

# Autonics

## Ø50mm Shaft type Single-turn Absolute Rotary Encoder EP50S SERIES

### INSTRUCTION MANUAL



Thank you for choosing our Autonics product.  
Please read the following safety considerations before use.

#### ■ Safety Considerations

- ⚠ Please observe all safety considerations for safe and proper product operation to avoid hazards.
- ⚠ symbol represents caution due to special circumstances in which hazards may occur.
- Warning** Failure to follow these instructions may result in serious injury or death.
- Caution** Failure to follow these instructions may result in personal injury or product damage.

#### ⚠ Warning

- 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.
- 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.
- Install on a device panel to use.**  
Failure to follow this instruction may result in fire.
- Do not connect, repair, or inspect the unit while connected to a power source.**  
Failure to follow this instruction may result in fire.
- Check 'Connections' before wiring.**  
Failure to follow this instruction may result in fire.
- Do not disassemble or modify the unit.**  
Failure to follow this instruction may result in fire.

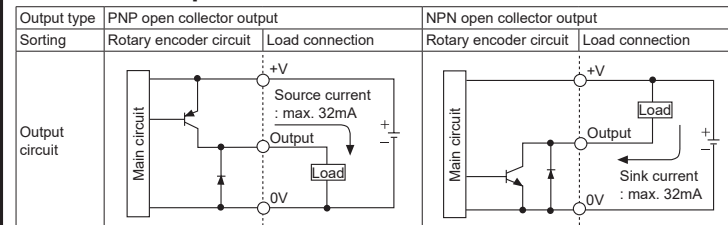
#### ⚠ Caution

- Use the unit within the rated specifications.**  
Failure to follow this instruction may result in fire or product damage.
- Do not short the load.**  
Failure to follow this instruction may result in product damage by fire.
- Do not use the unit near the place where there is the equipment which generates strong magnetic force or high frequency noise and strong alkaline, strong acidic exists.**  
Failure to follow this instruction may result in product damage.

#### ■ Ordering Information

EP50S	8	1024	1	R	P	24
Series	Shaft diameter	Pulses/revolution	Output code	Rotation 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%

#### ■ Control Output I/O Circuit



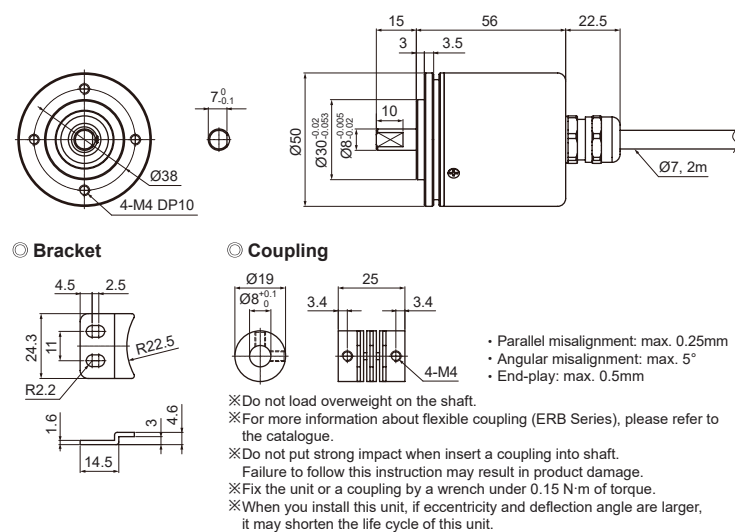
⚠ Each bit of output has the same circuit.  
⚠ Overload or short may cause circuit break.

⚠ The above specifications are subject to change and some models may be discontinued without notice.  
⚠ Be sure to follow cautions written in the instruction manual, and the technical descriptions (catalog, website).

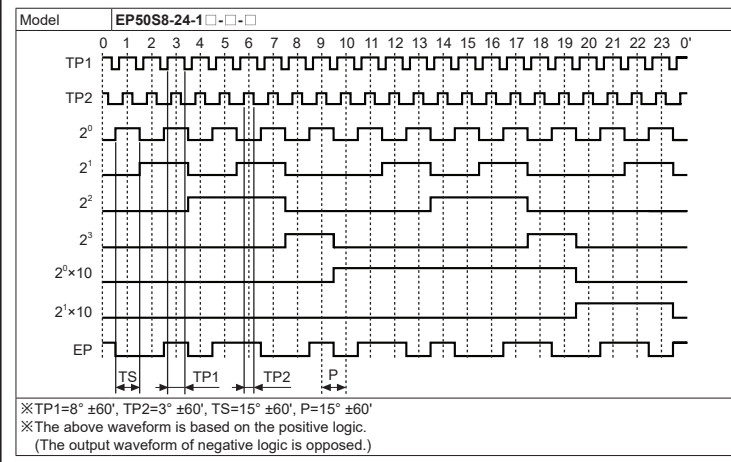
#### ■ Specifications

Type	Ø50mm shaft type 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		
Output code	Division	BCD Code	Binary Code
			Gray Code
Output phase/ Output angle*1	1024	TS: 0.3515 ±15' (13-bit)	TS: 0.3515 ±15' (10-bit)
	720	TS: 0.5 ±25' (11-bit)	TS: 0.5 ±25' (10-bit)
Electrical specification	512	TS: 0.703 ±15' (11-bit)	TS: 0.703 ±15' (9-bit)
	360	TS: 1 ±25' (10-bit)	TS: 1 ±25' (9-bit)
Control output	256	TS: 1.406 ±15' (10-bit)	TS: 1.406 ±15' (8-bit)
	180	TS: 2 ±25' (9-bit)	TS: 2 ±25' (8-bit)
Power supply	128	TS: 2.8125 ±15' (9-bit)	TS: 2.8125 ±15' (7-bit)
	90	TS: 4 ±25' (8-bit)	TS: 4 ±25' (7-bit)
Current consumption	64	TS: 5.625 ±15' (7-bit)	TS: 5.625 ±15' (6-bit)
	48	TS: 7.5 ±25' (7-bit)	TS: 7.5 ±25' (6-bit)
Insulation resistance	45	TS: 8 ±25' (7-bit)	TS: 8 ±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)
Dielectric strength	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)
	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)
Connection	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)
	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)
Vibration	12	TP1: 15 ±60' (1-bit) TP2: 2 ±60' (1-bit) TS: 30 ±60' (5-bit) EP: 30 ±60' (1-bit)	TP1: 15 ±60' (1-bit) TP2: 2 ±60' (1-bit) TS: 30 ±60' (4-bit) EP: 30 ±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)
Shock	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)
	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)
Environment	Output voltage: min. (power supply-1.5)VDC=, Load current: max. 32mA		
	Load current: max. 32mA, Residual voltage: max. 1VDC=		
Protection structure	Response time (rise, fall) Ton=800nsec, Toff=max. 800nsec (cable: 2m, I sink=32mA)		
	Max. response frequency 35kHz		
Cable	Power supply 5VDC= ±5% (ripple P-P: max. 5%), 12-24VDC= ±5% (ripple P-P: max. 5%)		
	Current consumption Max. 100mA (disconnection of load)		
Accessory	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)		
Approval	Connection Axial cable type (cable gland)		
	Starting torque Max. 70gf·cm (0.0069N·m)		
Weight	Moment of inertia Max. 40g·cm <sup>2</sup> (4×10 <sup>-4</sup> kg·m <sup>2</sup> )		
	Shaft loading Radial: 10kgf, Thrust: 2.5kgf		
Mechanical specification	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		
Approval	Shock Approx. max. 50G		
	Ambient temp. -10 to 70°C, storage: -25 to 85°C		
Approval	Ambient humid. 35 to 85%RH, storage: 35 to 90%RH		
	Protection structure IP64 (IEC standard)		
Approval	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*3 Approx. 482g (approx. 398g)		
Approval	*1: TS=Signal Pulse, TP=Timing Pulse, EP=Even Parity		
	*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.		
Approval	【Max. response revolution (rpm) = Max. response frequency × 60 sec】		
	Resolution		
Approval	*3: The weight includes packaging. The weight in parenthesis is for unit only.		
	*Environment resistance is rated at no freezing or condensation.		

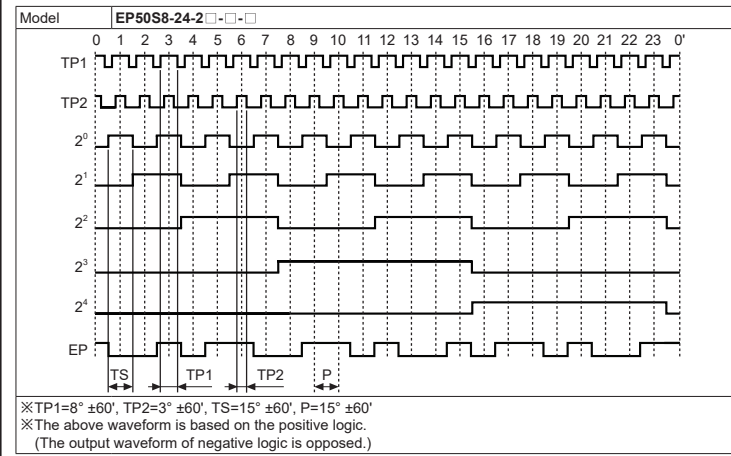
#### ■ Dimensions



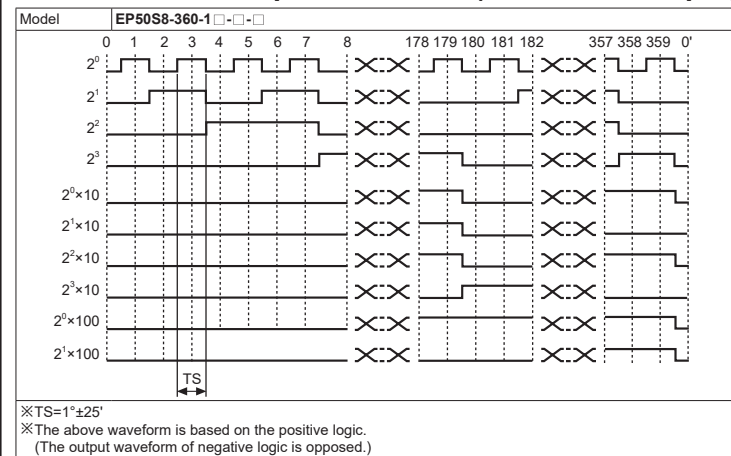
#### ■ 24-Division Output Waveform (BCD Code Output)



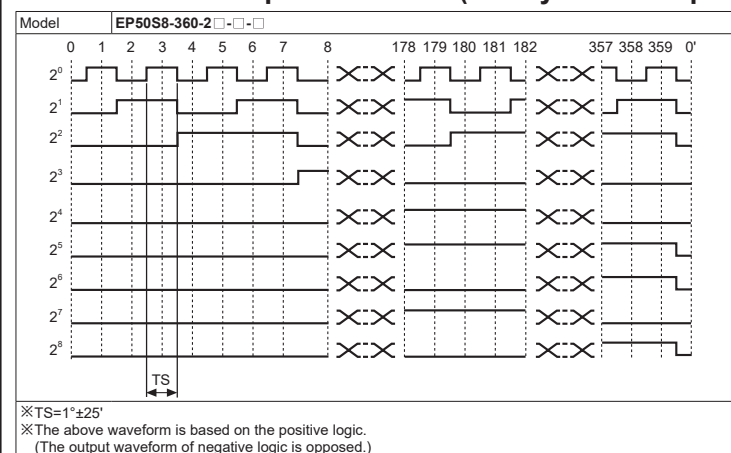
#### ■ 24-Division Output Waveform (Binary Code Output)



#### ■ 360-Division Output Waveform (BCD Code Output)



#### ■ 360-Division Output Waveform (Binary Code Output)



#### ■ Connection

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

#### ■ Binary Code/Gray Code

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

- ⚠ Non-using wires must be insulated.
- ⚠ Encoder case and shield cable must be grounded.
- ⚠ N/C (Not Connected) : Not using.
- ⚠ Please make sure not to short when wiring output cables because the dedicated driver IC is used at output circuit.
- ⚠ Do not apply tensile strength over 30N to the cable.

#### ■ Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- 5VDC, 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- For using the unit with the equipment which generates noise (switching regulator, inverter, servo motor, etc.), ground the shield wire to the F.G. terminal.
- Ground the shield wire to the F.G. terminal.
- When using switching mode power supply, frame ground (F.G.) terminal of power supply should be grounded.
- Wire as short as possible and keep away from high voltage lines or power lines, to prevent inductive noise.
- Check the wire type and response frequency when extending wire because of distortion of waveform or residual voltage increment etc by line resistance or capacity between lines.
- This unit may be used in the following environments.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000m
  - Pollution degree 2
  - Installation category II

#### ■ Major Products

- Photoelectric Sensors
- Fiber Optic Sensors
- Door Sensors
- Door Side Sensors
- Area Sensors
- Proximity Sensors
- Pressure Sensors
- Rotary Encoders
- Connector/sockets
- Switching Mode Power Supplies
- Control Switches/Lamps/Buzzers
- I/O Terminal Blocks & Cables
- Stepper Motors/Drivers/Motion Controllers
- Graphic/Logic Panels
- Field Network Devices
- Laser Marking System (Fiber, Co., Nd: YAG)
- Laser Welding/Cutting System
- Temperature Controllers
- Temperature/Humidity Transducers
- SSR/Power Controllers
- Counters
- Timers
- Panel Meters
- Tachometer/Pulse (Rate) Meters
- Display Units
- Sensor Controllers

**Autonics Corporation**  
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