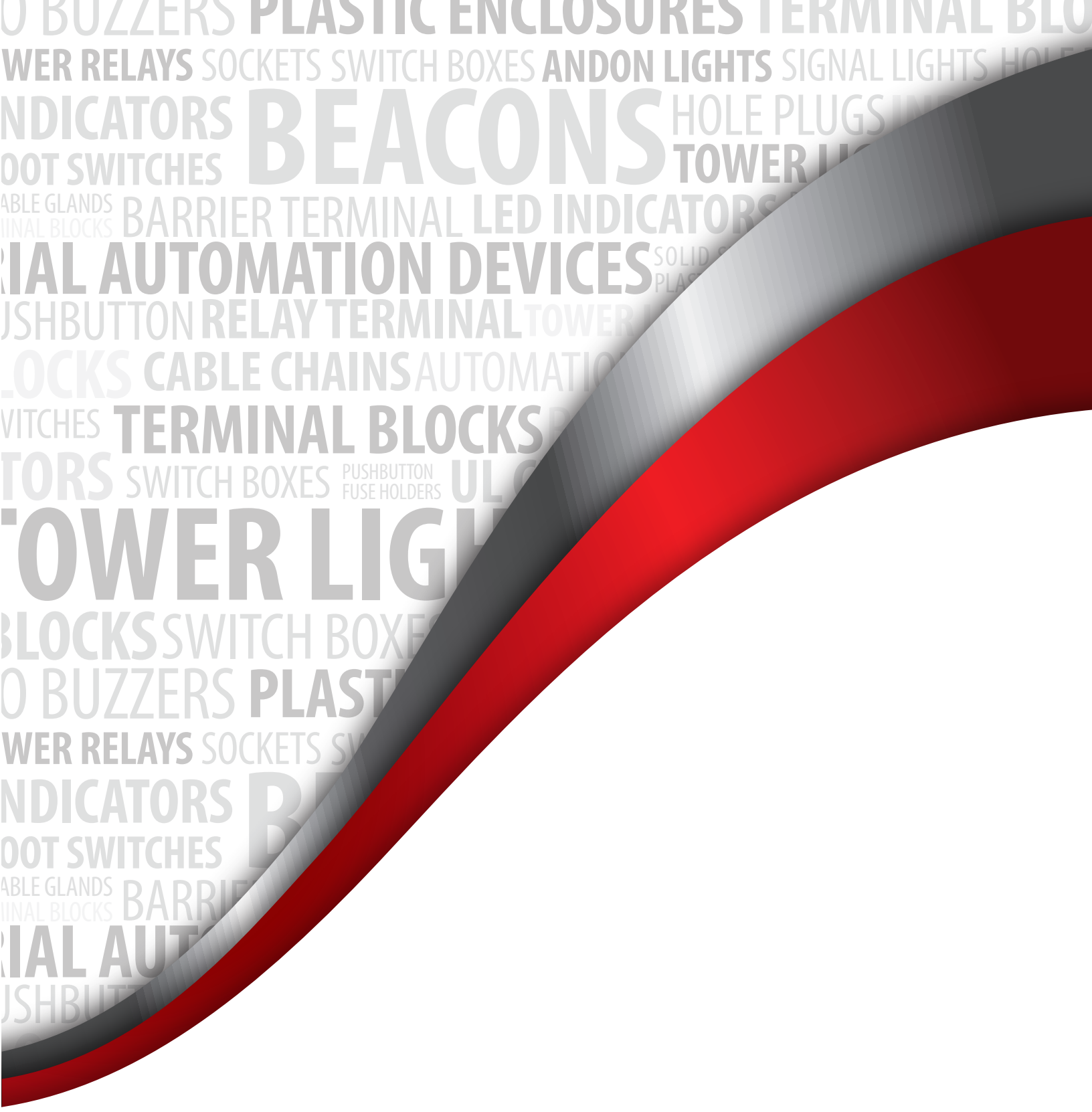


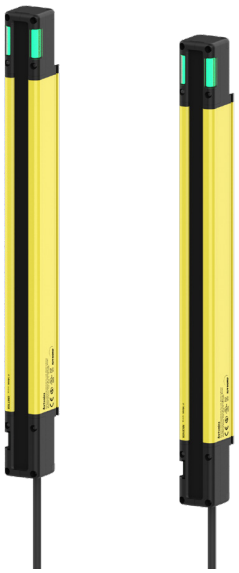
AmeriMation

AmériMation

SAFETY DEVICE

SAFETY DEVICE

Safety Cat. 4, Finger/Hand/Body Detection Safety Light Curtains



SFL / SFLA 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

- Select the light curtain suitable for the environmental condition with three detection capabilities
  : finger, hand, and hand-body
- Variable height for protection: 144 to1868 mm
- Expend up to 4 sets of 400 beams with series connection
- Built-in various safety-related functions to deal with the field conditions
  : interlock, lockout, EDM, muting, override, blanking, and reduced resolution, etc.
- SFLA Series supports various functions via the dedicated software (atLightCurtain)
  : Monitoring for real-time incident light level (SFL Series also supports it.)
  : Provide a variety of functions to set including automatic setting for muting and blanking zone
  : Save setting information of light curtain and apply the same settings to multiple light curtains
- Four mounting brackets (BK-SFL-□, sold separately) support various installation environments
- Select the sensing distance suitable for installation environment: Long or short mode
- Easy beam adjustment with the indicators at the top and bottom of the light curtain
- Easy switching NPN or PNP output via switch or dedicated software (atLightCurtain)
- Excellent visibility for the status of the light curtain with 7-segment display
- Built-in self-diagnosis function such as mutual interference prevention and disturbance light detection
- Easy to identify the operating status with the upper OSSD indicator without an additional device
- Four kinds of non-safety outputs for a variety of environmental conditions
  : AUX 1/2, and Lamp 1/2
- The product structure conforms with international safety regulations and standards
  : Type 4 ESPE(AOPD), SIL3, SIL CL3, Cat. 4, PL e, CE, UL Listed, S Mark and KCs (some of the models)
- The protection structure of IP65 and IP67 (IEC standard)

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. **Do not connect, repair, inspect, or replace the unit while connected to a power source.**
    Failure to follow this instruction may cause malfunction or danger due to the safety-related function that does not operate properly. For more information, please refer to laws, regulations and standards in the country or region.
04. **Do not disassemble or modify the unit.**
    Failure to follow this instruction may result in personal injury or fire. In addition, the manufacturer does not guarantee the performance and functionality.
05. **After 3 seconds of power input, use a machine or mechanical system.**
    Failure to follow this instruction may cause malfunction or danger due to the safety-related function that does not operate properly.
06. **Responsible person for use is an operator who:**
    - is fully knowledgeable about the installation, settings, use and maintenance of the product.
    - is familiar with the requirements of laws, regulations and standards in the country or region where the product is installed and used. Responsible person for use has an obligation to educate the requirements to machine users.
    Machine users are persons who have been fully trained by the responsible person for use and can operate the machine correctly. When any error occurs during the operation of the machine control system, they have a responsibility to report it to the responsible person for use immediately.
    If an unqualified person operates the product, it may result in personal injury, economic loss or fire.
07. **Qualified personnel shall carry out installation, configuration and combination with the machine control system.**
    If an unqualified person carries out installation, configuration and combination with the machine control system, it may cause malfunction or result in accidents due to undetected human body.
08. **Make sure that only the responsible person uses the keys or tools for accessing and setting the light curtains.**
    Failure to follow this instruction may cause malfunction or result in accidents.
09. **When the machine is not operating after installation, check that functions and settings of the product operate correctly as you intended.**
    Failure to follow this instruction may result in personal injury due to undetected human body.
10. **Always make sure that the safety distance between the light curtain and the hazardous part (hazardous zone or hazardous source) of the machine.**
    The machine may not stop before an operator reaches the hazardous zone so that it may result in personal injury.
    For more information on the safety distance, please refer to laws, regulations and standards in the country or region.
11. **To access the hazardous part (hazardous zone or hazardous source) of the machine, you shall install the light curtain as human body passes through the detection zone. If the hazardous part of the machine is accessible beyond the detection zone, install additional guards. In addition, when working in the hazardous zone, make sure that a part of human body is within the detection zone.**
    If the installation does not detect the human body, it may result in personal injury.
12. **Do not arrange or use the light curtain as a reflective or retroreflective type with reflector.**
    If the installation does not detect the human body, it may result in personal injury.
13. **Do not use the light curtain to detect flying objects toward the detection zone.**
    If there is a risk, take additional safety measures, such as installing an additional safety guard.
14. **The auxiliary output (AUX) is non-safety output, therefore, do not use it for safety purposes.**
    Failure to follow this instruction may result in serious injury because the safety cannot be guaranteed.

15. **The lamp output (Lamp) is non-safety output, therefore, do not use it for safety purposes.**
Failure to follow this instruction may result in serious injury because the safety cannot be guaranteed.
16. **Only qualified personnel shall use the PC setting tool (atLightCurtain) to configure functions of light curtain and manage the changed settings.**
If an unqualified person tries to change settings of function via the PC setting tool, it may cause malfunction or result in personal injury due to undetected human body.
17. **After setting or changing the function of light curtain via the PC setting tool, check that light curtain operates as you intended.**
Failure to follow this instruction may result in personal injury.
18. **When installation, if you have changed the configuration of light curtain (replacement of light curtain, change the number of beams, change the number of series connection, etc.), set the function of the light curtain via the PC setting tool again.**
Failure to follow this instruction may result in personal injury due to unintended settings.
19. **If the (master) receiver has been replaced, send the setting information of PC setting tool to the replaced receiver gain.**
Failure to follow this instruction may result in personal injury due to unintended settings.
20. **Install the devices for releasing Interlock condition (e.g. switch) in a location where the entire hazardous zone can be seen or the devices cannot be handled within the hazardous zone.**
21. **When restarting the machine in interlock condition, make sure that no operators are in the hazardous zone.**
Failure to follow this instruction may result in personal injury due to undetected human body.
22. **Follow the requirements described in this manual for the muting devices and installation method to use muting function.**
For more information, please refer to laws, regulations and standards in the country or region. Failure to follow these requirements, the functions and performance are not guaranteed. It may result in personal injury.
23. **Install the muting devices in a location that can be changed by only qualified and responsible person for use.**
Change the installation location under the supervision of responsible person for use.
24. **The muting function temporarily stops the safety related functions of light curtain.**
If the function is activated, take additional safety measures for the safety of the machine control system.
25. **When the muting function is activated, make sure that no operator is in the hazardous zone.**
Take additional safety measures to prevent the human body from entering the hazardous zone.
26. **When you need to inform that the muting function is activating, install the indicators with any forms (e.g. alarm lamp) where it can be seen from all sites.**
For more information, please refer to laws, regulations and standards in the country or region.
27. **Qualified and responsible person for use should conduct the risk assessment on the time related to the muting function, set the time correctly according to the conditions described in this manual. In particular, set the muting timeout (T2) to a finite value in the PC setting tool.**
Failure to follow this instruction may cause the function failure of safety related and result in personal injury or fire.
28. **When you use the auto scan for muting zone via PC setting tool, the OSSD output may temporarily go to ON state due to the operation of line or facilities for scan and measurement. Therefore, safety measures in workplace shall be implemented.**
If there is a risk, take additional safety measures, such as installing an additional safety guard.
29. **The installation environment and timing chart shown in the PC setting tool are examples for your understanding. Make sure that the qualified and responsible person for use check the light curtain operates in the actually installed site as intended.**
Failure to follow this instruction may result in personal injury due to undetected human body.
30. **Follow the requirements described in this manual for the devices and installation method to use the override function.**
For more information, please refer to laws, regulations and standards in the country or region. Failure to follow these requirements, the functions and performance are not guaranteed. It may result in personal injury.
31. **Connect the override switch to reset input to use the override function.**
Failure to release the override condition with the override switch may result in personal injury.
32. **The override function temporarily stops the safety related functions of light curtain. Therefore, safety measures in workplace shall be implemented.**
If the function is activated, take additional safety measures for the safety of the machine control system.
33. **When the override function is activated, make sure that no operator is in the hazardous zone.**
Take additional safety measures to prevent the human body from entering the hazardous zone.
34. **When you need to inform that the override function is activating, install the indicators with any forms (e.g. alarm lamp) where it can be seen from all sites.**
For more information, please refer to laws, regulations and standards in the country or region.
35. **Qualified and responsible person for use should conduct the risk assessment on the time related to the override function, set the time correctly according to the conditions described in this manual. In particular, set the override timeout to a finite value in the PC setting tool.**
Failure to follow this instruction may cause the function failure of safety related and result in personal injury or fire.
36. **After setting the fixed blanking function, check that it operates as intended.**
Failure to follow this instruction may result in personal injury due to undetected human body.
37. **If the tolerance is set for the fixed blanking function, the detection capability will be larger.**
Calculate the safety distance suitable for the minimum detection capability to secure minimum safety distance.
38. **If you use the fixed blanking function, conduct additional safety measures to prevent a part of human body from entering the hazardous zone passing by beams for the blanking zone.**
39. **After setting the floating blanking function, check that it operates as intended.**
Failure to follow this instruction may result in personal injury due to undetected human body.
40. **If the tolerance is set for the floating blanking function, the detection capability will be larger.**
Calculate the safety distance suitable for the minimum detection capability to secure minimum safety distance.
41. **If you use the floating blanking function, conduct additional safety measures to prevent a part of human body from entering the hazardous zone passing by beams for the blanking zone.**
42. **If you use the auto scan function for the fixed and floating blanking zone via the PC setting tool, the OSSD output temporarily goes to the OFF state.**
Please note that the operating status of the light curtain may be changed.
43. **If you use the reduced resolution function, the detection capability will be larger.**
Calculate the safety distance suitable for the minimum detection capability to secure minimum safety distance.
44. **Only qualified and responsible person for use shall use the factory reset via the PC setting tool. Also, check the safety distance and the operation of the light curtain again.**
Failure to follow this instruction may result in personal injury due to undetected human body.
45. **Check 'Connections' before wiring. And make sure that there are no safety problems.**
Failure to follow this instruction may result in fire.
46. **When using PNP output, be sure to connect the load between the OSSD output wire and 0V. Do not short the OSSD output wires to +24V.**
Incorrect wiring or shut down of the power supply is dangerous because the OSSD output is always in ON state.
47. **When using NPN output, be sure to connect the load between the OSSD output wire and +24V. Do not short the OSSD output wires to 0V.**
Incorrect wiring or shut down of the power supply is dangerous because the OSSD output is always in ON state.
48. **Use only the two OSSD output wires in this product to construct safety systems, and do not use output signals (e.g. auxiliary output) other than the OSSD output for safety purposes.**
When you use only one OSSD output or use other output signal as a safety output, the machine cannot be stopped in the event of a malfunction and result in personal injury due to the safety related function failure.
49. **When wiring, all input/output wires with double insulation or reinforced insulation should be used between the circuits.**
Failure to follow this instruction may result in fire.
50. **Do not install all input/output wires in the same piping with high voltage wire and power line.**
Failure to follow this instruction may cause malfunction or dangerous due to the safety related function do not operate properly.
51. **Use a separate power supply for the load and the product, and do not exceed the specified ratings.**
Failure to follow this instruction may result in damage or malfunction of the product.

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

01. **Use the product within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
02. **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.
03. **Use the cable within the rated length and do not modify, change, and extend the cable.**
If the cable is longer, it may cause malfunction or dangerous due to the safety related function do not operate properly.
04. **To use the light curtain in "PSDI mode", configure the appropriate control circuit between the light curtain and the machine according to the requirements of laws, regulations and standards in the country or region.**
05. **Do not use the product outdoors.**
Failure to follow this instruction may result in damage and malfunction of the product.
06. **Keep the product away from metal chip, dust, and wire residue which flow into the unit.**
Failure to follow this instruction may result in personal injury due to the malfunction of the light curtain.
07. **Be sure for responsible person for use to change the password of PC setting tool to prevent the setting change by the machine users (or operator). Securely manage your password and avoid forgetting the password.**
Failure to follow this instruction may result in personal injury due to the malfunction of the light curtain.
08. **You must conduct regular inspections and maintenance procedures according to the items listed on the "Check and Maintenance" within six months.**
Failure to follow this instruction may result in personal injury due to the malfunction of the light curtain.
09. **Check the installation status, normal operation, breakage, modification, and manipulation in the situations shown below, and conduct the weekly inspection.**
- When starting the safety system for the first time
- When replacing the accessories of the safety system
- When the safety system has not been operated for a long time
Failure to follow this instruction may result in personal injury because the safety-related function may not work properly due to the malfunction of the product.

Cautions for Installation

For more information, see the "SFL/SFLA User Manual."

- Install the unit correctly with the usage environment, location, and the designated specifications. Install the light curtain that complies with the following details.
  - Part(s) of the human body passes through the detection zone to the hazards of the machine.
  - Install an additional guard if part(s) of the human body access to hazards of the machine without passing through the detection zone.
  - If an operator works in the hazardous part of the machine, be sure to install the light curtain to detect part(s) of the human body.
- You must set the safety distance of the light curtain.
  Failure to this instruction, the machine cannot be stopped before reaching the hazardous part, and it may result in personal injury.
  The safety distance calculation may differ from laws, regulations, and standards. Therefore, be sure to use the appropriate formula which abides by the rules of the country.
- Install the emitter and the receiver face to each other and adjust the top and bottom beam of the light curtain to meet the centerline. Also, the switch settings of the emitter and the receiver must be the same.
- Use a bracket suitable for the mounting method.
  The type and number of brackets differ depending on the length of the light curtain.

Cautions during Use

- Follow instructions in "Cautions during Use". Otherwise, it may cause unexpected accidents.
- The power input of 24VDC⎓ model is insulated and limited voltage/current or supply via power supply with SELV and Class 2.
- When supplying power with SMPS, ground the FG terminal and connect the noise suppression capacitor between 0V and FG terminal.
- When installing the light curtain, make sure that the bottom indicators of the emitter and receiver are aligned exactly.
- Install the light curtain in a place where the emitter and receiver are not affected by walls or reflecting surfaces.
- If you use the light curtain as several sets, arrange them not to interfere with each other, or install with a shading plate.
- Do not install the light curtain in place where it is exposed to intense disturbance light (such as direct sunlight, sunlight, spotlights fluorescent lights, and etc.) or reflected light from glossary surface is directly incident on the receiver. If it is difficult to install in such a place, take additional safety measures using shading plates, hoods, etc.
  Failure to follow this instruction may cause malfunction or dangerous due to the safety related function do not operate properly.
- Make sure that any unused wires, when installing the product, should be insulated.
- Make sure that removable parts (including packing, end caps, product wires, covers, etc.) are properly assembled. Also, tighten the screws with specified tightening torque. Failure to follow this instruction may cause product degradation.
- Assessment of conformity to the required safety level is evaluated for the entire system. Please consult with a certified certification body regarding the assessment procedure.
- It should be done away regarded as an industrial waste. For more information, please refer to laws, regulations and standards in the country or region.
- This product may be used in the following environments.
  - Altitude max. 2000 m
  - Pollution degree 3
  - Installation Category II

Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

SFL ❶ ❷ - ❸

❶ Type
No-mark: Standard type
A: Advanced type

❷ Detection capability
14: Ø 14 mm, finger
20: Ø 20 mm, hand
30: Ø 30 mm, hand-body

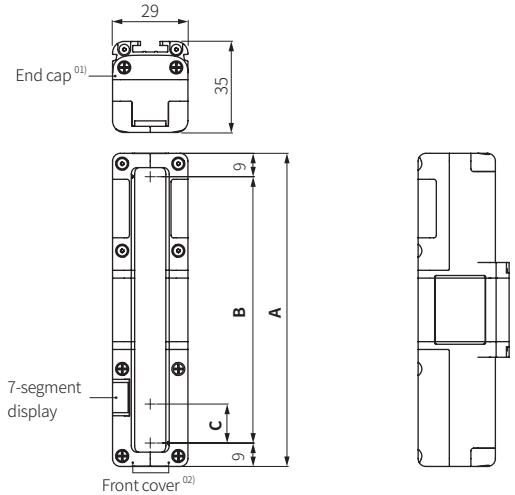
❸ Number of optical axes
Number: Number of optical axes

Manual

For proper use of the product, refer to the manuals and be sure to follow the safety considerations in the manuals.
Download the manuals from the Autonics website.

Dimensions

- Unit: mm, For the detailed dimensions of the product, follow the Autonics website.
- This dimension is based on the SFL(A) 14 model. The appearance varies depending on the detection capability.



01) When removing the end cap, there is the lamp output terminal (top) or the power supply terminal (bottom).
02) When removing the front cover, there is the setting switch (on the emitter and the receiver) or the PC communication port (on the receiver).

Detection capability	Models	Number of beams	A (protective height)	B (sensing height)	C (optical axis pitch)
Ø 14 mm (finger)	Standard	15 to 111	144 to 1,008	126 to 990	9
	Advanced	15 to 199	144 to 1,800	126 to 1,782	
Ø 20 mm (hand)	Standard	12 to 68	183 to 1,023	165 to 1,005	15
	Advanced	12 to 124	183 to 1,863	165 to 1,845	
Ø 30 mm (hand-body)	Standard	42 to 75	1,043 to 1,868	1,025 to 1,850	25
	Advanced	9 to 75	218 to 1,868	200 to 1,850	

Sold Separately

- Power I / O cable
  : SFL-BCT(R) (connector type),
  SFL-BCT(R) (cable connector type)
- Connector cable
  : CID8-□T(R) (socket type),
  C1D8-□T(R) (socket-plug type)
- Series connector cable: SFL-EC□T(R)
- Lamp output cable: SFL-LC
- Bracket: BK-SFL-□ (Top/Bottom (adjustable), Side (adjustable))
- USB / Serial communication converter
  : SCM-US
- SFL / SFLA dedicated converter cable
  : EXT-SFL
- Test piece: SFL-T□
- LOTO (Lockout-Tagout) device: SFL-LT

Specifications

Type	Standard type		
Models	**SFL14-□**	**SFL20-□**	**SFL30-□**
Sensing type	Through-beam		
Light source	Infrared LED (855 nm)		
Effective aperture angle (EAA)	Within ± 2.5 ° when the sensing distance is greater than 3 m for both emitter and receiver.		
Sensing distance	Short - Long mode (setting switch)		
Short mode	0.2 to 5 m	0.2 to 8 m	0.2 to 8 m
Long mode	0.2 to 10 m	0.2 to 15 m	0.2 to 15 m
Detection capability	Ø 14 mm (finger)	Ø 20 mm (hand)	Ø 30 mm (hand-body)
Detection object	Opaque object		
Number of optical axes 01)	15 to 111	12 to 68	42 to 75
Protective height	144 to 1,008 mm	183 to 1,023 mm	1,043 to 1,868 mm
Optical axis pitch	9 mm	15 mm	25 mm
Series connection	Max. 3 SET (≤ 300 optical axes)		

Type	Advanced type		
Models	**SFLA14-□**	**SFLA20-□**	**SFLA30-□**
Sensing type	Through-beam		
Light source	Infrared LED (855 nm)		
Effective aperture angle (EAA)	Within ± 2.5 ° when the sensing distance is greater than 3 m for both emitter and receiver.		
Sensing distance	Short - Long mode (setting switch or atLightCurtain)		
Short mode	0.2 to 5 m	0.2 to 8 m	0.2 to 8 m
Long mode	0.2 to 10 m	0.2 to 15 m	0.2 to 15 m
Detection capability	Ø 14 mm (finger)	Ø 20 mm (hand)	Ø 30 mm (hand-body)
Detection object	Opaque object		
Number of optical axes 01)	15 to 199	12 to 124	9 to 75
Protective height	144 to 1,800 mm	183 to 1,863 mm	218 to 1,868 mm
Optical axis pitch	9 mm	15 mm	25 mm
Series connection	Max. 4 SET (≤ 400 optical axes)		

01) It may differ depending on the models. For more information, see the "SFL/SFLA User Manual."

Power supply	24 VDC⎓ ± 20 % (Ripple P-P: ≤ 10 %)
Current consumption 01)	Emitter: ≤ 106 mA, receiver: ≤ 181 mA
Response time 01)	T_{OFF} (ON → OFF): ≤ 32.3 ms, T_{ON} (OFF → ON): ≤ 76.6 ms
Safety related output : OSSD output	NPN or PNP open collector Load voltage 02): ON - 24 VDC⎓ (except for the residual voltage), OFF - 0 VDC⎓, Load current 03): ≤ 300 mA, Residual voltage 04): ≤ 2 VDC⎓ (except for voltage drop due to wiring), Load capability: ≤ 2.2 μF, Leakage current: ≤ 2.0 mA, Wire resistance of load: ≤ 2.7 Ω
Auxiliary output (AUX 1/2) 05)	NPN or PNP open collector Load voltage: ≤ 24 VDC⎓, Load current: ≤ 100 mA, Residual voltage: ≤ 2 VDC⎓ (except for voltage drop due to wiring)
Lamp output (LAMP 1/2) 05)	NPN or PNP open collector Load voltage: ≤ 24 VDC⎓, Load current: ≤ 300 mA, Residual voltage: ≤ 2 VDC⎓ (except for voltage drop due to wiring), Incandescent lamp: 24 VDC⎓ / 3 to 7 W, LED lamp: Load current ≤ 50 to 300 mA
External input	Reset input, mute 1/2 input, EDM, external test When setting NPN output ON: 0 - 3 VDC⎓, OFF: 9 - 24 VDC⎓ or open, short-circuit current: ≤ 3 mA When setting PNP output ON: 9 - 24 VDC⎓, OFF: 0 - 3 VDC⎓ or open, short-circuit current: ≤ 3 mA
Protection circuit	Reverse power polarity, reverse output polarity, output short-circuit over-current protection
Safety-related functions	Interlock (reset hold), external device monitoring (EDM), muting/override, Blanking (fixed blanking, floating blanking), reduced resolution
General functions	Self-test, alarm for reduction of incident light level, mutual interference prevention
Others functions	Change of sensing distance, switching to NPN or PNP, external test (light emission stops), auxiliary output (AUX 1, 2), lamp output (LAMP1, 2)
Synchronization type	Timing method by synchronous line
Insulation resistance	≥ 20MΩ (at 500 VDC⎓ megger)
Noise immunity	± 240 VDC⎓ the square wave noise (pulse width: 1μs) by the noise simulation
Dielectric strength	1,000 VAC~ 50/60Hz for 1 minute
Vibration	0.7 mm amplitude at frequency of 10 to 55Hz (for 1 min), 20 sweeps in each X, Y, Z direction
Shock	100 m/s² (≈ 10 G), pulse width 16 ms in each X, Y, Z direction for 1,000 times
Ambient illumination	Incandescent lamp: ≤ 3,000 lx, sunlight: ≤ 10,000 lx (illumination of light receiving surface)
Ambient temperature	-10 to 55 °C, storage: -20 to 70 °C (non-freezing or non-condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 95 %RH (non-freezing or non-condensation)
Protection structure	IP65, IP67 (IEC standard)
Material	Case: Aluminum, Front cover and sensing part: Polymethyl methacrylate, End cap: polycarbonate, Cable: polyurethane (PUR)
Approval	TÜV NORD CE cULus LISTED KC 06)
International standards	UL 508, CSA C22.2 No. 14, ISO 13849-1 (PL e, Cat. 4), ISO 13849-2 (PL e, Cat. 4), UL 61496-1 (Type 4, ESPE), UL 61496-2 (Type 4, AOPDs), IEC/EN 61496-1 (Type 4, ESPE), IEC/EN 61496-2 (Type 4, AOPDs), IEC/EN 61508-1~7 (SIL 3), IEC/EN 62061 (SIL CL 3)

01) It may differ depending on the models. For more information, see the "SFL/SFLA User Manual."
02) The values of load voltage were drawn with PNP output, and in case of NPN output, apply these in reverse.
03) Be sure that the load current should be greater than 6 mA.
04) The residual voltage was drawn with 300 mA of load current.
05) It is the non-safety output. Do not use it for safety purposes.
06) In case of the KCs certified model, see the "SFL/SFLA User Manual."

Setting Switch

No.	Function	Settings (marks in the sticker)	
		ON	OFF (factory default)
1	NPN or PNP	NPN	PNP
2	Sensing distance	Short mode (S)	Long mode (L)
3	Frequency	Frequency B (FREQ B)	Frequency A (FREQ A)
4	Reset-hold	Reset-hold (R-H)	Deactivated (OFF)
5	Interlock	Manual reset (MAN)	Auto reset (AUTO)
6	EDM	EDM	Deactivated (OFF)
7	Muting	MUTE	Deactivated (OFF)
8	Apply settings	atLightCurtain (PC)	Setting switch (SW)

- Remove the front cover of the light curtain and set functions via the setting switch.
- Be sure to select the same settings of emitter and receiver. (factory defaults: OFF)
- For more information, see the "SFL/SFLA User Manual."

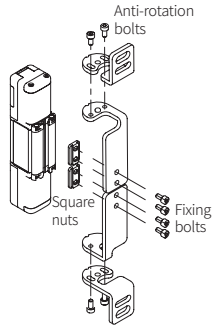
7-segment Display

Operation	Position	Display		Description
Emitter/ Receiver	PC connection (download)	P	Flashing	Flashes when downloading the setting information.
	Communication error	C	Flashing	Flashes when RS485 communication error occurs.
	Error condition	E	Flashing	Flashes when entering the lockout condition.
	Warning condition	A	Flashing	Flashes when in a warning condition.
Emitter	Default condition	0	ON	Displays when function is deactivated.
	Blanking	b	ON	Displays when the blanking function is activated.
	Muting	n	ON	Displays when in the muting state.
	Override	o	ON	Displays when in the override state.
	Reset-hold	H	ON	Displays when waiting for reset-hold input.
	Reduced resolution	r	ON	Displays when the reduced resolution function is activated.
Receiver	Light incident	0 to 9	ON	Displays the sensitivity level of beams with the lowest light incident (0 to 9).

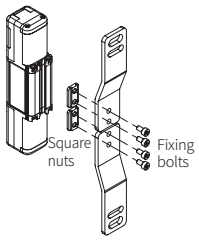
- This table shows the display during operation.
- For more information on the display of power on and error condition, see the "SFL/SFLA User Manual."

Brackets Installation

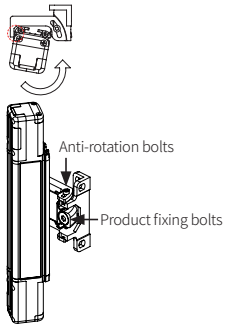
■ Top/Bottom adjustable bracket (BK-SFL-TBA)



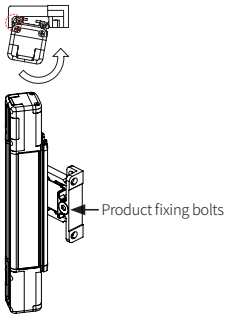
■ Top/Bottom bracket (BK-SFL-TBF)



■ Side adjustable bracket (BK-SFL-SA)



■ Side bracket (BK-SFL-SF)



- Tighten the product fixing bolts with a torque of 0.98 N m.
- The type and number of brackets differ depending on the length of the light curtain.

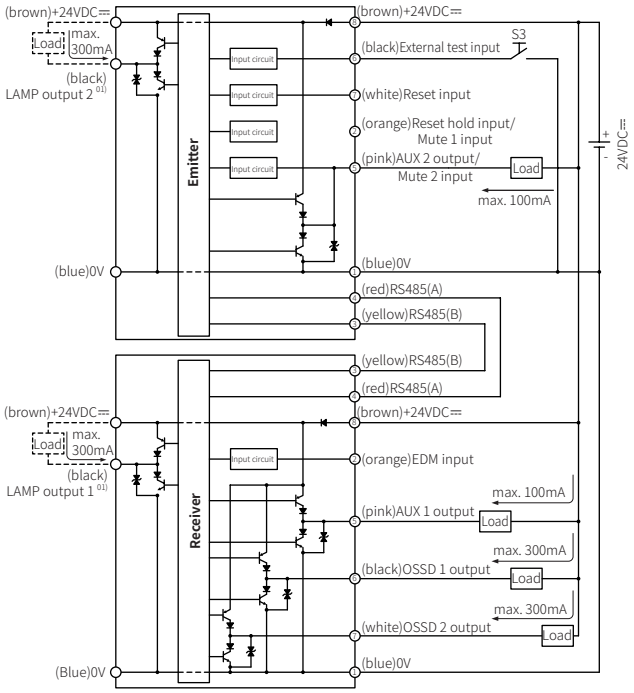
Brackets \ Length	Max. 1 m	Min. 1 m
Top/Bottom adjustable bracket	2	Unavailable
Top/Bottom bracket		
Side adjustable bracket	2	3
Side bracket		

- For more information, see the "SFL/SFLA User Manual."

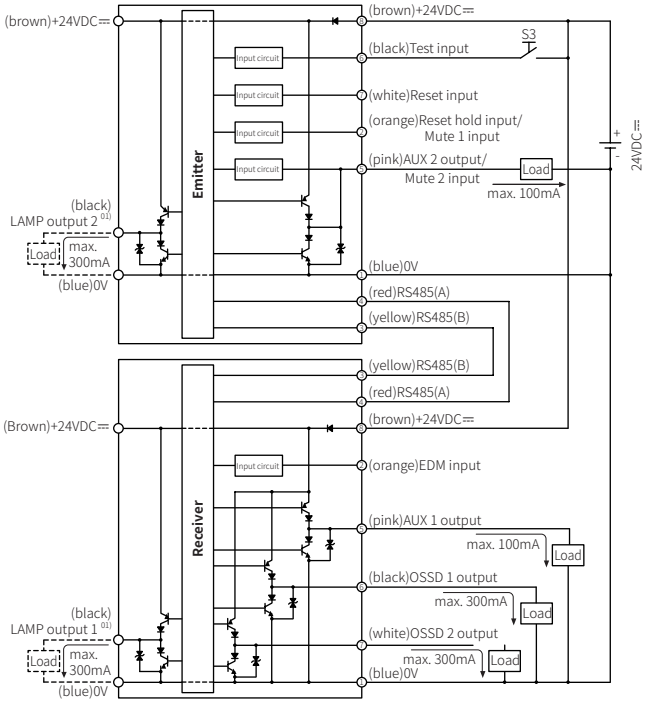
Example of Wiring Diagram

The wiring varies depending on the functions you use.
For more information, see the "SFL/SFLA User Manual."
If there is a potential malfunction due to noise, combine a protection circuit to the input wiring, or connect a device with a protection circuit and apply the signal.

■ NPN output



■ PNP output



01) This wiring is used to activated the lamp output and displays the status to the external indicator based on selected output mode.

Check and Maintenance

You must conduct regular inspections within six months, according to the items listed on the checklist. Or it may result in personal injury due to the malfunction of the light curtain. The checklist before the installation is the table below. For the checklist after the installation, see the "SFL/SFLA User Manual."

■ Check installation conditions

No.	Checklist	Check
1	Installed that the machine or additional safety measures (e.g., extra guards) do not cover the detection zone.	
2	Accessible to hazardous zone or source of the machine only by passing through the detection zone.	
3	Available to detect parts of the body when the operator works in hazardous zone or source of the machine.	
4	The distance from hazardous zone or source of the machine to the installed location of light curtain is equal to, or greater than the calculated safety distance. ※Safety distance: ( )mm / Actual distance: ( )mm	
5	If lustered objects or reflective surfaces are around, the light curtain is installed at a distance over the allowable installation distance.	
6	Installed in a place without the influence of inverter disturbance light (e.g., a fluorescent lamp).	
7	Installed in a place that no material causes deformation in a front window, such as corrosion or ignition.	
8	In use of the interlock function, the reset switch is installed in a position where the entire hazardous zone is visible and cannot be used in the hazardous zone.	
9	In use of the reset hold function, the reset hold switch is installed in a position that cannot be used in the hazardous zone.	
10	The installed emitter/receiver in a single or series connection matches the same specification (function, detection capability, number of optical axes).	
11	In case of the brackets, it is secured to prevent separation during use.	
12	No scratches or damages on the front window of the emitter/receiver.	
13	In use of the muting function, the muting sensors consist of two separate devices.	
14	In use of the muting function, the muting sensor meets the specific conditions to start muting.	
15	In use of the override function, the override starts when the specific conditions are met.	
16	In use of the muting and override functions, install the indicators with any forms (e.g., alarm lamp) where it can be seen from all sites.	
17	In use of the fixed blanking function, it is set to prevent the operator from entering the blanking zone.	
18	In use of the floating blanking or reduced resolution function, the installed light curtain has a distance that equal to or greater than a safety distance calculated by the changed detection capability (diameter). ※Safety distance: ( )mm / Actual distance: ( )mm	

■ Check wiring connection

No.	Checklist	Check
1	The power supply used for the product and safety-related devices (e.g., muting sensors) is 24VDC⎓, and it meets the rated specifications and not connected to other devices or equipment.	
2	When connecting power supply, the polarity is not connected in reverse.	
3	The appearance of the wires connected to the product is not damaged, such as cracks, breakage of the outer shell. And there are no sources for damage around the wiring.	
4	In case of connecting more than two products, it is configured to use dedicated series connection cable and mutual interference prevention.	
5	In case of the series connection for more than two products, use dedicated series connection cable, and it is configured not to be extended or arbitrarily connected.	
6	The wiring is suitable for each application and is configured not to be connected upper side of the product (e.g., wiring for the series connection cable and lamp output cable) and the lower side of the product (e.g., the power I/O cable) in reverse.	
7	The wiring and end cap connected to the product are firmly secured to prevent separation during use.	
8	The product is connected to the safety-related part of the control system using two OSSD control outputs and configures the safety system.	
9	In case of the product is set to PNP output, two OSSD wires are not shorted to +24V.	
10	In case of the product is set to PNP output, the load connected to two OSSD wires is connected between the OSSD wire and 0V.	
11	In case of the product is set to NPN output, two OSSD wires are not shorted to 0V.	
12	In case of the product is set to NPN output, the load connected to two OSSD wires is connected between the OSSD wire and +24V.	
13	In case of the auxiliary output (AUX 1/2, Lamp 1/2), it is configured to prevent the connection to the safety-related part of the control system.	

Software

Download the installation file and the manuals from the Autonics website.

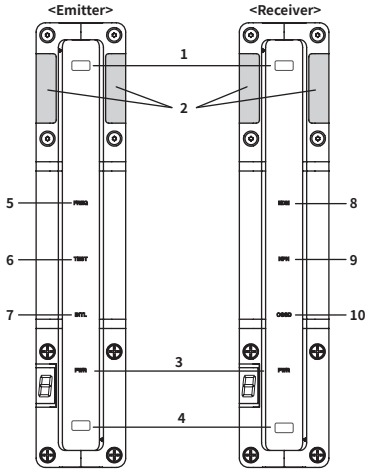
■ atLightCurtain

It is that provides configuration and monitoring of light curtain.
In case of SFL (Standard type), only monitoring function is supported, and in case of SFLA (advanced type), all functions such as parameter setting are available.

Unit Descriptions

The appearance may vary depending on the detection capability. For more information, see the "SFL/SFLA User Manual."

■ Front part



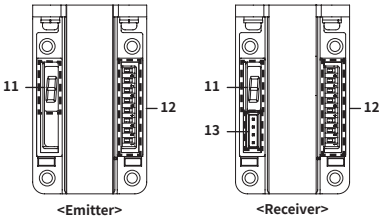
Position	Indicator		Color	Operation	Description
Emitter/ Receiver	-	1. Top beam indicator	Blue	ON	Top beam is clear (≥ incident light level 30 %)
				Flashing	Top beam is unstable (incident light level: 15 to 35 % 01))
				OFF	Top beam is blocked (≤ incident light level 15 %)
			Red	Flashing	Interruption of disturbance light
	-	2. Upper OSSD indicator	Green	ON	OSSD is ON
				Flashing	Muting or override function is activated.
			Red	ON	OSSD is OFF
				Flashing	Enter lockout condition
	PWR	3. Power/Lockout indicator	Green	ON	Normal operation
				Flashing	Warning condition
				OFF	No power
			Red	Flashing	Power on, enter lockout condition 02)
	-	4. Bottom beam indicator	Blue	ON	Bottom beam is clear (≥ incident light level 30 %)
				Flashing	Bottom beam is unstable (incident light level: 15 to 35 % 01))
				OFF	Bottom beam is blocked (≤ incident light level 15 %)
			Red	Flashing	Interruption of disturbance light
Emitter	FREQ	5. Frequency indicator	Green	ON	Set frequency B
				OFF	Set frequency A
	TEST	6. External test indicator	Green	ON	External test input is ON state.
				OFF	External test input is OFF state.
	INTL	7. Interlock indicator	Yellow	ON	Interlock condition
				Flashing	Reset-hold condition
				OFF	Release interlock condition
Receiver	EDM	8. EDM indicatior	Green	ON	EDM input is ON state.
				Flashing	EDM error 02)
				OFF	EDM input is OFF state or EDM is deactivated.
	NPN	9. NPN/PNP indicator	Green	ON	NPN output
				OFF	PNP output
	OSSD	10. OSSD indicator	Green	ON	OSSD is ON
			Red	ON	OSSD is OFF

01) It flashes if the amount of received light on the top or bottom beam decreases less than from 15 to 35%, and lasts for more than 30 minutes.

02) The light curtain enters the lockout condition. For more information on error and warnings, see the "SFL/SFLA User Manual."

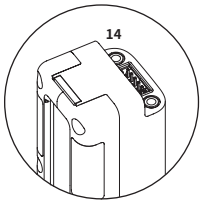
■ Front part - When removing the cover

Tighten the cover screws on the front part with a torque of 0.59 N m.



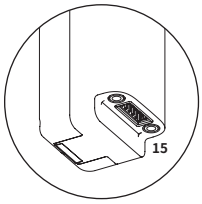
Position	Part	Description
Emitter/ Receiver	11. 7-segment display	It shows the status of light curtain.
	12. Setting switch	You can set the function.
Receiver	13. PC communication port	Insert the SFL / SFLA dedicated converter cable (EXT-SFL) and connect to the USB / Serial communication converter (SCM-US, sold separately).

■ Upper part



Position	Part	Description
Emitter/ Receiver	14. Lamp output terminal	It is located on the top of the emitter and receiver. Insert the lamp output cable and connect the external output indicator. Tighten the end cap screws with a torque of 0.59 N m. In case of the series connection, use dedicated series connection cable to connect light curtains.

■ Bottom part



Position	Part	Description
Emitter/ Receiver	15. Power supply terminal	It is located on the bottom of the emitter and receiver. Insert the power I/O cable for power supply. Tighten the end cap screws with a torque of 0.59 N m. In case of the series connection, use dedicated series connection cable to connect light curtains.

IEC 61508 Parameters

Parameters	Explanation
Proof test interval	20 years
PFH_D (Probability of dangerous failure per hour)	1.01×10^{-8} to 9.95×10^{-9}
SFF (Safe failure fraction)	99 %
HFT (Hardware fault tolerance)	1
Type of element	Type B
Failure response time	Within a response time
Safe state	OSSD 1/2 are in OFF-state

■ Finger detection (SFL(A)14-□, Ø 14 mm)

SFL Series	SFLA Series	PFH_D	MTTFd (years)
SFL14-15	SFLA14-15	2.87×10^{-9}	455
SFL14-23	SFLA14-23	3.86×10^{-9}	327
SFL14-31	SFLA14-31	4.40×10^{-9}	283
SFL14-39	SFLA14-39	5.07×10^{-9}	242
SFL14-47	SFLA14-47	5.62×10^{-9}	217
SFL14-55	SFLA14-55	6.29×10^{-9}	192
SFL14-63	SFLA14-63	6.84×10^{-9}	176
SFL14-71	SFLA14-71	7.51×10^{-9}	160
SFL14-79	SFLA14-79	8.06×10^{-9}	148
SFL14-87	SFLA14-87	8.73×10^{-9}	136
SFL14-95	SFLA14-95	9.28×10^{-9}	128
SFL14-103	SFLA14-103	9.95×10^{-9}	119
SFL14-111	SFLA14-111	1.05×10^{-8}	113
	SFLA14-119	1.12×10^{-8}	106
	SFLA14-127	1.17×10^{-8}	101
	SFLA14-135	1.24×10^{-8}	95
	SFLA14-143	1.29×10^{-8}	91
	SFLA14-151	1.36×10^{-8}	86
—	SFLA14-159	1.42×10^{-8}	83
	SFLA14-167	1.48×10^{-8}	79
	SFLA14-175	1.54×10^{-8}	76
	SFLA14-183	1.60×10^{-8}	73
	SFLA14-191	1.66×10^{-8}	70
	SFLA14-199	1.73×10^{-8}	68

■ Hand detection (SFL(A)20-□, Ø 20 mm)

SFL Series	SFLA Series	PFH_D	MTTFd (years)
SFL20-12	SFLA20-12	3.23×10^{-9}	398
SFL20-16	SFLA20-16	3.55×10^{-9}	358
SFL20-20	SFLA20-20	4.00×10^{-9}	314
SFL20-24	SFLA20-24	4.31×10^{-9}	289
SFL20-28	SFLA20-28	4.76×10^{-9}	260
SFL20-32	SFLA20-32	5.08×10^{-9}	242
SFL20-36	SFLA20-36	5.53×10^{-9}	221
SFL20-40	SFLA20-40	5.85×10^{-9}	208
SFL20-44	SFLA20-44	6.29×10^{-9}	193
SFL20-48	SFLA20-48	6.61×10^{-9}	183
SFL20-52	SFLA20-52	7.06×10^{-9}	171
SFL20-56	SFLA20-56	7.38×10^{-9}	163
SFL20-60	SFLA20-60	7.82×10^{-9}	153
SFL20-64	SFLA20-64	8.14×10^{-9}	147
SFL20-68	SFLA20-68	8.59×10^{-9}	139
	SFLA20-72	8.91×10^{-9}	134
	SFLA20-76	9.35×10^{-9}	127
	SFLA20-80	9.67×10^{-9}	123
	SFLA20-84	1.01×10^{-8}	117
	SFLA20-88	1.04×10^{-8}	113
	SFLA20-92	1.09×10^{-8}	109
—	SFLA20-96	1.12×10^{-8}	105
	SFLA20-100	1.16×10^{-8}	101
	SFLA20-104	1.20×10^{-8}	98
	SFLA20-108	1.24×10^{-8}	95
	SFLA20-112	1.27×10^{-8}	92
	SFLA20-116	1.32×10^{-8}	89
	SFLA20-120	1.35×10^{-8}	87
	SFLA20-124	1.39×10^{-8}	84

■ Hand-Body detection (SFL(A)30-□, Ø 30 mm)

SFL Series	SFLA Series	PFH_D	MTTFd (years)
	SFLA30-9	3.06×10-9	423
	SFLA30-12	3.32×10-9	386
	SFLA30-15	3.71×10-9	341
	SFLA30-18	3.97×10-9	316
	SFLA30-21	4.36×10-9	285
—	SFLA30-24	4.63×10-9	268
	SFLA30-27	5.02×10-9	245
	SFLA30-30	5.28×10-9	232
	SFLA30-33 01)	5.67×10-9	215
	SFLA30-36 01)	5.93×10-9	205
	SFLA30-39 01)	6.32×10-9	192
SFL30-42	SFLA30-42	6.58×10-9	184
SFL30-45	SFLA30-45	6.97×10-9	173
SFL30-48	SFLA30-48	7.23×10-9	166
SFL30-51	SFLA30-51	7.62×10-9	157
SFL30-54	SFLA30-54	7.88×10-9	152
SFL30-57	SFLA30-57	8.27×10-9	144
SFL30-60	SFLA30-60	8.54×10-9	140
SFL30-63	SFLA30-63	8.93×10-9	133
SFL30-66	SFLA30-66	9.19×10-9	129
SFL30-69	SFLA30-69	9.58×10-9	124
SFL30-72	SFLA30-72	9.84×10-9	120
SFL30-75	SFLA30-75	1.02×10-8	116

01) KCs certified products

Response Time / Current Consumption

Response time is based on when the switch is factory settings. The time may differ if the setting is changed.

- TOFF (ON → OFF): Time when OSSD output is switched from ON to OFF state
- TON (OFF → ON): Time when OSSD output is switched from OFF to ON state

To calculate the response time in series connection, see the "SFL/SFLA User Manual."

■ Finger detection (SFL(A)14-□, Ø 14 mm)

SFL Series	SFLA Series	Response time (ms)		Current consumption (mA)	
		T_{OFF}	T_{ON}	Emitter	Receiver
SFL14-15	SFLA14-15	8.7 ms	18.1 ms	69 mA	94 mA
SFL14-23	SFLA14-23	9.7 ms	20.6 ms	71 mA	97 mA
SFL14-31	SFLA14-31	10.7 ms	23.1 ms	72 mA	101 mA
SFL14-39	SFLA14-39	11.7 ms	25.6 ms	74 mA	105 mA
SFL14-47	SFLA14-47	12.8 ms	28.1 ms	76 mA	109 mA
SFL14-55	SFLA14-55	13.8 ms	30.6 ms	77 mA	113 mA
SFL14-63	SFLA14-63	14.8 ms	33.2 ms	79 mA	116 mA
SFL14-71	SFLA14-71	15.8 ms	35.7 ms	80 mA	120 mA
SFL14-79	SFLA14-79	16.9 ms	38.2 ms	82 mA	124 mA
SFL14-87	SFLA14-87	17.9 ms	40.7 ms	84 mA	128 mA
SFL14-95	SFLA14-95	18.9 ms	43.2 ms	85 mA	132 mA
SFL14-103	SFLA14-103	19.9 ms	45.7 ms	87 mA	135 mA
SFL14-111	SFLA14-111	20.9 ms	48.3 ms	88 mA	139 mA
	SFLA14-119	22.0 ms	50.8 ms	90 mA	143 mA
	SFLA14-127	23.0 ms	53.3 ms	92 mA	147 mA
	SFLA14-135	24.0 ms	55.8 ms	93 mA	151 mA
	SFLA14-143	25.0 ms	58.3 ms	95 mA	154 mA
	SFLA14-151	26.1 ms	60.8 ms	96 mA	158 mA
—	SFLA14-159	27.1 ms	63.3 ms	98 mA	162 mA
	SFLA14-167	28.1 ms	65.9 ms	100 mA	166 mA
	SFLA14-175	29.1 ms	68.4 ms	101 mA	170 mA
	SFLA14-183	30.1 ms	70.9 ms	103 mA	173 mA
	SFLA14-191	31.2 ms	73.4 ms	104 mA	177 mA
	SFLA14-199	32.2 ms	75.9 ms	106 mA	181 mA

■ Hand detection (SFL(A)20-□, Ø 20 mm)

SFL Series	SFLA Series	Response time (ms)		Current consumption (mA)	
		T_{OFF}	T_{ON}	Emitter	Receiver
SFL20-12	SFLA20-12	9.3 ms	19.7 ms	64 mA	91 mA
SFL20-16	SFLA20-16	10.1 ms	21.7 ms	65 mA	93 mA
SFL20-20	SFLA20-20	11.0 ms	23.8 ms	67 mA	95 mA
SFL20-24	SFLA20-24	11.8 ms	25.8 ms	68 mA	97 mA
SFL20-28	SFLA20-28	12.6 ms	27.8 ms	69 mA	99 mA
SFL20-32	SFLA20-32	13.4 ms	29.9 ms	70 mA	102 mA
SFL20-36	SFLA20-36	14.2 ms	31.9 ms	71 mA	104 mA
SFL20-40	SFLA20-40	15.1 ms	33.9 ms	72 mA	106 mA
SFL20-44	SFLA20-44	15.9 ms	36.0 ms	73 mA	108 mA
SFL20-48	SFLA20-48	16.7 ms	38.0 ms	74 mA	110 mA
SFL20-52	SFLA20-52	17.5 ms	40.0 ms	75 mA	113 mA
SFL20-56	SFLA20-56	18.4 ms	42.1 ms	76 mA	115 mA
SFL20-60	SFLA20-60	19.2 ms	44.1 ms	78 mA	117 mA
SFL20-64	SFLA20-64	20.0 ms	46.1 ms	79 mA	119 mA
SFL20-68	SFLA20-68	20.8 ms	48.2 ms	80 mA	121 mA
	SFLA20-72	21.6 ms	50.2 ms	81 mA	124 mA
	SFLA20-76	22.5 ms	52.2 ms	82 mA	126 mA
	SFLA20-80	23.3 ms	54.3 ms	83 mA	128 mA
	SFLA20-84	24.1 ms	56.3 ms	84 mA	130 mA
	SFLA20-88	24.9 ms	58.3 ms	85 mA	132 mA
	SFLA20-92	25.7 ms	60.4 ms	86 mA	135 mA
—	SFLA20-96	26.6 ms	62.4 ms	87 mA	137 mA
	SFLA20-100	27.4 ms	64.4 ms	89 mA	139 mA
	SFLA20-104	28.2 ms	66.5 ms	90 mA	141 mA
	SFLA20-108	29.0 ms	68.5 ms	91 mA	143 mA
	SFLA20-112	29.8 ms	70.5 ms	92 mA	146 mA
	SFLA20-116	30.7 ms	72.6 ms	93 mA	148 mA
	SFLA20-120	31.5 ms	74.6 ms	94 mA	150 mA
	SFLA20-124	32.3 ms	76.6 ms	95 mA	152 mA

■ Hand-Body detection (SFL(A)30-□, Ø 30 mm)

SFL Series	SFLA Series	Response time (ms)		Current consumption (mA)	
		T_{OFF}	T_{ON}	Emitter	Receiver
	SFLA30-9	8.8 ms	18.5 ms	64 mA	91 mA
	SFLA30-12	9.5 ms	20.1 ms	65 mA	93 mA
	SFLA30-15	10.1 ms	21.7 ms	67 mA	95 mA
	SFLA30-18	10.8 ms	23.4 ms	68 mA	97 mA
	SFLA30-21	11.4 ms	25.0 ms	69 mA	99 mA
	SFLA30-24	12.1 ms	26.6 ms	70 mA	102 mA
	SFLA30-27	12.7 ms	28.2 ms	71 mA	104 mA
	SFLA30-30	13.4 ms	29.8 ms	72 mA	106 mA
	SFLA30-33 01)	14.0 ms	31.4 ms	73 mA	108 mA
	SFLA30-36 01)	14.7 ms	33.0 ms	74 mA	110 mA
	SFLA30-39 01)	15.3 ms	34.6 ms	75 mA	113 mA
SFL30-42	SFLA30-42	16.0 ms	36.2 ms	76 mA	115 mA
SFL30-45	SFLA30-45	16.6 ms	37.8 ms	78 mA	117 mA
SFL30-48	SFLA30-48	17.3 ms	39.4 ms	79 mA	119 mA
SFL30-51	SFLA30-51	17.9 ms	41.1 ms	80 mA	121 mA
SFL30-54	SFLA30-54	18.6 ms	42.7 ms	81 mA	124 mA
SFL30-57	SFLA30-57	19.2 ms	44.3 ms	82 mA	126 mA
SFL30-60	SFLA30-60	19.9 ms	45.9 ms	83 mA	128 mA
SFL30-63	SFLA30-63	20.5 ms	47.5 ms	84 mA	130 mA
SFL30-66	SFLA30-66	21.2 ms	49.1 ms	85 mA	132 mA
SFL30-69	SFLA30-69	21.8 ms	50.7 ms	86 mA	135 mA
SFL30-72	SFLA30-72	22.5 ms	52.3 ms	87 mA	137 mA
SFL30-75	SFLA30-75	23.1 ms	53.9 ms	89 mA	139 mA

01) KCs certified products

Functions

■ Safety-related functions

- Interlock

Interlock is safety-related function, when OSSD output is switched to OFF state due to power on or, blocked beams or an error occurs during operation, keeping its OFF state when the beams are clear or the error is fixed. The interlock is reset by auto-reset or manual reset.

- Lockout reset

Lockout means that if an error occurs during self-test or operation, OSSD output goes to OFF state within the response time and maintains it.
After fixing the cause of the error, power on again or apply the reset input for more than 1 second. Then the light curtain performs self-test. If there is no error after the test, the lockout condition is released.
Depending on the cause of the error, the lockout condition may not be released.
If the lockout condition is not released by the reset input, power on again.

- External Device Monitoring (EDM)

This function monitors the state of external devices (e.g. safety relay, connectors, etc) connected to the OSSD output.

- Muting

In the muting condition, the OSSD output maintains ON state regardless of the object in the muting zone. You can set the muting zone as an entire or part of the detection zone.

- Override

Muting function ends due to the muting conditions, and OSSD outputs go to OFF, but resulting in an object in the detection zone. The override function is used to clear the detection zone; the OSSD outputs are switched to ON, and it deliberately removes the object.

- Blanking

If an attached or fixed object is in the detection zone, resulting in the OFF state of OSSD continuously, you can set the blocked beams as a blanking zone. The blanking function will not detect an object and allows the OSSD output to be maintained ON state.
You can use the fixed blanking function when a fixed object or materials continuously blocks certain beams of the light curtain. If the location of a moving object is changing, use the floating blanking function.

- Reduced resolution

Reduced resolution is a function that changes the detection capability of the light curtain. Even if the light curtain is blocked by the moving objects with a diameter smaller than the changed detection capability are ignored in the detection zone, resulting in the OSSD output is maintained ON state. The number of ignored beams can be set from 1 to 3 beams.

■ General functions

- Self-test

This function diagnoses an internal error of the light curtain.
Self-test is performed once within 2 seconds when power is on. Periodic self-test is performed during operation; it completes within the response time.The error is displayed on the status indicators and 7-segment LEDs.

- Alarm for incident light level

The received signal is divided into three areas (stable light ON, unstable light ON, and stable light OFF) based on the light incident level as follows.
The light incident level determines either OSSD output is ON or OFF and the OSSD indicators display the condition. And 7-segment indicator displays the level of the lowest light receiving beam (0 to 9 levels). The amount of received light may decrease due to the product distortion or long-term use. If the amount of received light, even one beam, decreases less than from 15 to 35% and lasts for more than 30 minutes, the alarm for the sensitivity reduction occurs.

• Mutual interference prevention
When you install more than two products, there is a risk of mutual interference. Change the frequency to prevent this interference. Change to frequency A or B using setting switch or atLightCurtain. If you change the frequency, the response time may be changed and affect original response time.

■ Other functions

• Series connection
If you need to extend the detection zone, connect the light curtains via series connection cable to use two or more emitter and receivers as one product.
It can be extended up to max. 3 sets / 300 beams for SFL and up to max. 4 sets / 400 beams for SFLA. The operation and control of light curtains in series connection are synchronized with the settings of the master. For example, if any light curtain is blocked, the OSSD outputs of all light curtains are switched to OFF state.

• Change sensing distance
It is the function to change the sensing distance to meet installation environment.
If you change the sensing distance, there is an effect to mutual interference.

Mode	Detection capability	Sensing distance
Short mode	Ø 14 mm (Finger)	0.2 to 5 m
	Ø 20 mm (Hand), Ø 30 mm (Hand-Body)	0.2 to 8 m
Long mode	Ø 14 mm (Finger)	0.2 to 10 m
	Ø 20 mm (Hand), Ø 30 mm (Hand-Body)	0.2 to 15 m

• Set NPN or PNP
You can set input/output of OSSD, auxiliary output (AUX 1, 2), and lamp output (Lamp 1/2). The ON or OFF state of input is determined by the output polarity.

• External test (stop transmission)
The external test is a function for; When the test signal is applied from the outside of the light curtain, it forcibly stops light emission and checks whether the safety system stops correctly. If the light emission stops, the light curtain is blocked, resulting in OSSD output is switched to the OFF state until the test input is released.The emitter operates again when the test input is released. If the restarted interlock is activated, entering interlock condition.
If the restarted interlock is activated, entering interlock condition.

• Non-safety output (auxiliary output, AUX 1 / 2)
The auxiliary output is an optional output for monitoring the status of the light curtain. It is provided at the bottom of the emitter and receiver.
Do not use the auxiliary output for safety purposes. This output cannot be deactivated.

• Non-safety output (lamp output, LAMP 1 / 2)
The lamp output is an optional output for monitoring the status of light curtain such as short-circuit, and disconnection of the load, damage and overcurrent. It is provided at the top of the emitter and receiver. After removing the end cap, the dedicated cable can be cconnected.
Do not use the lamp output for safety purposes. To activate the lamp output, you must remove the end cap.

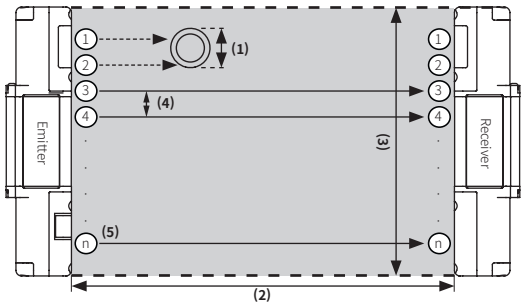
■ Combination of functions

	Interlock	Reset-hold	EDM	Muting	Override	Fixed blanking	Floating blanking	Reduced Resolution
Interlock	-	○ 01)	○	○	○	○	○	○
Reset-hold	○ 01)	-	○	× 02)	× 02)	× 03)	× 03)	○
EDM	○	○	-	○	○	○	○	○
Mution	○	× 02)	○	-	○	○ 04)	○ 04)	×
Override	○	× 02)	○	○	-	○	○	×
Fixed blanking	○	× 03)	○	○ 04)	○	-	○ 05)	×
Floating blanking	○	× 03)	○	○ 04)	○	○ 05)	-	×
Reduced Resolution	○	○	○	×	×	×	×	-

01) The reset-hold function is available only when the manual reset is activated.
02) The auxiliary output of emitter (AUX2) and reset-hold functions are not available when the muting or override is activated.
03) The functional combination of the reset-hold with fixed blanking and floating blanking is unavailable.
04) Both the muting zone and blanking zone can be set simultaneously.
05) Both Functions, fixed blanking and floating blanking, are simultaneously configurable, but a zone where the two functions overlap cannot be set.

Glossary

※The gray area is the detection zone.



(1) Detection capability
: The minimum diameter of the detectable cylindrical object (mm).
(2) Sensing distance
: The maximum distance between the emitter and receiver that can detect an object with the minimum detection capability.
(3) Protective height
: The height at which the minimum detection object can be detected in the direction of the optical axis.
(4) Optical axis pitch: Distance between the optical axis and the next optical axis (mm).
(5) Number of beams
: Number of optical axes that consist of the emitter and receiver. (same as emitter and receiver)

How to Install and Adjust Your Light Curtain

■ Install

01. Place the bracket in the position where the light curtain will be installed and install the emitter and the receiver face to each other.
Use suitable brackets meeting each method of mounting.
The type and number of brackets differ depending on the length of the light curtain.
02. Power on the light curtain.
03. Adjust the top and bottom beam of the light curtain to meet the centerline.
If the top and bottom beams are aligned, the indicator lights up.
You can monitor the light incident level via atLightCurtain.
04. If all beams are clear, tighten the bracket screws to fix it.

• If the beams are unstable because the beams are not completely aligned, the top beam and bottom beam indicators flash every 1 second. If the beams are blocked, the indicators light off.
• Do not install the light curtain in a place that is exposed directly to fluorescent lamps operating with a quick start or high frequency.

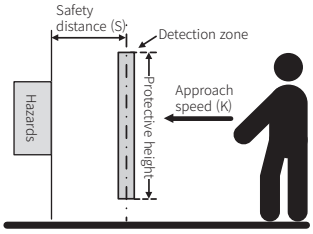
■ Safety distance

A safety distance is a minimum distance that a machine stops before the human or object approaches to hazards.
If you do not consider the safety distance when installing the light curtain, the machine may not stop before the human reaches hazards so that it may result in personal injury. The safety distance calculation may differ from laws, regulations, and standards. Therefore, be sure to use the appropriate formula which abides by the rules of the country.

Safety distance according to ISO 13855 (EN ISO 13855, KS C 13855) (basic formula)

S = K × T + C

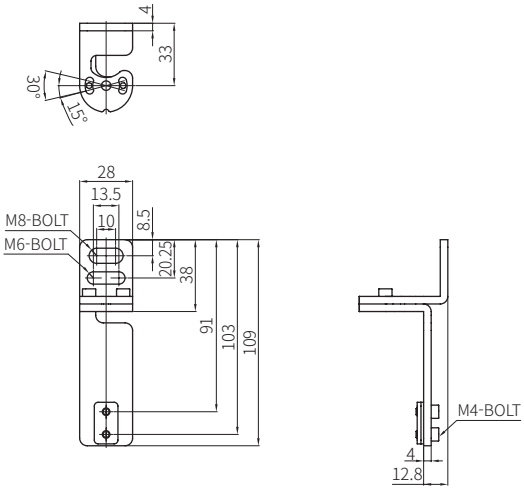
• Safety distance (S)
: minimum distance from the detection zone to the hazards
• Approach speed (K)
: The human approach speed in the detection zone
• The total stopping time of entire system (T) : T=t1+t2
(t1: the produect response time,
t2: response time of the safety system)
• Additional distance(C)
: Additional distance calculated from the detection capability



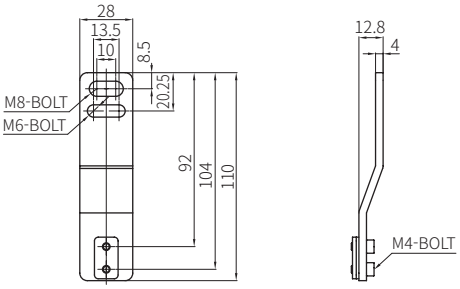
Sold Separately: Brackets

- Unit: mm, For the detailed dimensions of the product, follow the Autonics website.
- Tighten the brackets screws with a torque of 0.98 N m.

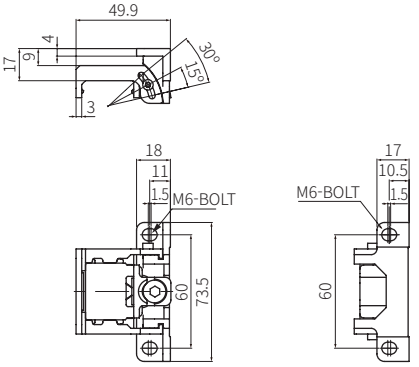
■ Top / Bottom adjustable bracket (BK-SFL-TBA)



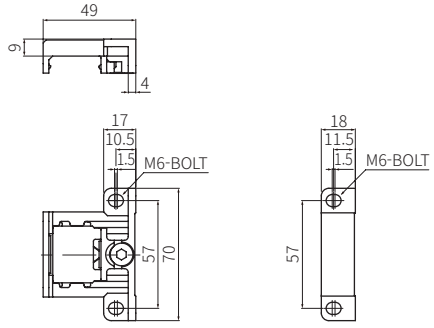
■ Top / Bottom bracket (BK-SFL-TBF)



■ Side adjustable bracket (BK-SFL-SA)



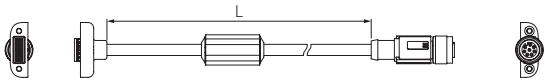
■ Side bracket (BK-SFL-SF)



Sold Separately: Connection Cable

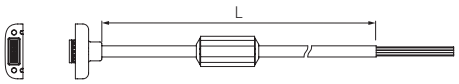
- Unit: mm, For the detailed dimensions of the product, follow the Autonics website.
- Tighten the connecting cable screws with a torque of 0.59 N m.

■ Power I/O cable (connector type)



Model		Length (L)
Emitter (black)	Receiver (black)	
SFL-BCT	SFL-BCR	0.3 m

■ Power I/O cable (wire type)

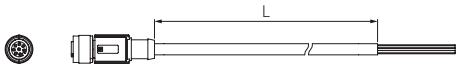


Model		Length (L)
Emitter (black)	Receiver (black)	
SFL-C3T	SFL-C3R	3 m
SFL-C7T	SFL-C7R	7 m
SFL-C10T	SFL-C10R	10 m
SFL-C15T	SFL-C15R	15 m

■ Connector cable

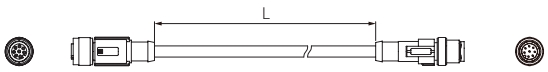
Pin No.	Color	Emitter (black)	Receiver (black)
1	Blue	0 V	0 V
2	Orange	Reset hold input / Mute 1 input	EDM input
3	Yellow	RS485(B)	RS485(B)
4	Red	RS485(A)	RS485(A)
5	Pink	AUX 2 output / Mute 2 input	AUX 1 output
6	Black	External test input	OSSD 1 output
7	White	Reset input	OSSD 2 output
8	Brown	+24 VDC⎓	+24 VDC⎓

- Socket type



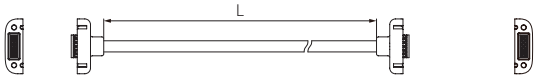
Model		Length (L)
Emitter (black)	Receiver (black)	
CID8-3T	CID8-3R	3 m
CID8-5T	CID8-5R	5 m
CID8-7T	CID8-7R	7 m
CID8-10T	CID8-10R	10 m

- Socket-plug type



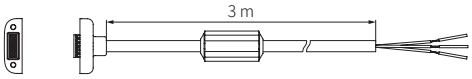
Model		Length (L)
Emitter (black)	Receiver (black)	
C1D8-3T	C1D8-3R	3 m
C1D8-5T	C1D8-5R	5 m
C1D8-7T	C1D8-7R	7 m
C1D8-10T	C1D8-10R	10 m
C1D8-15T	C1D8-15R	15 m
C1D8-20T	C1D8-20R	20 m

■ Series connection cable



Model		Length (L)
Emitter (black)	Receiver (black)	
SFL-EC03T	SFL-EC03R	0.3 m
SFL-EC3T	SFL-EC3R	3 m
SFL-EC7T	SFL-EC7R	7 m
SFL-EC10T	SFL-EC10R	10 m

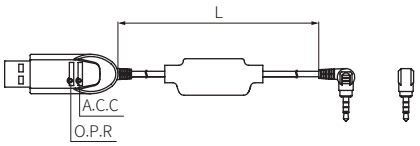
■ Lamp output cable



Model	Length (L)
SFL-LC	3 m

Color	Function
Blue	0 V
Brown	+24 VDC⎓
Black	Lamp output

■ USB / Serial communication converter



Model	Length (L)
SCM-US	1.5 m

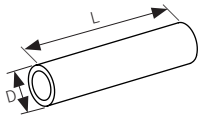
Item	Indicator color	Function
A.C.C	Green	Rx / Tx Data Transmission
O.P.R	Red	Power

■ SFL / SFLA dedicated converter cable

Model	Length (L)
EXT-SFL	0.3 m

■ Test piece

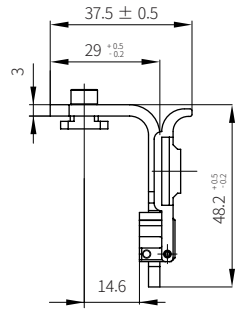
- The test piece is a black opaque object.

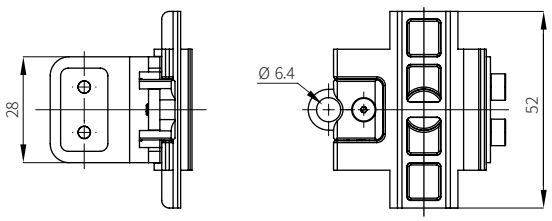


Model	Diameter (D)	Length (L)
SFL-T14	Ø 14 mm	200 mm
SFL-T20	Ø 20 mm	
SFL-T30	Ø 30 mm	

Sold Separately: LOTO (Lockout-Tagout) Device

- Unit: mm, For the detailed dimensions of the product, follow the Autonics website.
- The optical axis is forcibly blocked to maintain the interlock condition to prevent the equipment from restarting.
- For using the safety related functions (muting, blanking, reduced resolution) that disable detection, thoroughly analyze the potential for hazards and install this device.
- For more information, see the "SFL/SFLA User Manual."





Safety Controllers / Safety Relay Unit

SFC / SFC-R 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

- Slim size (17.5 / 22.5 / 35 mm) for saving installation space
- Various LED indicators for displaying status (power / input / logic input / error / feed back / output)
- Screw / Screwless connection models
- P channel FET / Relay contact safety output models
- Available off-delay output and time setting (advanced/non-contact door switch/relay output models)
- Available logic (AND) connection and extension relay unit connection (advanced/non-contact door switch models)
- The product structure conforms with international safety regulations and standards : SIL3, SIL CL3, PLe, CE, UL Listed, and S Mark

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. **Responsible person for use is an operator who:**
    - is fully knowledgeable about the installation, settings, use and maintenance of the product
    - is familiar with the requirements of laws, regulations and standards in the country or region where the product is installed and used.
    Responsible person for use has an obligation to educate the requirements to machine users.
    Machine users are persons who have been fully trained by the responsible person for use and can operate the machine correctly. When any error occurs during the operation of the machine control system, they have a responsibility to report it to the responsible person for use immediately.
    If an unqualified person operates the product, it may result in personal injury, economic loss or fire.
03. **Qualified personnel shall carry out installation, configuration and combination with the machine control system.**
    If an unqualified person carry out installation, configuration and combination with the machine control system, it may cause malfunction or result in accidents.
04. **When the connected devices (e.g., motor) is not operating after installation, check that functions and settings of the product correctly operate as you intended.**
    Failure to follow this instruction may result in personal injury, economic loss or fire.
05. **Be sure to consider the delay of the safety output when determining the safety distance to the hazardous source due to the response time (safety input and logic input), setting of off-delay time and off-delay time accuracy.**
    The machine may not stop before an operator reaches the hazardous zone so that it may result in personal injury and economic loss.
06. **Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, salinity, moisture, or steam, or dust may be present.**
    Failure to follow this instruction may result in explosion or fire.
07. **Do not disassemble or modify the unit.**
    Failure to follow this instruction may result in personal injury or fire. In addition, the manufacturer does not guarantee the performance and functionality.
08. **Do not connect, repair, inspect, or replace the unit while connected to a power source.**
    Failure to follow this instruction may cause the external devices connected to the product may unexpectedly operate. For more information, please refer to laws, regulations and standards in the country or region.
09. **Install the product on a device panel or DIN rail inside the control room with IP54 or higher protection structure.**
    Failure to follow this instruction may result in fire or electric shock.
10. **When using the product mounted on a DIN rail, fix it using an End plate (sold separately).**
    Failure to follow this instruction may result in fire or electric shock.
11. **When you use the product in a place where vibrations or shocks are very high, use screws to fix it to the panel for use.**
    Failure to follow this instruction may result in personal injury and fire.
12. **Check 'Connections' before wiring. And make sure that there are no safety problems.**
    Failure to follow this instruction may result in fire.
13. **You must conduct daily and regular inspections every six months.**
    Failure to follow this instruction may result in personal injury, economic loss or fire due to the malfunction of the product.
14. **The auxiliary output is non-safety output, therefore, do not use it for safety purposes.**
    Failure to follow this instruction may result in personal injury, economic loss or fire.
15. **This product is designed to comply with industrial environment A. Use of this product in residential environment B may cause unwanted electromagnetic interference. In this case, it requires to take appropriate mitigation measures.**

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

01. Use the product within the rated specifications.
Failure to follow this instruction may result in fire or product damage.
02. 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.
03. When connecting the power input and relay output, use AWG 18 (0.8mm²) cable or over and tighten the terminal screw model with a tightening torque of 0.3 N·m. Use the copper-conductor wire with the temperature class 60°C.
Failure to follow this instruction may result in fire or malfunction due to contact failure.
04. Keep the product away from metal chip, dust, and wire residue which might flow into the unit.
Failure to follow this instruction may result in fire, product damage or malfunction.
05. The durability of relay output depends on conditions of relay switching and load. Be sure to test under actual operating conditions and use it within the appropriate switching cycles without problem on product performance.
Failure to follow this instruction may result in fire or product damage.
06. Do not touch the relay output terminal immediately after the power source to the load is disconnected.
Failure to follow this instruction may result in electric shock.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- The power input is insulated and limited voltage/current or use SELV, Class 2 power supply.
- Connect a protective device (fuse etc.) to the safety output terminal for short-circuit, overcurrent and ground fault protection.
  Failure to follow this instruction may result in fire or malfunction.
- Do not use AC and DC circuits together between safety output terminals.
  -SFC-R212: between 13-14 terminal and 23-24 terminal
  -SFC-R412, SFC-ER412: between 13-14 terminal and 23-24 terminal or between 33-34 terminal and 43-44 terminal
  -SFC-R212-R2□: between 13-14 terminal and 23-24 terminal or between 37-38 terminal and 47-48 terminal
- 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 the product near the equipment which generates strong magnetic force or high frequency noise.
- Do not drop the product or expose it to excessive vibration or shock. It may cause failure or malfunction.
- Be sure to turn off the power before connecting, inspecting and repairing the product. It may cause malfunction or short circuit
- When mounting the products close to each other, the rated current of the relay output is 3A. Do not apply a current greater than 3A. If the current in the relay output flows 3A, or more, make sure that the distance between the products should be 20mm or more.
- Assessment of conformity to the required safety level is evaluated for the entire system. Please consult with a certified certification body regarding the assessment procedure.
- Be sure to set the off-delay time to maintain the safety function of the system. Set the setting of off-delay switch on both the front and back sides to the same value. If you set it differently, an error occurs.
- For switches used for safety inputs, logic input and feedback start input, use a switch with contacts capable of normally switching the micro loads (24 VDC⎓, 5mA).
- It should be done away regarded as an industrial waste. For more information, please refer to laws, regulations and standards in the country or region.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000m
  - Pollution degree 3
  - Installation category III

Ordering Information

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

SFC - ❶ ❷ ❸ 2 - ❹ ❺ ❻ - ❼

❶ Function
No mark: Basic unit
A: Advanced unit
N: Non-contact door switch unit (for Autonics SFN Series)
ER: Expansion relay unit
R: Relay unit

❷ No. of safety instantaneous outputs
Number: Number of outputs

❸ No. of auxiliary outputs
Number: Number of outputs

❹ Off-delay output elements
No mark: P channel FET
R: Relay (Relay unit)

❺ No. of Off-delay outputs
No mark: None
2: 2

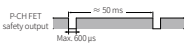
❻ Max. Off-delay time
Number: Time (unit: sec)

❼ Terminal type
No mark: Screw
L: Screwless

Specifications

Unit	Basic	Advanced	Non-contact door switch
Model	**SFC-422-□**	**SFC-A322-2□-□**	**SFC-N322-2□-□**
Power supply	24 VDC⎓		
Allowable voltage range	85 to 110% of rated voltage		
Power consumption [01]	≤ 2.5 W	≤ 3.0 W	≤ 3.5 W
Input	ON: ≥ 11 VDC⎓ ≥ 5 mA, OFF: ≤ 5 VDC⎓ ≤ 1 mA		
Input time	≥ 50 ms, feedback start (manual) : ≥ 100 ms		
Cable	≤ 100 m (≤ 100Ω, ≤ 10nF)		
Safety output	P channel FET [02]		
Instantaneous	4 ×	3 × [03]	3 × [03]
Off-delay [04]	-	2 × [03]	2 × [03]
Time accuracy	-	≤ ± 5%	≤ ± 5%
Load current	Below 2-point output: ≤ DC 1 A, Over 3-point output: ≤ DC 0.8 A		
Leakage current	≤ 0.1 mA		
Operating time (OFF → ON) [05]	Safety input: ≤ 50 ms		
	-	Logic input: ≤ 200 ms	
	-	-	Non-contact door switch input: ≤ 100 ms
Response (return) time (ON → OFF) [05]	≤ 15 ms, non-contact door switch input or logic input: ≤ 20 ms		
Auxiliary output	2 × PNP transistor: X1, X2 (error)		
Load current	≤ 100 mA		
Leakage current	≤ 0.1 mA		
Logical AND connections	No. of connections: max. 4 units, no. of total connections: max. 20 units No. of layers: max. 5 layers, cable length: ≤ 100 m		
SFN connections [06]	-	-	Max. 30 units
Approval	IEC/EN 61508 (SIL3), IEC/EN 62061 (SILCL3) IEC/EN 60947-5-1, EN ISO 13849-1 (Category 4, PLe) UL listed E249635		
Certification	CE TÜVNORD UL S		
Unit weight (package)	≈ 70 g (≈ 120 g)	≈ 90 g (≈ 140 g)	≈ 100 g (≈ 150 g)

01) Not include the power consumption of loads.
(SFC-N exclude the power supplied to the non-contact door switch.)
02) Includes a diagnostic pulse (max. 600 µs). Be cautious when using the output signal as an input signal for the control device.



03) Available changing via setting switch on the back side of the product.
04) Available to set Off-delay time (max. 3 sec. / 300 sec., depends on model)
05) The operation (response) time of each model. The time increases when a logical connection or expansion relay unit is connected.
06) SFC-N units can only be connected to Autonics non-contact door switch units SFN Series.

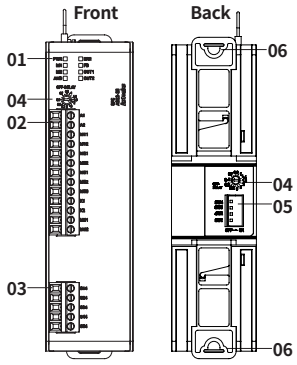
Unit	Expansion relay	Relay		
Model	**SFC-ER412-□**	**SFC-R412-□**	**SFC-R212-□**	**SFC-R212-R2□-□**
Power supply	24 VDC⎓			
Allowable voltage range	85 to 110% of rated voltage			
Power consumption [01]	≤ 2.5 W	≤ 4.0 W	≤ 4.0 W	≤ 6.0 W
Input	ON: ≥ 11 VDC⎓ ≥ 5 mA, OFF: ≤ 5 VDC⎓ ≤ 1 mA			
Input time	≥ 50 ms, feedback start (manual) : ≥ 100 ms			
Cable	≤ 100 m (≤ 100Ω, ≤ 10nF)			
Safety output	Relay (A contact)	Relay (A contact)		
Instantaneous	4 ×	4 ×	2 ×	2 ×
Off-delay [02]	-	-		2 ×
Time accuracy	-	-		≤ ± 5%
Capacity	240 VAC~ 5 A resistance load, 30 VDC⎓ 5 A resistance load			
Life expectancy	Mechanical: ≥ 10,000,000 operations, Malfunction: ≥ 50,000 operations			
Contact resistance	≤ 100 mΩ			
Inductive load switching	IEC60947-5-1: AC-15(230 V/2 A), DC-13(24 V/1.5 A), UL508: B300/R300			
Conditional short-circuit current	100 A [03]			
Operating time (OFF → ON) [04]	≤ 30 ms [05]	≤ 100 ms		
Response (return) time (ON → OFF) [04]	≤ 10 ms	≤ 15 ms		
Auxiliary output	1 × PNP transistor: X2 (error)	1 × PNP transistor: X1		
Load current	≤ 100 mA	≤ 100 mA		
Leakage current	≤ 0.1 mA			
Expansion units connections	Max. 5 units	-		
Approval	IEC/EN 61508 (SIL3), IEC/EN 62061 (SILCL3) IEC/EN 60947-5-1, EN ISO 13849-1 (Category 4, PLe) UL listed E249635			
Certification	CE UL	CE TÜVNORD UL S		
Unit weight (package)	≈ 100 g (≈ 150 g)	≈ 110 g (≈ 160 g)	≈ 80 g (≈ 130 g)	≈ 110 g (≈ 150 g)

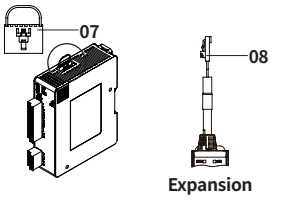
01) Not include the power consumption of loads.
02) Available to set Off-delay time (max. 3 sec. / 30 sec., depends on model)
03) Use 6 A fast-blow fuse under the IEC 60127 standard as a short-circuit protection device.
04) The operation (response) time of each model. The time increases when a logical connection or expansion relay unit is connected.
05) Except operation time of advanced unit, non-contact door switch unit

Pollution	3
Overvoltage category	III
Impulse withstand voltag for relay unit (IEC/EN 60947-5-1)	Input terminals and relay output terminals: 6 kV Relay contacts between 13-14 / 23-24 and 33-34 / 43-44 (37-38 / 47-48): 6 kV between 13-14 and 23-24: 4 kV between 33-34 and 43-44 (37-38 and 47-48): 4 kV
Dielectric strength	Basic / Advanced / Non-contact door switch unit: 500 VAC~ 50/60 Hz for 1 min. (between all terminals and case) Expansion relay / relay unit: 1,500 VAC~ 50/60 Hz for 1 min. (between all terminals and case) 2,500VAC~ 50/60Hz for 1 min. (between input terminals and output terminals [01])
Insulation resistance	≥ 100 MΩ (500 VDC⎓ megger)
Vibration [02]	0.75 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 1 hour
Vibration (malfunc.) [02]	0.5 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 10 minutes
Shock [02]	300 m/s² (≈ 30 G) in each X, Y, Z direction for 3 times
Shock (malfunc.) [02]	100 m/s² (≈ 10 G) in each X, Y, Z direction for 3 times
Protection structure	IP20
Ambient temperature	-10 to 55 °C, storage: -25 to 65 °C (rated at no freezing or condensation)
Ambient humidity	25 to 85 %RH, storage: 25 to 85 %RH (rated at no freezing or condensation)

01) In case of relay unit, output terminals between 13-14, 23-24 and 33-34, 43-44 (37-38, 47-48)
02) This data based on the product is mounted with bolts. When installing DIN rail, use the product in an environment with small vibration (condition: less than 0.4 mm double amplitude)

Parts Descriptions





01. Indicators

02. Power supply, I/O signal terminals

03. Safety output (P ch FET or relay) terminals

04. Setting switch for off-delay time

(only off-delay output model)

The settings of the switch on the front and back of the product must be the same. Other settings are displayed as an error.

05. Setting switch for function

(only advanced / non-contact door switch unit)

The setting of switches for each function must meet each other. Other settings are displayed as an error.

06. Rail Lock

07. Loop connector

(only advanced / non-contact door switch unit)

Do not disconnect the loop connector when using a single unit. When connecting the expansion relay unit, insert the loop connector to the loop port of a unit, which located at the end position (farthest to the right). If the loop connector is not inserted, FB error occurs.

08. Expansion connector

When connecting the expansion relay unit, remove the loop connector on the top of the controller and insert the expansion connector.

Indicators

Indicators / Model		SFC	SFC-A	SFC-N	SFC-ER	SFC-R□12-□	SFC-R212-R2□-□
PWR (green)	Power	●	●	●	●	●	●
M1 (white)	Safety input 1	●	●	●	—	●	●
M2 (white)	Safety input 2	●	●	●	—	●	●
NS (white)	Non-contact door switch input	—	—	●	—	—	—
AND (white)	Logic input	—	●	●	—	—	—
ERR (red)	Error	●	●	●	●	●	●
FB (white)	Feedback start input	●	●	●	—	●	●
OUT1 (green)	Instantaneous safety output	●	●	●	●	●	●
OUT2 (green)	Off-delay safety output	—	●	●	—	—	●

Setting Switches

■ Setting Switch for off-delay time

- Only off-delay output model
- Available to set off-delay time (max. 3 / 300 / 30 sec., depends on model)
- The settings of the switch on the front and back of the product must be the same. Other settings are displayed as an error.
- If the off-delay time is set as 0 (factory default), the product operates as the instantaneous output.

Model	Max. 3 sec.	Max. 300 sec.	Max. 30 sec.
	SFC-A322-23-□ SFC-N322-23-□ SFC-R212-R23-□	SFC-A322-2300-□ SFC-N322-2300-□	SFC-R212-R230-□
Total 16 level	0/0.2/0.3/0.4/0.5/0.6/0.7/0.8/0.9/1.0/1.2/1.4/1.8/2.0/2.5/3.0 sec.	0/10/20/30/40/50/60/70/80/90/100/120/150/180/240/300 sec.	0/1/2/4/5/6/7/8/9/10/12/14/16/20/25/30 sec.

■ Setting switch for function

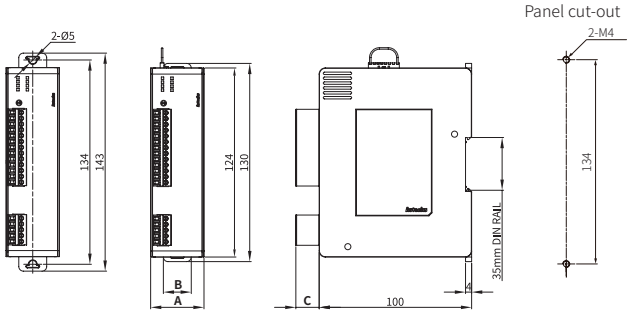
- Only advanced / Non-contact door switch unit.
- The setting of switches for each function must meet each other. Other settings are displayed as an error

Function	SW1	SW2	Logic (AND) input
Logic (AND) input	OFF	OFF	Not available
	ON	ON	Available

Function	SW3	SW4	Instantaneous safety output	Off-delay safety output
Off-delay safety output points	OFF	OFF	S14, S24, S34	S44, S54
	ON	ON	S14	S24, S34, S44, S54

Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics web site.
- The below is based on SFC-A (screw type) model



Mounting with bolts

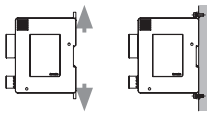
Mounting on DIN rail

Model		A	B	C
Basic unit	SFC-422-□	22.5	18.3	Screw type: 15.3 Screwless type: 15.5
Advanced unit	SFC-A322-□-□	35	18.3	
Non-contact door switch unit	SFC-N322-□-□	35	18.3	
Expansion relay unit	SFC-ER412-□	22.5	18.3	
Relay unit	SFC-R412-□	22.5	18.3	
	SFC-R212-□	17.5	13.3	
	SFC-R212-R□-□	22.5	18.3	

Installation

■ Mounting with bolts

1. Pull each rail locks to up and down.
   (attach/detach: ≥ 25N)
2. Insert bolts and fix it on rail lock.
   (fixing torque: 1.0 N m to 1.5 N m)

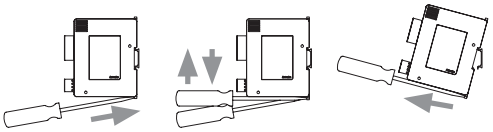


■ Mounting on DIN Rail

1. Hang the top rail lock to DIN rail.
2. Push and press the module to down direction.
3. Install END PLATE at both ends of the module to fix the products.
   (It is the same way when using one unit.)

■ Removing on DIN Rail

1. Insert a screwdriver into the rail hook of the lower rail lock.
2. Lift the screwdriver and pull the lower rail lock downward.
3. Lift the module with the lower rail lock pulled down.



■ How to connect the expansion relay units (SFC-ER412-□)

In case of advanced unit and non-contact door switch unit, it is possible to increase the number of safety outputs of relay type by connecting expansion relay unit (SFC-ER412-□). (Up to 5 expansion relay units can be connected to each controller)

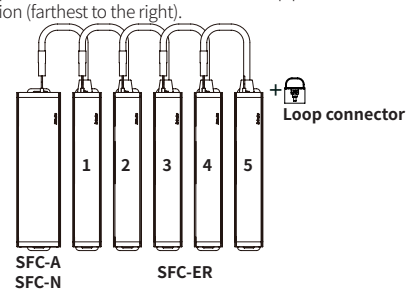
When the safety output of the controller is on, the output of the expansion relay unit also goes to on.

The controller is installed from the end of the left or right side.

Power of expansion relay unit should be supplied individually.

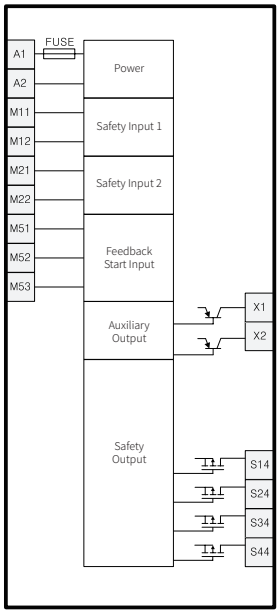
E.g.) Installation from the end of left side

1. Install the expansion relay units (max. 5 units) toward the right side based on the controller.
2. Remove the loop connector on the top of the controller.
3. Connect the expansion connector of each right (expansion relay unit) to the expansion connector of the left unit.
4. Insert the loop connector removed in 2 into the loop port of the unit, which located at the end position (farthest to the right).

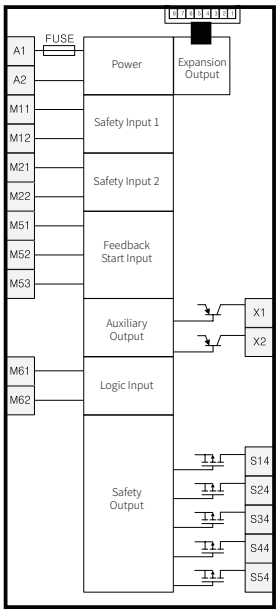


Connections

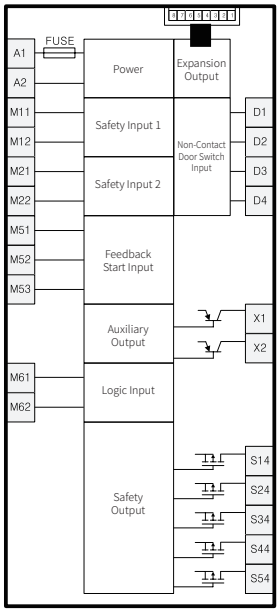
■ Basic unit: SFC-422-□



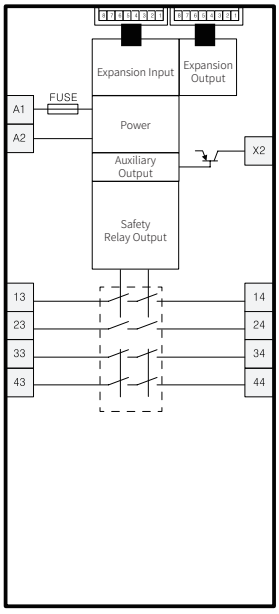
■ Advanced unit: SFC-A322-23□-□



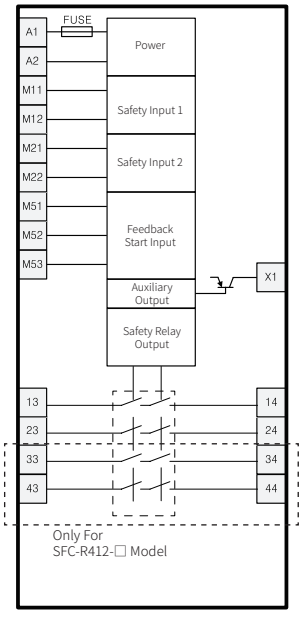
■ Non-contact door switch unit: SFC-N322-23□-□



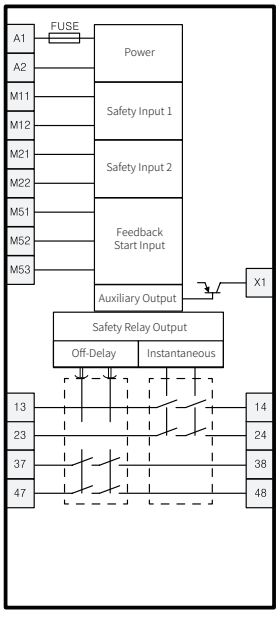
■ Expansion relay unit: SFC-ER412-□



■ Relay unit: SFC-R□12-□



■ Relay unit: SFC-R212-R2□-□



Wiring of Input

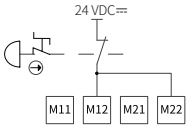
■ A1, A2: Power supply input

The input terminals for power supply. Connect the positive side (24 VDC⎓) of the external power supply to the A1 terminal and connect the negative side (GND) of the external power supply to the A2 terminal.

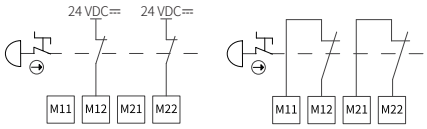
■ M11, M12: Safety input 1, M21, M22: Safety input 2

To turn ON the safety outputs, ON state signals must be input to both safety input 1 and safety input 2.

• 1-channel safety input



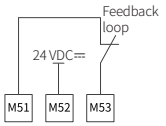
• 2-channel safety input



■ M51, M52, M53: Feedback start input

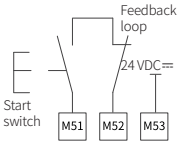
• Auto start

To turn ON the safety outputs, the feedback loop must remain ON state.



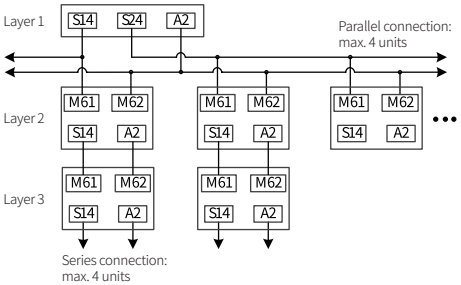
• Manual start

To turn ON the safety outputs, the feedback loop must remain ON state and the signal input to M52 must be changed from OFF state to ON state, and then to OFF state.
(The duration that the start switch is in the ON state: min. 100 ms)



■ M61, M62: Logic input

Connect the safety outputs of the upper unit to the logic (AND) input of the lower unit.
To use the logic input function, SW1 and SW2 of switch for setting function must be set to ON state.
Up to four units (advanced / non-contact door switch unit) can be connected as logic (AND) connections in parallel per safety output.
Up to four units can be connected in serial logic (AND) connection.
Up to 20 units can be connected to the entire unit via logic connection.
Basic unit can only be used in layer 1.



• Logical AND Connections

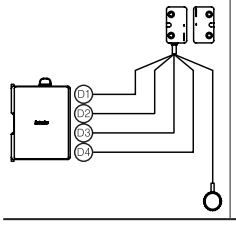
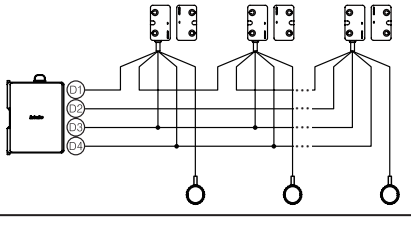
Unit	Basic / Advanced / Non-contact door switch unit
No. of units connected to logical AND connections	Max. 4 units
Total no. of units connected to logical AND connections	Max. 20 units
No. of layers for logical AND connections	Max. 5 layers
Cable length for logical AND connections	Max. 100 m

• Response time and Operating time

Item / Layer	Configuration	Max. response time (ON → OFF)		Max. operating time (OFF → ON)	
	Expansion unit	Excepts	Includes	Excepts	Includes
Layer 1	Basic / Advanced / Non-contact door switch unit	15 ms	25 ms	50 ms	80 ms
Layer 2	Advanced / Non-contact door switch unit	30 ms	40 ms	250 ms	280 ms
Layer 3		45 ms	55 ms	450 ms	480 ms
Layer 4		60 ms	70 ms	650 ms	680 ms
Layer 5		75 ms	85 ms	850 ms	880 ms

■ D1, D2, D3, D4: Non-contact door switch input

All the non-contact door switch inputs connected to the non-contact door switch SFN Series must be ON as a required condition for the safety outputs to be ON. Up to 30 non-contact door switches can be connected.
For more information, refer to the non-contact door switch SFN Series instruction manual.

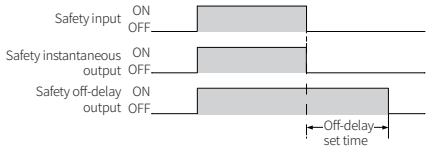
Wiring a single switch	Wiring multiple switch (up to 30 units)
	

Wiring of Output

■ S14, S24, S34, S44, S54 : P channel safety outputs

The instantaneous or off-delay safety outputs go to ON or OFF based on the safety inputs, feedback start input, logic input, and input signals of non-contact door switch.

- Leave unused safety outputs in the OPEN state.
- Configure a protection circuit against the counter electromotive force when connecting inductive loads.
- To expand the number of safety outputs in the form of contacts, connect the expansion cable of the expansion relay unit to advanced unit or the expansion connector of non-contact door switch unit, and connect the loop connector to the expansion relay unit located at the end of position.
- Operation of safety output and safety off-delay output based on the safety input signal



■ 13/14, 23/24, 33/34 (37/38), 43/44 (47/48) : Safety outputs of relay unit

The instantaneous or off-delay safety outputs go to ON or OFF based on the safety inputs, feedback start input.

- Leave unused safety outputs in the OPEN state.

■ X1: Auxiliary output 1

When the instantaneous safety outputs are ON, the X1 auxiliary output goes to ON. When the instantaneous safety outputs are OFF, the X1 also goes to OFF.

- Leave unused auxiliary output in the OPEN state.

■ X2: Auxiliary output 2

X2 auxiliary output goes to ON when the ERR indicator turns on or flashes.

- Leave unused auxiliary output in the OPEN state.

Error Indication

When an error occurs, the ERR indicator and other indicators turn on or flash to notice the cause of error.
Be sure to check and take measures according to the table below, and turn the power on again. If the measures are not valid, please contact the Autonics.

Indicator		Cause	Check and measures
ERR	Others		
ON	PWR flashes	The power voltage is out of the allowable range.	Check the supplied power voltage.
	M1 flashes	Wiring error of safety input 1	Check the wiring to M11, M12 terminal.
		Failure of internal circuit of safety input 1	Please contact the Autonics.
	M2 flashes	Wiring error of safety input 2	Check the wiring to M21, M22 terminal.
		Failure of internal circuit of safety input 2	Please contact the Autonics.
	FB flashes	Wiring error of feedback start input	Check the wiring to M51, M52 and M53 terminal.
		Internal circuit error of feedback start input	Please contact the Autonics.
		Error at the power of expansion relay unit	Check the supplied power voltage to the expansion relay unit.
		Feedback error of the relay unit	Check the cable of expansion relay unit and loop connector connection.
		Safety output error of the relay unit	Please contact the Autonics.
	NS flashes	Wiring error of input and output of the non-contact door switch	Check the wiring to the D1 and D2 terminal of non-contact door switch.
		Wiring error of series connection of the non-contact door switch	Check the wiring to between the non-contact door switches.
		Failure of internal circuit of the non-contact door switch	Replace the non-contact door switch (SFN series).
	AND flashes	Wiring error of logic input	Check the wiring to M61 and M62 terminal.
		Setting error of logic input	Check the setting values of SW1 and SW2 at switch for logic (AND) input.
		Failure of internal circuit of logic input	Please contact the Autonics.
	OUT1 flashes	Wiring error of instantaneous safety output	Check the wiring to instantaneous safety output terminal.
		Failure of internal circuit instantaneous safety output	Please contact the Autonics.
	OUT2 flashes	Wiring error of the off-delay safety output	Check the wiring to the off-delay safety output terminal.
		Failure of internal circuit of the off-delay safety output	Please contact the Autonics.
		Setting error of the off-delay time	Check the setting value of the switch for off-delay time.
Flash	-	Error at internal circuit and output relay of the expansion relay unit	Please contact the Autonics.
OFF	M1 M2 flashes	The different input signal between safety input 1 and safety input 2	Check the wiring to the safety input devices. Check the input sequence of safety inputs.

Check and Maintenance

■ Check installation conditions

	Checklist	Check
1	The distance from hazardous zone or source of the machine to the product, safety sensors connected to the product, installed location is equal to or greater than calculated safety distance. Safety distance: ()mm / Actual distance: ()mm	
2	Installed in the environment without the material causing deformation such as corrosion or ignition.	
3	When installing the DIN rail or panel, the product is firmly fixed to prevent separation.	
4	There is no product damage or appearance problem.	

■ Check wiring connection

	Checklist	Check
1	The power supply used for devices related to the product and safety-related functions is 24VDC, and a dedicated power supply meets the specified rated specifications and is not connected to other devices or equipment.	
2	When connecting power supply, the polarity is not connected in reverse.	
3	The appearance of the wiring connected to the product is not damaged, such as cracking, breakage, etc. of the outer shell, and there is no cause for damage around the wiring.	
4	In case of connecting more than two products, it is configured for the dedicated series connection or mutual interference.	
5	The wiring connected to the product is correctly connected to each purpose.	
6	The wiring connected to the product is firmly fixed to prevent separation during use.	
7	In case of auxiliary output (AUX1,AUX2), it is configured to prevent the connection to safety-related part of the control system.	

■ Safety system-check in operation

	Checklist	Check
1	Inspect without operator in hazardous zone or near the source of hazard.	
2	The safety input signal is off while the machine is operating, then the safety system immediately stops.	
3	In case of the power shut down, the safety system stops and maintains the status.	
4	The actual machine response time (the time taken for the hazard source to stop) is less than the calculated time Calculated machine response time: ()ms / Actual machine response time: ()ms	

■ Daily inspection

	Checklist	Check
1	Accessible to hazardous zone or source of the machine only by passing through the detection zone of the product.	
2	The distance from hazardous zone or source of the machine to the product, safety sensors connected to the product, installed location is equal to or greater than calculated safety distance. Safety distance: ()mm / Actual distance: ()mm	
3	When installing the DIN rail or panel, the product is firmly fixed to prevent separation.	
4	The wiring connected to the product is firmly fixed to prevent separation during use.	
5	The appearance of the wiring connected to the product is not damaged, such as cracking, breakage, etc. of the outer shell, and there is no cause for damage around the wiring.	
6	The input/output wiring of the product is firmly fixed to prevent separation from each device.	
7	There is no product damage or appearance problem.	

■ Regular inspection

	Checklist	Check
1	The distance from hazardous zone or source of the machine to the product, safety sensors connected to the product, installed location is equal to or greater than calculated safety distance. Safety distance: ()mm / Actual distance: ()mm	
2	When installing the DIN rail or panel, the product is firmly fixed to prevent separation.	
3	The wiring connected to the product is firmly fixed to prevent separation during use.	
4	The appearance of the wiring connected to the product is not damaged, such as cracking, breakage, etc. of the outer shell, and there is no cause for damage around the wiring.	
5	The input/output wiring of the product is firmly fixed to prevent separation from each device.	
6	There is no product damage or appearance problem.	

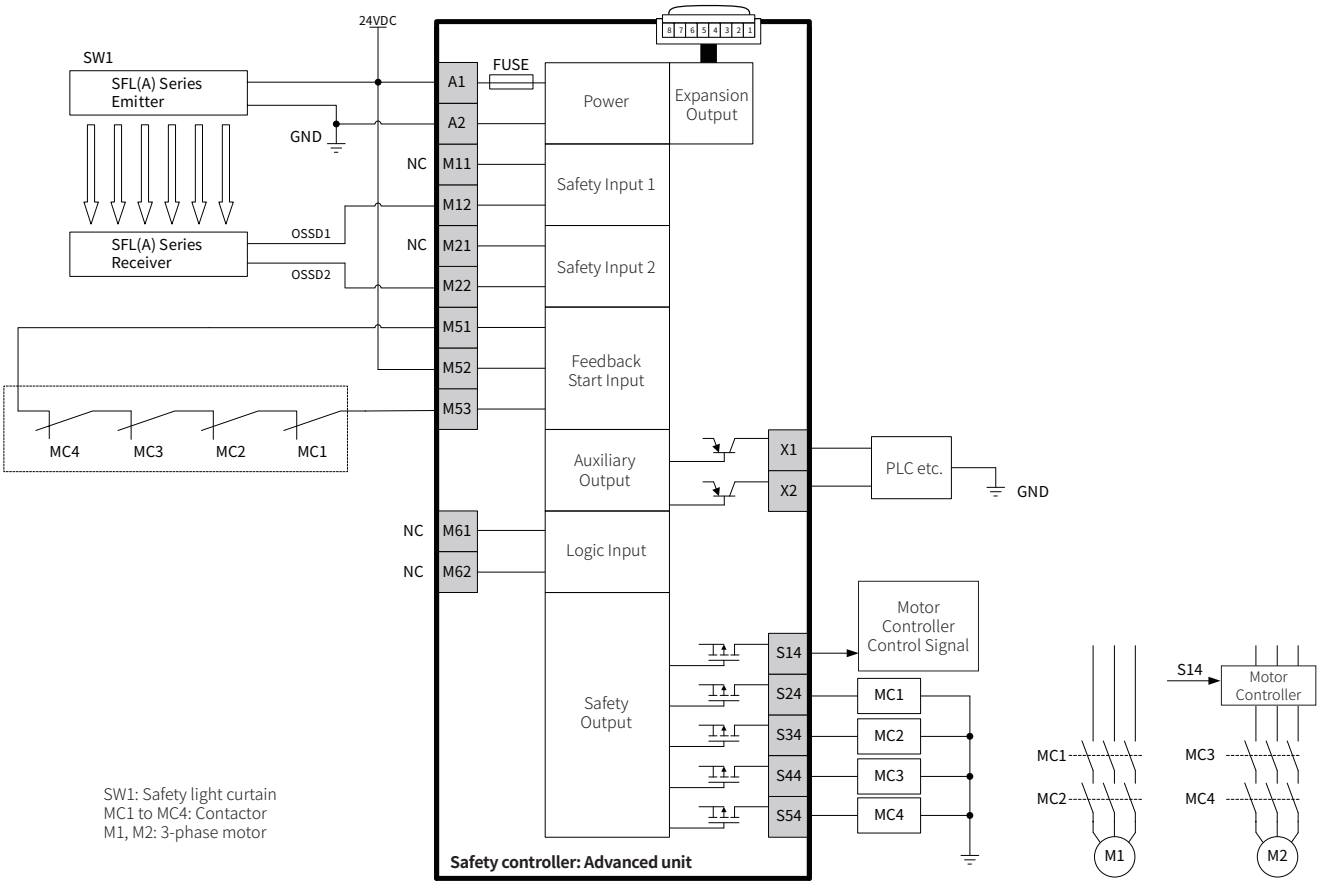
Failure Rate

Type	Model	SIL	PFHD	PL	Category	MTTFd	DCavg	Note
SFC	SFC-422	SIL 3	3.39E-09	e	4	264.38 year	99.00%	
	SFC-422-L							
SFC-A	SFC-A322-23	SIL 3	5.29E-09	e	4	218.18 year	99.00%	
	SFC-A322-23-L							
	SFC-A322-2300				4		99.00%	
	SFC-A322-2300-L							
SFC-N	SFC-N322-23	SIL 3	7.36E-09	e	4	183.67 year	99.00%	
	SFC-N322-23-L							
	SFC-N322-2300				4		99.00%	
	SFC-N322-2300-L							
SFC-R	SFC-R212	SIL 3	5.29E-09	e	4	247.78 year	99.00%	
	SFC-R212-L							
	SFC-R412				4		99.00%	
	SFC-R412-L							
	SFC-R212-R23				4		99.00%	
	SFC-R212-R23-L							
	SFC-R212-R230				4		99.00%	
	SFC-R212-R230-L							

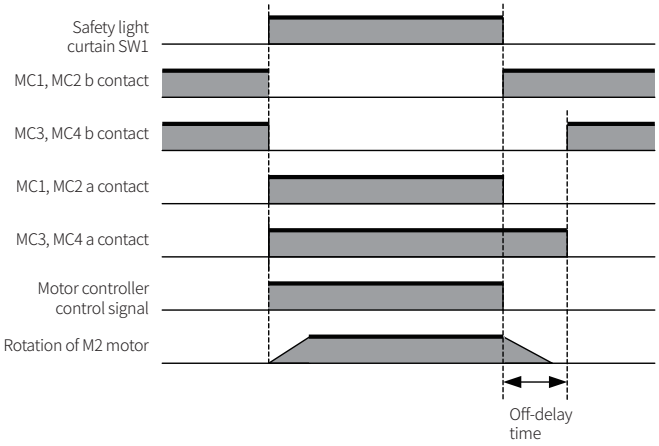
Connection Examples 1

■ Advanced unit-Safety light curtain

Connections	Start	PL/Safety category
Safety controller: Advanced unit SFC-A Series Safety light curtain: SFL / SFLA Series Contactor of rated load (from Annex C of ISO 13849-1)	Auto	PLe/Cat.4 equivalent



• Operation timing chart

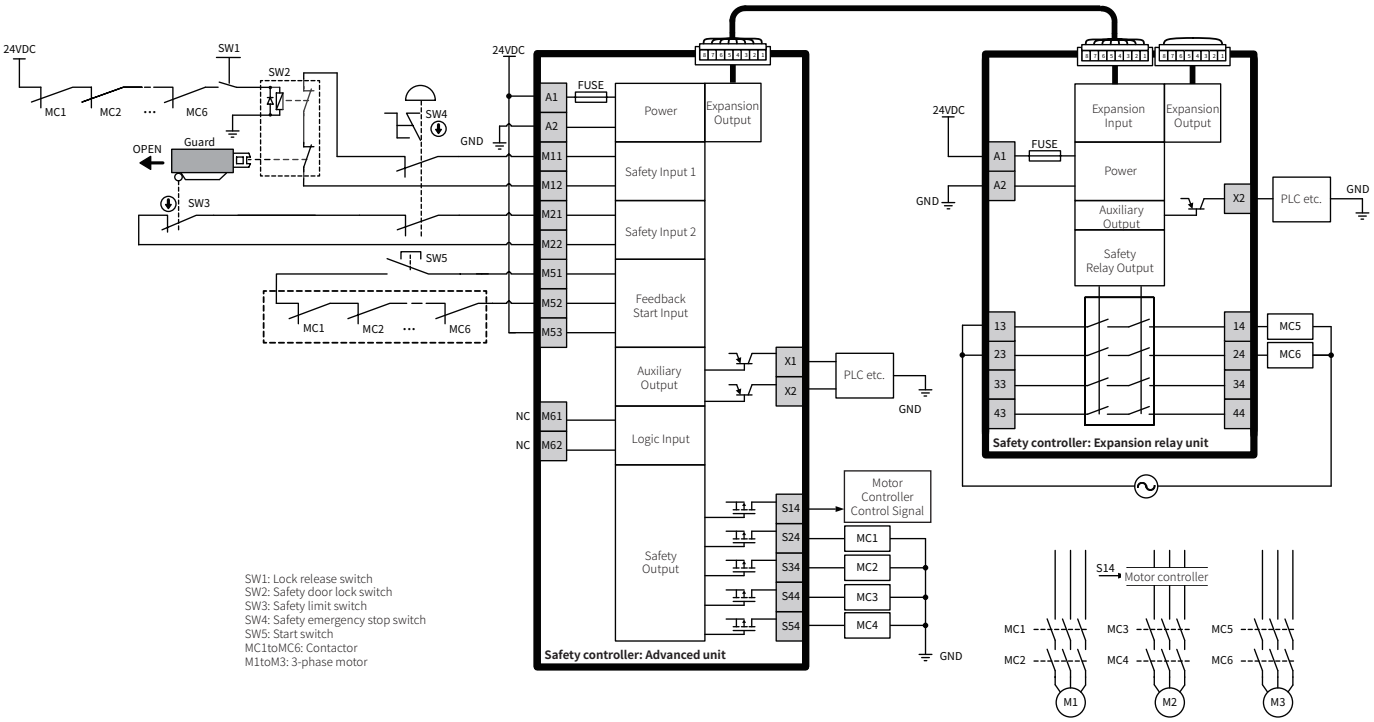


- For more information on wiring and detailed settings for safety light curtain (SFL/SFLA Series), see the "*SFL/SFLA user manual*."
- The control output of the safety light curtain (SFL(A) series) is based on the PNP output.
- When you do not use the logic input (M61, M62), set the switch of the logic (AND) input (SW1, SW2) to OFF.
- Set the switches for off-delay time on the front and back of the advanced unit to the same.

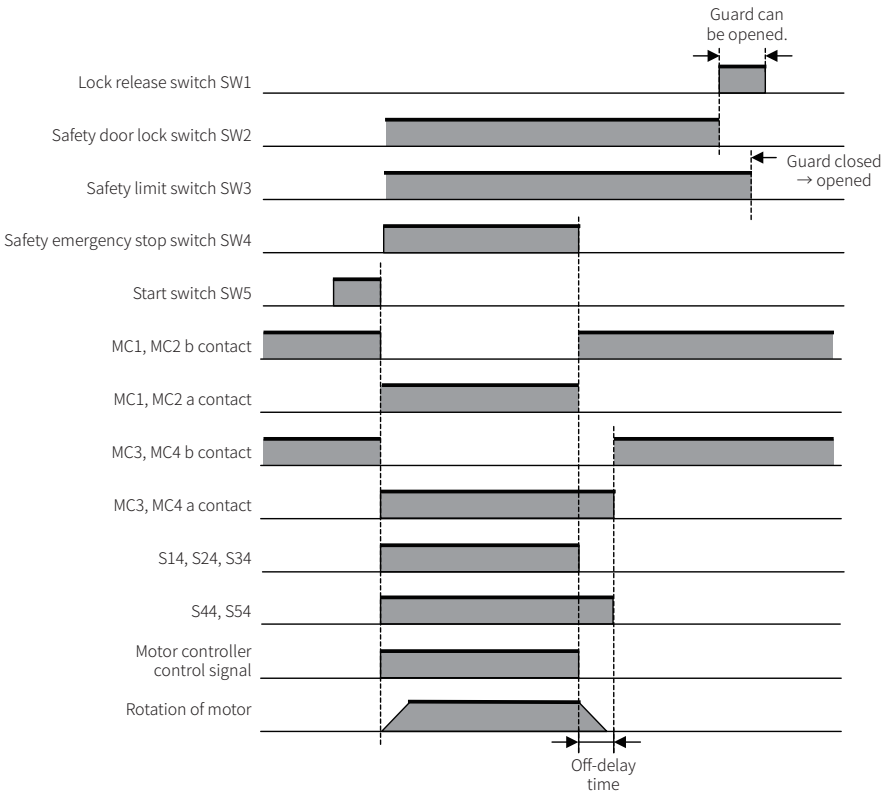
Connection Examples 2

■ Advanced unit-Safety door lock switch, Expansion relay unit

Connections	Start	PL/Safety category
Safety controller: Advanced unit SFC-A Series Safety door lock switch: SFDL Series Safety limit switch (from Annex C of ISO 13849-1) Safety emergency stop button switch: SF2ER Series Push button switch (from Annex C of ISO 13849-1) Contactor of rated load (from Annex C of ISO 13849-1)	Manual	PLe/Cat.4 equivalent
Safety controller: Expansion relay unit SFC-ER Series Contactor of rated load (from Annex C of ISO 13849-1)	-	



• Operation timing chart

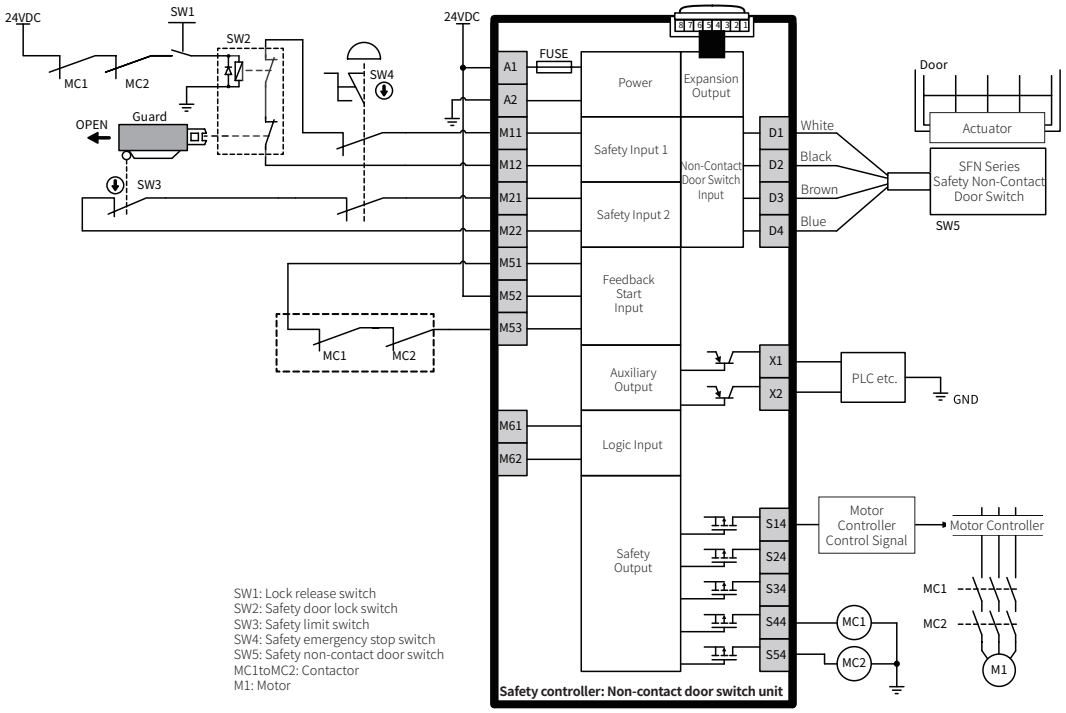


- When you do not use the logic input (M61, M62), set the switch of the logic (AND) input (SW1, SW2) to OFF.
- Set the switches for off-delay time on the front and back of the advanced unit to the same.
- Be sure to supply suitable DC or AC to the MC5 and MC6.

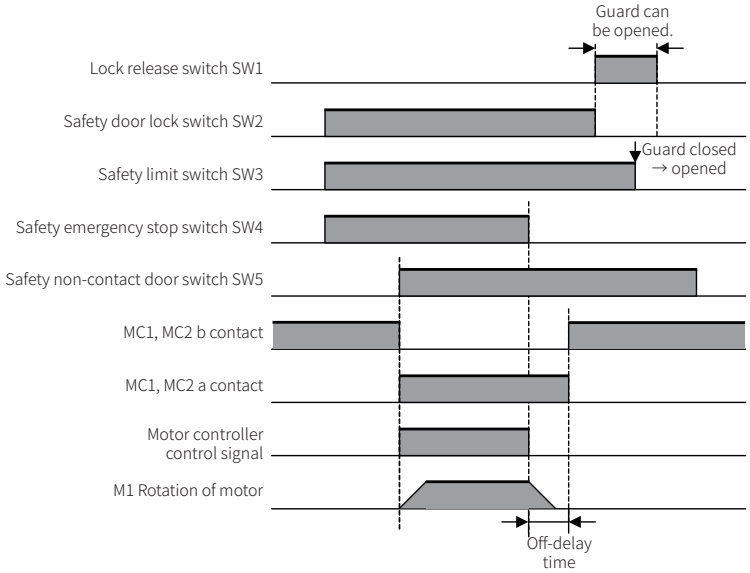
Connection Examples 3

■ Non-contact door switch unit-Safety non-contact door switch

Connections	Start	PL/Safety category
Safety controller: Non-contact door switch unit SFC-N Series Safety emergency stop button switch: SF2ER Series Safety limit switch (from Annex C of ISO 13849-1) Push button switch (from Annex C of ISO 13849-1) Safety non-contact door switch: SFN Series Contactor of rated load (from Annex C of ISO 13849-1)	Auto	PLd/Cat.3 equivalent



• Operation timing chart

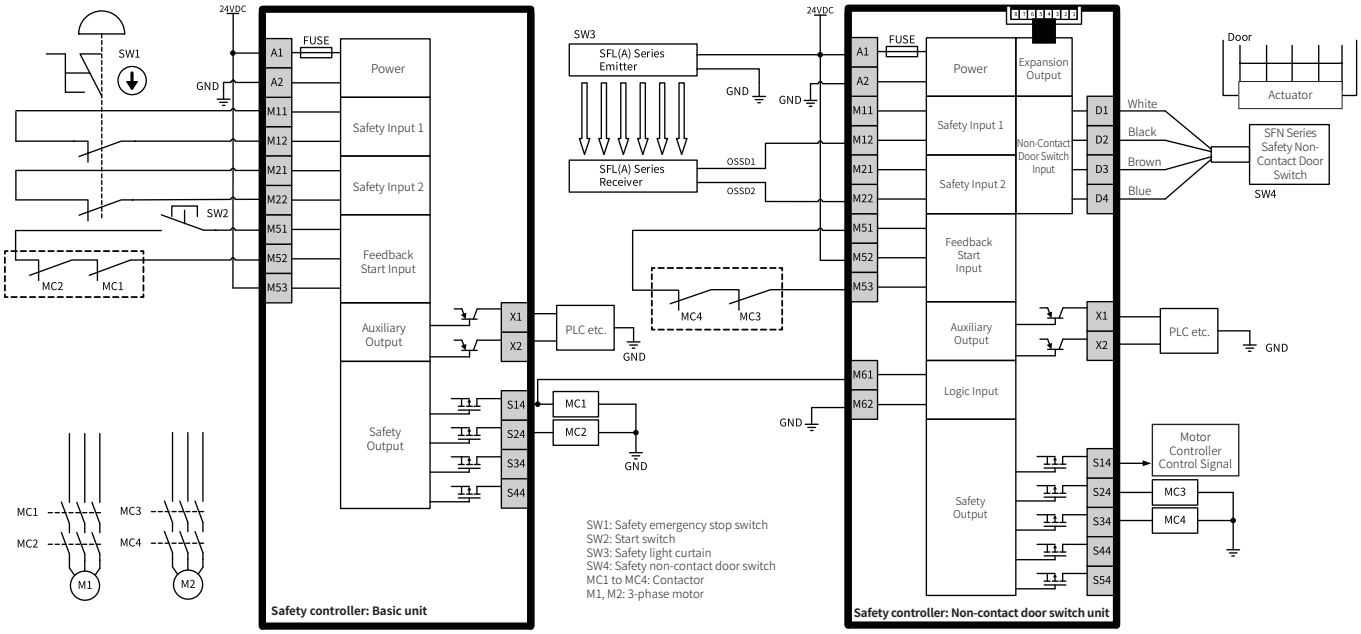


• For more information on detailed wiring for safety non-contact door switch (SFN Series), see the "*Instruction manual for SFN*."
• When you do not use the logic input (M61, M62), set the switch of the logic (AND) input (SW1, SW2) to OFF.
• Set the switches for off-delay time on the front and back of the non-contact switch unit to the same.

Connection Examples 4

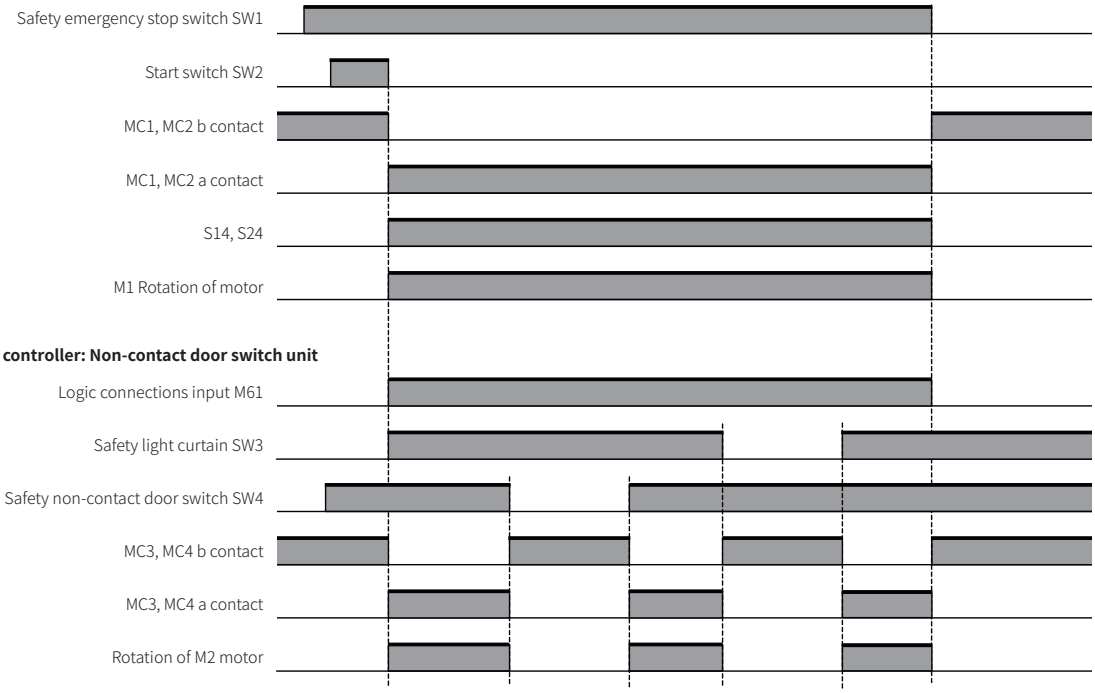
■ Basic unit-Safety emergency stop switch, Non-contact door switch unit-Safety non-contact door switch

Connections	Start	PL/Safety category
Safety controller: Basic unit SFC Series Safety emergency stop button switch: SF2ER Series Push button switch (from Annex C of ISO 13849-1) Contactor of rated load (from Annex C of ISO 13849-1)	Manual	PLd/Cat.3 equivalent
Safety controller: Non-contact door switch unit SFC-N Series Push button switch (from Annex C of ISO 13849-1) Safety light curtain: SFL / SFLA Series Safety non-contact door switch: SFN Series Contactor of rated load (from Annex C of ISO 13849-1)	Auto	



- Operation timing chart

Safety controller: Basic unit



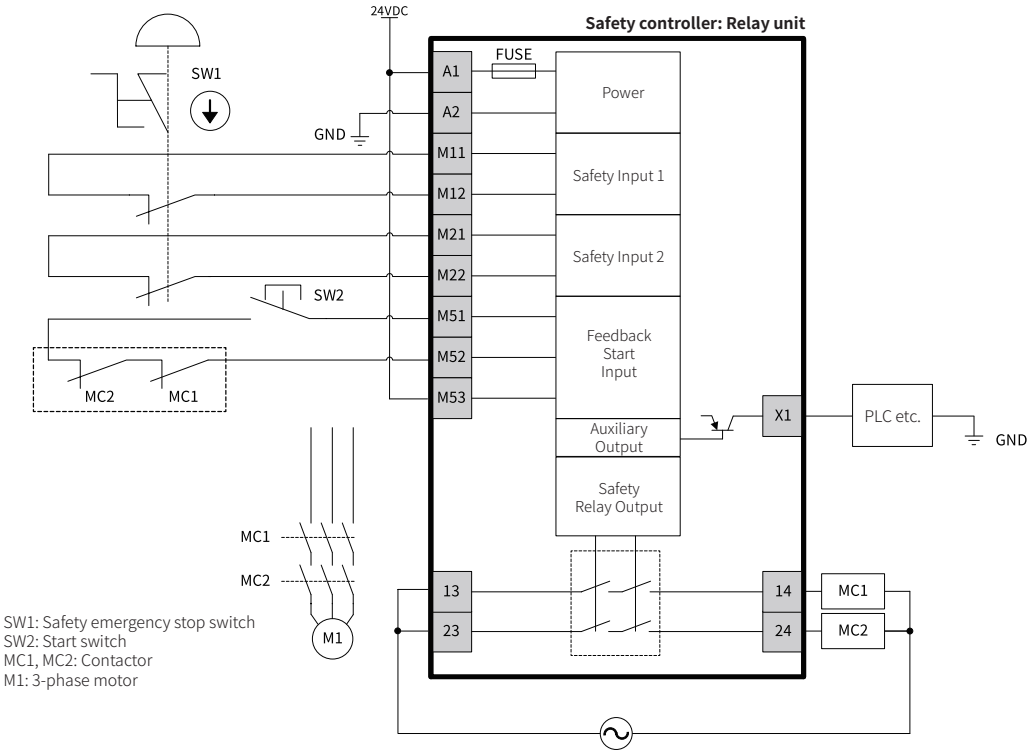
Safety controller: Non-contact door switch unit

- For more information on detailed wiring for safety non-contact door switch (SFN Series), see the "*Instruction manual for SFN*."
- For more information on wiring and detailed settings for safety light curtain (SFL/SFLA Series), see the "*SFL/SFLA user manual.*"
- The control output of the safety light curtain (SFL(A) series) is based on the PNP output.
- When you use the logic input (M61, M62), set the switch of the logic (AND) input (SW1, SW2) to ON.
- Set the switches for off-delay time on the front and back of the non-contact switch unit to the same.

Connection Examples 5

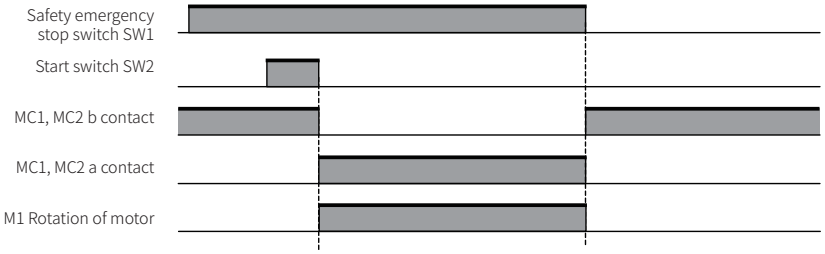
■ Relay unit-Safety emergency stop switch

Connections	Start	PL/Safety category
Safety controller: Relay unit SFC-R212 Safety emergency stop button switch: SF2ER Series Push button switch (from Annex C of ISO 13849-1) Contactor of rated load (from Annex C of ISO 13849-1)	Manual	PLe/Cat.4 equivalent



SW1: Safety emergency stop switch
SW2: Start switch
MC1, MC2: Contactor
M1: 3-phase motor

• Operation timing chart

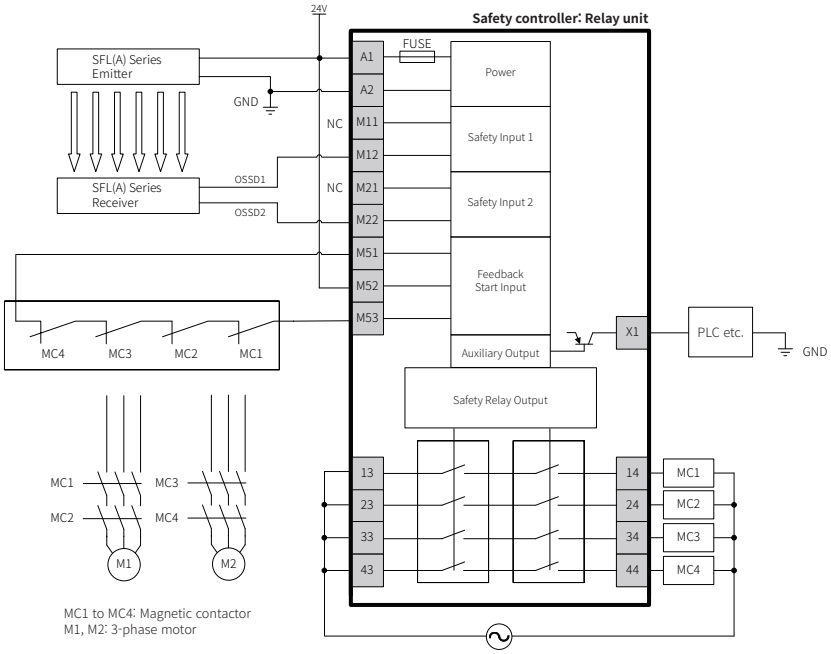


• When you do not use the logic input (M61, M62), set the switch of the logic (AND) input (SW1, SW2) to OFF.
• Set the switches for off-delay time on the front and back of the relay unit to the same.

Connection Examples 6

■ Relay unit-Safety light curtain

Connections	Start	PL/Safety category
Safety controller: Relay unit SFC-R412 Safety light curtain: SFL / SFLA Series Contactor of rated load (from Annex C of ISO 13849-1)	Auto	PLe/Cat.4 equivalent



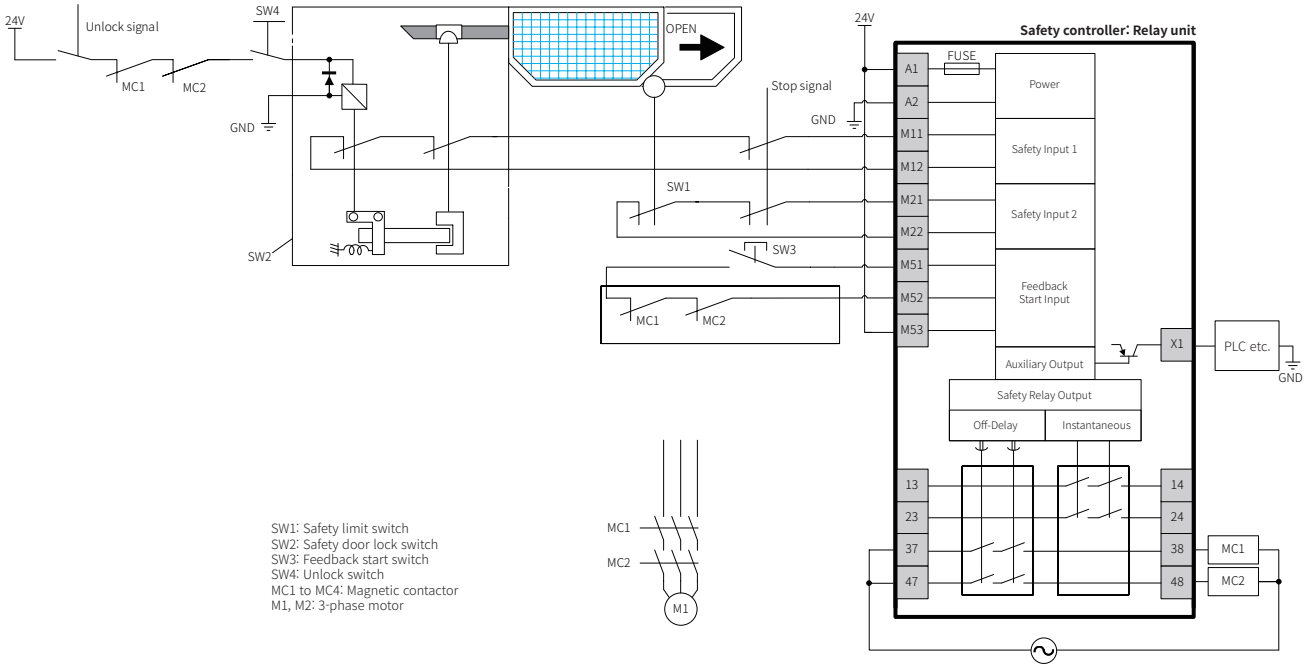
• Operation timing chart

• For more information on wiring and detailed settings for safety light curtain (SFL/SFLA Series), see the "*SFL/SFLA user manual.*"
• The control output of the safety light curtain (SFL(A) series) is based on the PNP output.

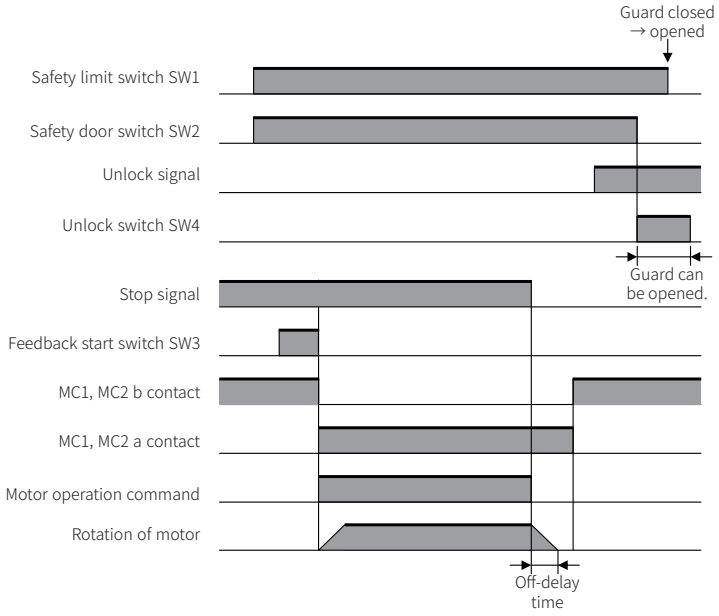
Connection Examples 7

■ Relay unit-Safety door lock switch

Connections	Start	PL/Safety category
Safety controller: Relay unit SFC-R212-R2□□ Safety door lock switch: SFDL Series Push button switch (from Annex C of ISO 13849-1) Contactor of rated load (from Annex C of ISO 13849-1)	Manual	PLe/Cat.4 equivalent



• Operation timing chart



• Set the switches for off-delay time on the front and back of the relay unit to the same.

Safety Non-contact Door Switch

SFN 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.

Features

- Vertical/Horizontal installation supported
- Available to install at back-forth, up-down, right-left moving door
- Connectable maximum 30 units to one controller
- Easy notification of operation status with an operation indicator (ON: green, OFF: red)

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. **System manager means followings;**
    - a personnel who is fully aware of installation, setting, operation, and maintenance of the product
    - a personnel who well observes standard/regulation/statute on the product by type of machine the product installed in and nation/region the product used in
    Machine user means a personnel who is appropriately trained about using machine by the system manager, so that machine user can operate the machine correctly.
    System manager has duty to train the machine user about operation of the product.
    Machine user has to report directly to the system manager when unusual status has been found while system is operating.
    Failure to follow this instruction may result in personal injury, economic loss or fire.
03. **The product has to be installed, set, and combined with machine control system by the qualified system manager.**
    Failure to follow this instruction may result in personal injury due to unintended operation and unstable detection.
04. **Before using the product, check that function of the product operates as intended while machine is turned off after installation.**
    Failure to follow this instruction may result in personal injury due to unintended operation and unstable detection.
05. **Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, salinity, moisture, or steam, or dust may be present.**
    Failure to follow this instruction may result in explosion or fire.
06. **Do not disassemble or modify the unit.**
    Failure to follow this instruction may result in personal injury or fire due to loss of safety function.
07. **Do not defeat, tamper, modify, or bypass the switch and enter the door.**
    Failure to follow this instruction may result in personal injury.
08. **Check whether machine is stopped or not when the door is opened.**
    Failure to follow this instruction may result in personal injury.
09. **Check the installed status of the switch, operating status of the switch, and signs of damage, modification, tampering of the switch at the following situation and on a weekly basis.**
    - when operating the safety system at first
    - when replacing component of the system
    - when the system has not been operated for a long time
    Failure to follow this instruction may result in personal injury due to malfunction of the product and safety function.
10. **Do not connect, repair, inspect, or replace the unit while connected to a power source.**
    Failure to follow this instruction may result in fire.
11. **Check 'Connections' before wiring.**
    Failure to follow this instruction may result in fire.
12. **Keep away from high voltage lines or power lines to prevent surge and inductive noise, and make cable as short as possible.**
    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.
    Failure to follow this instruction may result in personal injury due to malfunction of the product and safety function.

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

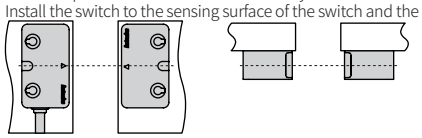
01. **Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
02. **Use a dry cloth to clean the unit, and do not use water or organic solvent.**
Failure to follow this instruction may result in fire.
03. **Make cable as short as possible, and keep the length of the cable within 100m when extent the length of the cable.**
Failure to follow this instruction may result in malfunction of the product and safety function due to surge.
04. **When wiring two or more products in series, keep the total length of the cable within 100m.**
Failure to follow this instruction may result in malfunction of the safety function due to voltage drop.
05. **When installing two or more product adjacently, give at least 26mm interval.**
Failure to follow this instruction may result in malfunction due to mutual interference.
06. **Do not install the switch and actuator on the magnetic object.**
Use bolt and nut of stainless steel or nonmagnetic material, when installing the switch and actuator.
Failure to follow this instruction may result in malfunction or affect sensing distance.
07. **Do not use the switch as a guard door stopper. Install separate mechanical stopper.**
Failure to follow this instruction may result in product damage.

Cautions during Use

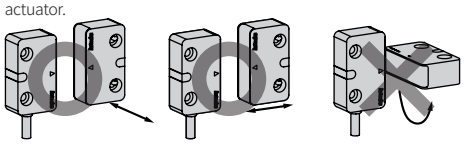
- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Use the switch with the dedicated actuator and controller. Do not use the switch with another actuator or controller randomly.
The switch is cannot be used without the controller (SFC-N322).
- Power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- When using switching mode power supply to supply the power, ground F.G. terminal and connect a condenser between 0V and F.G. terminal to remove noise.
- This unit may be used in the following environments.
  - Indoors (UL Type 1 Enclosure)
  - Altitude max. 2,000m
  - Pollution degree 3
  - Installation category II

Cautions during Installation

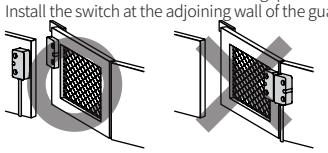
- Install the unit correctly with the usage environment, location, and the designated specifications.
- When installing the product, tightening the screw of M4×20mm with the tightening torque of 0.8N.m.
- Installing more than 2 non-contact door switches closely may result in malfunction due to mutual interference.
- Do not impact on the switch and excessively bend the cables.
- Install the switch to the sensing surface of the switch and the actuator be exactly parallel.



- Install the switch to the direction as below with the consideration of moving directions of the actuator.



- Install the switch and actuator with a gap of minimum 1mm between them.
- Install the switch at the adjoining wall of the guard door and the actuator at guard door.



Ordering Information

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

SFN - M - ❶

❶ Cable
020: cable type (2 m)
050: cable type (5 m)
W: cable connector type

Sold Separately

- Connector cable: C1D5-□, CID5-□, CID5-□-P
- Branch connector: CCD5, CYD5
- Loop connector: CND5
- Safety controller non-contat door switch unit: SFC-N322

Specifications

Model		SFN-M-□
Operating distance[01]	OFF→ON	≥ 5 mm
	ON→OFF	≤ 15 mm
Approval		CE cULus TÜVNORD
Unit weight (packaged)		Cable type (2m): ≈ 100.5 g (≈ 113.8 g) Cable type (5m): ≈ 199.5 g (≈ 214.8 g) Cable connector type: ≈ 58.1 g (≈ 71.6 g)

01) It is rated at 23°C of ambient temperature, and it may be differed up to ±20% by ambient temperature.

Power supply	24 VDC⎓ (± 10 %)
Operating frequency	100 Hz
Power consumption[01]	≤ 400 mA
Auxiliary output	PNP open collector output - 24 VDC⎓, 10 mA
Operation indicator	ON: green, OFF: red
Life expectancy	≥ 20,000,000 times (with low load)
Insulation resistance	≥ 50 MΩ (500 VDC⎓ megger)
Protection circuit	Surge protection circuit, output short over current protection circuit, reverse polarity protection circuit
Dielectric strength	1,500 VAC~ 50/60Hz for 1 minute
Vibration	1.0 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Vibration (malfunction)	1.0 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)	300m/s² (≈ 30G) in each X, Y, Z direction in output ON/OFF status 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)
Protection structure	IP67 (IEC standard)
Connection	cable type / cable connector type model
Cable	Ø 5 mm, 5-wire, cable type: 2 m/5 m, cable connector type: 0.3 m
Wire	AWG26 (0.08 mm), 28-core, core diameter: Ø 0.74 mm
connector spec.	M12 connector
material	Body/CAP: PC

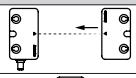
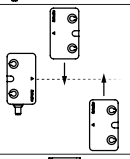
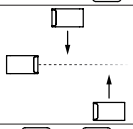
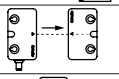
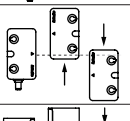
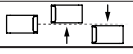
01) Power to the load is not included.

Charateristic level / Safety catagory (with SFC-N322)	IEC 61508 SIL 3 IEC 62061 SIL CL 3 ISO 13849-1 PLe Cat.4 - HFT = 1 - Diagnostic Coverage : 99 % (high) - MTTFd = 100 year (high) - Mission time = 20 year - PFH = 3.88E-09

Safety status in case of error: the switch does not have an internal error recognition function, so it cannot maintain a safety status in the event of error.
Error recognition is processed in the connected controller (SFC-N322).

Operation Distance

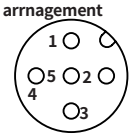
- Operating distance represents the distance between the sensing surface of switch and that of actuator.
- Operating distance can be differed according to the moving direction of actuator from the switch. (at ambient temperature of 23 °C)
- The operating distance may be affected by metal or magnetic substances which is placed closely to the switch.

Operation status	Moving direction		Operating distance
OFF → ON	Front - Back		≥ 5 mm
	Top - Bottom		≥ 2 mm
	Left - Right		≥ 5 mm
ON → OFF	Front - Back		≤ 15 mm
	Top - Bottom		≥ 6 mm
	Left - Right		≤ 15 mm

Connections

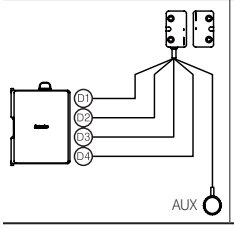
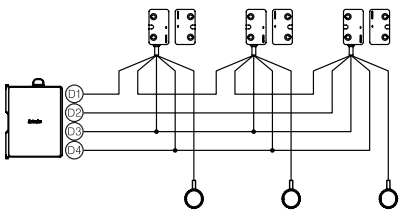
Signal	Function	Pin	Color	Controller (SFC-N322)
Power input	VCC	1	brown	D3
	GND	3	blue	D4
Signal input	IN	2	white	D1
Signal output	OUT	4	black	D2
Auxiliary output	AUX	5	yellow	-

• **M 12 connector pin arrnagement**

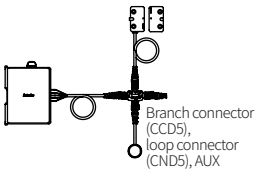
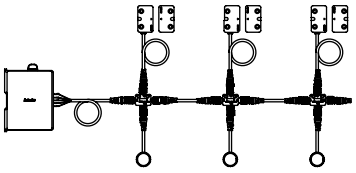
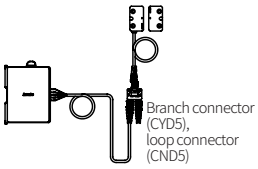
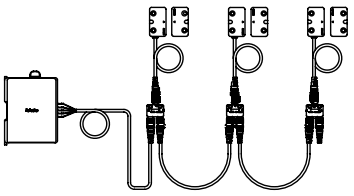


Connection Examples

■ Cable type

Wiring a single switch	Wiring multiple switches
	

■ Cable connector type

Wiring a single switch	Wiring multiple switches
	
	

Branch connector (CCD5), loop connector (CND5), AUX

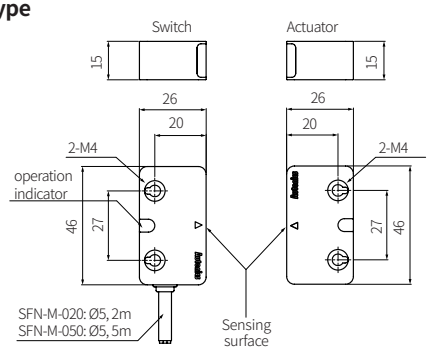
Branch connector (CYD5), loop connector (CND5)

Maximum 30 unit of switches can be connected to a controller (SFC-N322).

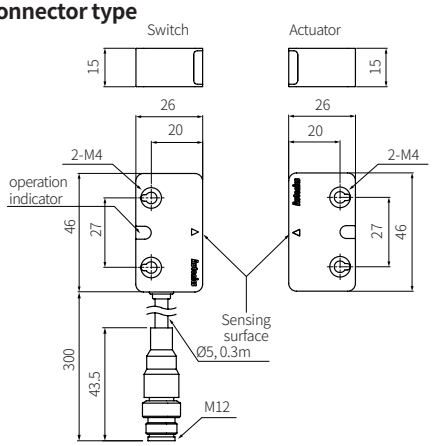
Dimensions

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

■ Cable type



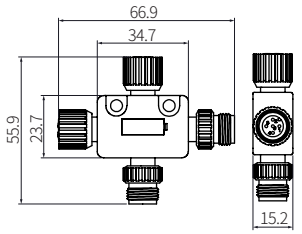
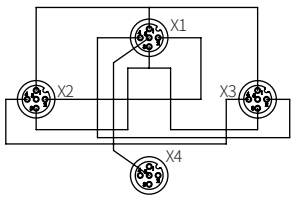
■ Cable connector type



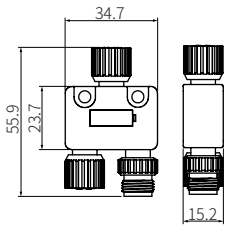
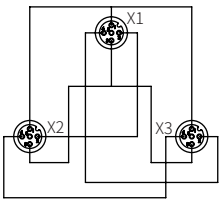
Branch Connector (sold separately)

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

■ CCD5

Dimension	Connection diagram
	

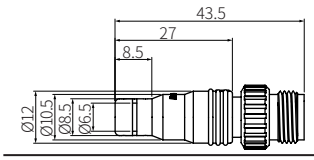
■ CYD5

Dimension	Connection diagram
	

Loop Connector (sold separately)

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

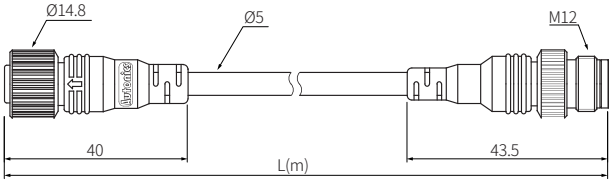
■ CND5

Dimension	Connection diagram
	

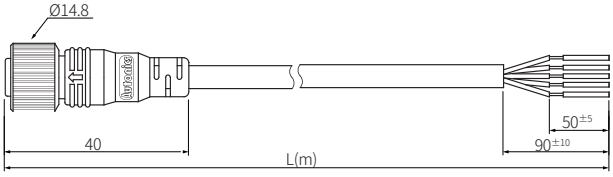
Connector Cable (sold separately)

• Unit: mm, For the detailed drawings, follow the Autonics website.
• □ in model stands for the cable length.

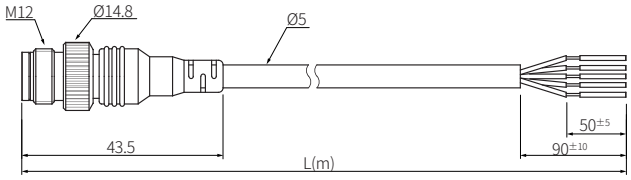
■ C1D5-□



■ CID5-□



■ CID5-□-P



Safety Door Switch

SFD 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.

Main Features

- Available to change the direction of inserting the operation key by rotating head
  : Inserting the operation key from 5 directions in the top and side
- Various kinds of contact composition
  : 1 N.O.+1 N.C., 2 N.C., 1 N.O.+2 N.C., 3 N.C.
- Selectable between connector type which reduces working process and terminal type which is useful for maintenance
- Selectable head material between metal and plastic

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. **System manager means followings;**
    - a personnel who is fully aware of installation, setting, operation, and maintenance of the product
    - a personnel who well observes standard/regulation/statute on the product by type of machine the product installed in and nation/region the product used in Machine user means a personnel who is appropriately trained about using machine by the system manager, so that machine user can operate the machine correctly.
    System manager has duty to train the machine user about operation of the product. Machine user has to report directly to the system manager when unusual status has been found while system is operating.
    Failure to follow this instruction may result in personal injury, economic loss or fire.
03. **The product has to be installed, set, and combined with machine control system by the qualified system manager.**
    Failure to follow this instruction may result in personal injury due to unintended operation and unstable detection.
04. **Before using the product, check that function of the product operates as intended while machine is turned off after installation.**
    Failure to follow this instruction may result in personal injury due to unintended operation and unstable detection.
05. **Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, salinity, moisture, or steam, or dust may be present.**
    Failure to follow this instruction may result in explosion or fire.
06. **Do not disassemble or modify the unit.**
    Failure to follow this instruction may result in personal injury or fire due to loss of safety function.
07. **Be cautious about the installing place of the operation key in order to protect worker from hitting the operation key when the door is opened.**
    Failure to follow this instruction may result in personal injury.
08. **Do not use a head of the door lock switch (SFDL Series).**
    Failure to follow this instruction may result in personal injury or fire due to loss of safety function.
09. **Install separate safety device to fix door closed, or door can be opened because of vibration or weight of the door.**
    Failure to follow this instruction may result in personal injury.
10. **Check the installed status of the switch, operating status of the switch, and signs of damage, modification, tampering of the switch at the following situation and on a weekly basis.**
    - when operating the safety system at first
    - when replacing component of the system
    - when the system has not been operated for a long time
    Failure to follow this instruction may result in personal injury due to malfunction of the product and safety function.
11. **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 a 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 the door switch away from debris and tighten the screw securely when replacing the head.**
    Failure to follow this instruction may result in malfunction.
04. **Keep the product away from metal chip, dust, and wire residue which might flow into the unit.**
    Failure to follow this instruction may result in fire, product damage or malfunction.
05. **Do not use the switch as a guard door stopper. Install separate mechanical stopper.**
    Failure to follow this instruction may result in product damage.
06. **Carefully manage the spare operation key in order to prevent use of the key without permission.**
    Failure to follow this instruction may result in loss of safety function due to insertion of the spare operation key.
07. **Use only Autonics operation key.**
    Failure to follow this instruction may result in product damage.
08. **Install the operation key tightly within the range written in 'Installation' with welding, rivet, or special bolt in order not to be easily released from the switch.**
    Failure to follow this instruction may result in product damage.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Use the switch with the dedicated controller. Do not use the switch with another controller randomly.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000m
  - Pollution degree 3
  - Installation category III
  - Enclosure Type I

Sold Separately

- Operation key
- M12 Connector cable

Ordering Information

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

SFD - ❶ ❷ - ❸ ❹

❶ Head materials
No mark: Plastic
M: Metallic

❷ Contact composition
AB: 1 N.O., 1 N.C.
2B: 2 N.C.
A2B: 1 N.O., 2 N.C.
3B: 3 N.C.

❸ Connection outlet
No mark: 1
2: 2

❹ Connection outlet specification
M20: M20 thread
G1/2: G1/2 thread
C: M12 connecter

Contact Composition and Operation

Contact composition represents the locked status with the operation key inserted.
■: ON, □: OFF

Model	Contact	Contact composition	Contact operation
			Operation key complete insertion / Operation key extrection
SFD-□AB-□□	1 N.C., 1 N.O.	11-12, 33-34	11-12, 33-34
SFD-□2B-□□	2 N.C.	11-12, 31-32	11-12, 31-32
SFD-□A2B-□□	2 N.C., 1 N.O.	11-12, 21-22, 33-34	11-12, 21-22, 33-34
SFD-□3B-□□	N.C. 3	11-12, 21-22, 31-32	11-12, 21-22, 31-32

Specifications

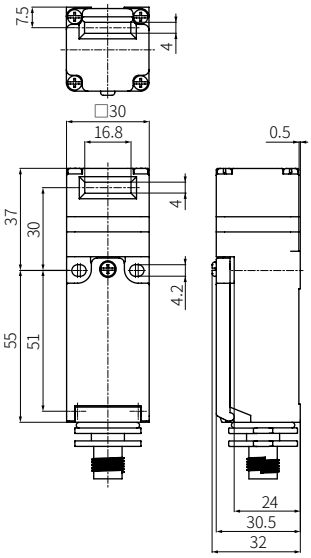
Model	SFD-□□-□M20	SFD-□□-□G1/2	SFD-□□-C
Rated voltage/current for load	Resistive load: 6 A/250 VAC~, 0.6 A/250 VDC⎓ Inductive load (IEC): AC-15 3 A/240 VAC~, DC-13 0.27 A/250 VDC⎓ Inductive load (UL): A300, Q300		
Directing opening force	≥ 80 N		
Directing opening distance	≥ 10 mm		
Operating speed	0.05 to 1 m/s		
Operating frequency	≤ 20/min		
Insulation resistance	≥ 100 MΩ (500 VDC⎓ megger)		
Contact resistance	≤ 50 mΩ (initial value)		
Impulse dielectric strength	Between the terminals: 2 kV (IEC 60947-5-1) Between each terminal and non-live part: 5 kV (IEC 60947-5-1)		
Conditional short circuit current	100 A		
Life cycle	Electrical: ≥ 100,000 operations (240 VAC~ 6 A) Machanical: ≥ 1,000,000 operations		
Vibration (malfunction)	0.75 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 10 min		
Shock	1,000 m/s² (≈ 100 G) in each X, Y, Z direction for 3 times		
Shock (malfunction)	300 m/s² (≈ 30 G) in each X, Y, Z direction for 3 times		
Ambient temperature	-30 to 70°C, storage: -40 to 70 °C [01] (a non freezing or condensation environment)		
Ambient humidity	35 to 90 %RH , storage: 35 to 90 %RH (a non freezing or condensation environment)		
Protection structure	IP67 [02] (IEC standard, except for head)		
Material	Plastic head - polyamide 6, metallic head - zinc case: polyamide 6, operation key: stanless steel 304		
Approval	CE cULus TÜVNORD Ⓢ		
Connection type	M20 connector cable	G1/2 connector cable	M12 connector
Unit weight (packaged)	• 1 connection outlet plastic: ≈ 80 g (≈ 120 g) metallic: ≈ 110 g (≈ 150 g) • 2 connection outlet plastic: ≈ 110 g (≈ 140 g) metallic: ≈ 130 g (≈ 170 g)		plastic: ≈ 85 g (≈ 130 g) metallic: ≈ 115 g (≈ 160 g)

01) UL approved ambient temperature: 65°C
02) Rated protection structure is for the switch body. Be cautious about preventing the head part from entering the foreign materials such as dust and water.

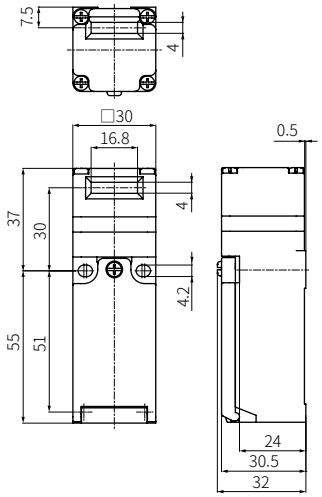
Dimensions

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

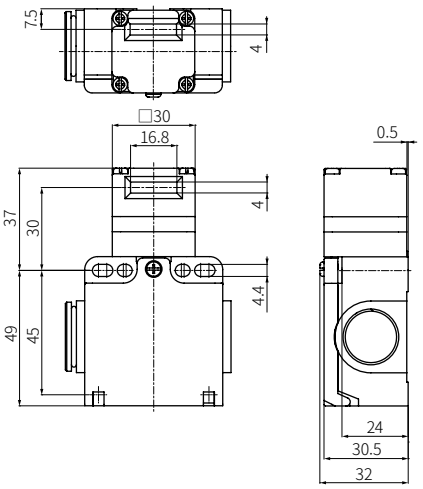
■ Connector type



■ 1 connection outlet terminal type

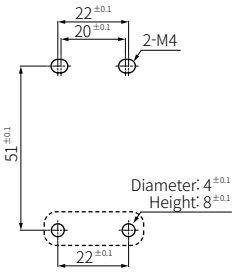


■ 2 connection outlet terminal type

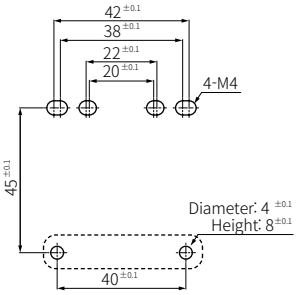


■ Mounting hole cut-out

- 1 connection outlet

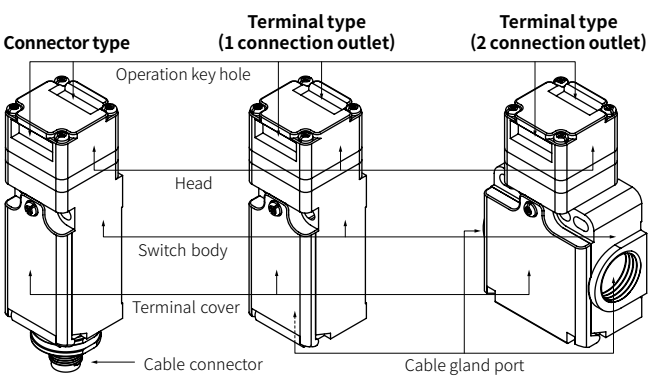


- 2 connection outlet



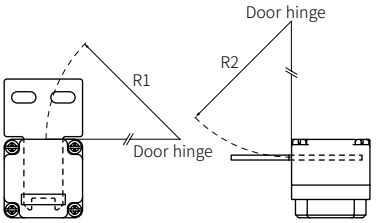
□ is installing spot of protrusion for fixing the switch firmly.

Unit Description



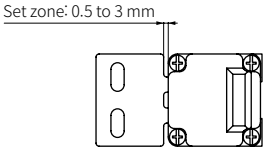
Installation

- The head of the switch can be rotated by loosening the four screws from the corners of the head and reinstalling the head in the desired orientation.
- Be sure to install the switch with the minimum radius at a hinged door as shown in the table.

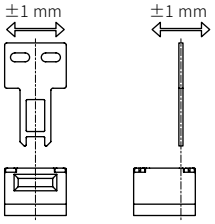


Operation key	Minimum radius	
	R1	R2
SFD-KH	300 mm	300 mm
SFD-KL	300 mm	300 mm
SFD-KHR	300 mm	300 mm
SFD-KLR	300 mm	300 mm
SFD-KLF	50 mm	300 mm
SFD-KLF2	50 mm	300 mm

- Inspect the inserted operation key remains within the set zone (0.5 to 3 mm).



- Install the operation key within ±1mm from the center of the operation key hole.

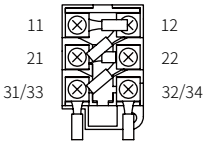


- Recommended screw tightening torque

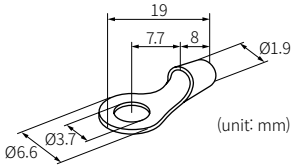
Screw	Tightening torque
Terminal screw (M3.5)	0.6 to 0.8 N·m
Terminal block screw (M3)	0.3 to 0.5 N·m
Terminal cover screw (M3)	0.4 to 0.6 N·m
Head mounting screw (M3)	0.7 to 0.9 N·m
Cable gland	2.7 to 3.3 N·m
M22 NUT, G1/2 NUT	1.3 to 1.5 N·m

Connections

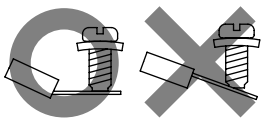
- When wiring with the ring crimp terminal, connect the terminals as shown in figure for the cable not to override to the case and cover.



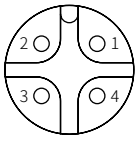
- Use the UL approved ring crimp terminal listed in below. Bend the terminal as following figure to use.



Manufacturer	Model
JST	FN0.5-3.7 (flared type) N0.5-3.7 (straight type)

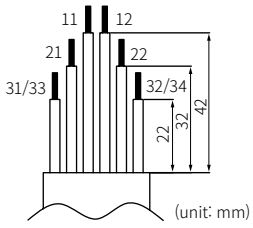


- M12 connector pin arrangement



Pin	Contact
1	12
2	11
3	31/33
4	32/34

- Use lead wire sizes AWG20 (0.518 mm^2) and prepare lead wires using the length given in the following diagram. If lead wires are too long or short, the cover may not be properly closed.



- Cable gland specification and recommended product

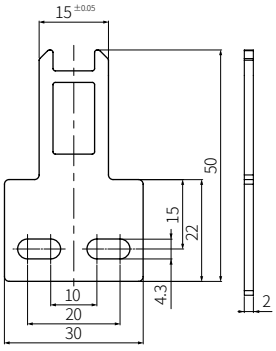
Thread spec	MFR	Model
G1/2	LAPP	ST-PT1/2 5380-1002
M20	LAPP	ST-M20X1.5 5311-1020

- In case of using the cable gland with the 9 mm screw thread or longer, a gap between the switch and cable may affect the protection structure.
- Do not use metallic duct. Using metallic duct can result in electric shock due to the damage on the service entrance.

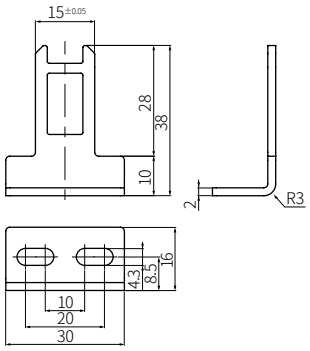
Operation Key (sold separately)

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

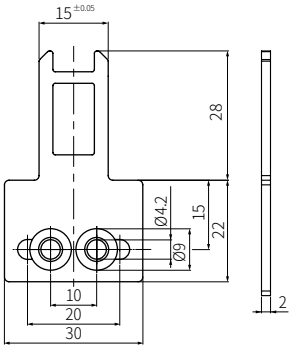
■ SFD-KH



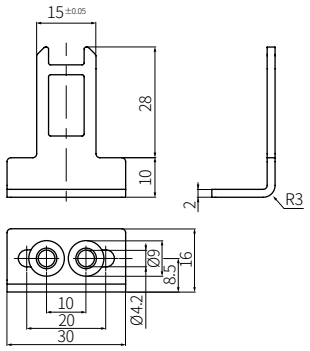
■ SFD-KL



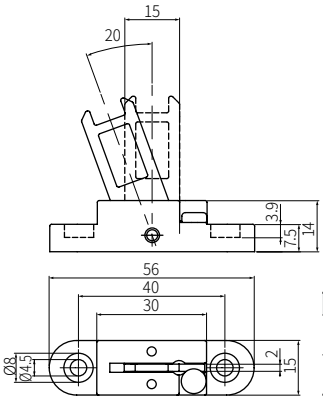
■ SFD-KHR



■ SFD-KLR



■ SFD-KLF, SFD-KLF2



Model	Material
SFD-KLF	Operation key: stainless steel 304, base: polyamide
SFD-KLF2	Operation key: stainless steel 304, base: zinc

Safety Door Lock Switch

SFDL 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.

Main Features

- Available to change the direction of inserting the operation key by rotating head
  : Inserting the operation key from 5 directions in the top and side
- Various kinds of contact composition
  :4-contact (connected), 4-contact (not connected), 5-contact, 6-contact
- Selectable between connector type which reduces working process and separable terminal type which is useful for maintenance
- Manual unlock function (release key) to handle the emergency and test for safe installation
  : Cross type/special type release key line-up
- Minimized solenoid heat with stable current supply
- Excellent solidity/durability of metallic head
- Applicable to various applications using the slide key unit accessory

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. **System manager means followings;**
    - a personnel who is fully aware of installation, setting, operation, and maintenance of the product
    - a personnel who well observes standard/regulation/statute on the product by type of machine the product installed in and nation/region the product used in
    Machine user means a personnel who is appropriately trained about using machine by the system
    manager, so that machine user can operate the machine correctly.
    System manager has duty to train the machine user about operation of the product.
    Machine user has to report directly to the system manager when unusual status has been found while system is operating.
    Failure to follow this instruction may result in personal injury, economic loss or fire.
03. **The product has to be installed, set, and combined with machine control system by the qualified system manager.**
    Failure to follow this instruction may result in personal injury due to unintended operation and unstable detection.
04. **Before using the product, check that function of the product operates as intended while machine is turned off after installation.**
    Failure to follow this instruction may result in personal injury due to unintended operation and unstable detection.
05. **Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, salinity, moisture, or steam, or dust may be present.**
    Failure to follow this instruction may result in explosion or fire.
06. **Do not disassemble or modify the unit.**
    Failure to follow this instruction may result in personal injury or fire due to loss of safety function.
07. **Be cautious about the installing place of the operation key in order to protect worker from hitting the operation key when the door is opened.**
    Failure to follow this instruction may result in personal injury.
08. **Do not use a head of the door switch (SFD Series).**
    Failure to follow this instruction may result in personal injury or fire due to loss of safety function.
09. **Install separate safety device to fix door closed, or door can be opened because of vibration or weight of the door.**
    Failure to follow this instruction may result in personal injury.
10. **Check the installed status of the switch, operating status of the switch, and signs of damage, modification, tampering of the switch at the following situation and on a weekly basis.**
    - when operating the safety system at first
    - when replacing component of the system
    - when the system has not been operated for a long time
    Failure to follow this instruction may result in personal injury due to malfunction of the product and safety function.
11. **Solenoid Lock/Mechanical Release type switch is locked with power connected and is unlocked without power. Be cautious that the switch can be unlocked before complete stop of the machine when blackout occurs.**
    Failure to follow this instruction may result in personal injury.
12. **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. **Since solenoid has polarity, wire cables and supply voltage ensuring correct polarity. Do not supply voltage above the rated voltage specification.**
    Failure to follow this instruction may result in fire or solenoid damage.
03. **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.
04. **Keep the door switch away from debris and tighten the screw securely when replacing the head.**
    Failure to follow this instruction may result in malfunction.
05. **Keep the product away from metal chip, dust, and wire residue which might flow into the unit.**
    Failure to follow this instruction may result in fire, product damage or malfunction.
06. **Do not use the switch as a guard door stopper. Install separate mechanical stopper.**
    Failure to follow this instruction may result in product damage.
07. **Carefully manage the spare operation key in order to prevent use of the key without permission.**
    Failure to follow this instruction may result in loss of safety function due to insertion of the spare operation key.
08. **Use only Autonics operation key.**
    Failure to follow this instruction may result in product damage.
09. **Install the operation key tightly within the range written in 'Installation' with welding, rivet, or special bolt in order not to be easily released from the switch.**
    Failure to follow this instruction may result in product damage.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Use the switch with the dedicated controller. Do not use the switch with another controller randomly.
- When it comes to the Solenoid Lock/Mechanical Release model, make it to be locked by supplying power after the door is closed. If the power is supplied when the door is opened, the switch will not be locked.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000m
  - Pollution degree 3
  - Installation category III
  - Enclosure Type I

Sold Separately

- Operation key
- Slide key unit
- Connector cable for the connector type model

Ordering Information

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

SFDL - ❶ ❷ ❸ - ❹ ❺ ❻

❶ Lock/Release method
M: Mechanical Lock/Solenoid Release
S: Solenoid Lock/Mechanical Release

❷ Contact
No-mark: 4-contct (connected)
C: 4-contact (not connected)
5: 5-contact
6: 6-contact

❹ Connection type
No-mark: Terminal type
C: Connector type

❺ Connection outlet specification
M20: M20 thread
G1/2: G1/2 thread

❻ Release key type
No-mark: Cross type
K: Special type

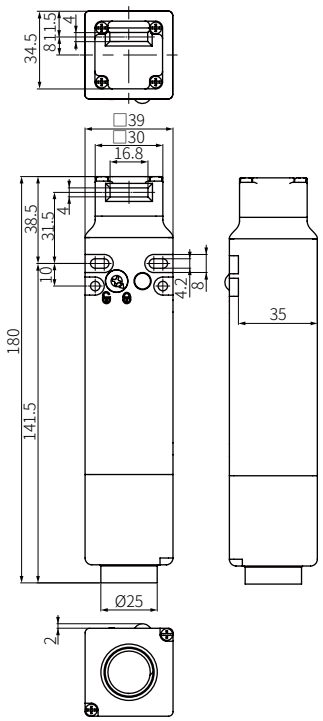
❸ Contact composition

	4-contact	5-contact	6-contact
A	Lock 1 N.C. / 1 N.O. + Door 1 N.C. / 1 N.O.	Lock 1 N.C. / 1 N.O. + Door N.C. 2 / N.O. 1	Lock 2 N.C. /1 N.O. + Door 2 N.C. /1 N.O.
B	Lock N.C. 2 + Door N.C. 1 / N.O. 1	Lock N.C. 2 + Door N.C. 2 / N.O. 1	Lock N.C. 3 + Door N.C. 2/N.O. 1
C	Lock N.C. 1 / N.O. 1 + Door N.C. 2	Lock N.C. 1 / N.O. 1 + Door N.C. 3	Lock N.C. 2/N.O. 1 + Door N.C. 3
D	Lock N.C. 2 + Door N.C. 2	Lock N.C. 2 + Door N.C. 3	Lock N.C. 3 + Door N.C. 3

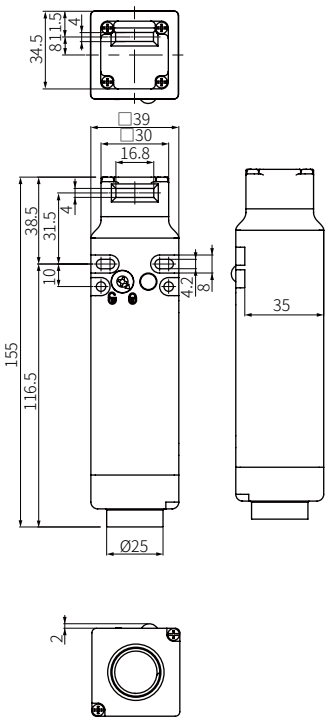
Dimensions

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

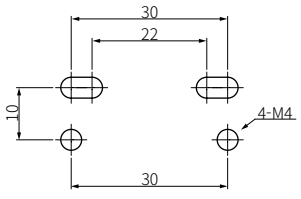
■ **Terminal type**



■ **Connector type**



■ **Panel cut out**



Specifications

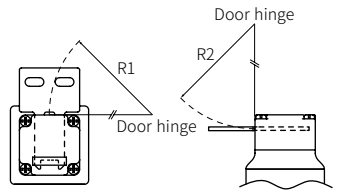
Model	SFDL-□□□-□□	SFDL-□□□-C□□
Directing opening force	≥ 80 N	
Directing opening distance	≥ 10 mm	
Locking pullout strength	≥ 1,300 N	
Operating speed	0.05 to 1 m/s	
Operating frequency	≤ 20/min	
Machanical life cycle	≥ 1,000,000 operations (20/min)	
Vibration (malfunction)	0.35mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 10 min	
Shock	1,000 m/s² (≈ 100 G) in each X, Y, Z direction for 3 times	
Shock (malfunction)	80 m/s² (≈ 8 G) in each X, Y, Z direction for 3 times	
Ambient temperature	-10 to 55°C [01], storage: -25 to 65 °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	IP67 [02] (IEC standard, except for head)	
Material	Head: zinc, case: polyamide 66, operation key: stainless steel 304	
Approval	CE cULus TÜV NORD KS	
Accessory	SFDL-□□□-□□K (Special type release keyse key) : rotating key	
Applicable cable	AWG22	–
Connection type	Terminal type	Connector type
Unit weight (packaged)	≈ 375 g (≈ 440 g)	≈ 325 g (≈ 395 g)

01) UL approved ambient temperature: 50°C
02) Rated protection structure is for the switch body. Be cautious about preventing the head part from entering the foreign materials such as dust and water.

Contact block		
Rated voltage/current for load	Resistive load: 1 A/120 VAC∼, 0.22 A/125 VDC⎓ Inductive load (IEC): AC-15 1 A/120 VAC∼, DC-13 0.22 A/125 VDC⎓ Inductive load (UL): C150, R150	
Impulse dielectric strength	Between the terminals of same polarity: 1.5 kV Between the terminals of different polarity: 1.5 kV Between each terminal and non-live part: 2.5kV	
Insulation resistance	≥ 100 MΩ (500 VDC⎓ megger)	
Contact resistance	≤ 200 mΩ	
Electrical life cycle	≥ 100,000 operations (125 VAC∼/1 A)	
Conditional short-circuit current	100 A	
Solenoid		
Rated voltage	24 VDC⎓, class 2	
Current consumption	Supplying power: 0.26A Normal: max. 0.2A (approx. 3 seconds after supplying power)	
Insulation class	Class E	

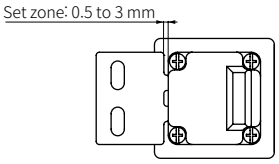
Installation

- The head of the switch can be rotated by loosening the four screws from th e corners of the head and reinstalling the head in the desired orientation.
- Be sure to install the switch with the minimum radius at a hinged door as shown in the table.

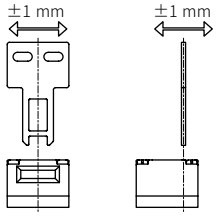


Operation key	Minimum radius	
	R1	R2
SFD-KH	300 mm	300 mm
SFD-KL	300 mm	300 mm
SFD-KHR	300 mm	300 mm
SFD-KLR	300 mm	300 mm
SFD-KLF	50 mm	300 mm
SFD-KLF2	50 mm	300 mm

- Inspect the inserted operation key remains within the set zone (0.5 to 3 mm).



- Install the operation key within ±1 mm from the center of the operation key hole.



- Recommended screw tightening torque

Screw	Tightening torque
Terminal screw	0.4 N·m
Head mounting screw (M3)	0.7 to 0.9 N·m
Cable cover	0.5 to 0.7 N·m
Cable gland	2.7 to 3.3 N·m

- Cable gland specification and recommended product

Thread spec	MFR	Model
G1/2	LAPP	ST-PT1/2 5380-1002
M20	LAPP	ST-M20X1.5 5311-1020

- In case of using the cable gland with the 9 mm screw thread or longer, a gap between the switch and cable may affect the protection structure.
- Do not use metallic duct. Using metallic duct can result in electric shock due to the damage on the service entrance.

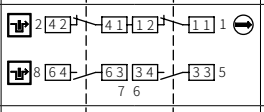
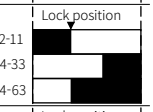
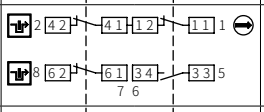
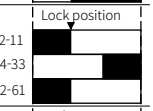
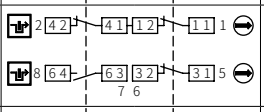
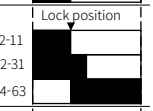
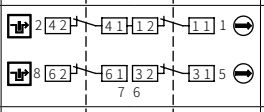
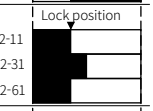
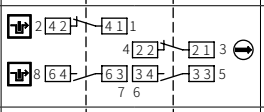
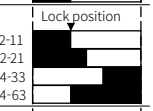
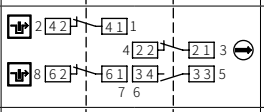
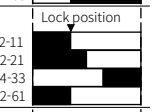
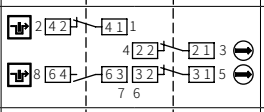
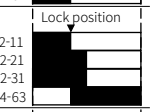
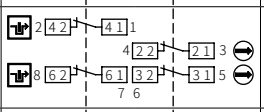
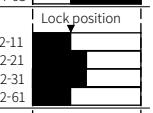
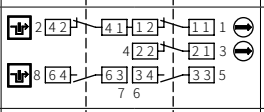
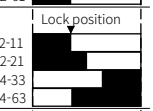
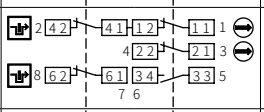
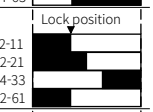
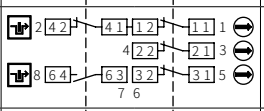
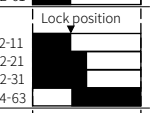
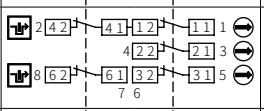
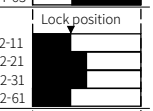
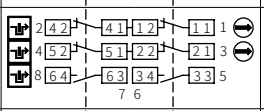
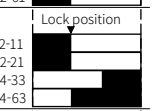
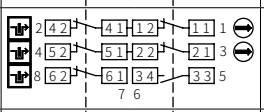
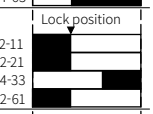
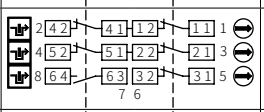
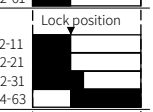
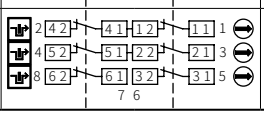
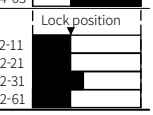
Release Key

Release key type	Normal position	Manual unlock position
Cross type		
Special type		

- You can manually unlock the switch in the emergency situation such as blackout, when wiring, before supplying power, or when testing operation of the switch.
- When using the release key, turn it to the end completely. Otherwise (under 90°), switch can be damaged or malfunction.
- Do not apply the power over 0.2 N·m on the release key. It can be result in product damage.

Contact Composition and Operation

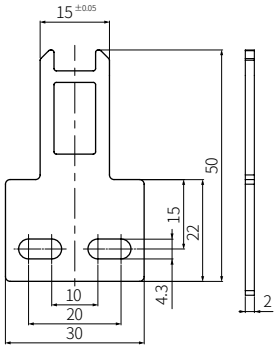
Connection diagram represents the locked status with the operation key inserted.
(■: ON, □: OFF)

Model	Contact (lock monitor+ door monitor)	Connection diagram		Contact operation
		Lock monitor	Door monitor	
		9 E1(+) E2(-) 10		Operation key complete insertion / Operation key extraction
SFDL-□A-□□□	1 N.C./1 N.O.+ 1 N.C./1 N.O.			 42-11 34-33 64-63
SFDL-□B-□□□	2 N.C.+1 N.C./1 N.O.			 42-11 34-33 62-61
SFDL-□C-□□□	1 N.C./1 N.O.+2 N.C.			 42-11 32-31 64-63
SFDL-□D-□□□	2 N.C.+2 N.C.			 42-11 32-31 62-61
SFDL-□CA-□□□	1 N.C./1 N.O.+ 1 N.C./1 N.O.			 42-11 22-21 34-33 64-63
SFDL-□CB-□□□	2 N.C.+1 N.C./1 N.O.			 42-11 22-21 34-33 62-61
SFDL-□CC-□□□	1 N.C./1 N.O.+2 N.C.			 42-11 22-21 32-31 64-63
SFDL-□CD-□□□	2 N.C.+2 N.C.			 42-11 22-21 32-31 62-61
SFDL-□5A-□□□	1 N.C./1 N.O.+ 2 N.C./1 N.O.			 42-11 22-21 34-33 64-63
SFDL-□5B-□□□	2 N.C.+2 N.C./1 N.O.			 42-11 22-21 34-33 62-61
SFDL-□5C-□□□	1 N.C./1 N.O.+3 N.C.			 42-11 22-21 32-31 64-63
SFDL-□5D-□□□	2 N.C.+3 N.C.			 42-11 22-21 32-31 62-61
SFDL-□6A-□□□	2 N.C./1 N.O.+ 2 N.C./1 N.O.			 42-11 52-21 34-33 64-63
SFDL-□6B-□□□	3 N.C.+2 N.C./1 N.O.			 42-11 52-21 34-33 62-61
SFDL-□6C-□□□	2 N.C./1 N.O.+3 N.C.			 42-11 52-21 32-31 64-63
SFDL-□6D-□□□	3 N.C.+3 N.C.			 42-11 52-21 32-31 62-61

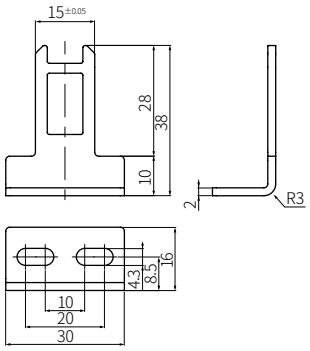
Operation Key (sold separately)

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

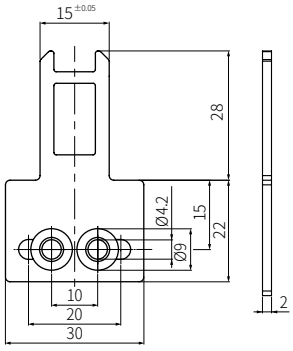
■ SFD-KH



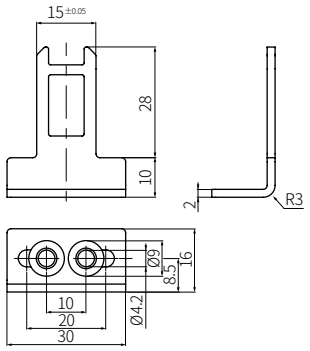
■ SFD-KL



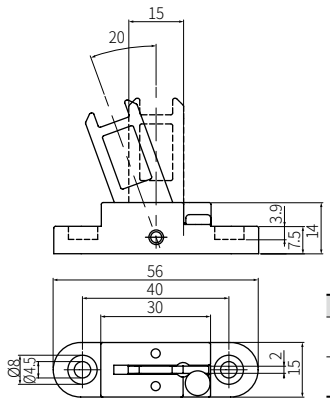
■ SFD-KHR



■ SFD-KLR



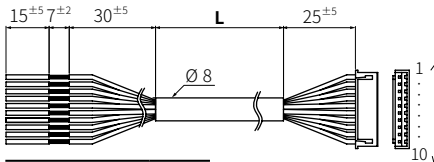
■ SFD-KLF, SFD-KLF2



Model	Material
SFD-KLF	Operation key: stainless steel 304, base: polyamide
SFD-KLF2	Operation key: stainless steel 304, base: zinc

Connector Cable (sold separately)

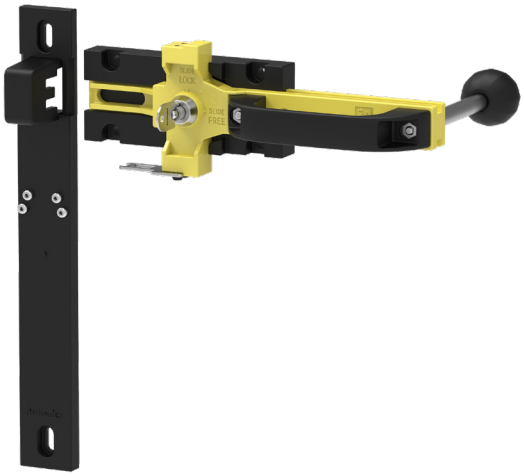
• Connector cable is the separately sold accessory for the connector type model.



Model	L
SFDL-CND10-1	1m
SFDL-CND10-3	3m
SFDL-CND10-5	5m

Pin	Lead wire color
1	Black
2	Black/White
3	Red
4	Red/White
5	Green
6	Green/White
7	Yellow
8	Yellow/White
9 (E1)	Brown
10(E2)	Brown/White

Safety Door Lock
Slide Key Unit



SFDL-SDK 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.

Main Features

- Using the lock out key, preventing the situation that a worker is locked in the working area
- With the lock out function, preventing operation of machine when a worker is in the working area
- Able to install on the 40mm × 40mm aluminum profile

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/toxic 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 personal injury due to loss of safety function.
04. **Check installed status of the switch and slide key unit, operating status, and signs of damage, modification, tampering on a regular basis.**
    Failure to follow this instruction may result in personal injury due to malfunction of the product and safety function.
05. **When keeping the lock out key by wearing on the wrists, keep cautious that the spring strap is not be rolled into the machine.**
    Failure to follow this instruction may result in personal injury.
06. **When operating the slide handle, be cautious to avoid catching hand.**
    Failure to follow this instruction may result in personal injury.

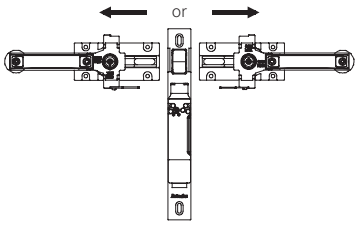
⚠ Caution Failure to follow instructions may result in injury or product damage.

01. **Use the unit within the rated specifications.**
    Failure to follow this instruction may result in product damage.
02. **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.
03. **Install this product on the light door under 20kg.**
    Failure to follow this instruction may result in product damage.
04. **Do not drop or impact the product.**
    Failure to follow this instruction may result in product damage or malfunction.
05. **Do not close the door without the bolt slide.**
    Failure to follow this instruction may result in product damage.
06. **Do not use the switch or cable with excessive force.**
    Failure to follow this instruction may result in product damage or malfunction.
07. **Do not slide the product with excessive force.**
    Failure to follow this instruction may result in product damage or malfunction.
08. **Do not use the lock out key with power over 1 N·m. To prevent product damage, attach the enclosed warning label near the product.**
    Failure to follow this instruction may result in product damage or malfunction.
09. **Press lightly towards the product and then turn the lock out key to operate.**
    Failure to follow this instruction may result in product damage or malfunction.

10. **When the door is closed or the lock out key is put out, do not forcibly use the slide handle.**
    Failure to follow this instruction may result in product damage or malfunction.
11. **When the slide key unit is installed, do not use the spare operation key besides the operation key on the slide key unit to operate switch.**
    Failure to follow this instruction may result in personal injury or fire due to loss of safety function.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- This product is dedicated for Autonics safety door lock switch, SFDL Series. Do not use with the door lock switch from other manufacturer.
- Turn the lock out key to the 'SLIDE LOCK' direction to open the door, and carefully manage the lock out key.
  Do not let others operate the slide key unit.
- Durability of the slide key unit can be differed according to opening condition. Check the environment where the product is used in and machine which the product is used for, and use the product within the rated number of mechanical durability.
- Use the slide handle only in the right and left direction as following image.



- For the detailed information such as installation and use about the safety door lock switch, SFDL Series, which is used with the slide key unit, please refer to the instruction manual of the safety door lock switch.

Product Components

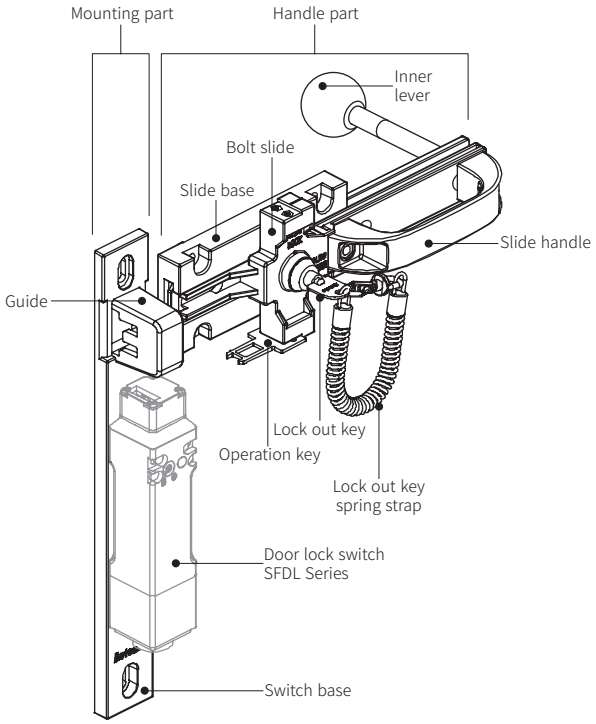
- Slide key unit mounting part
- Slide key unit handle part
- Inner lever
- Operation key (SFD-KH)
- Lock out key: 2
- Spring strap for lock out key
- Door lock switch mounting M4 bolt: 4 / M4 spring washer: 4
- Operation key mounting M4 bolt: 2 / M4 spring washer: 2 / M4 flat washer: 2
- Each Korean / English warning label

Specifications

Model	SFDL-SDK
Ambient temperature	-10 to 55°C, storage: -20 to 75°C (non-freezing or non-condensation)
Ambient humidity	≤ 95%RH, storage: 35 to 85%RH (non-freezing or non-condensation)
Mechanical durability	≥ 20,000 times
Material	Polyamide 66
Unit weight (Packaged)	≈ 720 g (≈ 900g)

Unit Description

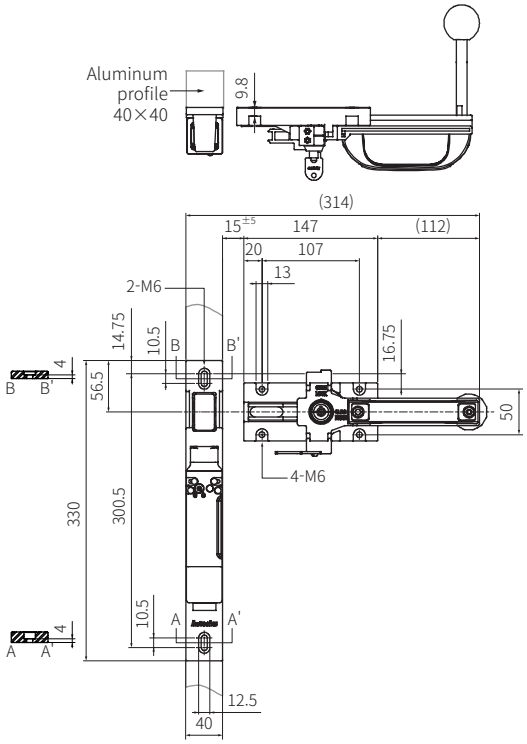
- Following image shows the status when door is opened.



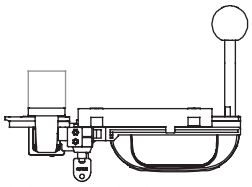
Dimensions

- Unit: mm, For the detailed dimensions of the product, follow the Autonics web site.
- Figures in ( ) can be differed according to the installing environment and product operation.

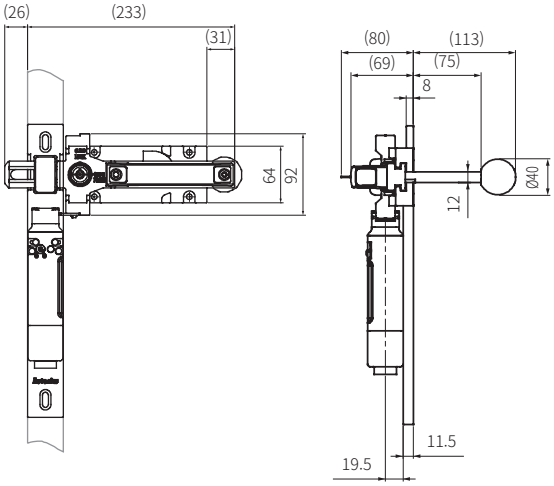
■ When the door is opened



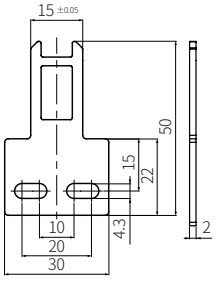
■ When the door is closed



■ Side



■ Operation key (SFD-KH)



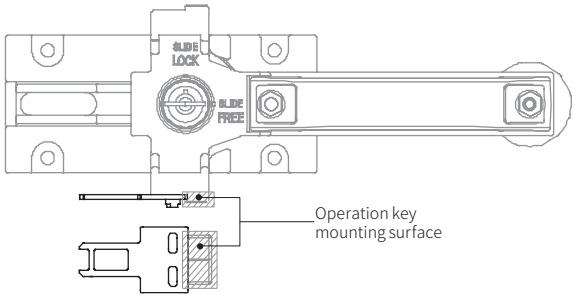
Cautions during Installation

- Tighten the bolt with the designated tightening torque of each, using spring washer/flat washer. Failure to follow Failure to follow this instruction may result in product failure or damage.

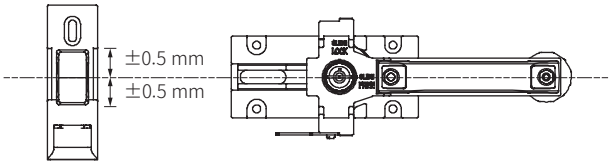
Bolt	Tightening torque
Slide key unit mounting bolt (M6 BOLT)	6.0 to 7.0 N·m
Operation key mounting bolt	2.4 to 2.8 N·m
Switch mounting bolt	0.75 to 1.15 N·m

Above tightening torque is for the status of installing with spring washer/flat washer.

- Apply additional methods such as glue to prevent loosening of the bolt. Mount the slide base with all of 4 bolts.
  - In order that the operation key is not to be tilted, mount the operation key tightly onto the operation key mounting surface.

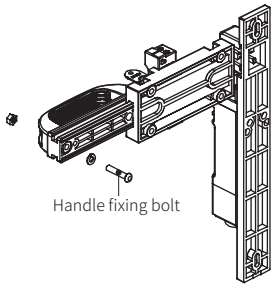


- Install the between bolt slide and guide aligning them within ±0.5 mm from the center line. Excessive wear and damage on the product may result in trouble in operating the slide key unit.

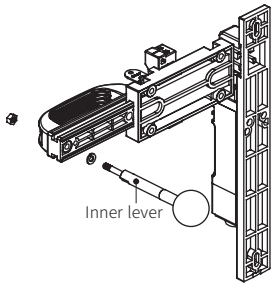


Inner Lever Installation

1. Disassemble the handle fixing bolt using 4mm hexagon wrench.



2. Tighten the hexagon nut+spring washer+inner lever with the designated tightening torque using a spanner with 10mm width. If the inner lever is screwed loosely, it may result in product failure.



Bolt	Tightening torque
Inner lever	9 to 10 N·m

- Keep cautious not to lose the hexagon nut and spring washer, when disassemble the handle fixing bolt.
- Do not use handle when the handle fixing bolt is disassembled. It may result in product failure.
- This inner lever is dedicated to Autonics SFDL-SDK. Do not use it for another product or purpose.

AmeriMation

Address 9 E College Dr,
Arlington Heights,
IL 60004

Telephone +1. 847. 388. 7189

Email sales@amerimation.net
Web www.amerimation.net