EP50S Series

Shaft Type Ø50mm 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 "Caution for your safety" in operation manual before using.** CE

▣ Ordering Information

EP50S	8	– 1024	– 1	R	– P	– 24
Series	Shaft diameter	Steps/revolution	Output code	Revolution direction	Control output	Power supply
50mm 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 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						

	Output code	Division	BCD code	Binary code	Gray code	Division	BCD code	Binary code	Gray code
Electrical specification	Output phase / Output angle[1]	1024	TS: 0.3515°±15' (13-bit)	TS: 0.3515°±15' (10-bit)	TS: 0.703°±15' (10-bit)	20	TP1: 12°±60' (1-bit) TP2: 2°±60' (1-bit) TS: 18°±60' (5-bit) EP: 18°±60' (1-bit)	TP1: 12°±60' (1-bit) TP2: 2°±60' (1-bit) TS: 18°±60' (5-bit) EP: 18°±60' (1-bit)	TP1: 12°±60' (1-bit) TP2: 2°±60' (1-bit) TS: 36°±60' (5-bit) EP: 18°±60' (1-bit)
		720	TS: 0.5°±25' (11-bit)	TS: 0.5°±25' (10-bit)	TS: 1°±25' (10-bit)				
		512	TS: 0.703°±15' (11-bit)	TS: 0.703°±15' (9-bit)	TS: 1.406°±15' (9-bit)				
		360	TS: 1°±25' (10-bit)	TS: 1°±25' (9-bit)	TS: 2°±25' (9-bit)	16	TP1: 15°±60' (1-bit) TP2: 2°±60' (1-bit) TS: 22.5°±60' (5-bit) EP: 22.5°±60' (1-bit)	TP1: 15°±60' (1-bit) TP2: 2°±60' (1-bit) TS: 22.5°±60' (4-bit) EP: 22.5°±60' (1-bit)	TP1: 15°±60' (1-bit) TP2: 2°±60' (1-bit) TS: 45°±60' (4-bit) EP: 22.5°±60' (1-bit)
		256	TS: 1.406°±15' (10-bit)	TS: 1.406°±15' (8-bit)	TS: 2.8125°±15' (8-bit)				
		180	TS: 2°±25' (9-bit)	TS: 2°±25' (8-bit)	TS: 4°±25' (8-bit)				
		128	TS: 2.8125°±15' (9-bit)	TS: 2.8125°±15' (7-bit)	TS: 5.625°±15' (7-bit)				
		90	TS: 4°±25' (8-bit)	TS: 4°±25' (7-bit)	TS: 8°±25' (7-bit)	12	TP1: 15°±60' (1-bit) TP2: 3°±60' (1-bit) TS: 30°±60' (5-bit) EP: 30°±60' (1-bit)	TP1: 15°±60' (1-bit) TP2: 3°±60' (1-bit) TS: 30°±60' (4-bit) EP: 30°±60' (1-bit)	TP1: 15°±60' (1-bit) TP2: 3°±60' (1-bit) TS: 60°±60' (4-bit) EP: 30°±60' (1-bit)
		64	TS: 5.625°±15' (7-bit)	TS: 5.625°±15' (6-bit)	TS: 11.25°±15' (6-bit)				
		48	TS: 7.5°±25' (7-bit)	TS: 7.5°±25' (6-bit)	TS: 15°±25' (6-bit)				
		45	TS: 8°±25' (7-bit)	TS: 8°±25' (6-bit)	TS: 16°±25' (6-bit)				
		40	TP1: 5°±60' (1-bit) TP2: 2°±60' (1-bit) TS: 9°±60' (6-bit) EP: 9°±60' (1-bit)	TP1: 5°±60' (1-bit) TP2: 2°±60' (1-bit) TS: 9°±60' (6-bit) EP: 9°±60' (1-bit)	TP1: 5°±60' (1-bit) TP2: 2°±60' (1-bit) TS: 18°±60' (6-bit) EP: 9°±60' (1-bit)	10	TP1: 30°±60' (1-bit) TP2: 12°±60' (1-bit) TS: 36°±60' (4-bit) EP: 36°±60' (1-bit)	TP1: 30°±60' (1-bit) TP2: 12°±60' (1-bit) TS: 36°±60' (4-bit) EP: 36°±60' (1-bit)	TP1: 30°±60' (1-bit) TP2: 12°±60' (1-bit) TS: 72°±60' (4-bit) EP: 36°±60' (1-bit)
		32	TP1: 7°±60' (1-bit) TP2: 2°±60' (1-bit) TS: 11.25°±60' (6-bit) EP: 11.25°±60' (1-bit)	TP1: 7°±60' (1-bit) TP2: 2°±60' (1-bit) TS: 11.25°±60' (5-bit) EP: 11.25°±60' (1-bit)	TP1: 7°±60' (1-bit) TP2: 2°±60' (1-bit) TS: 22.5°±60' (5-bit) EP: 11.25°±60' (1-bit)	8	TP1: 39°±60' (1-bit) TP2: 15°±60' (1-bit) TS: 45°±60' (3-bit) EP: 45°±60' (1-bit)	TP1: 39°±60' (1-bit) TP2: 15°±60' (1-bit) TS: 45°±60' (3-bit) EP: 45°±60' (1-bit)	TP1: 39°±60' (1-bit) TP2: 15°±60' (1-bit) TS: 90°±60' (3-bit) EP: 45°±60' (1-bit)
		24	TP1: 8°±60' (1-bit) TP2: 3°±60' (1-bit) TS: 15°±60' (6-bit) EP: 15°±60' (1-bit)	TP1: 8°±60' (1-bit) TP2: 3°±60' (1-bit) TS: 15°±60' (5-bit) EP: 15°±60' (1-bit)	TP1: 8°±60' (1-bit) TP2: 3°±60' (1-bit) TS: 30°±60' (5-bit) EP: 15°±60' (1-bit)	6	TP1: 53°±60' (1-bit) TP2: 15°±60' (1-bit) TS: 60°±60' (3-bit) EP: 60°±60' (1-bit)	TP1: 53°±60' (1-bit) TP2: 15°±60' (1-bit) TS: 60°±60' (3-bit) EP: 60°±60' (1-bit)	TP1: 53°±60' (1-bit) TP2: 15°±60' (1-bit) TS: 120°±60' (3-bit) EP: 60°±60' (1-bit)

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)	

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

■ Specifications

Item		Shaft Type Ø50mm Absolute Rotary Encoder
Mechanical specification	Starting torque	Max. 70gf·cm (0.0069N·m)
	Moment of inertia	Max. 40g·cm² (4×10⁻⁶kg·m²)
	Shaft loading	Radial: 10kgf, Thrust: 2.5kgf
	Max. allowable revolution[※2]	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
Environ-ment	Ambient temperature	-10 to 70℃, storage: -25 to 85℃
	Ambient humidity	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
Unit weight[※3]		Approx. 482g (approx. 398g)

※2: 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.

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

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

■ Output Waveform

● 24-division (BCD code output)
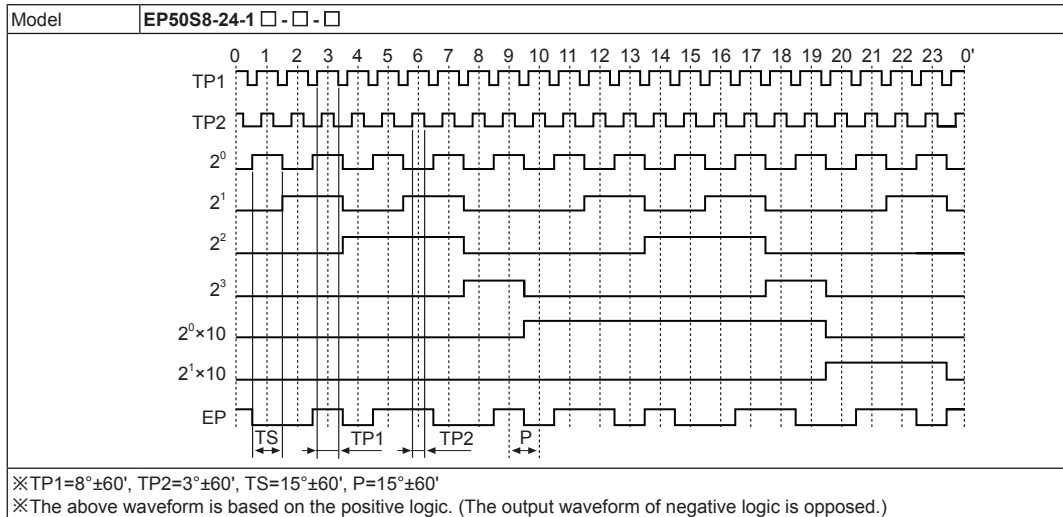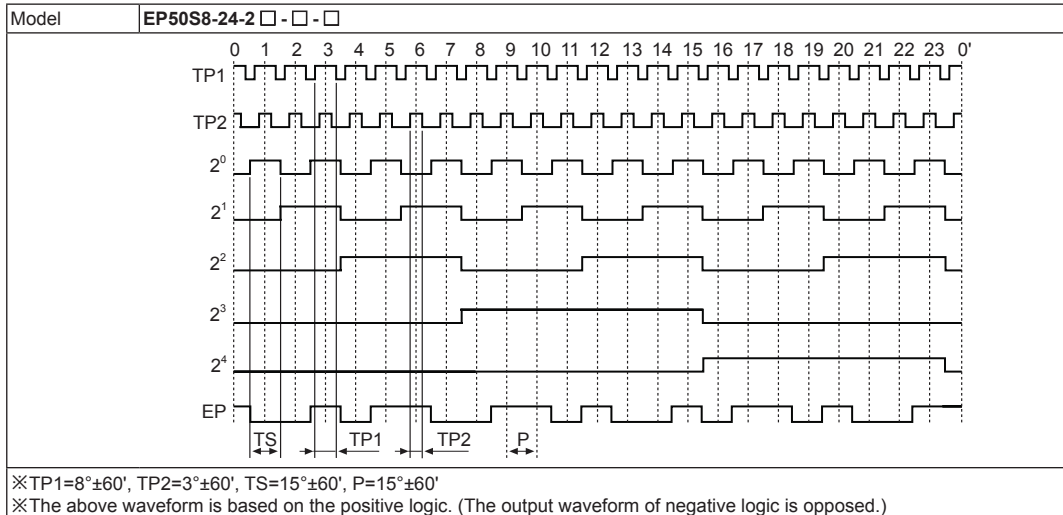
Model	EP50S8-24-1□ - □ - □

※TP1=8°±60', TP2=3°±60', TS=15°±60', P=15°±60'
※The above waveform is based on the positive logic. (The output waveform of negative logic is opposed.)

● 24-division (Binary code output)

Model	EP50S8-24-2□ - □ - □

※TP1=8°±60', TP2=3°±60', TS=15°±60', P=15°±60'
※The above waveform is based on the positive logic. (The output waveform of negative logic is opposed.)

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) Door/Area Sensors

(D) Proximity Sensors

(E) Pressure Sensors

(F) Rotary Encoders

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

(H) Temperature Controllers

(I) SSRs / Power Controllers

(J) Counters

(K) Timers

(L) Panel Meters

(M) Tacho / Speed / Pulse Meters

(N) Display Units

(O) Sensor Controllers

(P) Switching Mode Power Supplies

(Q) Stepper Motors & Drivers & Controllers

(R) Graphic/ Logic Panels

(S) Field Network Devices

(T) Software

EP50S Series

◼ Output Waveform

● 360-division (BCD code output)

Model	EP50S8-360-1□-P-□

※TS=1°±25'
※The above waveform is based on the positive logic. (The output waveform of negative logic is opposed.)

● 360-division (Binary code output)

Model	EP50S8-360-2□-P-□

※TS=1°±25'
※The above waveform is based on the positive logic. (The output waveform of negative logic is opposed.)

● 1024-division (BCD code output)

Model	EP50S8-1024-1□-□-□

※TS=0.3515°±15'
※The above waveform is based on the positive logic. (The output waveform of negative logic is opposed.)

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Absolute Ø50mm Shaft Type

▣ Output Waveform

● 1024-division (Binary code output)

Model	EP50S8-1024-2□-P-□

※TS=0.3515°±15'
※The above waveform is based on the positive logic. (The output waveform of negative logic is opposed.)

▣ Control Output I/O Circuit

PNP open collector output		NPN open collector output	
Rotary encoder circuit	Load connection	Rotary encoder circuit	Load connection

※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										
Power Boack										0V										
Output wire Brown										2^0										
Output wire Red										2^1										
Output wire Orange										2^2										
Output wire Yellow	N·C									2^3										
Output wire Blue		N·C								$2^0 \times 10$										
Output wire Purple			N·C							$2^1 \times 10$										
Output wire Gray				N·C								$2^2 \times 10$								
Output wire White/Brown			TP1							N·C			$2^3 \times 10$							
Output wire White/Red			TP2							N·C				$2^0 \times 100$						
Output wire White/Orange			EP							N·C					$2^1 \times 100$					
Output wire White/Yellow							N·C										$2^2 \times 100$			
Output wire White/Blue								N·C											$2^3 \times 100$	
Output wire White/Purple								N·C											$2^0 \times 1000$	
Output wire 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) : Not using.
※Please use caution to avoid short circuit when connecting output cables because I/O circuit uses the dedicated driver IC.

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) Door/Area Sensors

(D) Proximity Sensors

(E) Pressure Sensors

(F) Rotary Encoders

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

(H) Temperature Controllers

(I) SSRs / Power Controllers

(J) Counters

(K) Timers

(L) Panel Meters

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(P) Switching Mode Power Supplies

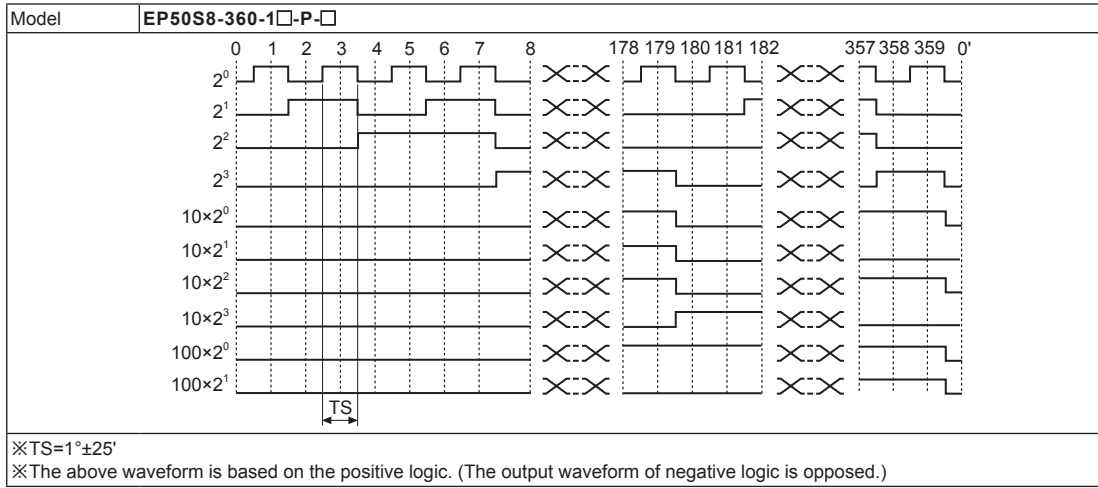(Q) Stepper Motors & Drivers & Controllers

(R) Graphic/ Logic Panels

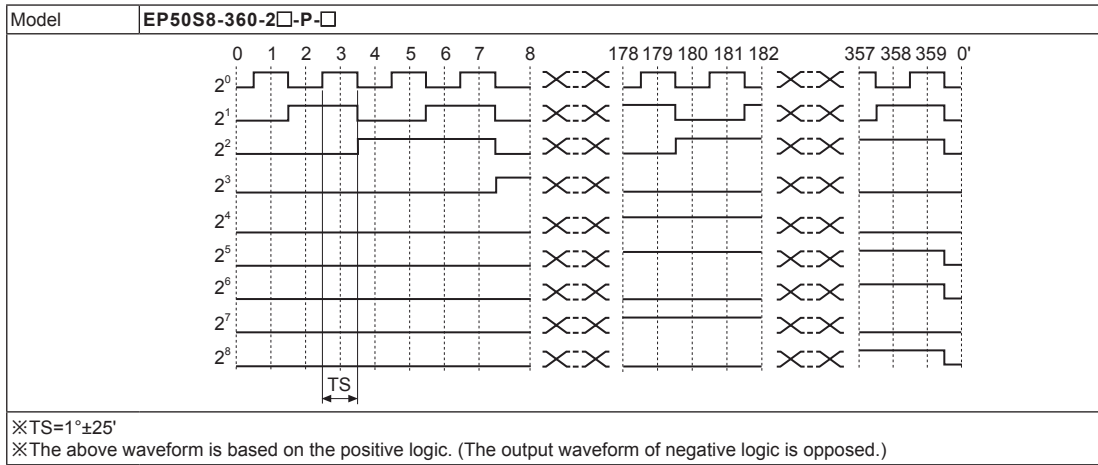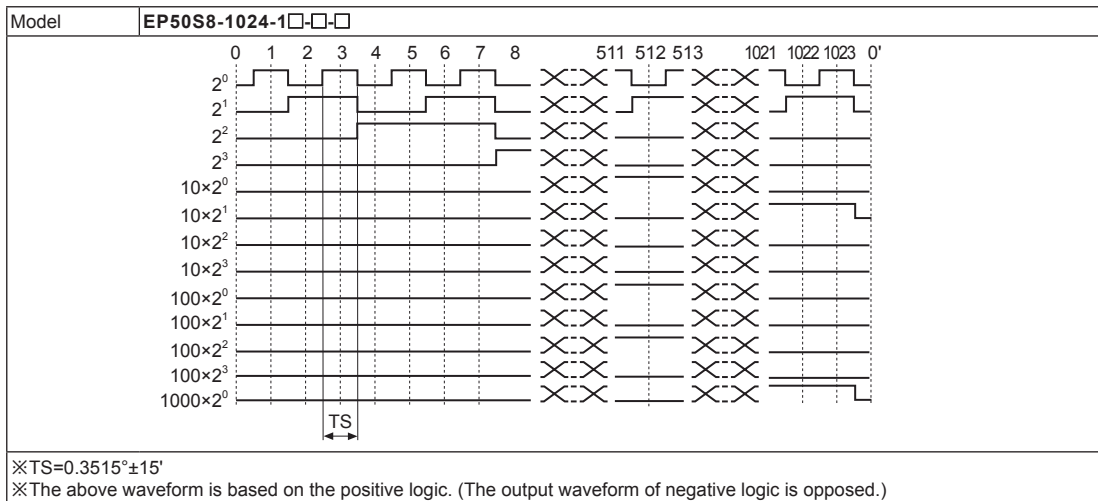(S) Field Network Devices

(T) Software

EP50S Series

▣ Connections

● Binary code/Gray code

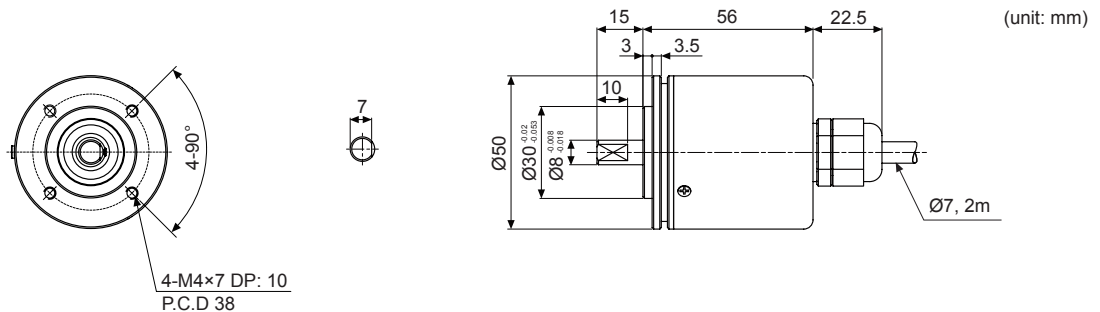| Resolution / Color	6	8	10	12	16	20	24	32	40	45	48	64	90	128	180	256	360	512	720	1024
Power — White	+V																			
Power — Black	0V																			
Output wire — Brown	2^0																			
Output wire — Red	2^1																			
Output wire — Orange	2^2																			
Output wire —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

※Unused wires must be insulated.
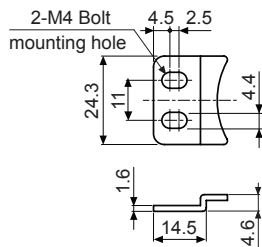※Encoder metal case and shield cable must be grounded (F.G.).
※N.C (Not Connected) : Not using.
※Please use caution to avoid short circuit when connecting output cables because I/O circuit uses the dedicated driver IC.
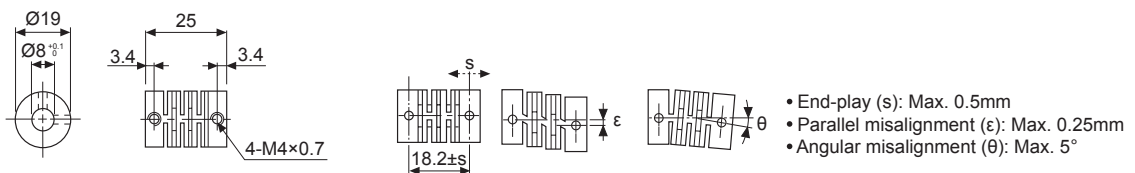
▣ Dimensions

(unit: mm)

15   56   22.5
3   3.5
10
Ø50   Ø30 +0.02/−0.053   Ø8 −0.008/−0.018
Ø7, 2m

7

4-90°
4-M4×7 DP: 10
P.C.D 38

● Bracket

2-M4 Bolt mounting hole
4.5   2.5
24.3   11   4.4
1.6   14.5   4.6

● Coupling (EP50S)

Ø19
Ø8 +0.1/0
3.4   25   3.4
4-M4×0.7
18.2±s
s   ε   θ

• End-play (s): Max. 0.5mm
• Parallel misalignment (ε): Max. 0.25mm
• Angular misalignment (θ): Max. 5°

※When mounting the coupling to encoder shaft, if there is combined misalignment (parallel, angular misalignment)
between rotating encoder shaft and mate shaft, it may shorten life cycle of encoder and coupling.
※ Do not load overweight on the shaft.
※For parallel misalignment, angular misalignment, end-play terms, refer to page F-87.
※For flexible coupling (ERB series) information, refer to page F-80.

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