DRW170201AB

Autonics

Ø50mm Shaft type Absolute Rotary Encoder
EP50S SERIES

INSTRUCTION MANUAL

CE

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

1. **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 fire, personal injury, or economic loss.
2. **Install on a device panel to use.**
   Failure to follow this instruction may result in fire.
3. **Do not connect, repair, or inspect the unit while connected to a power source.**
   Failure to follow this instruction may result in fire.
4. **Check 'Connections' before wiring.**
   Failure to follow this instruction may result in fire.
5. **Do not disassemble or modify the unit.**
   Failure to follow this instruction may result in fire.

⚠ Caution

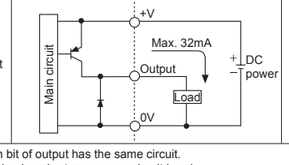
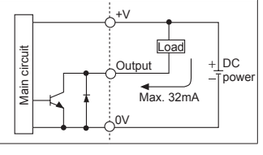
1. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in fire or product damage.
2. **Do not short the load.**
   Failure to follow this instruction may result in product damage by fire.
3. **Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
   Failure to follow this instruction may result in fire or explosion.
4. **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

Output type	PNP open collector output		NPN open collector output	
Sorting	Rotary encoder circuit	Load connection	Rotary encoder circuit	Load connection
Output 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, homepage).

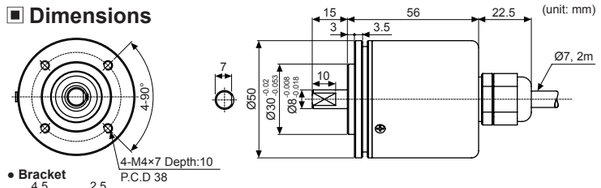
▣ Specifications

Type			Ø50mm shaft type 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	Output code		Division	BCD Code	Binary Code	Gray Code
			1024	TS: 0.3515˚±15' (13-bit)	TS: 0.3515˚±15' (10-bit)	TS: 0.703˚ ±15' (10-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)
			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)
			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)
			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)
			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)
			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)
			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)
			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)
			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)
			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)
			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 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·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		
Environment	Ambient temp.		-10 to 70℃, storage: -25 to 85℃		
	Ambient humid.		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※3			Approx. 482g (approx. 398g)		

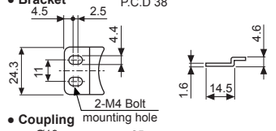
※1: TS=Signal Pulse, TP=Timing Pulse, EP=Even Parity
※2: In case of Parallel type model, Make sure that Max. response revolution should be lower than or equal to max. allowable revolution when selecting the resolution.
【Max. response revolution (rpm) = $\frac{\text{Max. response frequency}}{\text{Resolution}} \times 60$ sec】
※3: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Dimensions

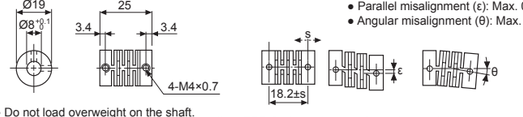
(unit: mm)



● **Bracket**



● **Coupling**

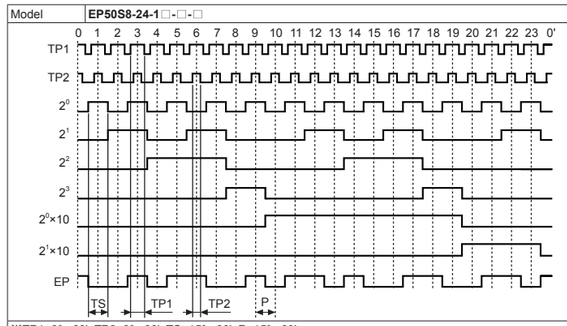


● End-play (s): Max. 0.5mm
● Parallel misalignment (ε): Max. 0.25mm
● Angular misalignment (θ): Max. 5°

● Do not load overweight on the shaft.
● For more information about flexible coupling (ERB Series), please refer to the catalogue.
● 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 0.15 N·m of torque.
● When you install this unit, if eccentricity and deflection angle are larger, it may shorten the life cycle of this unit.

▣ 24-Division Output Waveform (BCD Code Output)

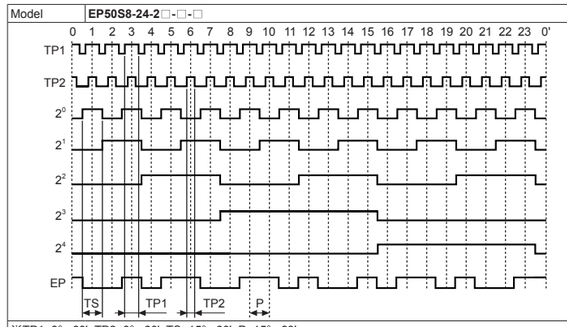
Model: **EP50S8-24-1□-□-□**



※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 Output Waveform (Binary Code Output)

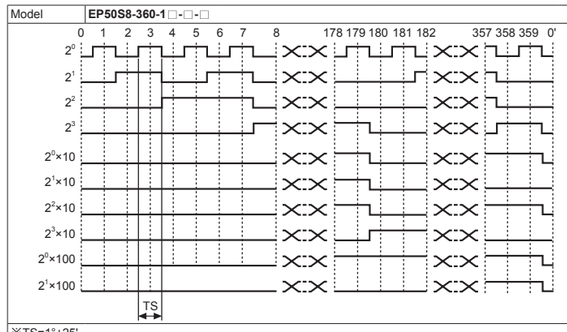
Model: **EP50S8-24-2□-□-□**



※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.)

▣ 360-Division Output Waveform (BCD Code Output)

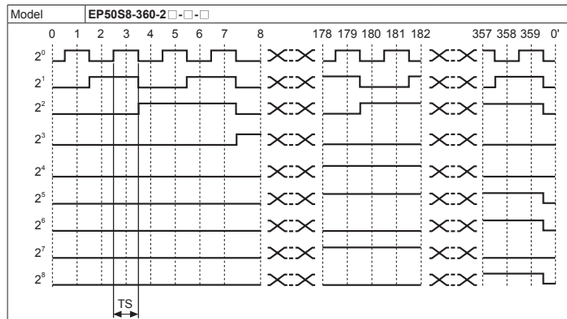
Model: **EP50S8-360-1□-□-□**



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

▣ 360-Division Output Waveform (Binary Code Output)

Model: **EP50S8-360-2□-□-□**



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

▣ Connection

● **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: Black	0V																			
Output cable: Brown	2^0																			
Output cable: Red	2^1																			
Output cable: Orange	2^2																			
Output cable: Yellow	N·C	2^3																		
Output cable: Blue	N·C	2^0×10																		
Output cable: Purple	N·C	2^1×10																		
Output cable: Gray	N·C	2^2×10																		
Output cable: White/Brown	TP1	N·C	2^3×10																	
Output cable: White/Red	TP2	N·C	2^0×100																	
Output cable: White/Orange	EP	N·C	2^1×100																	
Output cable: White/Yellow	N·C	2^2×100																		
Output cable: White/Blue	N·C	2^3×100																		
Output cable: White/Purple	N·C	2^0×1000																		
Shield cable	Signal shield cable (F.G.)																			

● **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																			
Power: Black	0V																			
Output cable: Brown	2^0																			
Output cable: Red	2^1																			
Output cable: Orange	2^2																			
Output cable: Yellow	N·C	2^3																		
Output cable: Blue	N·C	2^4																		
Output cable: Purple	N·C	2^5																		
Output cable: Gray	N·C	2^6																		
Output cable: White/Brown	TP1	N·C	2^7																	
Output cable: White/Red	TP2	N·C	2^8																	
Output cable: White/Orange	EP	N·C	2^9																	
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

1. Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
2. 5VDC, 12-24VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
3. 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.
4. Ground the shield wire to the F.G. terminal.
5. When using switching mode power supply, frame ground (F.G.) terminal of power supply should be grounded.
6. Wire as short as possible and keep away from high voltage lines or power lines, to prevent inductive noise.
7. 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.
8. This unit may be used in the following environments.
   ①Indoors (in the environment condition rated in 'Specifications')
   ②Altitude max. 2,000m
   ③Pollution degree 2
   ④Installation 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_2, 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

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