

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

EP50S	8	1024	1	R	P	24
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 ² (4×10 ⁻⁶ kg·m ²)	
	Shaft loading	Radial: max. 10kgf, Thrust: max. 2.5kgf	
	Max. allowable revolution ^{*1}	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 ^{*2}	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 ^{※1}	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

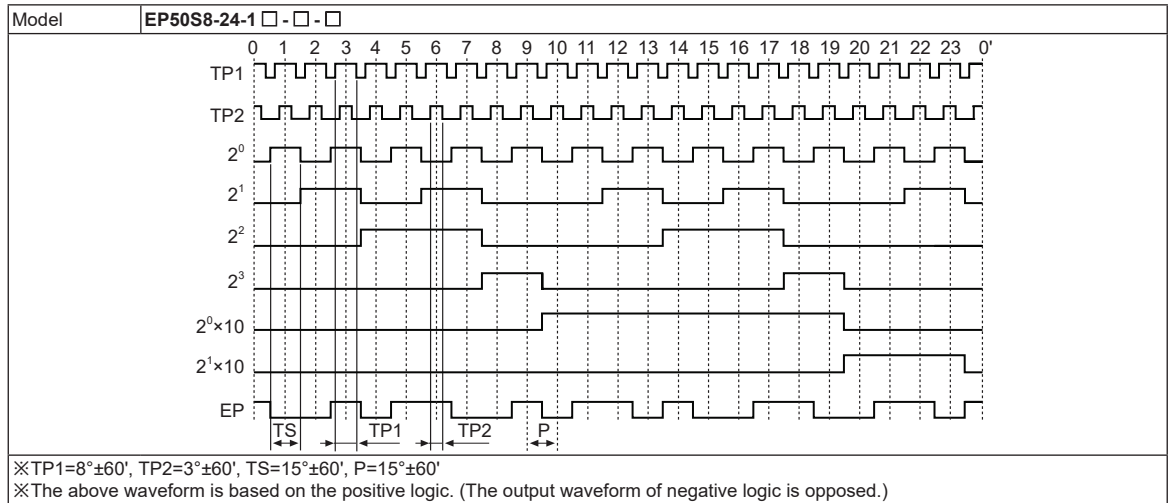
(H) Rotary Encoders

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

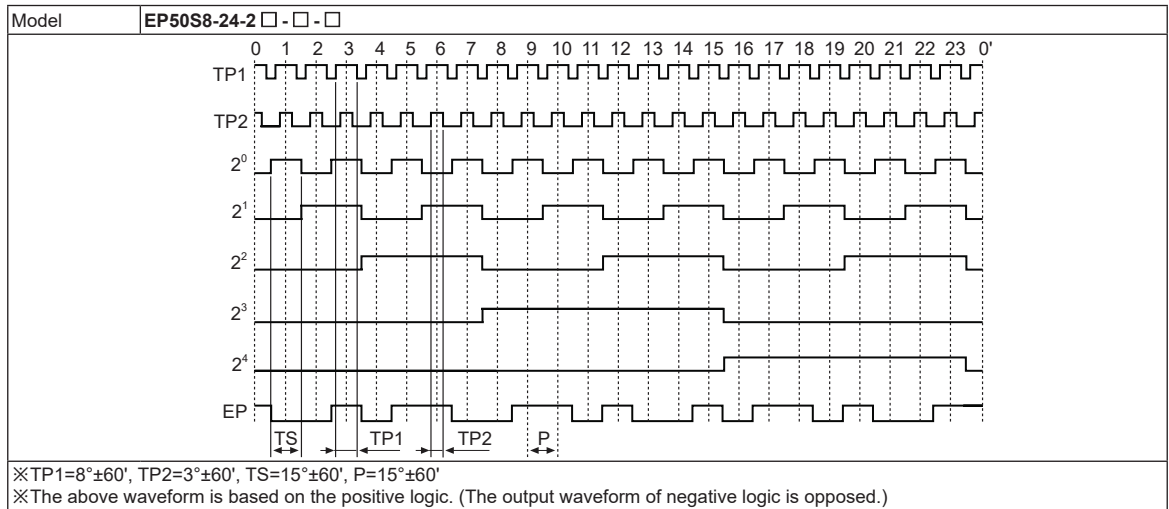
EP50S Series

Output Waveform

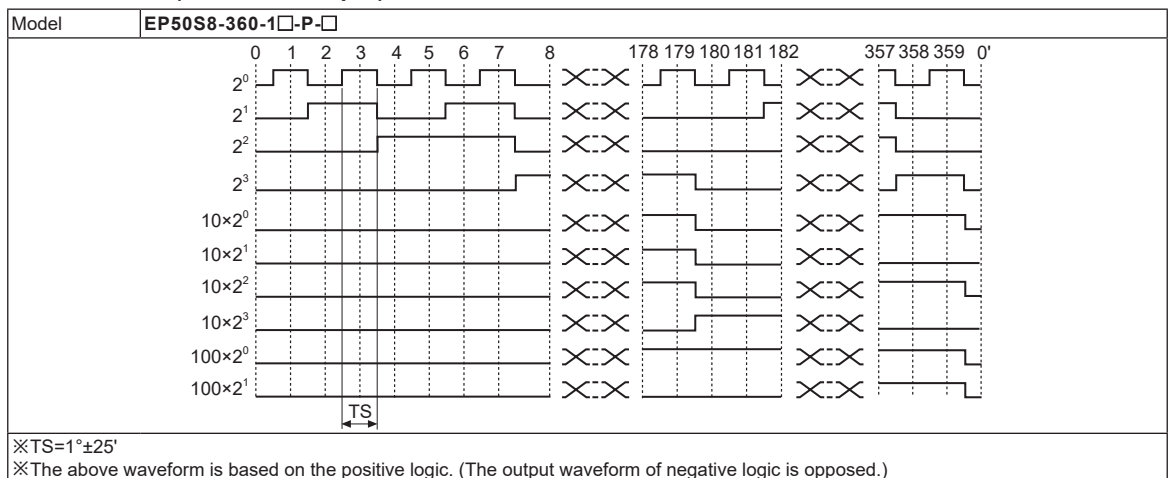
24-division (BCD code output)



24-division (Binary code output)



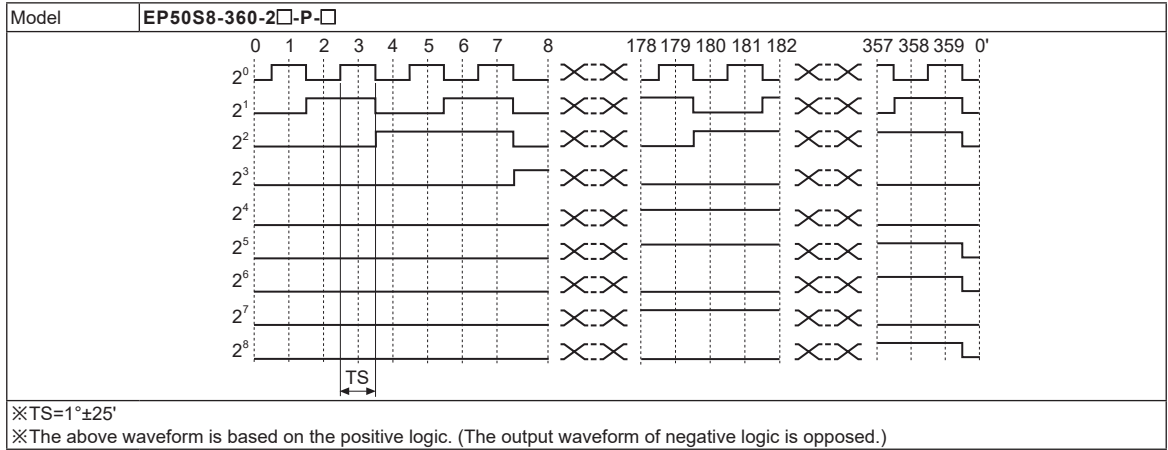
360-division (BCD code output)



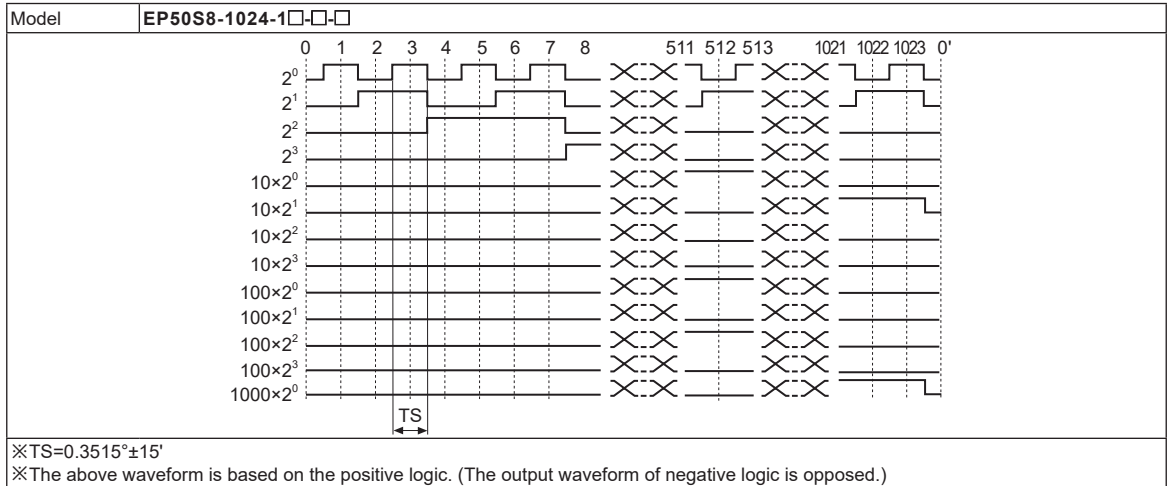
Absolute Ø50mm Single-turn Shaft Type

■ Output Waveform

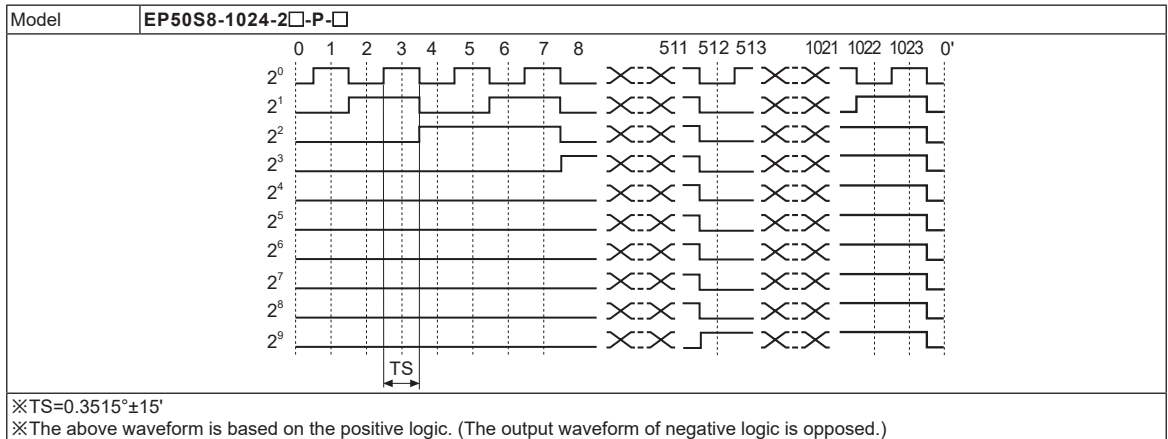
○ 360-division (Binary code output)



○ 1024-division (BCD code output)



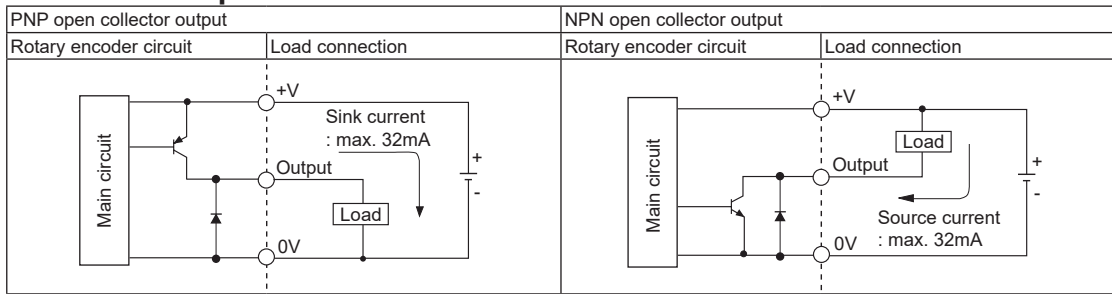
○ 1024-division (Binary code output)



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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

Color	Resolution																														
	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																$2^6 \times 10$													
	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								$2^9 \times 1000$									
	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

Color	Resolution																														
	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)

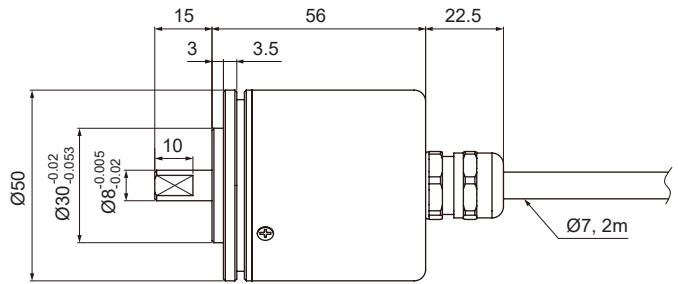
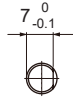
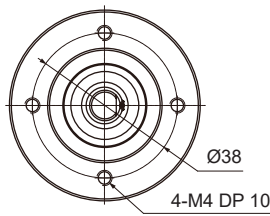
※Please use caution to avoid short circuit when connecting output cables because I/O circuit uses the dedicated driver IC.

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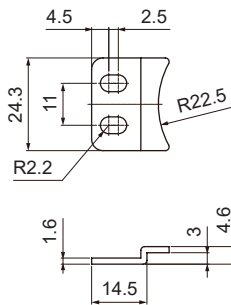
Absolute Ø50mm Single-turn Shaft Type

■ Dimensions

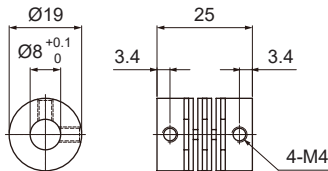
(unit: mm)



◎ 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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