

# EP50S Series

## Shaft Type Ø50mm Single-turn Absolute Rotary Encoder

### ■ Features

- Compact size of external diameter: Ø50mm
- Various output code: BCD, Binary, Gray code
- Various and high resolution (720, 1024-division)
- Protection structure IP64 (dust-proof, oil-proof)

### ■ Applications

- Precision machine tool, Fabric machinery, Robot, Parking system



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



### ■ Ordering Information

<b>EP50S</b>	<b>8</b>	<b>1024</b>	<b>1</b>	<b>R</b>	<b>P</b>	<b>24</b>
Series	Shaft diameter	Pulses/revolution	Output code	Revolution direction	Control output	Power supply
Ø50mm shaft type	Ø8mm	Refer to resolution	1: BCD code 2: Binary code 3: Gray code	F: Output increases by CW rotation direction at the shaft R: Output increases by CCW rotation direction at the shaft	P: PNP open collector output N: NPN open collector output	5 : 5VDC±5% 24: 12-24VDC ±5%

### ■ Specifications

Item	Shaft Type Ø50mm Single-turn Absolute Rotary Encoder		
Model	PNP open collector output	EP50S8-□□□□-P-□	
	NPN open collector output	EP50S8-□□□□-N-□	
Resolution	6, 8, 10, 12, 16, 20, 24, 32, 40, 45, 48, 64, 90, 128, 180, 256, 360, 512, 720, 1024-division		
Electrical specification	Control output	PNP open collector output	Output voltage: min. (power supply-1.5)VDC---, load current: max. 32mA
		NPN open collector output	Load current: max. 32mA, residual voltage: max. 1VDC---
	Response time (rise, fall)	Ton=800nsec, Toff=max. 800nsec (cable: 2m, I sink = 32mA)	
	Max. response frequency	35kHz	
	Power supply	• 5VDC---±5% (ripple P-P: max. 5%) • 12-24VDC---±5% (ripple P-P: max. 5%)	
	Current consumption	Max. 100mA (disconnection of the load)	
	Insulation resistance	Over 100MΩ (at 500VDC megger between all terminals and case)	
	Dielectric strength	750VAC 50/60Hz for 1 min (between all terminals and case)	
Connection	Axial cable type (cable gland)		
Mechanical specification	Starting torque	Max. 70gf·cm (0.0069N·m)	
	Moment of inertia	Max. 40g·cm <sup>2</sup> (4×10 <sup>-6</sup> kg·m <sup>2</sup> )	
	Shaft loading	Radial: max. 10kgf, Thrust: max. 2.5kgf	
	Max. allowable revolution <sup>*1</sup>	3,000rpm	
Vibration	1.5mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours		
Shock	Approx. max. 50G		
Environment	Ambient temp.	-10 to 70°C, storage: -25 to 85°C	
	Ambient humi.	35 to 85%RH, storage: 35 to 90%RH	
Protection structure	IP64 (IEC standard)		
Cable	Ø7mm, 15-wire, 2m, Shield cable (AWG28, core diameter: 0.08mm, number of cores: 40, insulator diameter: Ø0.8mm)		
Accessory	Bracket, Coupling		
Approval	CE		
Weight <sup>*2</sup>	Approx. 482g (approx. 398g)		

※1: In case of Parallel type model, Make sure that Max. response revolution should be lower than or equal to max. allowable revolution when selecting the resolution.

$$[\text{Max. response revolution (rpm)}] = \frac{\text{Max. response frequency}}{\text{Resolution}} \times 60 \text{ sec}$$

※2: The weight includes packaging. The weight in parenthesis is for unit only.

※Environment resistance is rated at no freezing or condensation.

# Absolute Ø50mm Single-turn Shaft Type

## Specifications

Item		Shaft Type Ø50mm Single-turn Absolute Rotary Encoder			
Model	PNP open collector output	EP50S8-□□□□-P-□			
	NPN open collector output	EP50S8-□□□□-N-□			
Output code		Division	BCD code	Binary code	Gray code
Output phase / Output angle <sup>※1</sup>	1024	TS: 0.3515° ±15'(13bit)	TS: 0.3515° ±15'(10bit)	TS: 0.703° ±15'(10bit)	TS: 0.703° ±15'(10bit)
	720	TS: 0.5° ±25'(11bit)	TS: 0.5° ±25'(10bit)	TS: 1° ±25'(10bit)	TS: 1° ±25'(10bit)
	512	TS: 0.703° ±15'(11bit)	TS: 0.703° ±15'(9bit)	TS: 1.406° ±15'(9bit)	TS: 1.406° ±15'(9bit)
	360	TS: 1° ±25'(10bit)	TS: 1° ±25'(9bit)	TS: 2° ±25'(9bit)	TS: 2° ±25'(9bit)
	256	TS: 1.406° ±15'(10bit)	TS: 1.406° ±15'(8bit)	TS: 2.8125° ±15'(8bit)	TS: 2.8125° ±15'(8bit)
	180	TS: 2° ±25'(9bit)	TS: 2° ±25'(8bit)	TS: 4° ±25'(8bit)	TS: 4° ±25'(8bit)
	128	TS: 2.8125° ±15'(9bit)	TS: 2.8125° ±15'(7bit)	TS: 5.625° ±15'(7bit)	TS: 5.625° ±15'(7bit)
	90	TS: 4° ±25'(8bit)	TS: 4° ±25'(7bit)	TS: 8° ±25'(7bit)	TS: 8° ±25'(7bit)
	64	TS: 5.625° ±15'(7bit)	TS: 5.625° ±15'(6bit)	TS: 11.25° ±15'(6bit)	TS: 11.25° ±15'(6bit)
	48	TS: 7.5° ±25'(7bit)	TS: 7.5° ±25'(6bit)	TS: 15° ±25'(6bit)	TS: 15° ±25'(6bit)
	45	TS: 8° ±25'(7bit)	TS: 8° ±25'(6bit)	TS: 16° ±25'(6bit)	TS: 16° ±25'(6bit)
	40	TP1: 5° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 9° ±60'(6bit) EP: 9° ±60'(1bit)	TP1: 5° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 9° ±60'(6bit) EP: 9° ±60'(1bit)	TP1: 5° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 18° ±60'(6bit) EP: 9° ±60'(1bit)	TP1: 5° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 18° ±60'(6bit) EP: 9° ±60'(1bit)
	32	TP1: 7° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 11.25° ±60'(6bit) EP: 11.25° ±60'(1bit)	TP1: 7° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 11.25° ±60'(5bit) EP: 11.25° ±60'(1bit)	TP1: 7° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 22.5° ±60'(5bit) EP: 11.25° ±60'(1bit)	TP1: 7° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 22.5° ±60'(5bit) EP: 11.25° ±60'(1bit)
	24	TP1: 8° ±60'(1bit) TP2: 3° ±60'(1bit) TS: 15° ±60'(6bit) EP: 15° ±60'(1bit)	TP1: 8° ±60'(1bit) TP2: 3° ±60'(1bit) TS: 15° ±60'(5bit) EP: 15° ±60'(1bit)	TP1: 8° ±60'(1bit) TP2: 3° ±60'(1bit) TS: 30° ±60'(5bit) EP: 15° ±60'(1bit)	TP1: 8° ±60'(1bit) TP2: 3° ±60'(1bit) TS: 30° ±60'(5bit) EP: 15° ±60'(1bit)
	20	TP1: 12° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 18° ±60'(5bit) EP: 18° ±60'(1bit)	TP1: 12° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 18° ±60'(5bit) EP: 18° ±60'(1bit)	TP1: 12° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 36° ±60'(5bit) EP: 18° ±60'(1bit)	TP1: 12° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 36° ±60'(5bit) EP: 18° ±60'(1bit)
	16	TP1: 15° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 22.5° ±60'(5bit) EP: 22.5° ±60'(1bit)	TP1: 15° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 22.5° ±60'(4bit) EP: 22.5° ±60'(1bit)	TP1: 15° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 45° ±60'(4bit) EP: 22.5° ±60'(1bit)	TP1: 15° ±60'(1bit) TP2: 2° ±60'(1bit) TS: 45° ±60'(4bit) EP: 22.5° ±60'(1bit)
	12	TP1: 15° ±60'(1bit) TP2: 3° ±60'(1bit) TS: 30° ±60'(5bit) EP: 30° ±60'(1bit)	TP1: 15° ±60'(1bit) TP2: 3° ±60'(1bit) TS: 30° ±60'(4bit) EP: 30° ±60'(1bit)	TP1: 15° ±60'(1bit) TP2: 3° ±60'(1bit) TS: 60° ±60'(4bit) EP: 30° ±60'(1bit)	TP1: 15° ±60'(1bit) TP2: 3° ±60'(1bit) TS: 60° ±60'(4bit) EP: 30° ±60'(1bit)
	10	TP1: 30° ±60'(1bit) TP2: 12° ±60'(1bit) TS: 36° ±60'(4bit) EP: 36° ±60'(1bit)	TP1: 30° ±60'(1bit) TP2: 12° ±60'(1bit) TS: 36° ±60'(4bit) EP: 36° ±60'(1bit)	TP1: 30° ±60'(1bit) TP2: 12° ±60'(1bit) TS: 72° ±60'(4bit) EP: 36° ±60'(1bit)	TP1: 30° ±60'(1bit) TP2: 12° ±60'(1bit) TS: 72° ±60'(4bit) EP: 36° ±60'(1bit)
	8	TP1: 39° ±60'(1bit) TP2: 15° ±60'(1bit) TS: 45° ±60'(3bit) EP: 45° ±60'(1bit)	TP1: 39° ±60'(1bit) TP2: 15° ±60'(1bit) TS: 45° ±60'(3bit) EP: 45° ±60'(1bit)	TP1: 39° ±60'(1bit) TP2: 15° ±60'(1bit) TS: 90° ±60'(3bit) EP: 45° ±60'(1bit)	TP1: 39° ±60'(1bit) TP2: 15° ±60'(1bit) TS: 90° ±60'(3bit) EP: 45° ±60'(1bit)
	6	TP1: 53° ±60'(1bit) TP2: 15° ±60'(1bit) TS: 60° ±60'(3bit) EP: 60° ±60'(1bit)	TP1: 53° ±60'(1bit) TP2: 15° ±60'(1bit) TS: 60° ±60'(3bit) EP: 60° ±60'(1bit)	TP1: 53° ±60'(1bit) TP2: 15° ±60'(1bit) TS: 120° ±60'(3bit) EP: 60° ±60'(1bit)	TP1: 53° ±60'(1bit) TP2: 15° ±60'(1bit) TS: 120° ±60'(3bit) EP: 60° ±60'(1bit)

※1: TS=Signal Pulse, TP=Timing Pulse, EP=Even Parity

SENSORS

CONTROLLERS

MOTION DEVICES

SOFTWARE

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) LIDAR

(D) Door/Area Sensors

(E) Vision Sensors

(F) Proximity Sensors

(G) Pressure Sensors

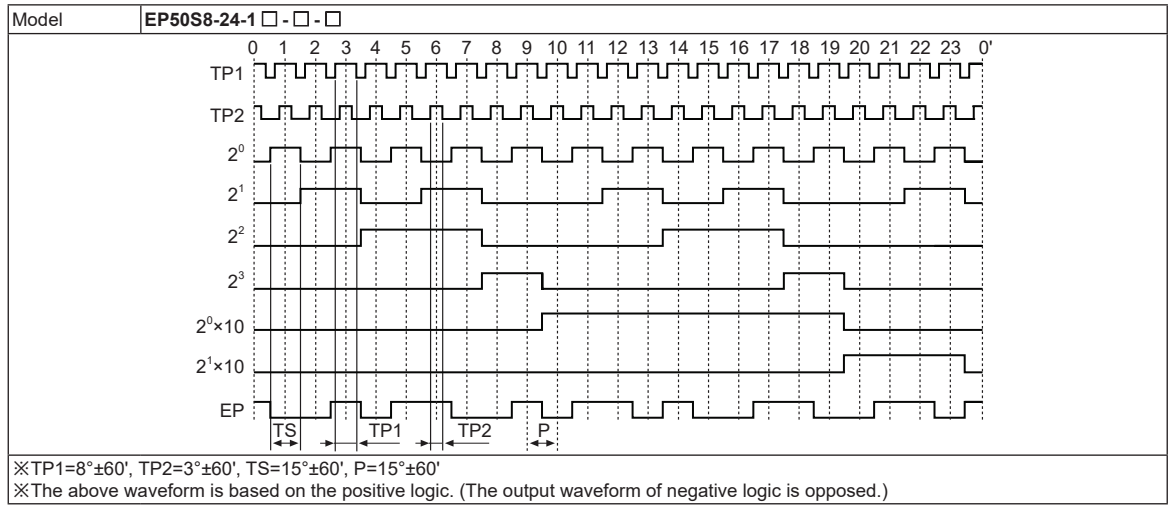
(H) Rotary Encoders

(I) Connectors/  
Connector Cables/  
Sensor Distribution  
Boxes/ Sockets

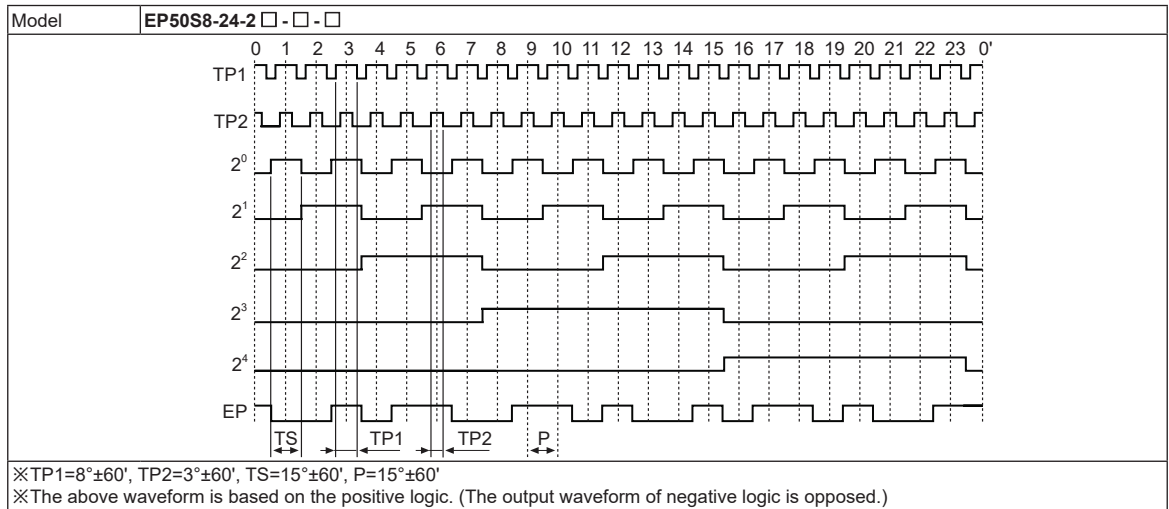
# EP50S Series

## Output Waveform

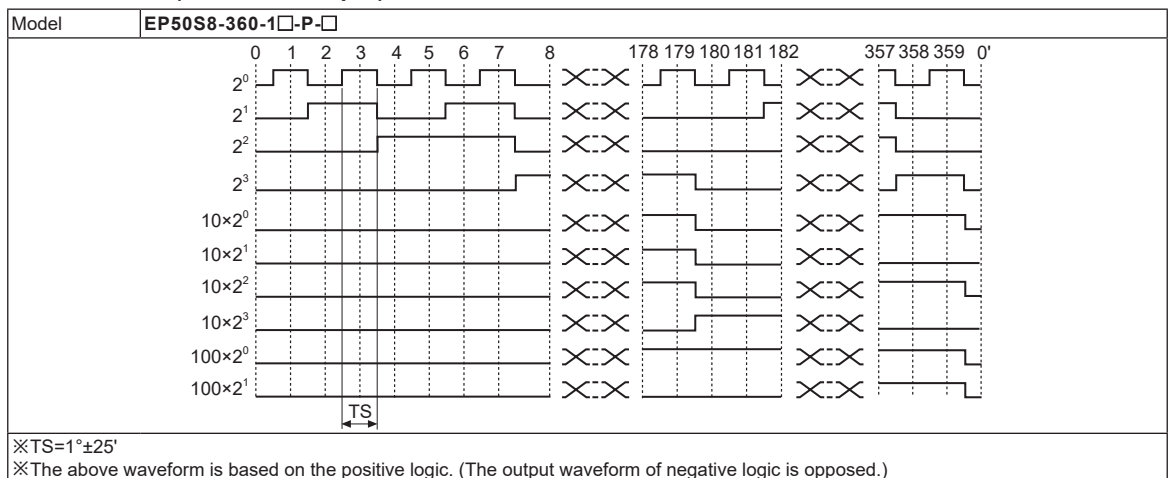
### 24-division (BCD code output)



### 24-division (Binary code output)



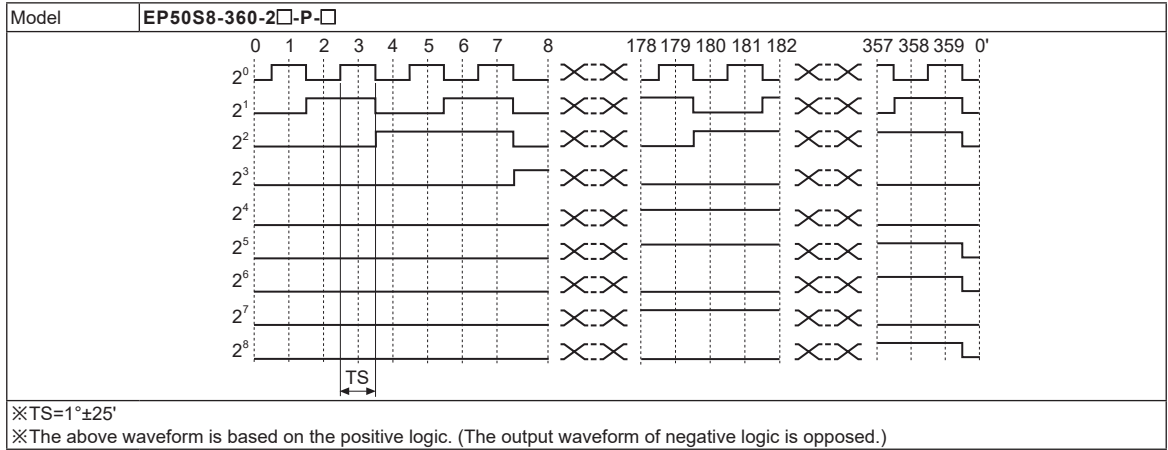
### 360-division (BCD code output)



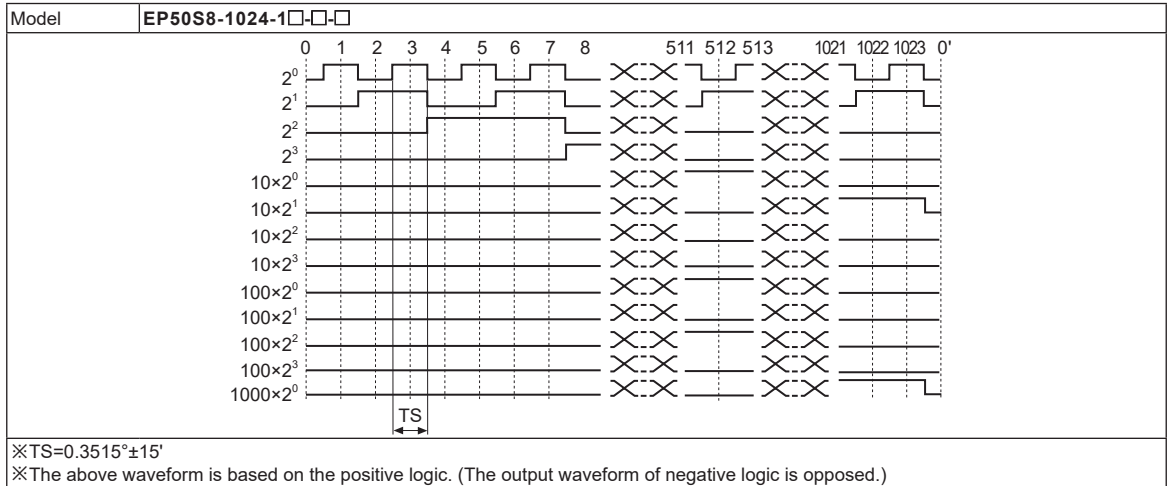
# Absolute Ø50mm Single-turn Shaft Type

## Output Waveform

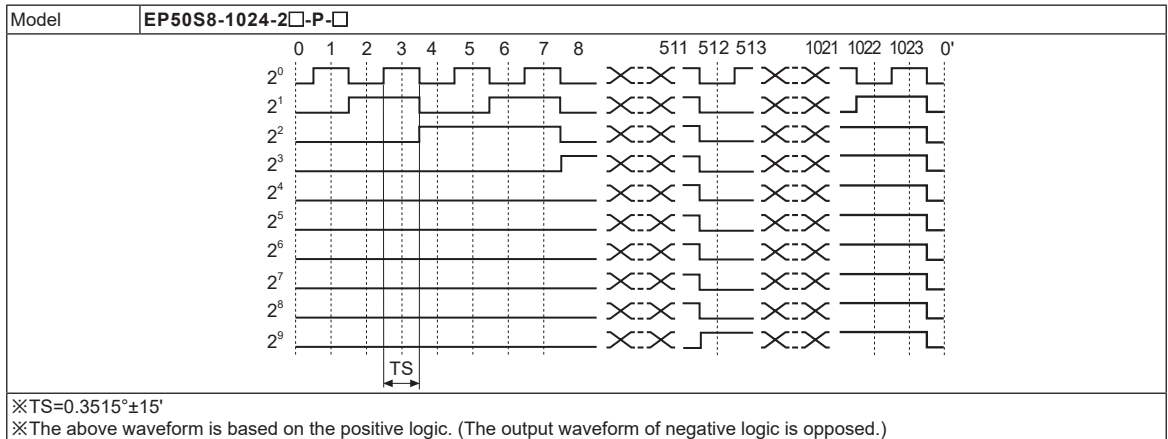
### 360-division (Binary code output)



### 1024-division (BCD code output)



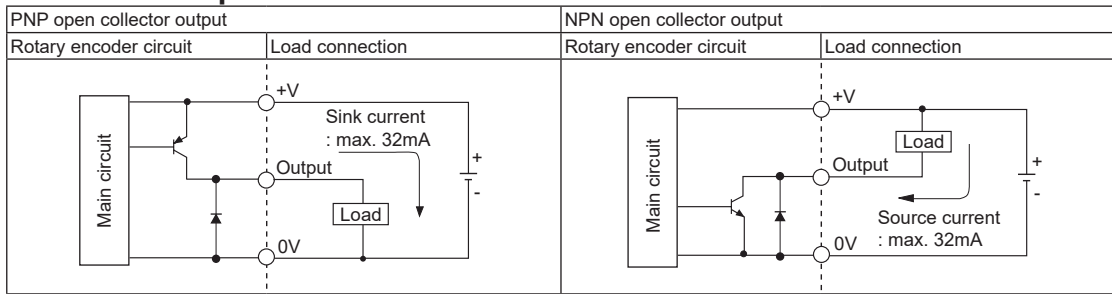
### 1024-division (Binary code output)



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- (I) Connectors/ Connector Cables/ Sensor Distribution Boxes/ Sockets

# EP50S Series

## Control Output Circuit



※Each bit of output has the same circuit.

※Please be aware of the fact that overload and short circuit may cause circuit break.

## Connections

### BCD code

Resolution		Color																																									
		6	8	10	12	16	20	24	32	40	45	48	64	90	128	180	256	360	512	720	1024																						
Power	White											+V																															
	Black											0V																															
Output wire	Brown											$2^0$																															
	Red											$2^1$																															
	Orange											$2^2$																															
	Yellow	N-C												$2^3$																													
	Blue	N-C																$2^0 \times 10$																									
	Purple	N-C																				$2^1 \times 10$																					
	Gray													N-C										$2^2 \times 10$																			
	White/Brown													TP1										N-C										$2^3 \times 10$									
	White/Red													TP2										N-C										$2^0 \times 100$									
	White/Orange													EP										N-C										$2^1 \times 100$									
	White/Yellow													N-C																				$2^2 \times 100$									
	White/Blue													N-C																				$2^3 \times 100$									
	White/Purple													N-C																				$2^0 \times 1000$									
	Shield wire	Signal shield cable (F.G.)																																									

※Unused wires must be insulated.

※Encoder metal case and shield cable must be grounded (F.G.).

※N-C (not connected)

※Please use caution to avoid short circuit when connecting output cables because I/O circuit uses the dedicated driver IC.

※Do not apply tensile strength over 30N to the cable.

### Binary code/Gray code

Resolution		Color																																									
		6	8	10	12	16	20	24	32	40	45	48	64	90	128	180	256	360	512	720	1024																						
Power	White											+V																															
	Black											0V																															
Output wire	Brown											$2^0$																															
	Red											$2^1$																															
	Orange											$2^2$																															
	Yellow	N-C												$2^3$																													
	Blue	N-C																$2^4$																									
	Purple	N-C																				$2^5$																					
	Gray													N-C										$2^6$																			
	White/Brown													TP1										N-C										$2^7$									
	White/Red													TP2										N-C										$2^8$									
	White/Orange													EP										N-C										$2^9$									
	Shield wire	Signal shield cable (F.G.)																																									

※Unused wires must be insulated.

※Encoder metal case and shield cable must be grounded (F.G.).

※N-C (not connected)

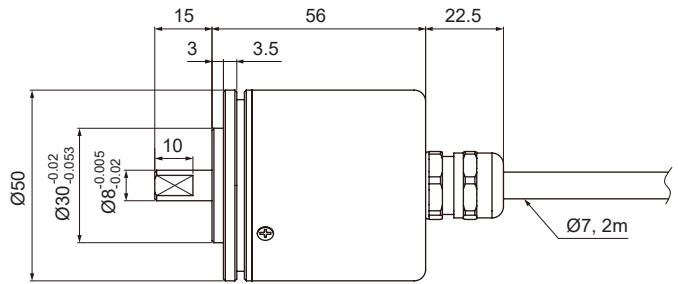
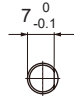
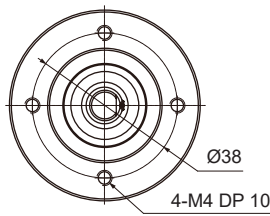
※Please use caution to avoid short circuit when connecting output cables because I/O circuit uses the dedicated driver IC.

※Do not apply tensile strength over 30N to the cable.

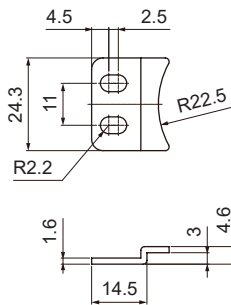
# Absolute Ø50mm Single-turn Shaft Type

## ■ Dimensions

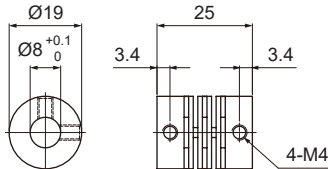
(unit: mm)



## ◎ Bracket



## ◎ Coupling



- Parallel misalignment: max. 0.25mm
- Angular misalignment: max. 5°
- End-play: max. 0.5mm

- ※ Do not load overweight on the shaft.
- ※ Do not put strong impact when insert a coupling into shaft. Failure to follow this instruction may result in product damage.
- ※ Fix the unit or a coupling by a wrench under 0.15N·m of torque.
- ※ When you install this unit, if eccentricity and deflection angle are larger, it may shorten the life cycle of this unit.
- ※ For parallel misalignment, angular misalignment, end-play terms, refer to the "Glossary" section of Technical Description.
- ※ For flexible coupling (ERB series) information, refer to the ERB series section.

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