: Counting display value ≧ PRESET1 Counting display value ≧ PRESET2
T [t]		※OUT1 output is off: Counting display value ≧ PRESET1 ※OUT2 keeps ON status in following condition: Counting display value ≧ PRESET2
D [d]		※When counting display value is equal to setting value [PRESET1, PRESET2) only, OUT1 or OUT2 output keeps ON status. ※When setting 1kcps for counting speed, solid state contact output should be used.

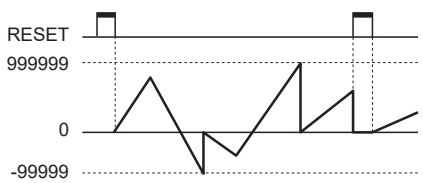
※The PRESET1 type output (OUT) is operated as OUT2 of PRESET2 type.
※The PRESET2 model OUT1 output is operated as one-shot or retained output. (except S, t, d mode)
※OUT1 output could be set to 0 in all modes and 0 value output turns ON.
※OUT2 output could not set to 0 in C[C], R[r], P[P] or Q[q] output mode.

▣ Counter Operation of the Indicator (CT6S-I, CT6Y-I, CT6M-I)

※Only displays on indicator models

Indicate mode [dSP.n]	Count chart		Operation
	In case of input mode is Up (Up, Up-1, Up-2)	In case of input mode is Down (Down, Down-1, Down-2)	
TOTAL [totAL]			Count value increases or decreases until RESET input is applied. When input is over max./min. counting value, it displays 0. When Reset input is applied, it displays 0(Up)/999999(Down).
HOLD [HoLd]			Count value increases or decreases until RESET input is applied. When input is reaching preset value(Up)/0(Down), the display value is hold. When Reset input is applied, it displays 0(Up)/preset value(Down).

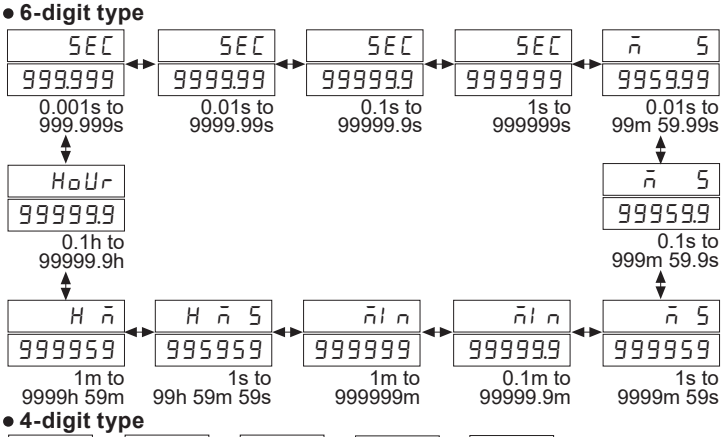
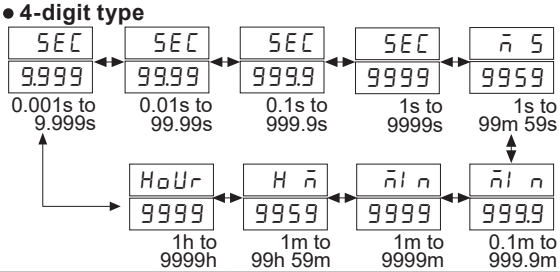
● In case of the Command input [Ud-A], Individual input [Ud-b], Phase difference input [Ud-C] mode.



※In case of UP/DOWN [Ud-A, Ud-b, Ud-C] input mode, indication mode [dSP.n] of the configuration is not displayed.

▣ Parameter Setting (Timer)

(MD key: Moves the settings, ⩒, ⩓ key: Changes the settings)

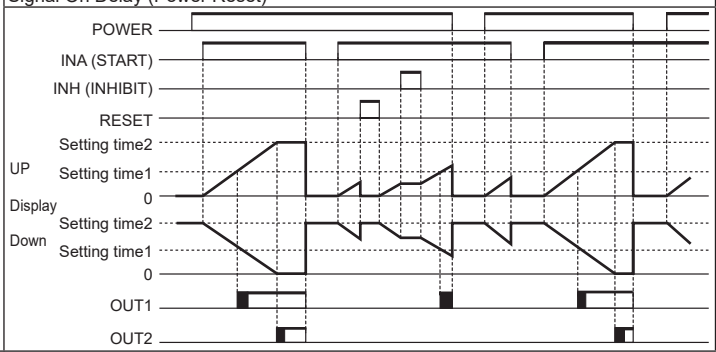
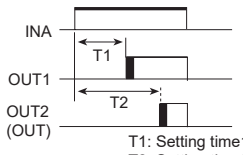
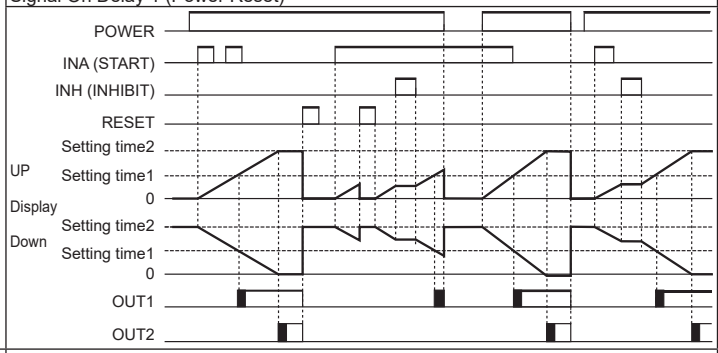
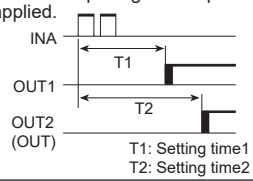
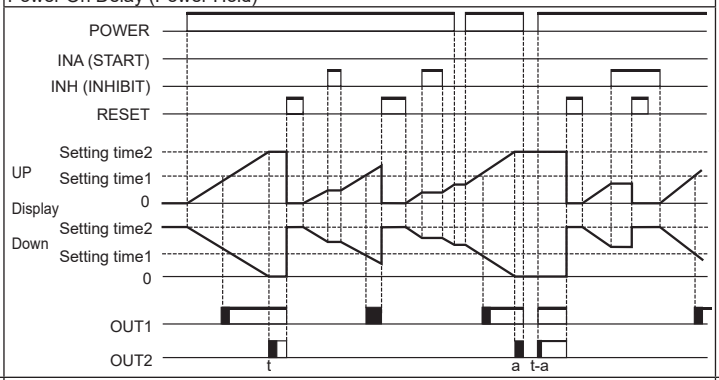
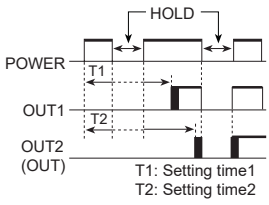
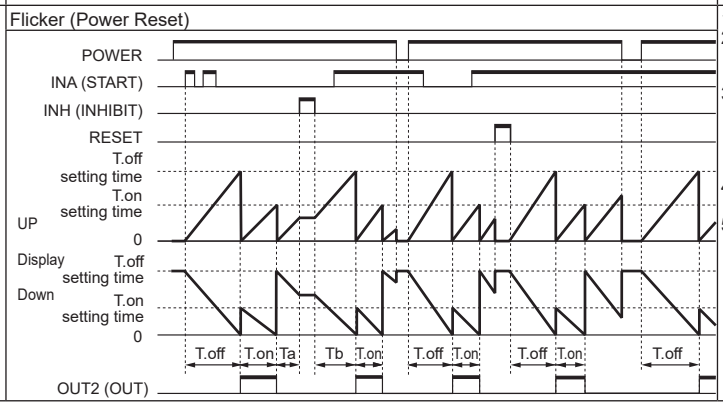
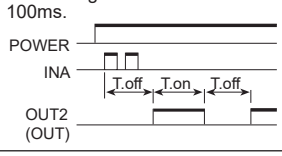
Parameter	Setting
Counter/Timer [C-t]	CoUn ◀▶ tImE ※CoUn: Counter, tImE: Timer
Time range [HoUr/mIn/SEC]	● 6-digit type  ● 4-digit type 
Up/Down mode [U-d]	UP ◀▶ dn ※UP: Time progresses from '0' to the setting time. dn: Time progresses from the setting time to '0'.
Indication mode [dSP.m]	totAL ◀▶ HoLd ◀▶ ontd ※Used for the indicator type only. ※It is added that the feature which set the setting time when selecting HoLd or ontd
Memory protection [dAtA]	CLr ◀▶ rEC ※Used for the indicator type only. ※CLr: Reset time value when power is off. rEC: Memorizes time value at the moment of power off.
Output mode [oUt.m]	ond ◀▶ ond.1 ◀▶ ond.2 ◀▶ FLY ◀▶ FLY.1 ◀▶ FLY.2 ◀▶ Int Int.1 ◀▶ Int.2 ◀▶ oFd ◀▶ nFd ◀▶ nFd.1 ◀▶ IntG
OUT2 output time [oUt2]※1	※Set one-shot output time of OUT2. ※Setting range: 00.01 to 99.99sec, Hold. ※When 1st digit is flashing, press the ⩤ key once and HoLd appears.
OUT1 output time [oUt 1]※1	※Set one-shot output time of OUT1. ※Setting range: 00.01 to 99.99sec, Hold. ※When 1st digit is flashing, press the ⩤ key once and HoLd appears.
OUT output time [oUt.t]※1	※Setting range: 00.01 to 99.99sec, Hold. ※When 1st digit is flashing, press the ⩤ key once and HoLd appears.
Input logic [SIG]	nPn: No-voltage input, PnP: Voltage input ※Check input logic value (PNP, NPN).
Input signal time [Int]	1 ◀▶ 20, unit: ms ※CTS/CTY: Set min. width of INA, INH, RESET signal. ※CTM: Set min. width of INA, RESET, INHIBIT, BATCH RESET signal.
Key lock [LoCK]	LoFF ◀▶ LoC.1 ◀▶ LoC.2 ◀▶ LoC.3 ※LoFF: Unlock keys, key lock indicator turns OFF LoC.1: Locks RST key, key lock indicator turns ON LoC.2: Locks ⩤, ⩒, ⩓ keys, key lock indicator turns ON LoC.3: Locks RST, ⩤, ⩒, ⩓ keys, key lock indicator turns ON

※1: When output mode is FLY.1, FLY.2, IntG and ond, ond.1, ond.2 of PRESET1 model, oUt 1 does not appear. The output time of oUt2 is displayed as oUt.t. When output mode is ond, ond.1, ond.2, Int.2, oUt 1 appears.

※2: Int.2 mode is available only for PRESET2 model.

▣ Output Operation Mode (Timer)

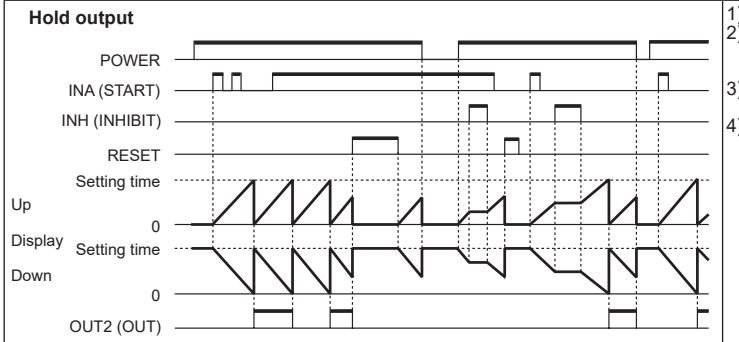
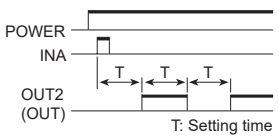
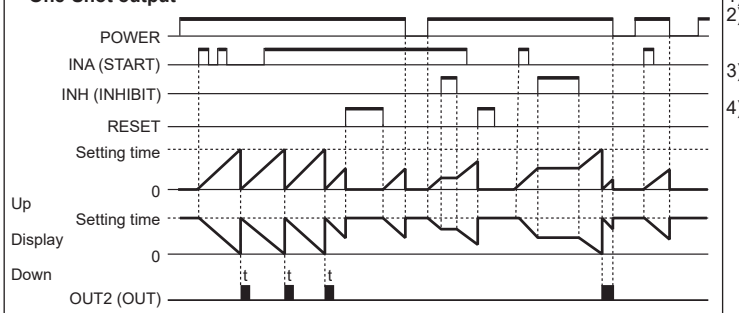
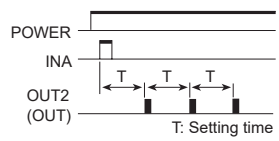
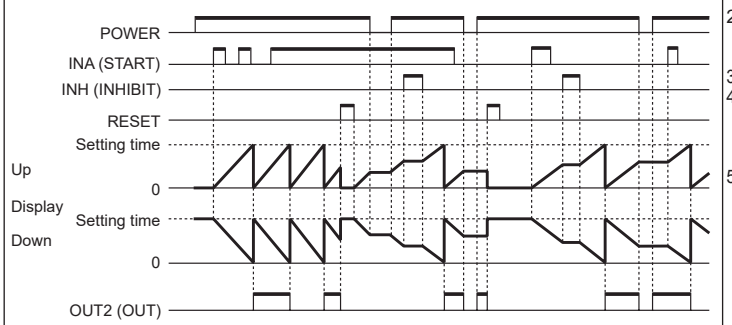
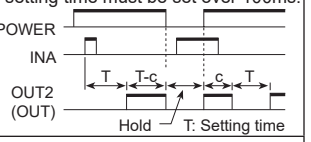
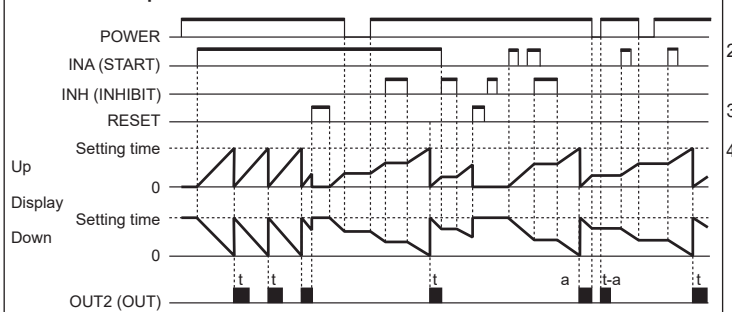
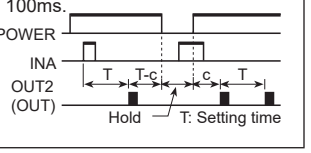
One-shot output / Retained output　One-shot output　Retained output

Output mode	Input mode	Operation
OND [ond]	Signal On Delay (Power Reset) 	1) Time starts when INA signal turns on. 2) When INA signal turns off, time resets. 3) When INA signal is on: Power ON Time Start is operated Power OFF Time Start is operated 4) Control output operates as retained or one-shot output. 
OND.1 [ond.1]	Signal On Delay 1 (Power Reset) 	1) Time starts when INA signal turns on, if INA signal is applied repeatedly, only initial signal is recognized. 2) When INA signal is on: Power ON Time Start is operated Power OFF Time Start is operated 3) Control output operates as retained or one-shot output. 4) Only first INA input signal is valid in case INA input signal is repeatedly applied. 
OND.2 [ond.2]	Power On Delay (Power Hold) 	1) Time starts when power turns on. (There is no INA function.) 2) Time resets when reset turns on. Time starts when reset turns off. 3) Control output operates as retained or one-shot output. 4) It memorizes display value at the moment of power off. 
FLK [FLK]	Flicker (Power Reset) 	1) Time starts when INA signal turns on. 2) When INA signal is on: Power ON Time Start is operated Power OFF Time Start is operated 3) Control output operates as retained output, output turns off for the T.off time and turns off for the T.off time and turns on for the T.on time repeatedly. Ta+Tb = T.off setting time 4) The T.on time and T.off time must be set individually. 5) In case of using the contact output, min.setting time must be set over 100ms. 

※Power Reset: There is no memory protection. (Initializes the display value when power is off)
Power Hold: There is memory protection. (Memorizes the display value at the moment of power off, indicates the memorized display value when power is resupplied.)

▣ Output Operation Mode (Timer)

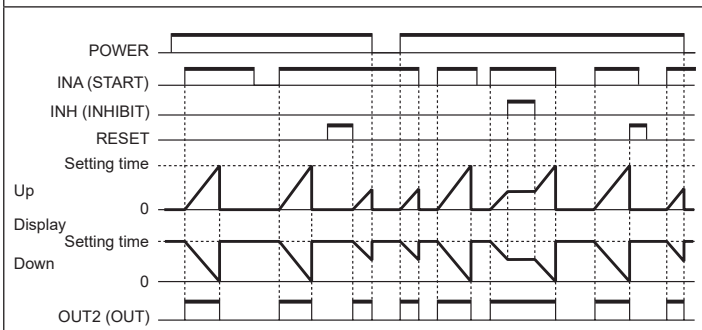
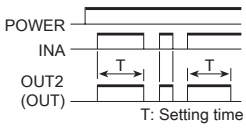
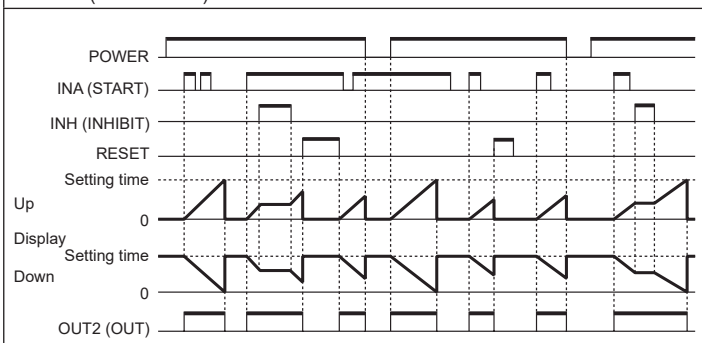
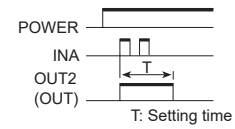
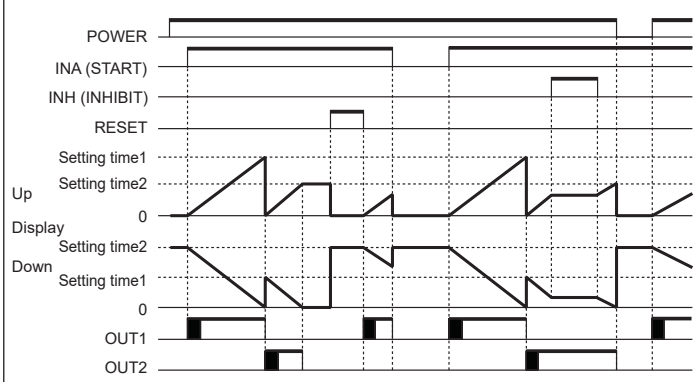
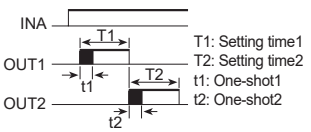
One-shot output / Retained output　One-shot output　Retained output

Output mode	Input mode	Operation
FLK.1 [FLK.1]	Flicker 1 (Power Reset)	
	Hold output 	1) Time starts when INA signal turns on. 2) When INA signal is on: Power ON Time Start is operated Power OFF Time Start is operated 3) Control output operates as retained output. 4) In case of using the contact output, min. setting time must be set over 100ms. 
	One-Shot output 	1) Time starts when INA signal turns on. 2) When INA signal is on: Power ON Time Start is operated Power OFF Time Start is operated 3) Control output operates as one-shot output. 4) In case of using the contact output, min. setting time must be set over 100ms. 
FLK.2 [FLK.2]	Flicker 2 (Power Hold)	
	Hold output 	1) Time starts when INA signal turns ON and the display value at the moment when power is off is memorized. 2) When INA signal is on: Power ON Time Start is operated Power OFF Time Start is operated 3) Control output operates as retained output. 4) Control output will be reversed when it reaches to setting time. (At the initial start, OUT2 control output is OFF). 5) In case of using the contact output, min. setting time must be set over 100ms. 
	One-Shot output 	1) Time starts when INA signal turns ON and the display value at the moment when power is off is memorized. 2) When INA signal is on: Power ON Time Start is operated Power OFF Time Start is operated 3) Control output operates as one-shot output. 4) In case of using the contact output, min. setting time must be set over 100ms. 

※Power Reset: There is no memory protection. (Initializes the display value when power is off)
Power Hold: There is memory protection. (Memorizes the display value at the moment of power off, indicates the memorized display value when power is resupplied.)

▣ Output Operation Mode (Timer)

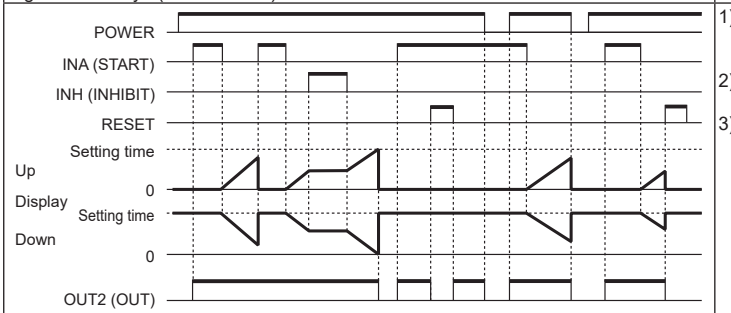
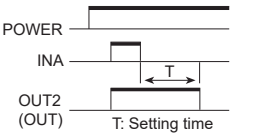
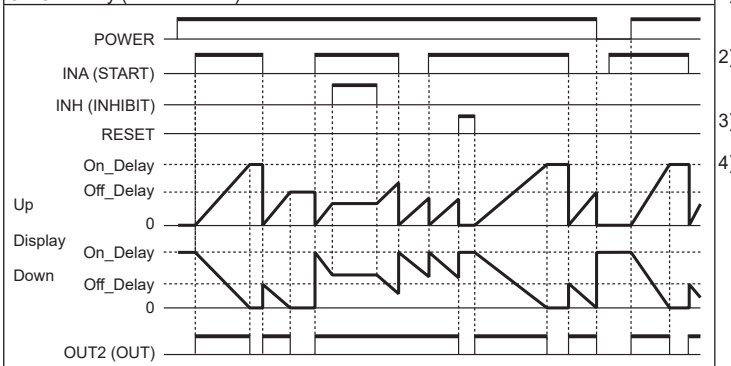
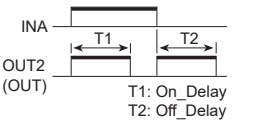
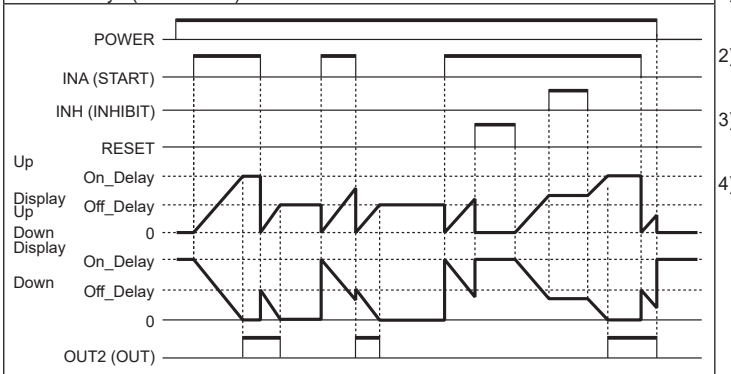
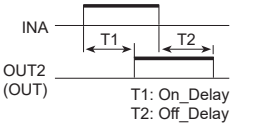
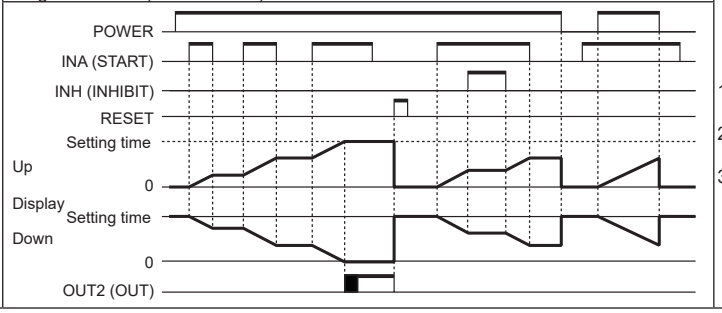
One-shot output / Retained output　One-shot output　Retained output

Output mode	Input mode	Operation
INT [I nt]	Interval (Power Reset) 	1) Control output turns ON and time starts when INA signal turns ON. 2) When INA signal is on: Power ON Time Start is operated Power OFF Time Start is operated 3) When it reaches setting time, indication value and control output are reset automatically. 4) Control output is ON when time is progressing. 
INT.1 [I nt. 1]	Interval 1 (Power Reset) 	1) Control output turns ON and time starts when INA signal turns ON. 2) When INA signal is on: Power ON Time Start is operated Power OFF Time Start is operated 3) When it reaches setting time, indication value and control output are reset automatically. 4) Control output is ON when time is progressing. 5) INA input is ignored while time is progressing. 
INT.2 [I nt.2]	Interval 2 (Power Reset) 	1) Time starts when INA input is ON and resets when INA input is OFF. 2) INA input is ON, OUT1 output is ON during T1 or t1. 3) When it reaches setting time1, display value resets and OUT2 output is ON during T2 or t2 output time. ※ Output turns OFF when reaching the setting time even if one-shot time is longer than setting time.  (PRESET1 model has no INT.2 mode)

※Power Reset: There is no memory protection. (Initializes the display value when power is off)
Power Hold: There is memory protection. (Memorizes the display value at the moment of power off, indicates the memorized display value when power is resupplied.)

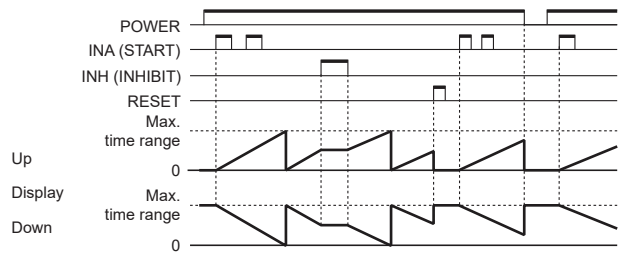
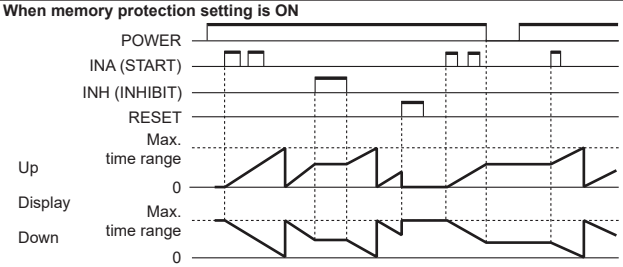
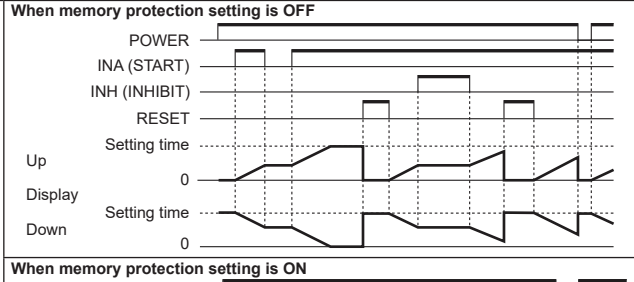
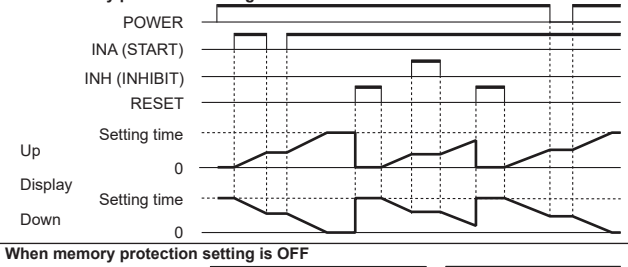
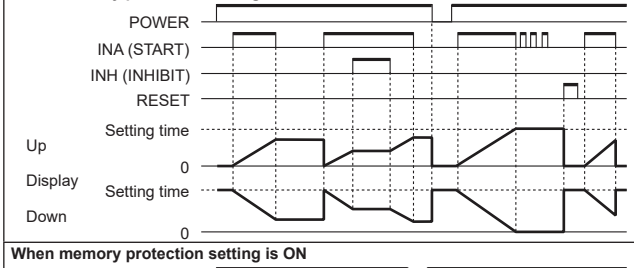
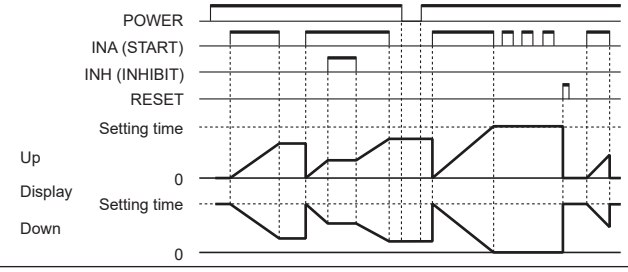
▣ Output Operation Mode (Timer)

One-shot output / Retained output　One-shot output　Retained output

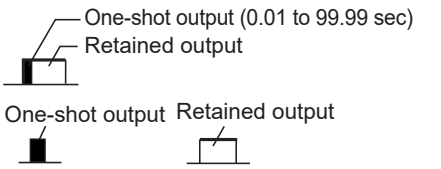
Output mode	Input mode	Operation
OFD [oFd]	Signal Off Delay1 (Power Reset) 	1) If INA is ON, control output remains ON. (except when power is off and reset is on) 2) When INA signal is OFF, time processes. 3) When it reaches setting time, indication value and control output are reset automatically. 
NFD [nFd]	On-Off Delay (Power Reset) 	1) When INA input is ON, output is ON and time is progressing, then output is OFF after On_Delay time. 2) When INA input is OFF, output is ON and time is progressing, then output is OFF after Off_Delay time. 3) If INA input is OFF within On_Delay time, step 2 starts again. 4) If INA input is ON within Off_Delay time, step 1 starts again. 
NFD.1 [nFd.1]	On-Off Delay1 (Power Hold) 	1) When INA input turns ON, time progresses and output turns ON after On_Delay time. 2) When INA input turns OFF, time progresses and output turns OFF after Off_Delay time. 3) If INA input turns OFF within On_ Delay time, output will turn ON and step2 operate. 4) If INA input turns ON within Off_ Delay time, output will turn OFF and step1 operate. 
INTG [intG]	Integration Time (Power Reset) 	1) Time is progressing while INA input is ON. 2) Time progress stops while INA input is OFF. 3) When it reaches the setting time, output is ON.

※Power Reset: There is no memory protection. (Initializes the display value and the output status when re-supplying the power.)
Power Hold: There is memory protection. (It memorizes the status of power off. When re-supplying the power, it returns the memorized display value and the output status.)

▣ Timer Operation of the Indicator (CT6S-I, CT6Y-I, CT6M-I)

TOTAL [tOtAL]	**When memory protection setting is OFF** 	1) Time starts when INA input is ON. 2) Setting value is initialized when Reset input is ON. 3) Time progress stops when INHIBIT input is ON. 4) Resets when power is OFF.
	When memory protection setting is ON 	1) Time starts when INA input is ON. 2) Setting value is initialized when Reset input is ON. 3) Time progress stops while INHIBIT input is ON. 4) Display value at the moment of power OFF is memorized.
HOLD [HoLd]	**When memory protection setting is OFF** 	1) Time progresses when INA input is ON. 2) Time progress stops while INA input is OFF. 3) When time reaches setting time, display value will stop and flash. 4) When reset input is applied, display value is initialized. 5) Resets when power is OFF.
	When memory protection setting is ON 	1) Time progresses when INA input is ON. 2) Time progress stops while INA input is OFF. 3) When time reaches setting time, display value will stop and flash. 4) When reset input is applied, display value is initialized. 5) Display value the moment when power is OFF is memorized.
On Time Display [ont.d]	**When memory protection setting is OFF** 	※ON time indicate mode of INA input 1) Time reset start operates when INA input turns ON. 2) Time progress stops while INA input is OFF. 3) When time progress stops and power is off, the display value is initialized. 4) If progress time is greater than setting time when INA input turns off, display value flashes and operation stops until reset signal is applied.
	When memory protection setting is ON 	※ON time indicate mode of INA input 1) Time reset start operates when INA input turns ON. 2) Time progress stops while INA input is OFF. 3) When time progress stops and power is off, the display value is memorized. 4) If progress time is greater than setting time when INA input turns off, display value flashes and operation stops until reset signal is applied.

▣ Timer '0' Time Setting



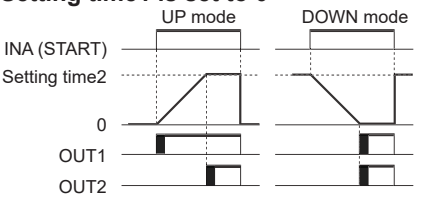
◎ Available output operation mode to set '0' time setting

ond, ond.1, ond.2, nFd, nFd.1

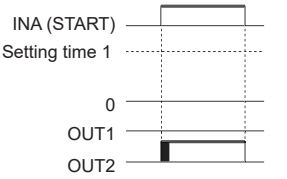
◎ Operation according to output mode (at 0 time setting)

1) OND (Signal ON Delay) mode [ond]

● Setting time1 is set to 0

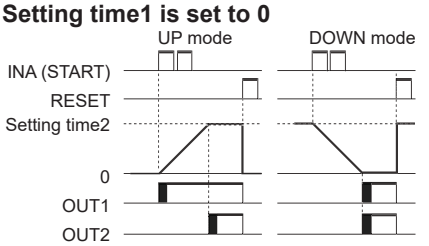


● Setting time2 is set to 0

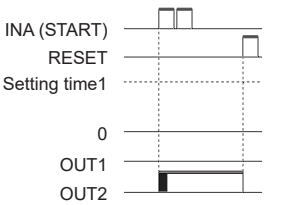


2) OND.1 (Signal ON Delay 1) mode [ond.1]

● Setting time1 is set to 0

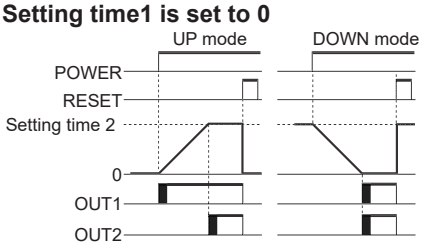


● Setting time2 is set to 0

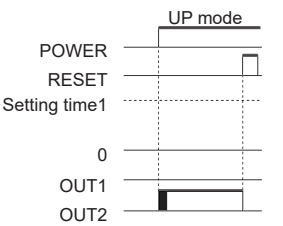


3) OND.2 (Power ON Delay2) mode [ond.2]

● Setting time1 is set to 0

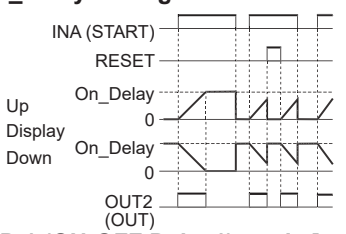


● Setting time2 is set to 0

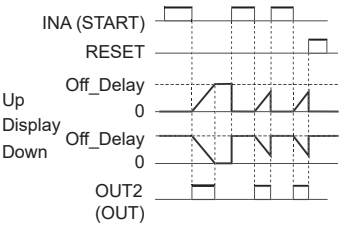


4) NFD (ON-OFF Delay) mode [nFd]

● OFF_Delay setting time is set to 0

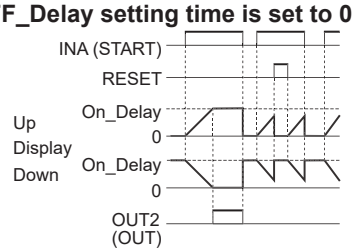


● ON_Delay setting time is set to 0

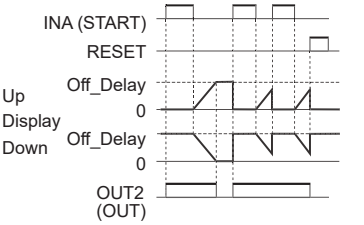


5) NFD.1 (ON-OFF Delay1) mode [nFd.1]

● OFF_Delay setting time is set to 0



● ON_Delay setting time is set to 0



◎ Setting value1 (PS1) is higher than Setting value2 (PS2)

OND[ond], OND.1[ond.1] or OND.2[ond.2] output mode

- UP mode: When the timer setting value1 is greater than the setting value 2, OUT1 output does not turn ON.
- DOWN mode: When the timer setting value1 is greater than the setting value 2, OUT1 output does not turn ON. If the setting value 1 is same as the setting value2 and START signal is applied, OUT1 output turns ON immediately.

▣ Communication Mode

◎ Parameter setting

(MD key: To select setting mode, ⩛ or ⩚ key: To change setting value)

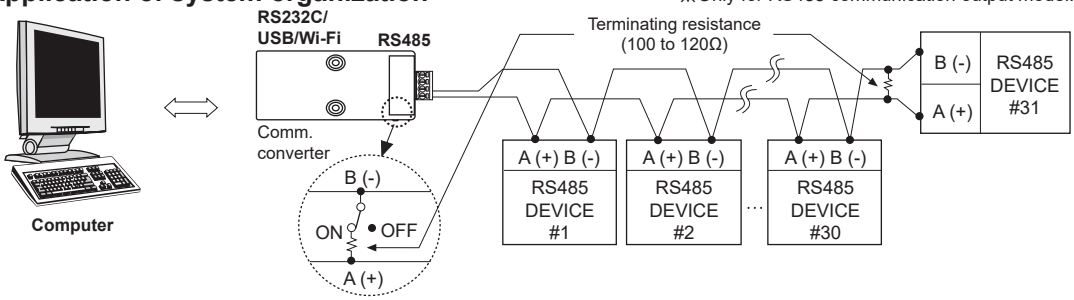
Setting mode	How to set
Comm. address [Addr]	⩤: To shift flashing digits of Comm. address. ⩛, ⩚: To change the flashing digits. ※Setting range of Comm. address: 1 to 127 ※If the same address is applied during multiComm., it will not work correctly.
Comm. speed [bPS]	24 ↔ 48 ↔ 96 ↔ 192 ↔ 384 ※2400/4800/9600/19200/38400bps
Comm. parity [PrtY]	nonE ↔ EuEn ↔ odd ※nonE: None EuEn: Even number odd: Odd number
Comm. stop bit [StP]	1 ↔ 2
Response waiting time [rSUt]	⩤: To shift flashing digits position of Comm. response waiting time. ⩛, ⩚: To change the flashing digits position value. ※Setting range according to comm. speed.

2400bps	16ms to 99ms
4800bps	8ms to 99ms
9600bps	5ms to 99ms
19200bps	5ms to 99ms
38400bps	5ms to 99ms

Comm. write [Conn]	EnA ↔ diSA ※EnA: Permits Comm. write (Enable) diSA: Prohibits Comm. write (Disable)

◎ Application of system organization

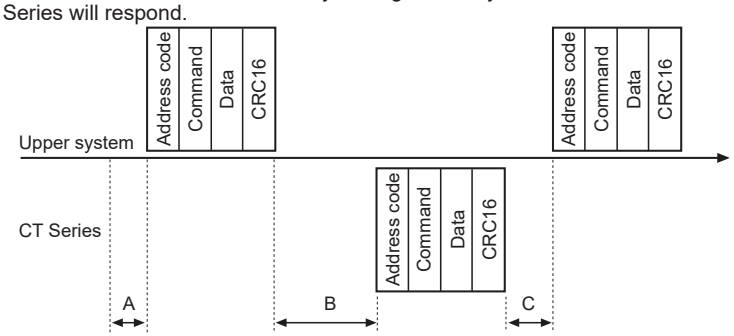
※Only for RS485 communication output model.



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately), SCM-US (USB to Serial converter, sold separately).
Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

◎ Communication control ordering

1. The communication method is Modbus RTU (PI-MBUS-300-REV.J).
2. After 1sec of power supply into the high order system, it starts to communicate.
3. Initial communication will be started by the high order system. When a command comes out from the high order system, CT Series will respond.



※A → Min. 1sec after applying power
B → 38400bps: approx. 1ms.
19200bps: approx. 2ms.
9600bps: approx. 4ms.
4800bps: approx. 8ms.
2400bps: approx. 16ms.
C → Min. 20ms

◎ Communication command and block

The format of query and response

1) Read coil status (func. 01 H), Read input status (func. 02 H)

● Query (master)

Slave Address	Function	Starting Address		No. of Points		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC 16

● Response (slave)

Slave Address	Function	Byte Count	Data	Data	Data	Error Check (CRC 16)	
						Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC 16

2) Read holding registers (func. 03 H), Read input registers (func. 04 H)

● Query (master)

Slave Address	Function	Starting Address		No. of Points		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC 16

● Response (slave)

Slave Address	Function	Byte Count	Data		Data		Data		Error Check (CRC 16)	
			High	Low	High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC 16

3) Force single coil. (func. 05 H)

● Query (master)

Slave Address	Function	Coil Address		Force Data		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC 16

● Response (slave)

Slave Address	Function	Coil Address		Force Data		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC 16

4) Preset single register (func. 06 H)

● Query (master)

Slave Address	Function	Register Address		Preset Data		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC 16

● Response (slave)

Slave Address	Function	Register Address		Preset Data		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC 16

5) Preset multiple registers (func. 10 H)

● Query (master)

Slave Address	Function	Starting Address		No. of Register		Byte Count	Data		Data		Error Check (CRC 16)	
		High	Low	High	Low		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC 16

● Response (slave)

Slave Address	Function	Starting Address		No. of Register		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC 16

6) Application

Read Coil Status (func. 01 H)
Master reads OUT2 000002 (0001H) to 000003 (0002H), OUT1 output status (ON: 1, OFF: 0) from the Slave (Address 01).

● Query (master)

Slave Address	Function	Starting Address		No. of Points		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
01 H	01 H	00 H	01 H	00 H	02 H	EC H	0B H

On slave side OUT2 000003 (0002H): OFF,
OUT1 000002 (0001H): ON

● Response (slave)

Slave Address	Function	Byte Count	Data (00003 to 00001)	Error Check (CRC 16)	
				Low	High
01 H	01 H	01 H	02 H	D0 H	49 H

Read Input Register (Func. 04 H)Master reads preset value 301004 (03EBH) to 301005 (03ECH) of counter/ timer, Slave (Address 15).

● Query (master)

Slave Address	Function	Starting Address		No. of Points		Error Check (CRC 16)	
		High	Low	High	Low	Low	High
0F H	04 H	03 H	EB H	00 H	02 H	00 H	95 H

In case that the present value is 123456 (0001 E240 H) in slave side, 301004 (03EBH): E240 H, 301005 (03ECH): 0001H

● Response (slave)

Slave Address	Function	Byte Count	Data		Data		Error Check (CRC 16)	
			High	Low	High	Low	Low	High
0F H	04 H	04 H	E2 H	40 H	00 H	01 H	E2 H	28 H

◎ Modbus mapping table

1) Reset/Output

No. (Address)	Func.	Explanation	Setting range	Notice
000001 (0000)	01/05	Reset	0:OFF 1:ON	—
000002 (0001)	01	OUT2 output	0:OFF 1:ON	—
000003 (0002)	01	OUT1 output	0:OFF 1:ON	—
000004 (0003)	01	BATCH output	0:OFF 1:ON	For BATCH output model
000005 (0004)	01/05	BATCH resets	0:OFF 1:ON	For BATCH output model

2) Terminal input status

No. (Address)	Func.	Explanation	Setting range	Notice
100001 (0000)	02	INA input status	0:OFF 1:ON	Terminal input status
100002 (0001)	02	INB input status	0:OFF 1:ON	Terminal input status
100003 (0002)	02	INHIBIT input status	0:OFF 1:ON	Terminal input status
100004 (0003)	02	RESET input status	0:OFF 1:ON	Terminal input status
100005 (0004)	02	BATCH RESET input status	0:OFF 1:ON	Terminal input status

3) Product information

No. (Address)	Func.	Explanation	Notice
300001 to 300100	04	Reserved	—
300101 (0064)	04	Product number H	Model ID
300102 (0065)	04	Product number L	
300103 (0066)	04	Hardware version	—
300104 (0067)	04	Software version	—
300105 (0068)	04	Model no. 1	"CT"
300106 (0069)	04	Model no. 2	"6M"
300107 (006A)	04	Model no. 3	"-2"
300108 (006B)	04	Model no. 4	"PT"
300109 (006C)	04	Reserved	—
300110 (006D)	04	Reserved	—
300111 (006E)	04	Reserved	—
300112 (006F)	04	Reserved	—
300113 (0070)	04	Reserved	—
300114 (0071)	04	Reserved	—
300115 (0072)	04	Reserved	—
300116 (0073)	04	Reserved	—
300117 (0074)	04	Reserved	—
300118 (0075)	04	Coil Status Start Address	0000
300119 (0076)	04	Coil Status Quantity	—
300120 (0077)	04	Input Status Start Address	0000
300121 (0078)	04	Input Status Quantity	—
300122 (0079)	04	Holding Register Start Address	0000
300123 (007A)	04	Holding Register Quantity	—
300124 (007B)	04	Input Register Start Address	0064
300125 (007C)	04	Input Register Quantity	—

4) Monitoring data

No. (Address)	Func.	Explanation	Setting range	Notice
301001 (03E8)	04	BA.O LED display status	0:OFF 1:ON	Bit 5
		OUT2 LED display status	0:OFF 1:ON	Bit 6
		OUT1 LED display status	0:OFF 1:ON	Bit 7
		BA.S LED display status	0:OFF 1:ON	Bit 10
		LOCK LED display status	0:OFF 1:ON	Bit 11
		PS2 LED display status	0:OFF 1:ON	Bit 12
		PS1 LED display status	0:OFF 1:ON	Bit 13
		TMR LED display status	0:OFF 1:ON	Bit 14
		CNT LED display status	0:OFF 1:ON	Bit 15
301002 (03E9)	04	Present value of BATCH counter	0 to 999999	For BATCH output model
301003 (03EA)				
301004 (03EB)	04	Present value of counter/timer	[Counter] 6-digit type : -99999 to 999999 4-digit type : -999 to 9999 [Timer]: Within time setting range	Use counter and timer in common
301005 (03EC)				
301006 (03ED)	04	Display unit	[Counter] : decimal point of display value [Timer] : Time range	Counter: 40058 Data Timer: 40102 Data
301007 (03EE)	04	PS (2) setting value	[Counter] 6-digit type : -99999 to 999999 4-digit type : -999 to 9999 [Timer]: Within time setting range	Use counter and timer in common
301008 (03EF)				
301009 (03F0)	04	PS1 setting value		
301010 (03F1)				
301011 (03F2)	04	Setting value of BATCH counter	0 to 999999	Use counter and timer in common
301012 (03F3)				
301013 (03F4)	04	Checking the input logic	0: NPN, 1: PNP	

● Date format of 301001 (03E8) address bit

Bit	Explanation	Data	Bit	Explanation	Data
Bit0	—	0	Bit8	—	0
Bit1	—	0	Bit9	—	0
Bit2	—	0	Bit10	BA.S	0 or 1
Bit3	—	0	Bit11	Lock	0 or 1
Bit4	—	0	Bit12	PRESET2	0 or 1
Bit5	BA.O	0 or 1	Bit13	PRESET1	0 or 1
Bit6	OUT2	0 or 1	Bit14	TMR	0 or 1
Bit7	OUT1	0 or 1	Bit15	CNT	0 or 1

※2 Words data format: Upper data has high number address.
E.g.)301004: Present Value (Low Word),
301005: Present Value (High Word)

5) Preset value setting group

No. (Address)	Func.	Explanation	Setting range	Notice
400001 (0000)	03/ 06/ 16	PS2 setting value PS setting value	[Counter] 6-digit type : 0 to 999999 4-digit type: 0 to 9999 [Timer]: Within time setting range	Use counter and timer in common
400002 (0001)				
400003 (0002)		PS1 setting value		
400004 (0003)				
400005 (0004)		BATCH counter setting value	0 to 999999	
400006 (0005)				

6) Function setting mode (counter group)

No. (Address)	Func.	Explanation	Setting range	Notice
400051 (0032)	03/06/16	Counter/Timer [C-t]	1: CoUn 1: tIME	Use counter and timer in common
400052 (0033)	03/06/16	Input mode [In]	0: UP 5: dn-2 1: UP-1 6: Ud-A 2: UP-2 7: Ud-b 3: dn 8: Ud-C 4: dn-1	—
400053 (0034)	03/06/16	Indication mode [dISP]	0: totAL 1: HoLd	For the indicator
400054 (0035)	03/06/16	Output mode [oUt.M]	0: F 3: r 6: 9 9: t 1: n 4: t 7: A 10: d 2: C 5: P 8: S	—
400055 (0036)	03/06/16	Maximum counting speed [CPS]	0: 1 2: 1t 4: 10t 1: 30 3: 5t	—
400056 (0037)	03/06/16	OUT2 (OUT) output time [oUt2 (oUt.t)]	0001 to 9999	unit: ×10ms
400057 (0038)	03/06/16	OUT1 Output time [oUt 1]	0001 to 9999	unit: ×10ms
400058 (0039)	03/06/16	Decimal point [dP]	0: ------ 2: ----.-- 4: --.---- 1: -----.- 3: ---.--- 5: -.-----	4-digit type 0: ---- 1: ---.- 2: --.-- 3: -.---
400059 (003A)	03/06/16	Min. reset time [rSt]	0: 1 1: 20	unit: ms
400060 (003B)	03/06/16	Prescale decimal point position [SCL.d]	0: -----.- 3: ---.--- 5: -.----- 2: ----.-- 4: --.----	4-digit type 1: ---.- 2: --.-- 3: -.---
400061 (003C) 400062 (003D)	03/06/16	Prescale value [SCL]	6-digit type: 0.0001 to 99999 4-digit type: 0.001 to 9999	Connected with prescale decimal point position
400063 (003E) 400064 (003F)	03/06/16	Start value [Strt]	6-digit type: 000000 to 999999 4-digit type: 0000 to 9999	Connected with decimal point position of display value
400065 (0040)	03/06/16	Memory protection [dAtA]	0: CLr 1: rEC	Use counter and timer in common
400066 (0041)	03/06/16	Lock key [LoCK]	0: LoFF 1: LoC.1 2: LoC.2 3: LoC.3	

7) Function setting mode (timer group)

No. (Address)	Func.	Explanation	Setting range	Notice
400101 (0064)	03/06/16	Counter/Timer[C-t]	0: CoUn 1: tIME	Use counter and timer in common
400102 (0065)	03/06/16	Time range [HoUr/MIn/SEC]	4-digit type 0: 0.001s to 9.999s 5: 0.1m to 999.9m 1: 0.01s to 99.99s 6: 1m to 9999m 2: 0.1s to 999.9s 7: 1m to 99h59m 3: 1s to 9999s 8: 1h to 9999h 4: 1s to 99m59s 6-digit type 0: 0.001s to 999.999s 6: 1s to 9999m 59s 1: 0.01s to 9999.99s 7: 1m to 99999.9m 2: 0.1s to 99999.9s 8: 1m to 999999m 3: 1s to 999999s 9: 1s to 99h 59m 59s 4: 0.01s to 99m 59.99s 10: 1m to 9999h 59m 5: 0.1s to 999m 59.9s 11: 0.1h to 99999.9h	—
400103 (0066)	03/06/16	UP/Down mode [U-d]	0: UP 1: dn	—
400104 (0067)	03/06/16	Output mode [oUt.M]	0: ond 3: FLt 7: Int.1 10: nFd 1: ond.1 4: FLt.1 8: Int.2 11: nFd.1 2: ond.2 5: FLt.2 9: oFd 12: Int.G	—
400105 (0068)	03/06/16	OUT2 (OUT) Output time [oUt2]	0000 to 9999 (0: Hold)	unit: ×10ms
400106 (0069)	03/06/16	OUT1 Output time [oUt 1]	0000 to 9999 (0: Hold)	unit: ×10ms
400107 (006A)	03/06/16	Input signal time [Int]	0: 1 1: 20	unit: ms
400108 (006B)	03/06/16	Memory protection [dAtA]	0: CLr 1: rEC	Use counter and timer in common
400109 (006C)	03/06/16	Lock key [LoCK]	0: LoFF 1: LoC.1 2: LoC.2 3: LoC.3	Use counter and timer in common
400110 (006D)	03/06/16	Indication mode [dSP.M]	0: totAL 1: HoLd 2: ont.d	For the indicator

8) Function setting mode (communication group)

No. (Address)	Func.	Explanation	Setting range	Notice
400151 (0096)	03/06/16	Comm. address [Addr]	1 to 127	—
400152 (0097)	03/06/16	Comm. speed [bPS]	0: 24 1: 48 2: 96 3: 192 4: 384	unit: ×100bps
400153 (0098)	03/06/16	Comm. parity [PrtY]	0: nonE 1: EuEn 2: odd	—
400154 (0099)	03/06/16	Stop bit [StP]	0: 1 1: 2	—
400155 (009A)	03/06/16	Response waiting time [rSUt]	05 to 99	unit: ms
400156 (009B)	03/06/16	Comm. writing [Con.U]	0: EnA 1: diSA	—

◎ Exception processing

When communication error occurs, the highest bit of received function is set to 1, then sends response command and transmits exception code.

Slave Address	Function + 80H	Exception Code	Error Check (CRC16)	
			Low	High
1Byte	1Byte	1Byte	1Byte	1Byte

- Illegal Function (Exception Code: 01H): Not supporting command
- Illegal Data Address (Exception Code: 02H)
  : Mismatch between the number of asked data and the number of transmittable data.
- Illegal Data Value (Exception Code: 03
  : Mismatch between asked the number of data and transmittable the number of data in device
- Slave Device Failure (Exception Code: 04H): Command is processed incorrectly.

E.g.)
Master reads output status (ON:1, OFF:0) of non existing coil 01001 (03E8 H) from Slave (Address17).

● Query (master)

Slave Address	Function	Starting Address		No. of Points		Error Check (CRC16)	
		High	Low	High	Low	Low	High
11H	01H	03H	E8H	00H	01H	##H	##H

● Response (slave)

Slave Address	Function + 80H	Exception Code	Error Check (CRC16)	
			Low	High
11H	81H	02H	##H	##H

▣ Read and Write of Parameter Value Using Communication

◎ Read of the parameter area

000002 (OUT2), 000003 (OUT1), 000004 (BA, 0), 100001 to 100005 (terminal input), 300101 to 300125 (product information), 301001 to 301013 (Monitoring data)

◎ Read and write of the parameter area

000001 (reset starts), 000005 (BATCH reset starts), 400001 to 400006 (setting value saving group), 400051 to 400066 (counter setting group), 400101 to 400110 (timer setting group), 400151 to 400156 (communication setting group)

◎ Read of communication

Read parameter value using communication. (function: 01H, 02H, 03H, 04H)
It is able to read communication regardless of permitting/prohibiting communication writing.

◎ Communication write

Change parameter value using communication. (function: 05H, 06H, 10H)

- When changing the parameter setting value of '▣ Function setting mode Counter group' or '▣ Function setting mode Timer group' using communication, reset indication will flash in 3 sec and display value will be reset. (counting display value and progress time before changing parameter setting value are not saved.)
- When changing the parameter setting value of '▣ Preset value setting group' or '▣ Function setting mode Communication group' using communication, counting display value or progress time will not be reset.
- In prohibit writing communication setting (Con. U = 1: diSA), a write command does not process.
- If setting value beyond the setting range, this setting value is substituted for the value within the setting range and then memorized.

▣ Factory Default

	Parameter	Factory default
Counter	In	Ud-C
	oUt.n	F
	dSP.n	totAL
	CPS	30
	oUt2(oUt.t)	Hold (fixed)
	oUt1	00.10
	dP	------
	rSt	20
	SIG	nPn
	SC.dP	6-digit type: -.----- 4-digit type: -.---
	SCL	6-digit type: 1.00000 4-digit type: 1.000
	Strt	000000
	dAtA	CLr
Timer	HoUr/nIn/SEC	6-digit type: 0.00 1s~999.999s 4-digit type: 0.00 1s~9.999s
	U-d	UP
	dSP.n	totAL
	dAtA	CLr
	oUt.n	and
	oUt2(oUt.t)	HoLd
	oUt1	00.10
	SIG	nPn
	Int	20
General	LoCK	L.oFF
	PS1	1000
	PS2	5000
Comm.	Addr	001
	bPS	96
	PrtY	nonE
	StP	2
	rSUt	20
	Con.Y	EnA

▣ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
2. 24-48VDC, 24VAC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
3. Use the product, 0.1 sec after supplying power.
4. When supplying or turning off the power, use a switch or etc. to avoid chattering.
5. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
6. In case of contact input, set count speed to low speed mode (1cps or 30cps) to operate.
   If set to high speed mode (1k, 5k, 10kcps), counting error occurs due to chattering.
7. Keep away from high voltage lines or power lines to prevent inductive noise.
   In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
   Do not use near the equipment which generates strong magnetic force or high frequency noise.
8. This product may be used in the following environments.
   ①Indoors (in the environment condition rated in 'Specifications')
   ②Altitude max. 2,000m
   ③Pollution degree 2
   ④Installation category II

DIN W72×H72, W48×H96mm Counter/Timer

■ Features

- Counting speed: 1cps / 30cps / 2kcps / 5kcps
- Selectable voltage input (PNP) method or no-voltage input (NPN) method
- Input mode: Up, Down, Up/Down
- Power supply: 100-240VAC 50/60Hz
- Dot for Decimal Point / Hour. Min. Second by RESET key
- Selectable Counter/Timer by internal DIP switch
- [Counter]
  20 input modes/18 output modes
- [Timer]
  16 output modes
  Various time setting range - 8-digit model: 0.01 sec to 99999 hour 59.9 min /
  6-digit model: 0.1 sec to 99999.9 hour /
  4-digit model: 0.01 sec to 9999 hour
- Output: Indicator, 1-stage setting, 2-stage setting

Please read "Safety Considerations" in the instruction manual before using.

■ Ordering Information

FX 4 H — 2P 4

Power supply	4	100-240VAC 50/60Hz
Output	1P	1-stage setting
	2P	2-stage setting
	I	Indicator
Size	H	DIN W48×H96mm
	M	DIN W72×H72mm
Display digit	4	9999 (4-digit)
	6	999999 (6-digit)
	8	99999999 (8-digit)
Item	FX	Counter/Timer

■ Specifications

Model	1-stage setting		**FX4H-1P4**	**FX4M-1P4**	**FX6M-1P4**	**FX8M-1P4**
	2-stage setting		**FX4H-2P4**	**FX4M-2P4**	**FX6M-2P4**	—
	Indicator		—	**FX4M-I4**	**FX6M-I4**	**FX8M-I4**
Display digit			4-digit		6-digit	8-digit
Character size (W×H)			6×10mm		4×8mm	3.8×7.6mm
Power supply			100-240VAC~ 50/60Hz			
Permissible voltage range			90 to 110% of rated voltage			
Power consumption			● 1-stage: max. 4.6VA ● 2-stage: max. 5.8VA ● Indicator: max. 3.8VA			
Max. counting speed of CP1/CP2			Selectable 1cps / 30cps / 2kcps / 5kcps (DIP switch)			
Return time			Max. 500ms			
Min. signal width			INHIBIT, RESET: approx. 20ms			
Input method			Selectable voltage input (PNP) method or no-voltage input (NPN) method [Voltage input (PNP) method]-input impedance: max. 10.8kΩ, [H]: 5-30VDC⎓, [L]: 0-2VDC [No-voltage input (NPN) method]-short-circuit impedance: max. 470Ω , short-circuit residual voltage: max. 1VDC, open-circuit impedance: min. 100kΩ			
One-shot output time			● 1-stage: 0.05 to 5 sec ● 2-stage: 1st setting 0.5 sec fixed, 2nd setting 0.05 to 5 sec			
Control output	Contact	Type	● 1-stage: Instantaneous SPDT (1c) ● 2-stage: OUT1-Instantaneous SPDT (1c), OUT2-Instantaneous SPDT (1c)			
		Capacity	250VAC~ 3A, 30VDC⎓ 3A resistive load			
	Solid state	Type	● 1-stage: 1 NPN open collector ● 2-stage: OUT1-1 NPN open collector, OUT2-1 NPN open collector			
		Capacity	● Load voltage: max. 30VDC⎓ ● Load current: max. 100mA ● Residual voltage: max. 1VDC⎓			
Relay life cycle	Mechanical		Min. 10,000,000 operations			
	Electrical		Min. 100,000 operations (250VAC 3A resistive load)			
Repeat/Set/Voltage/Temp. error			Max. ±0.01% ±0.05 sec			
Insulation resistance			Over 100MΩ (at 500VDC megger)			
External power supply			Max. 12VDC⎓ ±10% 50mA			
Memory retention			Approx. 10 years (non-volatile memory)			
Dielectric strength			2,000VAC 50/60Hz for 1 min (between all terminals and case)			
Noise immunity			±2kV the square wave noise (pulse width 1μs) by noise simulator			

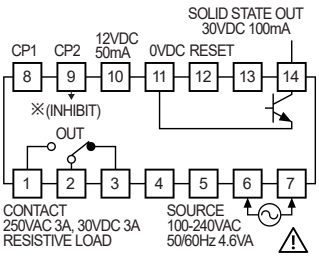
■ Specifications

Model	1-stage setting	**FX4H-1P4**	**FX4M-1P4**	**FX6M-1P4**	**FX8M-1P4**
	2-stage setting	**FX4H-2P4**	**FX4M-2P4**	**FX6M-2P4**	**—**
	Indicator	**—**	**FX4M-I4**	**FX6M-I4**	**FX8M-I4**
Vibration	Mechanical	0.75mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour			
	Malfunction	0.5mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min			
Shock	Mechanical	300m/s^2 (approx. 30G) in each X, Y, Z direction for 3 times			
	Malfunction	100m/s^2 (approx. 10G) in each X, Y, Z direction for 3 times			
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃			
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH			
Protection structure		IP20 (front part, IEC standard)			
Approval		CE c UL us			
Weight※1	1-stage setting	Approx. 245g (approx. 180g)			
	2-stage setting	Approx. 265g (approx. 200g)			
	Indicator	Approx. 225g (approx. 160g)			

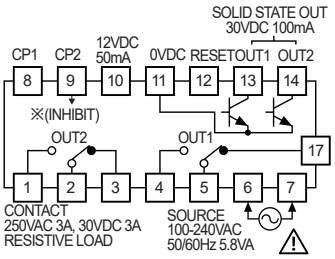
※1: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

■ Connections

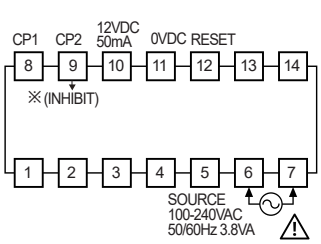
• FX□M-1P4



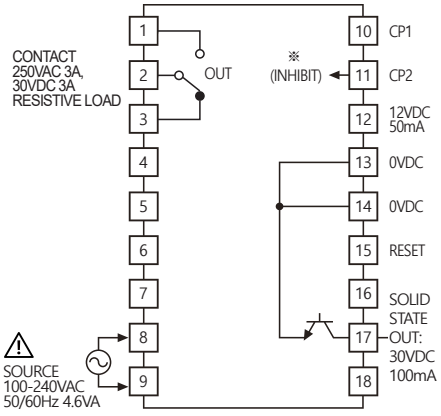
• FX□M-2P4



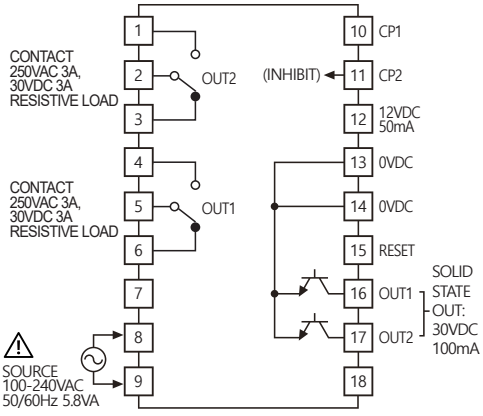
• FX□M-I4



• FX4H-1P4



• FX4H-2P4

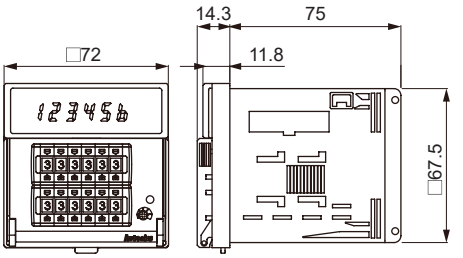


※INHIBIT: In case of timer mode, this terminal is for time hold.
(voltage input (PNP): connect with 12VDC, no-voltage input (NPN): connect with 0VDC)

▣ Dimensions

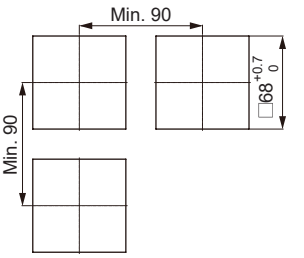
(unit: mm)

◎ FXM Series

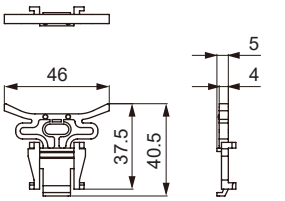


◎ Panel cut-out

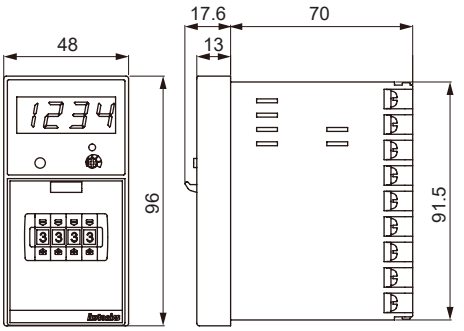
● FXM Series



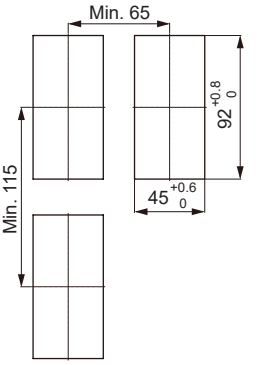
◎ Bracket (FXM, FXH Series universal)



◎ FXH Series



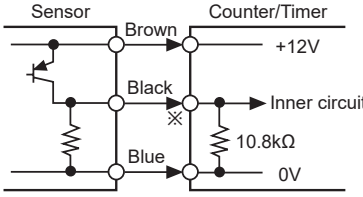
● FXH Series



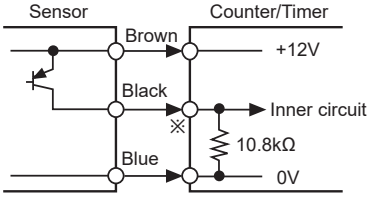
▣ Input Connections

◎ Voltage input (PNP)

● Solid-state input (standard sensor: PNP output type sensor)



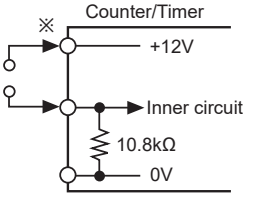
(PNP output)



(PNP open collector output)

※CP1, CP2 (INHIBIT), RESET input part

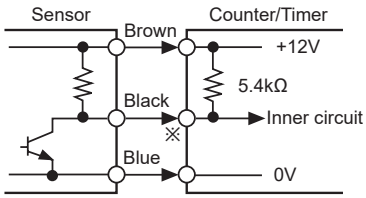
● Contact input



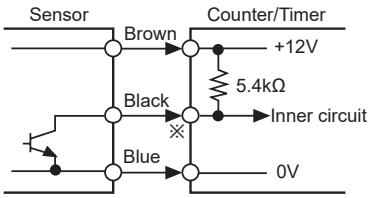
※Counting speed
: Set as 1 or 30cps

◎ No-voltage input (NPN)

● Solid-state input (standard sensor: NPN output type sensor)



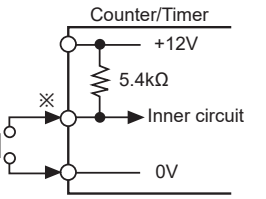
(NPN output)



(NPN open collector output)

※CP1, CP2 (INHIBIT), RESET input part

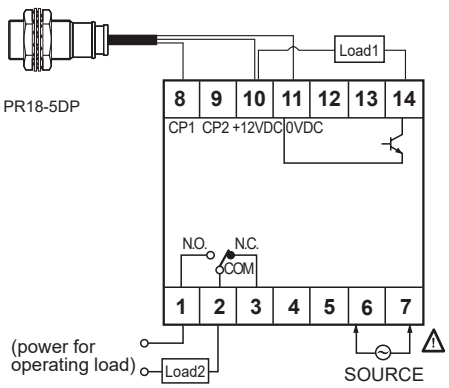
● Contact input



※Counting speed
: Set as 1 or 30cps

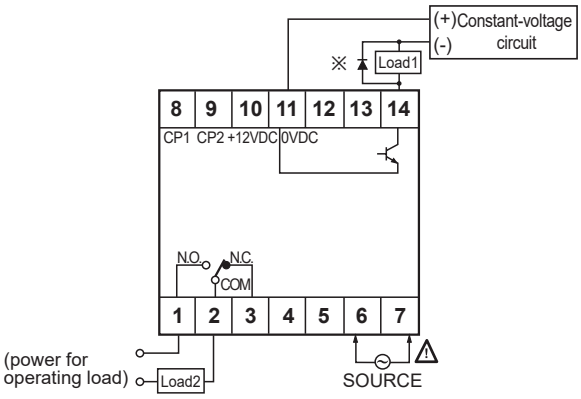
▣ Input & Output Connections

◎ When operation load by sensor power



- The sum of operating current capacity of load 1 and sensor should not be over external power capacity (50mA).

◎ When operating load by external power

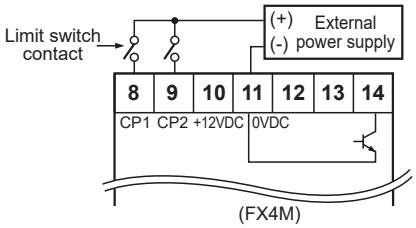


- The capacity of load 1 should not be over transistor switching capacity (max. 30VDC, 100mA)
- Do not supply the reverse polarity power.

※when using inductive load (relay, etc.), connector surge absorber at both ends of the load 1

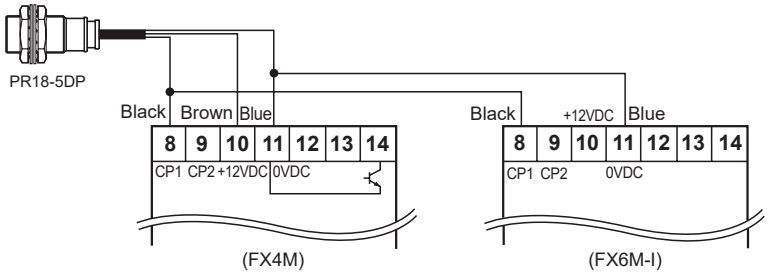
◎ How to count by external power supply

This unit starts to count when [H] (5-30VDC) is applied at CP1 or CP2 after selecting PNP.



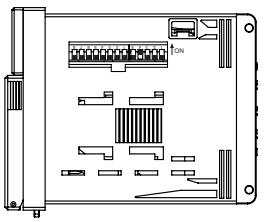
◎ Using 2 counters with one sensor

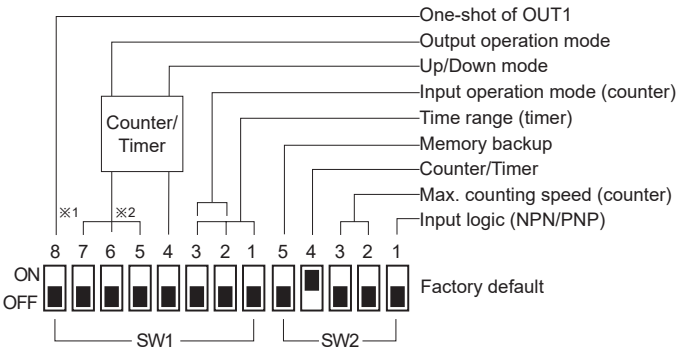
Please connect as the power of sensor is supplied from only one of counters and design input logic with same way.



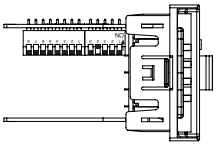
■ DIP Switch Setting

◎ FXM Series





◎ FXH Series



※1: Only 2-stage setting model has no. 8 of SW1.
※2: Indicator model does not have no. 5, 6, 7, 8 of SW1.

• Input logic (CP1, CP2, INHIBIT, RESET input)

SW2		Function
1	ON OFF	NPN (no-voltage input)
	ON OFF	PNP (voltage input)

• Max. counting speed (counter)

SW2	3 2 ON OFF	3 2 ON OFF	3 2 ON OFF	3 2 ON OFF
Function	1cps	30cps	2kcps	5kcps

• Counter/Timer

SW2		Function
4	ON OFF	Counter mode
	ON OFF	Timer mode

• Memory backup

SW2		Function
5	ON OFF	No memory backup
	ON OFF	Memory backup

• Up/Down mode

SW1		Function
4	ON OFF	Down mode
	ON OFF	Up mode

• Time range (timer)

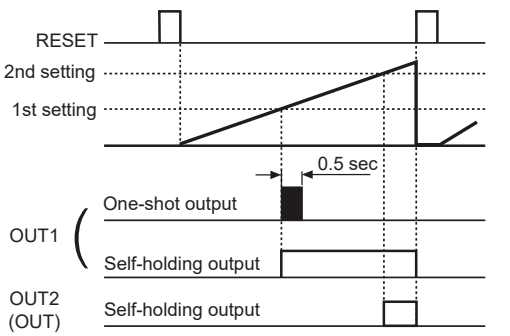
SW1	4-digit	6-digit	8-digit
3 2 1 ON OFF	99.99 sec	99999.9 sec	999999.99 sec
3 2 1 ON OFF	999.9 sec	999999 sec	9999999.9 sec
3 2 1 ON OFF	9999 sec	99 min 59.99 sec	99999999 sec
3 2 1 ON OFF	99 min 59 sec	999 min 59.9 sec	99999 min 59.9 sec
3 2 1 ON OFF	999.9 min	99999.9 min	9999999.9 min
3 2 1 ON OFF	99 hour 59 min	99 hour 59 min 59 sec	999 hour 59 min 59.9 sec
3 2 1 ON OFF	999.9 hour	9999 hour 59 min	9999 hour 59 min 59 sec
3 2 1 ON OFF	9999 hour	99999.9 hour	99999 hour 59.9 min

• One-shot output of OUT1

SW1		Function
8	ON OFF	One-shot output of OUT1
	ON OFF	Self-holding output of OUT1

※This function is for setting one-shot output (0.5 sec fixed) or self-holding output (until OUT2 turns OFF) of OUT1 at 2-stage setting model.

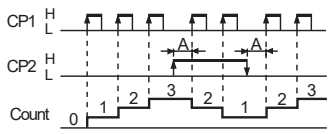
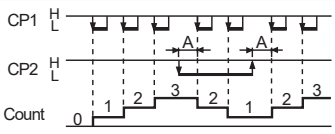
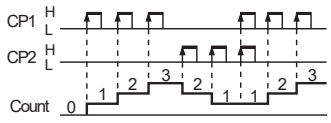
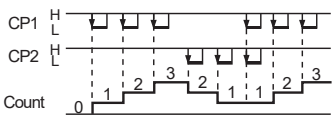
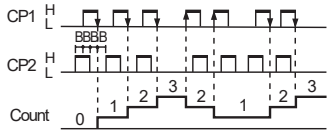
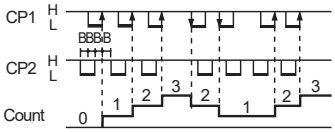
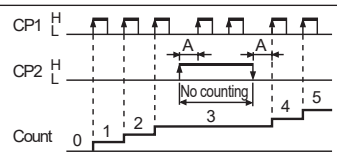
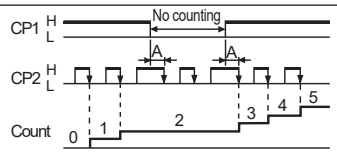
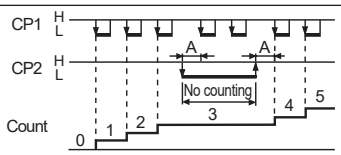
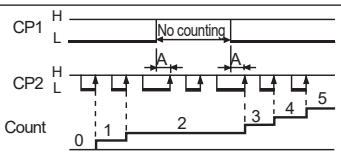
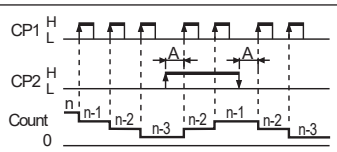
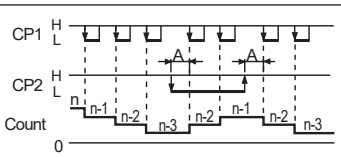
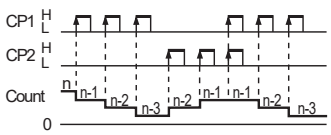
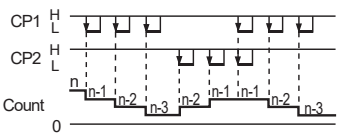
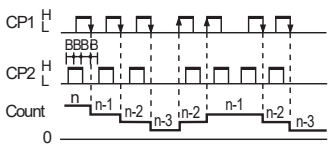
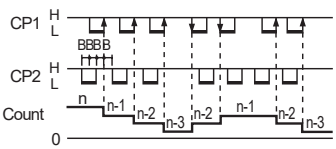
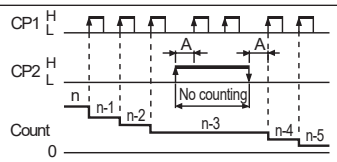
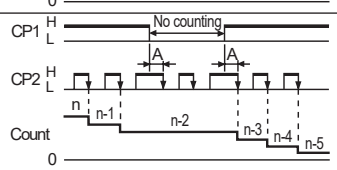
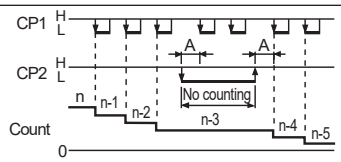
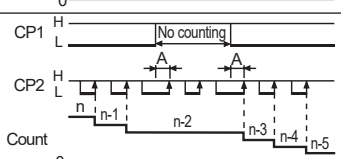
※Example of output operation mode F



※How to change settings
Power OFF → change settings → power ON → press RESET key or input signal (min. 20ms)

■ Input Operation Mode (Counter)

※CP: Clock Pulse

Input mode		SW1	Voltage input (PNP) method	No-voltage input (NPN) method
Up mode (4 ON / OFF)	Up/ Down-A (command input)	3 2 ON / OFF		
	Up/ Down-B (individual input)	3 2 ON / OFF		
	Up/ Down-C (phase difference input)	3 2 ON / OFF		
	Up (adding input)	3 2 ON / OFF	 	 
Down mode (4 ON / OFF)	Up/ Down-D (command input)	3 2 ON / OFF		
	Up/ Down-E (individual input)	3 2 ON / OFF		
	Up/ Down-F (phase difference input)	3 2 ON / OFF		
	Down (subtracting input)	3 2 ON / OFF	 	 

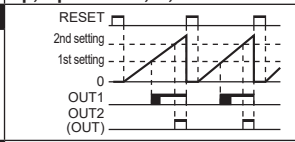
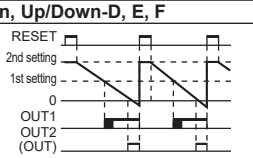
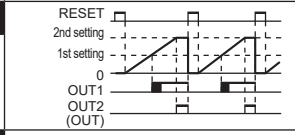
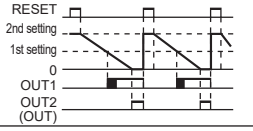
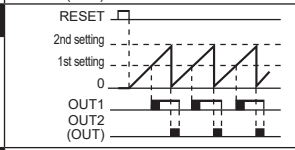
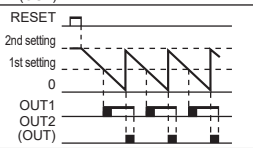
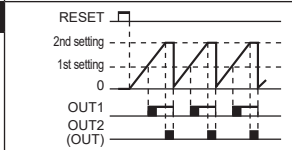
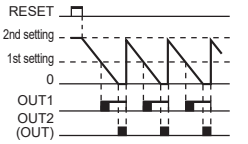
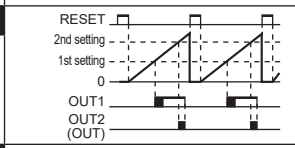
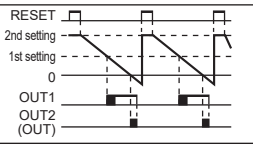
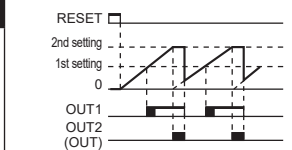
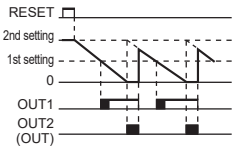
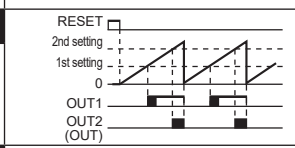
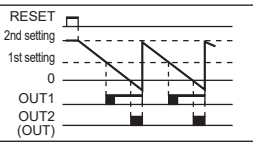
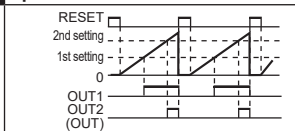
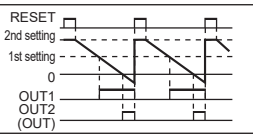
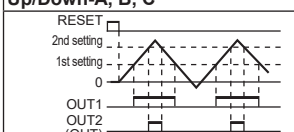
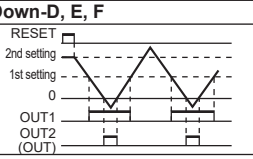
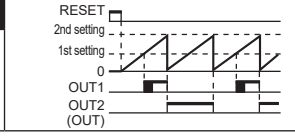
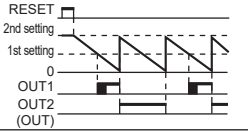
※A: over min. signal width, B: over than 1/2 of min. signal width. If the signal is smaller than these width, it may cause counting error (±1).

▣ Output Operation Mode

One-shot output of OUT2 **(0.05 to 5 sec)**

Self-holding output
One-shot output of OUT1 (0.5 sec fixed)

Self-holding output

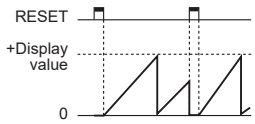
Output mode (SW1)	ON OFF 4 Up mode	ON OFF 4 Down mode	Operation
	Up, Up/Down-A, B, C	Down, Up/Down-D, E, F	
F 7 6 5 ON OFF			After count-up, counting display value increases or decreases until reset signal input is applied and self-holding output is maintained.
N 7 6 5 ON OFF			After count-up, counting display value and self-holding output are maintained until reset signal input is applied.
C 7 6 5 ON OFF			When count-up, counting display value is reset and it counts simultaneously. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2. One-shot output time of OUT1 is regardless of OUT2 output.
R 7 6 5 ON OFF			After count-up, counting display value is reset after one-shot output time of OUT2 and it counts simultaneously. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2. One-shot output time of OUT1 is regardless of OUT2 output.
K 7 6 5 ON OFF			After count-up, counting display value increases or decreases until reset signal input is applied. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2. One-shot output time of OUT1 is regardless of OUT2 output.
P 7 6 5 ON OFF			After count-up, counting display value is maintained while OUT2 output is ON. Counting value is internally reset and it counts simultaneously. When OUT2 output is OFF, displays counting value while OUT2 output is ON, and it increases or decreases. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2.
Q 7 6 5 ON OFF			After count-up, counting display value increases or decreases during one-shot time of OUT2. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2. One-shot output time of OUT1 is regardless of OUT2 output.
S Counter mode 7 6 5 ON OFF	Up	Down	● Up, Up/Down-A, B, C input mode : OUT1 output maintains ON when counting display value is larger or equal than 1st setting value. OUT2 output maintains ON when counting display value is larger or equal than 2nd setting value. ● Down, Up/Down-D, E, F input mode : OUT1 output maintains ON when counting display value is smaller or equal than 1st setting value. OUT2 output maintains ON when counting display value is smaller or equal than 2nd setting value.
			
	Up/Down-A, B, C	Up/Down-D, E, F	
			
S Timer mode 7 6 5 ON OFF			OUT1 and OUT2 turns OFF→ON→OFF repeatedly (flicker).

※Set one-shot output time by front TIME volume switch.

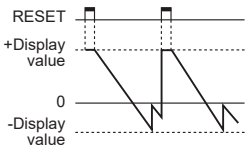
▣ Counting & Time Operation For Indicator (FX□M-I4)

◎ Counting operation

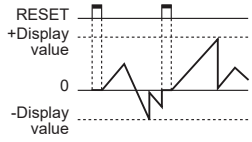
● **Input mode: Up**



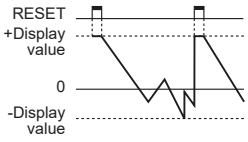
● **Input mode: Down**



● **Input mode: Up / Down-A, B, C**

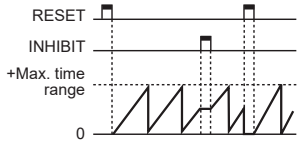


● **Input mode: Up / Down-D, E, F**

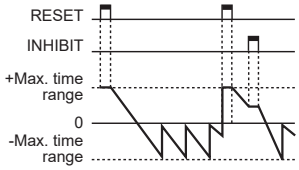


◎ Time operation

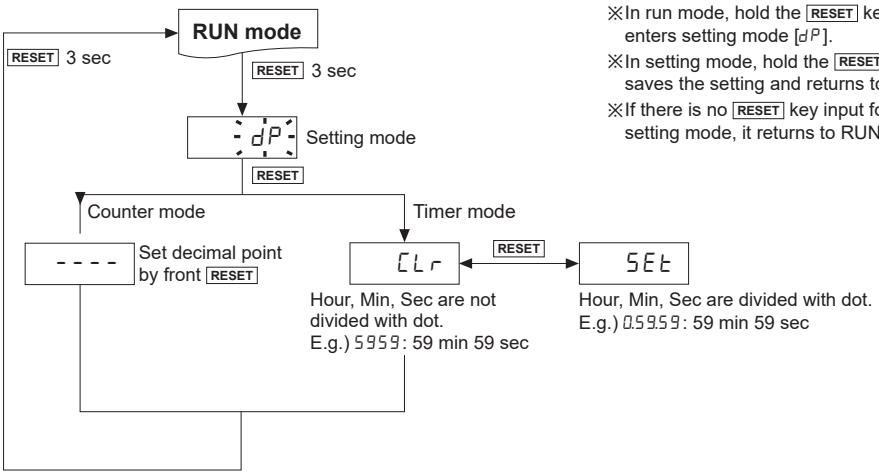
● **Up mode**



● **Down mode**



▣ Dot for Decimal Point / Hour, Min, Sec



※In run mode, hold the RESET key for over 3 sec, and it enters setting mode [dP].
※In setting mode, hold the RESET key for over 3 sec, and it saves the setting and returns to RUN mode.
※If there is no RESET key input for 60 sec when entering setting mode, it returns to RUN mode.

▣ Error Display and Output Operation

Error Display	Error description	Troubleshooting
Err0	Setting value is 0.	Change the setting value anything but 0.

※When error occurs, the output turns OFF.
※When 1st setting value is set as 0 (zero), OUT1 maintains OFF.
When 2nd setting value is smaller than 1st setting value, 1st setting value is ignored and only OUT2 output operates.
※Indicator model does not have error display function.

▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- Use the product, 0.1 sec after supplying power.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- In case of contact input, set count speed to low speed mode (1cps or 30cps) to operate.
  If set to high speed mode (2kcps or 5kcps), counting error occurs due to chattering.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- This product may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

DIN W48×H48mm 8 Pin Plug Counter

Features

- Upgraded counting speed: 1cps / 30cps / 2kcps / 5kcps
- Selectable voltage input (PNP) method or no-voltage input (NPN) method
- Decimal point setting (fixed decimal point of display)
- Wide range of power supply
  : 100-240VAC 50/60Hz, 24VAC 50/60Hz, 24-48VDC universal
- Memory protection for 10 years (using non-volatile semiconductor)
- Selectable Up/Down for counting value
- Built-in Microprocessor

Please read "Safety Considerations" in the instruction manual before using.

Ordering Information

FS 4 – 1P 4

Item		
Display digit	4	9999 (4-digit)
	5	99999 (5-digit)
Item	FS	8-pin plug counter
Output	1P	1-stage setting
	I	Indicator
Power supply	2	24VAC 50/60Hz, 24-48VDC
	4	100-240VAC 50/60Hz

※8-pin socket (PG-08, PS-08(N)) is sold separately.

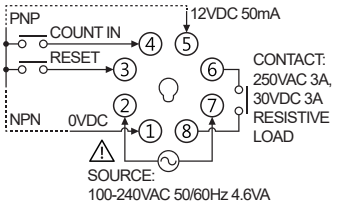
Specifications

Model	1-stage setting		**FS4-1P2**	**FS4-1P4**	—
	Indicator		—	—	**FS5-I4**
Display digit			4-digit		5-digit
Character size (W×H)			3.8×7.6mm		4×8mm
Power supply			24VAC~ 50/60Hz, 24-48VDC⎓	100-240VAC~ 50/60Hz	
Permissible voltage range			90 to 110% of rated voltage		
Power consumption			Max. 3.5VA (24VAC~ 50/60Hz), Max. 2.3W (24-48VDC⎓)	Max. 4.6VA (100-240VAC~ 50/60Hz)	Max. 3.8VA (100-240VAC~ 50/60Hz)
Max. counting speed for COUNT IN			Selectable 1cps/30cps/2kcps/5kcps (DIP switch)		
Return time			Max. 500ms		
Min. signal width			RESET: approx. 20ms		
Input method			Selectable voltage input (PNP) method or no-voltage input (NPN) method [Voltage input (PNP) method]-input impedance: max. 10.8kΩ, [H]: 5-30VDC⎓, [L]: 0-2VDC [No-voltage input (NPN) method]-short-circuit impedance: max. 470Ω, short-circuit residual voltage: max. 1VDC, open-circuit impedance: min. 100kΩ		
One-shot output time			0.05 to 5 sec		
Control output	Contact	Type	Instantaneous SPST (1a)		—
		Capacity	250VAC~ 3A, 30VDC⎓ 3A resistive load		
Relay life cycle	Mechanical		Min. 5,000,000 operations		
	Electrical		Min. 100,000 operations (250VAC 3A resistive load)		
Insulation resistance			Over 100MΩ (at 500VDC megger)		
External power supply			Max. 12VDC⎓ ±10% 50mA		
Memory retention			Approx. 10 years (non-volatile memory)		
Dielectric strength			2,000VAC 50/60Hz for 1 min (between all terminals and case)		
Noise immunity	AC voltage		±2kV the square wave noise (pulse width 1μs) by noise simulator		
	AC/DC voltage		±500V the square wave noise (pulse width 1μs) by noise simulator		
Vibration	Mechanical		0.75mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour		
	Malfunction		0.5mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min		
Shock	Mechanical		300m/s^2 (approx. 30G) in each X, Y, Z direction for 3 times		
	Malfunction		100m/s^2 (approx. 10G) in each X, Y, Z direction for 3 times		
Environment	Ambient temp.		-10 to 55℃, storage: -25 to 65℃		
	Ambient humi.		35 to 85%RH, storage: 35 to 85%RH		
Protection structure			IP20 (front part, IEC standard)		
Approval					
Weight※1			Approx. 130g (approx. 90g)		Approx. 120g (approx. 80g)

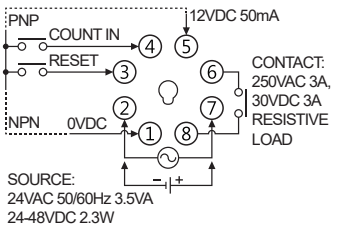
※1: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Connections

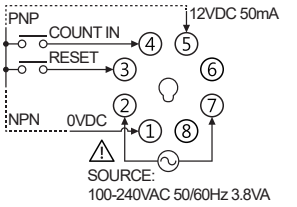
● **FS4-1P4**



● **FS4-1P2**



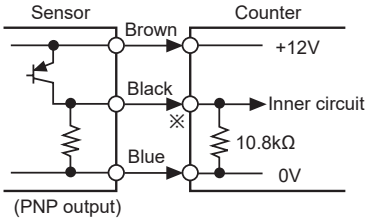
● **FS5-I4**

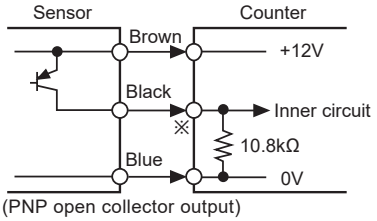


▣ Input Connections

◎ Voltage input (PNP)

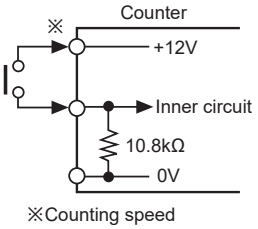
● **Solid-state input (standard sensor: PNP output type sensor)**





※COUNT IN, RESET input part

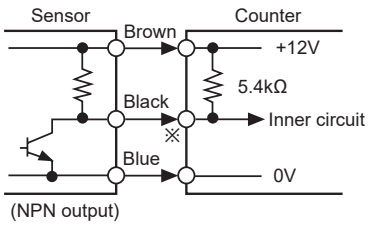
● **Contact input**

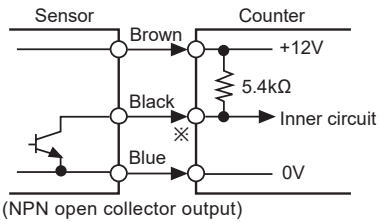


※Counting speed
: Set as 1 or 30cps

◎ No-voltage input (NPN)

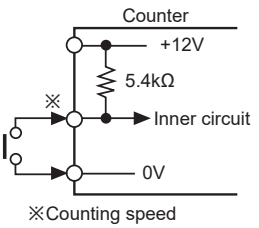
● **Solid-state input (standard sensor: NPN output type sensor)**





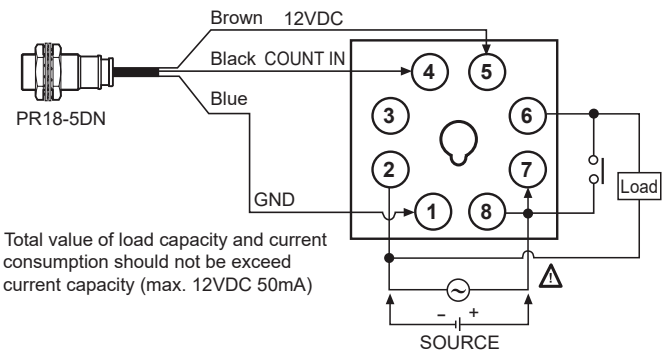
※COUNT IN, RESET input part

● **Contact input**



※Counting speed
: Set as 1 or 30cps

◎ Input & output connections

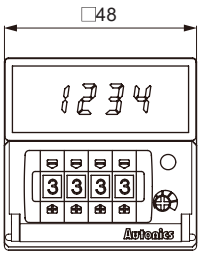


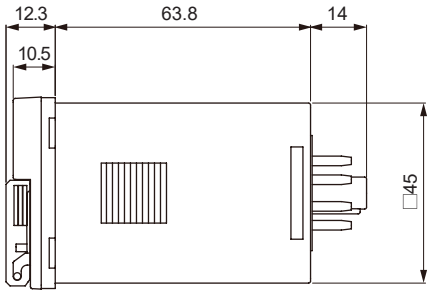
● Total value of load capacity and current consumption should not be exceed current capacity (max. 12VDC 50mA)

● Please select proper capacity of load not to exceed contact capacity.
Contact capacity: max. 250VAC 3A
Contact type: 1a

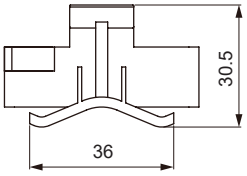
▣ Dimensions

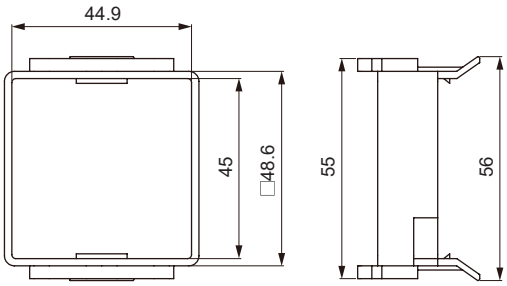
(unit: mm)



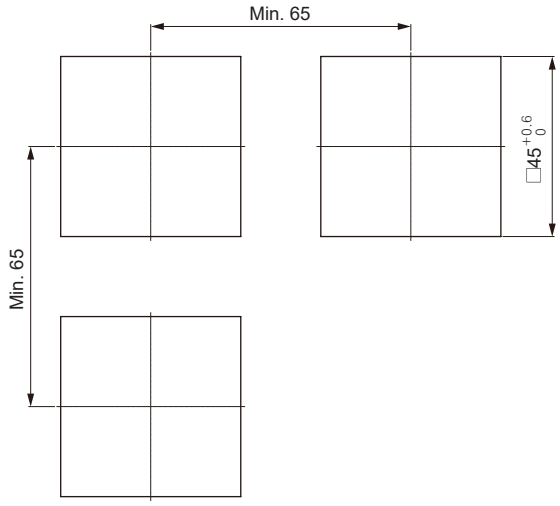


◎ Bracket

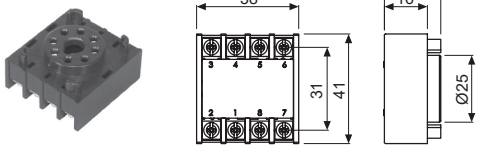
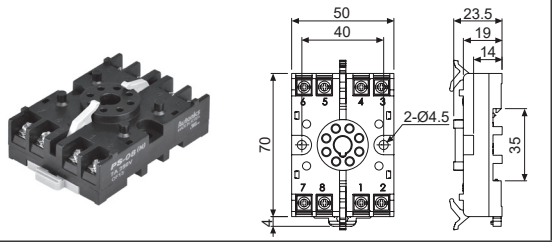




◎ Panel cut-out



◎ Socket (sold separately)

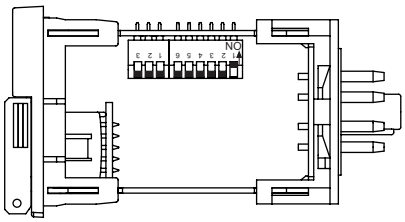
PG-08	PS-08(N)
	

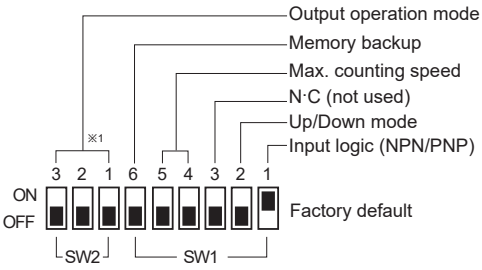
▣ Error Display and Output Operation

Error Display	Error description	Troubleshooting
Err0	Setting value is 0.	Change the setting value anything but 0.

※When error occurs, the output turns OFF.
※Indicator model does not have error display function.

▣ DIP Switch Setting





※1: Indicator model (FS5-I4) does not have no. 1, 2, 3 DIP switch of SW2 for output operation mode setting.

● Input logic (COUNT IN, RESET input)

SW1		Function
1	ON / OFF	NPN (no-voltage input)
	ON / OFF	PNP (voltage input)

● Up/Down mode

SW1		Function
2	ON / OFF	Down mode
	ON / OFF	Up mode

● Memory backup

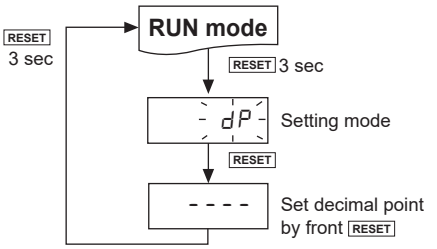
SW1		Function
6	ON / OFF	No memory backup
	ON / OFF	Memory backup

• Max. counting speed

SW1	Function
5 4 ON / OFF	1cps
5 4 ON / OFF	30cps
5 4 ON / OFF	2kcps
5 4 ON / OFF	5kcps

※How to change settings
Power OFF → change settings → power ON → press RESET key or input signal (min. 20ms)

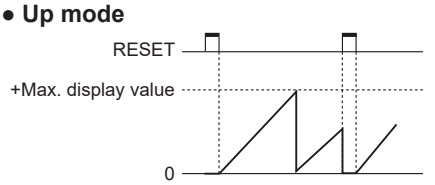
▣ Dot for Decimal Point



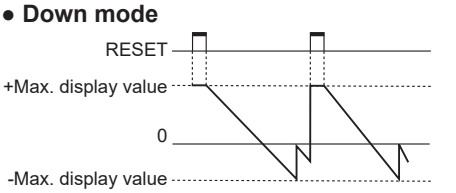
※In run mode, hold the RESET key for over 3 sec, and it enters setting mode [dP].
※In setting mode, hold the RESET key for over 3 sec, and it saves the setting and returns to RUN mode.
※If there is no RESET key input for 60 sec when entering setting mode, it returns to RUN mode.

▣ Counting Operation for Indicator (FS5-I4)

● Up mode



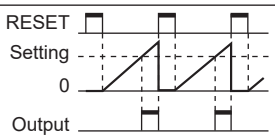
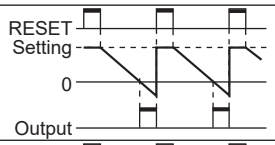
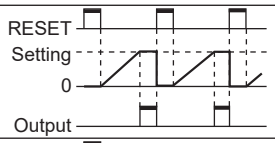
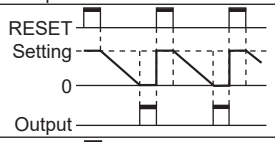
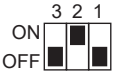
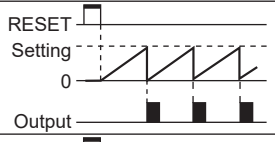
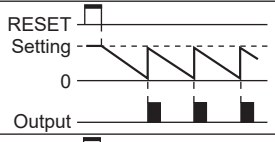
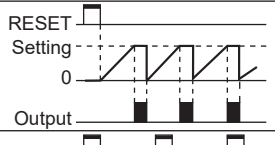
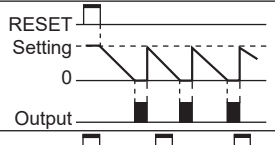
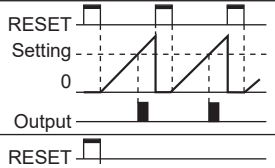
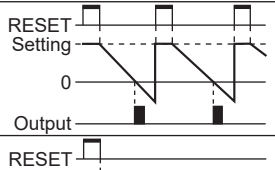
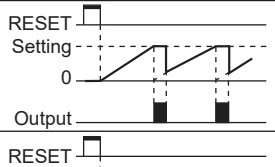
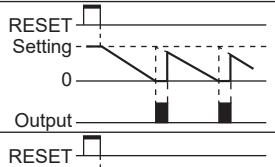
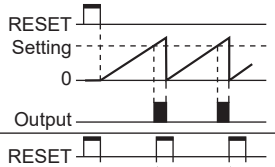
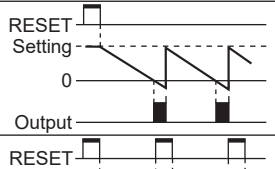
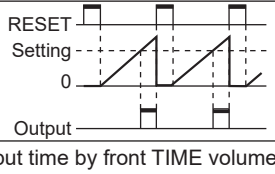
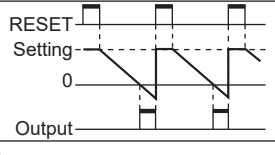
● Down mode



※- display is only for F, K, Q, S output operation mode and it cannot be set.

▣ Output Operation Mode

■ ← One-shot output (0.05 to 5 sec) ⊓ ← Self-holding output

Output mode (SW2)	SW1 ON OFF 2 Up mode	SW1 ON OFF 2 Down mode	Operation
F 			After count-up, counting display value increases or decreases until reset signal input is applied and self-holding output is maintained.
N 			After count-up, counting display value and self-holding output are maintained until reset signal input is applied.
C 			When count-up, counting display value is reset and it counts simultaneously.
R 			After count-up, counting display value is reset after one-shot output time and it counts simultaneously.
K 			After count-up, counting display value increases or decreases until reset signal input is applied.
P 			After count-up, counting display value is maintained while output is ON. Counting value is internally reset and it counts simultaneously.
Q 			After count-up, counting display value increases or decreases during one-shot output time.
S 			Output maintains ON when counting display value is larger or equal than setting value.

※Set one-shot output time by front TIME volume switch.

▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- 24-48VDC, 24VAC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Use the product, 0.1 sec after supplying power.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- In case of contact input, set count speed to low speed mode (1cps or 30cps) to operate.
  If set to high speed mode (2kcps or 5kcps), counting error occurs due to chattering.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- This product may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

DIN W72×H72mm Up·Down Measure Counter

▣ Features

- Parameter Setting
  : Input/Output operation mode, Max. counting speed, Decimal point position, OUT1/2 time (0.01 to 99.99 sec), Selectable voltage input (PNP) method or no-voltage input (NPN) method, Selectable Multiply or Divide mode function.
- Memory protection for 10 years (using non-voltage semiconductor)
- Power supply: 100-240VAC 50/60Hz
- Built-in Microprocessor

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

FM **4** **M** — **1P** **4**

Power supply	4	100-240VAC 50/60Hz
Output	1P	1-stage setting
	2P	2-stage setting
	I	Indicator
Function	M	Measure function
Display digit	4	9999 (4-digit)
	6	999999 (6-digit)
Size	FM	DIN W72×H72mm

▣ Specifications

Model	1-stage setting		**FM4M-1P4**	**FM6M-1P4**
	2-stage setting		**FM4M-2P4**	**FM6M-2P4**
	Indicator		**FM4M-I4**	**FM6M-I4**
Display digit			4-digit	6-digit
Character size (W×H)			6×10mm	4×8mm
Power supply			100-240VAC⎓ 50/60Hz	
Permissible voltage range			90 to 110% of rated voltage	
Power consumption			●1-stage: max. 4.6VA ●2-stage: max. 5.8VA ●Indicator: max. 3.8VA	
Max. counting speed of CP1/CP2			Selectable 1cps / 30cps / 300cps / 2kcps / 5kcps	
Return time			Max. 500ms	
Min. signal width			RESET: approx. 20ms	
Input method			Selectable voltage input (PNP) method or no-voltage input (NPN) method [Voltage input (PNP) method]-input impedance: max. 10.8kΩ, [H]: 5-30VDC⎓, [L]: 0-2VDC [No-voltage input (NPN) method]-short-circuit impedance: max. 470Ω, short-circuit residual voltage: max. 1VDC, open-circuit impedance: min. 100kΩ	
One-shot output time			0.01 to 99.99 sec	
Control output	Contact	Type	●1-stage: Instantaneous SPDT (1c) ●2-stage: Instantaneous OUT1-SPST (1a), Instantaneous OUT2-SPST (1a)	
		Capacity	250VAC⎓ 3A, 30VDC⎓3A resistive load	
	Solid state	Type	●1-stage: 1 NPN open collector ●2-stage: OUT1-1 NPN open collector, OUT2-1 NPN open collector	
		Capacity	NPN open collector output ●Load voltage: max. 30VDC⎓ ●Load current: max. 100mA ●Residual voltage: max 1VDC⎓	
Relay life cycle		Mechanical	Min. 5,000,000 operations	
		Electrical	Min. 100,000 operations (250VAC 3A resistive load)	
Insulation resistance			Over 100MΩ (at 500VDC megger)	
External power supply			Max. 12VDC⎓±10% 50mA	
Memory retention			Approx. 10 years (non-volatile memory)	
Dielectric strength			2,000VAC 50/60Hz for 1 min (between all terminals and case)	
Noise immunity			±2kV the square wave noise (pulse width 1μs) by noise simulator	

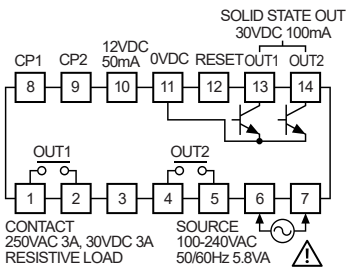
■ Specifications

Model	1-stage setting	**FM4M-1P4**	**FM6M-1P4**
	2-stage setting	**FM4M-2P4**	**FM6M-2P4**
	Indicator	**FM4M-I4**	**FM6M-I4**
Vibration	Mechanical	0.75mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour	
	Malfunction	0.5mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min	
Shock	Mechanical	300m/s^2 (approx. 30G) in each X, Y, Z direction for 3 times	
	Malfunction	100m/s^2 (approx. 10G) in each X, Y, Z direction for 3 times	
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃	
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH	
Protection structure		IP20 (front part, IEC standard)	
Approval		CE c UL us	
Weight※1	1-stage setting	Approx. 245g (approx. 180g)	
	2-stage setting	Approx. 265g (approx. 200g)	
	Indicator	Approx. 225g (approx. 160g)	

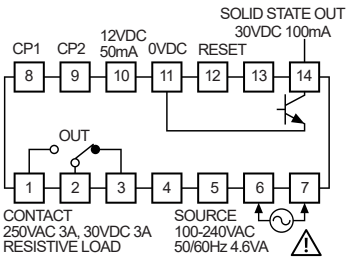
※1: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

■ Connections

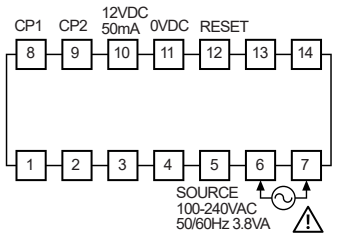
● **FM□M-2P4**



● **FM□M-1P4**

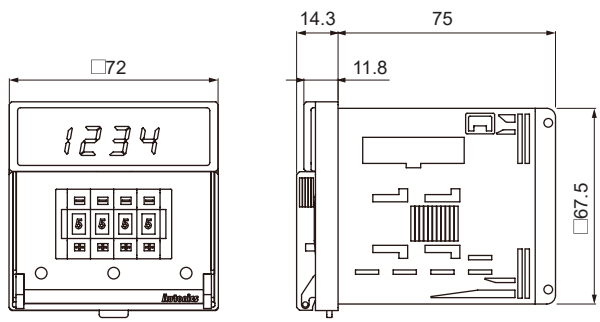


● **FM□M-I4**

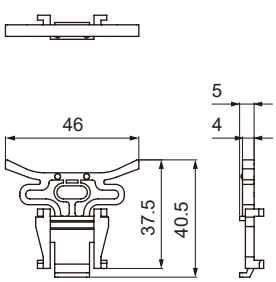


■ Dimensions

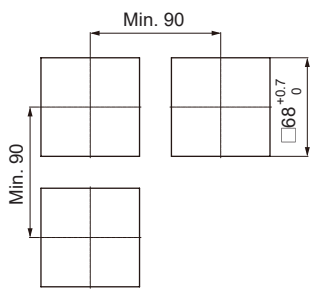
(unit: mm)



◎ Bracket



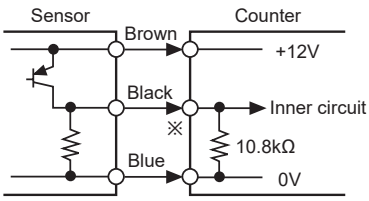
◎ Panel cut-out



▣ Input Connections

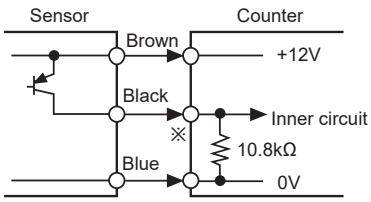
◎ Voltage input (PNP)

● Solid-state input (standard sensor: PNP output type sensor)



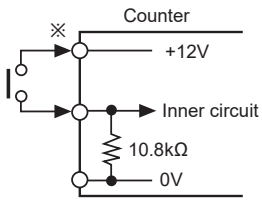
(PNP output)

※CP1, CP2, RESET input part



(PNP open collector output)

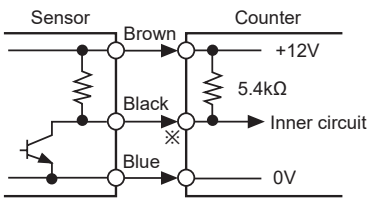
● Contact input



※Counting speed
: Set as 1 or 30cps

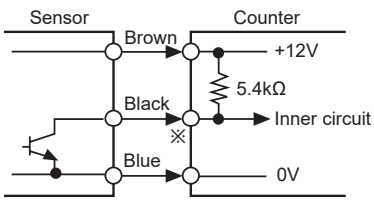
◎ No-voltage input (NPN)

● Solid-state input (standard sensor: NPN output type sensor)



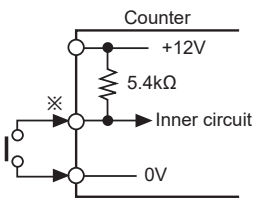
(NPN output)

※CP1, CP2, RESET input part



(NPN open collector output)

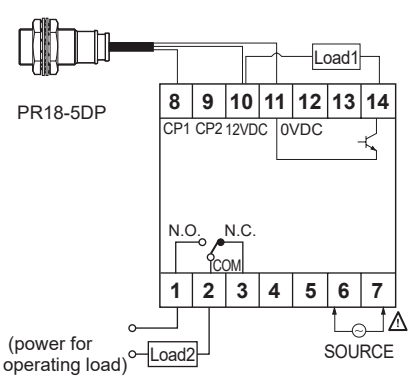
● Contact input



※Counting speed
: Set as 1 or 30cps

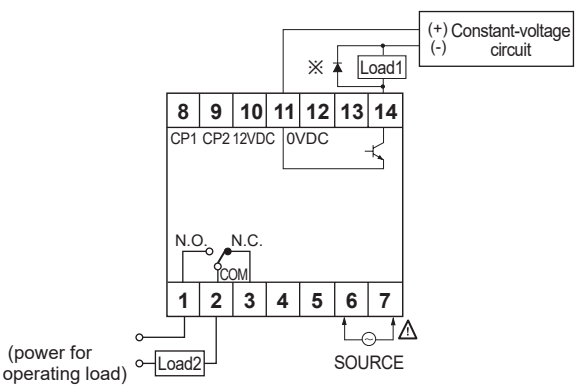
▣ Input & Output Connections

◎ When operation load by sensor power



- The sum of operating current capacity of load 1 and sensor should not be over external power capacity (50mA).

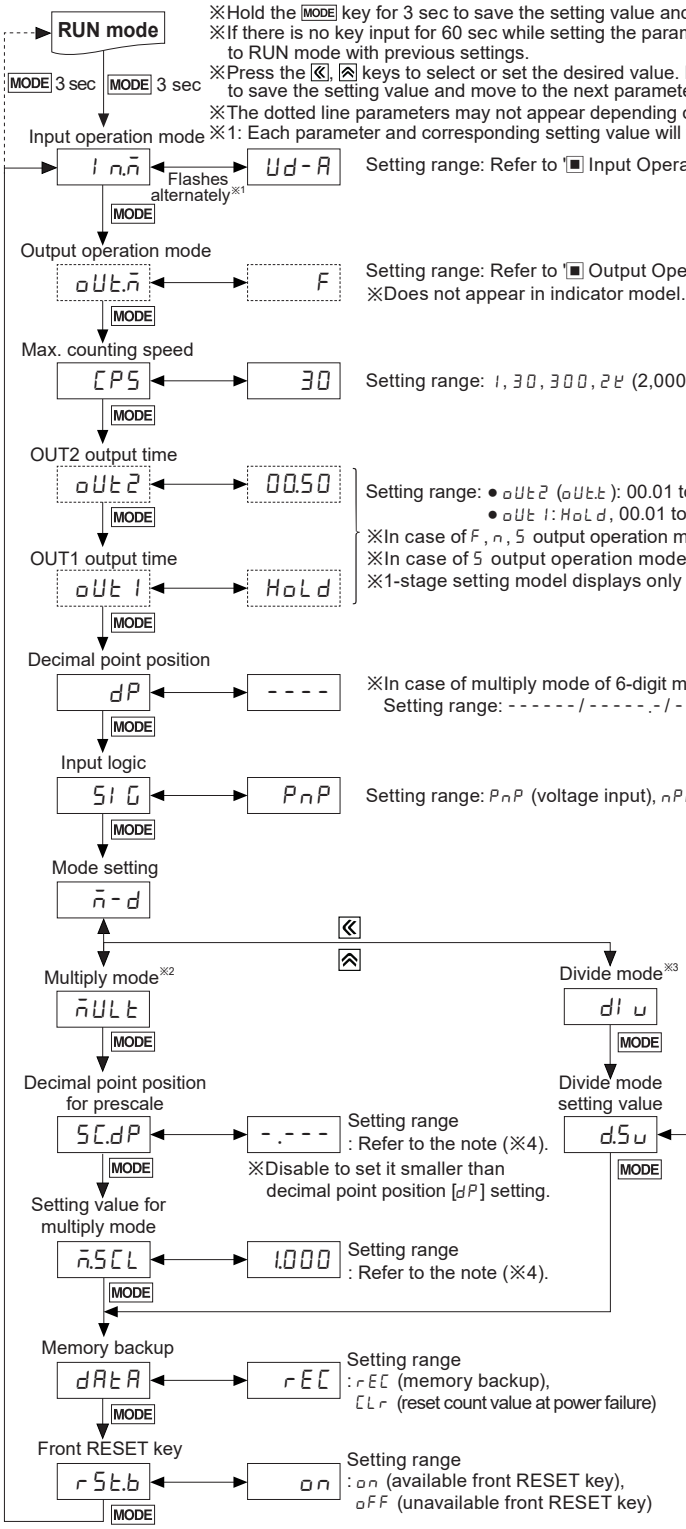
◎ When operating load by external power



- The capacity of load 1 should not be over transistor switching capacity (max. 30VDC, 100mA)
- Do not supply the reverse polarity power.

※when using inductive load (relay, etc.), connector surge absorber at both ends of the load 1

▣ Parameter Setting



※Hold the MODE key for 3 sec to save the setting value and return to RUN mode after changing the setting value.
※If there is no key input for 60 sec while setting the parameters, the new settings are ignored, and the unit returns to RUN mode with previous settings.
※Press the ≪, ≫ keys to select or set the desired value. Press the MODE key once after changing the setting value, to save the setting value and move to the next parameter.
※The dotted line parameters may not appear depending on output specifications or other parameter settings.
※1: Each parameter and corresponding setting value will flash alternately every 0.5 sec.

Setting range: Refer to '▣ Input Operation Mode'.

Setting range: Refer to '▣ Output Operation Mode'.
※Does not appear in indicator model.

Setting range: 1, 30, 300, 2K (2,000), 5K (5,000)

Setting range: ● oUt2 (oUt.t): 00.01 to 99.99 sec
● oUt1: HoLd, 00.01 to 99.99 sec
※In case of F, n, 5 output operation mode, oUt2 (oUt.t) does not appear.
※In case of 5 output operation mode for 2-stage setting, oUt1 does not appear.
※1-stage setting model displays only oUt.t.

※In case of multiply mode of 6-digit model, decimal point is available up to 3rd digit.
Setting range: ------/-----.-/----.--/---.---

Setting range: PnP (voltage input), nPn (no-voltage input)

Setting range
: Refer to the note (※4).
※Disable to set it smaller than decimal point position [dP] setting.

Setting range
: 1 to 9999

Setting range
: Refer to the note (※4).

Setting range
: rEC (memory backup),
CLr (reset count value at power failure)

Setting range
: on (available front RESET key),
oFF (unavailable front RESET key)

※4

Decimal point position [dP]	Prescale decimal point position [SC.dP]	Setting value for multiply mode [n.SCL]
----	----/---.-/--.--/-.---	0.001 to 9999
---.-	---.-/--.--/-.---	0.001 to 999.9
--.--	--.--/-.---	0.001 to 99.99
-.---	-.---	0.001 to 9.999

※2: Multiply mode [nULt]: Displayed by multiplying input signal and setting value.
Input signal×Setting value=Display value (input signal: 1, setting value: 4, it displays 4(1×4))
※3: Divide mode [dIv]: Displays 1 when input signals are input as the setting value.
Input signal/Setting value=Display value (input signal: 4, setting value: 4, it displays 1(4/4))

▣ Measure Counter

Measure counter sets multiply or divide integer per 1 pulse input.

● Multi Mode

It multiplies the inner SW3 setting value at a count input signal and displays it.

Input signal (N)×Multi Mode preset value=Indication value

∴ N × 4 = 4, 8, 12 … (N=1, 2, 3 ..)

● Divide Mode

It displays as 1 when the count input signal is entered as preset value of inner SW3.

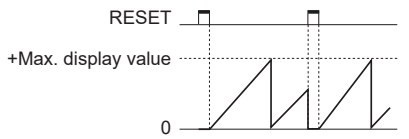
$$\frac{\text{Input signal (N)}}{\text{Divide Mode preset value}} = \text{Indication value}$$

$$\therefore \frac{N}{5} = 1, 2, 3 \ \ldots \ (N=5, 10, 15 \ldots)$$

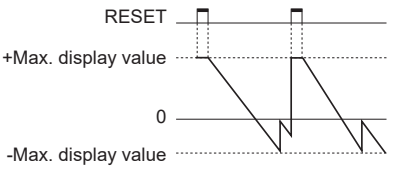
※Please be cautious the error can occur when down count is executed during up count.

▣ Counting Operation for Indicator (FM□M-I4)

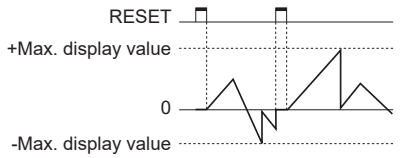
● Input mode: Up



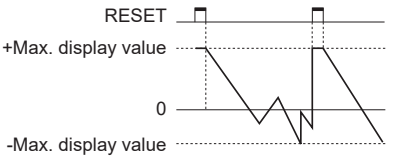
● Input mode: Down



● Input mode: Up / Down-A, B, C



● Input mode: Up / Down-D, E, F



※- display is only for F, K, Q, S output operation mode and it cannot be set.

▣ Factory Default

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
I n.n	Ud-A	oUt2	00.50	SI G	PnP	n.SCL	1.000
oUt.n.	F	oUt 1	HoLd	n-d	nULt	dAtA	rEC
CPS	30	dP	----	SC.dP	-.---	rSt.b	on

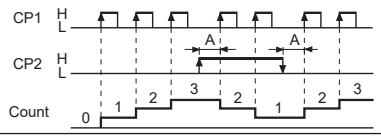
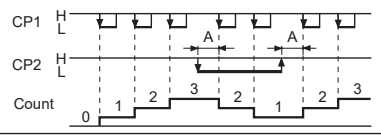
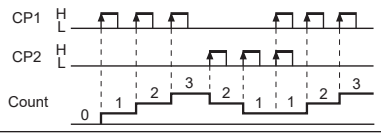
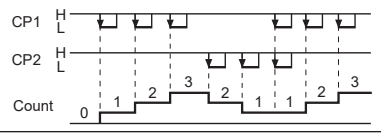
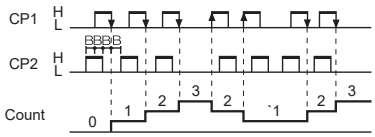
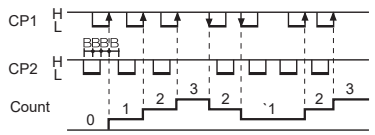
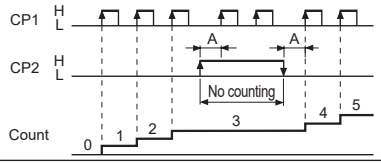
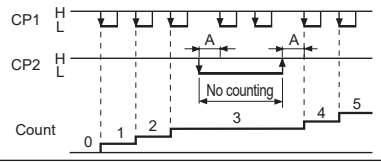
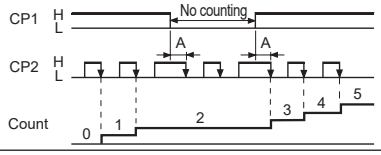
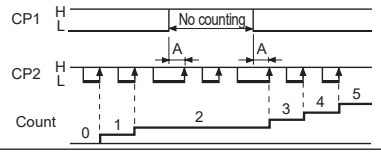
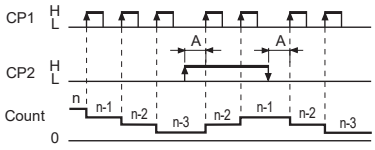
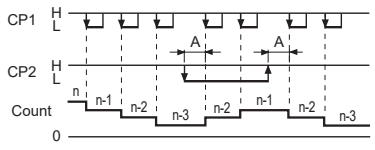
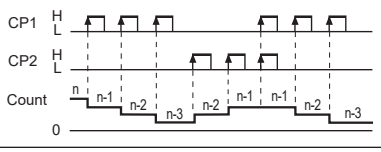
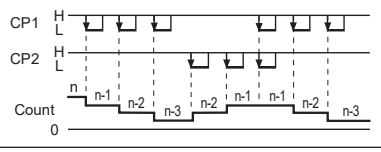
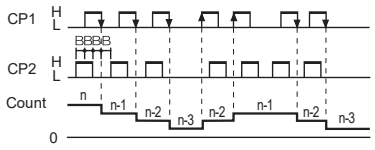
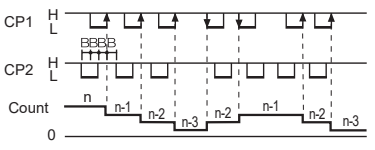
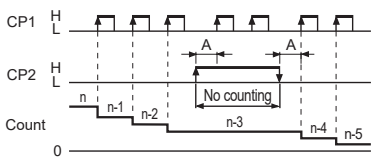
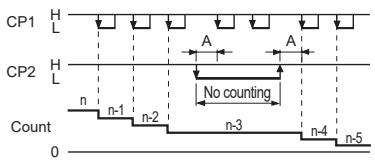
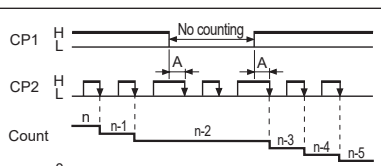
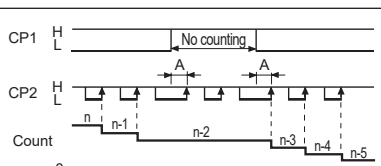
▣ Error Display and Output Operation

Error Display	Error description	Troubleshooting
Err0	Setting value is 0.	Change the setting value anything but 0.

※When error occurs, the output turns OFF.
※When 1st setting value is set as 0 (zero), OUT1 maintains OFF.
When 2nd setting value is smaller than 1st setting value, 1st setting value is ignored and only OUT2 output operates.
※Indicator model does not have error display function.

▣ Input Operation Mode

※CP: Clock Pulse

Input mode	Voltage input (PNP) method	No-voltage input (PNP) method
Up/Down-A command input [Ud-A]		
Up/Down-B individual input [Ud-b]		
Up/Down-C phase difference input [Ud-C]		
Up adding input [UP]		
		
Up/Down-D command input [Ud-d]		
Up/Down-D individual input [Ud-E]		
Up/Down-F phase difference input [Ud-F]		
Down subtracting input [dn]		
		

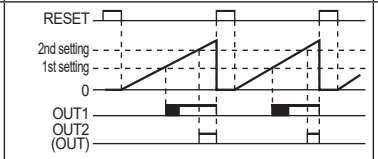
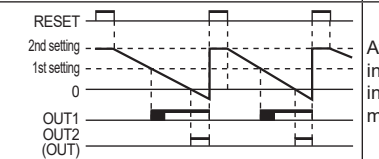
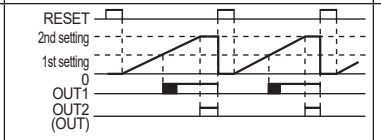
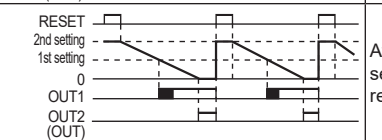
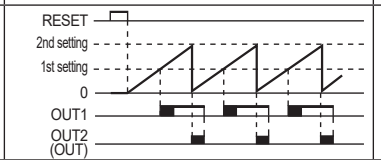
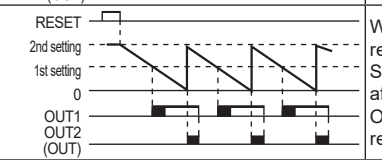
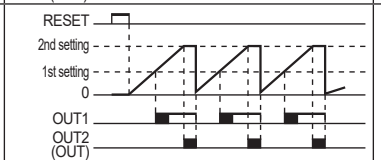
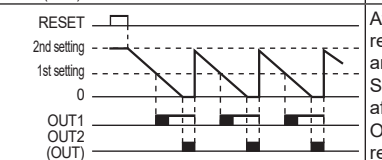
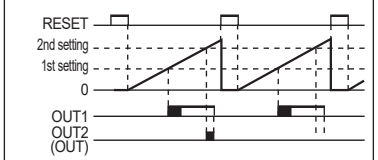
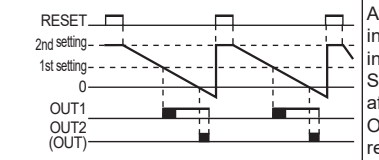
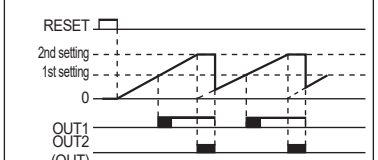
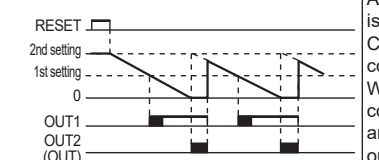
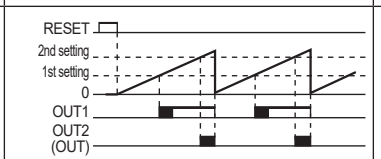
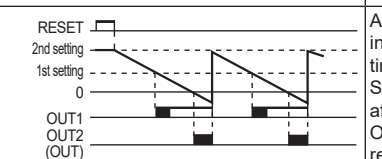
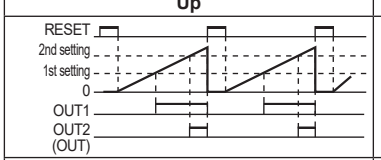
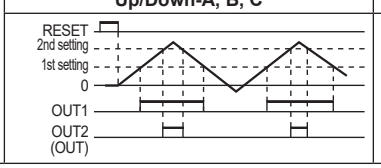
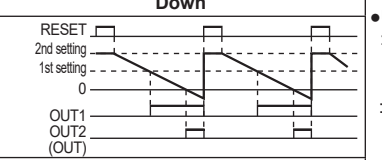
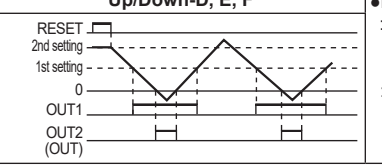
※A: over min. signal width, B: over than 1/2 of min. signal width. If the signal is smaller than these width, it may cause counting error (±1).

▣ Output Operation Mode

One-shot output of OUT2 (0.01 to 99.99 sec)

Self-holding output / One-shot output of OUT1 (0.01 to 99.99 sec)

Self-holding output

Output mode	Input mode: Up, Up/Down-A, B, C	Input mode: Down, Up/Down-D, E, F	Operation
F [F]			After count-up, counting display value increases or decreases until reset signal input is applied and self-holding output is maintained.
N [n]			After count-up, counting display value and self-holding output are maintained until reset signal input is applied.
C [C]			When count-up, counting display value is reset and it counts simultaneously. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2. One-shot output time of OUT1 is regardless of OUT2 output.
R [r]			After count-up, counting display value is reset after one-shot output time of OUT2 and it counts simultaneously. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2. One-shot output time of OUT1 is regardless of OUT2 output.
K [K]			After count-up, counting display value increases or decreases until reset signal input is applied. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2. One-shot output time of OUT1 is regardless of OUT2 output.
P [P]			After count-up, counting display value is maintained while OUT2 output is ON. Counting value is internally reset and it counts simultaneously. When OUT2 output is OFF, displays counting value while OUT2 output is ON, and it increases or decreases. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2.
Q [q]			After count-up, counting display value increases or decreases during one-shot time of OUT2. Self-holding output of OUT1 turns OFF after one-shot output time of OUT2. One-shot output time of OUT1 is regardless of OUT2 output.
S [S]	**Up**  **Up/Down-A, B, C** 	**Down**  **Up/Down-D, E, F** 	●Up, Up/Down-A, B, C input mode : OUT1 output maintains ON when counting display value is larger or equal than 1st setting value. : OUT2 output maintains ON when counting display value is larger or equal than 2nd setting value. ●Down, Up/Down-D, E, F input mode : OUT1 output maintains ON when counting display value is smaller or equal than 1st setting value. : OUT2 output maintains ON when counting display value is smaller or equal than 2nd setting value.

▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- Use the product, 0.1 sec after supplying power.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- In case of contact input, set count speed to low speed mode (1cps or 30cps) to operate.
  If set to high speed mode (300cps, 2kcps, 5kcps), counting error occurs due to chattering.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- This product may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

DIN W48×H24mm, Indication Only, LCD Timer (Hour Meter)

■ Features

- No additional power due to internal battery
- Signal input method: No-voltage input, voltage input, free voltage input
- Screw terminal type (attaching terminal cover)
- LCD display, backlight model
- Protection structure: IP66

⚠ **Please read "Safety Considerations" in the instruction manual before using.**

■ Ordering Information

LE	8	N	–	B	N	–	L

Backlight	No mark	None
	L	Backlight function
Input type	N	No-voltage (small signal) input
	V	Voltage input
	F	Free voltage input
Power supply	B	Internal lithium battery
Size	N	DIN W48×H24mm
Digit	8	99999999 (8-digit)
Item	LE	Compact LCD Timer

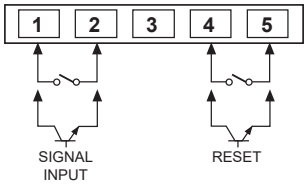
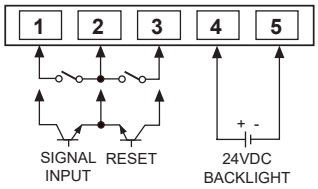
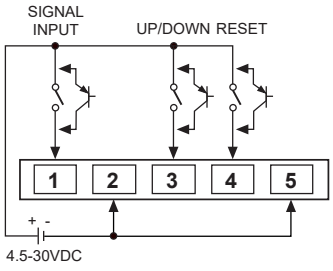
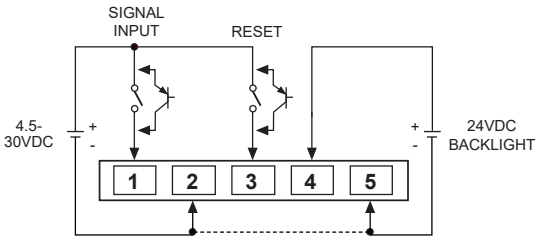
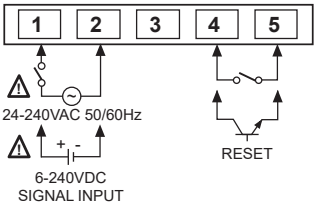
■ Specifications

Model		LE8N-BN	LE8N-BN-L	LE8N-BV	LE8N-BV-L	LE8N-BF
Digit		8-digit (0 to 99999999)				
Digit size		W3.4×H8.7mm				
Display method		LCD Zero Blanking type (character height size: 8.7mm)				
Operation method		Count up				
Power supply		Built-in battery				
Battery life cycle		Approx. over 10 years at 20℃				
Backlight power supply		—	24VDC⎓ ±10%	—	24VDC⎓ ±10%	—
Input method		No-voltage input		Voltage input		Free voltage input
START input		Residual voltage: max. 0.5VDC⎓ Short-circuit impedance: max. 10kΩ Open-circuit impedance: min. 750kΩ		[H]: 4.5-30VDC⎓ [L]: 0-2VDC		[H]: 24-240VAC∼/6-240VDC⎓ [L]: 0-2VAC/0-2.4VDC
RESET input		No-voltage input		Voltage input		No-voltage input
Min. input signal width		SIGNAL, RESET input: approx. 20ms				
Time specification (TS1)		9999.59.59 (h.m.s), 99999.59.9 (h.m), 99999.59 (h.m)				
Time specification (TS2)		9999.23.59 (d.h.m), 9999d23.9 (d.h), 99999999 (s)				
Time specification (TS3)		9999h59.9 (h.m), 99999h59 (h.m), 999999.9h (h)				
Time error, Temperature error		±0.01%				
External set switch		SW1※1, SW2※2, SW3※3				
Insulation resistance		Over 100MΩ (at 500VDC megger)				
Dielectric strength※4		2,000VAC 60Hz for 1 min				
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour				
	Malfunction	0.3mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min				
Shock	Mechanical	300m/s^2 (approx. 30G) in each X, Y, Z direction for 3 times				
	Malfunction	100m/s^2 (approx. 10G) in each X, Y, Z direction for 3 times				
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃				
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH				
Protection structure		IP66 (when using waterproof rubber for front panel, IEC standard)				
Accessory		Mounting bracket, Rubber waterproof ring				
Approval		CE cULus				
Weight※5		Approx. 96g (approx. 50g)				

※1: SW1 is the front panel RESET key enable/disable set switch.
※2: SW2 is the time range set switch.
※3: SW3 is available to select time specification TS1, TS2, or TS3.
※4: No-voltage input, voltage input: between terminals and the case/Free voltage input: between the free voltage input terminal and the RESET input terminal, between terminals and the case
※5: The weight includes packaging. The weight in parenthesis is for unit only.

※Environment resistance is rated at no freezing or condensation.

▣ Connections

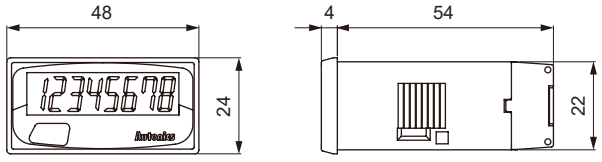
Input type	No-backlight	Backlight function
No-voltage input type	●LE8N-BN※1 	●LE8N-BN-L※2 
Voltage input type	●LE8N-BV※1 	●LE8N-BV-L※2  ※Backlight power is available as signal input and reset.
Free voltage input type	●LE8N-BF  ※Terminal (1, 2) and (4, 5) are insulated inside.	—

※1: Terminal 2 and 5 are connected inside. (non-isolated)
※Use reliable contacts enough to flow 5μA current.

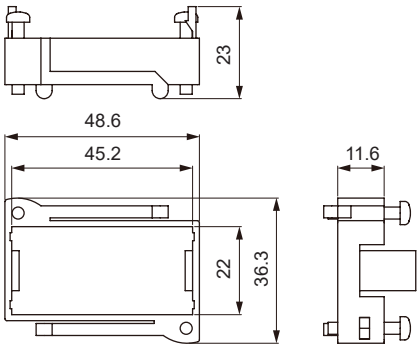
※2: Terminal (1, 2, 3) and (4, 5) are insulated inside.

▣ Dimensions

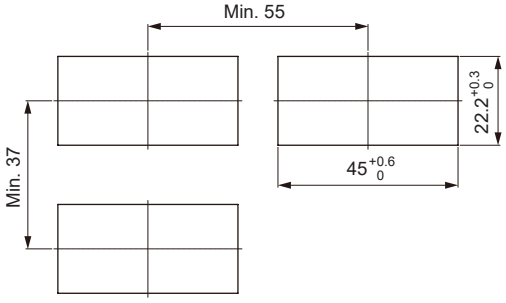
(unit: mm)



◎ Bracket



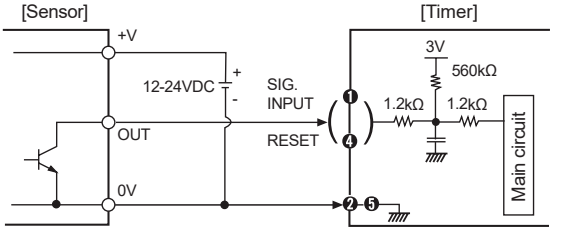
◎ Panel cut-out



▣ Input Connections

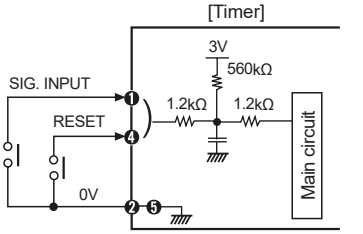
◎ No-voltage input (standard sensor: NPN open collector output type)

● Solid-state input



※When power is applied to terminal No ❶ and ❹, input terminal circuit can be broken and a malfunction can occur. (NPN output, PNP output, PNP open collector output type sensor cannot be used.)

● Contact input



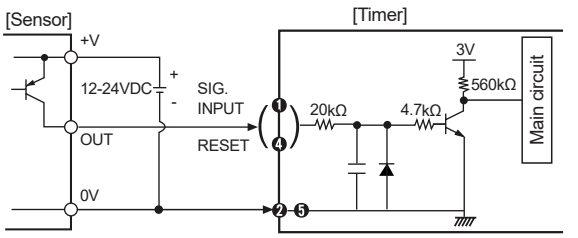
※Please use reliable contacts enough to flow 3VDC 5μA of current.

※❷ and ❺ are connected inside.

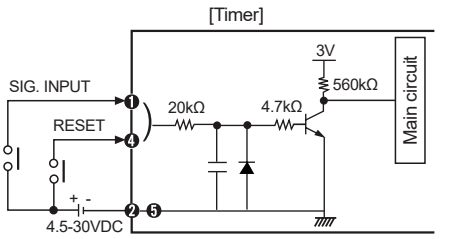
※For backlight function model, the input terminals are ❶, ❸ and the GND terminal is ❷.

◎ Voltage input (standard sensor: PNP open collector output type)

● Solid-state input



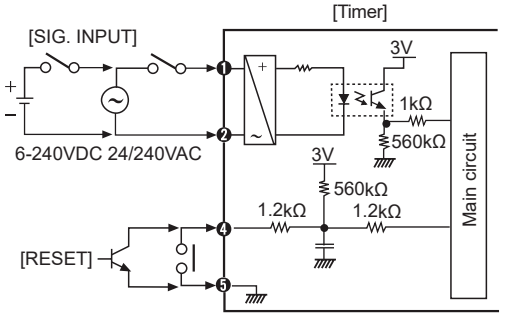
● Contact input



※Use reliable contacts enough to flow 3VDC 5μA of current.

※For backlight function model, the input terminals are ❶, ❸ and the GND terminal is ❷.

◎ Free voltage input

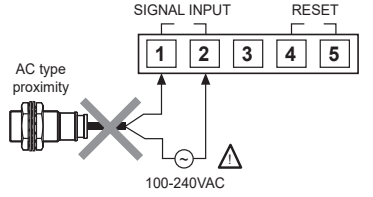


※AC type proximity sensor cannot be used as the source of input signals.
※Input terminal (❶, ❷) and reset terminal (❹, ❺) are insulated inside.
※It is not possible to reset with AC power or DC power.
※When relay contact is used as the source of RESET signal, please use reliable contacts enough to flow 3VDC 5μA of current.

◎ Input from AC type proximity sensor

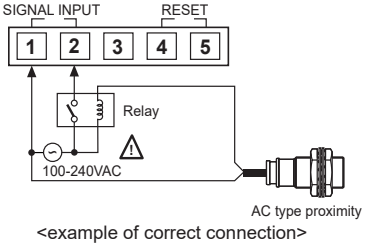
In case of free voltage input type, do not connect AC proximity sensors instead of a switch as shown in the figure 1.
It may cause malfunction due to sensor's leakage current. Connect a relay as shown in the figure 2.

(Figure 1)



<example of wrong connection>

(Figure 2)

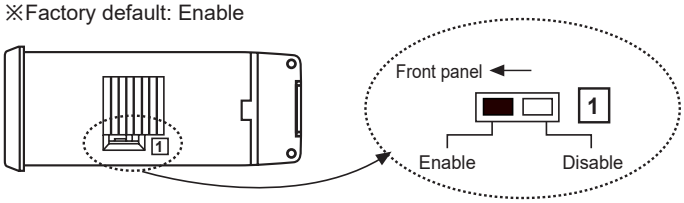


<example of correct connection>

▣ Set Switch

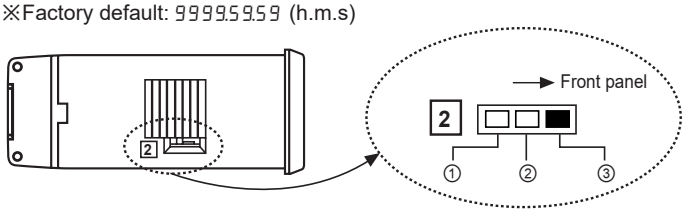
◎ SW1 setting (1 switch)

SW1 is a switch to Enable/Disable the front panel RESET key.
※Factory default: Enable



◎ SW2 setting (2 switch)

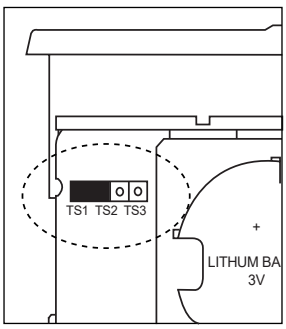
SW2 is a switch for setting time range.
※Factory default: 9999.59.59 (h.m.s)

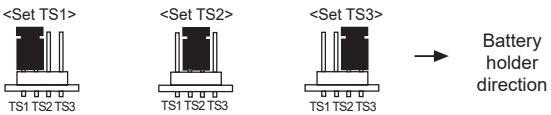


※Refer to "**<Time range>**" table of **SW3** for ①, ②, ③ descriptions.

◎ SW3 setting

SW3 is a switch for setting time specification. TS1, TS2, TS3 (※Factory default: TS1)



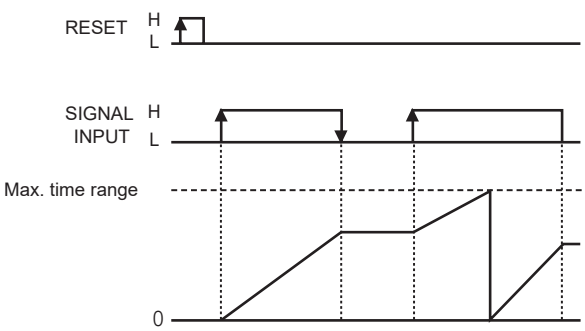


<Time range>※1

	TS1	TS2	TS3
①	hour. min. 9999.59	sec. 99999999	hour. 999999.9h
②	hour. min. 9999.59.99	day. hour 9999d23.9	hour. min. 99999h59
③	hour. min. sec. 999.59.59	day. hour. min. 999.23.59	hour. min. 9999h59.9

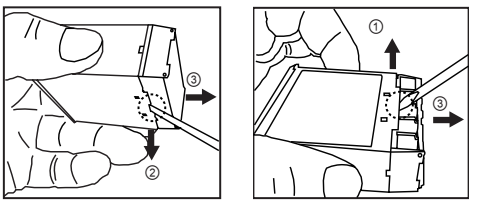
※1: Time range is set as SW2, SW3 combination.

▣ Time Operation



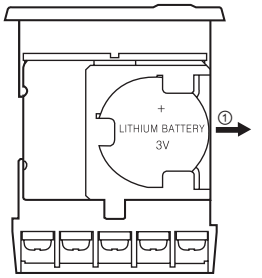
▣ Case Detachment and Battery Replacement

◎ Case detachment



※Hold up Lock part toward ①, ② of the product with the tool and pull toward ③ to detach the case.
⚠When using the tools, be careful not to be wounded.

◎ Battery replacement



1. Detach the case.
2. Push the battery and detach it toward ①.
3. Insert a new battery with correct alignment of polarity pushing it toward opposite of ①.

※Since lithium battery is embedded in the product, follow instructions below for safety.
①Do not charge, short, disassemble, subject it to shock, heat.
②Check the polarity.
③Use CR2477 battery.
④Do not solder on a battery directly.
⑤Insulate a battery with tape to dispose .
⑥Do not store this unit in the place with the direct sunlight, high temperature and humidity.
※The battery is sold separately.
Please replace a battery by yourself. (sold separately)
※Do not burn up or disassemble the lithium battery.

Digital LCD Timer DIN W48×H48mm

■ Features

- Power supply
  : 24-240VAC 50/60Hz, 24-240VDC universal
- Easy to switch Up/Down mode
- 10 programmable output modes
  and timing ranges (LE3S)
- Selectable function by front digital switches
- Graphic output contact status display (N.O./N.C.)
- BAR graph display of time progressing in 5% increments
- Compact size (length: 74mm)

Please read "Safety Considerations" in the instruction manual before using.

■ Ordering Information

LE 3 S □

Output	No mark	Time-limit SPDT (1c)
	A	Time-limit DPDT (2c)
	B	Time-limit SPDT (1c), Instantaneous SPDT (1c)
Size	S	DIN W48×H48mm
Digit	3	999 (3-digit)
Item	LE	LCD timer (digital switch type)

※8-pin socket (PG-08, PS-08(N)) is sold separately.

■ Specifications

Model		LE3S	LE3SA	LE3SB
Function		**Multi time and operation**	**Multi time range, Power ON Delay operation**	
Display method		LCD display (character size: W4×H8mm)		
Power supply		24-240VAC~ 50/60Hz, 24-240VDC⎓ universal		
Allowable voltage range		90 to 110% of rated voltage		
Power consumption		Max. 2.5VA (24-240VAC~ 50/60Hz), Max. 1W (24-240VDC⎓)	Max. 3.3VA (24-240VAC~ 50/60Hz), Max. 1.5W (24-240VDC⎓)	
Return time		Max. 200ms	Max. 100ms	
Min. input signal width	START	Approx. 20ms	—	
	INHIBIT			
	RESET			
Input	START	• No-voltage input Impedance at short-circuit: max. 1kΩ Residual voltage: max. 0.5VDC Impedance at open-circuit: min. 100kΩ	—	
	INHIBIT			
	RESET			
Timing operation		Signal ON Start	Power ON Start	
Control output	Contact type	Time limit SPDT (1c)	Time limit DPDT (2c)	Time limit SPDT (1c), Instantaneous SPDT (1c)
	Contact capacity	250VAC~ 5A, 30VDC⎓ 5A resistive load	250VAC~ 3A, 30VDC⎓ 3A resistive load	
Relay life cycle	Mechanical	Min. 10,000,000 operations		
	Electrical	Min. 100,000 operations (250VAC 5A resistive load)	Min. 100,000 operations (250VAC 3A resistive load)	
Output mode		10 operation modes	Power ON Delay mode fixed	
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃		
	Ambient humidity	35 to 85%RH		
Accessory		Bracket		

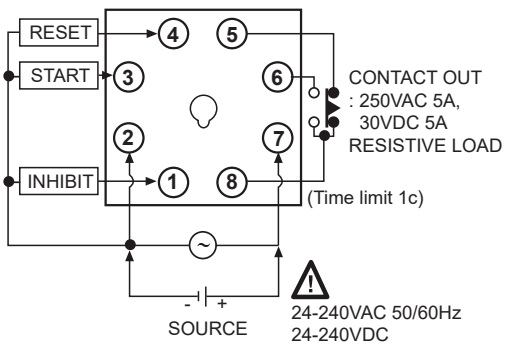
※Environment resistance is rated at no freezing or condensation.

▣ Specifications

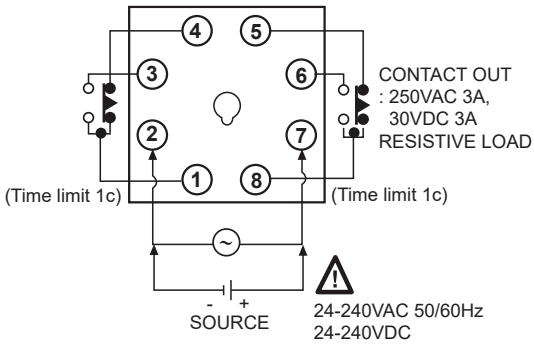
Model		LE3S	LE3SA	LE3SB
Repeat error		Max. ±0.01% ±0.05 sec (for Power ON Start) Max. ±0.005% ±0.03 sec (for Signal ON Start)	Max. ±0.01% ±0.05 sec	
SET error				
Voltage error				
Temperature error				
Insulation resistance		Over 100MΩ (at 500VDC megger)		
Dielectric strength		2,000VAC 50/60Hz for 1 min		
Noise immunity		±2kV the square wave noise (pulse width: 1μs) by the noise simulator		
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour		
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min		
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times		
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times		
Approval		CE c UL us		
Unit weight		Approx. 100g	Approx. 105g	

▣ Connections

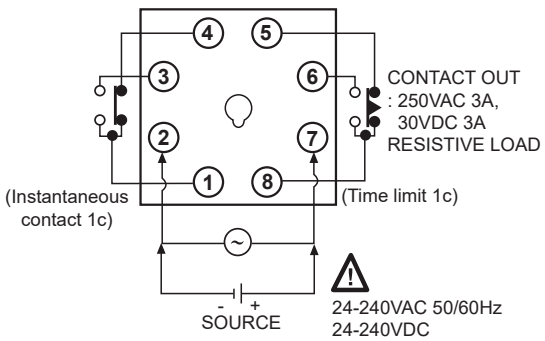
● LE3S



● LE3SA

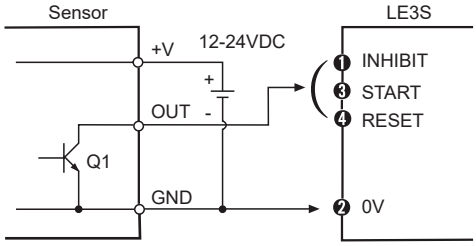


● LE3SB



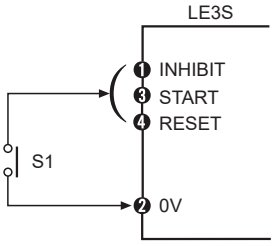
▣ Input Connections (LE3S Only)

◎ Solid-state input

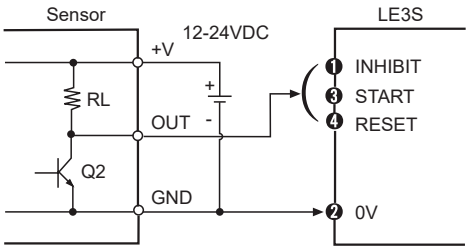


- Q1 is ON: Operating
- Sensor: NPN open collector output

◎ Contact input



- S1 is ON: Operating
- S1: Micro switch, push button switch, relay



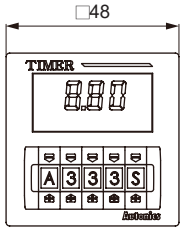
- Q2 is ON: Operating
- Sensor: NPN universal output

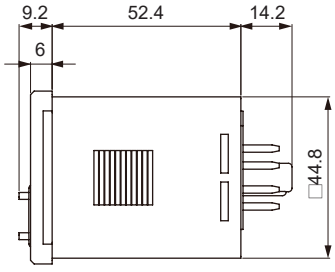
● Input level

No voltage input	● Short-level (transistor is ON) • Residual voltage: Max. 0.5V • Impedance: Max. 1kΩ
	●Open-level (transistor is OFF) • Impedance: Min. 100kΩ
Contact input	Please use reliable contacts enough to flow 5VDC 1mA of current.

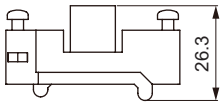
▣ Dimensions

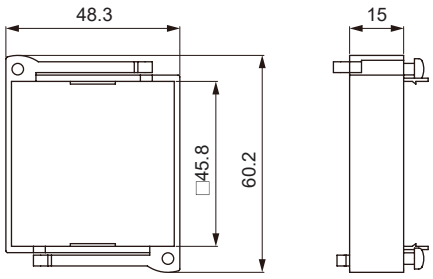
(unit: mm)



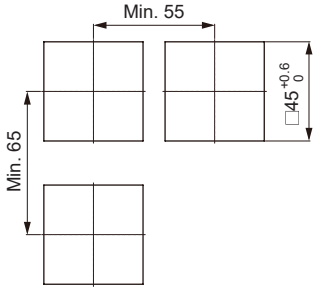


◎ Bracket

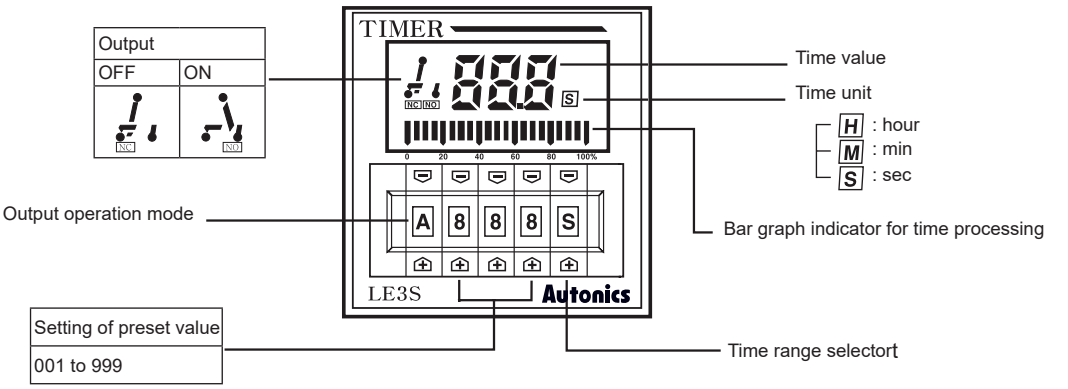




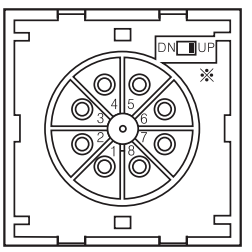
◎ Panel cut-out



▣ Unit Description



▣ Up/Down Mode



※Output operate as Up or Down mode by Up/Down switch location.

Up	Down
DN ■ UP	DN ■ UP

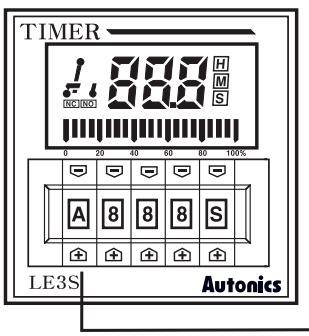
⚠ **Power must be cut off.**

● **Default specifications**

LE3S	LE3SA, LE3SB
Up/Down mode: Up	• Up/Down mode: Up • Output mode: A mode (fixed) ※Down mode is option.

▣ Output Operation Mode Selection

Please select operation mode by press the left of ⏶, ⏷ keys in front panel.



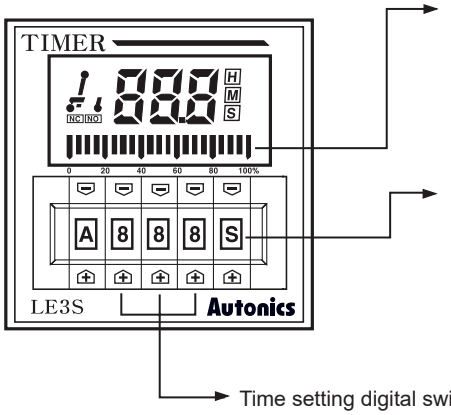
Output operation mode	
A	ON Delay Ⓐ
B	Interval Delay Ⓐ
C	ON Delay Ⓑ
D	Flicker Ⓐ
E	Flicker Ⓑ
F	One-shot Out Flicker
H	OFF Delay
K	ON/OFF Delay
L	Interval Delay Ⓑ
N	Integration Time

※Refer to ▣ **LE3SA, LE3SB Output Operation Mode**
- ON Delay Ⓐ of A mode and ON Delay Ⓑ of C mode are different.
- Interval delay Ⓐ of B mode and Interval Delay Ⓑ of L mode are different.
- Flicker Ⓐ of D mode and Flicker Ⓑ of E mode are different.

※Output mode Ⓐ is operated as time progresses only when the START signal applied continuously.
※Output mode Ⓑ is operated as time progresses even the START signal is applied as One-shot signal. (one-shot input signal should be over 20ms.)

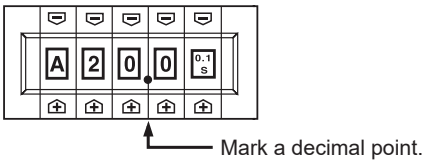
▣ Time Specifications and Time Range

Please select time unit and range by press the right of ⊕, ⊖ keys in front panel.



Time Range mode	
0.01s	0.01 sec to 9.99 sec
0.1s	0.1 sec to 99.9 sec
s	1 sec to 999 sec
0.1m	0.1 min to 99.9 min
m	1 min to 999 min
0.1h	0.1 hour to 99.9 hour
h	1 hour to 999 hour
10h	10 hour to 9990 hour
S	0 min 01 sec to 9min 59 sec
M	0 hour 01 min to 9 hour 59 min

● Setting of operation time: Please select operation time by press the center of 3 ⊕, ⊖ keys in front panel.
※When using this unit with 20.0 sec of operation time.
After selecting 0.1 S as time range, then set digital switches as 20.0 sec
In this case, it is convenient to put a decimal point as below figure.

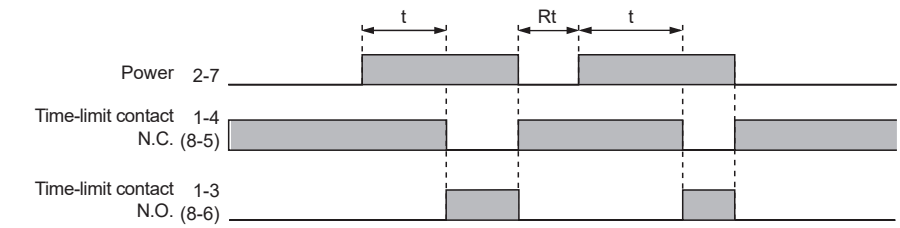


● Bar graph display: Display the progress rate of time for setting time with bar, it is calculated as below for 1bar.
Setting value (operation time) ÷ 20 (total number of bars) = The time for 1 bar is lighted.

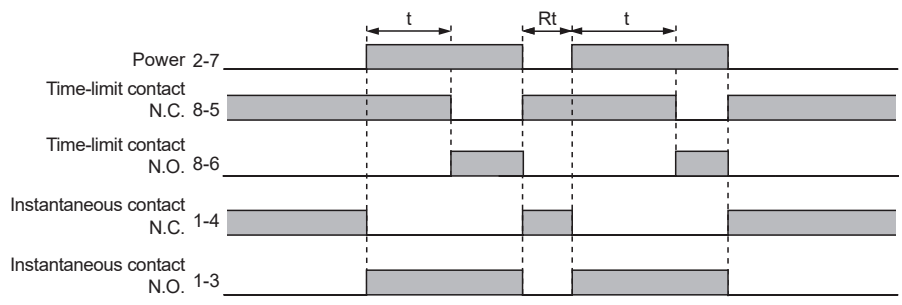
▣ LE3SA, LE3SB Output Operation Mode

t=Setting time, Rt=Reset time (min. 100ms)

LE3SA

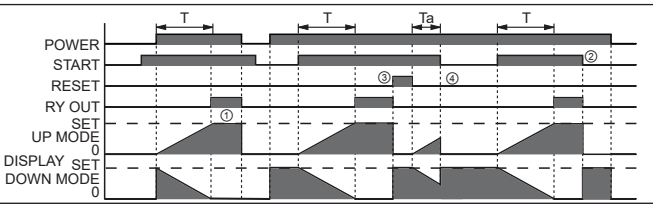
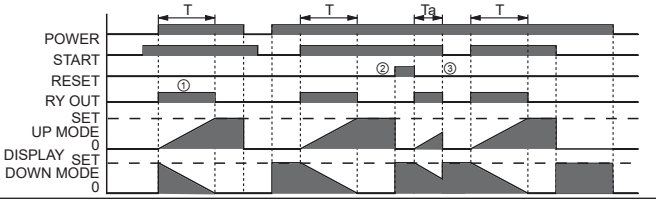
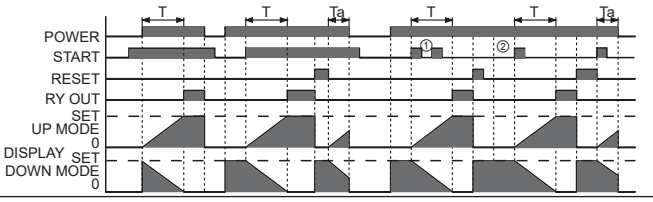
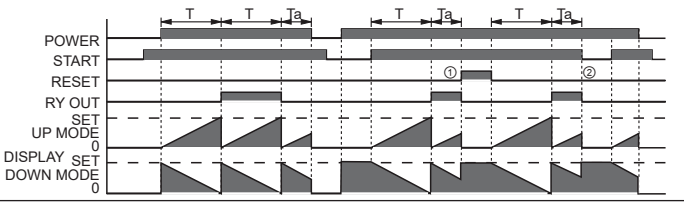
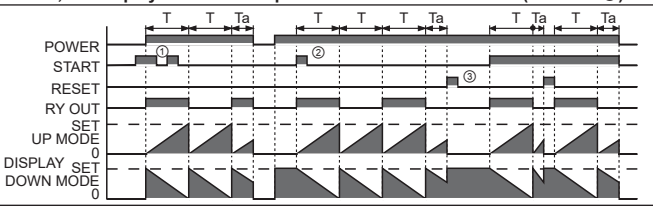


LE3SB



■ LE3S Output Operation Mode

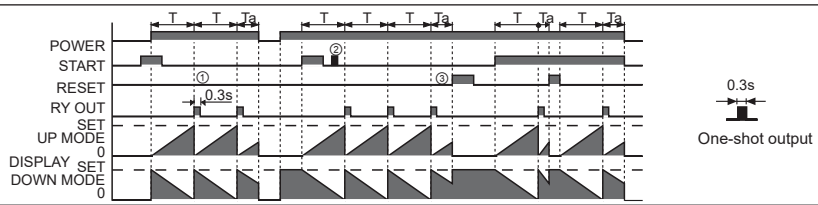
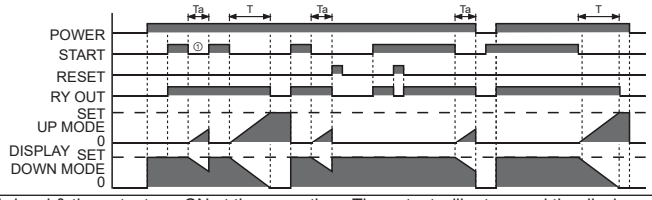
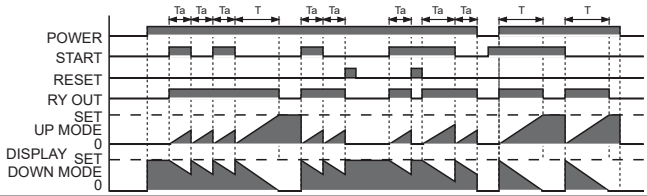
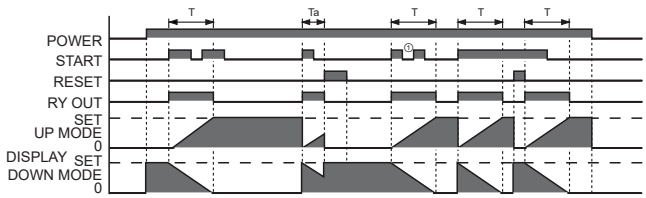
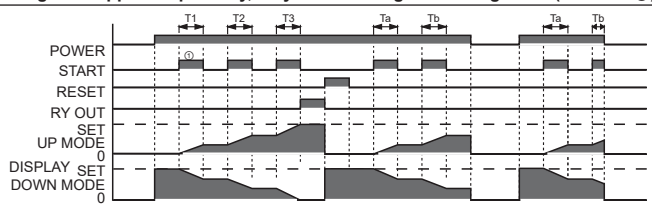
T=Setting time, T >Ta

Mode	Time chart
A **ON Delay** Ⓐ	 1. Time progresses when START signal is ON. 2. The output will be ON when the setting value is equal to the display value. (Position ①) 3. When the RESET signal is ON, the display value is returned to the initial state. (Position ③) ※**If START signal is OFF when the output is OFF the display value is returned to initial state (Position ④).**
B **Interval Delay** Ⓐ	 1. The output turns ON and time progresses when START signal is ON. 2. The output will be ON when the setting value is equal to the display value. (Position ①) 3. When the RESET signal is ON, the display value is returned to the initial state. (Position ②) ※**If START signal is OFF when the output is OFF the display value is returned to initial state. (Position ③)**
C **ON Delay** Ⓑ	 1. Time proceeds when START signal is ON. 2. The output will be ON when the setting value is equal to the display value. (Position ①) 3. When the RESET signal is ON, the display value is returned to the initial state. ※**When start signal is applied repeatedly (Position ①), only the initial signal is recognized.** ※**Even if the START signal is not applied, time progresses. (Position ②)**
D **Flicker** Ⓐ	 1. Time progresses repeatedly when the START signal is ON. 2. The output operates from N.C. to N.O., and from N.O. to N.C. repeatedly. 3. If RESET signal is ON, it is returned to initial state. (Position ①) ※**If the START signal is OFF, the display value and output is returned to initial state. (Position ②)**
E **Flicker** Ⓑ	 1. Time progresses repeatedly when the START signal is ON. 2. The output operates from N.C. to N.O., and from N.O. to N.C. repeatedly. 3. If RESET signal is ON, it is returned to initial state. (Position ③) ※**When START signal is applied repeatedly, only the initial signal is recognized. (Position ①)** ※**Even if the START signal is not applied, time progresses. (Position ②)**

※Initial state: Output is OFF, the display value is "0". (UP mode). The output is OFF and the display value is the setting value (DOWN mode)
※When set the time setting as 000, control output does not come out.
※When using D, E output operation modes, if the time is set too short, the output may not work properly. Please set the time at least over 100ms.

▣ LE3S Output Operation Mode

T=Setting time, T=T1+T2+T3, T >Ta, T >Ta+Tb

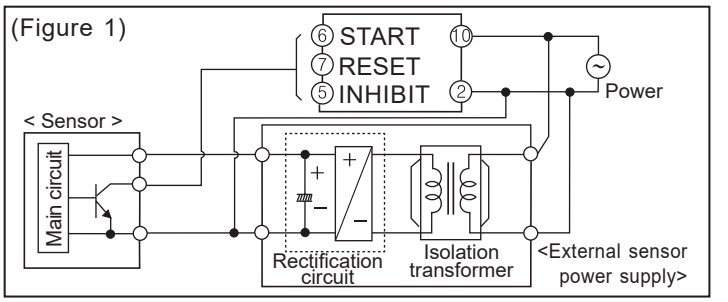
Mode	Time chart
F **One-shot Out Flicker**	 1. Time progresses from initial value to the preset value repeatedly and the output operates as one-shot (0.3 sec), when the START signal is ON. (Position ①) 2. If the RESET signal is ON, it is returned to initial state. (Position ③) ※**When START signal is applied repeatedly, only the initial signal is recognized. (Position ②)**
H **OFF Delay**	 1. The START signal & the output are ON at the same time. The output will return and the display value is held after the setting time. 2. If the RESET signal is ON, the display value is returned to initial state. ※**If the START signal is applied continuously, the output will be ON but time is not progressed.**
K **ON-OFF Delay**	 1. When the START signal is ON the output is ON the output will be reset and display value is held when setting value is equal to display value. 2. The START signal turns OFF, the output turns ON, the output will be reset and display value is held when setting value is equal to display value. 3. If RESET signal is ON, it is returned to initial state. ※**If START signal is applied repeatedly, output keeps ON but be sure that the time will be initialized.**
L **Interval Delay** Ⓑ	 1. When START signal is ON, the output turns ON and the time progresses at the same time. 2. When the time reaches at the preset value the output will be reset, and the display value is held. 3. If RESET signal is applied, the display value is returned to initial state. ※**When START signal is applied repeatedly, only the initial signal is recognized. (Position ①)**
N **Integration Time**	 1. When START signal is ON, time progresses. 2. If START signal turns off before the display value reaches the setting value, the time (display value) will be held. 3. If RESET signal is ON, it is returned to initial state.

※Initial state: Output is OFF, the display value is "0". (UP mode). The output is OFF and the display value is the setting value (DOWN mode)
※When set the time setting as 000, control output does not come out.
※When using D, E output operation modes, if the time is set too short, the output may not work properly. Please set the time at least over 100ms.

▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- In order to block peripheral current, use isolation transformer which of secondary part is not grounded as (Figure 1) to supply power to the external input device.

(Figure 1)



- Do not connect two or more timers with only one input contact or transistor simultaneously.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Change setting time, time range, operation mode or etc. after turning off the power of the timer.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

DIN W48×H48mm Digital Backlight LCD Timer

■ Features

- Mounting space saving with compact design
  : downsized by approx. 22% in depth compared to existing models (length of panel on the back side is 56mm)
- Available to set each value and time range separately when choosing Flicker (FK, FK I) or ON-OFF Delay (ON OFF D, ON OFF D I) output mode
- Adds Flicker 1 mode (LE4SA)
- Settable One-shot output time (0.01 to 99.99 sec) (existing model: fixed 0.5 sec)
- Configurable time range (added 9.999 sec)
  : Settable by 0.001 sec unit
- Selectable Min. input time: 1ms or 20ms (LE4S)
- Improved return time: 100ms
- Backlight ON/OFF function
- Wide time range (0.01 sec to 9999 hour)
- Lock setting function for saving setting data
- Soft touch setting
- High visibility display with backlight

Please read "Safety Considerations" in the instruction manual before using.

■ Ordering Information

LE 4 S ☐

- Item: LE — LCD Timer (touch type)
- Digit: 4 — 9999 (4-digit)
- Size: S — DIN W48×H48mm
- Output:
  - No mark — Time-limit SPDT (1c)
  - A — Time-limit DPDT (2c), Time-limit SPDT (1c)+Instantaneous SPDT (1c) (selectable)

※8-pin socket (PG-08, PS-08(N)) is sold separately.

■ Specifications

Model		LE4S	LE4SA
Function		**Multi time and Multi operation**	
Display method		LCD display (backlight)	
Power supply		24-240VAC~ 50/60Hz, 24-240VDC⎓ universal	
Allowable voltage range		90 to 110% of rated voltage	
Power consumption		Max. 4.5VA (24-240VAC~ 50/60Hz), Max. 2W (24-240VDC⎓)	Max. 4VA (24-240VAC~ 50/60Hz), Max. 1.6W (24-240VDC⎓)
Return time		Max. 100ms	
Min. input signal width	START	1ms, 20ms (selectable)	—
	INHIBIT		
	RESET		
Input	START	• No-voltage input Impedance at short-circuit: max. 1kΩ, Residual voltage: max. 0.5VDC⎓, Impedance at open-circuit: min. 100kΩ	—
	INHIBIT		
	RESET		
Timing operation		Signal ON Start	Power ON Start
Control output	Contact type	Time limit SPDT (1c)	Selectable Time limit DPDT (2c), Time limit SPDT (1c)+ Instantaneous SPDT (1c) (depends on operation mode)
	Contact capacity	250VAC~ 5A, 30VDC⎓ 5A resistive load	250VAC~ 3A, 30VDC⎓ 3A resistive load
Relay life cycle	Mechanical	Min. 10,000,000 operations	
	Electrical	Min. 100,000 operations (at rated contact capacity)	
Output mode		10 operation modes	8 operation modes
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃	
	Ambient humi.	35 to 85%RH	
Accessory		Bracket	

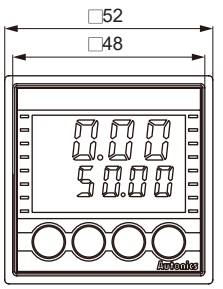
※Environment resistance is rated at no freezing or condensation.

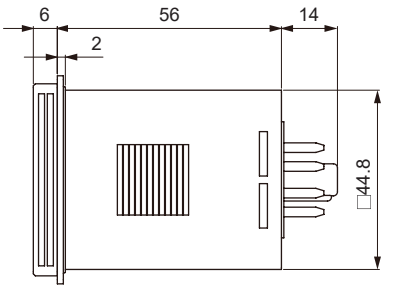
▣ Specifications

Model		LE4S	LE4SA
Repeat error		Max. ±0.01% ±0.05 sec (for Power ON Start) Max. ±0.005% ±0.03 sec (for Signal ON Start)	Max. ±0.01% ±0.05 sec
SET error			
Voltage error			
Temperature error			
Insulation resistance		Over 100MΩ (at 500VDC megger)	
Dielectric strength		2,000VAC 50/60Hz for 1 min	
Noise immunity		±2kV the square wave noise (pulse width: 1μs) by the noise simulator	
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1hour	
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min	
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times	
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times	
Approval		CE cULus	
Unit weight		Approx. 98g	

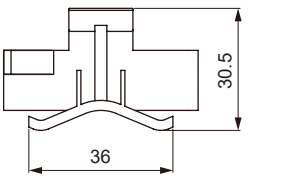
▣ Dimensions

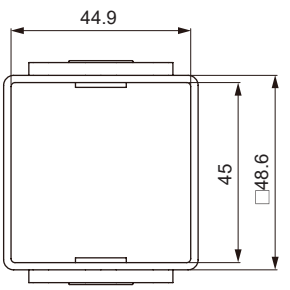
(unit: mm)

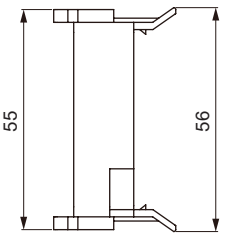




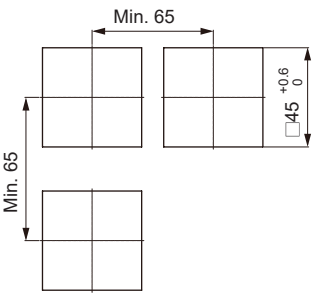
◎ Bracket





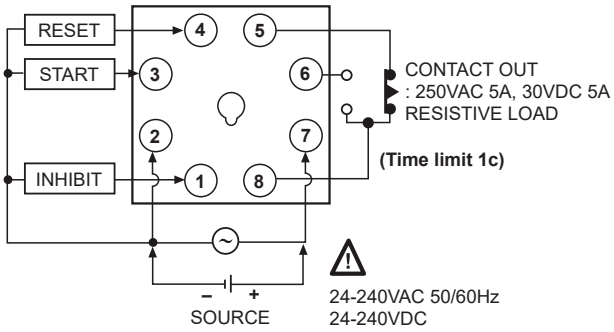


◎ Panel cut-out



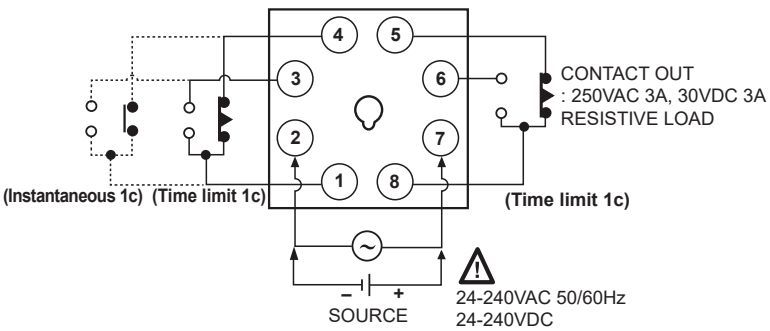
▣ Connections

◎ LE4S



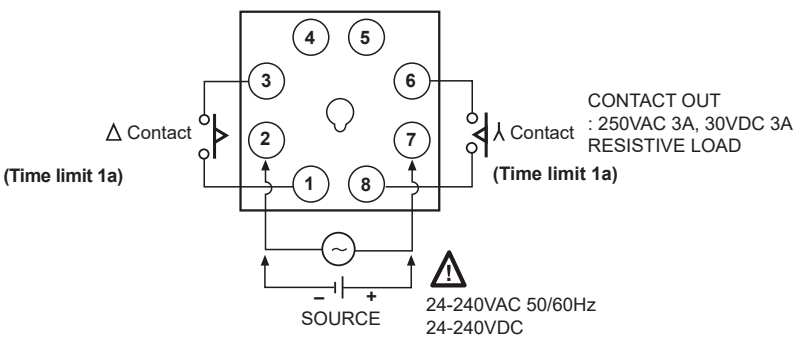
◎ LE4SA

● **[ON.D] [ON.D.II] [FK] [FKI] [INT] [T] [T.I]** mode



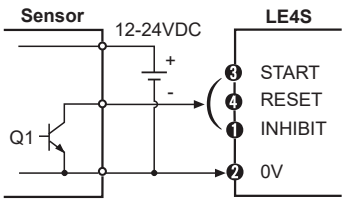
※Time limit 1c + Instantaneous 1c or Time limit 2c (selectable)
([**T**] [**T.I**]: Time limit 2c only.)

● **[λ-Δ] mode**

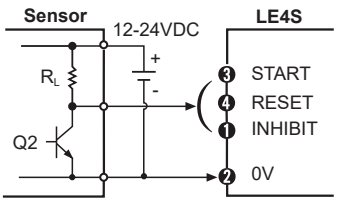


▣ Input Connections

◎ Solid-state input

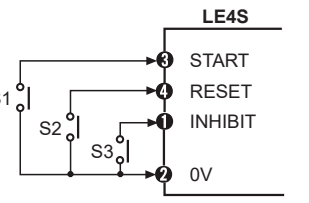


- Q1 is ON: Operating
- Sensor: NPN open collector output



- Q2 is ON: Operating
- Sensor: NPN output

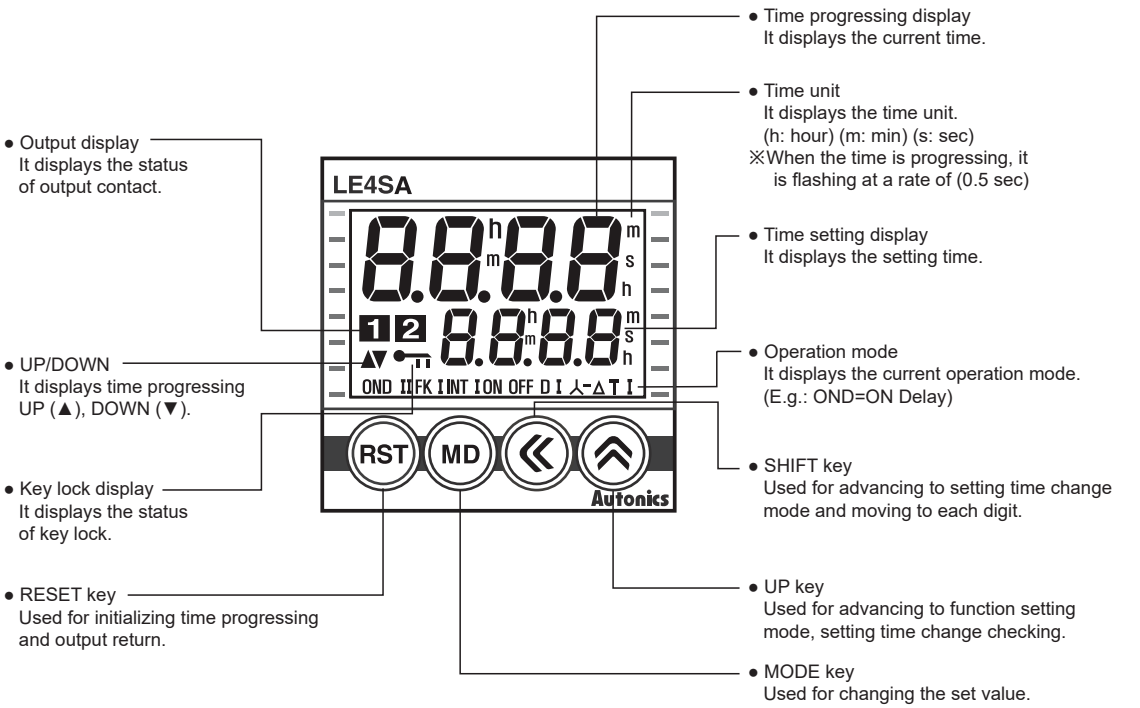
◎ Contact input



- S1, S2, S3 are ON: Operating
- Please use reliable contact enough to flow 5VDC 1mA.

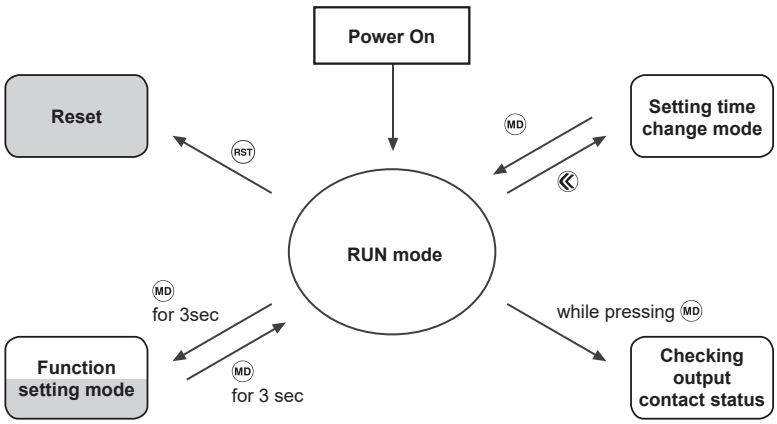
※Be sure that it is not insulated between power and input terminal block.

▣ Unit Description



▣ Function and Time Setting

◎ Configuration



● Reset
Reset using RST in Run mode

● Run mode
The operation status (when power is on for the first time: factory default setting) is displayed.
It could enter into function setting mode, setting value change mode and output contact status mode.

● Function setting mode
If pressing MD over 3 sec in the Run mode, it will enter into function setting mode and if pressing MD over 3 sec in function setting mode, it will return to Run mode.
※Even if it enters into function setting mode in Run mode, time progressing and output control will continue.
※If operation settings are changed in function setting mode, all outputs will be off and reset on returning to run mode.

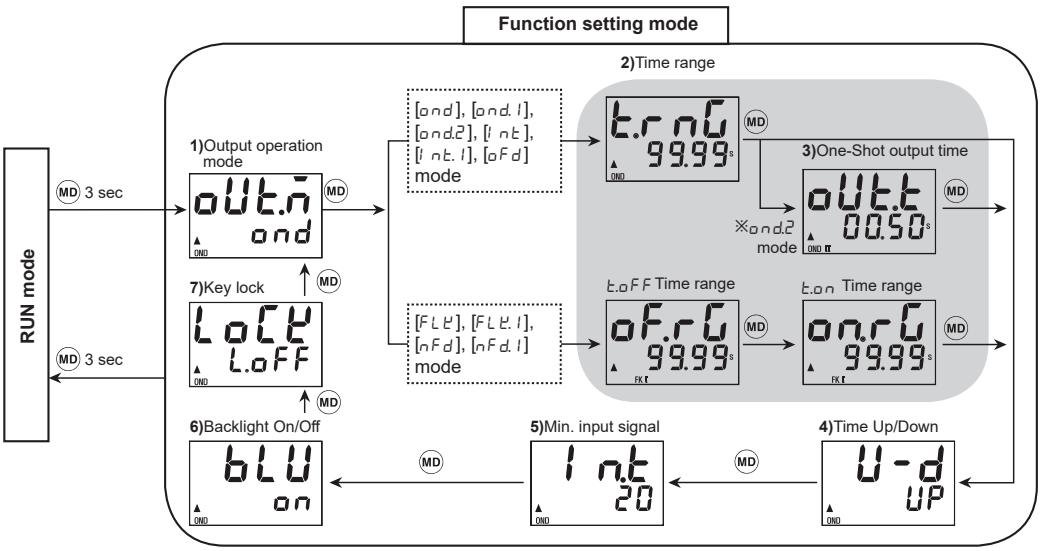
● Output contact status mode (LE4SA only)
Output contact status are displayed while pressing MD in Run mode.
※If pressing MD over 3 sec, it will enter into function setting mode.

● Setting time change mode
Press ≪ to enter into setting time change mode and press MD to return to Run mode.
Even if signal is input when changing setting time, time progressing and output control will be continue.
If no key is pressed over 60 sec in setting time change mode, it will return to Run mode.

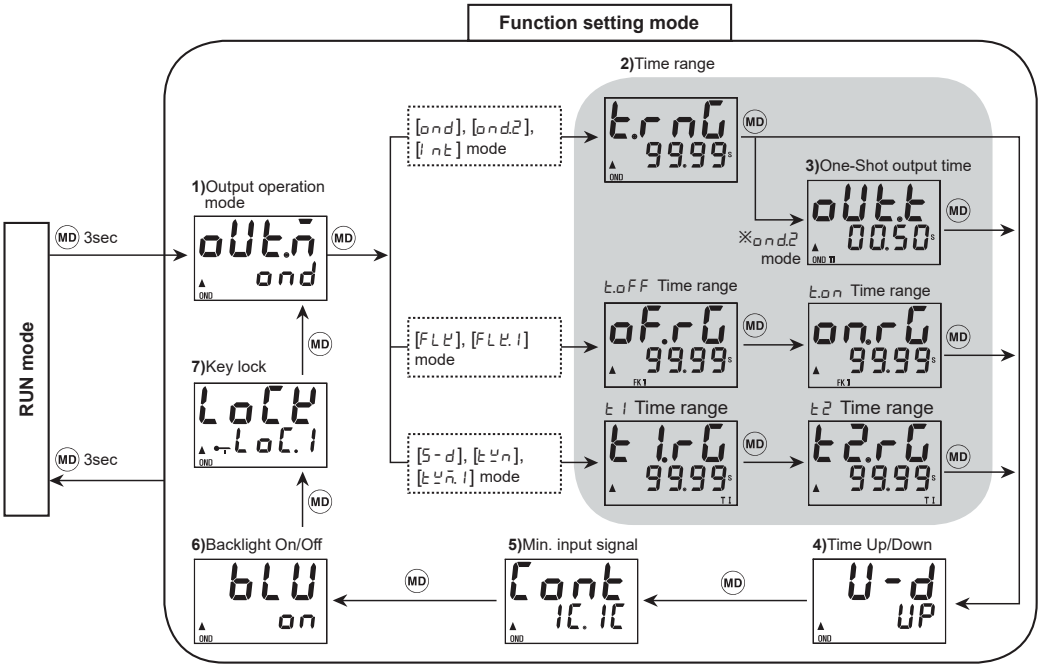
※If no key is pressed over 60 sec in setting time change mode, it will return to Run mode and previous parameter value is not stored.

▣ Function Setting Mode

◎ LE4S



◎ LE4SA



▣ Factory Default

◎ LE4S

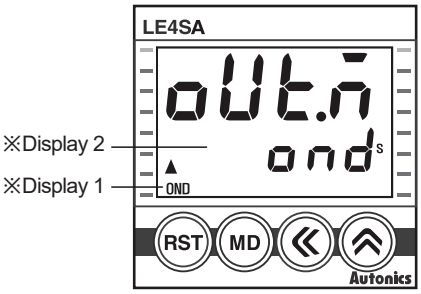
Parameter		Factory default
Output operation mode	oUt.n	ond
Time range	t.rnG	99.99
Time Up/Down	U-d	UP
Min. input signal	Int	20
Backlight On/Off	bLU	on
Key lock	LoCK	L.oFF
Setting time	—	50.00

◎ LE4SA

Parameter		Factory default
Output operation mode	oUt.n	ond
Time range	t.rnG	99.99
Time Up/Down	U-d	UP
Output contact	Cont	1C.1C
Backlight On/Off	bLU	on
Key lock	LoCK	LoC.1
Setting time	—	50.00

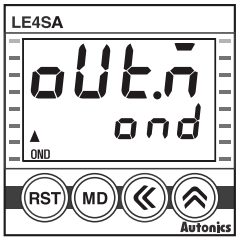
▣ Output Operation Mode

● LE4S/LE4SA output operation mode



NO	※Display 1	※Display 2	Operation mode	LE4S	LE4SA
1	**OND**	ond	ON Delay	○	○
2	**OND**I	ond.1	ON Delay 1	○	—
3	**OND**II	ond.2	ON Delay 2	○	○
4	**FK**	FLY	Flicker	○	○
5	**FK**I	FLY.1	Flicker 1	○	○
6	**INT**	Int	Interval	○	○
7	**INT**I	Int.1	Interval 1	○	—
8	**ON OFF D**	nFd	ON-OFF Delay	○	—
9	**ON OFF D**I	nFd.1	ON-OFF Delay 1	○	—
10	**OFF D**	oFd	OFF Delay	○	—
11	⅄ - Δ	S-d	STAR-Delta	—	○
12	**T**	tYn	Twin	—	○
13	**T**I	tYn.1	Twin 1	—	○

● Output operation mode

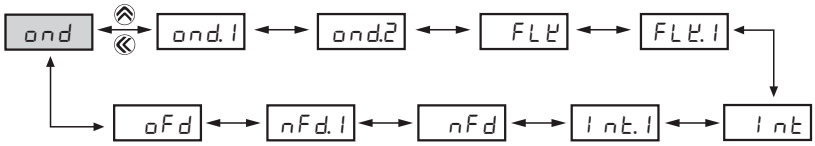


[Figure1]

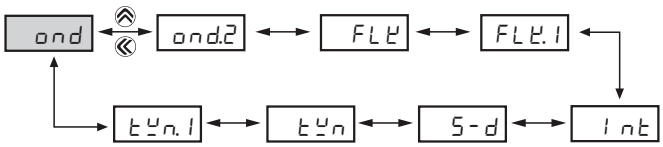
1) In function setting mode, it enters into output operation mode as shown in the [Figure 1].
2) Select proper output operation mode using ⋘ and ⋙.
   (refer to Output operation flowchart)
3) Press Ⓜ to set output operation mode and move to next mode.
4) If pressing Ⓜ for 3 sec in any function setting mode, it will return to Run mode.

※Output operation flowchart

< LE4S >



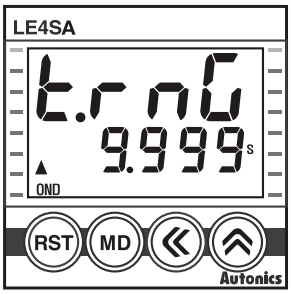
< LE4SA >



※The shaded parameter (▭) is factory default.

▣ Time Range

● Time range specifications



Parameter		Time range specification
9.999 s	**(9.999s)**	0.001 sec to 9.999 sec
99.99 s	**(99.99s)**	0.01 sec to 99.99 sec
999.9 s	**(999.9s)**	0.1 sec to 999.9 sec
9999 s	**(9999s)**	1 sec to 9999 sec
99m59 s	**(99m59s)**	0 min 01 sec to 99 min 59 sec
999.9 m	**(999.9m)**	0.1 min to 999.9 min
9999 m	**(9999m)**	1 min to 9999 min
99h59m	**(99h59m)**	0 hour 01 min to 99 hour 59 min
99.99 h	**(99.99h)**	0.01 hour to 99.99 hour
999.9 h	**(999.9h)**	0.1 hour to 999.9 hour
9999 h	**(9999h)**	1 hour to 9999 hour

t.oFF time range

t.on time range

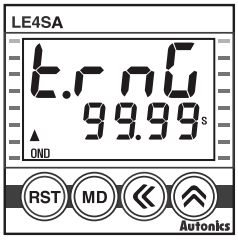
t 1 time range

t2 time range

※Time range according to output operation mode

-Time range[t.rnG]
: ond, ond.1, ond.2, Int, Int.1, oFd mode
- t.oFF/t.on time range[oF.rG/on.rG]
: FLE, FLE.1, nFd, nFd.1 mode
- t 1/t2 time range[t 1.rG/t2.rG]
: S-d, tUn, tUn.1 mode

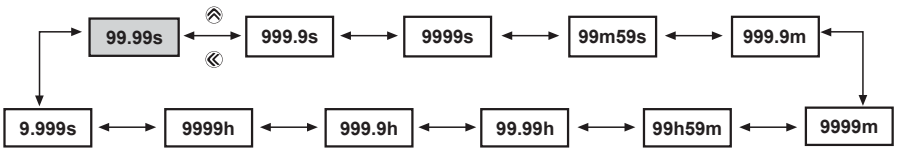
● Time range selection method



[Figure1]

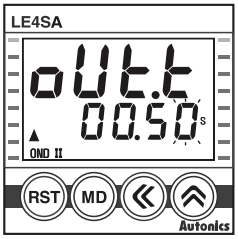
When ond, ond.1, ond.2, Int, Int.1, oFd mode
1) In function setting mode, if it enters into time range mode, the characters will be displayed as shown in the [Figure 1].
2) Select the time range using ≪ and ≫.
(refer to time range flowchart)
3) Press (MD) to complete the time range setting and the next mode.
4) If pressing (MD) for 3 sec, it will return to Run mode.
※When FLE, FLE.1, nFd, nFd.1, S-d, tUn, tUn.1 time range[t 1.rG, t2.rG or oF.rG, on.rG] can be individually set.

※Time range flowchart



※The shaded parameter (▭) is factory default.

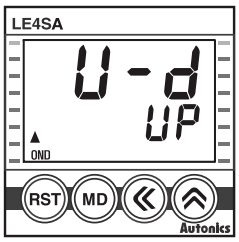
● One-shot output time setting



[Figure2]
※Factory default

When output operation mode ON Delay 2[ond.2],
1) In function setting mode, if it enters into One-shot output time setting mode as shown in the [Figure 2], the last digit will flash.
2) Set One-shot output time using ≪ and ≫. (setting range: 0.01s to 99.99s)
3) Pressing (MD) to complete one-shot output time setting and move to the next mode.
4) If pressing (MD) for 3 sec in any function setting mode, it will return to Run mode.

● Time progress UP/DOWN setting

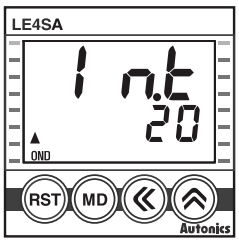


[Figure3]
※Factory default

1) In function setting mode, if it advances to UP/DOWN setting mode, the characters will be displayed as shown in the [Figure 3].
2) Select UP (▲), dn (▼) using ≪, ≫.

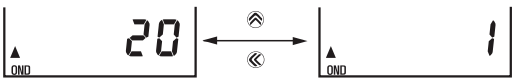
3) Press (MD) to complete UP/DOWN setting and move to the next mode.
4) If pressing (MD) for 3sec in any function setting mode, it will return to Run mode.

● The minimum input signal setting (LE4S only)



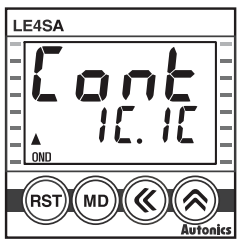
[Figure4]
※Factory default

RESET, START and INHIBIT.
1) In function setting mode, if it enters into input signal setting mode, the characters will be displayed as shown in the [Figure 4].
2) Select 1ms or 20ms using ≪, ≫.



3) Press (MD) to complete input signal width and move to the next mode.
4) If Pressing (MD) over 3 sec in any function setting mode, it will return to Run mode.

● Output contact setting (LE4SA only)

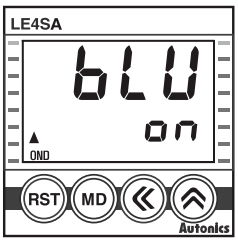


[Figure5]
※Factory default

1) In function setting mode, if it enters into output contact setting mode, the characters will be displayed as shown in the [Figure 5].
2) Select time limit 1c+instant limit 1c or time limit 2c using ≪, ≫.
(refer to LE4SA Series, Connections section for output contact connections)

3) Press (MD) to complete output contact setting and move to the next mode.
4) If pressing (MD) for 3 sec in any function setting, it will return to Run mode.
※Except for Star-Delta, Twin and Twin 1 modes (2C is set automatically)
※If pressing (MD) in Run mode, output contact setting value will be displayed.
(if no key is pressed over 3 sec, it will enter into function setting mode.)

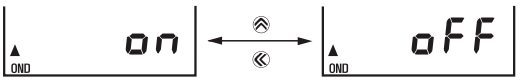
● **Backlight ON/OFF setting**



[Figure6]

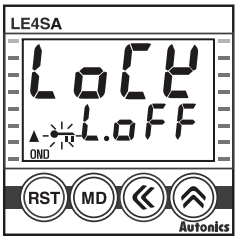
※Factory default

1) In function setting mode, if it enters into Backlight ON/OFF setting mode, the characters will be displayed as shown in the [Figure 6].
2) Select Backlight on or oFF using ≪, ≫.



3) Press (MD) to complete Backlight ON/OFF setting and move to the next mode.
4) If pressing (MD) for 3 sec in any function setting mode, it will return to Run mode.

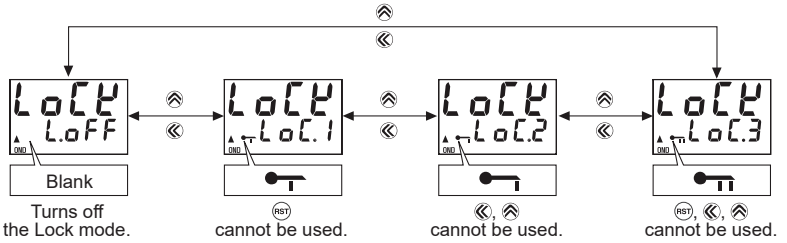
● **Key Lock setting**



[Figure7]

※Factory default

1) In function setting mode, if it enters into Key Lock setting mode, the characters will be displayed as shown in the [Figure 7].
2) Select L.oFF, LoC.1, LoC.2 or LoC.3 using ≪, ≫.



3) Press (MD) to complete key lock setting and move to the next mode.
4) If pressing (MD) for 3 sec in any function setting mode, it will return to Run mode.

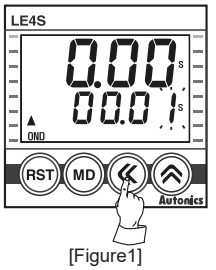
※Factory default for LE4S is L.oFF and Factory default for LE4SA is LoC.1.
※Key Lock function

Display	Function
L.oFF	Turns off the key Lock mode.
LoC.1	(RST) cannot be used.
LoC.2	≪, ≫ cannot be used.
LoC.3	(RST), ≪, ≫ cannot be used.

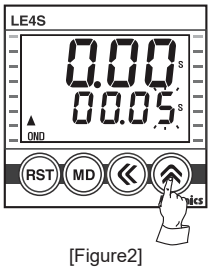
▣ Setting Time Change

Please set operation time according to following instruction as the setting is different depending on the output operation mode.

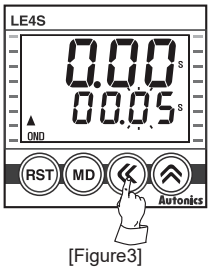
● **Output operation mode: OND, OND|, OND||, INT, INT|, OFF D**
(LE4SA does not have no OND|, INT|, OFF D.)



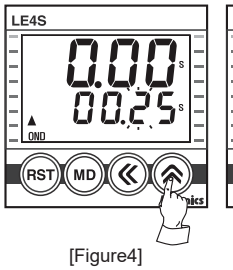
[Figure1]



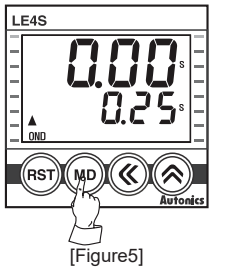
[Figure2]



[Figure3]



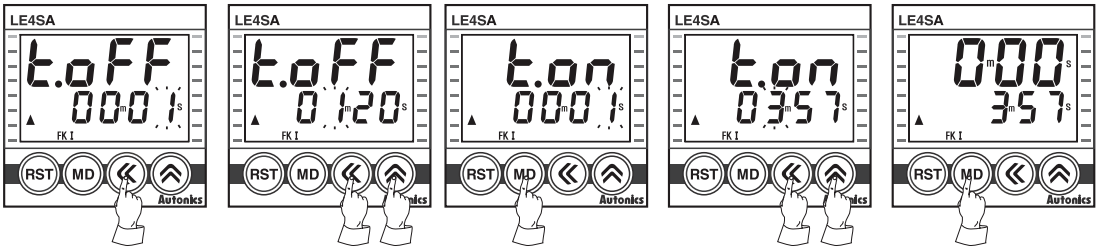
[Figure4]



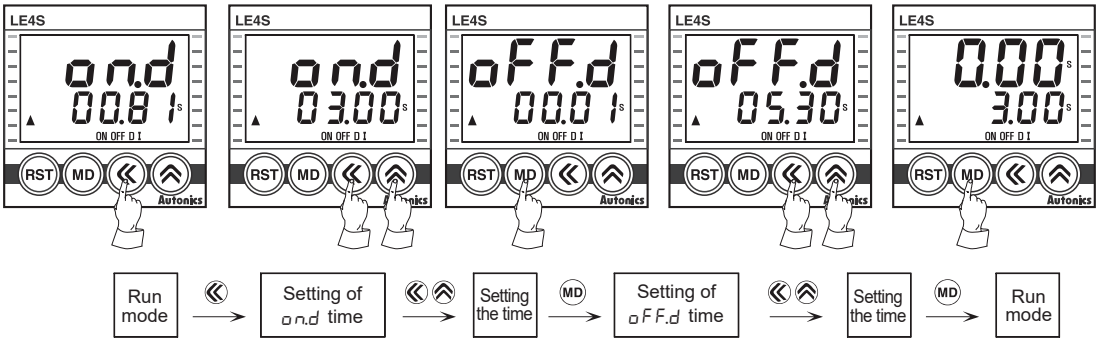
[Figure5]

1) Press ≪ in RUN mode, time set digits will flash. [Figure 1]
2) Change setting time by using ≪ or ≫. [Figure 2,3,4]
   - ≪ : Shift the setting digits.
   - ≫ : Shift the flashing position value. As press ≫ once, it will increase by 1digit, number will increase faster by press ≫ for over 2 sec
3) When the setting is completed, it will be stored and return to RUN mode by pressing (MD) [Figure 5]

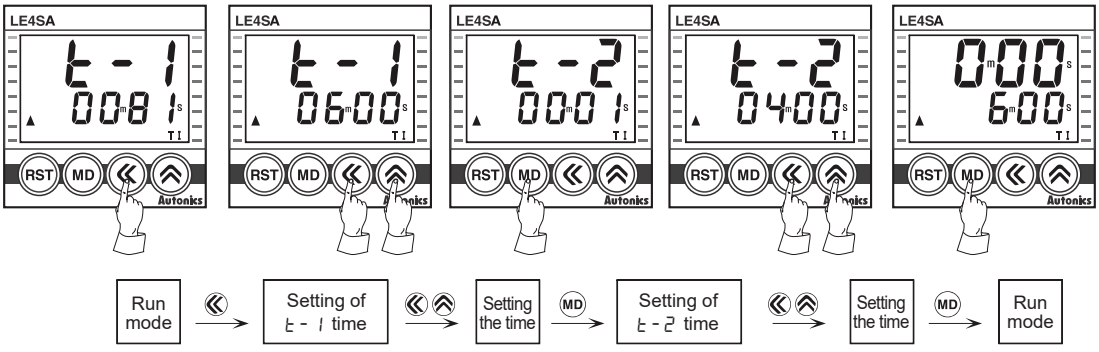
● **Output operation mode: FK, FK I**



● **Output operation mode: ON OFF D, ON OFF D I (LE4S only)**



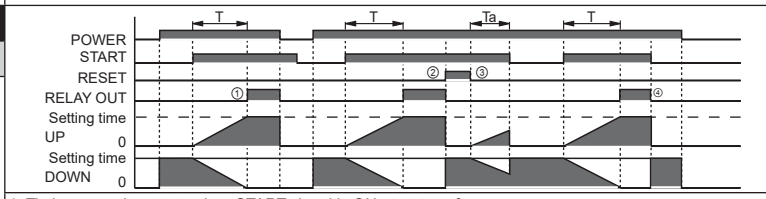
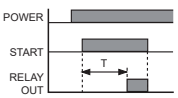
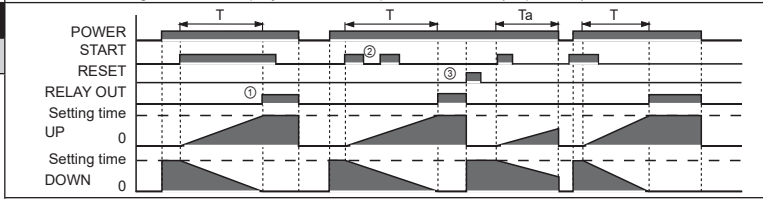
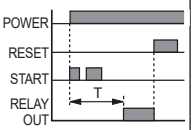
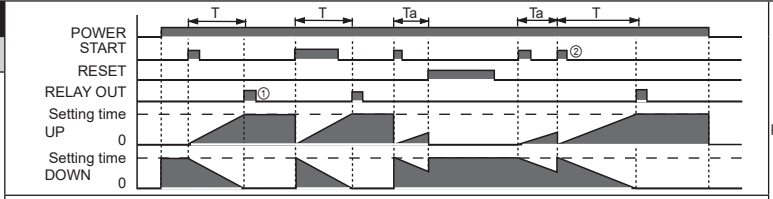
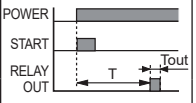
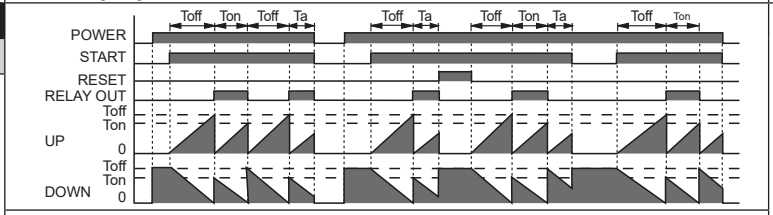
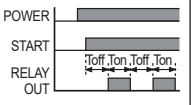
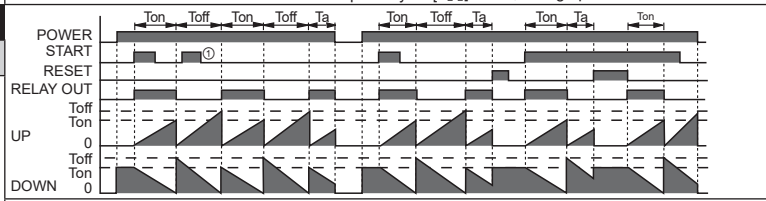
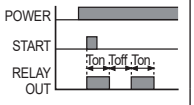
● **Output operation mode: ⅄-Δ, T, TI (LE4SA only)**



※It is able to change the setting time during the time progressing, but be sure about the time progressing while changing of the time.
※If pressing MD while setting time is shorter than min. setting time, setting value will be flickering three times and it will be returned to setting mode again, not to RUN mode.
※If there is no additional key operations in 60 sec after entering into setting mode, it will be return to RUN mode. (set value is not stored.)
※Min. setting time: 0.01 sec
(in case of: ond, ond.I, ond.2 modes, it is able to set "0" since no min. setting time is applied.)

▣ LE4S Output Operation Mode

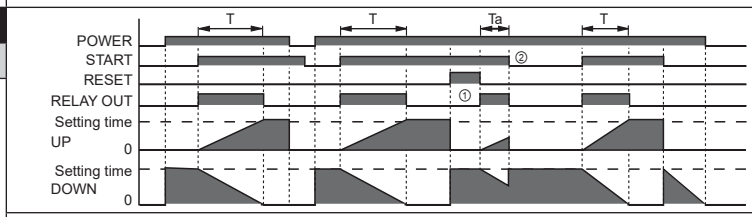
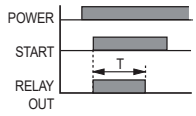
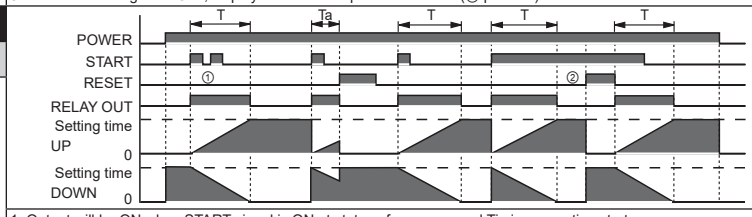
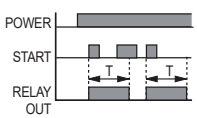
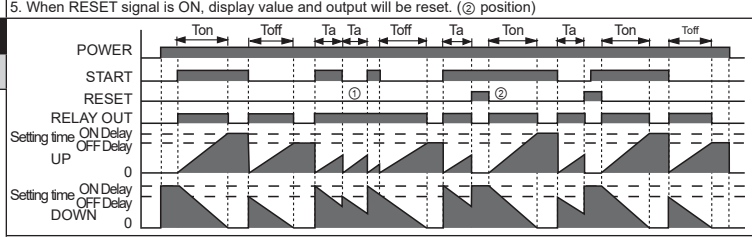
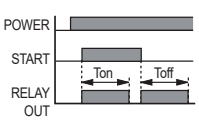
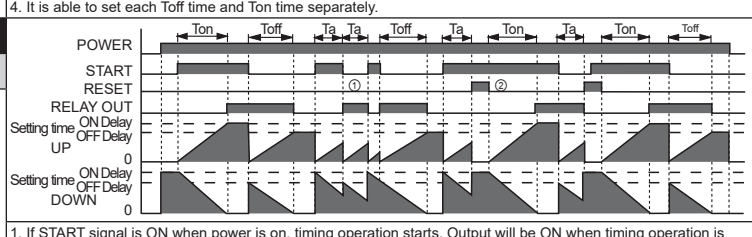
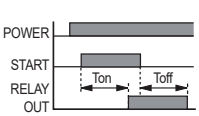
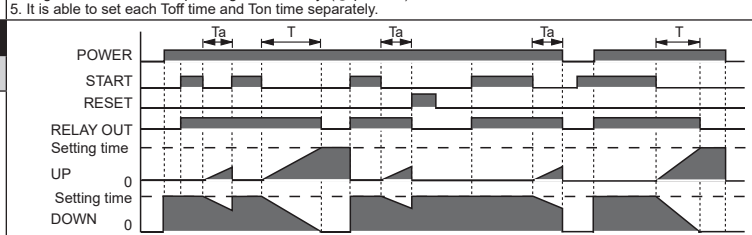
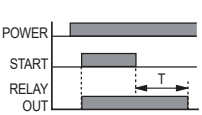
T = Setting time, T > Ta

Mode	Time chart	Operation
[ond] **OND** **ON Delay** T > Ta	 1. Timing operation starts when START signal is ON at status of power on. 2. Output will be ON when timing operation is progressed up to the setting time. Display value will be HOLD. (① position) 3. When RESET signal is ON, display value and output will be reset. (② position) 4. If RESET signal is OFF while START signal is ON,"STEP 1"will be restarted. (③ position) 5. When START signal is OFF, display value and output will be reset. (④ position)	 T = set time
[ond.1] **OND**I **ON Delay 1** T > Ta	 1. Timing operation starts when START signal is ON at status of power on. 2. Output will be ON when timing operation is progressed up to the setting time. Display value will be HOLD. (① position) 3. Even though START signal is applied repeatedly, only the initial signal is recognized. (② position) 4. When RESET signal is ON, display value and output will be reset. (③ position)	 T = set time
[ond.2] **OND**II **ON Delay 2** **(One-shot output)** T > Ta	 1. Timing operation starts when START signal is ON at status of power on. 2. Time limit output will be ON and goes OFF during Tout setting time when timing operation is progressed up to the setting time. Display value will be HOLD. (① position) 3. When RESET signal is ON, display value and output will be reset. 4. If START signal is applied while time is progressing, Timing operation will be reset and started again. (② position) 5. Tout setting range: 0.01 sec to 99.99 sec	 Tout = output time T = set time
[FLK] **FK** **Flicker** **(Toff operation precedes)** Ton, Toff > Ta	 1. If START signal is ON, output will be repeatedly OFF during Toff setting time and will be OFF during Ton setting time when power is ON. 2. When RESET signal is ON, display value and output will be reset. 3. If RESET signal is OFF when START signal is ON, "STEP 1" will be restarted. 4. When START signal is OFF, display value and output will be reset. 5. It is able to set each Toff time and Ton time separately. In [FLK] mode, timing operation starts with Toff.	 Ton, Toff = set time **Enables to set Ton and Toff time differently.**
[FLK.1] **FK.** I **Flicker 1** **(Ton operation precedes)** Ton, Toff > Ta	 1. IF START signal is ON, output will be repeatedly ON during Ton setting time and will be OFF during Toff setting time when power is ON. 2. Even though START signal is applied repeatedly, only the initial signal is recognized. (① position) 3. When START signal is ON, display value and output will be reset. If START signal is ON, it will be restarted. 4. It is able to set each Toff time and Ton time separately. In [FLK.1] mode, timing operation starts with Ton.	 Ton, Toff = set time **Enables to set Ton and Toff time differently.**

※Initial status: UP mode-display value is "0", output is "OFF". DOWN mode-display value is "setting time", output is "OFF".

▣ LE4S Output Operation Mode

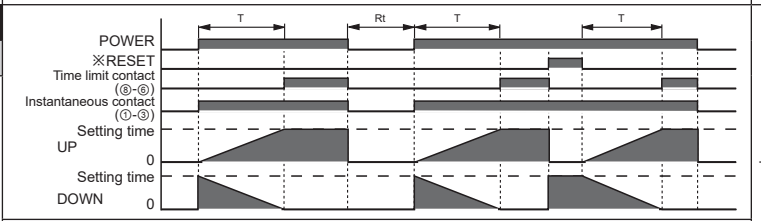
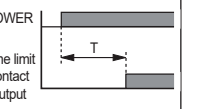
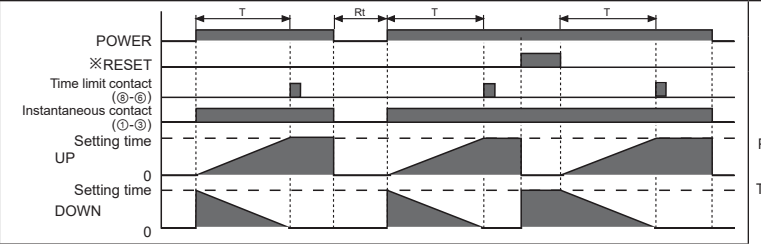
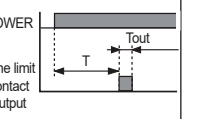
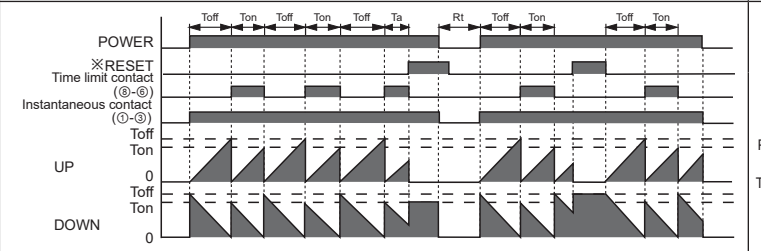
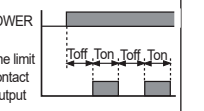
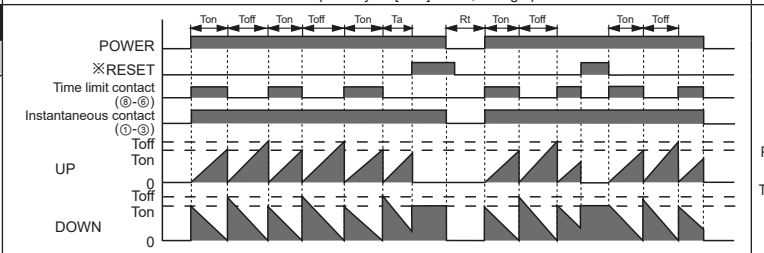
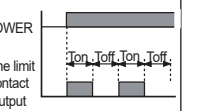
T = Setting time, T > Ta

Mode	Time chart	Operation
[I nt] **INT** **Interval** T > Ta	 1. Output will be ON when START signal is ON at status of power on and Timing operation starts. 2. Output will be OFF when timing operation is progressed up to the setting time. Display value will be HOLD. 3. When RESET signal is ON, display value and output will be reset. (① position) 4. If RESET signal is OFF when START signal is ON,"STEP 1" will be restarted. 5. When START signal is OFF, display value and output will be reset. (② position)	 T = set time
[I nt.1] **INT1** **Interval 1** T > Ta	 1. Output will be ON when START signal is ON at status of power on and Timing operation starts. 2. Output will be OFF when timing operation is progressed up to the setting time. Display value will be HOLD. 3. Even though START signal is applied repeatedly, only the initial signal is recognized. (① position) 4. If START signal is ON after timing operation is progressed up to the setting time, Output will be ON and setting time will be reset and then timing setting starts. 5. When RESET signal is ON, display value and output will be reset. (② position)	 T = set time
[nFd] **ON OFF D** **ON-OFF Delay** T > Ta	 1. If START signal is ON when power is on, Output will be ON when timing operation is progressed up to the Ton setting time (On-Delay). IF START signal is OFF, output will be ON when timing operation is progressed up to the Toff setting time (OFF-Delay). 2. If START signal is applied repeatedly, output is ON and display value will be reset. (① position) 3. When RESET signal is ON, display value and output will be reset. When RESET signal is OFF while START signal is ON, it will be operating as On-Delay. (② position) 4. It is able to set each Toff time and Ton time separately.	 Ton, Toff = set time
[nFd.1] **ON OFF D1** **ON-OFF Delay 1** T > Ta	 1. If START signal is ON when power is on, timing operation starts. Output will be ON when timing operation is progressed up to the Ton setting time (On-Delay). IF START signal is OFF, output will be ON when timing operation is progressed up to the Toff setting time (OFF-Delay). 2. Output will be ON when START signal is ON and goes OFF during setting time and display value will be reset. (① position) 3. Output will be OFF when START signal is OFF and goes ON during setting time and display value will be reset. (① position) 4. When RESET signal is ON, display value and output will be reset. When RESET signal is OFF while START signal is ON, it will be operating as On-Delay. (② position) 5. It is able to set each Toff time and Ton time separately.	 Ton, Toff = set time
[oFd] **OFF D** **OFF Delay** T > Ta	 1. If START signal is ON when power is on, output will be ON. 2. When START signal is OFF, timing operation starts. Output will be OFF when timing operation is progressed up to the setting time. Display value will be HOLD. 3. When RESET signal is ON, display value and output will be reset.	 T = set time

※Initial status: UP mode-display value is "0", output is "OFF". DOWN mode-display value is "setting time", output is "OFF".

■ LE4SA Output Operation Mode

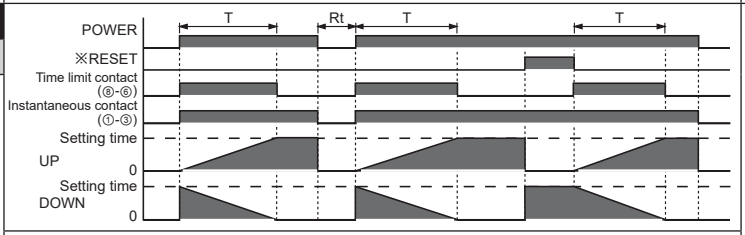
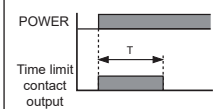
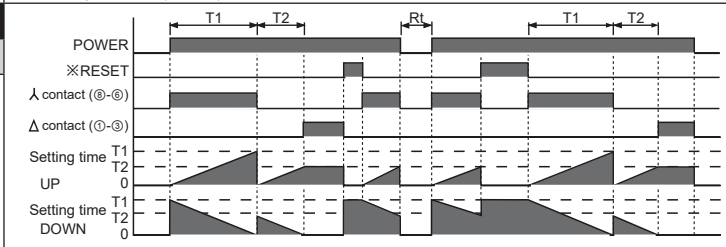
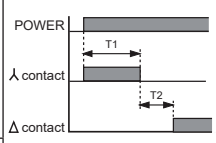
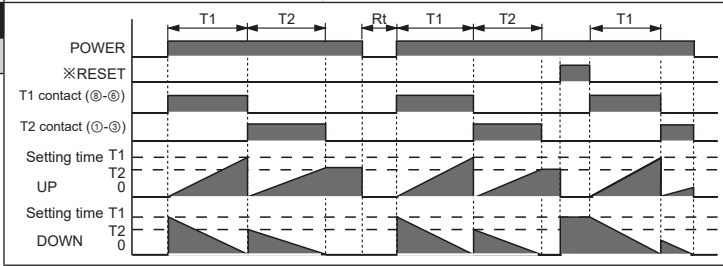
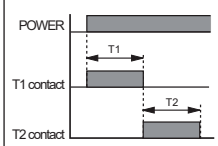
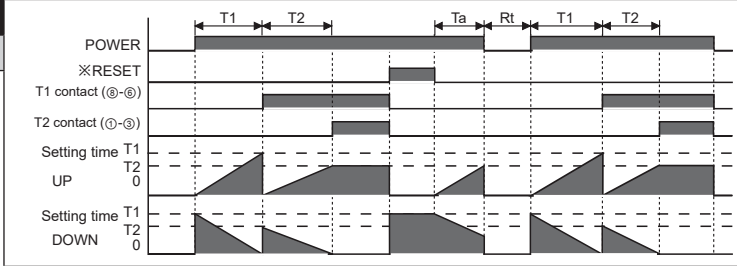
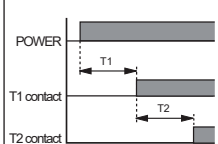
T = Setting time, T > Ta, Rt = Reset time

Mode	Time chart	Operation
[ond] **OND** **ON Delay**	 1. Timing operation starts when power is ON. 2. Time limit output will be ON when timing operation is progressed up to the setting time. Display value will be HOLD. 3. If selecting time limit 1c + instantaneous 1c mode, instantaneous output will be ON when power is ON and goes OFF when power is OFF. 4. If pressing RESET key, display value and time limit output will be reset.	 T = set time
[ond.2] **ONDII** **ON Delay 2 (One-shot output)**	 1. Timing operation starts when power is ON. 2. Time limit output will be ON during Tout setting time and goes OFF when timing operation is progressed up to the setting time. Display value will be HOLD. 3. If selecting time limit 1c + instantaneous 1c mode, instantaneous output will be ON when power is ON and goes OFF when power is OFF. 4. If pressing RESET key, display value and time limit output will be reset. 5. Tout setting range: 0.01 sec to 99.99 sec	 Tout = output time T = set time
[FLK] **FK** **Flicker (Toff operation precedes)** Ton, Toff > Ta	 1. Control output will be repeatedly OFF during Toff setting time and will be ON during Ton setting time when power is ON. 2. If selecting time limit 1c + instantaneous 1c mode, instantaneous output will be ON when power is ON and goes OFF when power is OFF. 3. If pressing RESET key, display value and time limit output will be reset. 4. It is able to set each Toff time and Ton time separately. In [FLK] mode, timing operation starts with Toff.	 Ton, Toff = set time **Enables to set Ton and Toff time differently.**
[FLK.1] **FKI** **Flicker 1 (Ton operation precedes)**	 1. Control output will be repeatedly ON during Ton setting time and will be OFF during Toff setting time when power is ON. 2. If selecting time limit 1c + instantaneous 1c mode, instantaneous output will be ON when power is ON and goes OFF when power is OFF. 3. If pressing RESET key, display value and time limit output will be reset. 4. It is able to set each Ton time and Toff time separately. In [FLK.1] mode, timing operation starts with Ton.	 Ton, Toff = set time **Enables to set Ton and Toff time differently.**

※Initial status: UP mode-display value is "0", output is "OFF". DOWN mode-display value is "setting time", output is "OFF".
※Instantaneous contact (OUT2) will be returned when power is off.
※RESET key is locked for default set and release the lock to use.

▣ LE4SA Output Operation Mode

Rt: Reset time (min. 500ms)

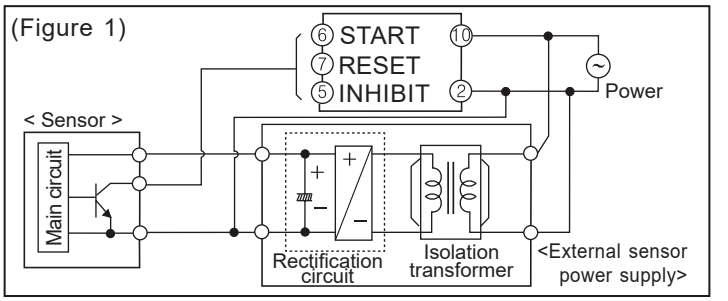
Mode	Time chart	Operation
[i nt] **INT** **Interval**	 1. Time limit output will be ON when power is ON and Timing operation starts. 2. Time limit output will be OFF when timing operation is progressed up to the setting time. Display value will be HOLD. 3. If selecting time limit 1c + instantaneous 1c mode, instantaneous output will be ON when power is ON and goes OFF when power is OFF. 4. If pressing RESET key, display value and time limit output will be reset.	 T = set time
[5-d] **人-Δ** **Star-Delta** **(output will be set automatically as Time limit 2c)**	 1. 人 contact will be ON when power is ON and Timing operation starts. 2. 人 contact will be OFF when timing operation is progressed up to the T1 setting time. Timing operation will be reset and started again. 3. Δ contact will be ON when timing operation is progressed up to the T2 switching time. Display value will be HOLD. 4. If pressing RESET key, display value and 人 - Δ contacts will be reset. 5. It is able to set each T1 and T2 time separately.	 ※T1: set time T2: switching time (人-Δ switching time)
[t 2n] **T** **Twin** **(output will be set automatically as Time limit 2c)**	 1. T1 contact will be ON when power is ON and Timing operation starts. 2. T1 contact will be OFF and T2 contact will be ON when timing operation is progressed up to the T1 setting time. Timing operation will be reset and started again. T2 contact will be OFF when timing operation is progressed up to the T2 setting time. Display value will be HOLD. 3. If pressing RESET key, display value and T1, T2 contacts will be reset. 4. It is able to set each T1 and T2 time separately.	 T1, T2 = set time Enables to set T1 and T2 time same or differently
[t 2n. i] **TI** **Twin 1** **(output will be set automatically as Time limit 2c)**	 1. Timing operation starts when power is ON. 2. T1 contact will be ON when timing operation is progressed up to the T1 setting time. Timing operation will be reset and started again. 3. T2 contact will be ON when timing operation is progressed up to the T2 setting time. Display value will be HOLD. 4. If pressing RESET key, display value and T1 and T2 contacts will be reset. 5. It is able to set each T1 and T2 time separately.	 T1, T2 = set time Enables to set T1 and T2 time same or differently

※Initial status: UP mode-display value is "0", output is "OFF". DOWN mode-display value is "setting time", output is "OFF".
※Instantaneous contact (OUT2) will be returned when power is off.
※RESET key is locked for default set and release the lock to use.

▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- In order to block peripheral current, use isolation transformer which of secondary part is not grounded as (Figure 1) to supply power to the external input device.

(Figure 1)



- Do not connect two or more timers with only one input contact or transistor simultaneously.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

DIN W48×H48mm 8 Pin Plug Timer

▣ Features

- Wide range of the time selection (0.01 sec to 9999.9 hour)
- Selectable voltage input (PNP) method or no-voltage input (NPN) method
- Dot for Decimal Point / Hour. Min. Sec. by RESET key
- Wide range of power supply
  : 100-240VAC 50/60Hz, 24VAC 50/60Hz, 24-48VDC universal
- Memory protection for 10 years (using non-volatile semiconductor)
- Built-in Microprocessor

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

FS 4 E – 1P 4

Power supply	2	24VAC 50/60Hz, 24-48VDC
	4	100-240VAC 50/60Hz
Output	1P	1-stage setting
	I	Indicator
Timer	E	Timer
Display digit	4	9999 (4-digit)
	5	99999 (5-digit)
Item	FS	8-pin plug timer

※8-pin socket (PG-08, PS-08(N)) is sold separately.

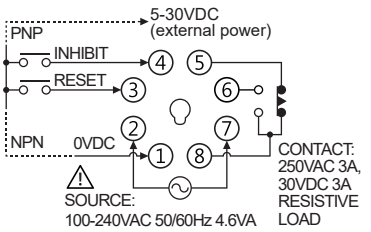
▣ Specifications

Model	1-stage setting	FS4E-1P2	FS4E-1P4	—
	Indicator	—	—	FS5E-I4
Display digit		4-digit		5-digit
Character size (W×H)		3.8×7.6mm		4×8mm
Power supply		24VAC~ 50/60Hz, 24-48VDC⎓	100-240VAC~ 50/60Hz	
Permissible voltage range		90 to 110% of rated voltage		
Power consumption		Max. 3.5VA (24VAC~ 50/60Hz), Max. 2.3W (24-48VDC⎓)	Max. 4.6VA (100-240VAC~ 50/60Hz)	Max. 3.8VA (100-240VAC~ 50/60Hz)
Return time		Max. 500ms		
Time operation		Power ON Start		
Min. signal width		RESET, INHIBIT: approx. 20ms		
Input method		Selectable voltage input (PNP) method or no-voltage input (NPN) method [Voltage input (PNP) method] input impedance: max. 10.8kΩ, [H]: 5-30VDC⎓, [L]: 0-2VDC [No-voltage input (NPN) method] short-circuit impedance: max. 470Ω, short-circuit residual voltage: max. 1VDC, open-circuit impedance: min. 100kΩ		
One-shot output time		0.05 to 5 sec		
Control output	Contact / Type	Time-limit SPDT (1c)		—
	Contact / Capacity	250VAC~ 3A, 30VDC⎓ 3A resistive load		
Relay life cycle	Mechanical	Min. 5,000,000 operations		
	Electrical	Min. 100,000 operations (250VAC 3A resistive load)		
Memory retention		Approx. 10 years (non-volatile memory)		
Repeat error		Max. ±0.01% ±0.05 sec		
Set error				
Voltage error				
Temp. error				
Insulation resistance		Over 100MΩ (at 500VDC megger)		
Dielectric strength		2,000VAC 50/60Hz for 1 min (between all terminals and case)		
Noise immunity	AC voltage	±2kV the square wave noise (pulse width 1μs) by noise simulator		
	AC/DC voltage	±500V the square wave noise (pulse width 1μs) by noise simulator		
Vibration	Mechanical	0.75mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour		
	Malfunction	0.5mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min		
Shock	Mechanical	300m/s^2 (approx. 30G) in each X, Y, Z direction for 3 times		
	Malfunction	100m/s^2 (approx. 10G) in each X, Y, Z direction for 3 times		
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃		
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH		
Protection structure		IP20 (front part, IEC standard)		
Approval				
Weight※1		Approx. 130g (approx. 90g)		Approx. 120g (approx. 80g)

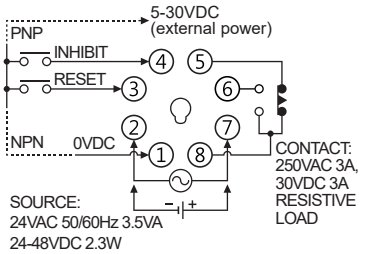
※1: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Connections

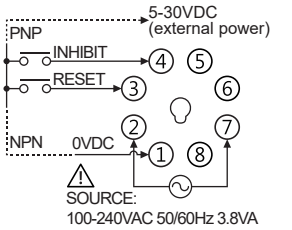
● **FS4E-1P4**



● **FS4E-1P2**



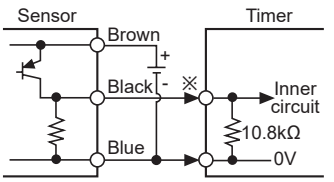
● **FS5E-I4**



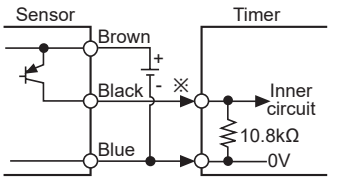
▣ Input Connections

◎ Voltage input (PNP)

● **Solid-state input (standard sensor: PNP output type sensor)**



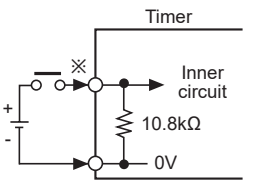
(PNP output)



(PNP open collector output)

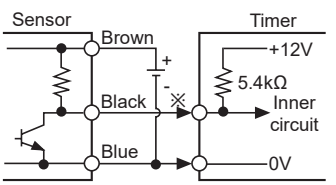
※INHIBIT, RESET input part

● **Contact input**

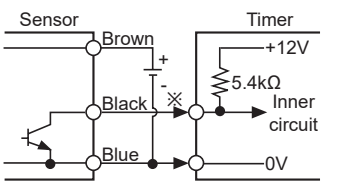


◎ No-voltage input (NPN)

● **Solid-state input (standard sensor: NPN output type sensor)**



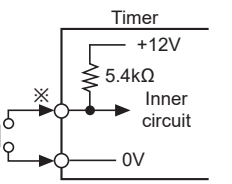
(NPN output)



(NPN open collector output)

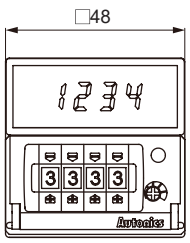
※INHIBIT, RESET input part

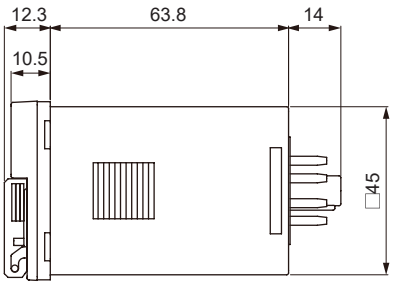
● **Contact input**



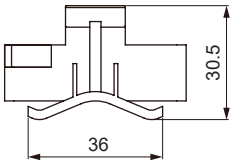
▣ Dimensions

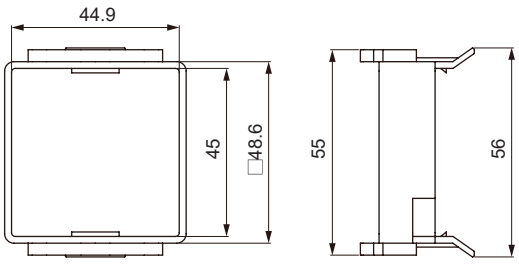
(unit: mm)



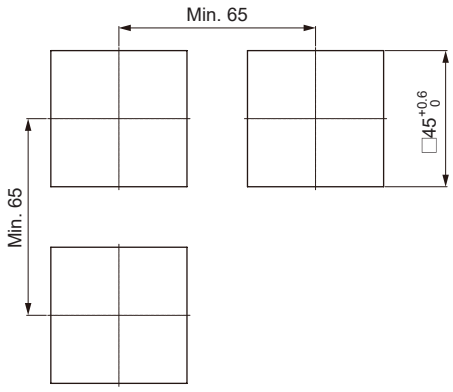


◎ Bracket

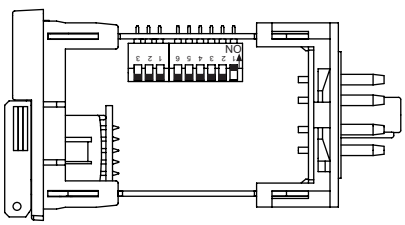


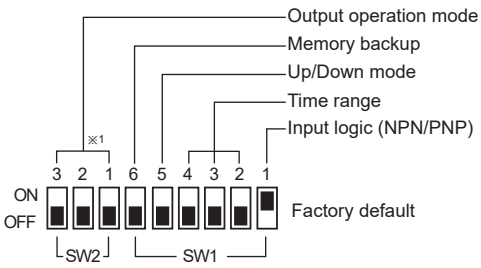


◎ Panel cut-out



▣ DIP Switch Setting





※1: Indicator model (FS5E-I4) does not have no. 1, 2, 3 of SW2 for output operation mode setting.

● Input logic (INHIBIT, RESET input)

SW1		Function
1	ON / OFF	NPN (no-voltage input)
	ON / OFF	PNP (voltage input)

● Up/Down mode

SW1		Function
5	ON / OFF	Down mode
	ON / OFF	Up mode

● Memory backup

SW1		Function
6	ON / OFF	No memory backup
	ON / OFF	Memory backup

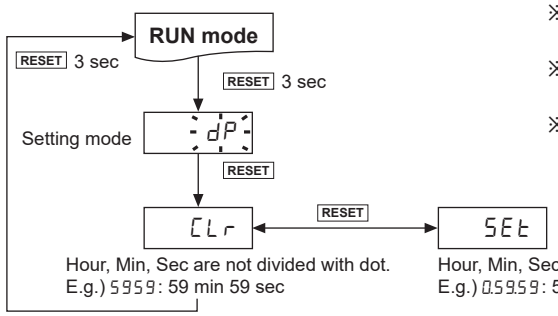
※How to change settings
Power OFF → change settings → power ON → press RESET key or input signal (min. 20ms)

■ Time Range

SW1	4-digit	5-digit
4 3 2 ON OFF	99.99 sec	9999.9 sec
4 3 2 ON OFF	999.9 sec	99999 sec
4 3 2 ON OFF	9999 sec	9 min 59.99 sec
4 3 2 ON OFF	99 min 59 sec	99 min 59.9 sec

SW1	4-digit	5-digit
4 3 2 ON OFF	999.9 min	9999.9 min
4 3 2 ON OFF	99 hour 59 min	9 hour 59 min 59 sec
4 3 2 ON OFF	999.9 hour	999 hour 59 min
4 3 2 ON OFF	9999 hour	9999.9 hour

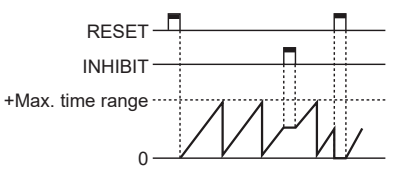
■ Dot for Hour, Min, Second



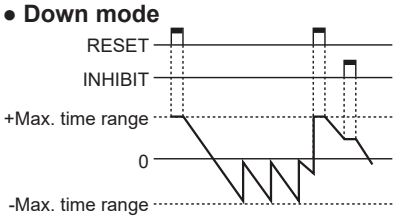
※In run mode, hold the RESET key for over 3 sec, and it enters setting mode[dP].
※In setting mode, hold the RESET key for over 3 sec, and it saves the setting and returns to RUN mode.
※If there is no RESET key input for 60 sec when entering setting mode, it returns to RUN mode.

■ Time Operation for Indicator (FS5E-I4)

● Up mode



● Down mode



※- display is only for F, K, Q, S output operation mode and it cannot be set.

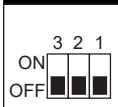
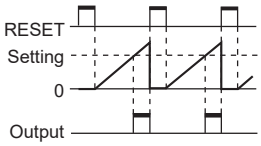
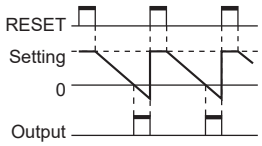
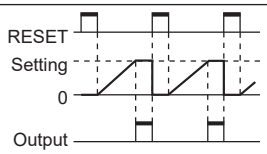
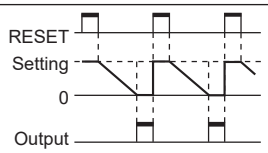
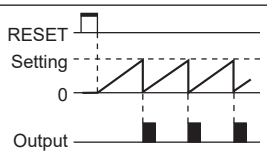
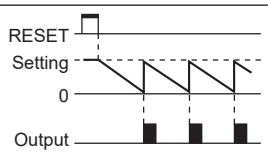
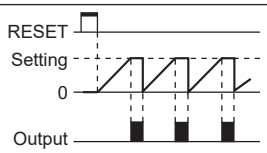
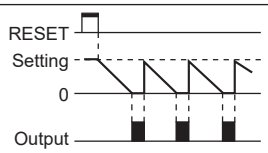
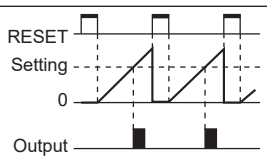
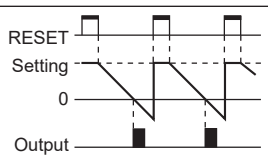
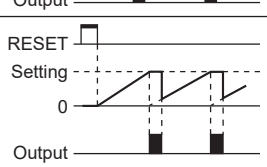
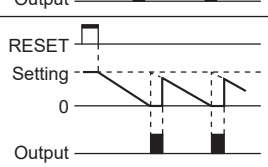
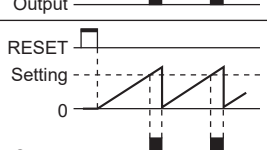
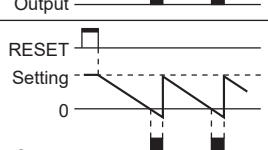
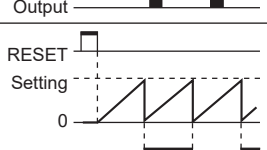
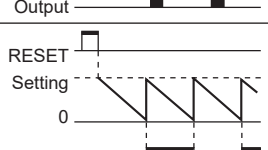
■ Error Display and Output Operation

Error Display	Error description	Troubleshooting
Err0	Setting value is 0.	Change the setting value anything but 0.

※When error occurs, the output turns OFF.
※Indicator model does not have error display function.

▣ Output Operation Mode

■ ← One-shot output (0.05 to 5 sec)　　⊓ ← Self-holding output

Output mode (SW2)	ON OFF 5 Up mode	ON OFF 5 Down mode	Operation
F 			After time-up, the display value increases or decreases until reset signal input is applied and self-holding output is maintained.
N 			After time-up, the display value and self-holding output are maintained until reset signal input is applied.
C 			When time-up, the display value is reset and it operates simultaneously.
R 			After time-up, the display value is reset after one-shot output time and it operates simultaneously.
K 			After time-up, the display value increases or decreases until reset signal input is applied.
P 			After time-up, the display value is maintained while output is ON. The value is internally reset and it operates simultaneously.
Q 			After time-up, the display value increases or decreases during one-shot output time.
S 			Output turns OFF→ON→OFF operates repeatedly (flicker).

※Set one-shot output time by front TIME volume switch.

▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- 24-48VDC, 24VAC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Use the product, 0.1 sec after supplying power.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Change setting time(T1), time range or etc. after turning off the power of the timer.
- This product may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

W48×H48mm, Weekly/Yearly Timer

▣ Features

- Easy to check and change the program setting
- Customizable weekly or yearly unit time setting and control by user
- Includes daylight saving time function
- 1 independent control output. (relay)
- Flush and surface, DIN rail mounting are in one unit.

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

LE365 S — 4 1

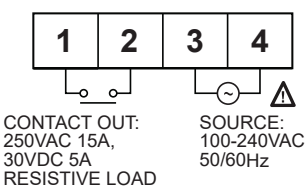
Output	1	1 Relay output
Power supply	4	100-240VAC 50/60Hz
Size	S	DIN W48×H48mm
Item	LE365	Weekly/Yearly timer

▣ Specifications

Model		LE365S-41
Power supply		100-240VAC～ 50/60Hz
Allowable voltage range		90 to 110% of rated voltage
Power consumption		Max. 2.4VA (100-240VAC～)
Timing program		48 steps for weekly, 24 steps for yearly
Operation mode		ON/OFF mode, cycle mode, pulse mode
Mounting		Panel flush, surface, DIN rail
Time deviation		±15 sec/month (ambient temperature: 25℃) (±4 sec/week)
Temperature error		±0.01% ±0.05 sec
Memory protection		Over 5 years (at 25℃)
Control Output	Contact type	SPST (Single Pole Single Throw)
	Contact capacity	250VAC～ 15A, 30VDC⎓ 5A resistive load
	Output number	Independent 1 output (1a)
Relay life cycle	Mechanical	Min. 5,000,000 operations (switching capacity 30 times/min)
	Electrical	50,000 operations<switching capacity 20 times/min, 250VAC 15A (resistive load)>
Insulation resistance		Over 100MΩ (at 500VDC megger)
Dielectric strength		2,000VAC 50/60Hz for 1min
Noise immunity		±2kV the square wave noise (pulse width: 1μs) by the noise simulator
Environment	Ambient temperature	-10 to 55℃, storage: -25 to 65℃
	Ambient humidity	35 to 85%RH
Approval		CE c UL us
Unit weight		Approx. 110g

※Environment resistance is rated at no freezing or condensation.

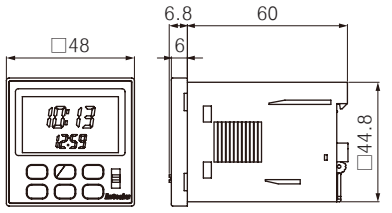
▣ Connections



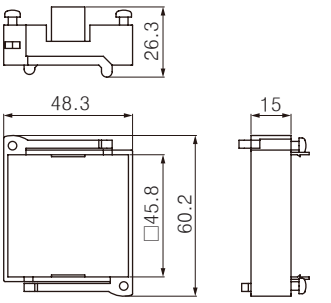
▣ Dimensions

(unit: mm)

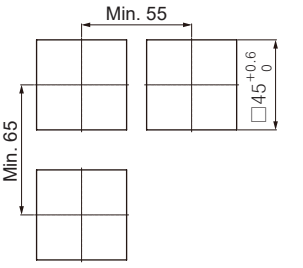
1) Front panel mounting



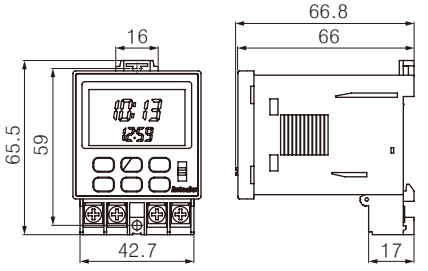
◎ Bracket



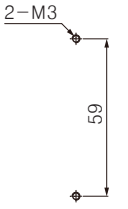
◎ Panel cut-out



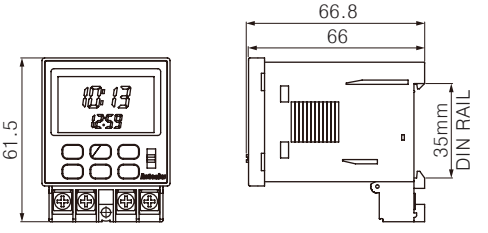
2) Surface mounting



◎ Panel hole cut-out

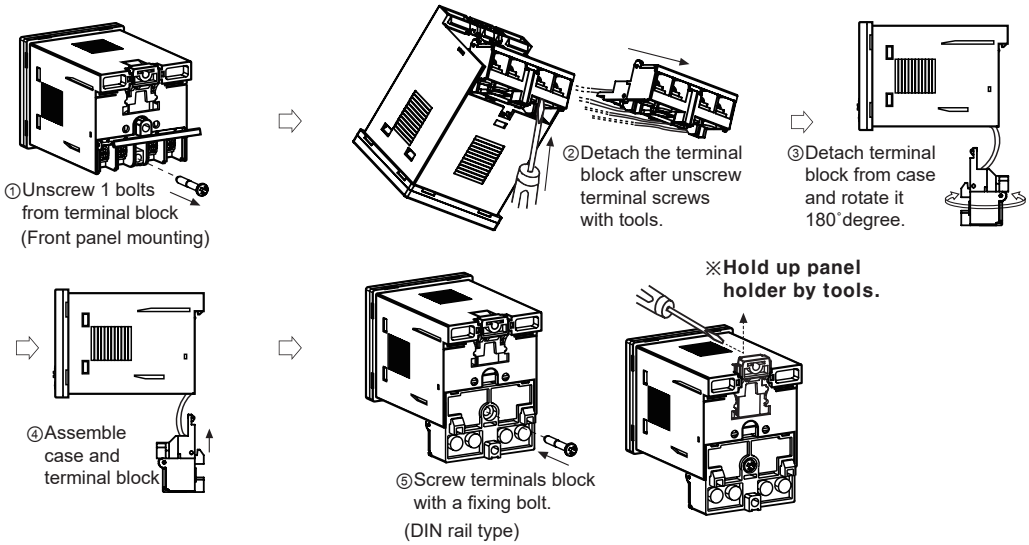


3) DIN rail mounting

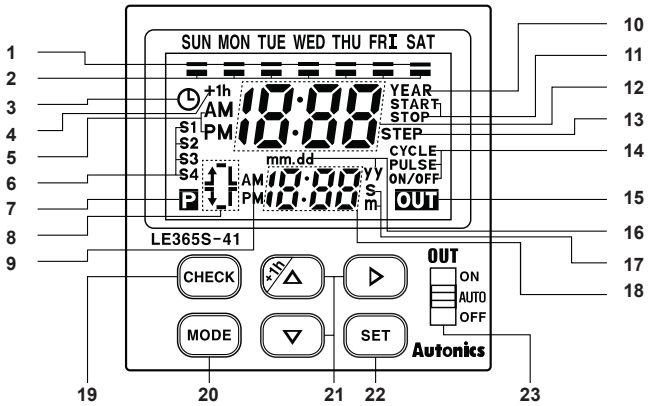


▣ How to Switch from The Flush Mounting to Surface or DIN Rail Mounting Type

Remove terminals from the body after unscrewing terminals screws, and then assemble terminals to the body after rotating terminals as shown below.



▣ Unit Description



1. Day indicator
2. Day display
● Light: Day is selected.
● Light-out: Day is not selected.
3. Current time setting mode indicator
4. DST display (daylight saving time)
5. AM/PM display (main display)
6. Season display
7. Program display
8. Display ON time/day, OFF time/day, ON time width, OFF time width
9. AM/PM display (sub-display)
10. YEAR display
: It turns ON when set, check, modify, delete yearly program, set yearly holidays and operate yearly program.
11. Yearly START/STOP day display
12. Main display
13. Remaining step display
14. Operation mode display
15. Output mode display
16. Year, month, date display
17. Unit of pulse width display
18. Sub display
19. CHECK key
20. MODE key
21. Operation key
: Press +1h key over 3 sec in RUN mode, DST mode is set and released.
22. SET key
23. Output selection switch
● AUTO: Control output according to the set program.
● ON: Output is ON. (operation)
● OFF: Output is OFF. (block)

▣ Functions

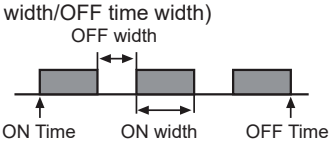
◎ Definitions
● Record: A part of program that controls output operation.
● Step: Basic component of Record.

◎ Operation modes
● If the operation mode of Program 1 (program 2) is set on pulse mode initially, the pulse mode is fixed for additional programs. If the operation mode of Program 1 (program 2) is set on ON/OFF or cycle mode initially, pulse mode cannot be used for additional pulse programs.
● If the weekly operation mode is set on ON/OFF or cycle mode, the yearly operation mode is fixed on ON/OFF mode.
If the yearly operation mode is set on ON/OFF, the weekly operation mode is fixed on ON/OFF or cycle mode.
● If the weekly operation mode is set on pulse mode, the yearly operation mode is fixed on pulse mode. If the yearly operation mode is set on pulse mode, the weekly operation mode is fixed on pulse.

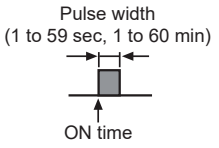
●Weekly ON/OFF mode
Output operation by ON/OFF set time.
• Min. time setting unit: 1 min
• It is able to set ON/OFF day separately.
• One record in two steps
(ON day/ON time, OFF day/OFF time)

●Weekly Cycle operation
It outputs ON the set ON time width which is from Cycle operation ON time to Cycle operation OFF time, and it outputs OFF the set OFF time width.

• Set range for ON/OFF time width
: 1 min to 12 hour 59 min
• One record in 3 steps (ON day/ON time, OFF day/OFF time, ON time width/OFF time width)



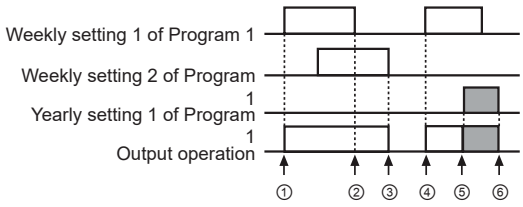
● Weekly pulse mode
Output turns ON at ON time for a specified pulse width. (Pulse width: 1 to 59 sec, 1 to 60 min)
• One record in two steps (ON day/ON time, pulse width)



● Yearly ON/OFF mode
Output turns ON at ON time on START date and turns OFF at OFF time on STOP date.
• One Record in three Steps (START/STOP date, ON/OFF time)

● Yearly pulse mode
Output turns ON at ON time on START date and turns OFF at OFF time on STOP time for a specified pulse width repeatedly.
• One record in three steps (START/STOP date, ON time, Pulse width)

◎ Program operation



● ① to ②: Operated by weekly setting 1 of Program 1.
● ② to ③: Operated by weekly setting 2 of Program 1.
● ④ to ⑤: Operated by weekly setting 1 of Program 1.
● ⑤ to ⑥: Operated by yearly setting 1 of Program 1.
(during weekly program operation at 12:00 AM on START date, the weekly program operation stops, and it changes to yearly program operation mode. The yearly program operation stops at 12:00 AM on the next day of STOP date.)

◎ Display and change of next mode

● The day of next mode in Program is displayed on the day indicator, and the time of next mode is displayed on the lower row of screen.
● In ON/OFF operation mode, set ON time and OFF time to next mode. In Pulse operation mode, set Pulse ON time to next mode.

◎ Power restore mode

In setting group 2 - LEVEL2 (rEt turns ON, At or nor flashes), select Auto[At] or Normal [nor] by ▲ or ▼ key and press SET key to set.
● Auto [At] power restore mode
Output operates according to program when power turns ON again after power failure.
●Normal[nor] power restore mode
When power turns ON again after power failure, output is kept OFF and r.In flashes on the lower row of screen and power restore input (press SET key over 3 sec in RUN mode) is applied, r.In turns OFF and output operates according to program.

◎ Season switching mode

This feature uses for setting seasonal weekly operation mode. To operate this mode, save starting month and date, ending month and date of each season which displays S1, S2, S3, S4 then set day and time of each season in weekly program setting. It is also able to operate only in summer and winter season. (S1: set summer season, S2: set winter season, S3/S4: do not set)
In setting group 2-Level 2 (SEn turns ON, oFF flashes.), select ON[on] by ▲ or ▼ key and press SET key to save.
When the season switching mode changed from oFF to on or vice versa, previous set programs are deleted.
● ON[on] mode
Weekly program is switched automatically by season switching.
• Period setting per season
① Press SET key in period setting per season mode of setting group 2. (SEn flashes, season with preset period turns ON and **START** and **STOP** turn ON.)
② Advance to the flashing position of season selection among S1, S2, S3, S4 by ▲ or ▼ key and press SET key.
③ After set **START** month, date per season and press SET key.
④ SET key is pressed after set **STOP** month, date per season, it is advanced to LEVEL1 of period setting per season. Add or adjust the period setting by SET key.
● It is disable to use when it is OFF [oFF].
● If season terms are overlapped, these are prioritized in S4>S3>S2>S1 order.

◎ Daylight saving time

To utilize daylight during the summer season, daylight saving time is adjusted forward one hour from standard time.
In setting group 2-LEVEL 2 (dSt turns ON, At or nor flashes), select Auto [At] or Normal [nor] by ▲ or ▼ key and press SET key to set.

● Auto [At] daylight saving time mode
Current time will be faster as an hour when it is started and slower as an hour when it is finished.

• Automatic daylight saving time period setting

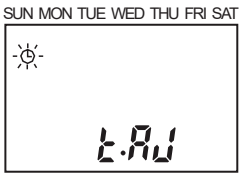
① Automatic daylight saving time period setting LEVEL 1 of setting group 2.
(press SET key when dSt flashes and **START** and **STOP** turn ON.)
② Set START date (month, date) of automatic daylight saving time mode and press SET key.
③ Set START time (AM/PM, hour) of automatic daylight saving time mode and press SET key. But, the minute will be fixed as 00.
④ Set STOP date (month, date) of automatic daylight saving time mode and press SET key.
⑤ Set STOP time (AM/PM, hour) of automatic daylight saving time mode and press SET key. But, the minute will be fixed as 00.

● Normal [nor] daylight saving time mode
Press +1h key over 3sec in RUN mode, "+1h" turns ON and current time is faster as an hour and "+1h" turns ON out or vice versa, when press +1h key over 3sec again.

◎ Current time setting

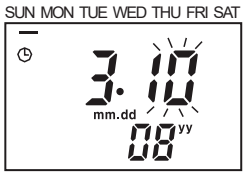
(E.g.) Set the current time as 10, Mar, 2008, 5:10 PM.

① Advance to the current time setting mode



MODE + SET keys are pressed over 3 sec in RUN mode, it is advanced to current time setting of setting group 2 and clock will be flashed and t.Au will be lighted in second display part, press SET key.

② Year, Month, Date setting

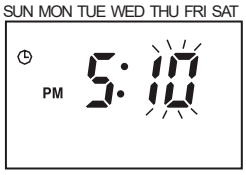


Press ▲ or ▼ key to set 08 (year 2008) and move the flashing digit to position month by ▶ key.
Press SET key after pressing ▲ or ▼ key to set date 10.

③ Current time (AM, PM) setting

Press ▲ or ▼ key to select PM and move the flashing digit to position hour by ▶ key.

④ Current time (hour, min) setting

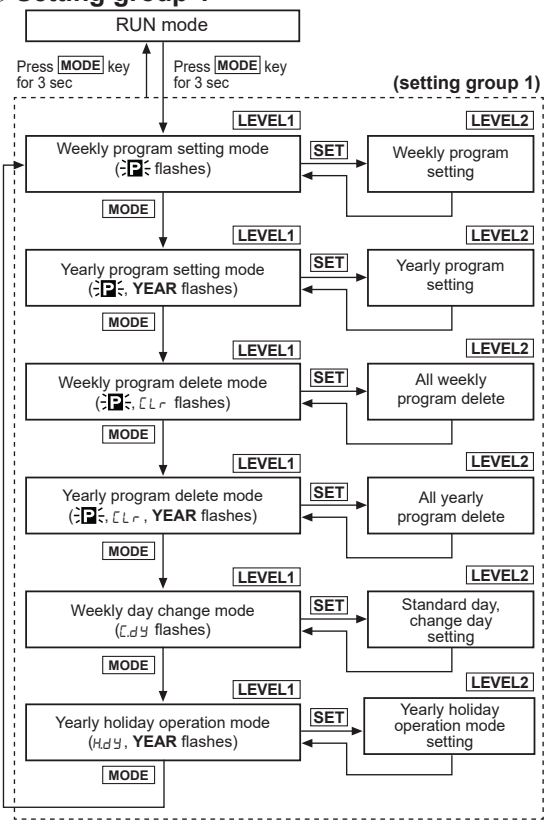


Press ▲ or ▼ key to set 5 PM and move the flashing digit to position min by ▶ key.
Press ▲ or ▼ key to set 10 min and press SET key and it is returned to RUN mode when pressing MODE key over 3 sec

● It advances to "①Current time setting mode" in ON status and set current time as shown above ② to ④ by SET key.
● Current time is set up to 31, Dec., 2099.
● Check current year/month/date in RUN mode When ▶ key is pressed over 3sec in RUN mode, it advances to current year/month/date display. After display current year/month/date for 3sec, it returns to RUN mode displaying current display.

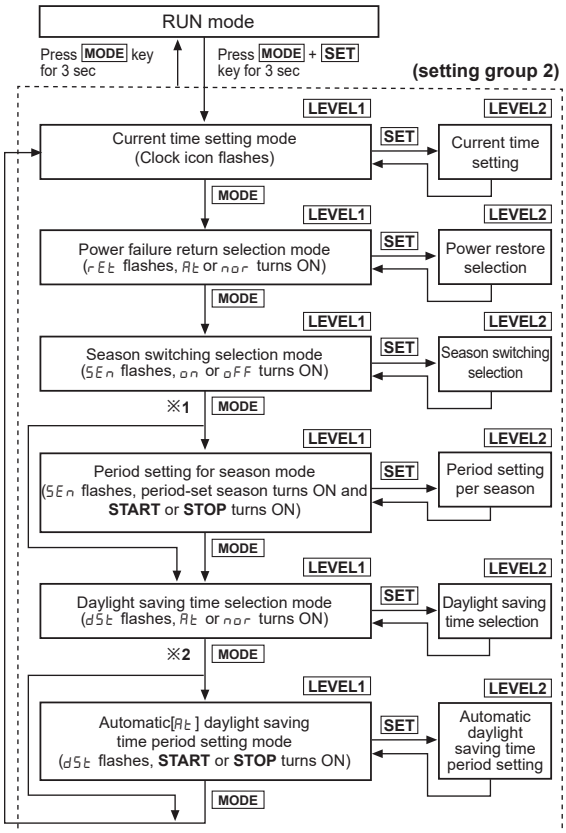
▣ Program Setting

◎ Setting group 1



- When it is advanced to setting group 1 in RUN mode, output will be OFF.
- It is returned to previous setting group 1 when power of time switch is ON again in setting group 1.
- When MODE key is pressed in LEVEL2 of setting group 1, current setting will be canceled and it is returned to previous LEVEL1.
- When press SET key to program over max. number of steps for weekly program in Weekly program setting mode of setting group 1-LEVEL 1, number of remaining steps and **STEP** flash and it returns to LEVEL 1 status.
- When press SET key to program over max. number of steps for yearly program in Yearly program setting mode of setting group 1-LEVEL 1, number of remaining steps and **STEP** flash it returns to LEVEL 1 status.

◎ Setting group 2



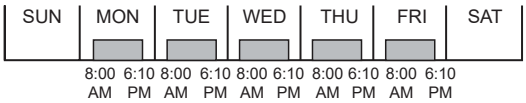
※**1:** Season switching selection is oFF.
※**2:** Automatic switching selection of Daylight Saving Time is Normal[nor].

- When it advances to setting group 2 in RUN mode, output (OUT1, OUT2) will be OFF.
- When power of time switch is ON again in setting group 2, it is returned to previous setting group 1.
- Front MODE key is pressed in LEVEL2 of setting group 2, it is returned to previous LEVEL1.
- When season switching selection is changed from oFF to on or on to oFF, previous set weekly program will be deleted.

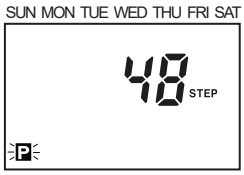
◎ Example of Weekly program setting

• Weekly ON/OFF mode

(E.g.) Output 1 (OUT1) is ON from Monday to Friday at 8:00 AM and OFF at 6:10 PM.

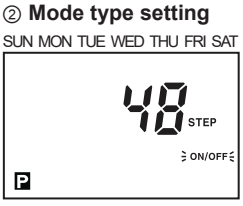


① Advance to weekly program setting mode



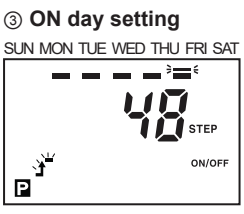
MODE key is pressed over 3sec in RUN mode P flashes and press SET key.

② Mode type setting



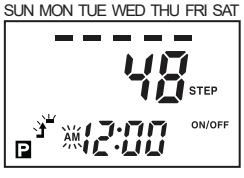
Press SET key in ON/OFF mode.

③ ON day setting



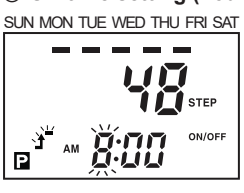
Press ▶ key to move the indicator to Monday, it will be lighted when ▲ or ▼ key are pressed and move it to Tuesday by ▶ key.
Press SET key after Tuesday, Wednesday, Thursday, Friday turn ON.

④ ON time setting (AM, PM)



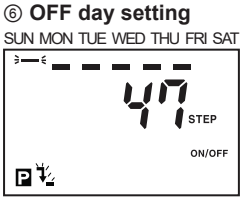
▶ key is pressed, move the flashing to hour position and select PM by ▲ or ▼ key when ON time is afternoon.

⑤ ON time setting (hour, min)



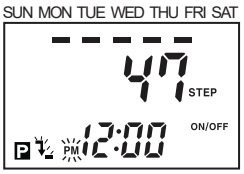
Set 8:00 by ▲ or ▼ key and press SET key.

⑥ OFF day setting



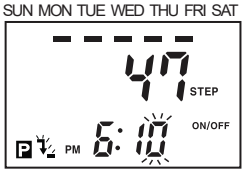
Press SET key to check ON/OFF day.

⑦ OFF time setting (AM, PM)



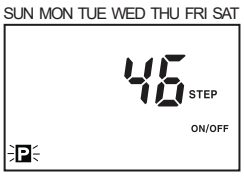
Select PM by ▲ or ▼ key and move the flashing to hour position by ▶ key.

⑧ OFF time setting (hour, min)



Move the flashing to minute position by ▶ key after set 6:00 by ▲ or ▼ key and set the minute as 10 by ▲ or ▼ key and press SET key.

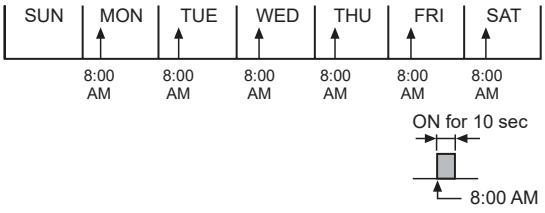
⑨ Complete to set



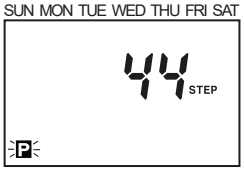
Press SET key to set additional program.

• Weekly Pulse mode

(E.g.) Output 2 (OUT2) is ON for 10 sec at 8:00 AM from Monday to Friday during S2 season in case, period of S1, S2, S3, S4 is set.

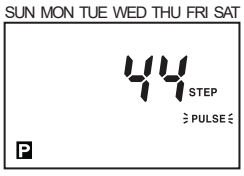


① Advance to weekly program setting mode



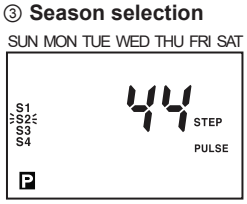
MODE key is pressed for 3 sec in RUN mode, P flashes and press SET key.

② Mode type setting



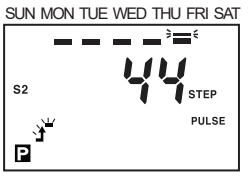
Press ▲ or ▼ key when ON/OFF flashes, pulse flashes and press SET key.

③ Season selection



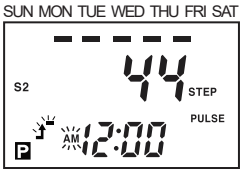
Press ▲ or ▼ key to select season S2 and press SET key.

④ **ON day setting**



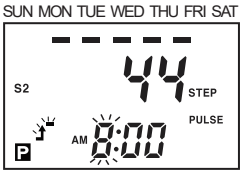
Press ▶ key to move the indicator to Monday, it will be lighted when ▲ or ▼ key is pressed and move it to Tuesday by ▶ key. Press SET key after light Tuesday, Wednesday, Thursday and Friday.

⑤ **ON time setting (AM, PM)**



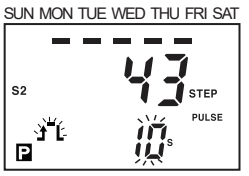
Press ▶ key, move the flashing to hour position and select PM by ▲ or ▼ key when ON time is afternoon.

⑥ **ON time setting (hour, min)**



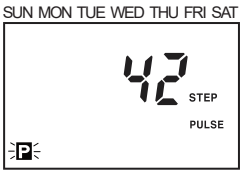
Set 8:00 by ▲ or ▼ key and press SET key.

⑦ **Pulse width setting**



Press ▲ or ▼ key to select pulse width as 10s and press SET key.

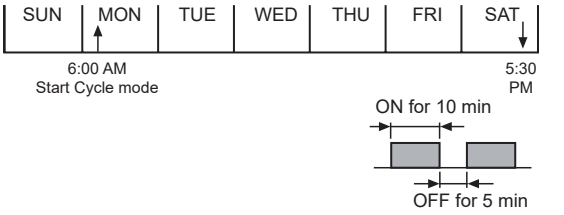
⑧ **Complete to set**



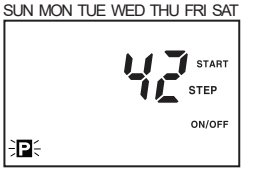
Press SET key to set additional program.

● **Weekly Cycle mode**

(E.g.) Output 1 (OUT1) is ON for 10 min and OFF for 5 min from Monday 6:00 AM to Saturday 5:30 PM.

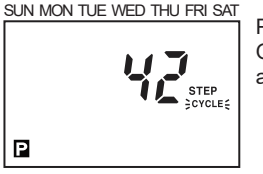


① **Advance to weekly program setting mode**



In RUN mode, press MODE key for 3 sec and P flashes. Press SET key.

② **Mode type setting**

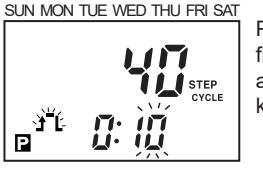


Press ▲ or ▼ key when ON/OFF flashes, cycle flashes and press SET key.

③ to ⑧

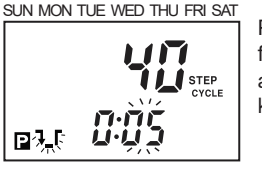
Refer to ③ to ⑧ of "Weekly ON/OFF mode" to set ON day, ON time, OFF day and OFF time.

⑨ **ON time width setting**



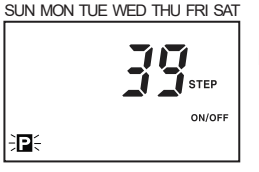
Press ▶ key to move the flashing to minute position and set as 10 min by ▲ or ▼ key and press SET key.

⑩ **OFF time width setting**



Press ▶ key to move the flashing to minute position and set as 5 min by ▲ or ▼ key and press SET key.

⑪ **Complete to set**



Press SET key to set additional program.

◎ Weekly day change

When the specified day mode is required to install in other day, it is started from the set day and returned to previous program setting automatically when it is finished.

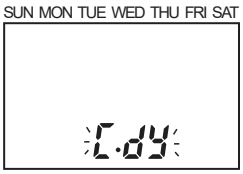
● Weekly day change cancellation

① Change current year, month, date in current time setting mode
② Change standard day
③ Delete all program in program
④ Season switching

● Setting example

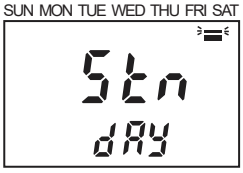
Output is ON in Saturday at 9:00 AM and OFF at 12:00 PM and it is ON 8:30 AM and OFF at 6:00 PM from Monday to Friday and the mode of Monday and Tuesday is operated temporarily as Saturday (standard) program.

① Advance to weekly day change mode



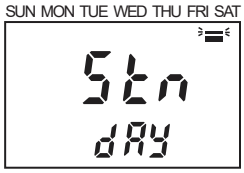
Press MODE key over 3 sec to move to the setting group1 in RUN mode and press it repeatedly until C.dY flashes in second display part and press SET key.

② Standard day selection



Press ▶ key to move the indicator to Saturday and press SET key. after select Saturday as standard day (SAT turns ON) by ▲ or ▼ key.

③ Change day selection



Press ▶ key to move the indicator to Monday and select Monday to change (Monday turns ON) by ▲ or ▼ key and repeat the procedure to select Tuesday to change (TUE turns ON) and press SET key to complete.

◎ Yearly holiday mode

It operates to off the output without program adjustment during previously set yearly holiday period available from present year to 31, Dec. of the next year.
Designate the start date of yearly holiday and year of end date as every year [- -] to repeat the holiday mode for specified in every year.

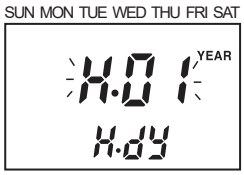
● Setting example

Set every year 5, May to off the output.

① Advance to yearly holiday mode

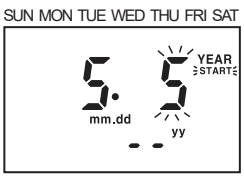
Press MODE key over 3 sec to move to the setting group1 in RUN mode and press it repeatedly until H.dY flashes in second display part and press SET key.

② Yearly holiday number display



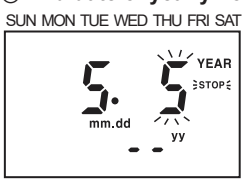
Press SET key after check yearly holiday number.

③ Start date of yearly holiday setting



Press ▶ key until month[- -] position flashes and set May by ▲ or ▼ key and press ▶ key until dazte position flashes. Press SET key after set 5th by ▲ or ▼ key.

④ End date of yearly holiday setting



The flashing is moved to month[- -] position directly and press ▲ or ▼ key to set May and press ▶ key until date position flashes. Press SET key after set 5th by ▲ or ▼ key.

⑤ Complete to yearly holiday

Press MODE key to finish the additional yearly holiday setting and press SET key to set .

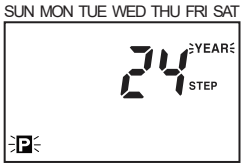
※It is able to set yearly holiday up to 12 times.

◎ Yearly program setting

● Yearly ON/OFF mode

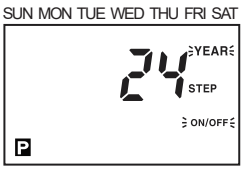
(E.g.) Output (OUT) is ON from every 5, Apr to 7, Apr at 9:00 AM and OFF 5:10 PM.

① Advance to Program 1 (P1) yearly program setting mode



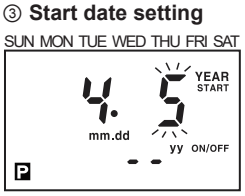
Press MODE key for 3 sec in RUN mode, P flashes and press MODE key once, then, P and YEAR flash and press SET key to set.

② Mode type setting



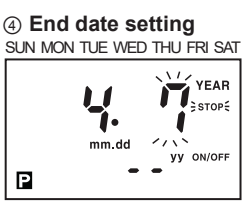
Press SET key when ON/OFF flashes.

③ Start date setting



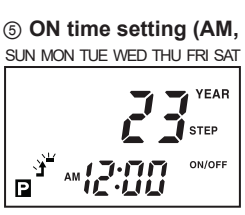
Press ▶ key until month position flashes and set Apr by ▲ or ▼ key and press ▶ key until date position flashes. Press SET key after set 5th by ▲ or ▼ key.

④ End date setting



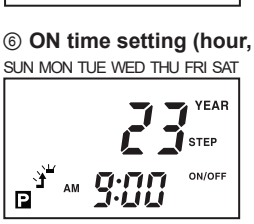
The flashing is moved to month position directly and press ▲ or ▼ key to set April and press ▶ key until date position flashes. Press SET key after set 7th by ▲ or ▼ key.

⑤ ON time setting (AM, PM)



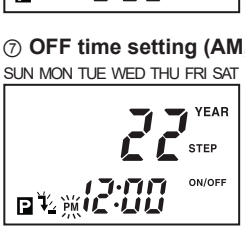
▶ key is pressed, move the flashing to hour position and select PM by ▲ or ▼ key when ON time is afternoon.

⑥ ON time setting (hour, min)



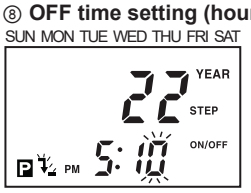
Press ▲ or ▼ key to set 9 and press SET key after check 00 min

⑦ OFF time setting (AM, PM)



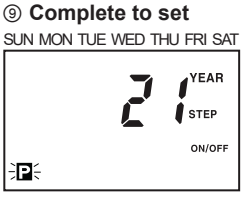
Select PM by ▲ or ▼ key and move the flashing to hour position by ▶ key.

⑧ OFF time setting (hour, min)



Move the flashing to minute position after set 5:00 by ▲ or ▼ key and set the minute as 10 and press SET key.

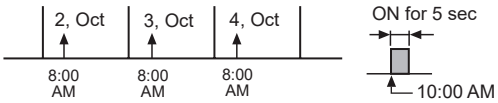
⑨ Complete to set



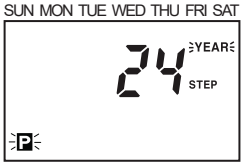
Press SET key to set additional program.

● **Yearly pulse mode**

(E.g.) Output (OUT) is ON from 2, Oct., 2008 to 4,Oct, 2008 at 10:00 AM and OFF after 5 sec (present is 2007.)

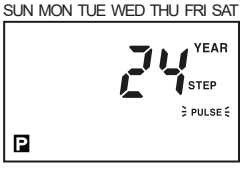


① Advance to yearly program setting mode



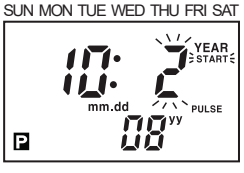
MODE key is pressed for 3 sec in RUN mode, P flashes and press MODE key again, P flashes and press SET key.

② Mode type setting



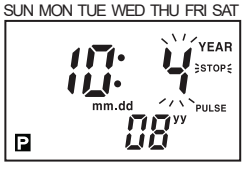
▲ or ▼ key is pressed when ON/OFF flashes to set pulse mode and press SET key.

③ Start date setting



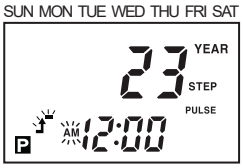
Press ▲ or ▼ key twice to set 08 (year 2008) and move to month position by ▶ key. Set Oct. by ▲ or ▼ key and move to date position by ▶ key and press SET key after set 2nd by ▲ or ▼ key.

④ End date setting



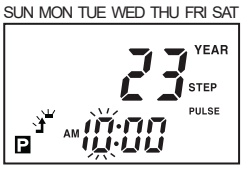
The flashing is moved to month position directly by ▶ key and set 4th by ▲ or ▼ key after move it to date position by ▶ key, then press SET key.

⑤ **ON time setting (AM, PM)**



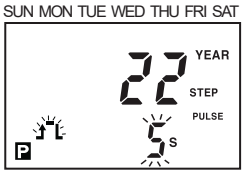
▶ key is pressed, move the flashing to hour position and select PM by ▲ or ▼ key when ON time is afternoon.

⑥ **ON time setting (hour, min)**



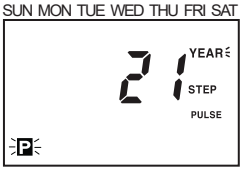
Press ▲ or ▼ key twice to set 10 and press SET key after check 00 min

⑦ **Pulse width setting**



Press ▲ or ▼ key 4 times to select pulse width as 5s and press SET key.

⑧ **Complete to set**

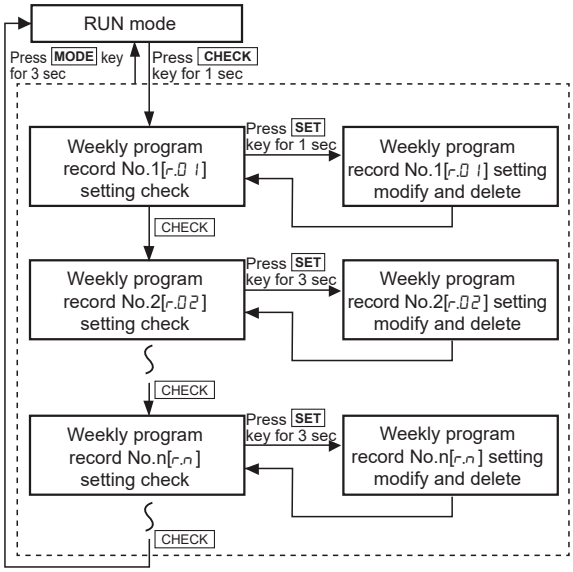


Press SET key to set additional program.

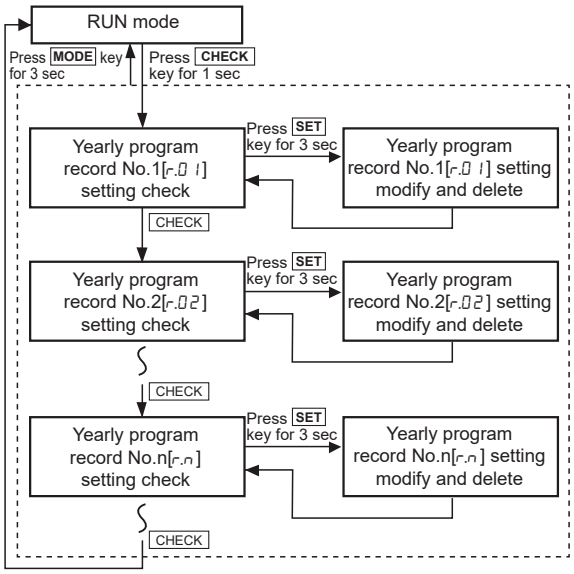
※It is able to set year of start/end date in yearly program setting up to 2 years later from the present year.

▣ Program Check, Modify and Delete

◎ Weekly program check, modify and delete



◎ Yearly program check, modify and delete



※**YEAR** turns ON when check, modify or delete yearly program.

- If any key is untouched for 60 sec, it is returned to RUN mode in weekly or yearly program check.
- In weekly or yearly program check, it controls output according to program setting and output is OFF in modify or delete mode.
- When MODE key is pressed in weekly or yearly program record modify, delete stand by or delete mode, current work is canceled and it is returned to check mode.
- Weekly or yearly program record modify and delete

(1) Program record modify
① When press SET key over 3 sec in program check, Edt flashes in second display part, press SET key.
② It returns to check mode when finish the modify same as the above procedure.

(2) Program record delete
① When press SET key over 3 sec in program check, Edt flashes in second display part, press ▲ or ▼ key until CLr flashes in second display part and press SET key.
② Press CLr key over 3 sec when SET turns ON in second display part, it returns to program check.

W72×H72mm, Weekly/Yearly Timer

▣ Features

- Easy to check and change the program setting
- Customizable weekly or yearly unit time setting and control by user
- Includes daylight saving time function
- Built-in 2 independent control output (relay)
- Flush and surface mounting are in one unit
- Enable to mount on DIN rail with base plate

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

LE7 M — 2

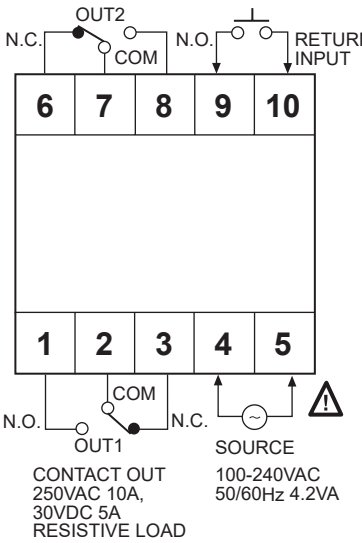
Output	2	2 Relay outputs
Size	M	DIN W72×H72mm
Item	LE7	Weekly/Yearly timer

▣ Specifications

Model		**LE7M-2**
Power supply		100-240VAC～ 50/60Hz
Allowable voltage range		90 to 110% of rated voltage
Power consumption		Max. 4.2VA (100-240VAC～)
RETURN input		Short-circuit or open by switch or relay
Timing program		48 steps for weekly, 24 steps for yearly
Operation mode		ON/OFF mode, cycle mode, pulse mode
Mounting		Front panel, surface, DIN rail
Time deviation		±15 sec/month (ambient temperature: 25℃) (±4 sec/week)
Temperature error		±0.01% ±0.05 sec (ratio by set time)
Memory protection		Over 5 years (at 25℃)
Control Output	Contact type	SPDT (Single Pole Double Throw)
	Contact capacity	250VAC～ 10A, 30VDC⎓ 5A resistive load
	Output number	Independent 2 output (1c×2)
Relay life cycle	Mechanical	Min. 5,000,000 operations (switching capacity: 30 times/min)
	Electrical	Min. 50,000 operations<switching capacity: 20 times/min, 250VAC 10A (resistive load)>
Insulation resistance		Over 100MΩ (at 500VDC megger)
Dielectric strength		2,000VAC 50/60Hz for 1 min
Noise immunity		±2kV the square wave noise (pulse width: 1μs) by the noise simulator
Environment	Ambient temperature	-10 to 55℃, storage: -25 to 65℃
	Ambient humidity	35 to 85%RH
Approval		c UL us
Unit weight		Approx. 272g

※Environment resistance is rated at no freezing or condensation.

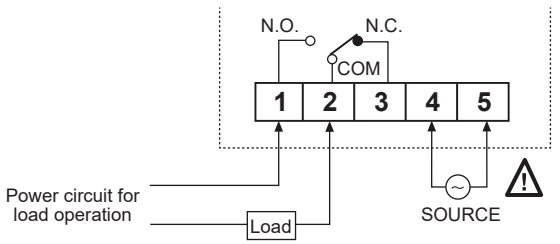
▣ Connections



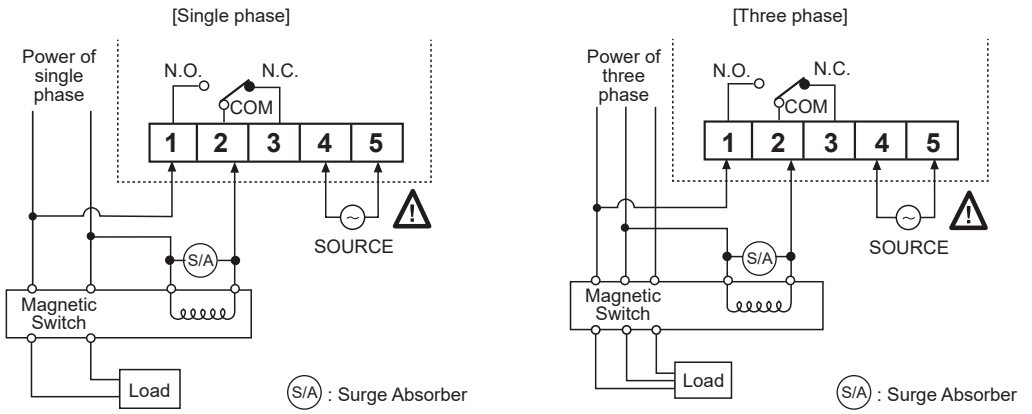
▣ Load Connection

You must connect a surge absorber to the both ends of the load to prevent from damage or malfunction of this unit when controlling non-resistive load (E.g.: magnetic switch, etc).

● In case of controlling the load directly



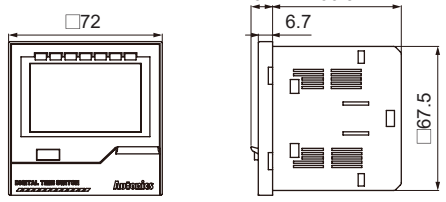
● In case of controlling the load by using a magnetic switch



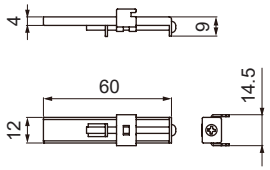
▣ Dimensions

(unit: mm)

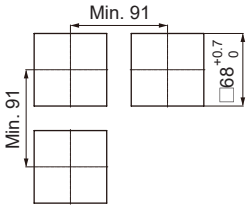
1) Front panel mounting



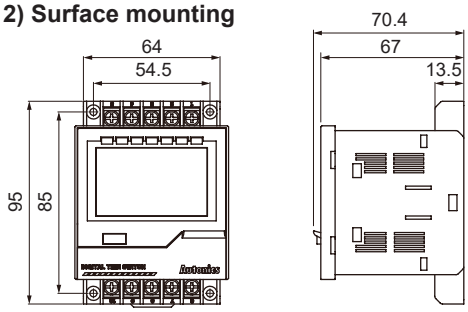
◎ Bracket



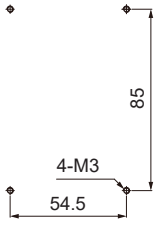
◎ Panel cut-out



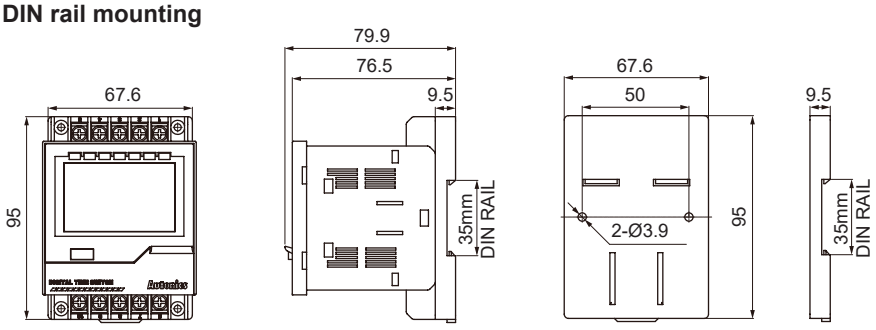
2) Surface mounting



◎ Panel hole cut-out

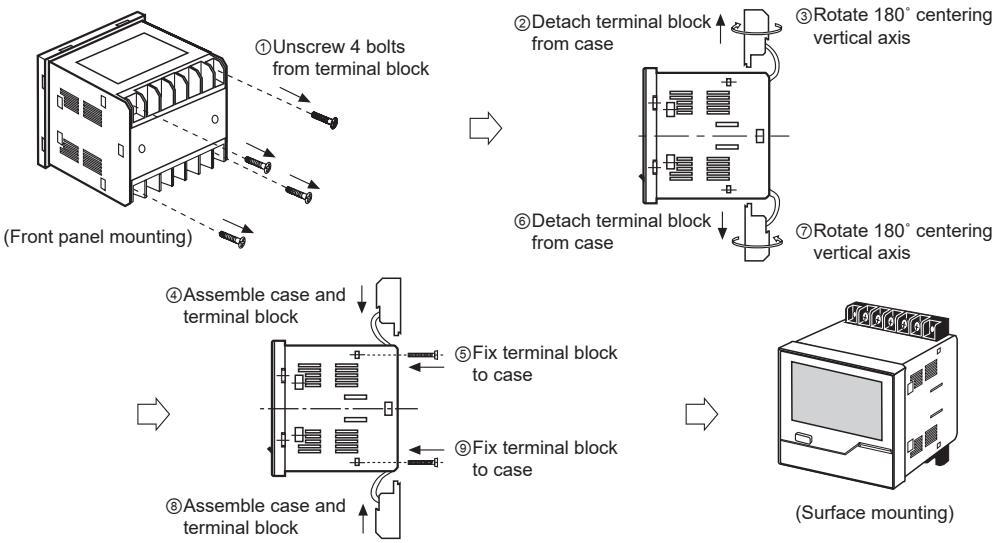


3) DIN rail mounting

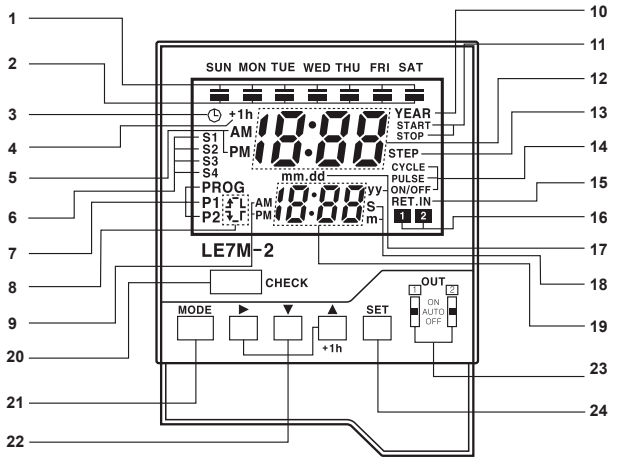


▣ How To Switch From The Flush Mounting To Surface Mounting Type

Remove terminals from the body after unscrewing terminal screws, and then assemble terminals to the body after rotating terminals as shown below.



▣ Unit Description



1. Day indicator
2. Day display
● Light: Day is selected.
● Light-out: Day is not selected.
3. Current time setting mode indicator
4. DST display (daylight saving time)
5. AM/PM display
6. Season display
7. Program display
8. Display ON time/day, OFF time/day, ON time width, OFF time width
9. AM/PM display
10. YEAR display
: It turns ON when set, check, modify, delete yearly program, set yearly holidays and operate yearly program.
11. Yearly START/STOP day display
12. Main display
13. Remaining step display
14. Operation mode display
15. Power restore input display
16. Output mode display
17. Year, month, date display
18. Unit of pulse width display
19. Sub-display
20. CHECK key
21. MODE key
22. Operation key
23. Output selection switch
● AUTO: Control output according to the set program.
● ON: Output is ON. (operation)
● OFF: Output is OFF.
※Output 1 (OUT1) and Output 2 (OUT2) are selected independently.
24. SET key

▣ Functions

◎ Program setting and output operation

Output 1/Output 2 operates according to Program 1 and Program 2.

◎ Definitions

● Record: A part of program that controls output operation.
● Step: Basic component of record.

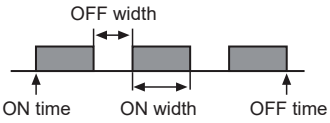
◎ Operation modes

If the operation mode of Program 1 (program 2) is set on pulse mode initially, the pulse mode is fixed for additional programs.
If the operation mode of Program 1 (program 2) is set on ON/OFF or cycle mode initially, pulse mode cannot be used for additional programs.

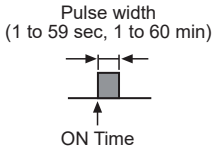
● Weekly ON/OFF mode
Output operation by ON/OFF set time.
• Min. time setting unit: 1 min
• It is able to set ON/OFF day separately.
• One record in two Steps
(ON day/ON time, OFF day/OFF time)

● Weekly Cycle mode
Output turns ON for ON time and turns OFF for OFF time. And the ON/OFF cycle is repeated.

- Set range for ON/OFF time width
  : 1min to 12 hour 59 min
- One record in 3 steps (ON day/ON time, OFF day/OFF time, ON time width/OFF time width)



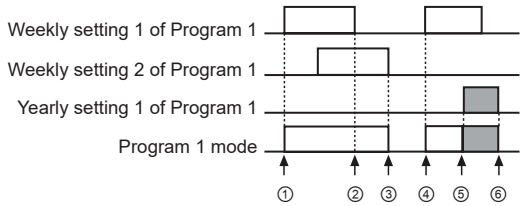
● Weekly pulse mode
Output turns ON at ON time for a specified pulse width. (pulse width: 1 to 59 sec, 1 to 60 min)
- One record in two steps (ON day/ON time, pulse width)



● Yearly ON/OFF mode
Output turns ON at ON time on START date and turns OFF at OFF time on STOP date.
- One record in three steps
  (START/STOP date, ON/OFF time)

● Yearly pulse mode
Output turns ON at ON time on START date and turns OFF at OFF time on STOP time for a specified pulse width repeatedly. (pulse width: 1 to 59 sec, 1 to 60 min).
- One record in three steps (START/STOP date, ON time, pulse width)

◎ Program operation



- ① to ②: Operated by weekly setting 1 of Program 1.
- ② to ③: Operated by weekly setting 2 of Program 1.
- ④ to ⑤: Operated by weekly setting 1 of Program 1.
- ⑤ to ⑥: Operated by yearly setting 1 of Program 1. (during weekly program operation at 12:00 AM on START date, the weekly program operation stops, and it changes to yearly program operation mode. The yearly program operation stops at 12:00 AM on the next day of STOP date.)

◎ Display and change of next mode

- The day of next mode in Program 1 or Program 2 is displayed on the day indicator, and the time of next mode is displayed on the lower row of screen. Press **SET** + **CHECK** in RUN mode it is changed from program 1 to program 2 or from program 2 to program 1.
- In ON/OFF operation mode, set ON time and OFF time to next mode. In Pulse operation mode, set Pulse ON time to next mode.

◎ Power restore mode

In setting group 2-Level 2 (power restore), select auto [AŁ] or normal [nor] by ▲ or ▼ key, and press **SET** key to set.

● Auto [AŁ] power restore mode
Output (OUT1, OUT2) operates according to program when power turns on again after power failure.

● Normal [nor] power restore mode
When power turns on again after power failure, output is kept OFF and **RET.IN** flashes on the panel. When power restore input is detected, **RET.IN** turns off and output operates according to program.
- Power restore input
  Input contact signal in external "Return input terminals (⑨ to ⑩)" by switch or relay, or press **SET** key for 3 sec in RUN mode.
  Please use reliable contacts enough to flow 0.1mA of current at 5VDC when use switch or relay.

◎ Season switching mode

This feature uses for setting seasonal weekly operation mode.
To operate this mode, save starting month and date, ending month and date of each season which displays S1, S2, S3, S4 then set day and time of each season in weekly program setting. It is also able to operate only in summer and winter season. (S1: set summer season, S2: set winter season, S3/S4: do not set)
At the season switching selection LEVEL 2 status in setting 2 group (SEn turns ON, oFF flashes), select ON [on] by pressing ▲ or ▼ key and press **SET** key to complete the season switching.
Be sure that if changing season switching from oFF to on or, on to oFF, the weekly program 1 (P1) and the weekly program 2 (P2) which are set before are deleted.

● ON [on] mode
Weekly program is switched automatically by season switching.
- Period setting per season
  ① At the season switching selection LEVEL 2 status in setting 2 group (SEn flashes, the set season turns ON, **START** and **STOP** turn ON), press **SET** key.
  ② Advance to the flashing position of season selection among S1, S2, S3, S4 by ▲ or ▼ key and press **SET** key.
  ③ After set START month, date per season and press **SET** key.
  ④ **SET** key is pressed after set STOP month, date per season, it is advanced to LEVEL1 of period setting per season. Add or adjust the period setting by **SET** key.

● It is disable to use when it is OFF [oFF].
● If season terms are overlapped, these are prioritized in S4>S3>S2>S1 order.

◎ Daylight saving time

To utilize daylight during the summer season, daylight saving time is adjusted forward one hour from standard time.

In setting group 2-LEVEL 2 (dSt turns ON, At or nor flashes.), select Auto [At] or Normal [nor] by ▲ or ▼ key and press SET key to set.

● Auto[At] Daylight Saving Time mode

Current time will be faster as an hour when it is started and slower as an hour when it is finished.

• Automatic Daylight Saving Time period setting

① Automatic Daylight Saving Time period setting LEVEL 1 of setting group 2. (dSt flashes and **START** and **STOP** turn ON.)

② Set START date (month, date) of automatic Daylight Saving Time mode and press SET key.

③ Set START time (AM/PM, hour) of automatic Daylight Saving Time mode and press SET key. But, the minute will be fixed as 00.

④ Set STOP date (month, date) of automatic Daylight Saving Time mode and press SET key.

⑤ Set STOP time (AM/PM, hour) of automatic Daylight Saving Time mode and press SET key. But, the minute will be fixed as 00.

● Normal [nor] daylight saving time mode

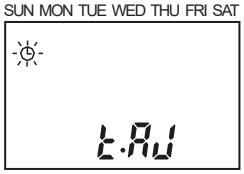
Press +1h key over 3 sec in RUN mode, **+1h** turns ON and current time is faster as an hour and **+1h** turns ON out or vice versa, when press +1h key over 3 sec again.

◎ Current time setting

(E.g.) Set the current time as 10, Mar, 2008, 5:10 PM.

① Advance to the current time setting mode

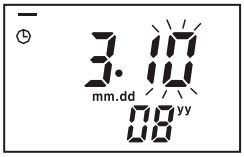
SUN MON TUE WED THU FRI SAT



MODE + SET keys are pressed over 3 sec in RUN mode, it is advanced to current time setting of setting group 2 and clock will be flashed and t.AJ will be lighted in second display part, press SET key.

② Year, month, date setting

SUN MON TUE WED THU FRI SAT



Press ▲ or ▼ key to set 08 (year 2008) and move the flashing digit to position month by ▶ key. Press SET key after press ▲ or ▼ key to set date 10.

③ Current time (AM, PM) setting

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Press ▲ or ▼ key to select PM and move the flashing digit to position hour by ▶ key.

④ Current time (hour, min) setting

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Press ▲ or ▼ key to set 5 PM and move the flashing digit to position min by ▶ key. Press ▲ or ▼ key to set 10 min and press SET key and it is returned to RUN mode when press MODE key over 3 sec

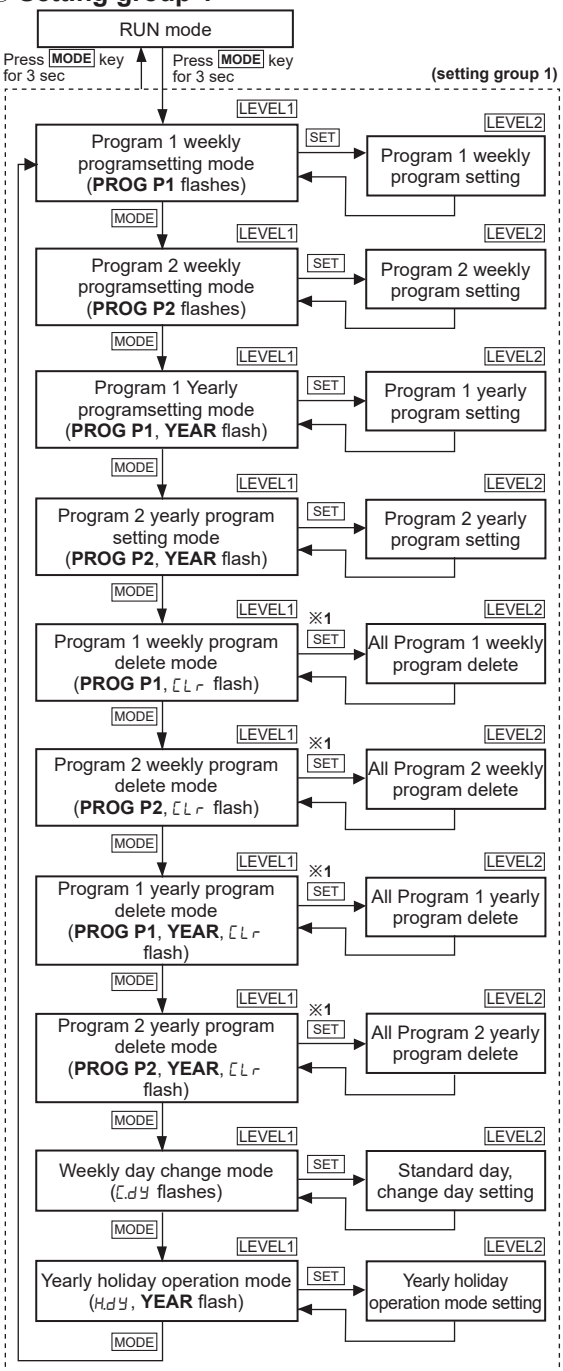
● It advances to "①Current time setting mode" in ON status and set current time as shown above ② to ④ by SET key.

● Current time is set up to 31, Dec., 2099.

● Check current year/month/date in RUN mode When ▶ key is pressed over 3 sec in RUN mode, it advances to current year/month/date display. After display current year/month/date for 3 sec, it returns to RUN mode displaying current display.

▣ Program Setting

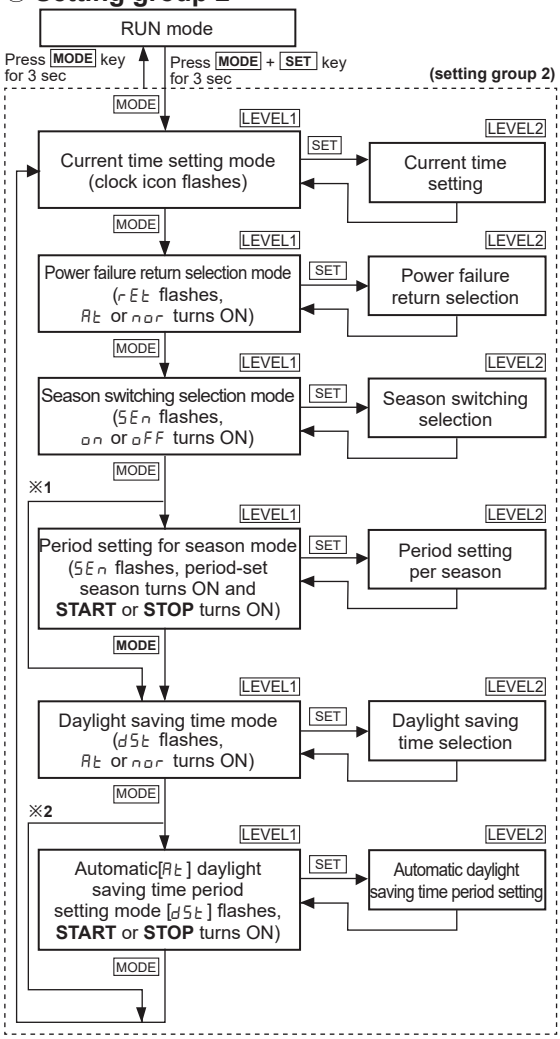
◎ Setting group 1



※1: When the CLr turns ON, hold the SET key for 3 sec, the ALL turns ON and all programs are deleted.

- When it advances to setting group 1 in RUN mode, output (OUT1, OUT2) will be OFF.
- It returns to previous setting group 1 when power of time switch is ON again in setting group 1.
- When MODE key is pressed in LEVEL2 of setting group 1, current setting will be canceled and it returns to previous LEVEL1.

◎ Setting group 2



※1: Season switching selection is oFF.

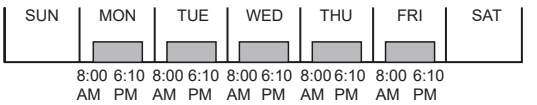
※2: Automatic switching selection of Daylight Saving Time is Normal [nor].

- When it advances to setting group 2 in RUN mode, output (OUT1, OUT2) will be OFF.
- When power of time switch is ON again in setting group 2, it returns to previous setting group 1.
- Front MODE key is pressed in LEVEL2 of setting group 2, it returns to previous LEVEL1.
- When season switching selection is changed from oFF to on or on to oFF, previous set weekly program will be deleted.

◎ Weekly program setting

• Weekly ON/OFF mode

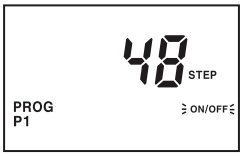
(E.g.) Output 1 (OUT1) is ON from Monday to Friday at 8:00 AM and OFF at 6:10 PM.



① Advance to program 1 (P1) weekly program setting mode

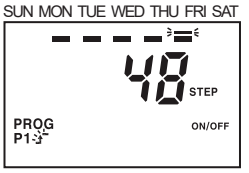
MODE key is pressed over 3 sec in RUN mode, **PROG P1** flashes and press SET key.

② Mode type setting



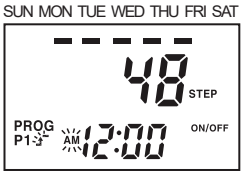
Press SET key in ON/OFF mode.

③ ON day setting



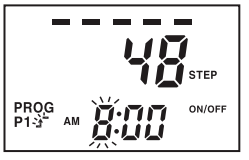
Press ▶ key to move the indicator to Monday, it will be lighted when ▲ or ▼ key are pressed and move it to Tuesday by ▶key. Press SET key after Tuesday, Wednesday, Thursday, Friday turn ON.

④ ON time setting (AM, PM)



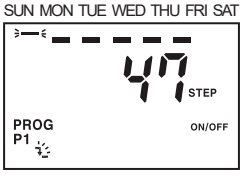
▶key is pressed, move the flashing to hour position and select PM by ▲ or ▼ key when ON time is afternoon.

⑤ ON time setting (hour, min)



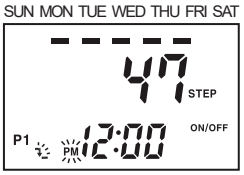
Set 8:00 by ▲ or ▼ key and press SET key.

⑥ OFF day setting



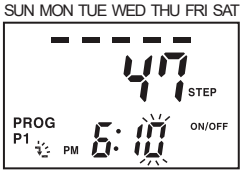
Press SET key to check ON/OFF day.

⑦ OFF time setting (AM, PM)



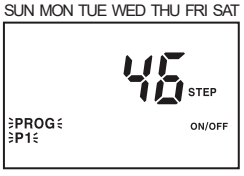
Select PM by ▲ or ▼ key and move the flashing to hour position by ▶ key.

⑧ OFF time setting (hour, min)



Move the flashing to minute position after set 6:00 by ▲ or ▼ key and set the minute as 10 and press SET key.

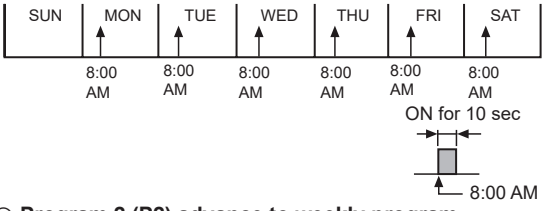
⑨ Complete to set



Press SET key to set additional program.

• Weekly pulse mode

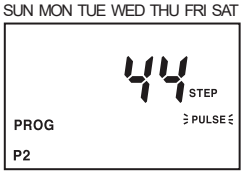
Output 2 (OUT2) is ON for 10 sec at 8:00AM from Monday to Friday during S2 season in case, period of S1, S2, S3, S4 is set.



① Program 2 (P2) advance to weekly program setting mode

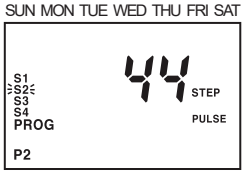
MODE key is pressed for 3 sec in RUN mode, **PROG P1** is flashed and press MODE key again, **PROG P2** flashes and press SET key.

② Mode type setting



Press ▲ or ▼ key when ON/OFF flashes, Pulse flashes and press SET key.

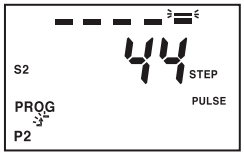
③ Season selection



Press ▲ or ▼ key to select season S2 and press SET key.

④ **ON day setting**

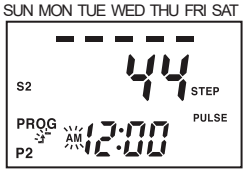
SUN MON TUE WED THU FRI SAT



Press ▶ key to move the indicator to Monday, it will be lighted when ▲ or ▼ key is pressed and move it to Tuesday by ▶ key.
Press SET key after light Tuesday, Wednesday, Thursday and Friday.

⑤ **ON time setting (AM, PM)**

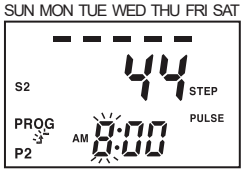
SUN MON TUE WED THU FRI SAT



Press ▶ key, move the flashing to hour position and select PM by ▲ or ▼

⑥ **ON time setting (Hour, Min)**

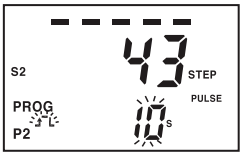
SUN MON TUE WED THU FRI SAT



Set 8:00 by ▲ or ▼ key and press SET key.

⑦ **Pulse width setting**

SUN MON TUE WED THU FRI SAT



Press ▲ or ▼ key to select pulse duration as 10s and press SET key.

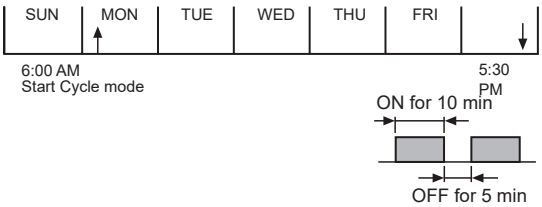
⑧ **Complete to set**

SUN MON TUE WED THU FRI SAT

Press SET key to set additional program.

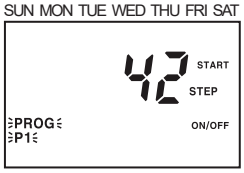
● **Weekly cycle mode**

(E.g.) Output 1 (OUT1) is ON for 10min and OFF for 5 min from Monday 6:00 AM to Saturday 5:30 PM.



① **Advance to program 1 (P1) weekly program setting mode**

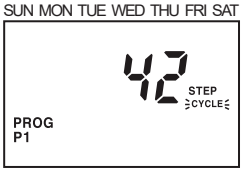
SUN MON TUE WED THU FRI SAT



In RUN mode, press MODE key for 3 sec and **PROG P1** flashes. Press SET key.

② **Mode type setting**

SUN MON TUE WED THU FRI SAT



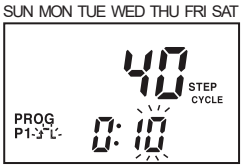
Press ▲ or ▼ key when ON/OFF flashes, CYCLE flashes and press SET key.

③ to ⑧

Refer to ③ to ⑧ of "**●Weekly ON/OFF mode**" to set ON day, ON time, OFF day and OFF time.

⑨ **ON time width setting**

SUN MON TUE WED THU FRI SAT



Press ▶ key to move the flashing to minute position and set as 10 min by ▲ or ▼ key and press SET key

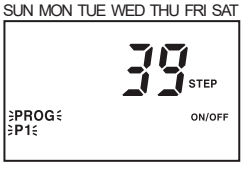
⑩ **OFF time width setting**

SUN MON TUE WED THU FRI SAT

Press ▶ key to move the flashing to minute position and set as 5 min by ▲ or ▼ key and press SET key.

⑪ **Complete to set**

SUN MON TUE WED THU FRI SAT



Press SET key to set additional program.

◎ Weekly day change

It operates when the specified day mode is required to install in other day from the set day and it returns to previous program setting automatically when it is finished. It is applied to program 1 (P1) and program 2 (P2).

● Weekly day change cancellation

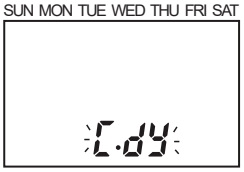
① Change current year, month, date in current time setting mode
② Change standard day
③ Delete all program in program 1 (P1) and program 2 (P2)
④ Season switching

● Setting example

Output 1 (OUT1) is ON in Saturday at 9:00 AM and OFF at 12:00 PM and it is ON 8:30 AM and OFF at 6:00 PM from Monday to Friday and the mode of Monday and Tuesday is operated temporarily as Saturday (standard) program.

① Advance to weekly day change mode

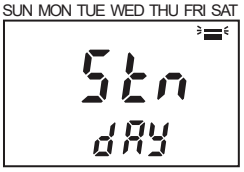
SUN MON TUE WED THU FRI SAT



Press [MODE] key over 3 sec to move to the setting group1 in RUN mode and press it repeatedly until C.dY is flashed in second display part and press [SET] key.

② Standard day selection

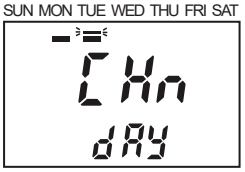
SUN MON TUE WED THU FRI SAT



Press [▶] key to move the indicator to Saturday and press [SET] key. after select Saturday as standard day (SAT turns ON) by [▲] or [▼] key.

③ Change day selection

SUN MON TUE WED THU FRI SAT



Press [▶] key to move the indicator to Monday and select Monday to change (MON turns ON) by [▲] or [▼] key and repeat the procedure to select Tuesday to change (TUE turns ON) and press [SET] key to complete.

◎ Yearly holiday mode

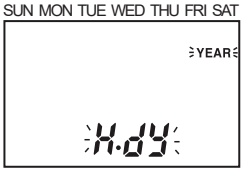
It operates to off the output without program adjustment during previously set yearly holiday period available from present year to 31, Dec. of the next year.
Designate the start date of yearly holiday and year of end date as every year [- -] to repeat the holiday mode for specified in every year.

● Setting example

Set every year 5, May to off the output (OUT1, OUT2).

① Advance to yearly holiday mode

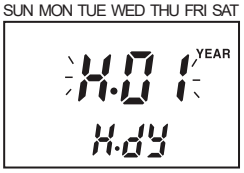
SUN MON TUE WED THU FRI SAT



Press [MODE] key over 3secto move to the setting group1 in RUN mode and press it repeatedly until H.dY flashes in second display part and press [SET] key.

② Yearly holiday number display

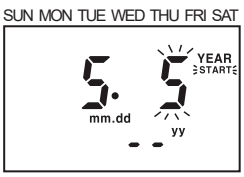
SUN MON TUE WED THU FRI SAT



Press [SET] key after check yearly holiday number.

③ Start date of yearly holiday setting

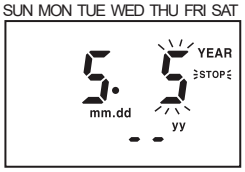
SUN MON TUE WED THU FRI SAT



Press [▶] key until month position flashes and set May by [▲] or [▼] key and press [▶] key until date position flashes. Press [SET] key after set 5th by [▲] key.

④ End date of yearly holiday setting

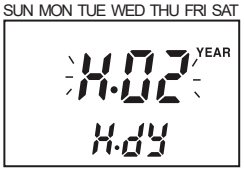
SUN MON TUE WED THU FRI SAT



The flashing is moved to month position directly and press [▲] or [▼] key to set May and press [▶] key until date position flashes. Press [SET] key after set 5th by [▲] or [▼] key.

⑤ Complete to yearly holiday

SUN MON TUE WED THU FRI SAT



Press [MODE] key to finish the additional yearly holiday setting and press [SET] key to set .
※It is able to set yearly holiday up to 12 times.

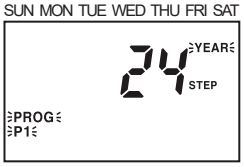
◎ Yearly program setting

• Yearly ON/OFF mode

(E.g.) Output 1 (OUT1) is ON from every 5, Apr to 7, Apr at 9:00 AM and OFF 5:10 PM.

① Advance to program 1 (P1) yearly program setting mode

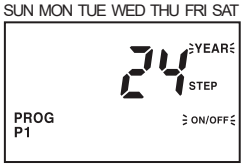
SUN MON TUE WED THU FRI SAT



Press [MODE] key for 3 sec in RUN mode, **PROG P1** is flashed and press [MODE] key 3 times more until **PROG P2 YEAR** flashes and press [SET] key.

② Mode type setting

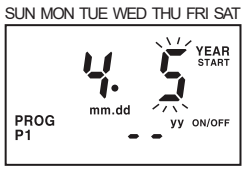
SUN MON TUE WED THU FRI SAT



Press [SET] key when ON/OFF flashes.

③ Start date setting

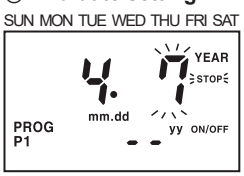
SUN MON TUE WED THU FRI SAT



Press ▶ key until month position flashes and set April by▲ or ▼ key and press ▶ key until date position flashes. Press [SET] key after set 5th by ▲ or ▼ key.

④ End date setting

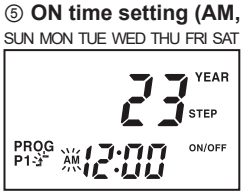
SUN MON TUE WED THU FRI SAT



The flashing is moved to month position directly and press ▲ or ▼ key to set April and press ▲ or ▼ key until date position flashes. Press ▲ key after set 7th by [SET] key.

⑤ ON time setting (AM, PM)

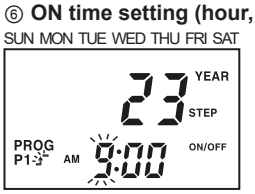
SUN MON TUE WED THU FRI SAT



▶ key is pressed, move the flashing to hour position and select PM by ▲ or ▼ key when ON time is afternoon.

⑥ ON time setting (hour, min)

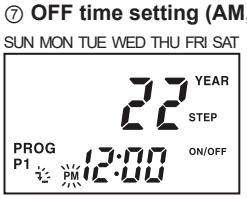
SUN MON TUE WED THU FRI SAT



Press ▲ or ▼ key to set 9 and press [SET] key after check 00min

⑦ OFF time setting (AM, PM)

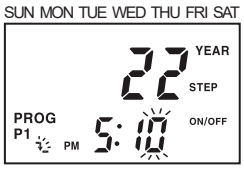
SUN MON TUE WED THU FRI SAT



Select PM by ▲ or ▼ key and move the flashing to hour position by ▶ key.

⑧ OFF time setting (hour, Min)

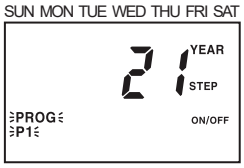
SUN MON TUE WED THU FRI SAT



Move the flashing to minute position after set 5:00 by ▲ or ▼ key and set the minute as 10 and press [SET] key.

⑨ Complete to set

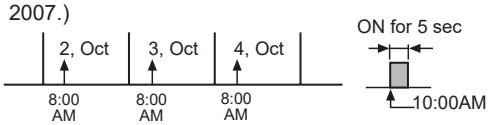
SUN MON TUE WED THU FRI SAT



Press [SET] key to set additional program.

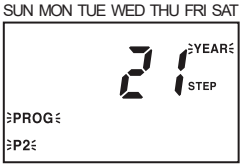
• Yearly pulse mode

(E.g.) Output 2 (OUT2) is ON from 2, Oct, 2008 to 4, Oct, 2008 at 10:00 AM and OFF after 5 sec (present is 2007.)



① Advance to program 2 (P2) yearly program setting mode

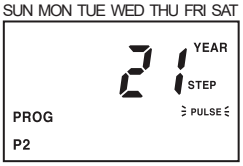
SUN MON TUE WED THU FRI SAT



[MODE] key is pressed for 3 sec in RUN mode, **PROG P1** is flashed and press [MODE] key again, **PROG P2 YEAR** is flashed and press [SET] key.

② Mode type setting

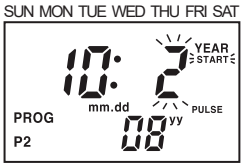
SUN MON TUE WED THU FRI SAT



▲ or ▼ key is pressed when ON/OFF flashes to set pulse mode and press [SET] key.

③ Start date setting

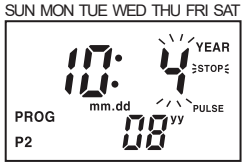
SUN MON TUE WED THU FRI SAT



Press ▲ or ▼ key twice to set 08 (year 2008) and move to month position by ▶ key.
Set Oct. by ▲ or ▼ key and move to date position by ▶ key and press [SET] key after set 2nd by ▲ or ▼ key.

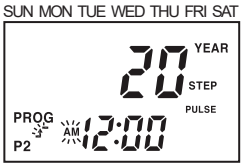
④ End date setting

SUN MON TUE WED THU FRI SAT



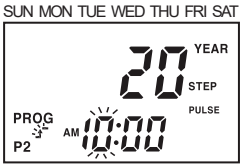
The flashing is moved to month position directly by ▶ key and set 4th by ▲ or ▼ key after move it to date position by ▶ key, then press [SET] key.

⑤ **ON time setting (AM, PM)**



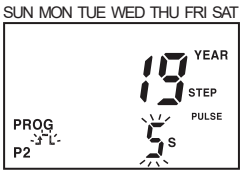
▶ key is pressed, move the flashing to hour position and select PM by ▲ or ▼ key when ON time is afternoon.

⑥ **ON time setting (hour, Min)**



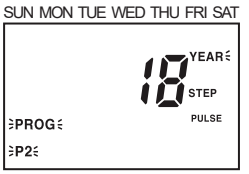
Press ▲ or ▼ key twice to set 10 and press SET key after check 00 min

⑦ **Pulse width setting**



Press ▲ or ▼ key 4 times to select pulse width as 5s and press SET key.

⑧ **Complete to set**

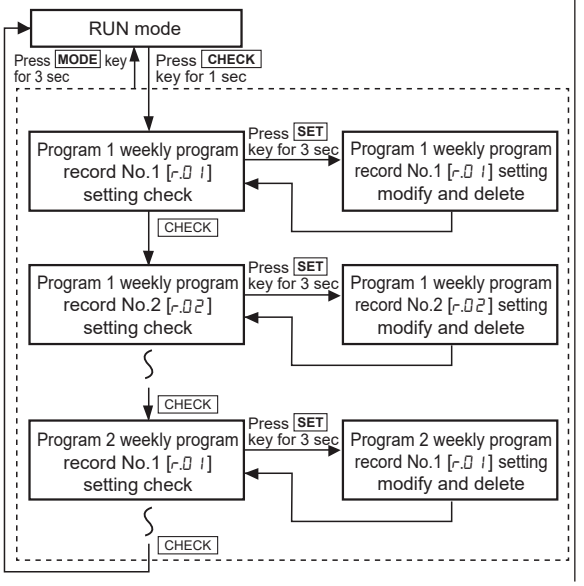


Press SET key to set additional program.

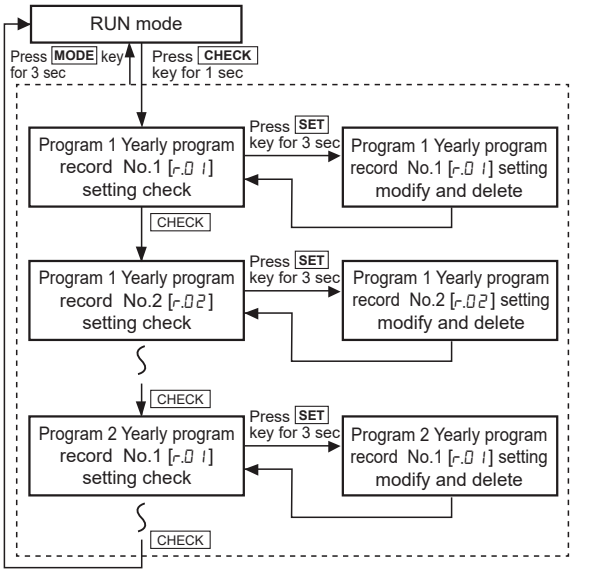
※It is able to set year of start/end date in yearly program setting up to 2 years later from the present year.

▣ Program Check, Modify And Delete

◎ Weekly program check, modify and delete



◎ Yearly program check, modify and delete



※**YEAR** turns ON when check, modify or delete yearly program.

- If any key is untouched for 60 sec, it is returned to RUN mode in weekly or yearly program check.
- In weekly or yearly program check, it controls output according to program setting and output is OFF in modify or delete mode.
- When MODE key is pressed in weekly or yearly program record modify, delete stand by or delete mode, current work is canceled and it is returned to check mode.
- Weekly or yearly program record modify and delete

(1) Program record modify

① When press SET key over 3 sec in program check, Edt flashes in second display part, press SET key.

② It returns to check mode when finish the modify same as the above procedure.

(2) Program record delete

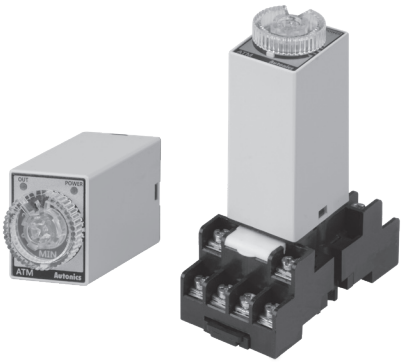
① When press SET key over 3 sec in program check, Edt flashes in second display part, press ▲ or ▼ key until CLr flashes in second display part and press SET key.

② Press CLr key over 3 sec when SET turns ON in second display part, it returns to program check.

W21.5×H28mm Miniature Timer

■ Features

- Miniature Size (W21.5×H28×L59.3mm)
- 4c (4PDT) contact (250VAC, 3A)
- High precise time control
- Easy time setting using dial
- Various time ranges
  : 0.1 sec to 3 hour (11 time ranges, different by models)
- Power supply
  - ATM4-2: 24VDC
  - ATM4-5: 220VAC 50/60Hz
  - ATM4-6: 110VAC 50/60Hz



Mounting My socket
(sold separately)

■ Ordering Information

ATM 4 — 5 10 S

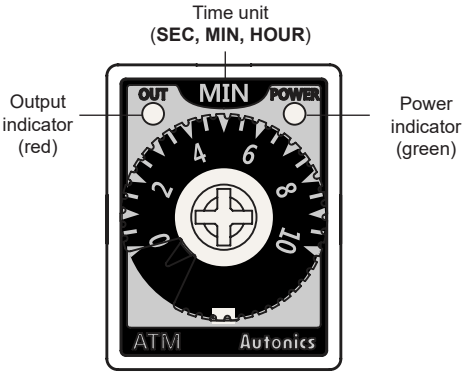
Time unit	S	Sec (1, 5, 10, 30, 60)
	M	Min (3, 5, 10, 30, 60)
	H	Hour (3)
Time range	Number	Max. time range
Power supply	2	24VDC
	5	220VAC 50/60Hz
	6	110VAC 50/60Hz
Output	4	4c (4PDT)
Item	ATM	Miniature Analog Timer

■ Specifications

Model		ATM4 - 2□S 2□M 23H	ATM4 - 5□S 5□M 53H	ATM4 - 6□S 6□M 63H
Function		**Power ON Delay**		
Control time setting range※1		0.1 sec to 3 hour		
Power supply		24VDC⎓	220VAC～ 50/60Hz	110VAC～ 50/60Hz
Allowable voltage range		21.6-26.4VDC⎓	200-230VAC～ 50/60Hz	100-120VAC～ 50/60Hz
Power consumption		Approx. 1.2W	Approx. 3VA	Approx. 3VA
Return time		Max. 100ms		
Timing operation		Power ON Start		
Control output	Contact type	4PDT (4c)		
	Contact capacity	250VAC～ 3A, 24VDC⎓ 3A resistive load		
Relay life cycle	Mechanical	Min. 10,000,000 operations		
	Electrical	Min. 200,000 operations		
Repeat error		Max. ±0.5% ±10ms		
SET error		Max. ±10% ±50ms		
Voltage error		Max. ±0.5% ±10ms		
Temperature error		Max. ±2% ±10ms		
Insulation resistance		Over 100MΩ (at 500VDC megger)		
Dielectric strength		3,000VAC 50/60Hz for 1 min		
Noise immunity		±2kV the square wave noise (pulse width: 1μs) by noise simulator		
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour		
	Electrical	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min		
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction 3 times		
	Electrical	100m/s² (approx. 10G) in each X, Y, Z direction 3 times		
Environment	Ambient temperature	-10 to 50℃, storage: -25 to 65℃		
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH		
Weight※2		Approx. 48g (approx. 42g)		

※1: Refer to time specifications for control time setting range by model.
※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Unit Descriptions

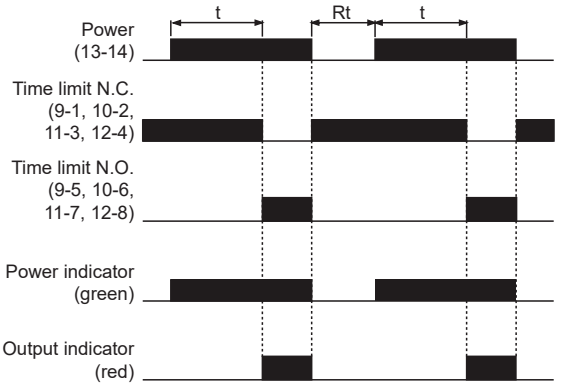


▣ Time Specifications

Model	Time unit	Time setting range
ATM4-□1S	SEC	0.1 to 1 sec
ATM4-□5S		0.5 to 5 sec
ATM4-□10S		1 to 10 sec
ATM4-□30S		3 to 30 sec
ATM4-□60S		6 to 60 sec
ATM4-□3M	MIN	0.3 to 3 min
ATM4-□5M		0.5 to 5 min
ATM4-□10M		1 to 10 min
ATM4-□30M		3 to 30 min
ATM4-□60M		6 to 60 min
ATM4-□3H	HOUR	0.3 to 3 hour

▣ Operation Specifications

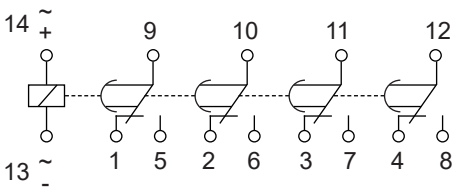
t : setting time, Rt : return time



▣ Connections

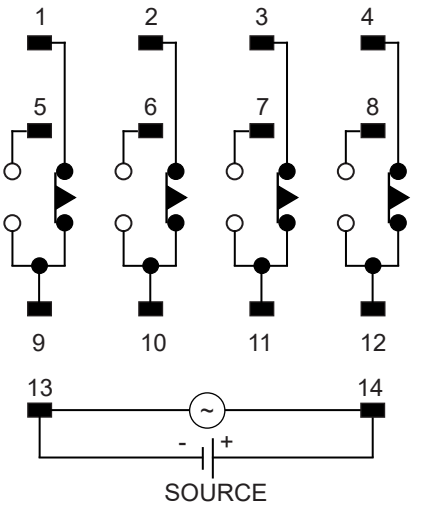
SOURCE	ATM4-2□□	24VDC 1.2W
	ATM4-5□□	200-230VAC 50/60Hz 3VA
	ATM4-6□□	100-120VAC 50/60Hz 3VA
CONTACT		250VAC 3A, 24VDC 3A RESISTIVE LOAD

● IEC marking



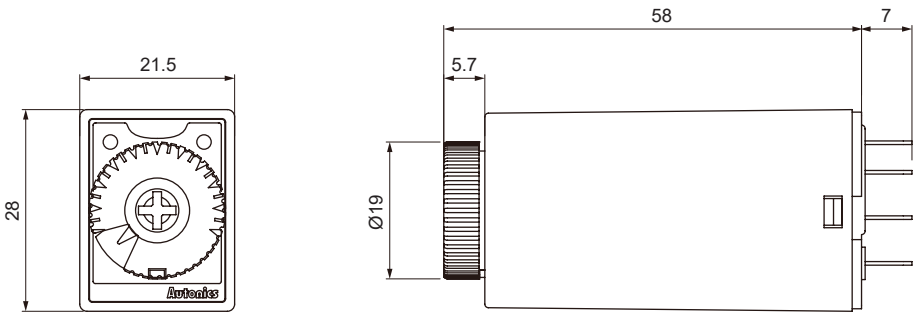
※IEC marking is on the unit.

● NEMA marking



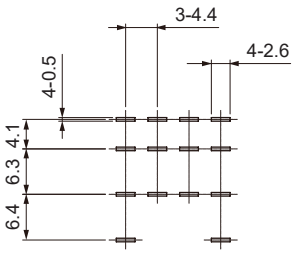
▣ Dimensions

(unit: mm)



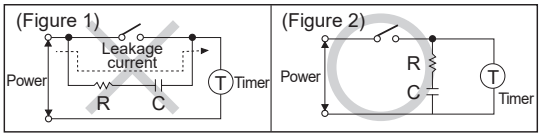
※Use My socket which is commercially available.

◎ Pin arrangement



▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- 24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- In order to avoid leakage current flowing, connect resistance and condenser as (Figure 2).
  If connect as (Figure 1), it may cause malfunction due to leakage current.



- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Change setting time, time range, operation mode or etc. after turning off the power of the timer.
- Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.
  Failure to follow this instruction may result in fire or explosion.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Multi Function Timer with Free Power, Compact Size W38×H42mm

▣ Features

- Wide power supply range
  : 100-240VAC 50/60Hz, 24-240VDC universal,
  24VAC 50/60Hz, 24VDC universal, 12VDC
- Various output operations (6 operation modes)
- Multi time range (12 types of time range)
- Wide time setting range (0.1 sec to 30 hour)
- Close and DIN rail mounting
  with the dedicated socket (PS-M8) width 41mm (for ATS8)
- Easy mounting and installation/maintenance
  with the dedicated bracket for DIN 48×48mm

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

ATS 8 – 4 1 □

Output	No mark	Time limit DPDT (2c) or Instantaneous SPDT (1c) + Time limit SPDT (1c) selectable by output operation mode
	D	Time limit DPDT (2c)
	E	Instantaneous SPDT (1c) + Time limit SPDT (1c)
Time range	1	Time range 1 (0.1 to 1)
	3	Time range 3 (0.3 to 3)
Power supply	1	12VDC
	2	24VAC 50/60Hz, 24VDC
	4	100-240VAC 50/60Hz, 24-240VDC
Number of plug pins	8	8-pin plug type
	11	11-pin plug type
Item	ATS	Small Analog Timer

※8-pin socket (PG-08, PS-08(N), PS-M8) and 11-pin socket (PG-11, PS-11(N)) are sold separately.

▣ Specifications

Model		ATS8-□1	ATS8-□3	ATS11-□1D	ATS11-□3D	ATS11-□1E	ATS11-□3E
Function		Multi Function Timer					
Control time setting range※1		0.1 sec to 10 hour	0.3 sec to 30 hour	0.1 sec to 10 hour	0.3 sec to 30 hour	0.1 sec to 10 hour	0.3 sec to 30 hour
Power supply		•100-240VAC~ 50/60Hz, 24-240VDC⎓ universal •24VAC~ 50/60Hz, 24VDC⎓ universal •12VDC⎓					
Allowable voltage range		90 to 110% of rated voltage					
Power consumption		•Max. 4.2VA (100-240VAC~), Max. 2W (24-240VDC⎓) •Max. 4.5VA (24VAC~), Max. 2W (24VDC⎓) •Max. 1.5W (12VDC⎓)		•Max. 3.5VA (100-240VAC~), Max. 1.5W (24-240VDC⎓) •Max. 4VA (24VAC~), Max. 1.5W (24VDC⎓) •Max. 1W (12VDC⎓)		•Max. 4.2VA (100-240VAC~), Max. 2W (24-240VDC⎓) •Max. 4.5VA (24VAC~), Max. 2W (24VDC⎓) •Max. 1.5W (12VDC⎓)	
Return time		Max. 100ms					
Timing operation		Power ON Start		Signal ON Start			
Min. input signal width		—		START, INHIBIT, RESET: approx. 50ms			
Input		—		START, INHIBIT, RESET: [No-voltage input] - Short-circuit impedance: max. 1kΩ, Residual voltage: max. 0.5VDC, Open-circuit impedance: min. 100kΩ			
Control output	Contact type	Time limit DPDT (2c) or Instantaneous SPDT (1c) + Time limit SPDT (1c) selectable by output operation mode		Time limit DPDT (2c)		Instantaneous limit SPDT (1c) + Time limit SPDT (1c)	
	Contact capacity	250VAC~ 3A, 30VDC⎓ 3A resistive load		250VAC~ 3A, 24VDC⎓ 3A resistive load			
Relay life cycle	Mechanical	Min. 10,000,000 operations					
	Electrical	Min. 100,000 operations (250VAC 3A resistive load)					

※1: Refer to time specifications for control time setting range by model.

▣ Specifications

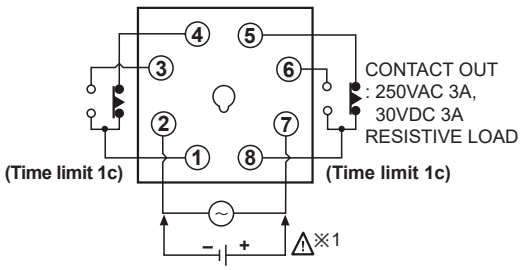
Model		ATS8-□1	ATS8-□3	ATS11-□1D	ATS11-□3D	ATS11-□1E	ATS11-□3E
Repeat error		Max. ±0.2% ±10ms					
SET error		Max. ±5% ±50ms					
Voltage error		Max. ±0.5%					
Temperature error		Max. ±2%					
Insulation resistance		Over 100MΩ (at 500VDC megger)					
Dielectric strength		2,000VAC 50/60Hz for 1 min					
Noise immunity	ATS□-1□□ ATS□-2□□	±500V the square wave noise (pulse width 1μs) by noise simulator					
	ATS□-4□□	±2kV the square wave noise (pulse width 1μs) by noise simulator					
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1min) in each X, Y, Z direction for 1hour					
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1min) in each X, Y, Z direction for 10min					
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction 3 times					
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction 3 times					
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃					
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH					
Approval		CE c UL us					
Accessory		Bracket					
Weight※2		Approx. 95g (approx. 70g)					

※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

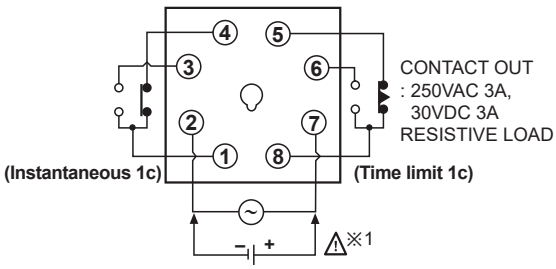
▣ Connections

◎ ATS8

●When selecting [A], [F] output operation mode

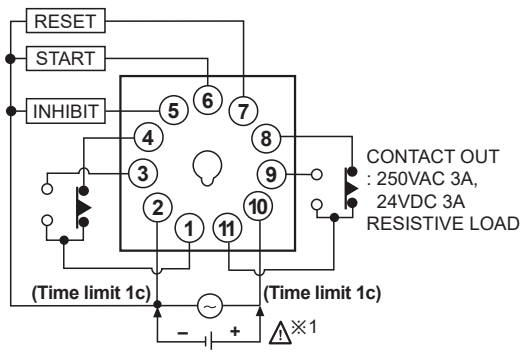


●When selecting [A1], [B], [F1], [I] output operation mode

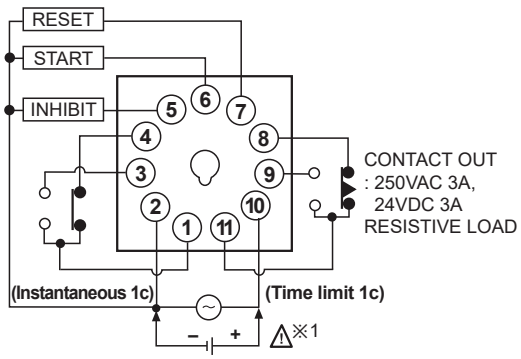


※1: AC/DC voltage: 100-240VAC 50/60Hz, 24-240VDC
24VAC 50/60Hz, 24VDC
DC voltage: 12VDC

◎ ATS11-□ □D



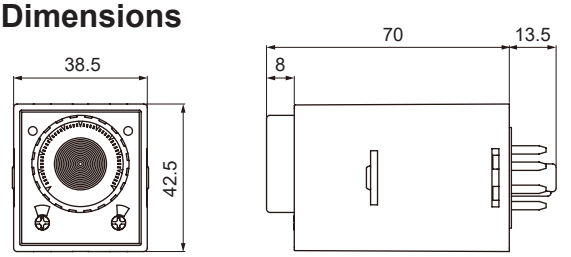
◎ ATS11-□ □E



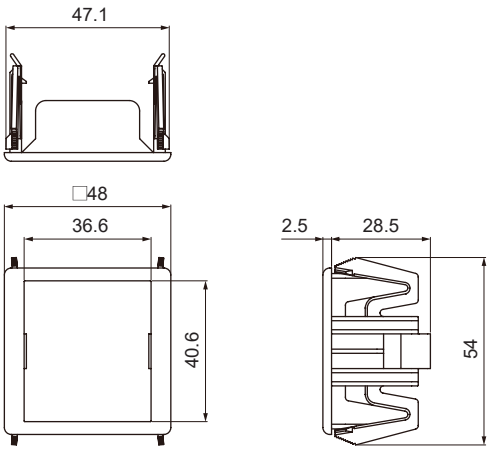
※1: AC/DC voltage: 100-240VAC 50/60Hz, 24-240VDC
24VAC 50/60Hz, 24VDC
DC voltage: 12VDC

▣ Dimensions

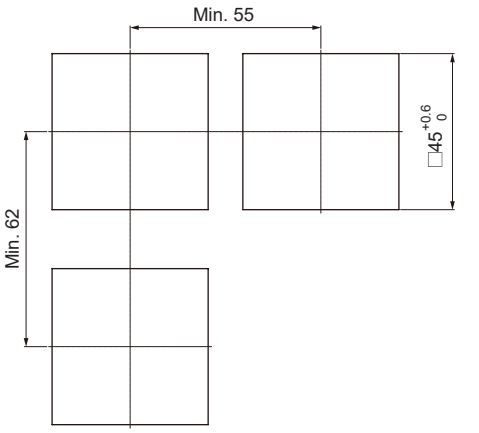
(unit: mm)



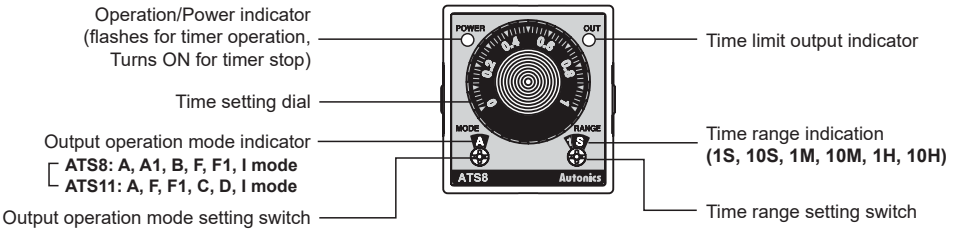
◎ Bracket



◎ Panel cut-out



▣ Unit Description



▣ Time Specifications

Model	Time range	Time unit	Time setting range
ATS□-□1□	1S	SEC	0.1 to 1 sec
	10S		1 to 10 sec
	1M	MIN	0.1 to 1 min
	10M		1 to 10 min
	1H	HOUR	0.1 to 1 hour
	10H		1 to 10 hour
ATS□-□3□	1S	SEC	0.3 to 3 sec
	10S		3 to 30 sec
	1M	MIN	0.3 to 3 min
	10M		3 to 30 min
	1H	HOUR	0.3 to 3 hour
	10H		3 to 30 hour

▣ Output Operation Mode

◎ ATS8

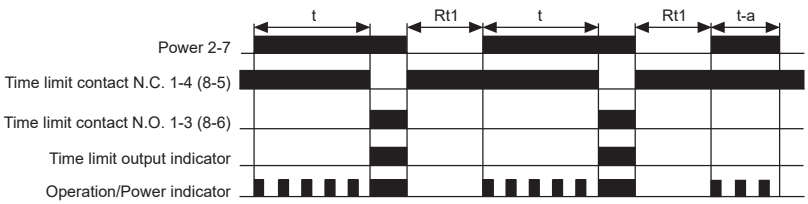
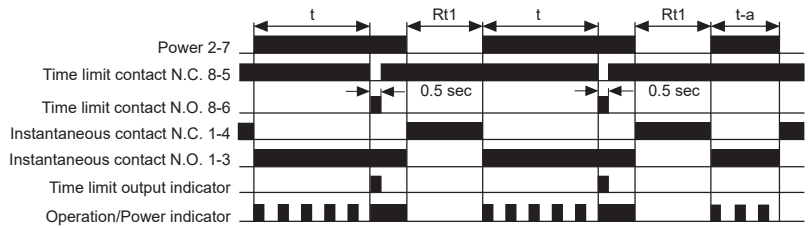
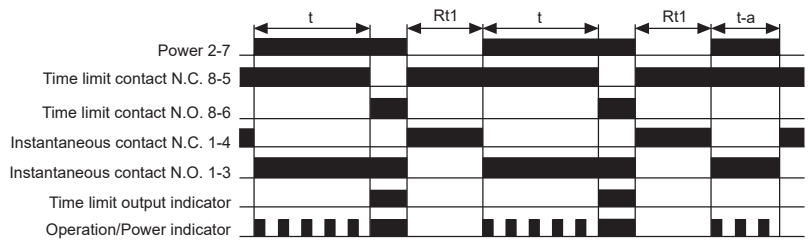
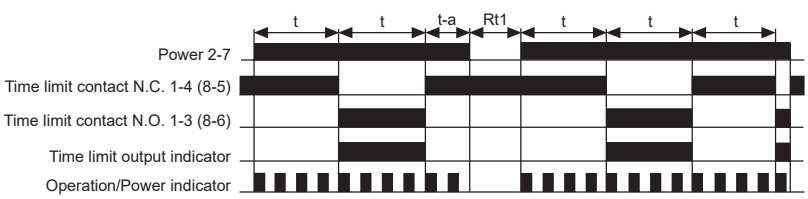
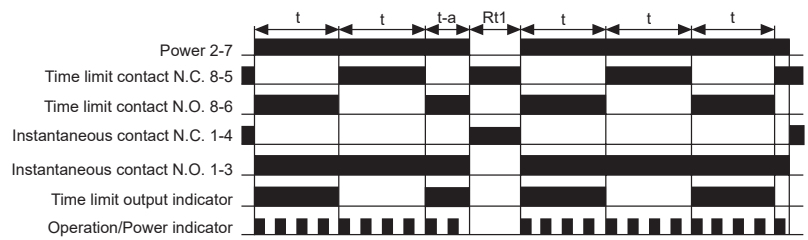
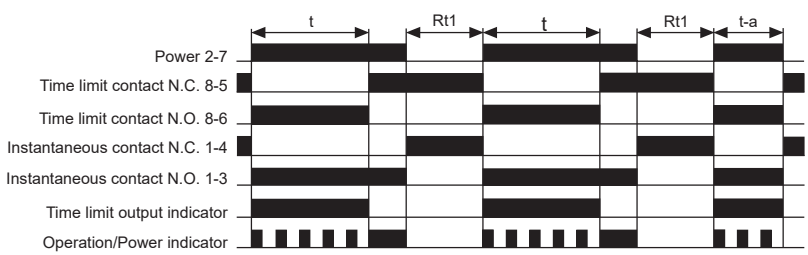
Display	Output operation mode
A	Power ON Delay
A1	Power ON Delay 1 (One-Shot output)
B	Power ON Delay 2
F	Flicker (OFF Start)
F1	Flicker 1 (ON Start)
I	Interval

◎ ATS11

Display	Output operation mode
A	Signal ON Delay
F	Flicker (OFF Start)
F1	Flicker 1 (ON Start)
C	Signal OFF Delay
D	Signal ON/OFF Delay
I	Interval

▣ Output Operation Mode (ATS8)

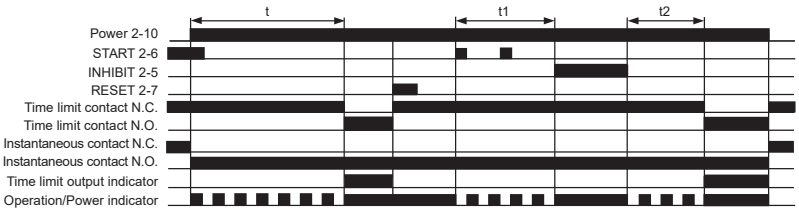
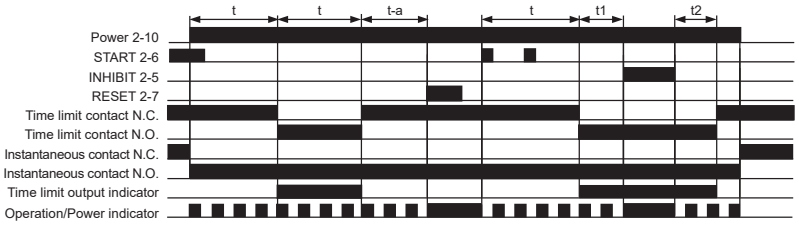
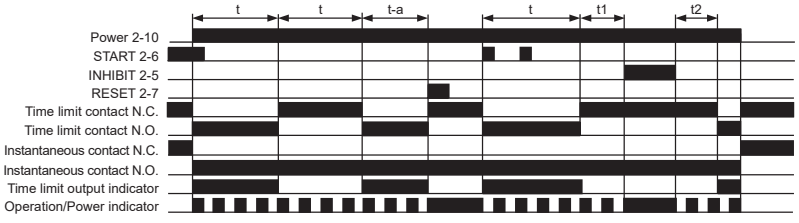
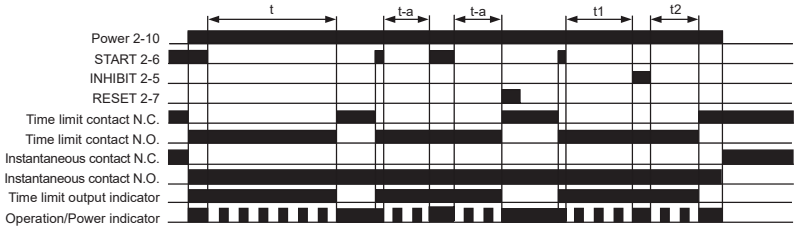
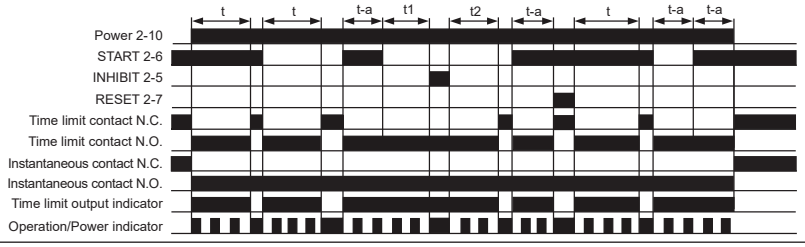
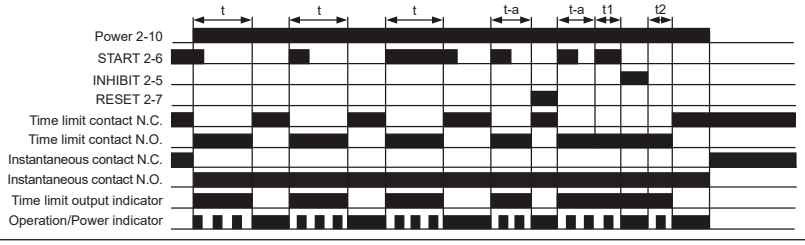
[t: Setting time, t>t-a, Rt: Return time, Rt1>Rt]

Mode	Time chart
A **Power ON Delay**	
A1 **Power ON Delay 1 (One-Shot output)**	 ※One-Shot output is 0.5 sec fixed.
B **Power ON Delay 2**	
F **Flicker (OFF Start)**	
F1 **Flicker 1 (ON Start)**	
I **Interval**	

※In case of F, F1 output operation mode, setting time should be over 100ms.
If not, it may cause abnormal output operation due to under 100ms of setting time.

▣ Output Operation Mode (ATS11)

[t: Setting time, t=t1+t2, t>t-a]

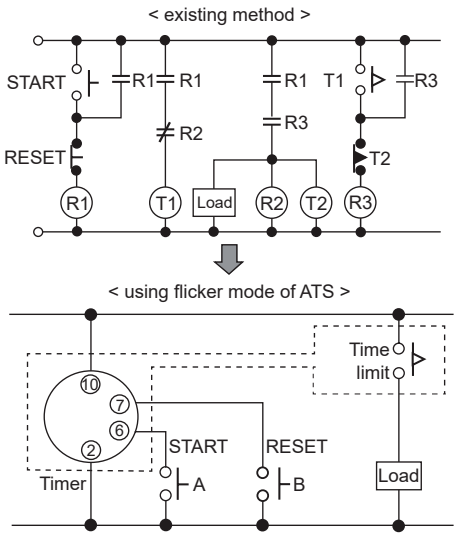
Mode	Time chart
A **Signal ON Delay**	
F **Flicker (OFF Start)**	
F1 **Flicker 1 (ON Start)**	
C **Signal OFF Delay**	
D **Signal ON/OFF Delay**	
I **Interval**	

※ATS11-□□E model only supports Instantaneous contact.
※If power is cut or the RESET terminal is short-circuited, the timer will be RESET.
※If the INHIBIT terminal is short-circuited during a time limit operation, the time will stop.
※In case of F, F1 output operation mode, setting time should be over 100ms.
If not, it may cause abnormal output operation due to under 100ms of setting time.

▣ Proper Usage

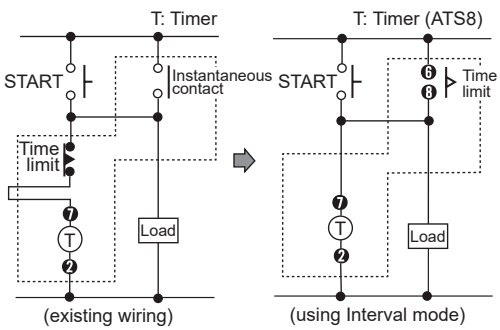
◎ Flicker mode

- Flicker mode which needs 3 subsidiary relays and 2 timers is available with an ATS timer.
  You can organize flicker function economically.
- START it with a switch A and RESET it with a switch B.



◎ Interval mode

When using interval mode, you can simply organize Instantaneous ON, Time limit OFF (self hold circuit).



◎ Conditions of input signal (ATS11-□□D, ATS11-□□E)

1. Input with contact

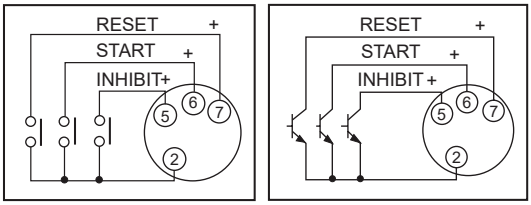
Use a switch which is gilded and has good reliability of contact.

Use a switch which has short bound(chattering) time for input contact because bound(chattering) time of contact timer may be error for operation time. Open resistance should be over 100kΩ and short resistance should be below 1kΩ.

※Use contact which has good reliability to open/close for 0.4mA small current.

2. Input with NPN open collector type

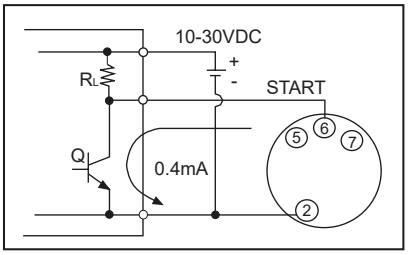
Characteristics of transistor should be Vceo = Min. 25V, Ic = Min. 10mA, Icbo = Max. 0.2μA, residual voltage = Max. 0.5V.



3. Input with NPN universal type

For non-contact circuit (proximity sensor, photoelectric sensor, etc.) which output voltage range is 10-30VDC, voltage output is also available as input signal not as open collector output.

In this case, when signal changes from H to L, a timer starts. Residual voltage should be below 0.5V when transistor (Q) is ON.



◎ Terminal connection

- Refer to the connection diagrams and wire it correctly.
- Power connection

For power connection of ATS Series, when it is AC power, connect it to the designated power terminal regardless of polarity. When it is DC power input after checking polarity of power.

Power voltage	8-pin type	11-pin type
AC type	Terminal ② - ⑦	Terminal ② - ⑩
DC type	Terminal ② - ⊖ Terminal ⑦ - ⊕	Terminal ② - ⊖ Terminal ⑩ - ⊕

- Turn OFF a power switch and be sure not to supply induced voltage, residual voltage between timer power terminals. (when wiring power cable parallel with high voltage line, power line, induced voltage may occur between power terminals.)
- For DC power, ripple should be below 10% and power voltage should be within the allowable range.
- When applying the power to the Timer, please apply the rated power at the moment by switch, relay, etc. Otherwise it might cause malfunction.
- Load for control output should be below the rated load capacity.

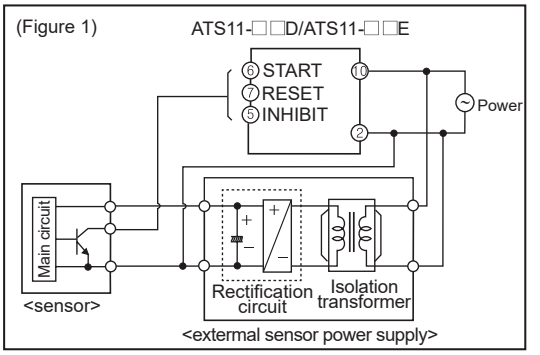
◎ Changing of setting time, time range, operation mode

It might cause malfunction if changing the setting time, time range or operation mode during operating unit. Please Change the setting time, time range or operation mode after cut the power off.

◎ Input connection

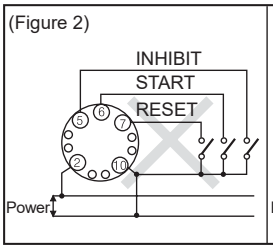
- Power circuit of ATS11-□□D/ATS11-□□E timer does not use trans. Use isolation transformer which secondary part is not grounded as (Figure 1) to cut off peripheral current flow for supplied power to external input deivces.

(Figure 1)

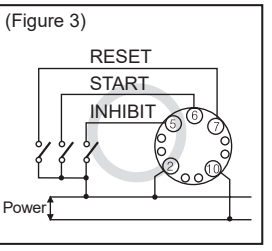


- As (Figure 2), if using terminal ⑩ as common terminal of input signal, it may cause damage to inner circuit of ATS11 timer. Use terminal ② as common terminal referring to (Figure 3).

(Figure 2)

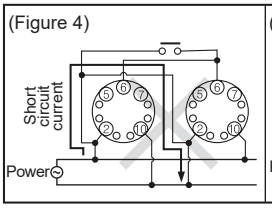


(Figure 3)

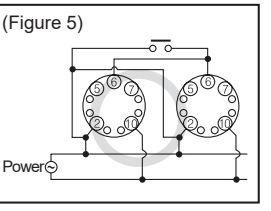


- When controlling several timers by one input contact or transistor, do not wire it as (Figure 4). This wiring causes short current due to not accorded phase of power. Wire it as (Figure 5) to accord to phase of power.

(Figure 4)



(Figure 5)

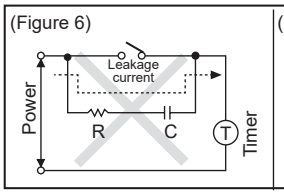


- In order to apply input signals (INHIBIT, START, RESET), short-circuit the terminal no. ②-⑤, ②-⑥ or ②-⑦. It may cause internal circuit damage by wrong connections.
- Do not wire INHIBIT, START, RESET signal input line with power line, high voltage line in parallel.
- Use shield cable when input (INHIBIT, START, RESET) cable is longer. Cable length should be as short as possible.

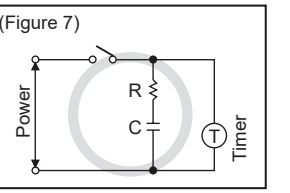
◎ Common

- Be sure that when using a timer at high temperature for a long time, it may cause deterioration for inner parts (electrolytic condenser, etc.).
- In case of 12VDC, 24VDC, 24VAC model, isolated and limited voltage/current or Class 2 source should be provided for power supply.
- When supply the power to the Timer, connection shown in (Figure 6) might cause malfunction due to leakage current through R and C. Please connect R and C as shown in (Figure 7) to prevent malfunction.

(Figure 6)



(Figure 7)



- Do not use this unit at below places.
  - Place where there are severe vibration or impact.
  - Place where strong alkalis or acids are used.
  - Place where there are direct ray of the sun.
  - Place where strong magnetic field or electric noise are generated.

- Installation environment
  - Indoors
  - Altitude Max. 2,000m
  - Pollution Degree 2
  - Installation Category II

DIN W48×H48mm, Universal Voltage Multi-Function Timer

▣ Features

- Realization of wide range of power supply
  :100-240VAC 50/60Hz, 24-240VDC universal,
  24VAC 50/60Hz, 24VDC universal, 12VDC
- Various output operation (6 kinds modes)
- Multi time range (16 kinds of time range)
- Wide control time (0.05 sec to 100 hour)
- Easy setting of time, time range, output operation mode
- Easy to check output status by indicator

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

AT **8** **N** – □

Power supply	No mark	100-240VAC 50/60Hz, 24-240VDC
	1	12VDC
	2	24VAC 50/60Hz, 24VDC
Time operation	N	Time limit DPDT (2c) or instantaneous SPDT (1c)+Time limit SPDT (1c) selectable by output operation mode
	DN	Time limit DPDT (2c)
	EN	Instantaneous SPDT (1c)+Time limit SPDT (1c)
Number of plug pins	8	8-pin plug type
	11	11-pin plug type
Item	AT	Analog Timer

※8-pin socket (PG-08, PS-08(N), PS-08) and 11-pin socket (PG-11, PS-11(N)) are sold separately.

▣ Specifications

Model		AT8N-□	AT11DN-□	AT11EN-□
Function		**Multi Function Timer**		
Control time setting range※1		0.05 sec to 100 hour		
Power supply		• 100-240VAC~ 50/60Hz, 24-240VDC⎓ universal • 24VAC~ 50/60Hz, 24VDC⎓ universal • 12VDC⎓		
Allowable voltage range		90 to 110% of rated voltage		
Power consumption		• Max. 4.3VA (100-240VAC~), Max. 2W (24-240VDC⎓) • Max. 4.5VA (24VAC~), Max. 2W (24VDC⎓) • Max. 1.5W (12VDC⎓)	• Max. 3.5VA (100-240VAC~), Max. 1.5W (24-240VDC⎓) • Max. 4VA (24VAC~), Max. 1.5W (24VDC⎓) • Max. 1W (12VDC⎓)	• Max. 4.3VA (100-240VAC~), Max. 2W (24-240VDC⎓) • Max. 4.5VA (24VAC~), Max. 2W (24VDC⎓) • Max. 1.5W (12VDC⎓)
Return time		Max. 100ms		
Timing operation		Power ON Start	Signal ON Start	
Min. input signal width		—	INHIBIT, START, RESET: approx. 50ms	
Input		—	INHIBIT, START, RESET: [No-voltage input] - Short-circuit impedance: max. 1kΩ, Residual voltage: max. 0.5V, Open-circuit impedance: min. 100kΩ	
Control output	Contact type	Time limit DPDT (2c) or Instantaneous SPDT (1c)+ Time limit SPDT (1c) selectable by output operation mode	Time limit DPDT (2c)	Instantaneous SPDT (1c)+ Time limit SPDT (1c)
	Contact capacity	250VAC~ 5A, 30VDC⎓ 5A resistive load	250VAC~ 5A, 24VDC⎓ 5A resistive load	250VAC~ 5A, 30VDC⎓ 5A resistive load
Relay life cycle	Mechanical	Min. 10,000,000 operations		
	Electrical	Min. 100,000 operations (250VAC 5A resistive load)		
Repeat error		Max. ±0.2% ±10ms		
SET error		Max. ±5% ±50ms		
Voltage error		Max. ±0.5%		
Temperature error		Max. ±2%		
Insulation resistance		Over 100MΩ (at 500VDC megger)		

※1: Refer to time specifications for control time setting range by model.

▣ Specifications

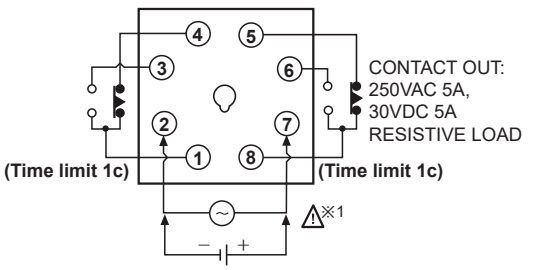
Model		AT8N-□	AT11DN-□	AT11EN-□
Dielectric strength		2,000VAC 50/60Hz for 1 min		
Noise immunity	AT□□-1 AT□□-2	±500V the square wave noise (pulse width 1μs) by noise simulator		
	AT□□	±2kV the square wave noise (pulse width 1μs) by noise simulator		
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour		
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min		
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction 3 times		
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction 3 times		
Environment	Ambient temperature	-10 to 55℃, storage: -25 to 65℃		
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH		
Approval		CE c UL us		
Accessory		Bracket		
Weight※2		Approx. 134.12g (approx. 86.71g)	Approx. 132.2g (approx. 85g)	Approx. 134.7g (approx. 87.5g)

※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

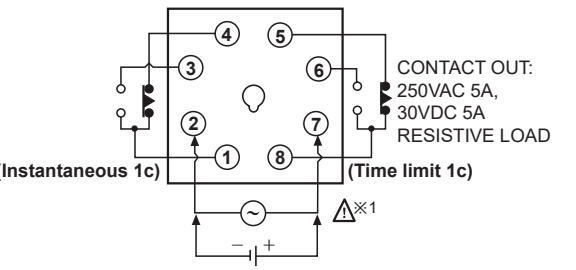
▣ Connections

◎ AT8N

• When selecting [A], [F] output operation mode

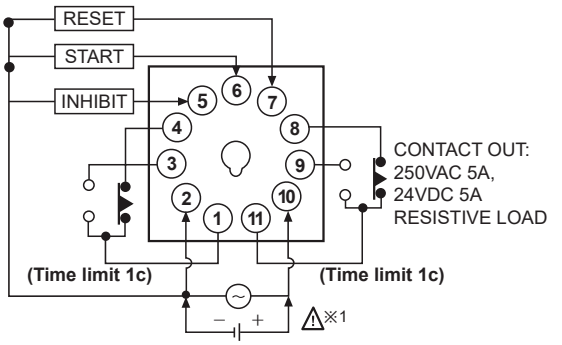


• When selecting [A1], [B], [F1], [I] output operation mode

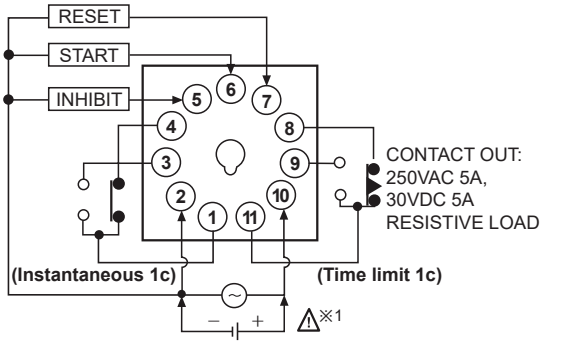


※1: AC/DC voltage: 100-240VAC 50/60Hz, 24-240VDC
: 24VAC 50/60Hz, 24VDC
DC voltage: 12VDC

◎ AT11DN



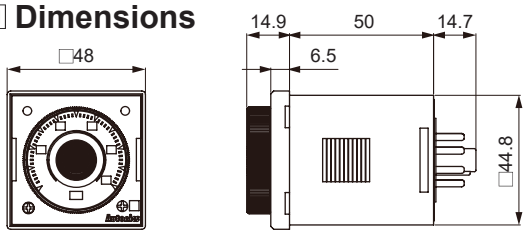
◎ AT11EN



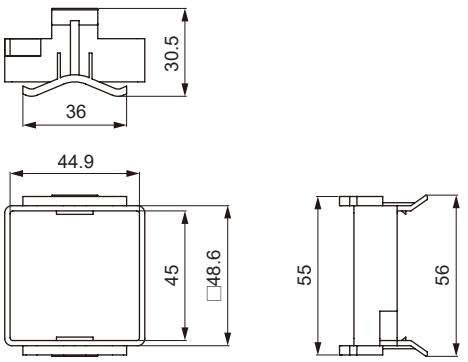
※1: AC/DC voltage: 100-240VAC 50/60Hz, 24-240VDC
: 24VAC 50/60Hz, 24VDC
DC voltage: 12VDC

■ Dimensions

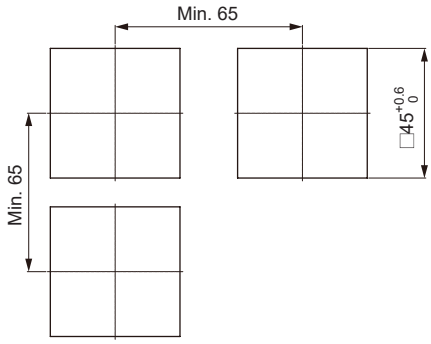
(unit: mm)



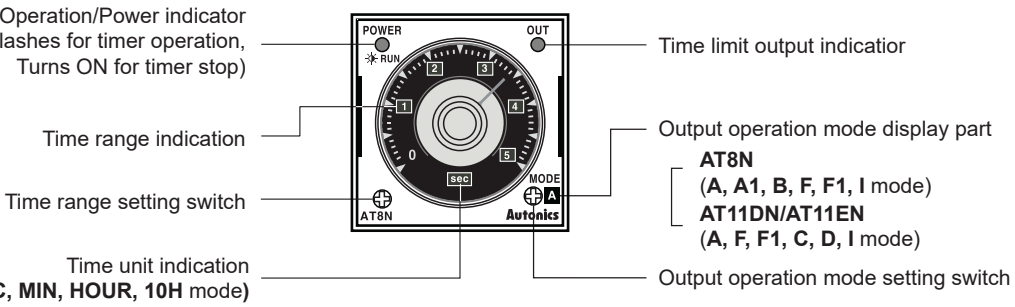
◎ Bracket



◎ Panel cut-out



■ Unit Description



■ Time Specifications

Time range	Time unit	Time setting range	Time range	Time unit	Time setting range
0.5	SEC	0.05 to 0.5 sec	0.5	HOUR	0.05 to 0.5 hour
1		0.1 to 1 sec	1		0.1 to 1 hour
5		0.5 to 5 sec	5		0.5 to 5 hour
10		1 to 10 sec	10		1 to 10 hour
0.5	MIN	0.05 to 0.5 min	0.5	10H	0.5 to 5 hour
1		0.1 to 1 min	1		1 to 10 hour
5		0.5 to 5 min	5		5 to 50 hour
10		1 to 10 min	10		10 to 100 hour

■ Output Operation Mode

● AT8N

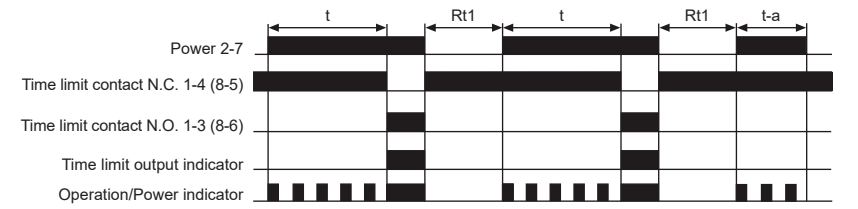
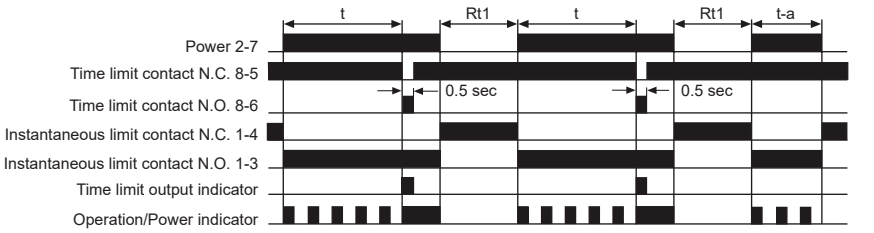
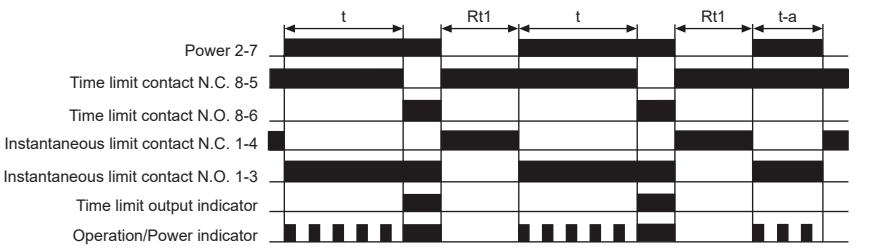
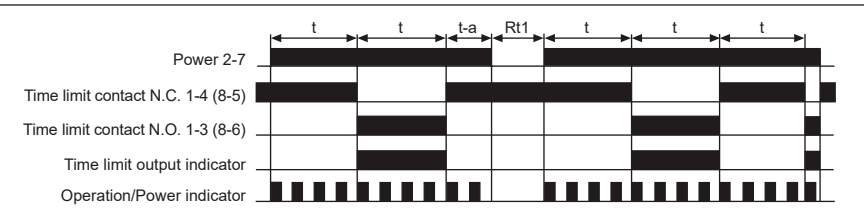
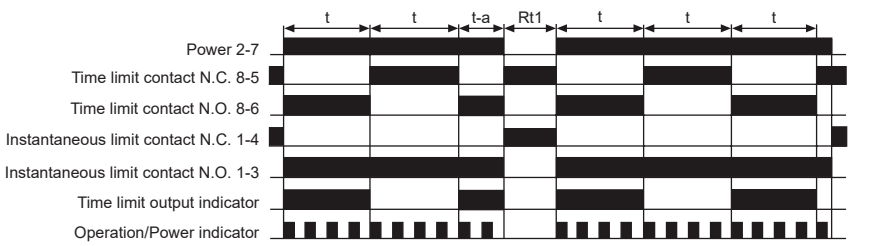
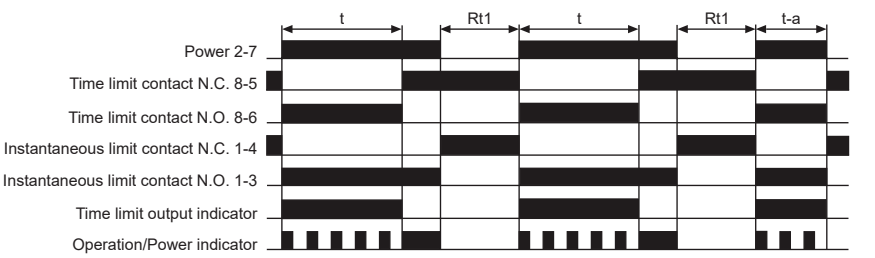
Display	Output operation mode
A	Power ON Delay
A1	Power ON Delay1 (One-Shot output)
B	Power ON Delay2
F	Flicker (OFF Start)
F1	Flicker1 (ON Start)
I	Interval

● AT11DN/AT11EN

Display	Output operation mode
A	Signal ON Delay
F	Flicker (OFF Start)
F1	Flicker1 (ON Start)
C	Signal OFF Delay
D	Signal ON/OFF Delay
I	Interval

▣ Output Operation Mode (AT8N)

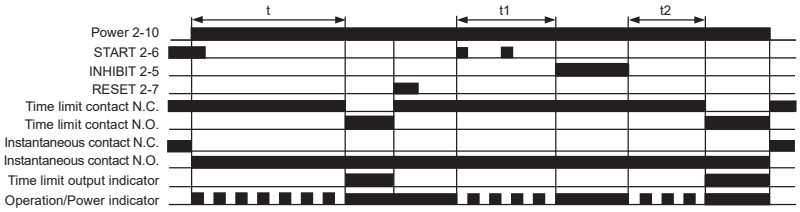
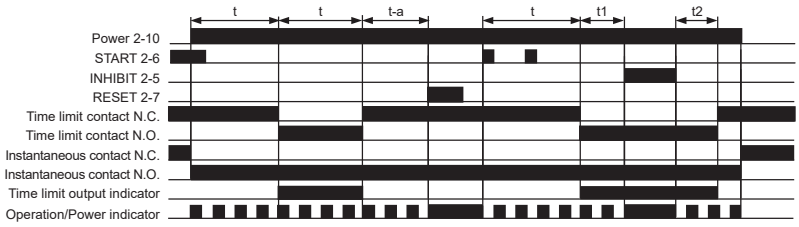
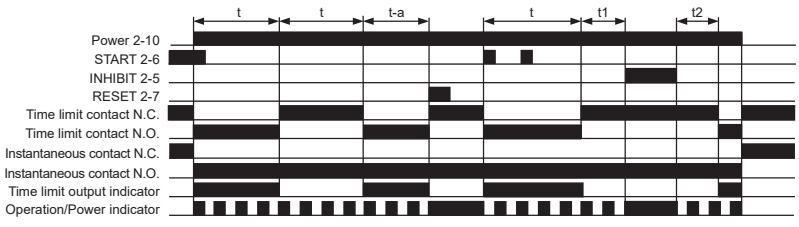
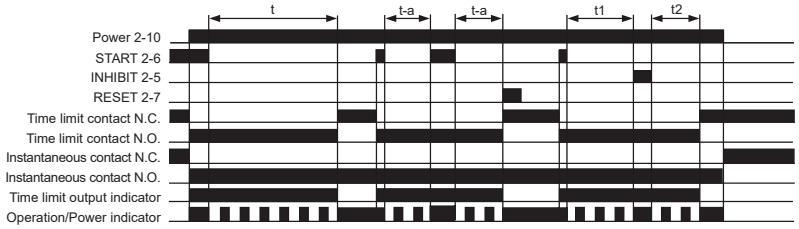
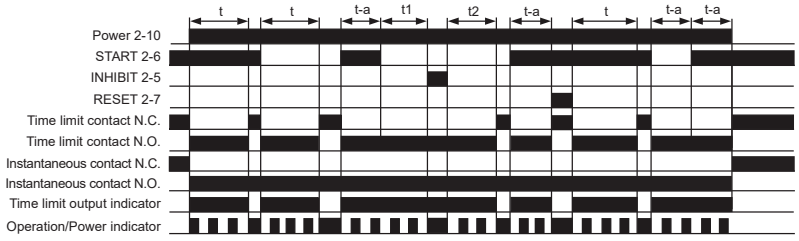
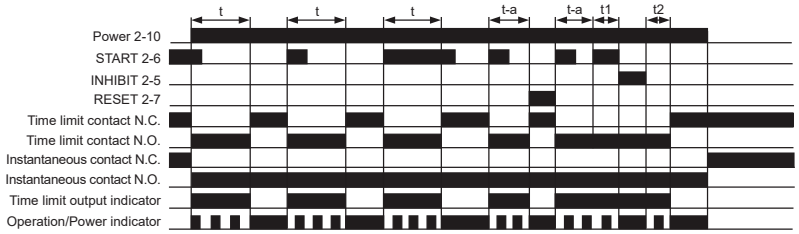
[t: Setting time, t > t-a, Rt: Return time, Rt1>Rt]

Mode	Time chart
A **Power ON Delay**	
A1 **Power ON Delay1** **(One-Shot output)**	 ※One- Shot output is 0.5 sec fixed.
B **Power ON Delay2**	
F **Flicker** **(OFF Start)**	
F1 **Flicker1** **(ON Start)**	
I **Interval**	

※In case of F, F1 output operation mode, setting time should be over 100ms.
If not, it may cause abnormal output operation due to under 100ms of setting time.

■ Output Operation Mode (AT11DN/AT11EN)

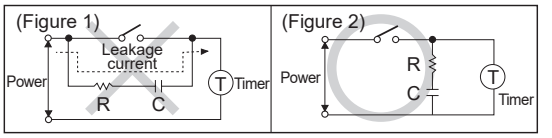
[t: Setting time, t=t1+t2, t>t-a]

Mode	Time chart
A **Signal ON Delay**	
F **Flicker (OFF Start)**	
F1 **Flicker 1 (ON Start)**	
C **Signal OFF Delay**	
D **Signal ON/OFF Delay**	
I **Interval**	

※AT11EN-□ model only supports Instantaneous contact.
※If power is cut or the RESET terminal is short-circuited, the timer will be RESET.
※If the INHIBIT terminal is short-circuited during a time limit operation, the time will stop.
※In case of F, F1 output operation mode, setting time should be over 100ms.
If not, it may cause abnormal output operation due to under 100ms of setting time.

▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- 12VDC, 24VDC, 24VAC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- In order to avoid leakage current flowing, connect resistance and condenser as (Figure 2).
  If connect as (Figure 1), it may cause malfunction due to leakage current.



- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Change setting time, time range, operation mode or etc. after turning off the power of the timer.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Star-Delta Timer with Free Power, Compact Size W38×H42mm

▣ Features

- Wide power supply range
  : 100-240VAC 50/60Hz, 24-240VDC universal
- Wide time setting range and switching time
- T1 (setting time): selectable 0.5 to 100 sec
- T2 (switching time): selectable 0.05, 0.1, 0.2, 0.3, 0.4, 0.5 sec
- Close and DIN rail mounting
  with the dedicated socket (PS-M8) width 41mm
- Easy installation/maintenance
  with the dedicated bracket for DIN 48×48mm
- Application: Starting large capacity motors

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

ATS **8** **SD** – **4**

Power supply	4	100-240VAC 50/60Hz, 24-240VDC universal
Time operation	SD	Star-Delta type
Number of plug pins	8	8-pin plug type
Item	ATS	Small Analog Timer

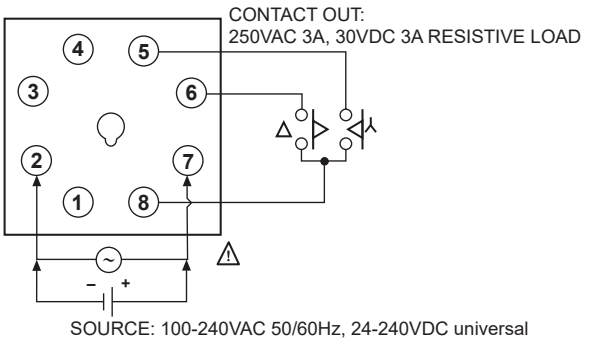
※8-pin socket (PG-08, PS-08(N), PS-M8) is sold separately.

▣ Specifications

Model		**ATS8SD-4**
Function		**Star-Delta Timer**
Control time setting range※1		0.5 to 100 sec
Power supply		100-240VAC～ 50/60Hz, 24-240VDC⎓ universal
Allowable voltage range		90 to 110% of rated voltage
Power consumption		Max. 3VA (100-240VAC～), Max. 1.5W (24-240VDC⎓)
Return time		Max. 100ms
Timing operation		Power ON Start
Control output	Contact type	⅄ contact: SPST (1a), Δ contact: SPST (1a)
	Contact capacity	250VAC～ 3A, 30VDC⎓ 3A resistive load
Relay life cycle	Mechanical	Min. 10,000,000 operations
	Electrical	Min. 100,000 operations (250VAC 3A resistive load)
Repeat error		Max. ±0.2% ±10ms
⅄ setting error		Max. ±5% ±50ms
Voltage error		Max. ±0.5%
Temperature error		Max. ±2%
⅄ -Δ switching time error		Max. ±25%
Insulation resistance		Over 100MΩ (at 500VDC megger)
Dielectric strength		2,000VAC 50/60Hz for 1 min
Noise immunity		±2kV the square wave noise (pulse width 1μs) by noise simulator
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction 3 times
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction 3 times
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH
Approval		
Accessory		Bracket
Unit weight		Approx. 72g

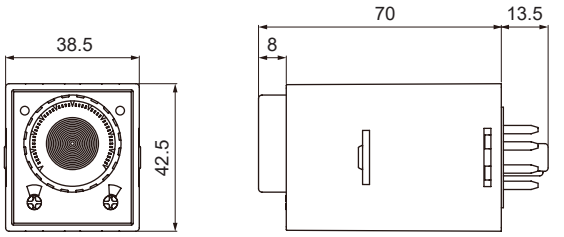
※1: Refer to time specifications for control time setting range.
※Environment resistance is rated at no freezing or condensation.

▣ Connections

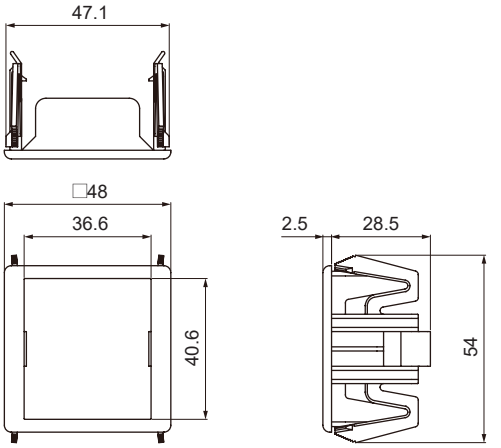


▣ Dimensions

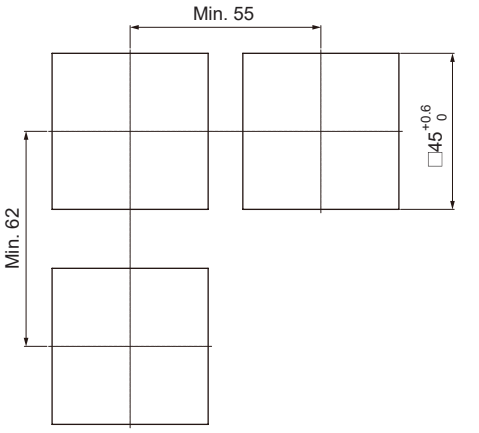
(unit: mm)



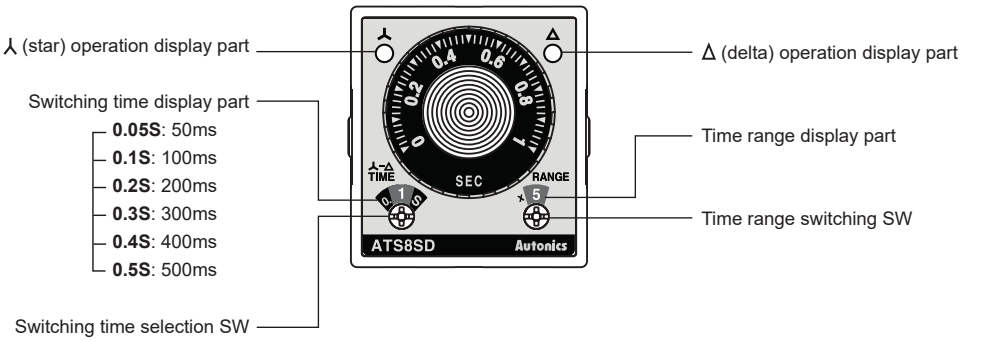
◎ Bracket



◎ Panel cut-out



▣ Unit Description



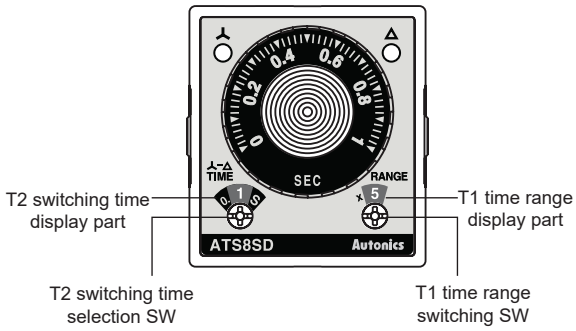
▣ Time Specifications

1. T1 (setting time) time

Time range	Time unit	Time setting range
5	SEC	0.5 to 5 sec
10		1 to 10 sec
50		5 to 50 sec
100		10 to 100 sec

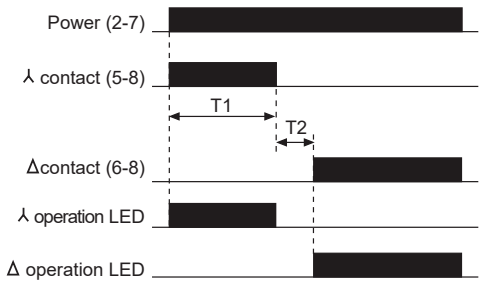
2. T2 (⅄-Δ switching time) time (unit: sec)

Switching time display part	0.05S	0.1S	0.2S	0.3S	0.4S	0.5S
T2 (⅄-Δ switching time)	0.05	0.1	0.2	0.3	0.4	0.5



▣ Operation

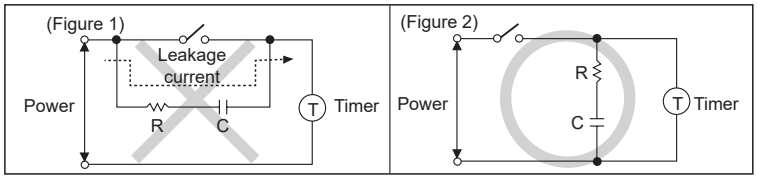
When power is applied, ⅄ contact will be ON. When reaching to T1 setting time, ⅄ contact will be OFF and Δ contact will be ON after switching time of T2 is passed. If the power is OFF, ⅄ contact will be OFF.



※T1: setting time (⅄ contact operation time)
※T2: ⅄-Δ switching time
(⅄ contact and Δ contact are OFF simultaneously at power ON)

▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- In order to avoid leakage current flowing, connect resistance and condenser as (Figure 2).
  If connect as (Figure 1), it may cause malfunction due to leakage current.



- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Change setting time(T1), ⅄-△ switching time or etc. after turning off the power of the timer.
- This product may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

DIN W48×H48mm Star-Delta Timer

▣ Features

- Realization of wide range of power supply
  : 100-240VAC 50/60Hz, 24-240VDC universal
- Wide range of setting time and switching time
  - T1 (setting time): Selectable 0.5 to 100 sec
  - T2 (switching time): Selectable 0.05, 0.1, 0.2, 0.3, 0.4, 0.5 sec
- Simple setting time, switching time operation
- Easy to check output status by LED display
- Application: Starting large capacity motors

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

AT **8** **SDN**

Item		
Number of plug pins	8	8-pin plug type
Time operation	SDN	Star-Delta type
	AT	Analog Timer

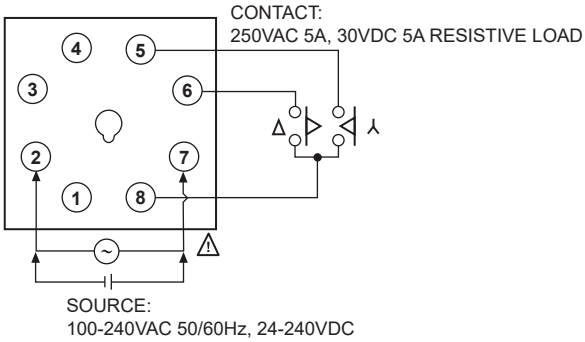
※8-pin socket (PG-08, PS-08(N)) is sold separately.

▣ Specifications

Model		**AT8SDN**
Function		**Star-Delta timer**
Control time setting range※1		0.5 to 100 sec
Power supply		100-240VAC～ 50/60Hz, 24-240VDC⎓ universal
Allowable voltage range		90 to 110% of rated voltage
Power consumption		Max. 3.2VA (100-240VAC～), Max. 1.5W (24-240VDC⎓)
Return time		Max. 100ms
Timing operation		Power ON start type
Control output	Contact type	⅄ contact: SPST (1a), Δ contact: SPST (1a)
	Contact capacity	250VAC～ 5A, 30VDC⎓ 5A resistive load
Relay life cycle	Mechanical	Min. 10,000,000 operations
	Electrical	Min. 100,000 operations (250VAC 5A resistive load)
Repeat error		Max. ±0.2 % ±10ms
⅄Setting error		Max. ±5% ±50ms
Voltage error		Max. ±0.5%
Temperature error		Max. ±2%
⅄-Δ Switching time error		Max. ±25%
Insulation resistance		Over 100MΩ (at 500VDC megger)
Dielectric strength		2,000VAC 50/60Hz for 1 min
Noise immunity		±2kV the square wave noise (pulse width: 1μs) by the noise simulator
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times
Environment	Ambient temperature	-10 to 55℃, storage: -25 to 65℃
	Ambient humidity	35 to 85%RH
Approval		
Accessory		Bracket
Unit weight		Approx. 90g

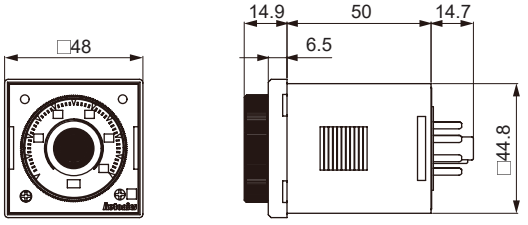
※1: Refer to time specifications for control time setting range.
※Environment resistance is rated at no freezing or condensation.

▣ Connections

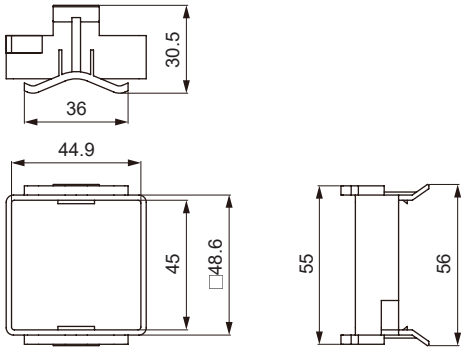


▣ Dimensions

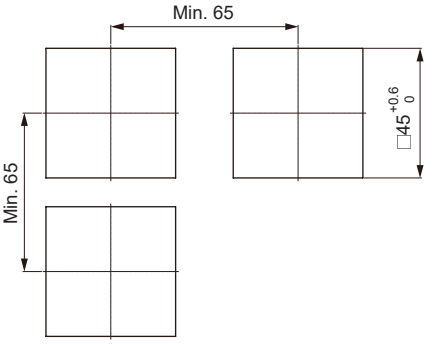
(unit: mm)



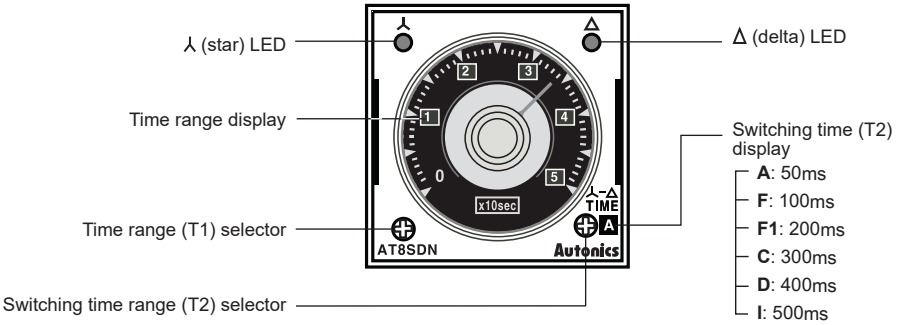
◎ Bracket



◎ Panel cut-out



▣ Unit Description



▣ Time Specifications

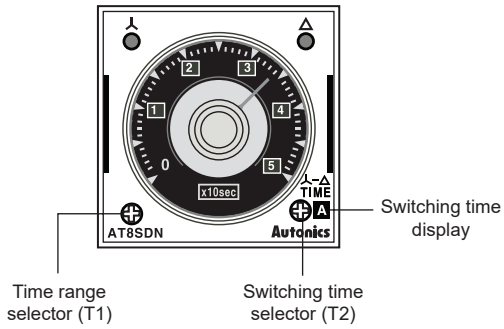
1. T1 (setting time)

Time range	Time unit	Time setting range
0.5	**10 SEC**	0.5 to 5 sec
1		1 to 10 sec
5		5 to 50 sec
10		10 to 100 sec

2. T2 (⅄ - Δ switching time)

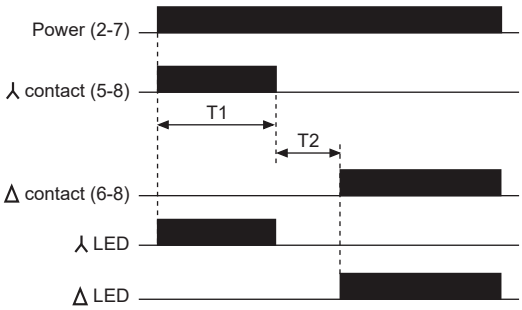
(unit: sec)

Display	**A**	**F**	**F1**	**C**	**D**	**I**
T2 (⅄-Δ switching time)	0.05	0.1	0.2	0.3	0.4	0.5



▣ Output Operation Mode

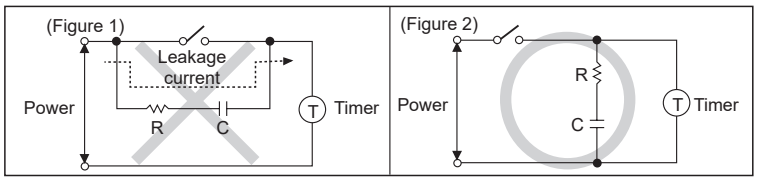
⅄ contact will be ON as soon as power is supplied, ⅄ contact will be OFF when T1 setting time is up then Δ contact will be ON after T2 switching time is up. Δ contact will be OFF when cut off the power at the status of Δ contact is ON.



※T1: Setting time (⅄contact operation time)
※T2: ⅄-Δ Swtiching time (⅄ and Δ contact are OFF when power is ON.)

▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- In order to avoid leakage current flowing, connect resistance and condenser as (Figure 2).
  If connect as (Figure 1), it may cause malfunction due to leakage current.



- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Change setting time(T1), ⅄-△ switching time or etc. after turning off the power of the timer.
- This product may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Power-OFF Delay Timer, Compact Size W38×H42mm

▣ Features

- Control time range
  (ATS8P-□S: 0.1 to 10 sec, ATS8P-□M: 0.1 to 10 min)
- Direct reading for time setting and time range with easy adjustment
- Power supply: 100-120VAC50/60Hz, 200-240VAC 50/60Hz,
  24VAC 50/60Hz, 24VDC universal
- Close and DIN rail mounting
  with the dedicated socket (PS-M8) width 41mm
- Easy mounting and installation/maintenance
  with the dedicated bracket for DIN 48×48mm
- Application
  : Protection circuit when momentary power failure and start it again

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

ATS 8 P – 2 S

Time unit	S	SEC
	M	MIN
Power supply	2	24VAC 50/60Hz, 24VDC type
	5	200-240VAC 50/60Hz
	6	100-120VAC 50/60Hz
Time operation	P	Power OFF Delay
Number of plug pins	8	8-pin plug type
Item	ATS	Compact Analog Timer

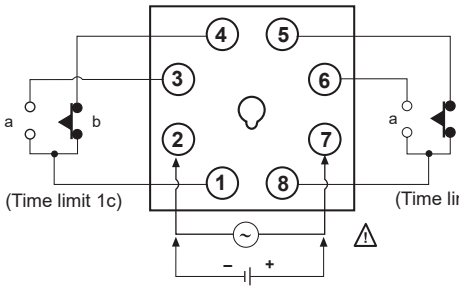
※8-pin socket (PG-08, PS-08(N), PS-M8) is sold separately.

▣ Specifications

Model		**ATS8P-□S**	**ATS8P-□M**
Function		**Power OFF Delay**	
Control time setting range※1		0.1 to 10 sec	0.1 to 10 min
Power supply		•100-120VAC～ 50/60Hz •200-240VAC～ 50/60Hz •24VAC～ 50/60Hz, 24VDC⎓ universal	
Allowable voltage range		90 to 110% of rated voltage	
Power consumption		•Max. 1.5VA (100-120VAC～ 50/60Hz) •Max. 1.5VA (200-240VAC～ 50/60Hz) •Max. 0.2VA (24VAC～ 50/60Hz), Max. 0.2W (24VDC⎓)	
Timing operation		Power OFF Start	
Control output	Contact type	Time limit DPDT (2c)	
	Contact capacity	250VAC～ 3A, 30VDC⎓ 3A resistive load	
Relay life cycle	Mechanical	Min. 10,000,000 operations	
	Electrical	Min. 100,000 operations (250VAC 3A resistive load)	
Repeat error		Max. ±0.2% ±10ms	
SET error		Max. ±5% ±50ms	
Voltage error		Max. ±0.5%	
Temperature error		Max. ±2%	
Insulation resistance		Over 100MΩ (at 500VDC megger)	
Dielectric strength		2,000VAC 50/60Hz for 1 min	
Noise immunity		±2kV the square wave noise (pulse width: 1μs) by noise simulator	
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour	
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min	
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction 3 times	
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction 3 times	
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃	
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH	
Approval			
Accessory		Bracket	
Unit weight		Approx. 80g	Approx. 85g

※1: Refer to time specifications for control time setting range by model.
※Environment resistance is rated at no freezing or condensation.

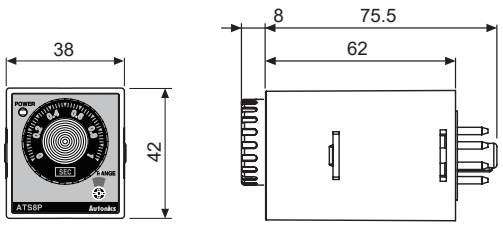
▣ Connections



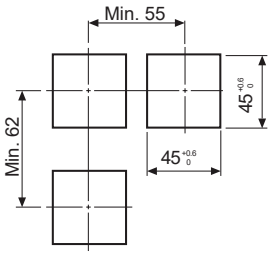
SOURCE: •100-120VAC 50/60Hz
•200-240VAC 50/60Hz
•24VAC 50/60Hz, 24VDC

▣ Dimensions

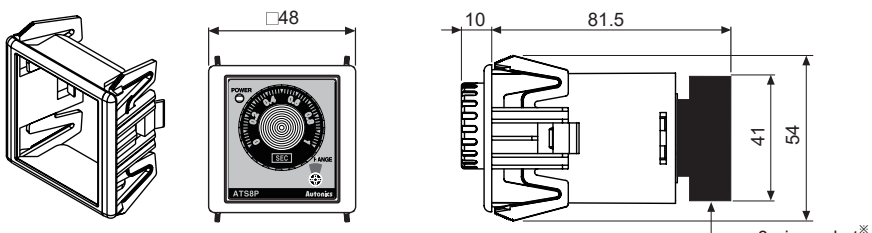
(unit: mm)



●Panel cut-out

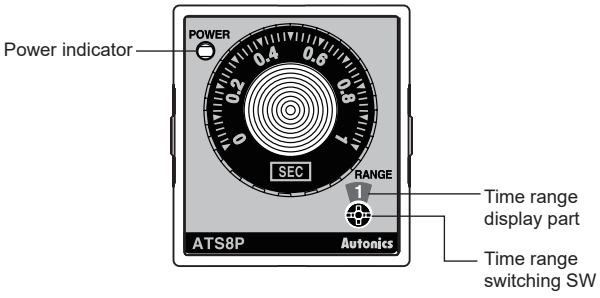


● Bracket



※8-pin socket (PG-08, PS-08(N), PS-M8) is sold separately.
Refer to the '(I)Connectors/Connector Cables/Sensor Distribution Boxes/Sockets's.

▣ Unit Description

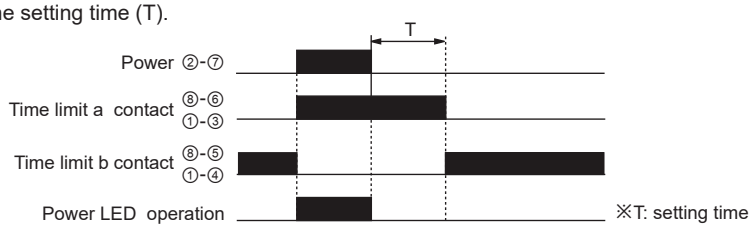


●Time specifications

Model	Time range	Time unit	Time setting range
ATS8P-□S	1	SEC	0.1 to 1 sec
	10		1 to 10 sec
ATS8P-□M	1	MIN	0.1 to 1 min
	10		1 to 10 min

▣ Operation

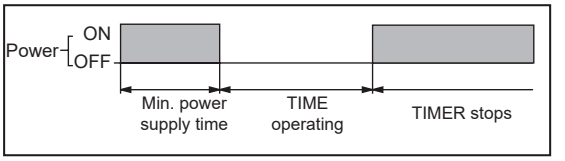
When supplying the power, 'a' contact turns ON at the same time. When turning OFF the power, 'a' contact turns OFF after the setting time (T).



▣ Proper Usage

◎ Power

- This product is Power OFF Delay Timer, the time of min. power supply is 0.1 sec for ATS8P-□S, and 2 sec for ATS8P-□M. Therefore be sure that this timer does not operate when supplying power but operates when turning OFF the power.



- Please observe the allowable voltage range and apply or cut the power at once to prevent from chattering.
- 24VDC, 24VAC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- When supplying the power, inrush current flows for a certain moment.

◎ Noise

- We test 2kV, pulse width 1μs against Impulse voltage between power terminals and 1kV, pulse width 1μs at noise simulator against external noise voltage. Please install MP condenser (0.1 to 1μF) or oil condenser between power terminals when over impulse noise voltage occurs.
- Dielectric, impulse voltage or insulation resistance test of electrical circuit when this unit is installed in the control panel.
  - Separate the unit from control panel circuit.
  - Short circuit all terminals of the unit.
    (to prevent from damage of this inner circuit by inner, insulation failure of control panel parts)

◎ Environment

Do not use this unit at below places.

- Place where temperature and humidity is out of the rated specifications.
- Place where freezing generates by temperature changes
- Place where there is flammable or explosive gas
- Place where there is lots of dust, oil or strong vibration or shock
- Place where strong alkalis or acid is used.
- Place where there is direct ray of the sun
- Place where strong magnetic field or electric noise is generated

DIN W48×H48mm Solid-State, Power OFF Delay Timer

■ Features

- Time setting range
  (AT8PSN: 0.05 to 10 sec, AT8PMN: 0.05 to 10 min)
- Simple time setup and direct read of time range
- Power supply
  : 100-120VAC 50/60Hz, 200-240VAC 50/60Hz
  100/110VDC, 24VAC 50/60Hz, 24VDC universal
- Application: Protect circuit when momentary power failure and start it again

Please read "Safety Considerations" in the instruction manual before using.

■ Ordering Information

AT | **8** | **P** | **SN** | **–** | □

Power supply	No mark	200-240VAC 50/60Hz
	2	24VAC 50/60Hz, 24VDC
	6	100-120VAC 50/60Hz
	7	100/110VDC
Time unit	SN	SEC
	MN	MIN
Time operation	P	Power OFF Delay
Number of plug pins	8	8-pin plug type
Item	AT	Analog Timer

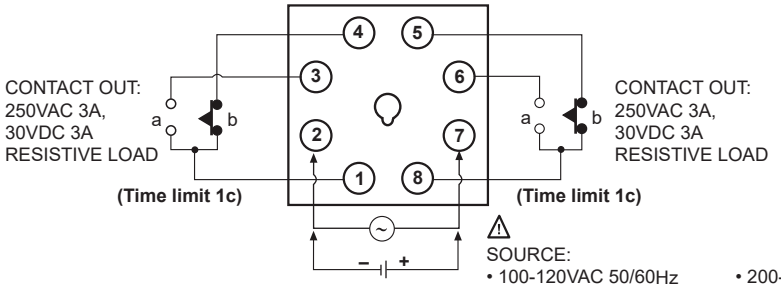
※8-pin socket (PG-08, PS-08(N)) is sold separately.

■ Specifications

Model		AT8PSN-□	AT8PMN-□
Function		**Power OFF Delay**	
Control time setting range※1		0.05 to 10 sec	0.05 to 10 min
Power supply		• 100-120VAC～ 50/60Hz • 200-240VAC～ 50/60Hz • 100/110VDC⎓ • 24VAC～ 50/60Hz, 24VDC⎓ universal	
Allowable voltage range		90 to 110% of rated voltage	
Power consumption		• Max. 1.5VA (100-120VAC～) • Max. 1.5VA (200-240VAC～) • Max. 0.8W (100/110VDC⎓) • Max. 2VA (24VAC～), Max. 2W (24VDC⎓)	
Timing operation		Power OFF start	
Control output	Contact type	Time limit DPDT (2c)	
	Contact capacity	250VAC～ 3A, 30VDC⎓ 3A resistive load	
Relay life cycle	Mechanical	Min.10,000,000 operations	
	Electrical	Min. 100,000 operations (250VAC 3A resistive load)	
Repeat error		Max. ±0.2% ±10ms	
SET error		Max. ±5% ±50ms	
Voltage error		Max. ±0.5%	
Temperature error		Max. ±2%	
Insulation resistance		Over 100MΩ (at 500VDC megger)	
Dielectric strength		2,000VAC 50/60Hz for 1 min	
Noise immunity		±2kV the square wave noise (pulse width: 1μs) by the noise simulator	
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour	
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min	
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction 3 times	
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction 3 times	
Environment	Ambient temperature	-10 to 55℃, storage: -25 to 65℃	
	Ambient humidity	35 to 85%RH	
Approval		CE c UL us	
Accessory		Bracket	
Unit weight		Approx. 100g	

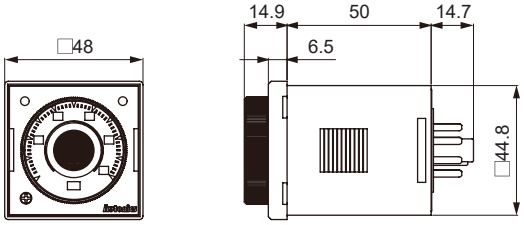
※1: Refer to time specifications for control time setting range.
※Environment resistance is rated at no freezing or condensation.

▣ Connections

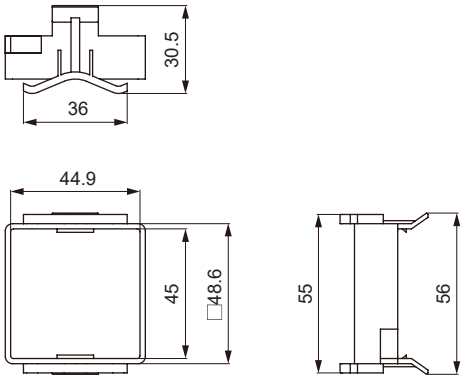


▣ Dimensions

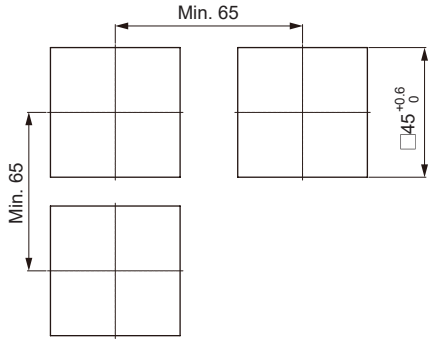
(unit: mm)



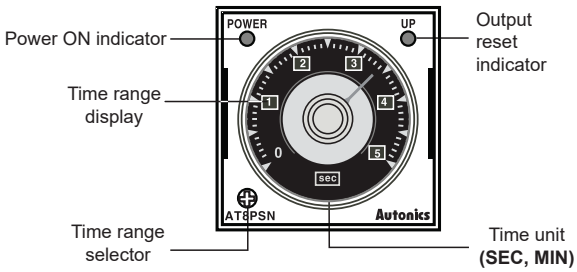
◎ Bracket



◎ Panel cut-out



▣ Unit Description

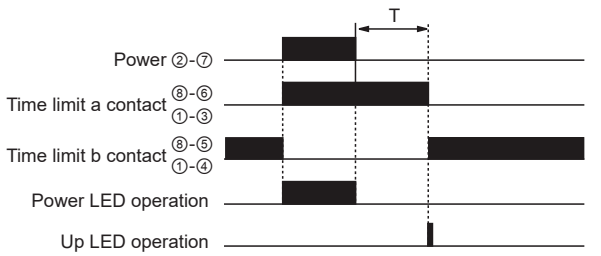


● Time specifications

Model	Time range	Time unit	Time setting range
AT8PSN-□	0.5	SEC	0 to 0.5 sec
	1		0 to 1 sec
	5		0 to 5 sec
	10		0 to 10 sec
AT8PMN-□	0.5	MIN	0 to 0.5 min
	1		0 to 1 min
	5		0 to 5 min
	10		0 to 10 min

▣ Output Operation Mode

Contact a turns ON when the power applied and then turns off after setting time (T) is passed when the power off. There is memory protection function. Even though changing setting time after cutting the power, time limit a contact turns OFF after the setting time before cutting the power.



※T: Setting time

▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- 24VDC, 24VAC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Supply power for over 0.1 sec for AT8PSN- □ and 2 sec for AT8PMN- □.
  Since AT8PSN/PMN are Power Off Delay timer, they operate after turning of the power.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Change setting time(T1) or etc. after turning off the power of the timer.
- This product may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Twin Timer with Free Power, Compact Size W38×H42mm

▣ Features

- Wide power supply range
  : 100-240VAC 50/60Hz, 24-240VDC universal,
  24VAC 50/60Hz, 24VDC universal, 12VDC
- Various output operations (6 operation modes)
- Multi time range (12 types of time range)
- Twin timer to set ON/OFF time individually
- Close and DIN rail mounting
  with the dedicated socket (PS-M8) width 41mm (for ATS8W)
- Easy installation/maintenance with
  the dedicated bracket for DIN 48×48mm

⚠ **Please read "Safety Considerations" in the instruction manual before using.**

▣ Ordering Information

ATS 8 W – 4 1

Time range	1	Time range 1 (0.1 to 1)
	3	Time range 3 (0.3 to 3)
Power supply	1	12VDC
	2	24VAC 50/60Hz, 24VDC
	4	100-240VAC 50/60Hz, 24-240VDC
Time operation	W	Twin (flicker) operation
Number of plug pins	8	8-pin plug type
	11	11-pin plug type
Item	ATS	Compact Analog Timer

※8-pin socket (PG-08, PS-08(N), PS-08) and 11-pin socket (PG-11, PS-11(N)) are sold separately.

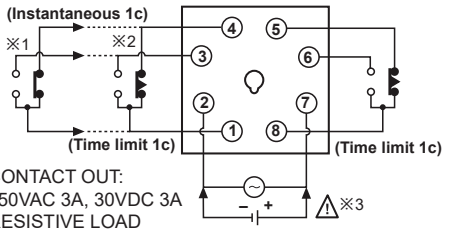
▣ Specifications

Model		ATS8W-□1	ATS11W-□1	ATS8W-□3	ATS11W-□3
Function		ON/OFF Flicker operation			
Control time setting range※1		0.1 sec to 10 hour		0.3 sec to 30 hour	
Power supply		•100-240VAC~ 50/60Hz, 24-240VDC⎓ universal •24VAC~ 50/60Hz, 24VDC⎓ universal •12VDC⎓			
Allowable voltage range		90 to 110% of rated voltage			
Power consumption		•Max. 4.2VA (100-240VAC~), Max. 2W (24-240VDC⎓) •Max. 4.5VA (24VAC~), Max. 2W (24VDC⎓) •Max. 1.5W (12VDC⎓)			
Return time		Max. 100ms			
Timing operation		Power ON Start			
Control output	Contact type	Time limit DPDT (2c) or Instantaneous SPDT (1c)+Time limit SPDT (1c) selectable by output operation mode			
	Contact capacity	250VAC~ 3A, 30VDC⎓ 3A resistive load			
Relay life cycle	Mechanical	Min. 10,000,000 operations			
	Electrical	Min. 100,000 operations (250VAC 3A resistive load)			
Repeat error		Max. ±0.2% ±10ms			
SET error		Max. ±5% ±50ms			
Voltage error		Max. ±0.5%			
Temperature error		Max. ±2%			
Insulation resistance		Over 100MΩ (at 500VDC megger)			
Dielectric strength		2,000VAC 50/60Hz for 1 min			
Noise immunity	ATS□W-1□ ATS□W-2□	±500V the square wave noise (pulse width 1μs) by noise simulator			
	ATS□W-4□	±2kV the square wave noise (pulse width 1μs) by noise simulator			
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1min) in each X, Y, Z direction for 1 hour			
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1min) in each X, Y, Z direction for 10 min			
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction 3 times			
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction 3 times			
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃			
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH			
Approval		CE c UL us			
Accessory		Bracket			
Weight※2		Approx. 100g (approx. 75g)			

※1: Refer to time specifications for control time setting range by model.
※2: The weight includes packaging. The weight in parenthesis is for unit only. ※Environment resistance is rated at no freezing or condensation.

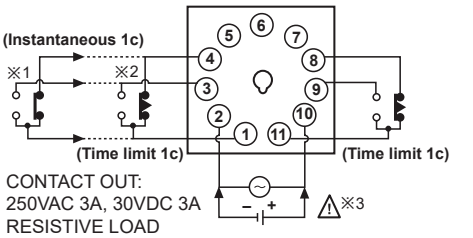
▣ Connections

◎ ATS8W



※1: When selecting [F2], [N2] output operation mode.
※2: When selecting [F1], [F3], [N1], [N3] output operation mode.

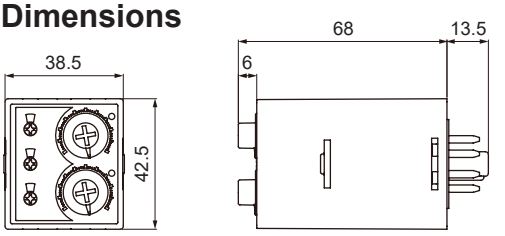
◎ ATS11W



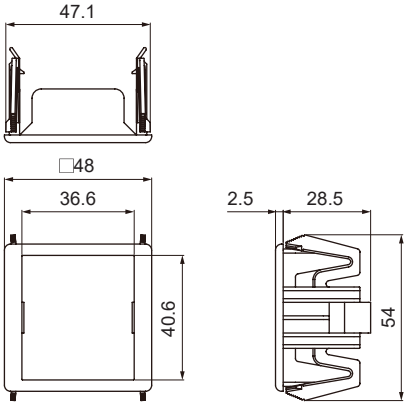
※3: AC/DC voltage: 100-240VAC 50/60Hz, 24-240VDC
24VAC 50/60Hz, 24VDC
DC voltage: 12VDC

▣ Dimensions

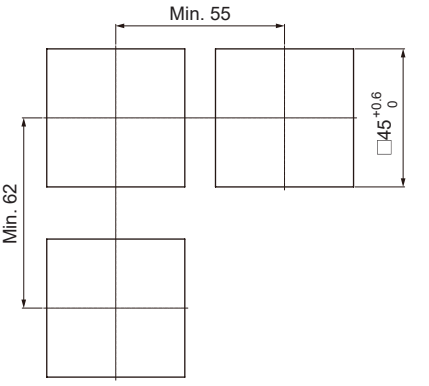
(unit: mm)



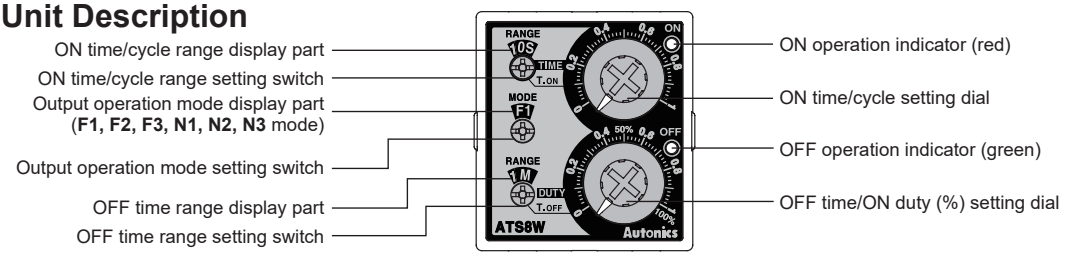
◎ Bracket



◎ Panel cut-out



▣ Unit Description

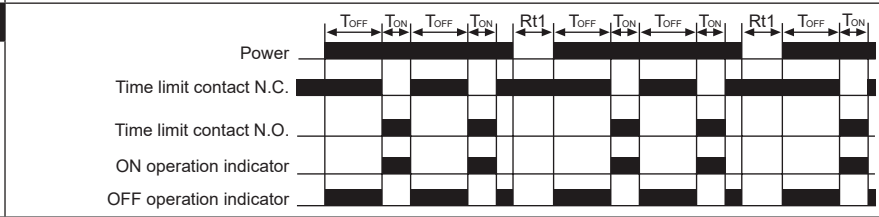
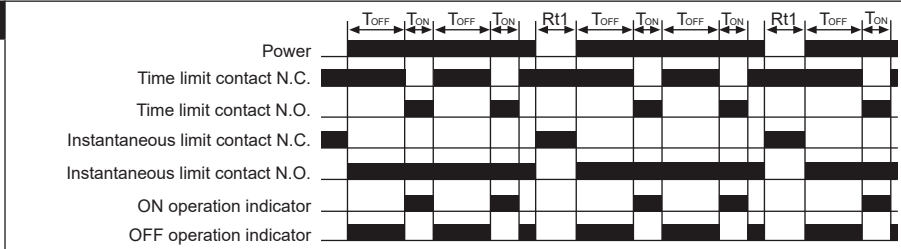
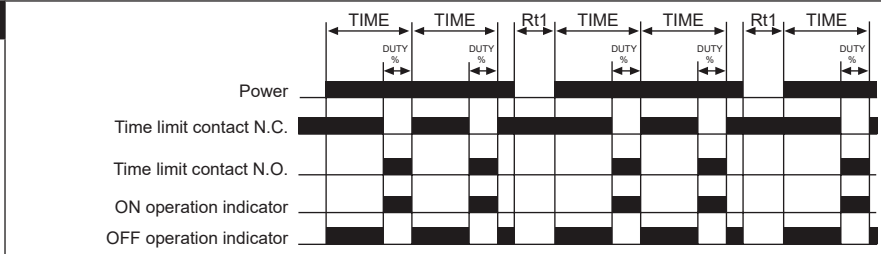
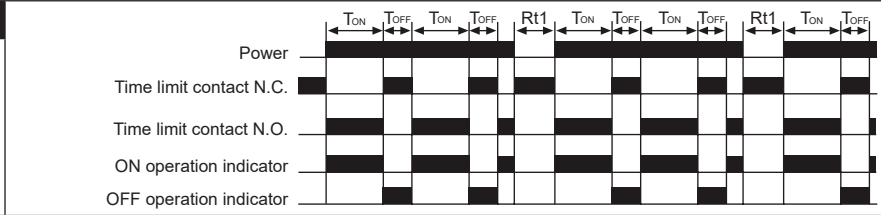
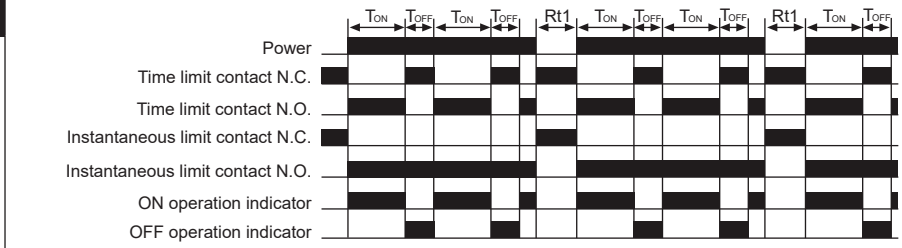
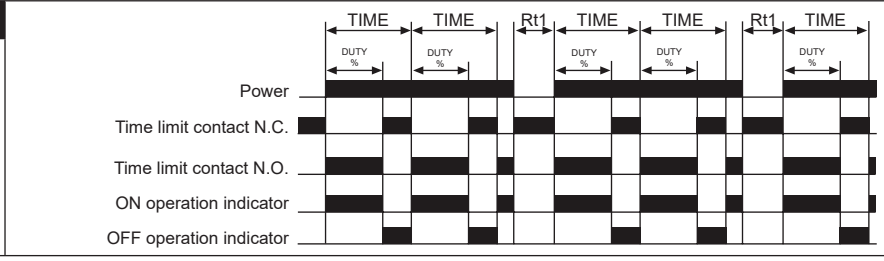


▣ Time Specifications

Model	Time range	Time unit	Time setting range	Model	Time range	Time unit	Time setting range
ATS□W-□1	1S	SEC	0.1 to 1 sec	ATS□W-□3	1S	SEC	0.3 to 3 sec
	10S		1 to 10 sec		10S		3 to 30 sec
	1M	MIN	0.1 to 1 min		1M	MIN	0.3 to 3 min
	10M		1 to 10 min		10M		3 to 30 min
	1H	HOUR	0.1 to 1 hour		1H	HOUR	0.3 to 3 hour
	10H		1 to 10 hour		10H		3 to 30 hour

▣ Output Operation Mode

[T_{ON}: ON Setting time, T_{OFF}: OFF Setting time, TIME: Cycle, DUTY: ON Time duty rate, Rt: Return time, Rt1>Rt]

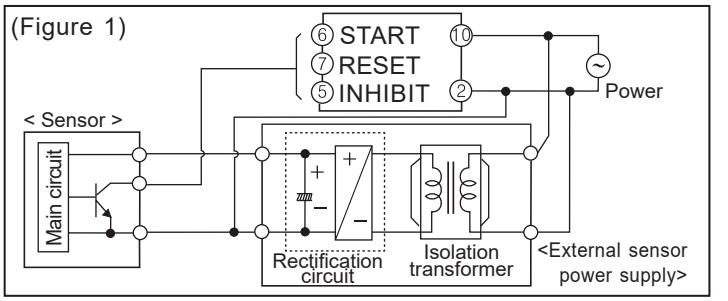
Mode	Time chart
F1 **OFF Start Flicker1**	
F2 **OFF Start Flicker2**	
F3 **OFF Start Flicker3**	
N1 **ON Start Flicker1**	
N2 **ON Start Flicker2**	
N3 **ON Start Flicker3**	

※Setting time should be over 100ms. If not, it may cause abnormal output operation due to under 100ms of setting time.
※[F3], [N3] mode operates flicker by setting cycle (time) and ON duty (%). ON time range changes to cycle (time) range and OFF time range changes to ON duty (%).

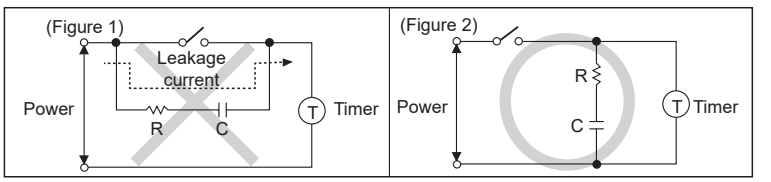
▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- 12VDC, 24VDC, 24VAC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- In order to block peripheral current, use isolation transformer which of secondary part is not grounded as (Figure 1) to supply power to the external input device.

(Figure 1)



- In order to avoid leakage current flowing, connect resistance and condenser as (Figure 2).
  If connect as (Figure 1), it may cause malfunction due to leakage current.



- Do not connect two or more timers with only one input contact or transistor simultaneously.
- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Change setting time, time range, operation mode or etc. after turning off the power of the timer.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

DIN W48×H48mm Analog Timer

▣ Features

- DIN W48×H48mm
- Easy and simple time setting
- Cost-effective
- Easy time setting
- Wide range of time
- Power supply: 100-240VAC 50/60Hz, 24-240VDC

⚠ Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

ATE | 8 | – | 4 | 3 | D

Control output	**No mark**	Time limit SPDT (1c)+Instantaneous SPST (1a)
	D	Time limit DPDT (2c)
	E	Time limit SPDT (1c)+Instantaneous SPDT (1c)
Time range	**1**	1 sec/10 sec/1 min/10 min/1 hour
	3	3 sec/30 sec/3 min/30 min/3 hour
	6	6 sec/60 sec/6 min/60 min/6 hour
	C	12 sec/12 min/24 min/12 hour/24 hour
Power supply	**4**	100-240VAC 50/60Hz, 24-240VDC
Number of plug pins	**8**	8-pin plug type
Item	**ATE**	Analog timer

※8-pin socket (PG-08, PS-08(N)) is sold separately.

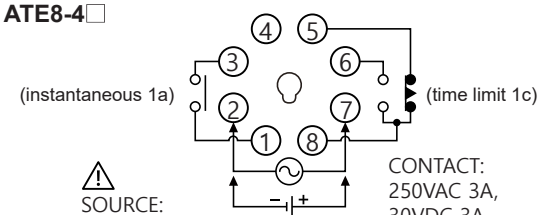
▣ Specifications

Model		ATE8-4□	ATE8-4□D	ATE8-4□E
Function		**Power ON Delay Timer**		
Control time setting range※1		0.1 sec to 24 hour		
Power supply		100-240VAC~ 50/60Hz, 24-240VDC⎓		
Permissible voltage range		90 to 110% of rated voltage		
Power consumption		Max. 3.5VA (100-240VAC~ 50/60Hz), Max. 2.0W (24-240VDC⎓)		
Return time		Max. 200ms		
Time operation		Power ON Start		
Control output	Contact type	Time-limit SPDT (1c)+ Instantaneous SPST (1a)	Time-limit DPDT (2c)	Time-limit SPDT (1c)+ Instantaneous SPDT (1c)
	Contact capacity	250VAC~ 3A, 30VDC⎓ 3A resistive load		
Relay life cycle	Mechanical	Min. 5,000,000 operations		
	Electrical	Min. 100,000 operations (250VAC 3A resistive load)		
Repeat error		Max. ±0.3% ±0.01 sec		
Set error		Max. ±5% ±0.05 sec		
Voltage error		Max. ±0.5% ±0.01 sec		
Temp. error		Max. ±2% ±0.01 sec		
Insulation resistance		Over 100MΩ (at 500VDC megger)		
Dielectric strength		2,000VAC 50/60Hz for 1 min		
Noise immunity		±2kV the square wave noise (pulse width 1μs) by noise simulator		
Vibration	Mechanical	0.75mm amplitude at frequency 10 to 55Hz (for 1min) in each X, Y, Z direction for 1 hour		
	Malfunction	0.5mm amplitude at frequency 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 min		
Shock	Mechanical	300m/s^2 (approx. 30G) in each X, Y, Z direction for 3 times		
	Malfunction	100m/s^2 (approx. 10G) in each X, Y, Z direction for 3 times		
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃		
	Ambient humid.	35 to 85%RH, storage: 35 to 85%RH		
Protection structure		IP40 (front part, IEC standard)		
Approval		CE c UL us		
Weight※2		Approx. 122.2g (approx. 75g)		

※1: Refer to time specifications for control time setting range by model.
※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Connections

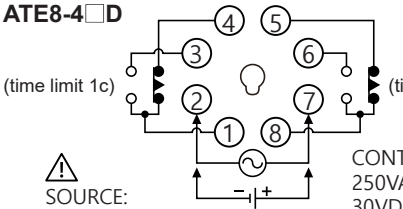
● **ATE8-4□**



SOURCE:
100-240VAC 50/60Hz 3.5VA
24-240VDC 1.5W

CONTACT:
250VAC 3A,
30VDC 3A
RESISTIVE
LOAD

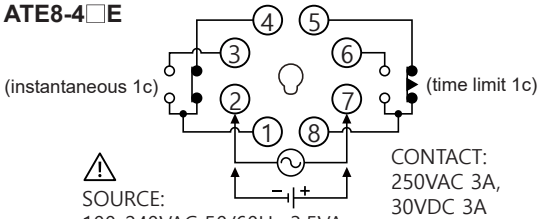
● **ATE8-4□D**



SOURCE:
100-240VAC 50/60Hz 3.5VA
24-240VDC 1.5W

CONTACT:
250VAC 3A,
30VDC 3A
RESISTIVE
LOAD

● **ATE8-4□E**

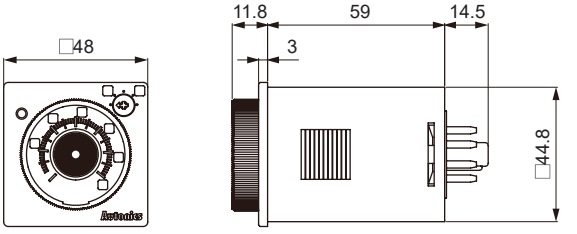


SOURCE:
100-240VAC 50/60Hz 3.5VA
24-240VDC 1.5W

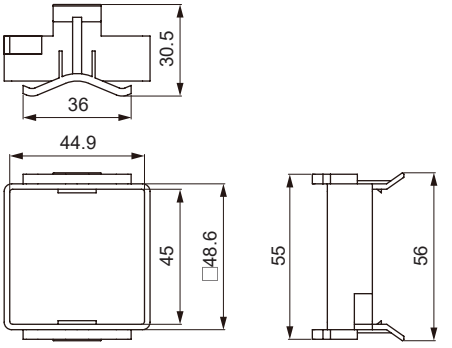
CONTACT:
250VAC 3A,
30VDC 3A
RESISTIVE
LOAD

▣ Dimensions

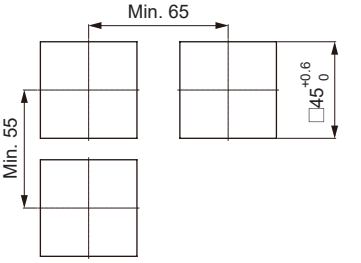
(unit: mm)



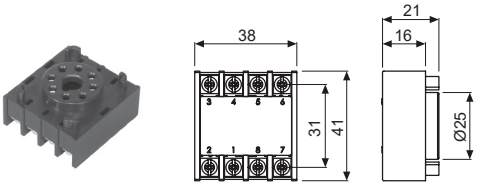
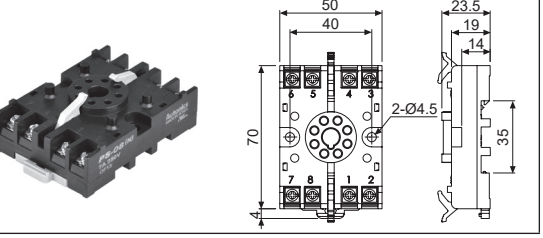
◎ Bracket (sold separately (BK-S))



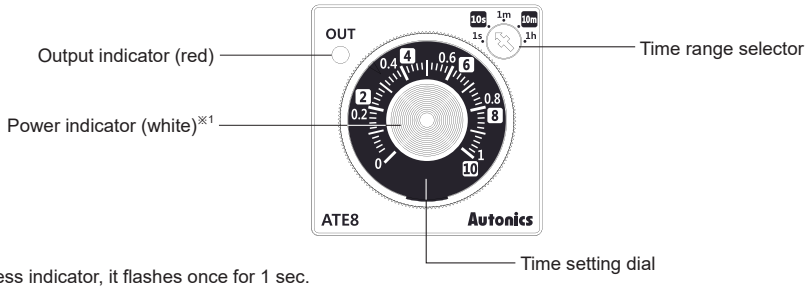
◎ Panel cut-out



● Socket (sold separately)

PG-08	PS-08(N)
	

▣ Unit Description



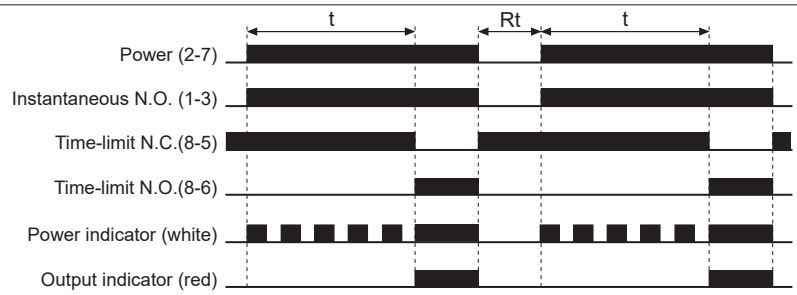
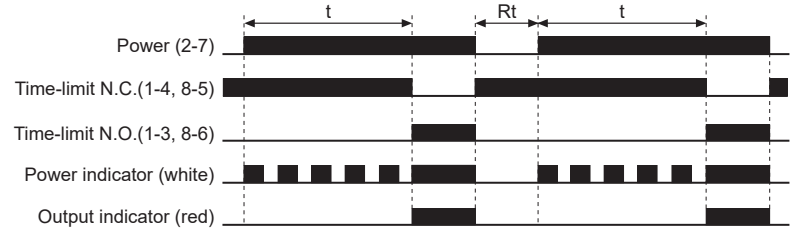
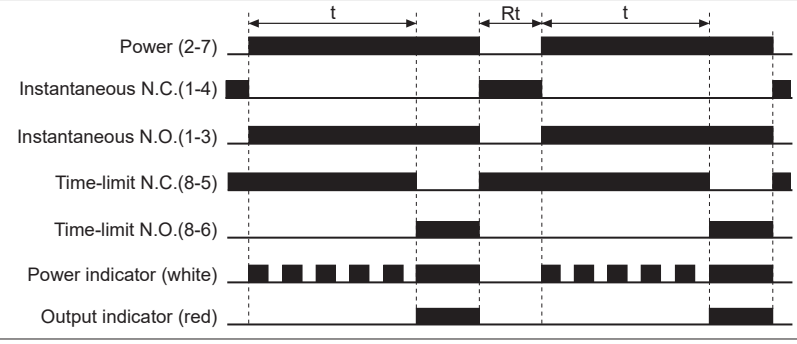
※1: As time progress indicator, it flashes once for 1 sec.

▣ Time Specifications

Model	Time range	Time unit	Time setting range	Model	Time range	Time unit	Time setting range
ATE8-41□	1	s	0.1 to 1 sec	ATE8-46□	6	s	0.6 to 6 sec
	10		1 to 10 sec		60		6 to 60 sec
	1	m	0.1 to 1 min		6	m	0.6 to 6 min
	10		1 to 10 min		60		6 to 60 min
	1	h	0.1 to 1 hour		6	h	0.6 to 6 hour
ATE8-43□	3	s	0.3 to 3 sec	ATE8-4C□	12	s	1.2 to 12 sec
	30		3 to 30 sec		12	m	1.2 to 12 min
	3	m	0.3 to 3 min		24		2.4 to 24 min
	30		3 to 30 min		12	h	1.2 to 12 hour
	3	h	0.3 to 3 hour		24		2.4 to 24 hour

▣ Operation Mode

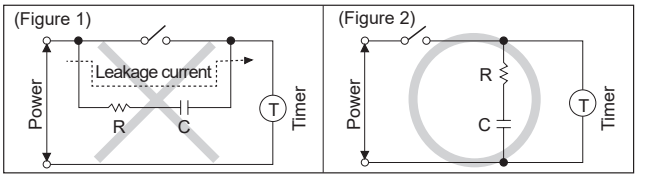
[t: Setting time, Rt: Return time]

Model	Time chart
ATE8-4□	
ATE8-4□D	
ATE8-4□E	

※When time-limit of ATE8-4□, ATE8-4□E is set to 0, time-limit contact operates within 30ms right after instantaneous contact operation.

▣ Proper Usage

- Follow instructions in 'Proper Usage'. Otherwise, it may cause unexpected accidents.
- When supplying or turning off the power, use a switch or etc. to avoid chattering.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- In order to avoid leakage current flowing, connect resistance and condenser as (Figure 2).
  If connect as (Figure 1), it may cause malfunction due to leakage current.



- Keep away from high voltage lines or power lines to prevent inductive noise.
  In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
  Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Connect output contacts of different pole to be electrokinetic potential.
- Change setting time(T1), time range or etc. after turning off the power of the timer.
- This unit may be used in the following environments.
  ①Indoors (in the environment condition rated in 'Specifications')
  ②Altitude max. 2,000m
  ③Pollution degree 2
  ④Installation category II

Intelligent Display Unit

▣ Features

- Simple wiring without soldering
  : multi-stage connection using expansion connectors or ribbon cables.
  : power supply and data wiring required on base unit only.
- Various input options
  : Serial input
  : Parallel input
  : RS485 communication input
  : RS485 communication time sync display
  : PT temperature sensor input
  : PT temperature sensor + RS485 communication input
- Expandable up to 24 units with multi-stage connection
- Available in various sizes: 16mm, 22.5mm, 40mm, 60mm
- Available in 7-segment display and 16-segmentt display types
- Available in red display and green display types
- High luminance LED display
- Various unit display plates (switchable) with flashing or ON/OFF options
- Display 64 unique characters (0 to 9, A to Z, 27 symbols, period)

DS(A)40

DS(A)60

DS16

DS(A)22

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

D S 16 — R S

Unit type	S	Basic unit	Serial input
	P		Parallel input
	T		RS485 comm. input
	C		RS485 synchronous comm. type for time display
	R		Pt temp. sensor input
	RT		Pt temp. sensor input+RS485 comm. output
	E	Expansion unit	
	No-mark	Unit-display unit	
Display color	R※3	Red	
	G	Green	
Size (character size)	16※1	W16×H24mm (W9.0×H16.0mm)	
	22	W20×H33mm (W11.2×H22.5mm)	
	40	W40×H60mm (W22.4×H40.0mm)	
	60	W60×H96mm (W33.6×H60.0mm)	
Display method	S	7-segment	
	A	16-segment	
	U※2	Unit-display unit	
Item	D	Display unit	

※1: The '16' size model has the serial input model, RS485 comm. input model and does not support 16-segment display method.
※2: Unit-display unit has only 16, 22 size.
※3: Pt temp. sensor input, Pt temp. sensor input+RS485 comm. output models support only red display color.

▣ Specifications

◎ Serial / Parallel / RS485 communication input type

Model	Basic unit	DS16-□S/T	D□22-□S/P/T	D□40-□S/P/T	D□60-□S/P/T
	Expansion unit	DS16-□E	D□22-□E	D□40-□E	D□60-□E
Input method		D□□-□S: Serial			
		D□□-□P: Parallel (dynamic parallel 1, dynamic parallel 2)			
		D□□-□T: RS485 communication (modbus protocol)			
Display color		Red, green (selectable by model)			
Power supply		12-24VDC⎓			
Allowable voltage range		90 to 110% of rated voltage			
Current consumption	Red	Max. 20mA	Max. 25mA	Max. 55mA	Max. 65mA
	Green	Max. 15mA	Max. 20mA	Max. 40mA	Max. 45mA
Character size		W9×H16mm	W11.2×H22.5mm	W22.4×H40mm	W33.6×H60mm
Max. Clock※1, ※2		• Serial input: max. 2kHz • Parallel input - dynamic parallel 1: max. 3kHz, dynamic parallel 2: max. 1.5kHz			
Input logic※1		Selectable positive logic (PNP), negative logic (NPN) (change by the function set switch)			
Input resistance※1		20kΩ			
Input level※1		High: 4.5-24VDC⎓, low: 0-1.2VDC⎓			
Display character		64 characters and signs (0 to 9, A to Z, 27 symbols, decimal point)			
Max. connection		Serial / RS485 comm. input: 24 units			
		Parallel input - dynamic parallel 1: 6 units (4-bit), 4 units (6-bit), dynamic parallel 2: 24 units (6-bit)			

※1: It is only for Serial, Parallel input models.
※2: Max. Clock is for 1:1 of duty ratio (ON, OFF ratio).

◎ RS485 synchronous communication type for time display

Model	Basic unit	DS22-□C	DS40-□C	DS60-□C
	Expansion unit	D□22-□E	D□40-□E	D□60-□E
Input method		RS485 communication (modbus protocol)		
Display color		Red, green (selectable by model)		
Power supply		12-24VDC⎓		
Allowable voltage range		90 to 110% of rated voltage		
Current consumption	Red	Max. 25mA	Max. 55mA	Max. 65mA
	Green	Max. 20mA	Max. 40mA	Max. 45mA
Character size		W11.2×H22.5mm	W22.4×H40mm	W33.6×H60mm
Time display		World local time, 12/24-hour, summer time supported		
Max. connection		10 units		

※1: Use 16-segment expansion unit for displaying delimiter for hour/min/sec and 'M' character for AM/PM.

◎ Pt temp. sensor input / Pt temp. sensor input + RS485 communication ouput type

Model	Basic unit	DS22-RR	DS40-RR/RRT	DS60-RR/RRT
	Expansion unit	DS22-RE	DS40-RE	DS60-RE
Input method		Pt temp. sensor input (supports DPt100Ω, JPt 100Ω)		
Display color		Red		
Power supply		12-24VDC⎓		
Allowable voltage range		90 to 110% of rated voltage		
Current consumption		Max. 40mA	Max. 55mA	Max. 65mA
Character size		W11.2×H22.5mm	W22.4×H40mm	W33.6×H60mm
Display temp. range		-50.0 to 400.0℃ or -58.0 to 752.0℉		
Display accuracy		F.S.±0.5%		
Output		—	RS485 comm. output (modbus RTU)※1	
Max. connection		4 units (except unit-display unit)		

※1: RS485 comm. output supports only DS40-RRT, DS60-RRT models.

◎ General Specifications

Model	Basic unit	**DS16-□S/T**	**D□22-□S/P/T/C/R**	**D□40-□S/P/T/C/R/RT**	**D□60-□S/P/T/C/R/RT**
	Expansion unit	**DS16-□E**	**D□22-□E**	**D□40-□E**	**D□60-□E**
Noise immunity		±500V the square wave noise (pulse width: 1μs) by the noise simulator			
Environment	Ambient temp.	-10 to 55℃, storage: -25 to 65℃			
	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH			
Accessory	Basic unit	Right/Left cap: 1	Right/Left cap: 1 Connector: 1	Connector: 1※1	
	Expansion unit	—		Ribbon cable (50mm): 1	
Protection structure		IP40 (front part)			
Approval		CE			
Weight※2	Basic unit	Approx. 52g (approx. 12g)	Approx. 58g (approx. 17g)	Approx. 63g (approx. 28g)	Approx. 110g (approx. 60g)
	Expansion unit	Approx. 77g (approx. 12g)※3	Approx. 92g (approx. 17g)※3	Approx. 63g (approx. 28g)	Approx. 110g (approx. 60g)

※1: It is only for parallel input model.
※2: The weight includes packaging. The weight in parenthesis is for unit only.
※3: The weight represents a pack of 3 units. The weight in parenthesis is for 1 unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Unit Description and Function Setting

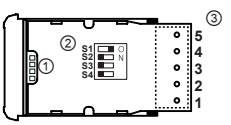
Only the basic unit model has the function set switch and the input terminal.
The DS16, D□22 models have them at the side, and the D□40. D□60 models have them at the rear.

◎ Serial input model

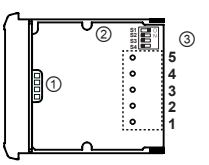
① Expansion connector

Using for connecting units.
Refer to '▣ Connection of Units'.

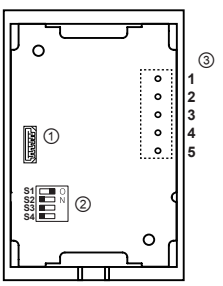
● **DS16-□S**



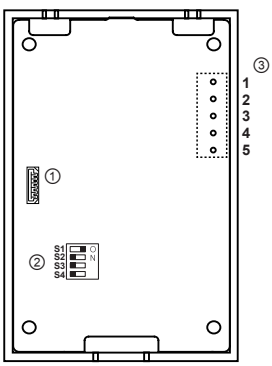
● **D□22-□S**



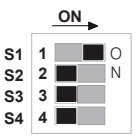
● **D□40-□S**



● **D□60-□S**



② Function set switches



<factory default>

No.	Switch		Function
	OFF(■)	ON(□■)	
S1	Positive logic (PNP)	Negative logic (NPN)	Input logic
S2	Not used	Used	Zero Blanking
S3	Not used	Used	Decimal number display※1
S4	8-bit	5-bit※2	Data input bit

※1: The other data except 0 to 9 are blank.
※2: 5-bit data input is compatible with Autonics panel meter (MT4Y, MT4W).

③ Input terminal

No.	Code	Function
1	VCC	12-24VDC
2	GND	0V
3	Data	Data input
4	CLOCK	CLOCK input
5	LATCH	LATCH input

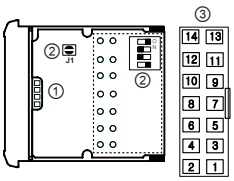
※For the D□22-□S, connect the connector to input terminal.

◎ Parallel input model

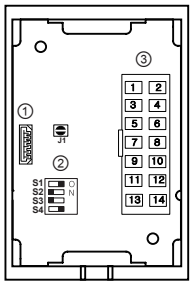
① Expansion connector

Using for connecting units.
Refer to '■ Connection of Units'.

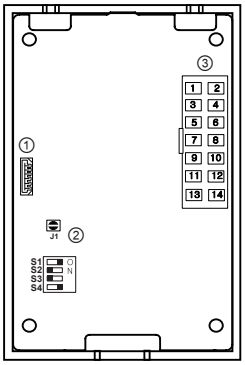
● D□22-□P



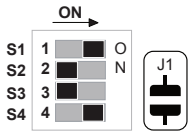
● D□40-□P



● D□60-□P



② Function set switches

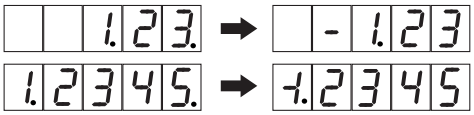


<factory default>

No.	Switch		Function
	OFF(■)	ON(■)	
S1	Positive logic (PNP)	Negative logic (NPN)	Input logic
S2	Not used	Used	Zero Blanking
S3	6-bit	4-bit※1,※2	Data input bit
S4	Dynamic 1	Dynamic 2	Dynamic 1/2 selection
J1			All Zero Blanking※3

※1: 4-bit data input is compatible with Autonics pulse meter (MP5Y, MP5W) and panel meter (MT4Y, MT4W).

※2: 4-bit data input displays "-" or "-1" when dot display data at the lowest display unit.
(minus display function is available when Zero Blanking, or All Zero Blanking is set as ON)



※3: When every number is '0', it becomes All Zero Blanking.
E.g.) When displaying 000045 using two basic units,
Uses All Zero Blanking

Does not use All Zero Blanking

③ Input terminal

Terminal	Dynamic parallel 1				Dynamic parallel 2※1	
	4-bit data input		6-bit data input		6-bit data input	
	Code	Function	Code	Function	Code	Function
1	VCC	12-24VDC	VCC	12-24VDC	VCC	12-24VDC
2	GND	0V	GND	0V	GND	0V
3	LE5	LATCH 5	LE3	LATCH 3	LATCH	LATCH input
4	LE4	LATCH 4	LE2	LATCH 2	CLOCK	CLOCK input
5	LE3	LATCH 3	LE1	LATCH 1	—	—
6	LE2	LATCH 2	LE0	LATCH 0	UNIT	Unit
7	LE1	LATCH 1	DP	Decimal point	DP	Decimal point
8	LE0	LATCH 0	D5	2^5 Data	D5	2^5 Data
9	DP	Decimal point	D4	2^4 Data	D4	2^4 Data
10	D3	2^3 Data	D3	2^3 Data	D3	2^3 Data
11	D2	2^2 Data	D2	2^2 Data	D2	2^2 Data
12	D1	2^1 Data	D1	2^1 Data	D1	2^1 Data
13	D0	2^0 Data	D0	2^0 Data	D0	2^0 Data
14	GND	0V	GND	0V	GND	0V

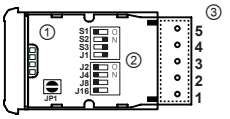
※1: When selecting Dynamic Parallel 2, 6-bit data input, All Zero Blanking OFF are fixed.

◎ RS485 communication input model

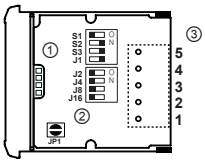
① Expansion connector

Using for connecting units.
Refer to '■ Connection of Units'.

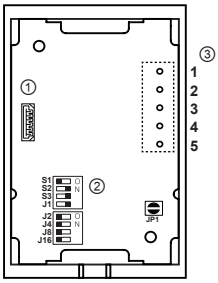
● **DS16-□T**



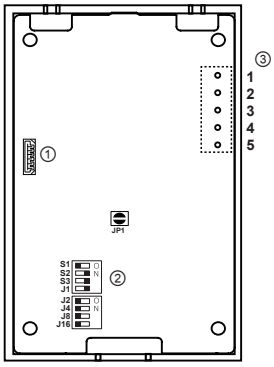
● **D□22-□T**



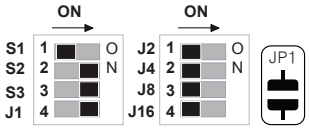
● **D□40-□T**



● **D□60-□T**



② Function set switches



<factory default>

※Functions are varied by JP1 setting (RS485 master mode/RS485 slave mode).

●RS485 slave mode (JP1 ⇌ (open))

No.	Switch OFF(■)/ON(■)	Function
S1	5ms 20ms	Comm. response time
S2 S3	4800 9600 19200 38400 S2 ■ ■ ■ ■ S3 ■ ■ ■ ■	Comm. speed selection (bps)
J1 to J16	1 2 31 32 J1 ■ ■ ■ ■ J2 ■ ■ ■ ■ J4 ■ ■ .... ■ ■ J8 ■ ■ ■ ■ J16 ■ ■ ■ ■	Comm. address selection

●RS485 master mode (JP1 ▮ (short))

No.	Switch OFF(■)/ON(■)	Function
S1	Manual setting ■ Auto setting ■	Series setting method
S2 S3	4800 9600 19200 38400 S2 ■ ■ ■ ■ S3 ■ ■ ■ ■	Comm.speed selection (bps)
J1 to J8	CT6 CT4 MP5 MT4 TK/TX TM2 TM4 THD J1 ■ ■ ■ ■ ■ ■ ■ ■ J2 ■ ■ ■ ■ ■ ■ ■ ■ J4 ■ ■ ■ ■ ■ ■ ■ ■ J8 ■ ■ ■ ■ ■ ■ ■ ■	Series selection (manual setting)
	CT6 MP5 MT4 TK/TX J1 ■ ■ ■ ■ J2 ■ ■ ■ ■ J4 ■ ■ ■ ■ J8 ■ ■ ■ ■	Series selection (manual setting), Not using the highest digit
J16	No ■ Yes ■	Unit-display unit

※RS485 Master mode supports only for Autonics RS485 comm. output models. Refer to '■ Data Input Method' '◎ RS485 comm. (master mode) input model'.

③ Input terminal

No.	Code	Function
1	VCC	12-24VDC
2	GND	0V
3	—	—
4	A (+)	RS485 A (+)
5	B (-)	RS485 B (-)

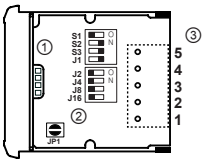
※For D□22-□T connect the connector to input terminal.

◎ RS485 synchronous communication type for time display model

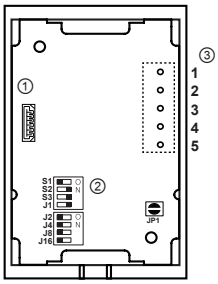
① Expansion connector

Using for connecting units.
Refer to '■ Connection of Units'.

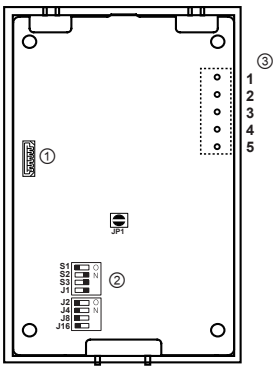
● **DS22-□C**



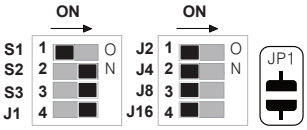
● **DS40-□C**



● **DS60-□C**



② Function set switches



<factory default>

● JP1 terminal setting

JP1	Delimiter for hour/min/sec
(Open)	Sign [:] (using 16-segment expansion unit)
(Short)	Period [.] (using 7-segment expansion unit)

● Switch setting

No.	Switch OFF(■)/ON(■)	Function
S1	24-hour 12-hour	12/24-hour setting
S2 S3	4800 9600 19200 38400 S2 S3	Comm. speed selection (bps)
J1 to J16	UTC -12:00 UTC -11:00 UTC +11:00 UTC +12:00 J1 J2 J4 ···· J8 J16	World time zone selection※1

※1: Refer to "■ World Time Zone".

③ Input terminal

No.	Code	Function
1	VCC	12-24VDC
2	GND	0V
3	—	—
4	A (+)	RS485 A (+)
5	B (-)	RS485 B (-)

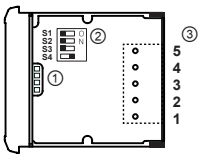
※For DS22-□C connect the connector to input terminal.

◎ Pt temp. sensor input model

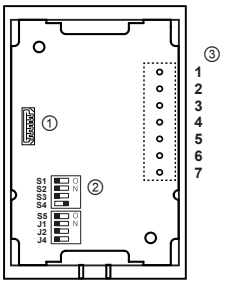
① Expansion connector

Using for connecting units.
Refer to '▣ Connection of Units'.

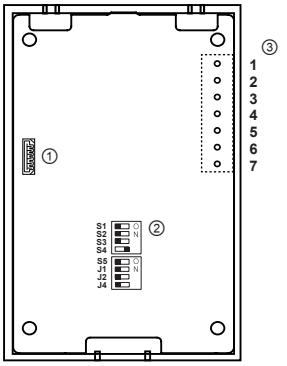
● **DS22-RR**



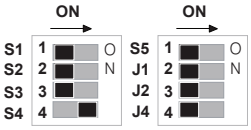
● **DS40-RR/RRT**



● **DS60-RR/RRT**



② Function set switches



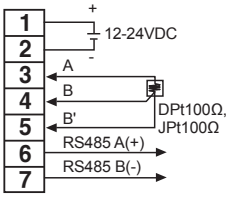
<factory default>

No.	Switch		Function
	OFF(■)	ON(■)	
S1	DPt100Ω	JPt100Ω	Temp.sensor
S2	℃	℉	Temp. unit
S3	10^2	10^1	Integer display
S4	Not used	Used	Decimal point
S5	9600bps	38400bps	Comm. speed selection (bps)
J1 J2 J4	1 2 ····· 7 8 J1 ■ ■ ■ ■ J2 ■ ■ ■ ■ J4 ■ ■ ■ ■		Comm. address selection

③ Input terminal

No.	Code	Function
1	VCC	12-24VDC
2	GND	0V
3	A	Pt temp. sensor A
4	B	Pt temp. sensor B
5	B'	Pt temp. sensor B'
6	A (+)	RS485 A (+)
7	B (-)	RS485 B (-)

● **Connections**



※For DS22-RR connect the connector to input terminal.
※Function set switches S5, J1, J2, J4 and input terminal 6, 7 are only for RS485 comm. ouptut models (DS40-RRT, DS60-RRT).

▣ Unit-display Unit

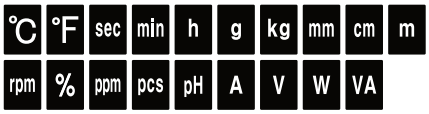
This unit is for displaying unit by inserting a name plate.
It has only 16, 22 sizes. (sold separately)

● **Model**

Size \ Color	Red	Green
16mm	DU16-R	DU16-G
22mm	DU22-R	DU22-G

◎ Unit name plates

It provides unit-printed name plates as an accessory. You can select the desired unit name plate and insert this plate.
(single-stage unit name plate: 19 types, dual-stage unit name plate: 2 types)

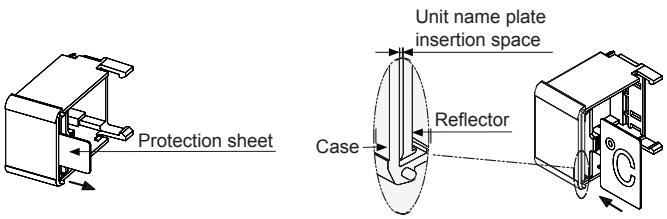


Single-stage unit name plate

Dual-stage unit name plate

◎ Unit name plate insertion

Remove the protection sheet and insert the unit name plate at between the case and the reflector.

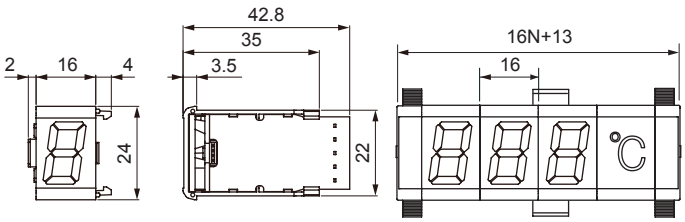


⚠ **Caution: Be sure about the correct insert direction.**

▣ Dimensions

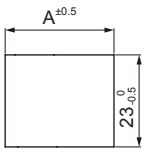
◎ DS16/DU16

(unit: mm)



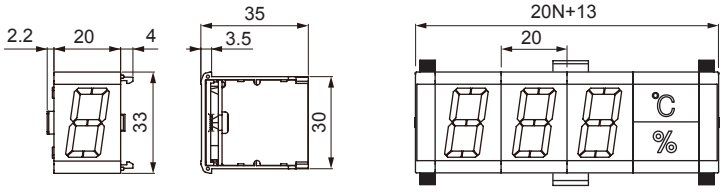
● **Panel cut-out**

※N: Number of units
※Panel thickness: 1.5 to 4mm

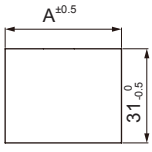


Units (N)	A (16N+11)
1	27
2	43
3	59
4	75
5	91
:	:

◎ DS22/DA22/DU22

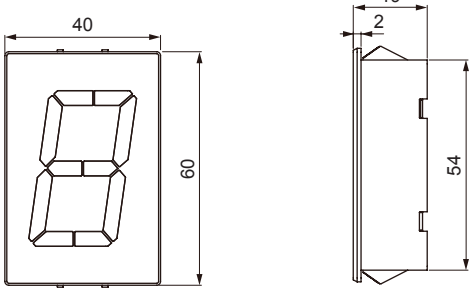


● **Panel cut-out**

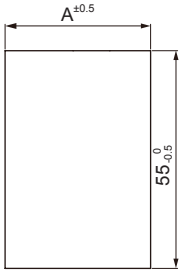


Units (N)	A (20N+11)
1	31
2	51
3	71
4	91
5	111
:	:

◎ DS40/DA40

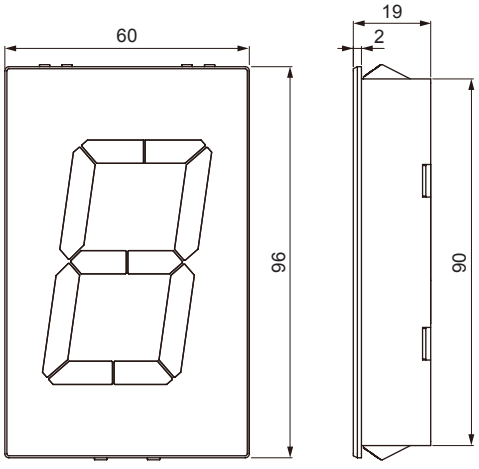


● **Panel cut-out**

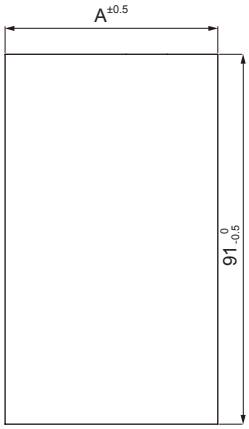


Units (N)	A (40N-2)
1	38
2	78
3	118
4	158
5	198
6	238
7	278
8	318
9	358
10	398
:	:

◎ DS60/DA60



● **Panel cut-out**

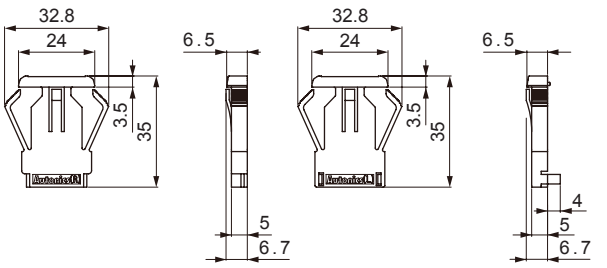


Units (N)	A (60N-3)
1	57
2	117
3	177
4	237
5	297
6	357
7	417
8	477
9	537
10	597
:	:

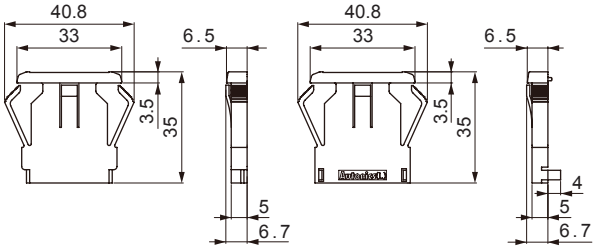
▣ Accessories

◎ Cap

• **DS16**

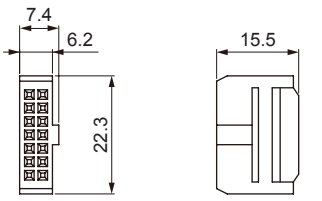


• **D□22**

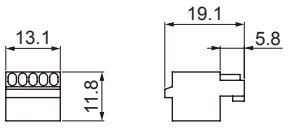


◎ Connector

• **D□□-P**
: for Parallel input model

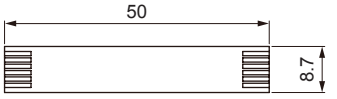


• **D□22**



◎ Ribbon cable

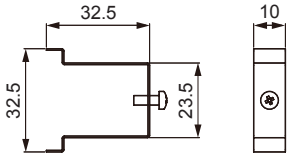
• **D□40/D□60**



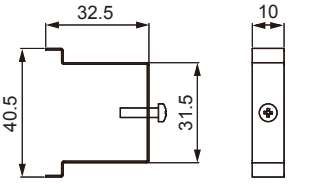
▣ Sold Separately

◎ Middle bracket

• **BK-D16R**
(for DS16)



• **BK-D16R**
(for D□22)



◎ Communication converter

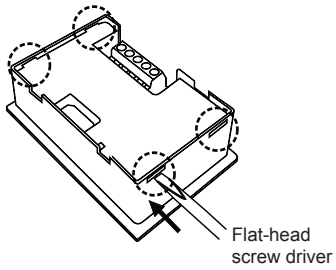
• **SCM-WF48**
(Wi-Fi to RS485·USB wireless communication converter)

• **SCM-US48I**
(USB to RS485 converter)

• **SCM-38I**
(RS232C to RS485 converter)

▣ Removing Protection Cover

To operate the function set switch of the D□40, D□60 models, you should remove the protection cover.
Press the connection parts (4-point) of the protection cover at the top/bottom of the product with a flat-head screwdriver and the protection cover is removed.

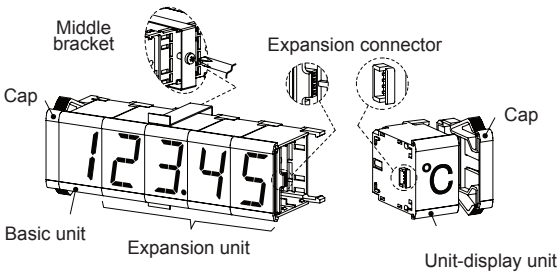


⚠Caution: Before removing the protection cover, power must be turned OFF.

▣ Connection of Units

◎ DS16/D□22

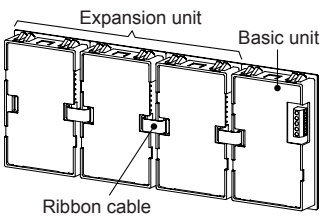
- Connect a basic unit, expansion units, a unit-display unit from the left and connect the caps the end of right and left.
- The middle bracket (sold separately) helps to protect deflection when connecting over 7 units.
  Use one middle bracket per 7 units.
- The basic unit supplies the power for expansion units and the unit-display unit and DATA input.



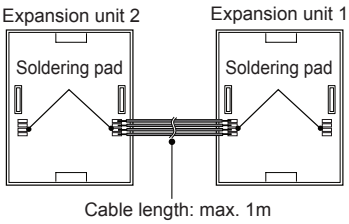
※Tighten it with below 0.5N·m.

◎ D□40/D□60

Connect expansion connectors of units using a ribbon cable (accessory) as (figure 1).
If the distance between expansion units is far as (figure 2), you can connect the cable at the soldering pad.
To use a soldering pad, remove the protection cover which only expansion units have.



(figure 1)



(figure 2)

※You can use both the 7-segment display method model and the 16-segment display method model mixed.

▣ Input Data Chart [Serial, Parallel, RS485 Comm.(Slave Mode) Input Model]

When selecting 5-bit data input for the serial input model, or 4-bit data input for the parallel input model, it displays only shaded part (0 to 9, A to F). If there is no input data after supplying the power, the basic unit differently displays by each input method; serial input model displays 'S', parallel input model displays 'P', and RS485 communication input model displays 'T'.

※In case of positive logic (PNP)

DS Series (7-segment)								DA Series (16-segment)								DU Series (unit)		Hi 2-bit / Low 4-bit			
D5	D4	D5	D4	D5	D4	D5	D4	D5	D4	D5	D4	D5	D4	D5	D4	D5	D4	D3	D2	D1	D0
L	L	L	H	H	L	H	H	L	L	L	H	H	L	H	H	X	X				
0	G	W	]	0	G	W	]	No unit		L	L	L	L								
1	H	X		1	H	X	[	Upper-Lower OFF		L	L	L	H								
2	I	Y		2	I	Y	+	Upper-Lower ON		L	L	H	L								
3	J	Z		3	J	Z	:	Upper ON		L	L	H	H								
4	K	-1	°	4	K	-1	;	Lower ON		L	H	L	L								
5	L	(	₩	5	L	(	<	Upper-Lower flashes		L	H	L	H								
6	M	)	H (h)	6	M	)	>	Upper flashes		L	H	H	L								
7	N	'	I	7	N	'	|	Lower flashes		L	H	H	H								
8	O	"	J	8	O	"	!	※1		H	L	L	L								
9	P	^	K	9	P	^	@			H	L	L	H								
A	Q	.	K	A	Q	.	#			H	L	H	L								
B	R	/	N	B	R	/	$			H	L	H	H								
C	S	?	O	C	S	?	%			H	H	L	L								
D	T	-	T	D	T	-	&			H	H	L	H								
E	U	_	X	E	U	_	★			H	H	H	L								
F	V	=	Blank	F	V	=	Blank			H	H	H	H								

※1: If this data is not for the unit-display unit, it maintains former state.

※The unit-display unit does not use the upper bit over D4. (don't care: X)

※Unit-display unit function

Upper/Lower selection, ON/Flash function → 123 °C %

ON/Flash function → 123.45 sec

※It is only available to use the unit-display unit with serial 5-bit, parallel 4/6-bit Dynamic 1 input when connecting the unit display unit and turning ON it. (do not input data to the unit-display unit.)

※To display two data using zero blanking function

① Using the unit-display unit: If sending unit data signal after data 1 (00123), it applies zero blanking function when displaying data 2 (04567).

123 % 4567

② Not using the unit-display unit: If sending no-unit data (HXXXLLLL) after data 1 (00123), it applies zero blanking function to display data 2. In this case, transmitted data should be added one to the display digits. (no-unit data is added)

123 4567

When do not using unit-display unit, no-unit data is used for data division. If it does not send no-unit data (HXXXLLLL), it displays data 1 (00123) and data 2 (04567) as one data. Zero-blanking function is applied to data 1 only.

1230567

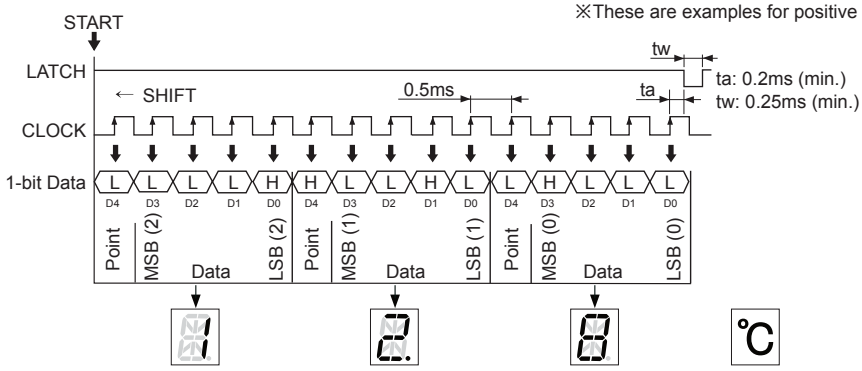
※Do not transfer unit data to basic/expansion unit. Unit bit (D7) of unit data is only for unit. If transferring unit data to basic/expansion unit, unit bit (D7) displays the ignored data value. In this case, Zero blanking does not operate normally.

▣ Data Input Method [Serial, Parallel, RS485 Comm. Input Model]

◎ Serial input model

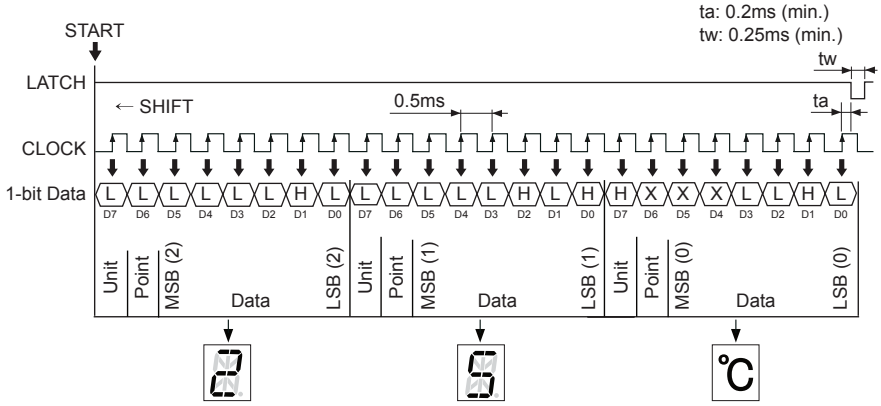
● 5-bit serial input (e.g.: displays 12.8℃)

※Clock: max. 2kHz
※These are examples for positive logic (PNP).



⚠ **Caution: The unit-display unit is available only for turning ON. Do not input data to the unit-display unit.**

● 8-bit serial input (e.g.: displays 25℃)

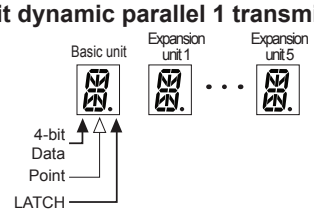


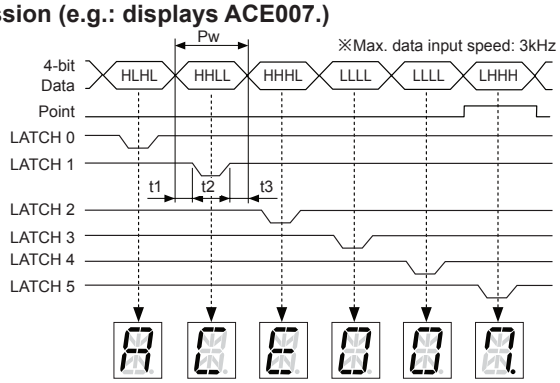
◎ Parallel input model

Example of unit organization by data input

Dynamic Parallel 1	4-bit	Connectable 1 basic unit and 5 expansion units (6-digit) E.g.) 10-digit organization: (1 basic unit + 5 expansion units)+ (1 basic unit + 3 expansion units)
	6-bit	Connectable 1 basic unit and 3 expansion units (4-digit) E.g.) 10-digit organization: (1 basic unit + 3 expansion units)×2+ (1 basic unit + 1 expansion units)
Dynamic Parallel 2	6-bit	Connectable 1 basic unit and 23 expansion units (24-digit) E.g.) 30-digit organization: (1 basic unit + 23 expansion units)+ (1 basic unit + 5 expansion units)

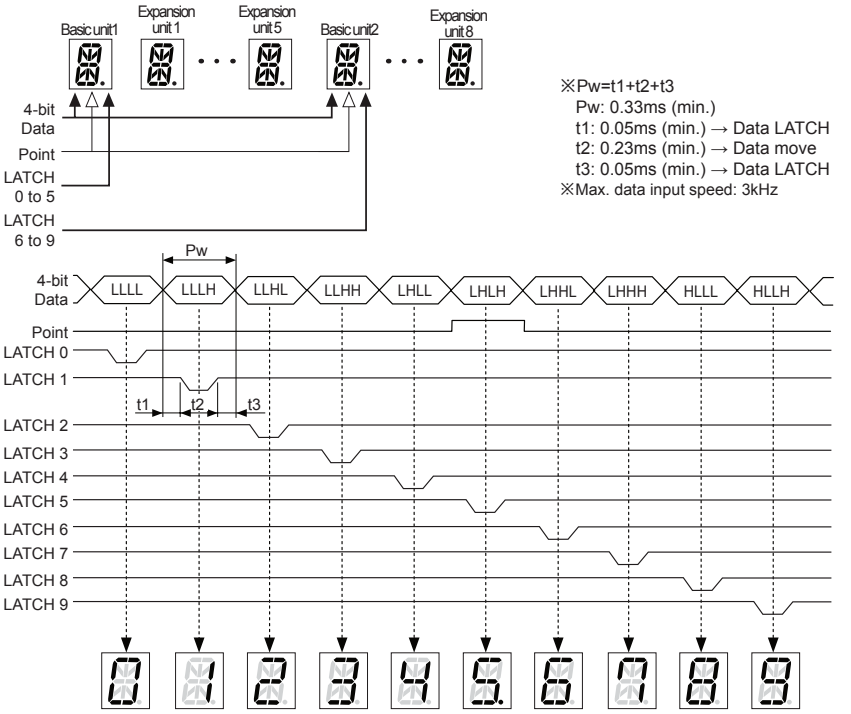
● 4-bit dynamic parallel 1 transmission (e.g.: displays ACE007.)



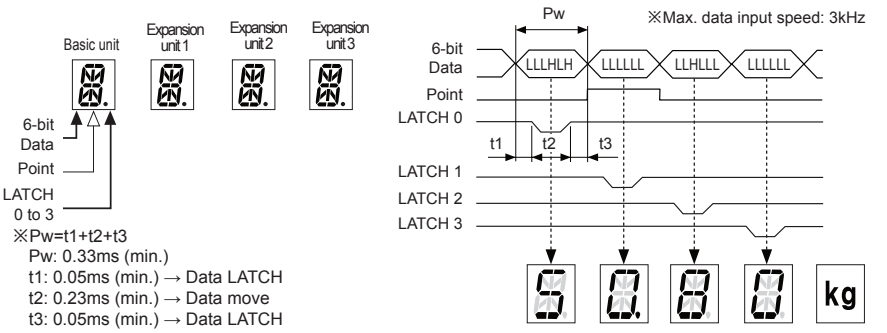


※Pw=t1+t2+t3
Pw: 0.33ms (min.)
t1: 0.05ms (min.) → Data LATCH
t2: 0.23ms (min.) → Data move
t3: 0.05ms (min.) → Data LATCH

● **4-bit dynamic parallel 1 transmission (e.g.: displays 012345.6789)**

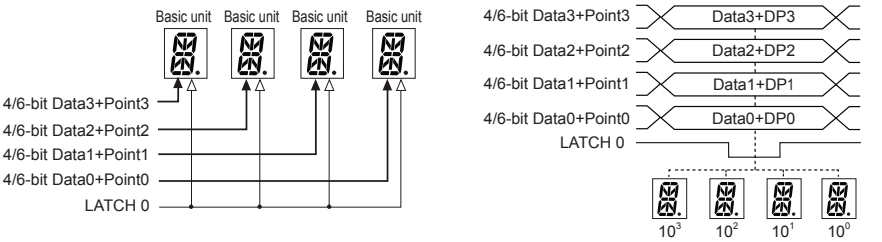


● **6-bit dynamic parallel 1 transmission (e.g.: displays 50.80kg)**

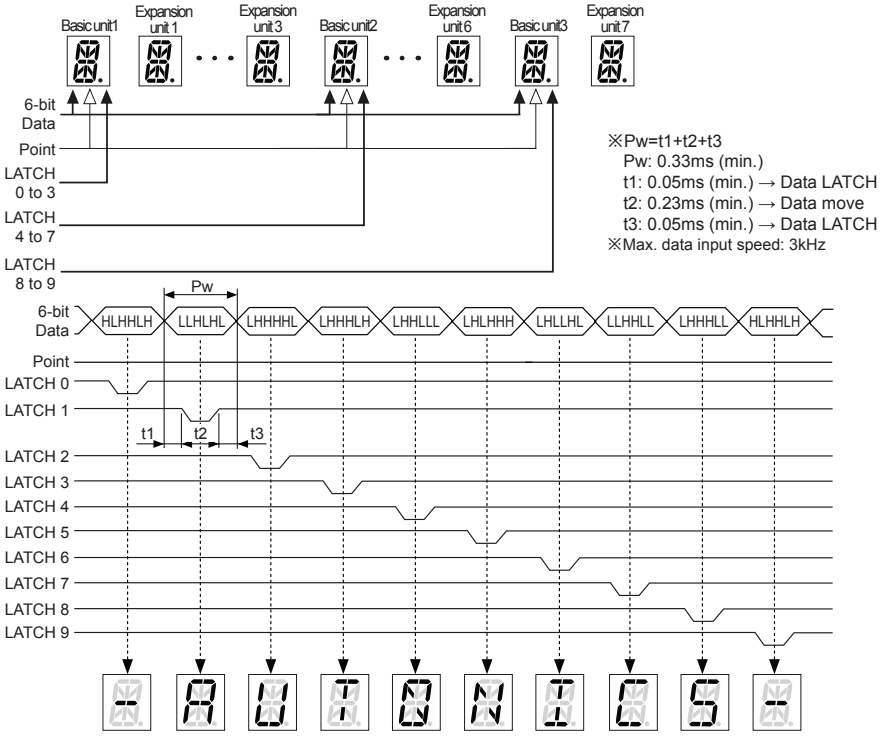


⚠**Caution: The unit-display unit is available only for turning ON. Do not input data to the unit-display unit.**

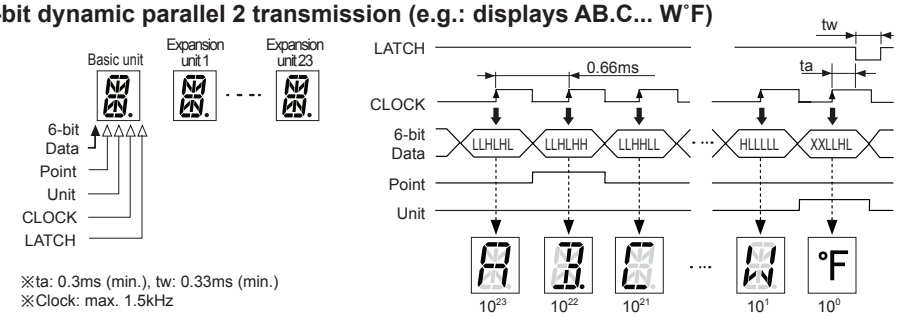
※General parallel input is only for basic unit (dynamic parallel 1).



● 6-bit dynamic parallel 1 transmission (e.g.: displays-AUTONICS-)



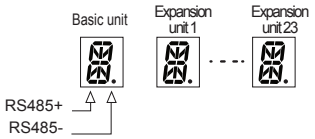
● 6-bit dynamic parallel 2 transmission (e.g.: displays AB.C... W˚F)



◎ RS485 comm. (slave mode) input model

● E.g.: Displays 10H38M (10 hour 38 min)

Communication address: 1, Communication speed: 9600bps, Data bit: 8-bit, Start/Stop bit: 1-bit, Parity bit: none

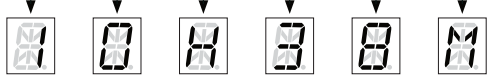


• Query (master)

Slave address	Function	Starting address		No. of Register	
		High	Low	High	Low
01H	10H	00H	00H	00H	04H

Byte Counter (No. of data byte)	Data (400001)		Data (400002)		Data (400003)		Data (400004)		Error check (CRC16)	
	High	Low	High	Low	High	Low	High	Low	Low	High
08H	00H	01H	01H	00H	11H	03H	08H	16H	D4H	59H

Zero Blanking ON



• Response (slave)

Slave Address	Function	Starting Address		No. of Register		Error Check (CRC16)	
		High	Low	High	Low	Low	High
01H	10H	00H	00H	00H	04H	C1H	CAH

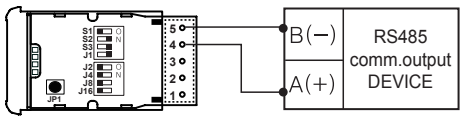
◎ RS485 comm. (master mode) input model

Connect the unit and the specified Autonics device which supports master mode for displaying current value without PC/PLC. The specified Autonics devices are connected by auto or manual setting.

● Supported Autonics device for RS485 master mode

Only for RS485 communication output model of the below series.

Item	Series
Temperature controller/sensor	TK, TX, TM2, TM4, THD
Counter/Timer	CT4, CT6
Pulse meter	MP5
Panel meter	MT4



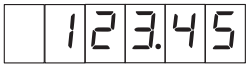
※Connect input terminal 4(A+) and 5(B-) of display unit to RS485 communication output terminal of the dedicated device.

▣ Examples of Display

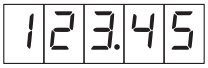
◎ RS485 communication input model

In case of manual connection setting, the highest digit may be not used.

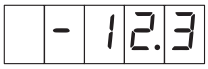
1) CT6 Series (using 6-digit)



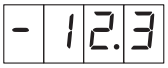
2) CT6 Series (using 5-digit)



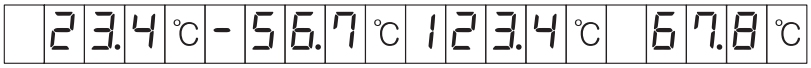
3) MP5 Series (using 5-digit)



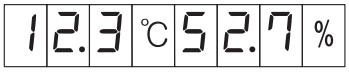
4) MP5 Series (using 4-digit)



5) TM4 Series (4CH connection, using unit-display unit)



6) THD Series (using unit-display unit)



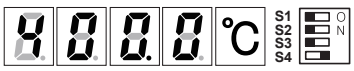
◎ RS485 synchronous comm. type for time display model (delimiter for hour/min/sec)

Delimiter for hour/min/sec		Displaying 24-hour	Displaying 12-hour※1
Sign [:] (using 16 seg. expansion unit)	Hour/Min		
	Hour/ Min/Sec		
Period [.] (using 7 seg. expansion unit)	Hour/Min		
	Hour/ Min/Sec		

※Use 16-segment expansion unit for 'M' character for AM/PM when displaying 12 hours time.

◎ Pt temp. sensor input model

1) Temperature (℃) display (displays DPt100Ω, 400.0℃)

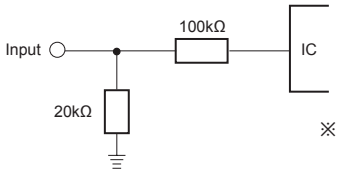


2) Temperature (℉) display (JPt100Ω, 75.2℉)

※Pt temp. sensor input model are applied Zero Blanking function automatically.

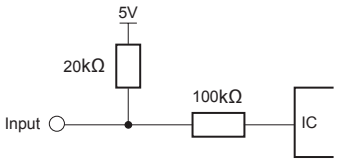
▣ Input Circuit

● **Positive logic (PNP) input**



※Input level ┌ High: 4.5-24VDC
└ Low: 0-1.2VDC

● **Negative logic (NPN) input**



▣ World Time Zone [RS485 Synchronous Comm. Type for Time Display Model]

※Select the desired world time zone by function set switches (J1 to J16).
※If communication is not connected when supplying the power, the unit displays the set local time zone.

No.	Switch		OFF(■): 0 ON (□): 1			Time Zone	Location
	J1	J2	J4	J8	J16		
0	0	0	0	0	0	UTC-12:00	International Date Line West
1	0	0	0	0	1	UTC-11:00	Coordinated Universal Time -11
2	0	0	0	1	0	UTC-10:00	Hawaii
3	0	0	0	1	1	UTC-09:00	Alaska
4	0	0	1	0	0	UTC-08:00	Pacific Time(US&Canada), Baja California
5	0	0	1	0	1	UTC-07:00	Mountain Time(US&Canada), Arizona, Chihuahua, La Paz, Mazatlan
6	0	0	1	1	0	UTC-06:00	Guadalajara, Mexico City, Monterrey, Saskatchewan, Central America, Central Time(US&Canada)
7	0	0	1	1	1	UTC-05:00	Eastern Time(US&Canada), Indiana(East), Bogota, Lima, Quito, Rio Branco, Chetumal
8	0	1	0	0	0	UTC-04:00	Atlantic Time(Canada), Asuncion, Georgetown, La Paz, Manaus, San Juan, Cuiaba
9	0	1	0	0	1	UTC-03:30	Newfoundland
10	0	1	0	1	0	UTC-03:00	Greenland, Montevideo, Buenos Aires, Brasilia, Santiago, Salvador, Cayenne, Fortaleza
11	0	1	0	1	1	UTC-02:00	Coordinated Universal Time -02
12	0	1	1	0	0	UTC-01:00	Cabo Verde Is., Azores
13	0	1	1	0	1	UTC 00:00	Coordinated Universal Time, Dublin, Edinburgh, Lisbon, London, Monrovia, Reykjavik, Casablanca
14	0	1	1	1	0	UTC+01:00	Belgrade, Bratislava, Budapest, Ljubljana, Prague, Brussels, Copenhagen, Madrid, Paris, Windhoek, Sarajevo, Skopje, Warsaw, Zagreb, West Central Africa, Amsterdam, Berlin, Bern, Rome, Stockholm, Vienna
15	0	1	1	1	1	UTC+02:00	Damascus, E.Europe, Beirut, Athens, Bucharest, Amman, Jerusalem, Istanbul, Cairo, Kaliningrad, Tripoli, Harare, Pretoria, Helsinki, Kyiv, Riga, Sofia, Tallinn, Vilnius
16	1	0	0	0	0	UTC+03:00	Nairobi, Moscow, St. Petersburg, Volgograd, Minsk, Baghdad, Kuwait, Riyadh
17	1	0	0	0	1	UTC+03:30	Tehran
18	1	0	0	1	0	UTC+04:00	Baku, Abu Dhabi, Muscat, Yerevan, Izhevsk, Samara, Tbilisi, Port Louis
19	1	0	0	1	1	UTC+04:30	Kabul
20	1	0	1	0	0	UTC+05:00	Ashgabat, Tashkent, Ekaterinburg, Islamabad, Karachi
21	1	0	1	0	1	UTC+05:30	Sri Jayawardenepura, Chennai, Kolkata, Mumbai, New Delhi
22	1	0	1	1	0	UTC+05:45	Kathmandu
23	1	0	1	1	1	UTC+06:00	Novosibirsk, Dhaka, Astana
24	1	1	0	0	0	UTC+06:30	Yangon(Rangoon)
25	1	1	0	0	1	UTC+07:00	Bangkok, Hanoi, Jakarta, Krasnoyarsk
26	1	1	0	1	0	UTC+08:00	Beijing, Chongqing, Hong Kong, Urumqi, Ulaanbaatar, Irkutsk, Kuala Lumpur, Singapore, Taipei, Perth
27	1	1	0	1	1	UTC+09:00	Seoul, Yakutsk, Osaka, Sapporo, Tokyo
28	1	1	1	0	0	UTC+09:30	Darwin, Adelaide
29	1	1	1	0	1	UTC+10:00	Guam, Port Moresby, Magadan, Brisbane, Vladivostok, Canberra, Melbourne, Sydney, Hobart
30	1	1	1	1	0	UTC+11:00	Solomon Is., New Caledonia, Chokurdakh
31	1	1	1	1	1	UTC+12:00	Coordinated Universal Time +12, Anadyr, Petropavlovsk-Kamchatsky, Auckland, Wellington, Fiji

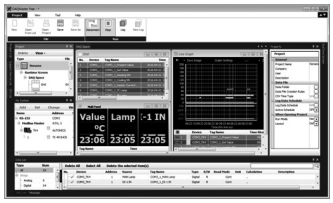
▣ Comprehensive Device Management Program [DAQMaster]

- DAQMaster is comprehensive device management program for convenient management of parameters and multiple device data monitoring.
- Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



▣ Device Synchronized Time Transfer Program [World Clock]

- World Clock is time synchronization program for RS485 synchronous comm. type DS□-C Series.
- Visit our website (www.autonics.com) to download user manual and device synchronized time transfer program.

< Computer specification for using software >

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024×768 or higher
Others	RS-232 serial port (9-pin), USB port

< World Clock screen >

▣ RS485 Communication Specifications

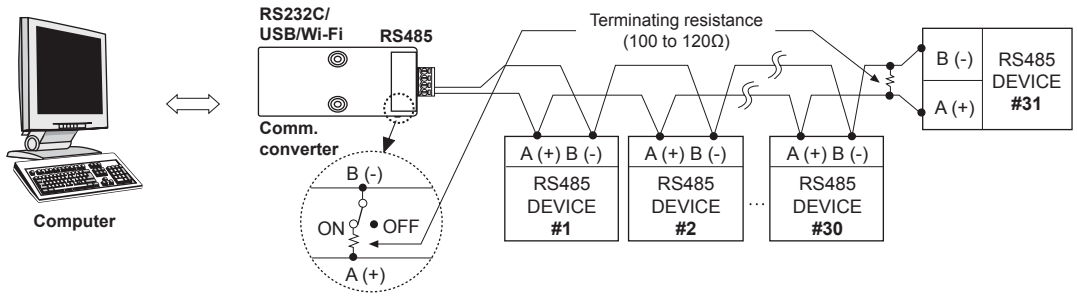
※Only for RS485 communication input/output model.

Item	RS485 comm. input model (D□□-□T)		RS485 synchronous comm. type for time display model (DS□-□C)	RS485 comm. output model (DS□-RRT)
	Slave mode	Master mode		
Comm. protocol	Modbus RTU with 16-bit CRC			
Connection type	RS485			
Application standard	Compliance with EIA RS485			
Max. connection	31 units (address: 01 to 32)	1 unit (address: 01(fixed))	1 unit (address: 226 (fixed))	8 units (address: 01 to 08)
Comm. type	Two-wire half duplex			
Comm. distance	Max. 800m			
Comm. speed (bps)	4800, 9600, 19200, 38400		4800, 9600, 19200, 38400	9600, 38400
Comm. response time	5ms, 20ms	—	—	5ms (fixed)
Start bit	1-bit (fixed)			
Data bit	8-bit (fixed)			
Parity bit	None (fixed)			
Stop bit	1-bit (fixed)			

▣ Communication Setting

◎ Application of system organization

※It is only for the RS485 communication input/output model.



※It is recommended to use Autonics communication converter; SCM-WF48 (Wi-Fi to RS485·USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately). Please use twisted pair wire for RS485 communication.

◎ Modbus address mapping

● Data format

Digit 1, 3, 5, ...23 data								Digit 2, 4, 6, ...24 data							
D7	D6	D5	D4	D3	D2	D1	D0	D7	D6	D5	D4	D3	D2	D1	D0
	Unit	Dot			Data										

※Unit, point are displayed when it is 'H'.

● Product information

No. (Address)	Function	R/W	Parameter	Description	Factory default		Note	
					D□□-□T	DS□-RRT	D□□-□T	DS□-RRT
300001 to 300100	04	R	Reserved					
300101(0064)	04	R	—	Product number H	—		—	
300102(0065)	04	R	—	Product number L	—		—	
300103(0066)	04	R	—	Hardware version	—		—	
300104(0067)	04	R	—	Software version	—		—	
300105(0068)	04	R	—	Model name 1	'DS'		DS(A)xx-xT	DSxx-RRT
300106(0069)	04	R	—	Model name 2	'(A'	'xx'		
300107(006A)	04	R	—	Model name 3	')x'	'-R'		
300108(006B)	04	R	—	Model name 4	'x-'	'RT'		
300109(006C)	04	R	—	Model name 5	'xT'	0		
300110(006D) to 300114 (0071)	04	R	—	Model name 6 to 10	0		—	

※The below Series are automatically reconized RS485 master mode.

No. (Address)	Function	R/W	Parameter	Description	Factory default						Note
					CT Series	MP5 Series	MT4 Series	TK Series	TX Series	TM Series	THD Series	
300105(0068)	04	R	—	Model name 1	'CT'	'MP'	'MT'	'TK'	'TX'	'TM'	'TH'	Series name
300106(0069)	04	R	—	Model name 2	'6M'	'5W'	'4W'	'4M'	'4'	'2'	'D'	
300107(006A)	04	R	—	Model name 3	'-2'	'-4'	'DV'	'14'	'S'	' '	' '	
300108(006B)	04	R	—	Model name 4	'PT'	'1X'	'-8'	'RR'	'14'	' '	' '	

● Monitoring data

※Supports only Pt temp. input+RS485 comm. output model (DS□-RRT).

No. (Address)	Function	R/W	Parameter	Description	Factory default	Note
301001(03E8)	04	R	—	℃ Temp. (-500 to 4000)	—	×10 data
301002(03E9)	04	R	—	℉ Temp. (-580 to 7520)	—	×10 data
301003 to 301100	04	R	—	Reserved		

● Display data (RS485 slave mode)

※Supports only when RS485 comm. input model (D□□-□T) uses slave mode.

No. (Address)	Function	R/W	Parameter	Parameter name	Description	Setting range	Factory default
400001(0000)	03/06/16	R/W	—	Zero Blanking	Zero Blanking ON/OFF set	0: OFF, 1 :ON	0
400002(0001)	03/06/16	R/W	—	Digit 1, 2	1, 2 display data	Refer to Input data chart	0
400003(0002)	03/06/16	R/W	—	Digit 3, 4	3, 4 display data		0
400004(0003)	03/06/16	R/W	—	Digit 5, 6	5, 6 display data		0
400005(0004)	03/06/16	R/W	—	Digit 7, 8	7, 8 display data		0
400006(0005)	03/06/16	R/W	—	Digit 9, 10	9, 10 display data		0
400007(0006)	03/06/16	R/W	—	Digit 11, 12	11, 12 display data		0
400008(0007)	03/06/16	R/W	—	Digit 13, 14	13, 14 display data		0
400009(0008)	03/06/16	R/W	—	Digit 15, 16	15, 16 display data		0
4000010(0009)	03/06/16	R/W	—	Digit 17, 18	17, 18 display data		0
4000011(000A)	03/06/16	R/W	—	Digit 19, 20	19, 20 display data		0
4000012(000B)	03/06/16	R/W	—	Digit 21, 22	21, 22 display data		0
4000013(000C)	03/06/16	R/W	—	Digit 23, 24	23, 24 display data		0
4000014 to 4000050	03/06/16	R/W	Reserved				

● Display data of RS485 master mode supporting device

When using RS485 comm. input model (D□□-□T) as master mode, it supports only for the Autonics device of supporting RS485 master mode.

※CT Series

No. (Address)	Function	R/W	Parameter	Description	Setting range	Note
301004(03EB)	04	R	—	Current value	Counter: 6-digit -99999 to 99999 / 4-digit -999 to 9999 Timer: within time range	—
301005(03EC)	04	R	—			
301006(03ED)	04	R	—	Decimal point	Counter: Decimal Point Timer: Timer Time_Range	—

※MP5 Series

No. (Address)	Function	R/W	Parameter	Description	Setting range	Note
301002(03E9)	04	R	—	Current value	-19999 to 99999: Normal display >99999: Flashes 99999 <-19999: Flashes 19999	—
301003(03EA)	04	R	—			
301004(03EB)	04	R	—	Decimal point	0: 00000, 1: 0000.0, 2: 000.00, 3: 00.000, 4: 0.0000	—

※MT4 Series

No. (Address)	Function	R/W	Parameter	Description	Setting range		Note
300001(0000)	04	R	—	Current value	StAd: -5 to 110% SCAL: -1999 to 9999	30000: HHHH, -30000: LLLL, 30001: d-HH, -30001: d-LL, 30002: F-HH	—
300002(0001)	04	R	—	Decimal point	In case of StAd, 0: 0000, 1: 000.0 2: 00.00, 3: 0.000	In case of SCAL, 0x0100: 0000, 0x0101: 000.0, 0x0102: 00.00, 0x0103: 0.000	

※TK/TX Series

No. (Address)	Function	R/W	Parameter	Description	Setting range	Note
301001(03E8)	04	R	—	Current value	-1999 to 9999	—
301002(03E9)	04	R	—	Decimal point	0: 0000, 1: 000.0, 2: 00.00, 3: 0.000	

※TM Series

No. (Address)	Function	R/W	Parameter	Description	Setting range	Note
301001(03E8)	04	R	—	CH1 Current value	-1999 to 9999	—
301002(03E9)	04	R	—	CH1 Decimal point	0: 0000, 1: 000.0	
301007(03EE)	04	R	—	CH2 Current value	-1999 to 9999	
301008(03EF)	04	R	—	CH2 Decimal point	0: 0000, 1: 000.0	
301013(03F4)	04	R	—	CH3 Current value	-1999 to 9999	
301014(03F5)	04	R	—	CH3 Decimal point	0: 0000, 1: 000.0	
301019(03FA)	04	R	—	CH4 Current value	-1999 to 9999	
301020(03FB)	04	R	—	CH4 Decimal point	0: 0000, 1: 000.0	

※THD Series

No. (Address)	Function	R/W	Parameter	Description	Setting range	Note
300001(0000)	04	R	—	Temperature value	-1990 to 6000	×100 data
300002(0001)	04	R	—	Humidity value	0 to 9990	×100 data

◎ Modbus address mapping

When using RS485 comm. input model (D□□-□T) as master mode, it supports only for the Autonics devices of supporting RS485 master mode and **not using the upper digit.**

※CT6 Series (using 5-digit)

No. (Address)	Function	R/W	Parameter	Description	Setting range	Note
301004(03EB)	04	R	—	Current value	5 digit: -19999 to 99999	—
301005(03EC)	04	R	—			
301006(03ED)	04	R	—	Decimal point	Decimal point	—

※MP5 Series (using 4-digit)

No. (Address)	Function	R/W	Parameter	Description	Setting range	Note
301001(03E8)	04	R	—	Current value	4 digit: -1999 to 9999	—
301002(03E9)	04	R	—			
301003(03EA)	04	R	—	Decimal point	0: 0000, 1: 000.0, 2: 00.00, 3: 0.000	—

※MT4 Series (using 3-digit)

No. (Address)	Function	R/W	Parameter	Description	Setting range	Note
300001(0000)	04	R	—	Current value	3 digit: -199 to 999	—
300002(0001)	04	R	—	Decimal point	0: 000, 1: 00.0, 2: 0.00	

※TK/TX Series (using 3-digit)

No. (Address)	Function	R/W	Parameter	Description	Setting range	Note
301001(03E8)	04	R	—	Current value	3 digit: -199 to 999	—
301002(03E9)	04	R	—	Decimal point	0: 000, 1: 00.0, 2: 0.00	

● Time synchronized data

※Supports only when synchronous comm. type for time display model (DS□-□C).

No. (Address)	Function	R/W	Parameter	Description	Setting range	Note
400001(0000)	0x90	W	—	UTC universal time	Hour (high byte), Min (low byte)	—
400002(0001)	0x90	W	—		Sec (high byte), 1/100 sec (low byte)	
400003(0002)	0x90	W	—	Summer time	· Configuration: 1-byte (summer time setting) +1-byte (summer time setting) · Summer time setting: local code (5-bit)+summer time (3-bit) Summer time / +30 min / +1 hour / -1 hour / -30 min 3-bit / 001 (1) / 010 (2) / 011 (3) / 100 (4) · Available up to max. 16 locals · For displaying summer time, transfer the local data and summer time data also. E.g.) Seoul +1 hour (0b01001010)	
400004(0003)	0x90	W	—			
400005(0004)	0x90	W	—			
400006(0005)	0x90	W	—			
400007(0006)	0x90	W	—			
400008(0007)	0x90	W	—			
400009(0008)	0x90	W	—			
400010(0009)	0x90	W	—			

▣ Definition of Communication Command and Block

- Displays format of Query and Response.

1) Read coil status (func. 01H), read input status (func. 02H)

● Query (server)

Address	Function	Start address		No. of data		CRC16	
		HI	LO	HI	LO	LO	HI
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

● Response (slave)

Address	Function	No. of data byte	Data	Data	Data	CRC16	
						LO	HI
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

2) Read holding registers (func. 03H), read input registers (func. 04H)

● Query (server)

Address	Function	Start address		No. of data		CRC16	
		HI	LO	HI	LO	LO	HI
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

● Response (slave)

Address	Function	No. of data byte	Data		Data		Data		CRC16	
			HI	LO	HI	LO	HI	LO	LO	HI
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

3) Force single coil (func. 05H)

● Query (server)

Address	Function	Coil address		Force Data		CRC16	
		HI	LO	HI	LO	LO	HI
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

●Response (slave)

Address	Function	Coil address		Force Data		CRC16	
		HI	LO	HI	LO	LO	HI
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

4) Preset single register (func. 06H)

● Query (server)

Address	Function	Register address		Preset Data		CRC16	
		HI	LO	HI	LO	LO	HI
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

● Response (slave)

Address	Function	Register address		Preset Data		CRC16	
		HI	LO	HI	LO	LO	HI
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

5) Preset multiple registers (func. 90H): broadcast

● Query (server)

Address	Function	Start address		No. of Reg		No. of data byte	Data		Data		CRC16	
		HI	LO	HI	LO		HI	LO	HI	LO	LO	HI
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

● Response (slave): no response

6) Preset multiple registers (func. 10H)

● Query (server)

Address	Function	Start address		No. of Reg		No. of data byte	Data		Data		CRC16	
		HI	LO	HI	LO		HI	LO	HI	LO	LO	HI
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

● Response (slave)

Address	Function	Start address		Register data		CRC16	
		HI	LO	HI	LO	LO	HI
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

▣ Communication Output

◎ Example of communication: displays "DA16" 4-digit

● Communication setting

Communication address: 1 (J1-ON, J2-OFF, J3-OFF, J4-OFF, J8-OFF, J16-OFF)
Communication speed: 9600bps (S2-ON, S3-OFF)
Data bit: 8-bit (fixed)
Start/Stop bit: 1-bit (fixed)
Parity bit: none (fixed)

● Query

Address	Function	Start address		No. of data		No. of byte	Data (400001)		Data (400002)		Data (400003)		Error Check (CRC16)	
		HI	LO	HI	LO		HI	LO	HI	LO	HI	LO	LO	HI
01	10	00	00	00	03	06	00	01	0D	0A	01	06	78	7C

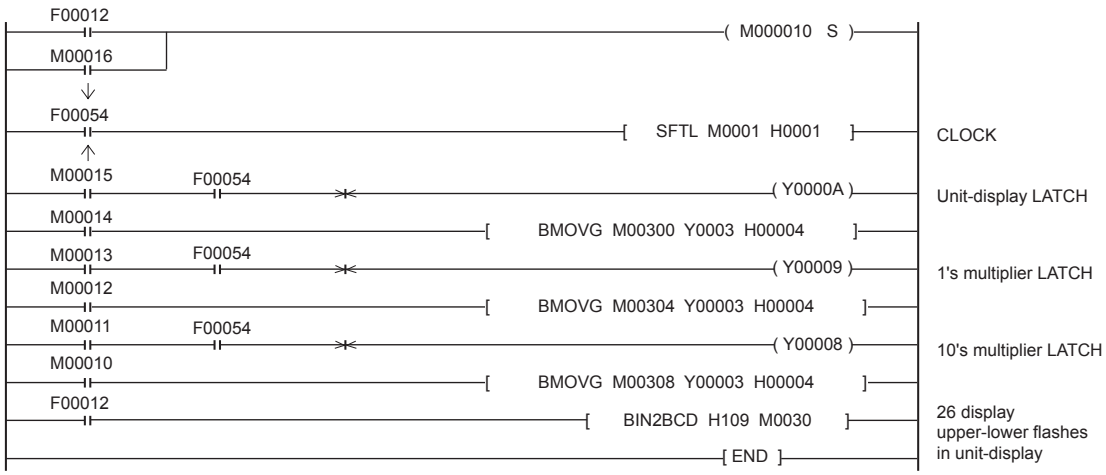
● Response

Address	Function	Start address		No. of data		CRC16	
		HI	LO	HI	LO	LO	HI
01	10	00	00	00	03	80	08

▣ PLC Example Program

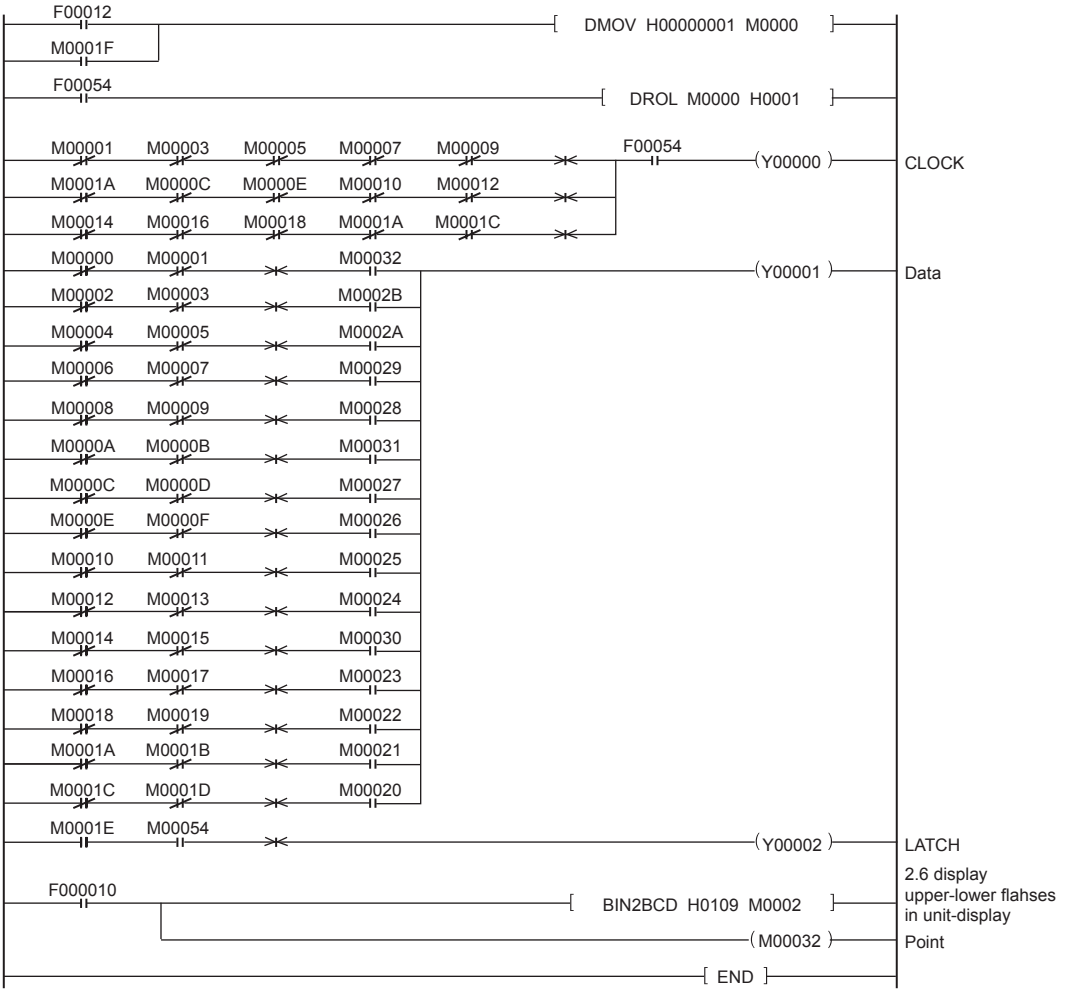
◎ Parallel dynamic1 (4-bit) input method

① Display Unit DS/DA22-RP: 1, Display Unit DS/DA22-RE: 1
② Data input method: parallel dynamic 1 (4-bit)
③ Display result: "26℃" 3-digit display (flashes ℃)
④ PLC: Autonics LP Series



◎ Serial (5-bit) input method

① Display Unit DS/DA22-RS:1, Display Unit DS/DA22-RE: 1
② Data input method: serial (5-bit)
③ Display result: "26℃" display (flashes ℃)
④ PLC: Autonics, LP Series



▣ Error

◎ Pt temp. sensor input model

Display	Description	Troubleshooting
o (1 unit) oP (2 units) oPn (3 units)	Flashes when input sensor is disconnected or sensor is not connected.	Check input sensor status.
H	Flashes when measured value is higher than input range.	When input is within the rated input range, this display disappears.
L	Flashes when measured value is lower than input range.	

▣ Proper Usage

1. Follow instructions in 'Proper Usage'.
   Otherwise, It may cause unexpected accidents.
2. 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
3. Check the polarity of the terminals before wiring the temperature sensor.
   For Pt temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
4. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
5. Keep away from high voltage lines or power lines to prevent inductive noise.
   In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
   Do not use near the equipment which generates strong magnetic force or high frequency noise.
6. This unit may be used in the following environments.
   ① Indoors (in the environment condition rated in 'Specifications')
   ②Altitude max. 2,000m
   ③Pollution degree 2
   ④Installation category I

7-Segment Display Unit with High Bright Characters (D1SC-N: W32×H57mm, D1SA Series: W11×H22mm)

■ Features

- Selectable decimal (0 to 9) or hexadecimal (0 to 9, A to F) indication code
  Selectable positive or negative input logic
  Selectable serial or parallel data input method
- 7-segment, red/green display (D1SA Series)
- Power source: 12-24VDC
- Wide range on signal input voltage level (Low: Max. 0-1.2VDC, High: 4.5-24VDC)
- Easy multi-stages connection (D1SA Series)
- Zero Blanking function

Please read "Safety Considerations" in the instruction manual before using.

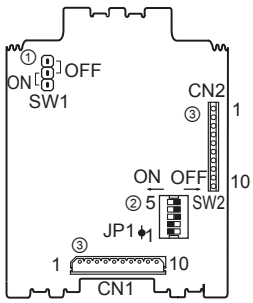
■ Specifications

Model		D1SC-N	D1SA-RN	D1SA-GN※1
Display method		7-segment LED display (red)		7-segment LED display (green)
Power supply		12-24VDC⎓		
Allowable voltage range		90 to 110% of rated voltage		
Current consumption		Max. 70mA	Max. 35mA	
Character size		W32×H57mm	W11×H22mm	
Display character※2		• Decimal number: 0 to 9, decimal point • Hexadecimal number: 0 to 9, A to F, decimal point		
Input		• Parallel: Parallel 4-bit data, latch, zero blanking, decimal point • Serial: Serial 4-bit or 5-bit data, clock, zero blanking, latch, decimal point (for 4-bit input)		
Input resistance		12kΩ	20kΩ	
Input level		High: 4.5-24VDC⎓, Low: 0-1.2VDC⎓		
Max. Clock		Max. 3kHz		
Output		Data output (serial input), zero blanking output		
Input logic		Selectable positive logic (PNP) or negative logic (NPN) (D1SC-N: by the function set switch, D1SA Series: by inner soldering)		
Noise immunity		±300V the square wave noise (pulse width: 1μs) by the noise simulator		
Environ-ment	Ambient temperature	0 to 60℃, storage: -10 to 85℃		
	Ambient humidity	35 to 85%RH		
Accessory		Housing[5264-10], Terminal[5263 (PBT)], Sub-PCB for multi-stage connection	Connector (CT-10S), Cap	
Unit weight		Approx. 100g	Approx. 22g (including right/left caps)	

※1: It is option.
※2: Only D1SC-N supports Minus displaying.
※Max. Clock is for 1:1 of duty ratio (ON, OFF ratio).
※Environment resistance is rated at no freezing or condensation.

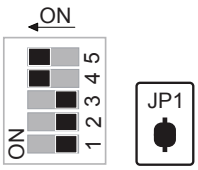
▣ Terminal Layout and Function

◎ D1SC-N



(rear terminal layout)

② Function set switches (SW2, JP1)

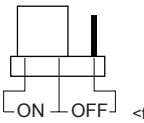


<factory default>

Switch		ON	OFF	Function
SW2	1	Decimal	Hexadecimal	Characters
	2	Parallel	Serial	Input
	3	5-bit	4-bit	Serial input
	4	Used	Not used	Serial data output※1
	5	Used	Not used	Zero Blanking
JP1		7-segment	Minus	Minus

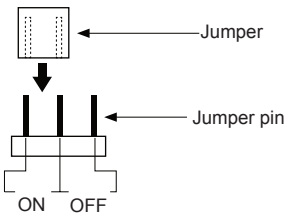
※1: For Serial input, set this as ON.
For Parallel input, set this as OFF.

① Function set jumper (SW1)



<factory default>

ON	OFF	Function
Neg. logic (NPN)	Pos. logic (PNP)	Input logic



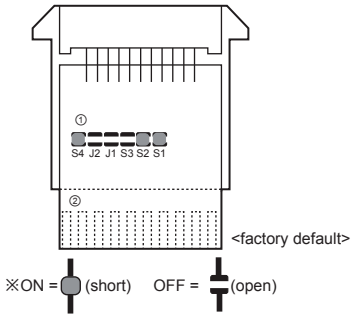
③ Input/Output terminals

Input / Terminal	Parallel input		Serial input	
	Code	Function	Code	Function
1	V+	12-24VDC	VCC	12-24VDC
2	D0	Data input	N·C	Do not connect anything
3	D1		CK	Clock input
4	D2		DI	Data input
5	D3		DO	Data output
6	BI	Zero blanking input	BI	Zero blanking input
7	BO	Zero blanking output	BO	Zero blanking output
8	LE	Latch input	LE	Latch input
9	DP	Decimal point input	DP	Decimal point input
10	GND	0V	GND	0V

※Terminals of CN1 and CN2 is corresponding 1:1.

◎ D1SA Series

① Function set switches

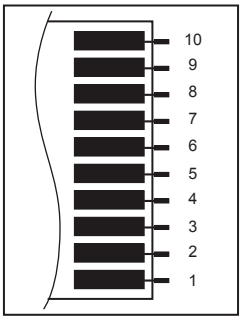


<factory default>

Switch	ON	OFF	Function
S1	Decimal	Hexadecimal	Characters
S2	Parallel	Serial	Input
S3	5-bit	4-bit	Serial input
J1	Used	Not used	Serial data output※1
J2	Used	Not used	Zero Blanking
S4	Neg. logic (NPN)	Pos. logic (PNP)	Input logic

※1: For serial input, set this as ON. For Parallel input, set this as OFF.

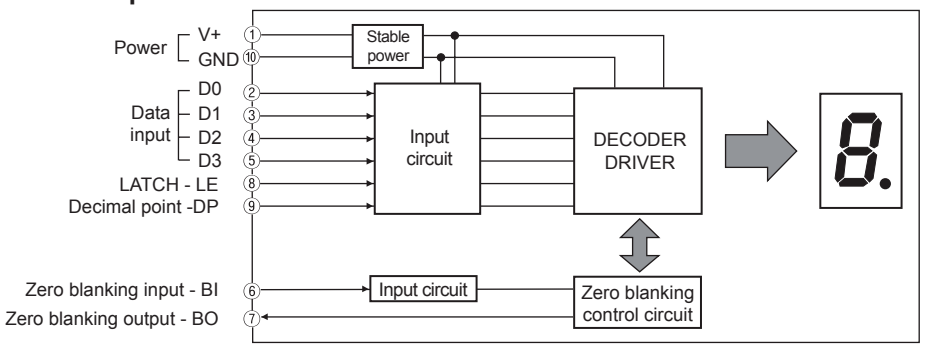
② Input/Output terminals



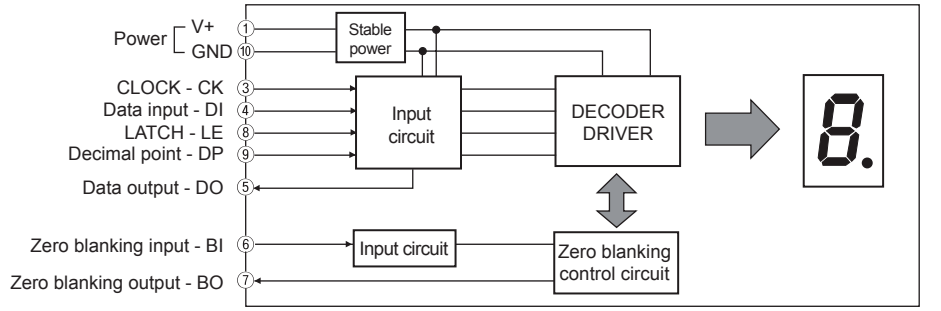
Input / Terminal	Parallel input		Serial input	
	Code	Function	Code	Function
1	V+	12-24VDC	VCC	12-24VDC
2	D0	Data input	N·C	Do not connect anything
3	D1		CK	Clock input
4	D2		DI	Data input
5	D3		DO	Data output
6	BI	Zero Blanking input	BI	Zero Blanking input
7	BO	Zero Blanking output	BO	Zero Blanking output
8	LE	LATCH input	LE	LATCH input
9	DP	Point input	DP	Point input
10	GND	0V	GND	0V

▣ Block Diagram

◎ Parallel input



◎ Serial input

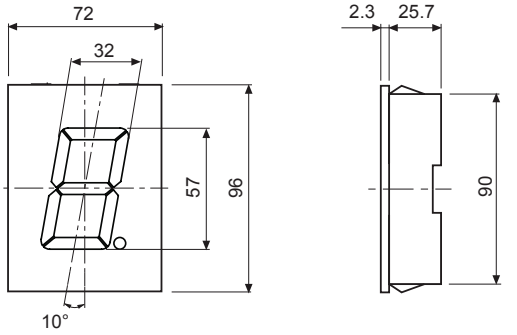


※The ② pin is not used.

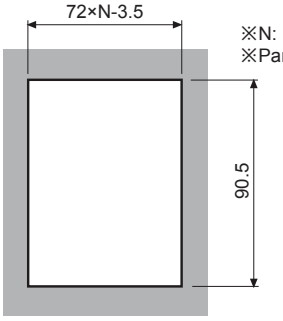
▣ Dimensions

(unit: mm)

◎ D1SC-N

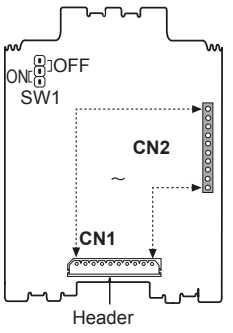


● Panel cut-out



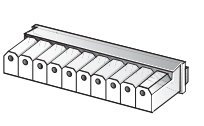
※N: Number of units
※Panel thickness: 2 to 4mm

◎ Accessories

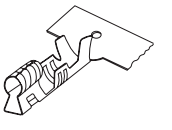


■ CN1: Connector specification

- Connector maker: Korea Morex
  - Housing: 5264-10
  - Header: 5264-10A (straight)
  - Terminal: 5263 (PBT)
- Using cable specification
  - AWG28 to 22 (cable diameter: Max. Ø1.9mm)
  - Shielding length of wire cover: 2.4 to 2.9mm



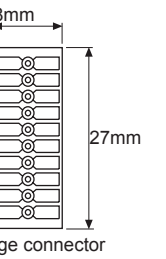
Housing[5264-10]



Terminal[5263 (PBT)]

■ CN2: Connector for multi-stage

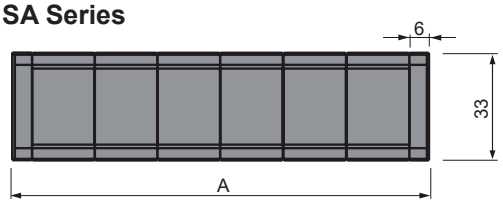
- This connector must be used with connection PCB
- CN1 and CN2 must be connected as below drawing.

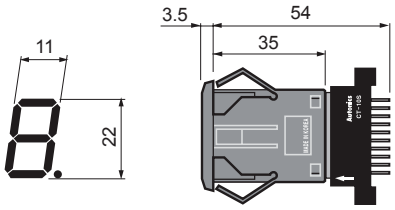


Multi-stage connector

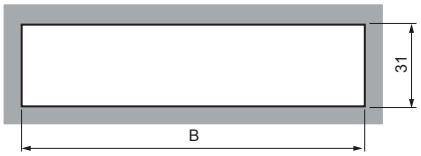
◎ D1SA Series

(unit: mm)





● Panel cut-out

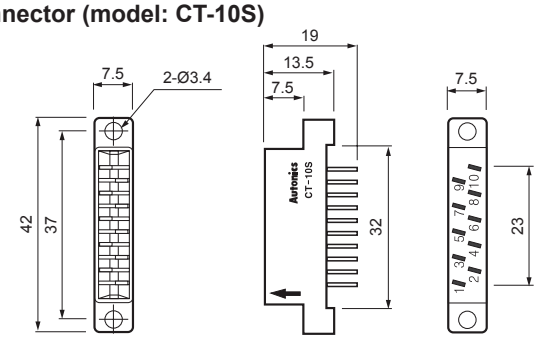


● Panel cut-out chart

Digit (N)	A (20×N+12)	B (20×N+10)
1	32	30±0.1
2	52	50±0.1
3	72	70±0.1
4	92	90±0.1
5	112	110±0.1
6	132	130±0.1
7	152	150±0.1
8	172	170±0.1

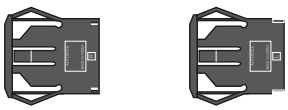
◎ Accessory

● Connector (model: CT-10S)



◎ Sold separately

● CAP



● D1SA-RN: DAR(L) -R (left/right 1 set)
● D1SA-GN: DAR(L) -BL (left/right 1 set)
※Cap is optional (1set).

▣ Input Data Chart

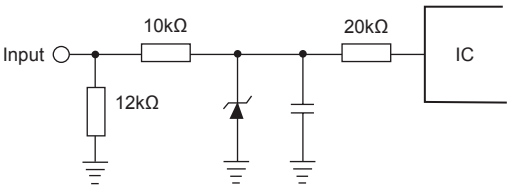
Indication				Negative input				Positive input			
Minus※1		7-segment		D3	D2	D1	D0	D3	D2	D1	D0
Hexa decimal	Decimal	Hexa decimal	Decimal								
Blank	Blank	0	0	H	H	H	H	L	L	L	L
Blank	Blank	1	1	H	H	H	L	L	L	L	H
-	-	2	2	H	H	L	H	L	L	H	L
-	-	3	3	H	H	L	L	L	L	H	H
-	-	4	4	H	L	H	H	L	H	L	L
-	-	5	5	H	L	H	L	L	H	L	H
-	-	6	6	H	L	L	H	L	H	H	L
Blank	Blank	7	7	H	L	L	L	L	H	H	H
-	-	8	8	L	H	H	H	H	L	L	L
-	-	9	9	L	H	H	L	H	L	L	H
-	Blank	A	Blank	L	H	L	H	H	L	H	L
-	Blank	b	Blank	L	H	L	L	H	L	H	H
Blank	Blank	C	Blank	L	L	H	H	H	H	L	L
-	Blank	d	Blank	L	L	H	L	H	H	L	H
-	Blank	E	Blank	L	L	L	H	H	H	H	L
-	Blank	F	Blank	L	L	L	L	H	H	H	H

※When BI terminal connect GND, “0” is displayed. When BI terminal is open, it is blank (not display)
※"X": Either high or low level can be input.
※1: Only D1SC-N supports Minus display. Set the rear JP1 as OFF.
※Blank: If input signal as input DATA, it does not display.

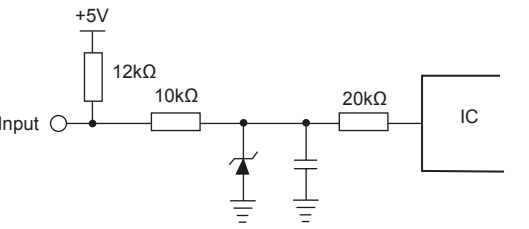
▣ Input Circuit

◎ D1SC-N

● Positive logic (PNP) input (SW1: OFF)



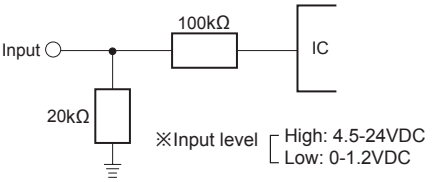
● Negative logic (NPN) input (SW1: ON)



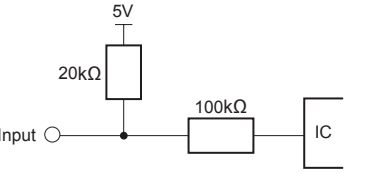
※Input level - High: 4.5-24VDC, Low: 0-1.2VDC

◎ D1SA Series

● Positive logic (PNP) input (SW1: OFF)



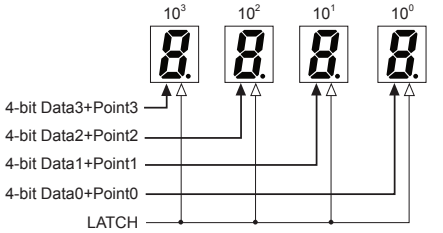
● Negative logic (NPN) input (SW1: ON)

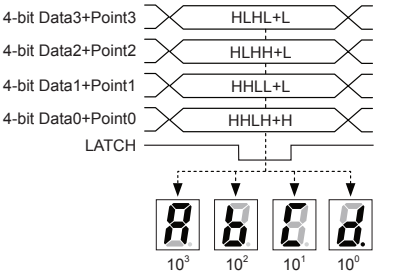


▣ Data Input Method

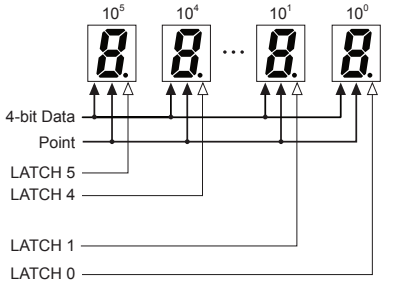
◎ Parallel input

● 4-bit static parallel input (e.g.: displays ABCD.)

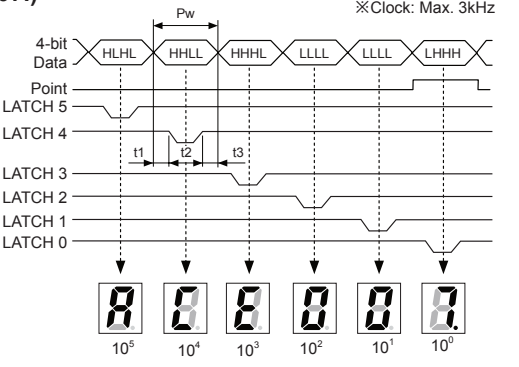




● 4-bit dynamic parallel input (e.g.: displays ACE007.)



※Clock: Max. 3kHz

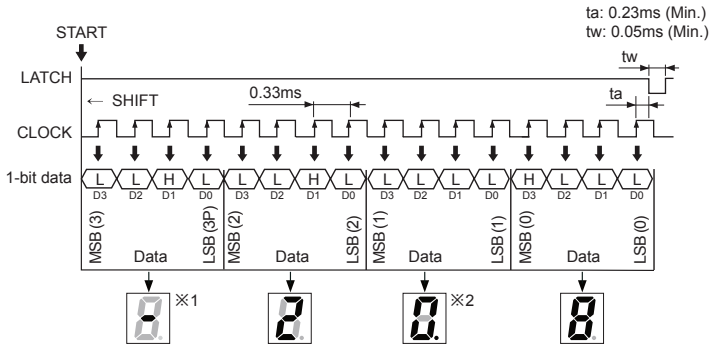


※Pw=t1+t2+t3
Pw: 0.33ms (Min.)
t1: 0.05ms (Min.) → Data LATCH
t2: 0.23ms (Min.) → Data move
t3: 0.05ms (Min.) → Data

◎ Serial input

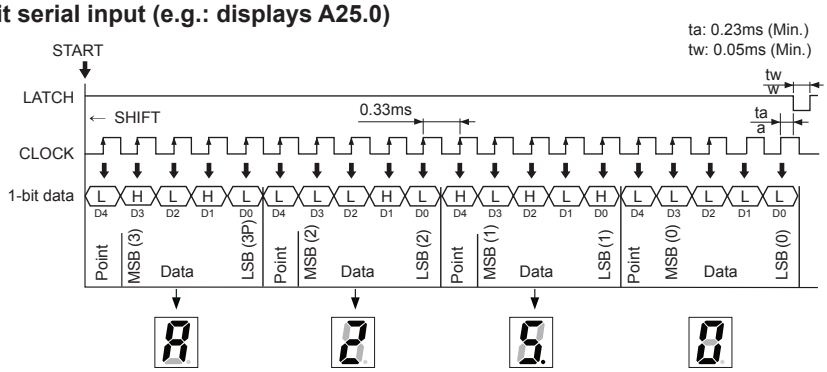
※Clock max. 3kHz
※In case of positive logic (PNP), hexadecimal number

● 4-bit serial input (e.g.: displays -20.8)



※1: To display Minus, set the rear JP1 as OFF.
※2: In case of 4-bit Serial input, to display decimal point, connect DP of the rear input terminal to V+.
In case of negative logic (NPN), connect DP to GND.

● 5-bit serial input (e.g.: displays A25.0)



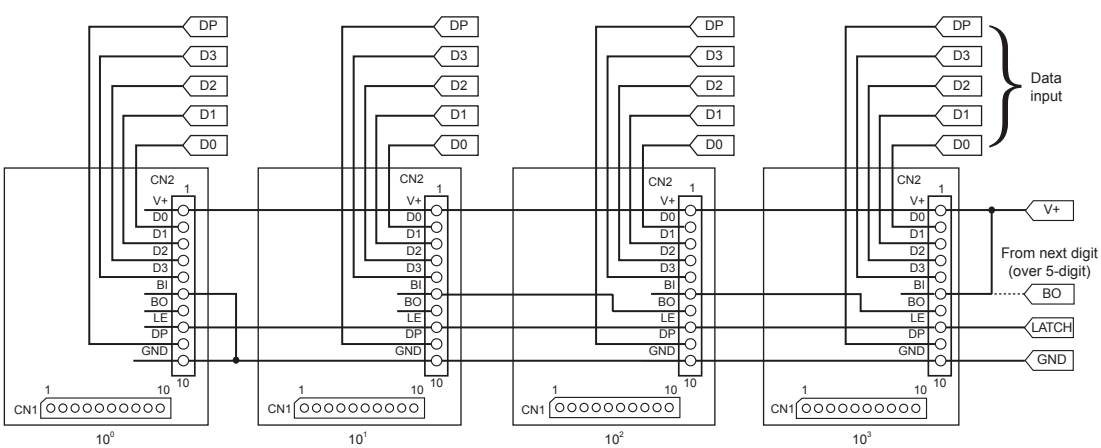
▣ Multi-Stage Connection Method

※Do wiring after removing the rear case of the product.

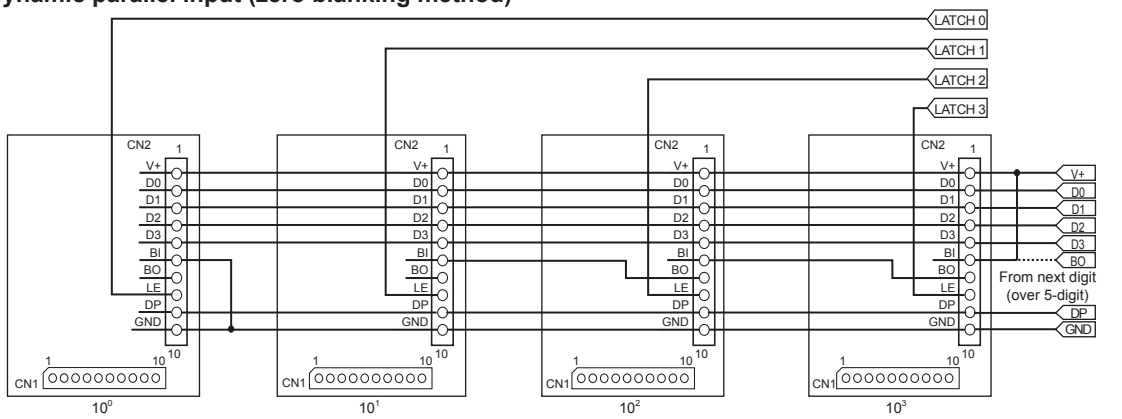
◎ Parallel input: 4-digit

※The below connection is example of D1SC-N. For D1SA, connection is same but the order of pin is reverse.
※CN1, CN2 terminals of D1SC-N corresponds 1:1 and it is able to connect as CN1 depending on the need.
※When not using Zero Blanking, connect BI terminal to GND.

● Static parallel input (zero blanking method)

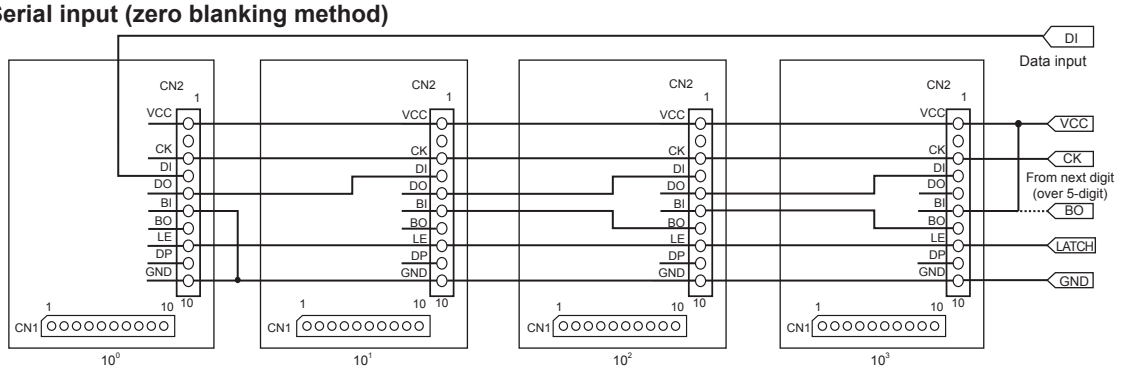


● **Dynamic parallel input (zero blanking method)**



◎ Serial input: 4-digit

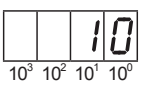
● **Serial input (zero blanking method)**



▣ Zero Blanking Method?

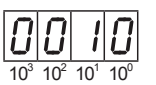
It is to remove "0" indication which is no meaning.
E.g.1) When displaying 10

① Using Zero Blanking



("0" of 10^3, 10^2 are no meaning and they are not displayed.)

② Not using Zero Blanking

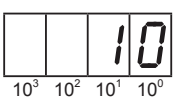


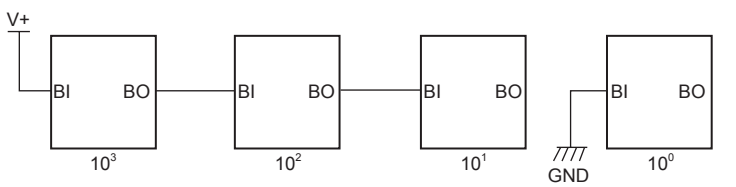
※If indication data is "101", meaningful tens place "0" will be displayed.

◎ Using zero blanking for multi-stage

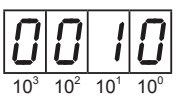
Set 5 (zero blanking output) of the rear function set switch (SW2) as ON.
For 10 (0) to display '0', set this as OFF.

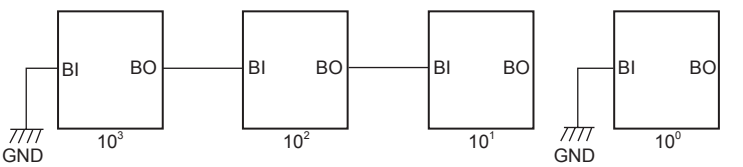
1) Using Zero Blanking





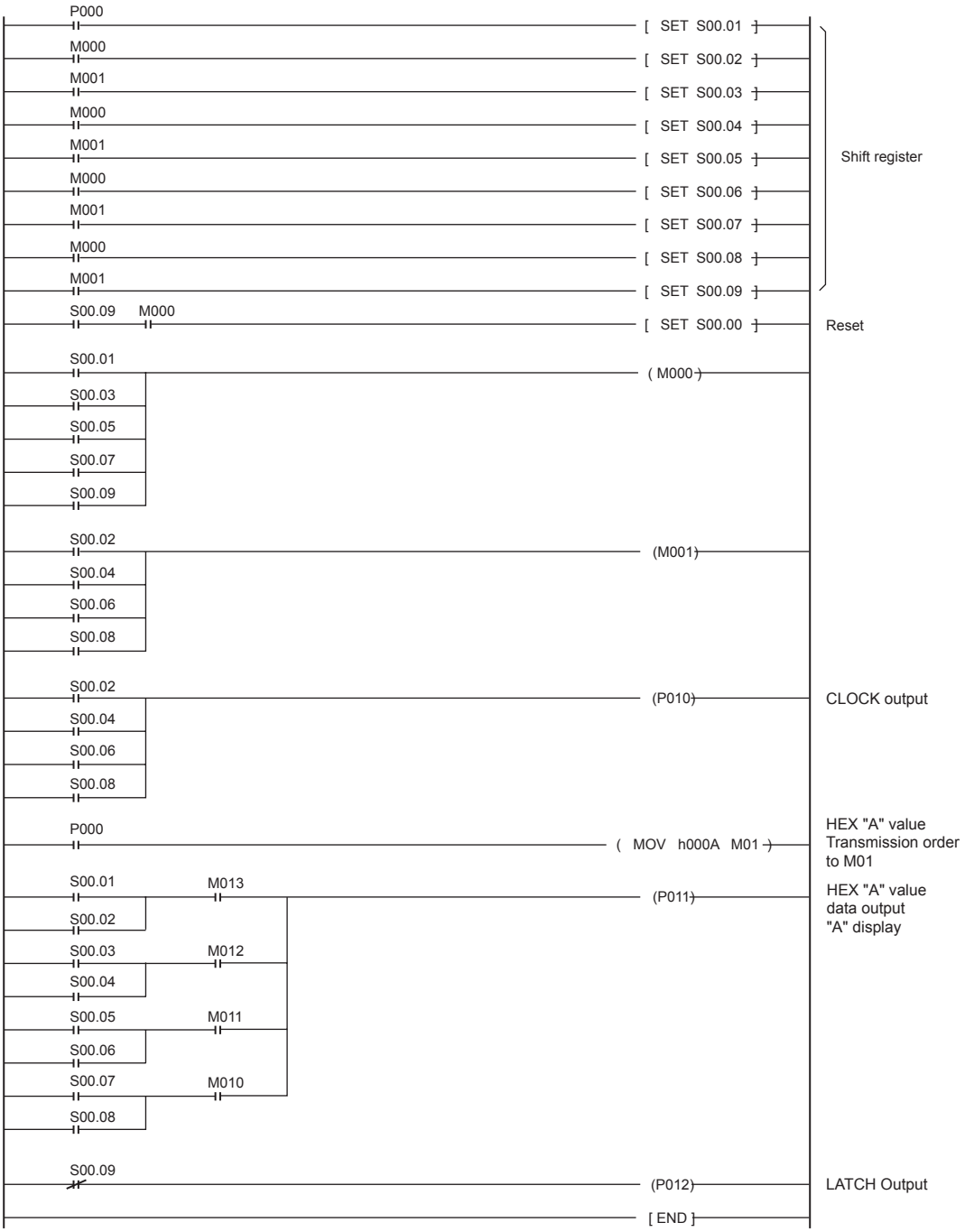
2) Not using Zero Blanking





▣ The Application of PLC Program [Serial Input Type]

1. Display Unit D1SA-□
2. Data input type: Serial
3. Connection method: Refer to serial connection type when using more than 2.
4. Display result: "A" Display
5. PLC: LSIS (LS Industrial Systems), MASTER-K Series
6. When using serial type, use transistor output card of PLC
7. Negative logic (NPN)

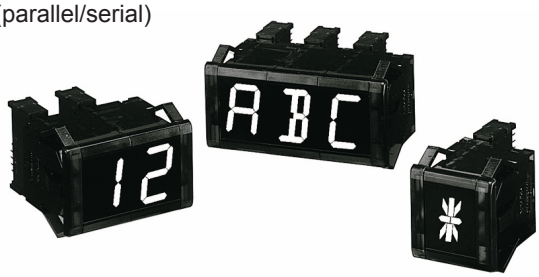


※Visit our web site (www.autonics.com) to download various applications of PLC program.

Small Display Unit for Vivid Display (W11×H22mm) and Various 61 Characters and Symbols

▣ Features

- Displays 61 types of characters and signs
  (0 to 9, A to Z, decimal point, 24 symbols)
- Selectable input logic (PNP/NPN), data input type (parallel/serial)
- 16-segment in red/green
- Wide range of input signal level
  : Low: 0-1.2VDC, High: 4.5-24VDC
- 12-24VDC power supply
- Multi-stage connection available



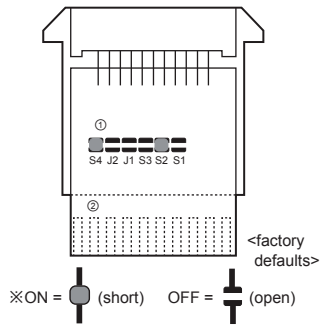
▣ Specifications

Model		**D1AA-RN**	**D1AA-GN**※1
Display method		16-segment LED display (red)	16-segment LED display (green)
Power supply		12-24VDC⎓	
Allowable voltage range		90 to 110% of rated voltage	
Current consumption		Max. 32mA	
Display character		61 characters (0 to 9, A to Z, decimal point, 24 symbols)	
Character size		W11×H22mm	
Input		•Parallel: Parallel 6-bit data, latch, decimal point •Serial: Serial 6-bit or 7-bit data, clock, latch, decimal point (for 6-bit input)	
Input level		High: 4.5-24VDC⎓, Low: 0-1.2VDC⎓	
Max. Clock		Max. 3kHz	
Input resistance		20kΩ	
Output		Data output (serial input)	
Input logic		Selectable positive (PNP) or negative (NPN) (by inner soldering)	
Noise immunity		±300V the square wave noise (pulse width: 1μs) by the noise simulator	
Environ-ment	Ambient temperature	0 to 60℃, storage: -10 to 85℃	
	Ambient humidity	35 to 85%RH	
Accessory		Connector	
Unit weight		Approx. 22g (including right/left caps)	

※1: It is option.
※Max. Clock is for 1:1 of duty ratio (ON, OFF ratio).
※Environment resistance is rated at no freezing of condensation.

▣ Unit Description

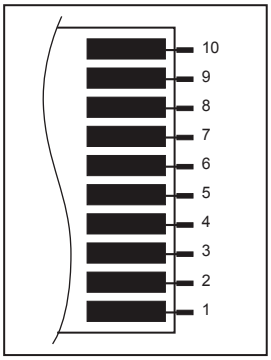
① Function set switches



Switch	ON	OFF	Function
S1	—	—	Unused
S2	Parallel	Serial	Input
S3	7-bit	6-bit	Serial input
J1	Use	Unused	Serial data output※1
J2	—	—	Always set as OFF.
S4	Negative (NPN)	Positive (PNP)	Input logic

※1: For Serial input, set this as ON. For Parallel input, set this as OFF.

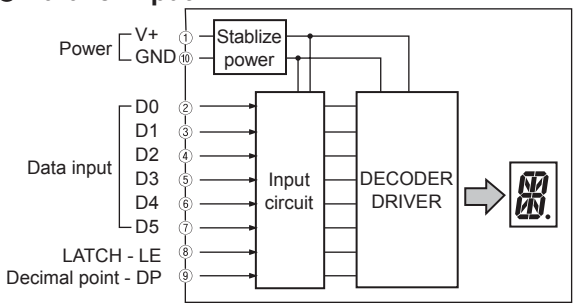
② Input/Output terminals



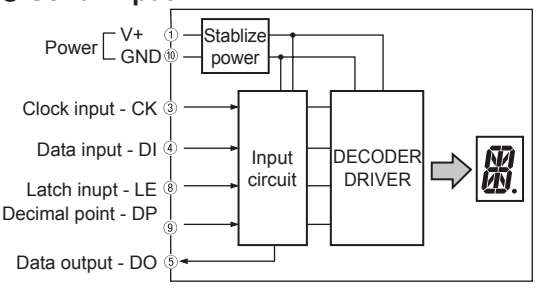
Input / Terminal	Parallel input Code	Parallel input Function	Serial input Code	Serial input Function
1	VCC	12-24VDC	VCC	12-24VDC
2	D0	Data input	N·C	Do not connect anything.
3	D1		CK	Clock input
4	D2		DI	Data input
5	D3		DO	Data output
6	D4		N·C	Do not connect anything.
7	D5		N·C	
8	LE	Latch input	LE	Latch input
9	DP	Decimal point input	DP	Decimal point input
10	GND	0V	GND	0V

▣ Block Diagram

◎ Parallel input



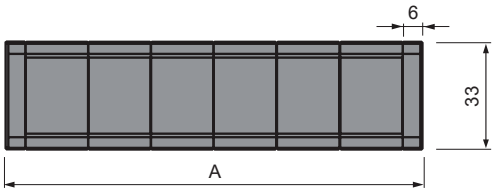
◎ Serial input

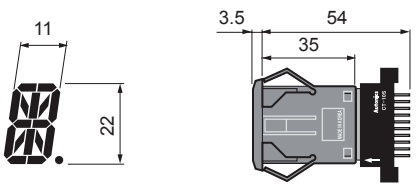


※The ②, ⑥, ⑦ pin are not used.

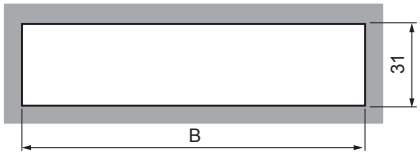
▣ Dimensions

(unit: mm)





● Panel cut-out

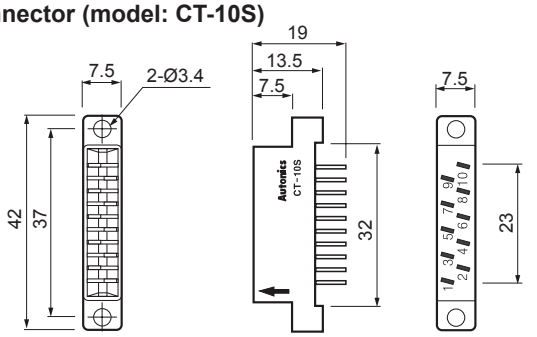


● Panel cut-out chart

Digit (N)	Dimension A (20×N+12)	Dimension B (20×N+10)
1	32	30±0.1
2	52	50±0.1
3	72	70±0.1
4	92	90±0.1
5	112	110±0.1
6	132	130±0.1
7	152	150±0.1
8	172	170±0.1

◎ Accessory

● **Connector (model: CT-10S)**



◎ Sold separately

● **CAP**

● D1AA-RN: DAR(L)-R (right/left 1 set)
● D1AA-GN: DAR(L)-BL (right/left 1 set)
※Cap is optional (1 set).

▣ Input Data Chart

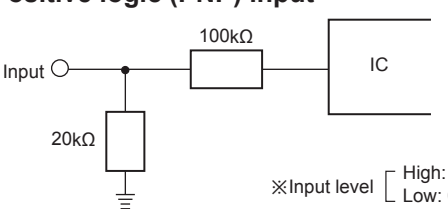
※In case of positive logic (PNP).

Upper 2-bit data (PNP type) in positive logic								Lower 4-bit data (PNP type) in positive logic			
D5	D4	D5	D4	D5	D4	D5	D4	D3	D2	D1	D0
L	L	L	H	H	L	H	H				
Blank		P		Blank		0		L	L	L	L
A		Q		Blank		1		L	L	L	H
B		R		"		2		L	L	H	L
C		S		#		3		L	L	H	H
D		T		$		4		L	H	L	L
E		U		%		5		L	H	L	H
F		V		Blank		6		L	H	H	L
G		W		'		7		L	H	H	H
H		X		(		8		H	L	L	L
I		Y		)		9		H	L	L	H
J		Z		*		:		H	L	H	L
K		[		+		;		H	L	H	H
L		\		,		<		H	H	L	L
M		]		-		=		H	H	L	H
N		^		.		>		H	H	H	L
O		_		/		?		H	H	H	H

※Blank: Even though data is input as signal, it does not display.

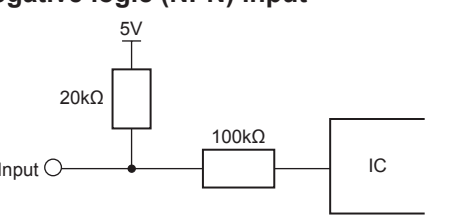
▣ Input Circuit

◎ Positive logic (PNP) input



※Input level ┌ High: 4.5-24VDC
└ Low: 0-1.2VDC

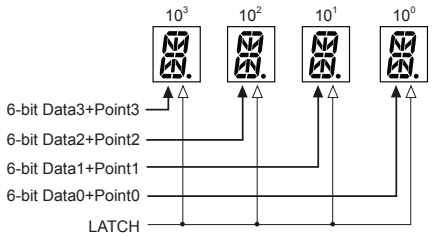
◎ Negative logic (NPN) input

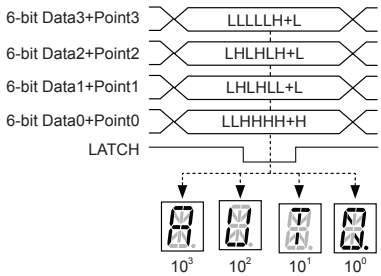


▣ Data Input Method

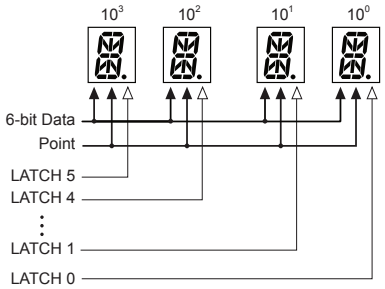
◎ Parallel input

● 6-bit static parallel input (e.g.: displays Auto.)

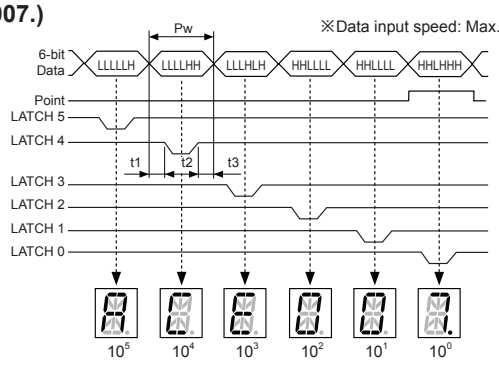




● 6-bit dynamic parallel input (e.g.: displays ACE007.)



※Data input speed: Max. 3kHz

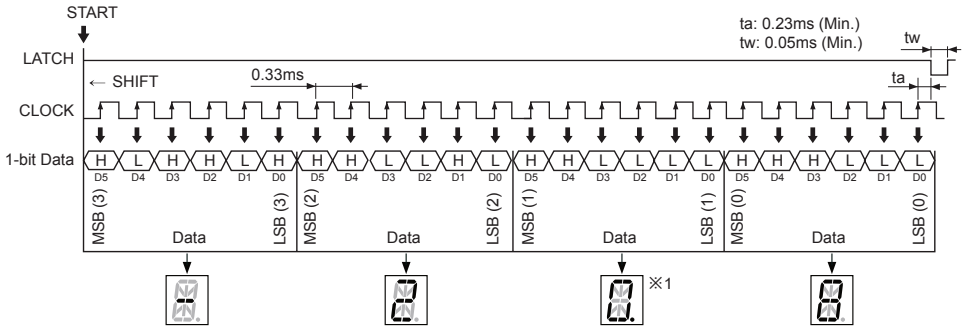


※Pw=t1+t2+t3
Pw: 0.33ms (Min.)
t1: 0.05ms (Min.) → Data LATCH
t2: 0.23ms (Min.) → Data move
t3: 0.05ms (Min.) → Data

◎ Serial input

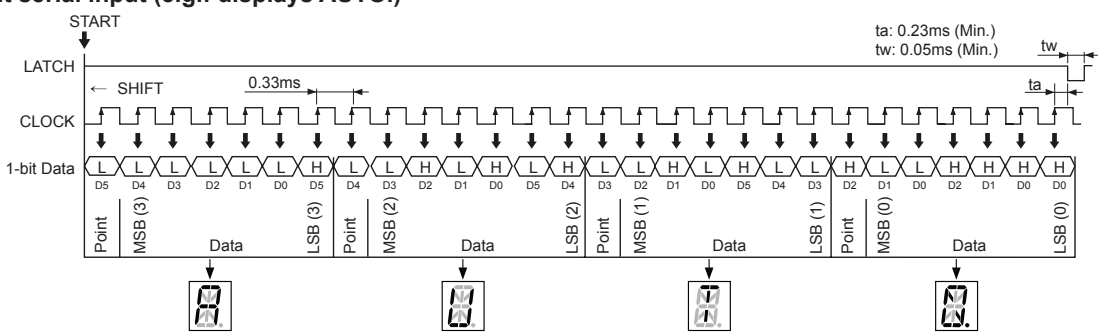
● 6-bit serial input (e.g.: displays -20.8)

※Clock: Max. 3kHz
※In case of positive logic (PNP), hexadecimal number



※1: For 6-bit Serial input, connect DP of rear input terminal to V+ to display decimal point.
In case of negative logic (NPN), connect DP to GND.

● 7-bit serial input (e.g.: displays AUTO.)

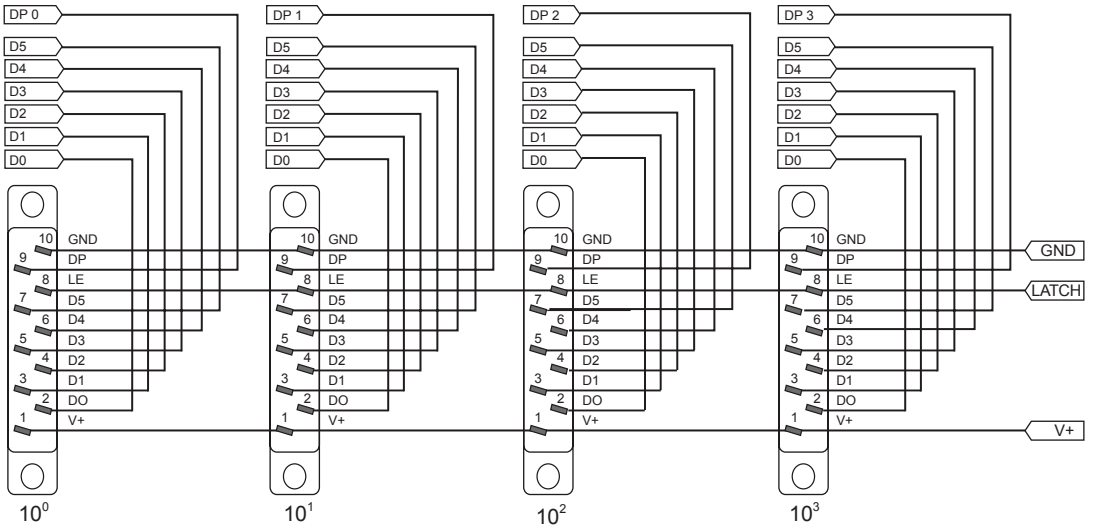


▣ Multi-Stage Connection Method

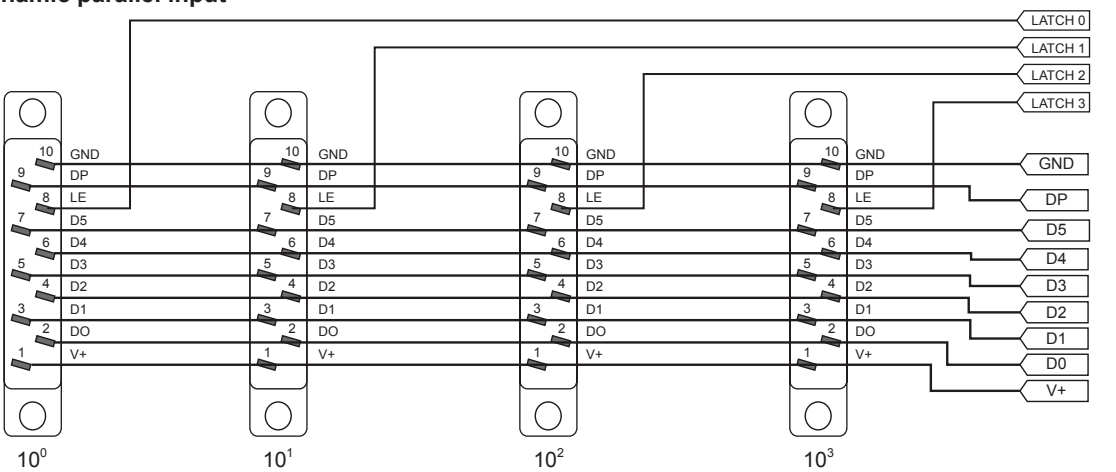
※Do wiring after removing the rear case of the product.

◎ Parallel input: 4-digit

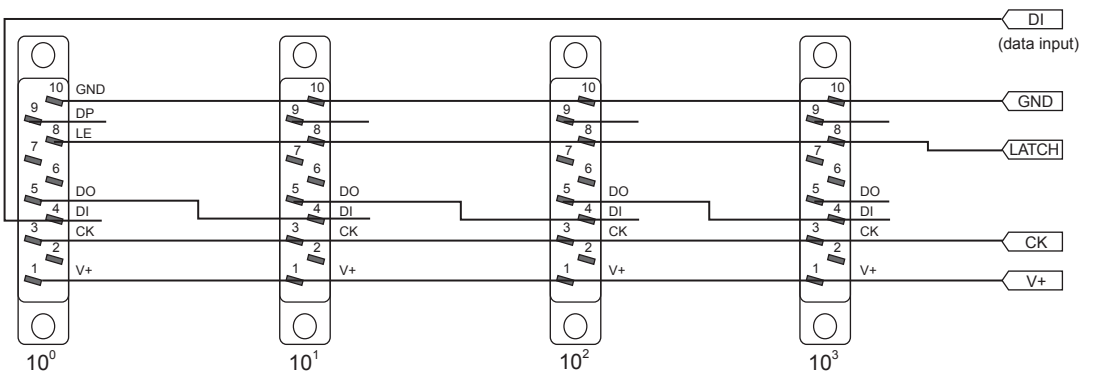
● Static parallel input



● Dynamic parallel input

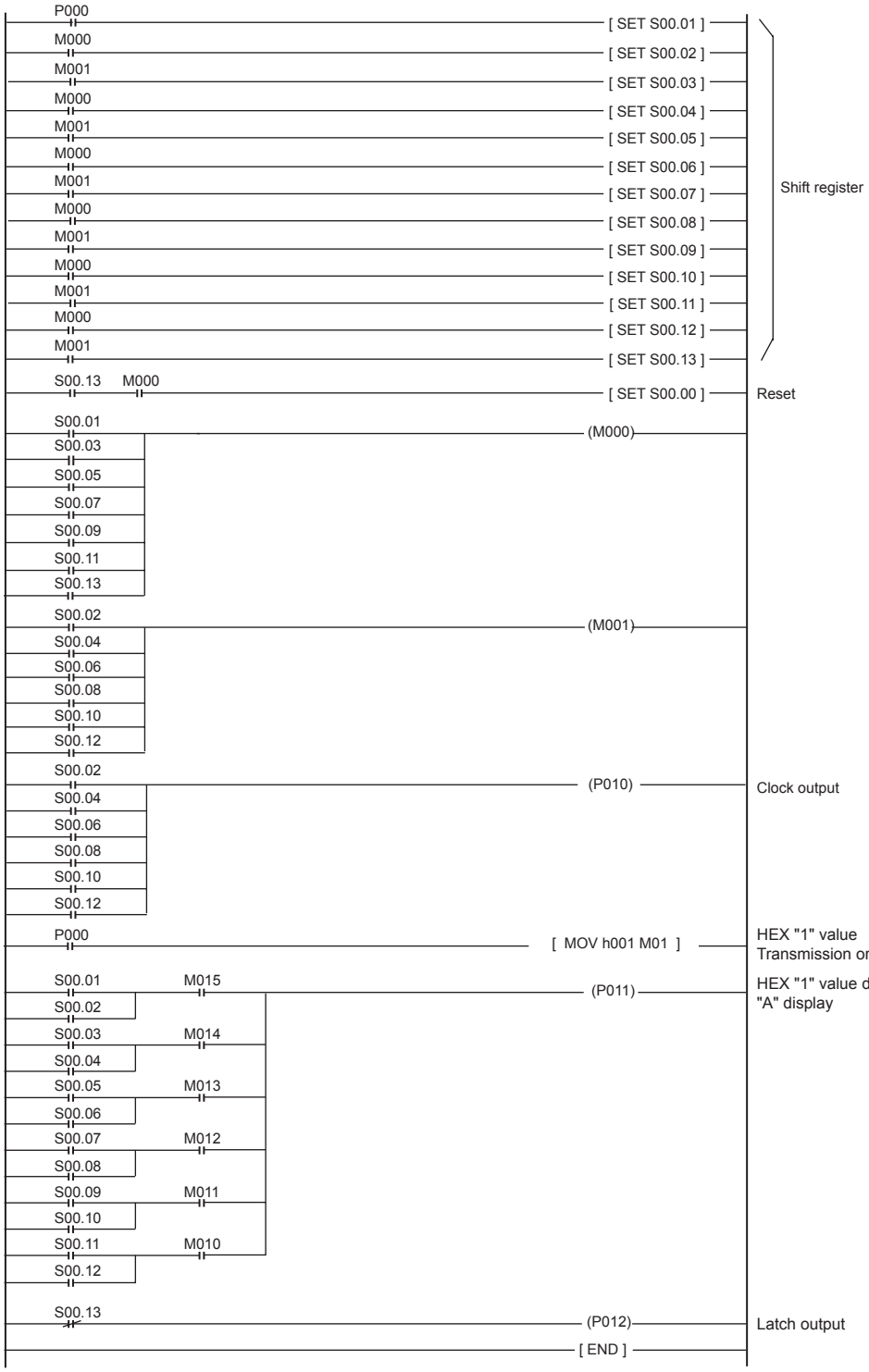


◎ Serial input: 4-digit



▣ The Application of PLC Program [Serial Input Type]

1. Display unit: D1AA - □
2. Data transmission type: Serial input
3. Connection method: Refer to serial connection type when using more than 2.
4. Display result: "A" display
5. PLC: LSIS (LS Industrial Systems), Master-K Series
6. When using serial type, use transistor output card of PLC
7. Negative logic (NPN)



5-digit Display Unit of DIN W72×36, W96×48mm Size

▣ Features

- Various input specifications
  : Static Parallel input, Dynamic Parallel input, 4/5-bit serial input, 16/20/25-bit serial input method
- Decimal point, "–" minus sign display selection function
  : Display type by serial input
  Display type by external DP terminal and MINUS terminal
- Positive/Negative logic input selection function
- Display digit selection function
  : 4-digit (-9999 to 9999), 5-digit (0 to 99999)
- Zero blanking function selection function
- Selectable reversion function of latch signal

Please read "Safety Considerations" in the instruction manual before using.

▣ Ordering Information

D 5 W — M X

Power supply	No-mark	12-24VDC
	X※1	110/220VAC 50/60Hz
Input	M	Multi-input mode
Size	Y	DIN W72×H36mm
	W	DIN W96×H48mm
Digit	5	99999 (5-digit)
Item	D	Display Unit

※1: AC Power is only for D5W and it is option.

▣ Specifications

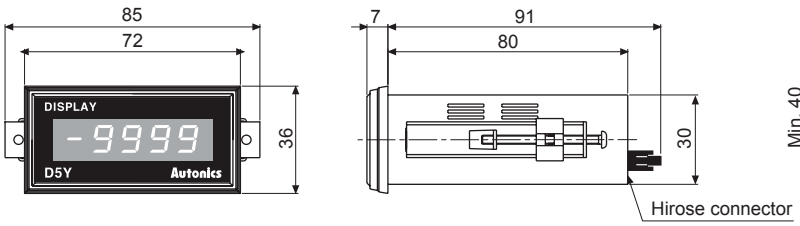
Model		D5Y-M	D5W-M	D5W-MX
Power supply		12-24VDC⎓		110/220VAC 50/60Hz
Allowable voltage range		90 to 110% of rated voltage		
Power consumption		Max. 1.1W		Max. 2VA
Character size		W7×H14mm		
Display method		7-segment LED display (red)		
Display digit		Selectable 4-digit (or 4 ½ digit including symbol bit), 5-digit		
Max. Clock		100Hz to 5kHz		
Input logic		Selectable positive (PNP) or negative (NPN)		
Input method		Static parallel, Dynamic parallel, 4/5-bit serial, Serial (16/20/25-bit)		
Input level		High: 5-24VDC⎓, Low: 0-1.2VDC⎓		
Insulation resistance		Over 100MΩ (at 500VDC megger)		
Dielectric immunity		2,000VAC 50/60Hz for 1 min		
Noise immunity		±1kV the square wave noise (pulse width: 1μs) by the noise simulator		
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 1 hour		
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 10 minutes		
Shock	Mechanical	300m/s² (approx. 30G) in each X, Y, Z direction for 3 times		
	Malfunction	100m/s² (approx. 10G) in each X, Y, Z direction for 3 times		
Environ -ment	Ambient temperature	-10 to 50℃, storage: -25 to 65℃		
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH		
Unit weight		Approx. 75g	Approx. 165g	Approx. 267g

※Max. Clock is for 1:1 of duty ratio (ON, OFF ratio).
※Environment resistance is rated at no freezing or condensation.

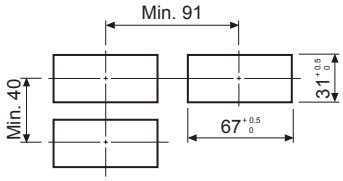
▣ Dimensions

(unit: mm)

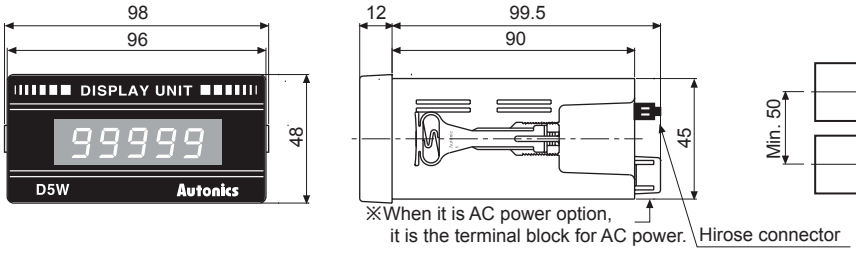
● D5Y-M



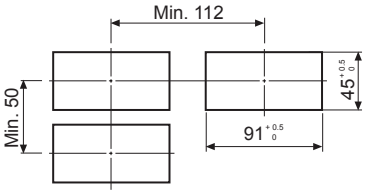
● Panel cut-out



● D5W-M/D5W-MX



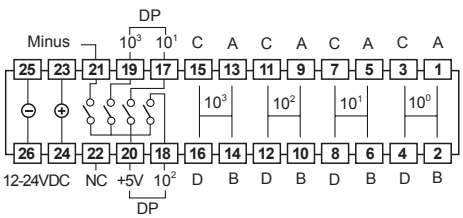
● Panel cut-out



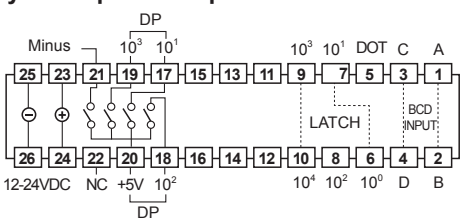
※Hirose connector pin header model: HIF3BA-26PA-2.54DS
※Hirose connector socket is not included with this unit.
Contact hirose connector vendors for socket and cable.
[Socket: HIF3BA-26D-2.54R]
※"△" mark indicates pin 1 of hirose connector.

▣ Connections

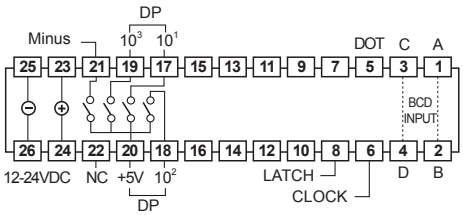
● Static parallel input



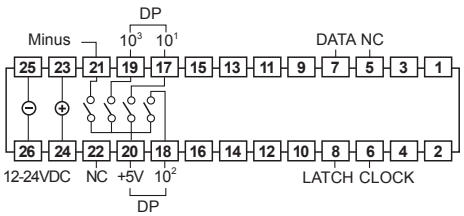
● Dynamic parallel input



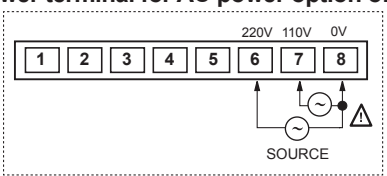
● 4/5-bit serial input



● Serial input



● Power terminal for AC power option of D5W series

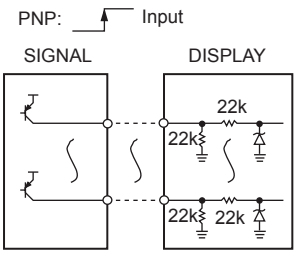


※Above terminal connection diagrams's number set by pin 1 of hirose connector. Please note that "△" mark indicates pin 1 of hirose connector.

※In case of Static parallel input, 5-digit cannot be used because of external terminal
※To display 5 digit in Dynamic parallel, 4/5-bit serial, serial input, display range is 0 to 99999 and it cannot display minus sign. Therefore, the applied signal to the external minus sign input terminal (pin 21) is ignored.
※Regardless of input logic, connect external DP terminal (pin 17, 18, 19) or external minus sign input terminal (pin 21) to +5V (pin 20) and it displays decimal point and minus sign.

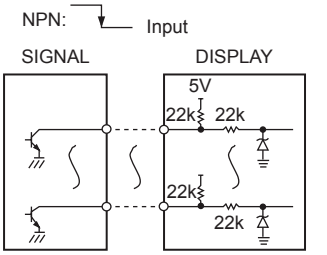
▣ Input Circuit

● Positive logic (PNP) input



※Input level
- High: 5-24VDC
- Low: 0-1.2VDC

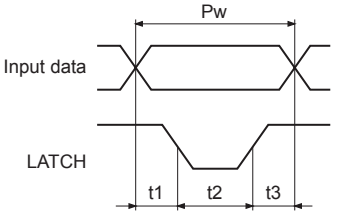
● Negative logic (NPN) input



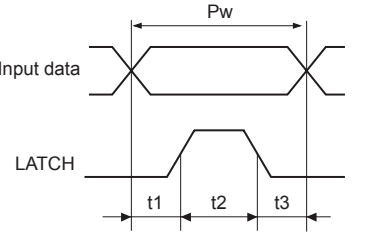
▣ Input Timing

◎ Parallel input

● Positive logic (PNP) input



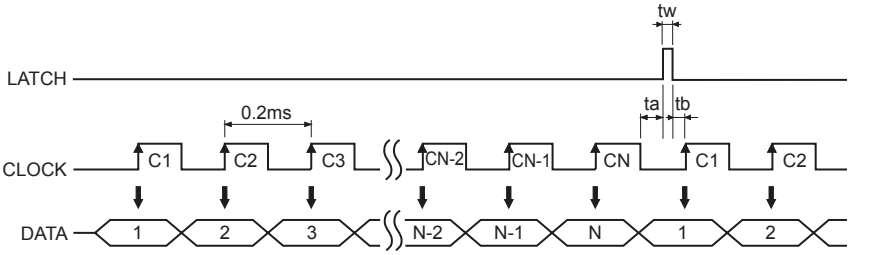
● Negative logic (NPN) input



Pw=t1+t2+t3
- Pw: Min. 0.2ms
- t1: Min. 0.05ms → Data latch
- t2: Min. 0.1ms → Data move
- t3: Min. 0.05ms → Data latch

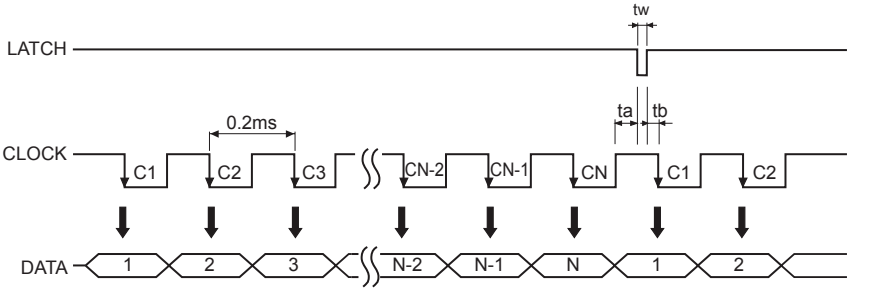
◎ Serial input

● Positive logic (PNP) input: CLOCK Max. 5kHz



- ta: Min. 0.05ms
- tw: Min. 0.02ms
- tb: Min.0.03m

● Negative logic (NPN) input: CLOCK Max. 5kHz



- ta: Min. 0.05ms
- tw: Min. 0.02ms
- tb: Min. 0.03ms

▣ Input Data Chart

Display	Negative (NPN) input					Positive (PNP) input				
	A	B	C	D	LATCH	A	B	C	D	LATCH
0	H	H	H	H	L	L	L	L	L	H
1	L	H	H	H	L	H	L	L	L	H
2	H	L	H	H	L	L	H	L	L	H
3	L	L	H	H	L	H	H	L	L	H
4	H	H	L	H	L	L	L	H	L	H
5	L	H	L	H	L	H	L	H	L	H
6	H	L	L	H	L	L	H	H	L	H
7	L	L	L	H	L	H	H	H	L	H
8	H	H	H	L	L	L	L	L	H	H
9	L	H	H	L	L	H	L	L	H	H
HOLD	X	X	X	X	H	X	X	X	X	L

※Input level: High → 5-24VDC, Low → 0-1.2VDC
※"X": Either high or low level can be input.

▣ How to Select Decimal Point

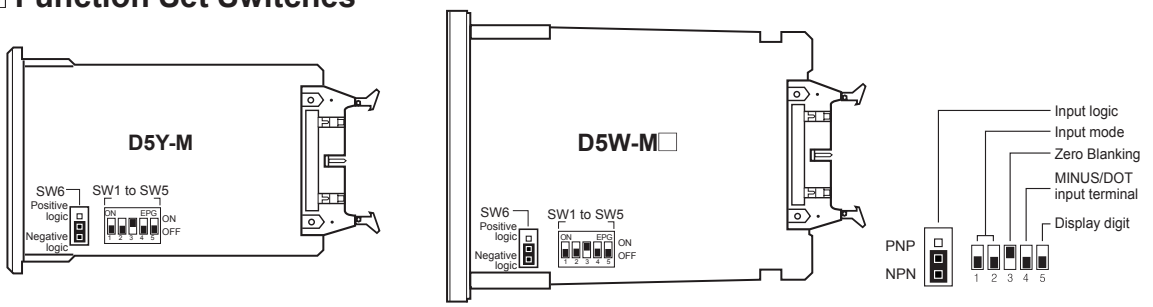
● DOT and minus sign input is not serial input [SW4 = OFF]

Terminal 17-20: 8888.8
18-20: 888.88
19-20: 88.888
21-20: -8888
OPEN: 88888

● DOT and minus sign input is serial input [SW4 = ON]

① When it is Dynamic parallel input and 4/5-bit input, it connects with pin 5. (refer to time chart for 4-digit)
② When it is serial input, 1-bit of serial data should have DOT and minus sign and the DATA is input. (refer to time chart for 4-digit)

▣ Function Set Switches



● Input mode

SW1 SW2 ON OFF ON OFF	Static parallel input
SW1 SW2 ON OFF ON OFF	Dynamic parallel input
SW1 SW2 ON OFF ON OFF	4/5-bit serial input
SW1 SW2 ON OFF ON OFF	Serial input

● Zero blanking function

SW3	ON OFF	Using zero blanking function
	ON OFF	Non-using zero blanking function

※Zero blanking function
It is to remove "0"indication which is no meaning.

E.g.)When indication value is "10" in 4-digit LED
- Zero blanking function is applied: 10
- Zero blanking function is not applied: 0010

● Minus signal/DOT (decimal point) input terminal

SW4	ON OFF	Using DOT terminal (pin 5)
	ON OFF	Using external DP (pin 17, 18, 19, 20) terminal and minus (pin 21) terminal

● Display digit

SW5	ON OFF	5-digit (0 to 99999)
	ON OFF	4-digit (-9999 to 9999)

※In case of Static parallel input, 5-digit cannot be used because of external terminal.

● Input logic

SW6	PNP NPN	Positive (PNP) input
	PNP NPN	Negative (NPN) input

※If changing inner selecting switch when power is ON, it does not operate as a changed mode.
If the mode is changed when power is ON, please turn OFF and then turn ON the power.

● Latch input signal

SW7	ON	Reverse latch signal to set logic in SW6
	OFF	Correspond latch signal to set logic in SW6

※BCD output and latch signal of low speed serial output, which are optional of Autonics pulse meter (MP5Y/W Series) and panel meter (MT4Y/W Series) is output to positive logic (NPN). If connecting D5Y/W, use it after setting SW6 to NPN and soldering (ON) the semi-contact (SW7) of inner PCB solder plate.

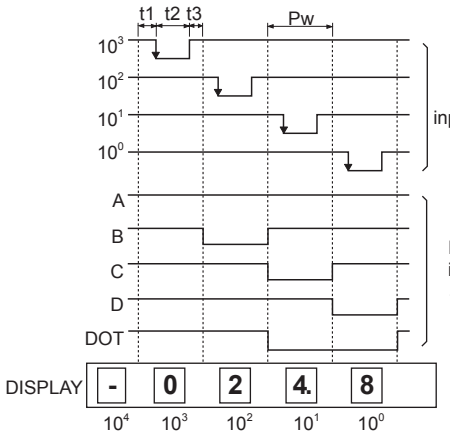
◎ Factory default

Selection switch	Factory default	Selection switch	Factory default
SW1	OFF	SW5	OFF
SW2	OFF	SW6	Negative logic
SW3	ON	SW7	OFF
SW4	OFF		

▣ Time Chart (4-digit)

◎ Dynamic parallel input

Function set switches: SW1 → ON, SW2 → OFF, SW3 → OFF, SW4 → ON, SW5 → OFF

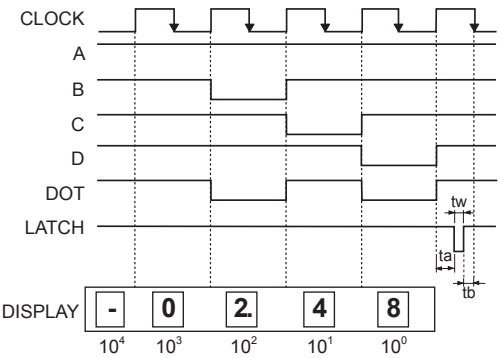


Pw = Min. 0.2ms
t1 = Min. 0.05ms
t2 = Min. 0.10ms
t3 = Min. 0.05ms

※The waveform is for negative logic input (NPN).
In case of positive logic (PNP), it will be reversed.
※For 4 digit, external 10^4 LATCH input terminal is not available.
※If DOT data is inputted on 10^0 position, it displays "—" signal.
(function set switches SW4 → ON)
※Concerning decimal point and "—" signal, it can be displayed using outer DP and minus terminal not a serial input.
(function set switches SW4 → OFF)
※Latch input should be later than BCD input, otherwise, it will display the previous data.
※The left application of display indicates non-using zero black function. If using zero blank function, the "0" on 10^3 position is not displayed.
(function set switches SW3 → ON)

◎ 4/5-bit serial input

Function set switches: SW1 → ON, SW2 → ON, SW3 → OFF, SW4 → ON, SW5 → OFF

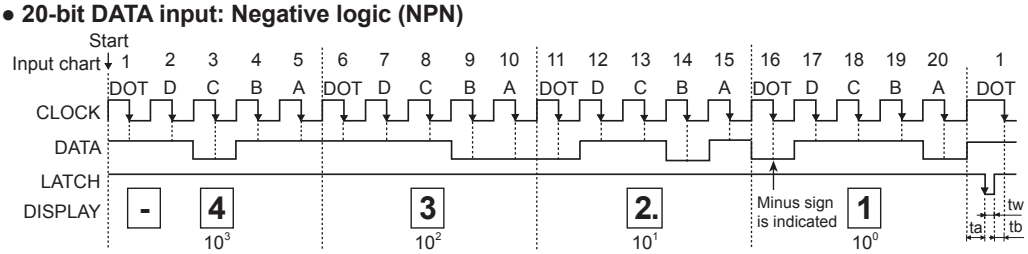


※The waveform is for negative logic input (NPN).
In case of positive logic (PNP), it will be reversed.
※If dot data is inputted on 10^0 position, it displayed "—" signal.
(function set switches SW4 → ON)
※Concerning decimal point and "—" signal, it can be displayed using outer DP and minus terminal not a serial input.
(function set switches SW4 → OFF)
※The left application of display indicates non-using zero blank function. If using zero blank function, the "0" on 10^3 position is not displayed. (function set switches SW3 → ON)

ta = Min. 0.05ms
tw = Min. 0.02ms
tb = Min. 0.03ms

◎ Serial input

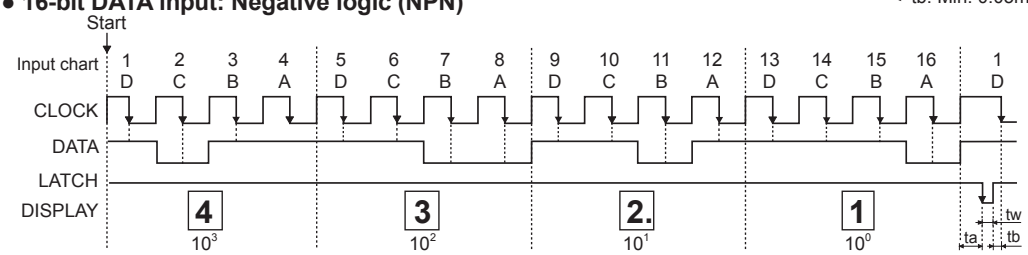
• 20-bit DATA input: Negative logic (NPN)



※The waveform is for negative logic input (NPN) . In case of positive logic (PNP), it will be reversed.
※When DOT signal data (16th) is input on 10^0 position, minus sign is indicated.

ta: Min. 0.05ms
tw: Min. 0.02ms
tb: Min. 0.03ms

• 16-bit DATA input: Negative logic (NPN)

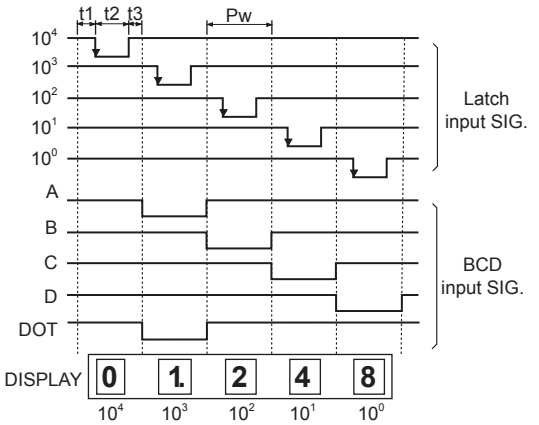


※The waveform is for negative logic input (NPN) . In case of positive logic (PNP), it will be reversed.
※DATA is fixed when CLOCK is changed from high to low and held when LATCH is changed from high to low.
※DATA hold term is before next LATCH is changed from high to low.

▣ Time Chart (5-digit)

◎ Dynamic parallel input

Function set switches: SW1 → ON, SW2 → OFF, SW3 → OFF, SW4 → ON, SW5 → ON

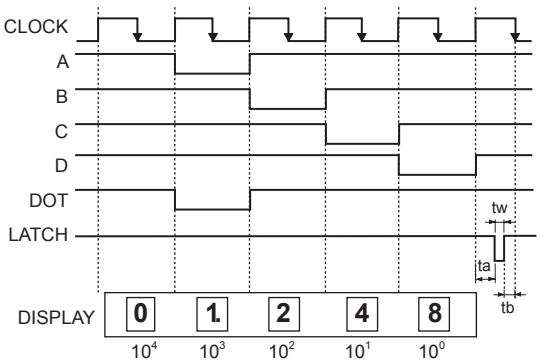


Pw = t1+t2+t3
- Pw = Min. 0.2ms
- t1 = Min. 0.05ms
- t2 = Min. 0.10ms
- t3 = Min. 0.05ms

※The waveform is for negative logic input (NPN) . In case of positive logic (PNP), it will be reversed.
※It is impossible to display the "—" at 5-digit line.
※LATCH input should be later than BCD input, otherwise, it will display the previous DATA.
※The left application of display indicates non-using zero blank function, If using zero blank function, the "0" on 10^4 position is not displayed.
(function set switches SW3 → ON)

◎ 4/5-bit serial input

Function set switches: SW1 → ON, SW2 → ON, SW3 → OFF, SW4 → ON, SW5 → ON

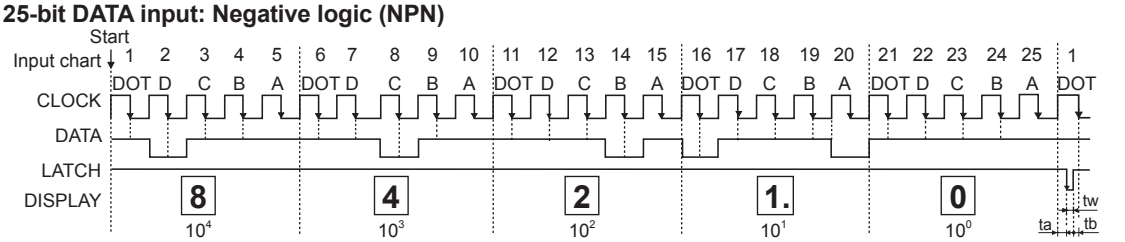


※The waveform is for negative logic input (NPN) . In case of positive logic (PNP), it will be reversed.
※It is impossible to display the "—" at 5-digit line.
※The left application of display indicates non-using zero blank function, the "0" on 10^4 position is not displayed.
(function set switches SW3 → ON)

- ta = Min. 0.05ms
- tw = Min. 0.02ms
- tb = Min. 0.03ms

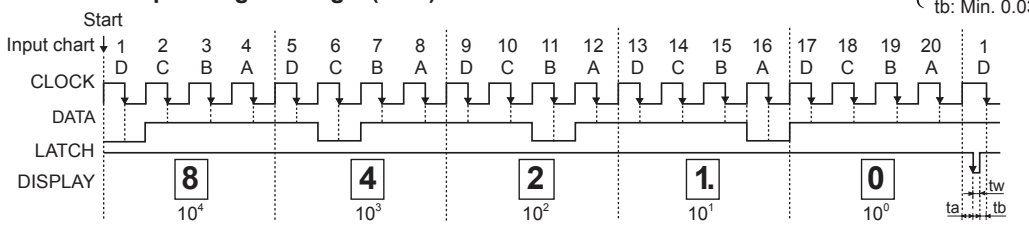
◎ Serial input

● 25-bit DATA input: Negative logic (NPN)



- ta: Min. 0.05ms
- tw: Min. 0.02ms
- tb: Min. 0.03ms

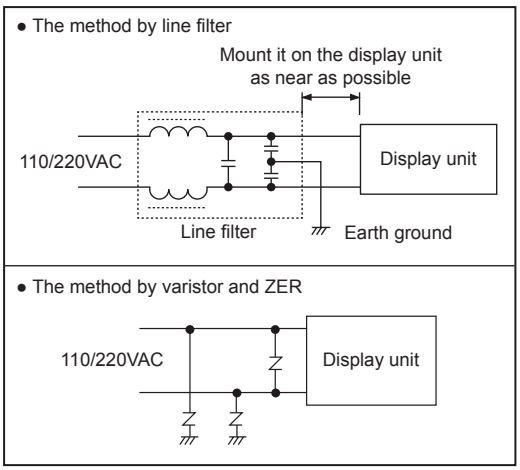
● 20-bit DATA input: Negative logic (NPN)



※The waveform is for negative logic input (NPN). In case of positive logic (PNP), it will be reversed.
※Minus sign cannot be indicated in 5-digit type. [The input of DOT signal on 100 position and MINUS terminal (pin 21) is ignored.]
※DATA is fixed when CLOCK is changed from high to low and held when LATCH is changed from high to low.
※DATA hold term is before next LATCH is changed from high to low.

▣ Proper Usage

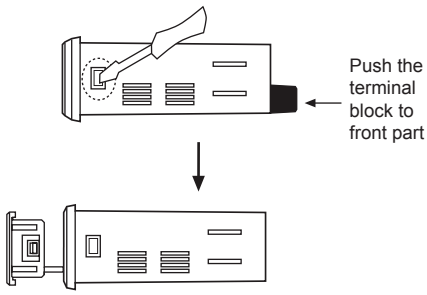
- Storage
  Avoid direct ray of light when keeping this unit long time, and keep it under -25 to 65℃, 35 to 85%RH of relative humidity.
- Noise
  In case of the product (D5W-MX) using AC power, inflow of noise through a power line is a major circuit built-in small product. Therefore, use an absorbing circuit such as outer line filter and varistor when abnormal voltage occurs in the same line by power relay, magnet S/W, using a high-frequency machine, high voltage of spark of lightning stroke.



- Input signal line should be short as much as possible. If the line is too long, it is easy to affect noise.
- If the time of input signal is overlapped, it may occur faint light.
- Oil, soot or dust must not be flown into the product.
- A decimal point and minus sign can be displayed with the outer DP terminal and the minus terminal when signal level is "High". (high level: 5V-24VDC)
- Because hirose connector has both power line (12-24VDC) and data signal line, please connect the lines after checking the connection figure.

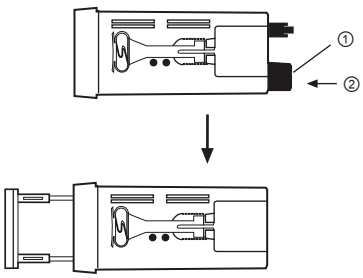
▣ Case Detachment

● D5Y-M



Widen the both inside of lock devices with a driver, and push the terminal block to the direction of front part.

● D5W-M / D5W-MX



Push the lock part on the side to the direction ①, and then push the terminal block to the direction ② to detach the case.

※Be careful in order not to be wounded.
※**Turn OFF the power** before detaching the case.

AmeriMation

Address 9 E College Dr,
Arlington Heights,
IL 60004

Telephone +1. 847. 388. 7189

Email sales@amerimation.net
Web www.amerimation.net