

ROTARY ENCODER (ABSOLUTE TYPE) EP50S8 SERIES

M A N U A L



Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

Caution for your safety

- ⊗ Please keep "Caution for your safety" to avoid accidents or damages as using it correctly.
- ⊗ The meaning of 'Warning' and 'Caution' is as follows;
 - Warning** In case a serious injury or dead may be occurred.
 - Caution** In case a little injury or damage of this unit may be occurred.
- ⊗ The meaning of the mark on the product and manual is as follows;
 - ⚠ is a caution mark for danger in special condition.

Warning

1. Please use it with double safety devices when it is used at the equipments which may cause damages to human life or assets (Ex: Nuclear power control, Medical equipment, Vehicle, Train, Air plane, Combustion apparatus, Entertainment or Safety device etc.) It may cause a fire, human life or assets.

Caution

1. Do not drop water or oil on this unit. It may cause damage or miscontrol due to malfunction.
2. Please observe the rated voltage. It may damage or shorten the life cycle of the product.
3. Please check the polarity of power and wrong wiring. It may cause damage to this unit.
4. Do not short circuit the load. It may cause damage to this unit.

Outline

Absolute rotary encoder divides a revolution angle as certain rate from 0° to 360° and specifies electrical digital code (BCD, Binary, Gray Code) to the each divided angle position. By reading the absolute digital code output of the rotational shaft's position, this encoder is as the absolute revolution angle sensor. Because this absolute output do not have impact on the electric characteristic, this encoder does not need memory retention circuit against power failure and has high strength against noise.

Features

- Compact size of external diameter ø50mm
- Various output code (BCD, Binary, Gray code)
- Realization of high resolution (720 division, 1024 division)
- Dust-proof, oil-proof by IP64

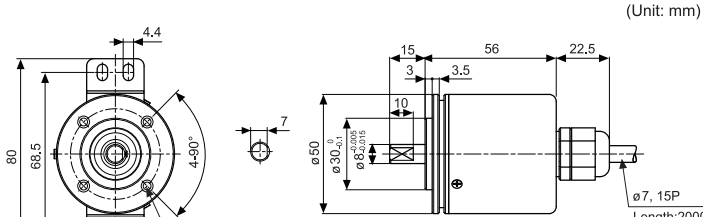
Application

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

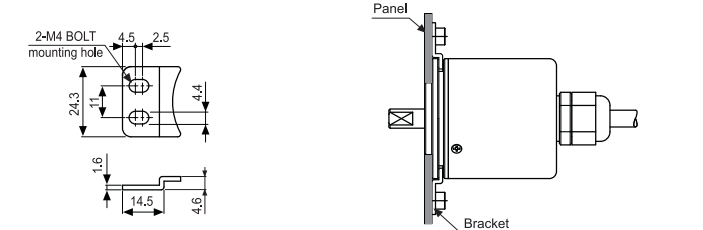
Ordering information

EP50S8	1024	1	R	P	24
Series	Resolution/1revolution	Output code	Revolution direction	Control output	Power supply
ø50mm axis type (Shaft diameter :ø8mm)	Consult resolution	1:BCD code 2:Binary code 3:Gray code	F:Output value increase at CW direction R:Output value increase at CCW direction	P:PNP open collector output N:NPN open collector output	5:5VDC ±5% 24:12-24VDC ±5%

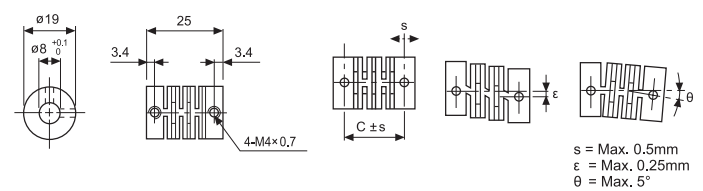
Dimensions



Bracket



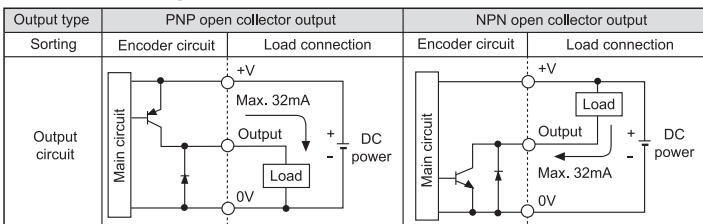
Coupling



Using flexible coupling

- When combining the coupling to encoder shaft, if there is big eccentricity or bend between rotating encoder shaft and mate shaft, it shortens the life cycle of encoder and coupling.
- Do not apply excessive loads to the axis of rotation.

Control output circuit



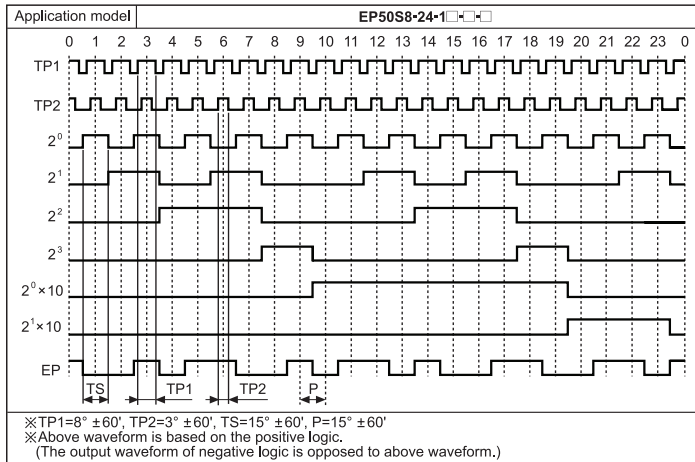
⊗ Output circuit shall be changed if overload is applied at output terminal or short circuit.
⊗ The above specifications are subject to change and some models may be discontinued without notice.

Specifications

Type	Diameter 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	BCD Code	Binary Code	Gray Code	
		1024 division	TS: 0.3515° ± 15'(13bit)	TS: 0.3515° ± 15'(10bit)	TS: 0.703° ± 15'(10bit)
		720 division	TS: 0.5° ± 25'(11bit)	TS: 0.5° ± 25'(10bit)	TS: 1° ± 25'(10bit)
		512 division	TS: 0.703° ± 15'(11bit)	TS: 0.703° ± 15'(9bit)	TS: 1.406° ± 15'(9bit)
		360 division	TS: 1° ± 25'(10bit)	TS: 1° ± 25'(9bit)	TS: 2° ± 25'(9bit)
		256 division	TS: 1.406° ± 15'(10bit)	TS: 1.406° ± 15'(8bit)	TS: 2.8125° ± 15'(8bit)
		180 division	TS: 2° ± 25'(9bit)	TS: 2° ± 25'(8bit)	TS: 4° ± 25'(8bit)
		128 division	TS: 2.8125° ± 15'(9bit)	TS: 2.8125° ± 15'(7bit)	TS: 5.625° ± 15'(7bit)
		90 division	TS: 4° ± 25'(8bit)	TS: 4° ± 25'(7bit)	TS: 8° ± 25'(7bit)
		64 division	TS: 5.625° ± 15'(7bit)	TS: 5.625° ± 15'(6bit)	TS: 11.25° ± 15'(6bit)
		48 division	TS: 7.5° ± 25'(7bit)	TS: 7.5° ± 25'(6bit)	TS: 15° ± 25'(6bit)
		45 division	TS: 8° ± 25'(7bit)	TS: 8° ± 25'(6bit)	TS: 16° ± 25'(6bit)
Electrical specification	Output phase/Output angle*1	BCD Code	Binary Code	Gray Code	
		20 division	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)
		16 division	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: 2.8125° ± 15'(8bit) EP: 22.5° ± 60'(1bit)	TP1: 15° ± 60'(1bit) TP2: 2° ± 60'(1bit) TS: 45° ± 60'(4bit) EP: 22.5° ± 60'(1bit)
		12 division	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: 11.25° ± 15'(6bit) EP: 30° ± 60'(1bit)	TP1: 15° ± 60'(1bit) TP2: 3° ± 60'(1bit) TS: 60° ± 60'(4bit) EP: 30° ± 60'(1bit)
		10 division	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: 18° ± 60'(6bit) EP: 36° ± 60'(1bit)	TP1: 30° ± 60'(1bit) TP2: 12° ± 60'(1bit) TS: 72° ± 60'(4bit) EP: 36° ± 60'(1bit)
		8 division	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: 22.5° ± 60'(5bit) EP: 45° ± 60'(1bit)	TP1: 39° ± 60'(1bit) TP2: 15° ± 60'(1bit) TS: 90° ± 60'(3bit) EP: 45° ± 60'(1bit)
		6 division	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: 30° ± 60'(5bit) EP: 60° ± 60'(1bit)	TP1: 53° ± 60'(1bit) TP2: 15° ± 60'(1bit) TS: 120° ± 60'(3bit) EP: 60° ± 60'(1bit)
		Control output	Output voltage: Min.(Power supply-1.5)VDC, Load current: Max. 32mA		
		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	Min. 100MΩ (at 500VDC megger between all terminals and case)				
Dielectric strength	750VAC 50/60Hz for 1 minute(Between all terminals and case)				
Connection	Cable outgoing type(Cable gland)				
Mechanical specification	Starting torque	Max. 40g·cm(0.004N·m)			
	Moment of inertia	Max. 40g·cm ² (4×10 ⁻⁶ kg·m ²)			
	Shaft loading	Radial: 10kgf, Thrust: 2.5kgf			
	Max. revolution	3000rpm			
Vibration	1.5mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z direction for 2 hours				
Shock	Max. 50G				
Environment	Ambient temperature	-10 to 70°C, Storage: -25 to 85°C			
	Ambient humidity	35 to 85%RH, Storage: 35 to 90%RH			
Protection	IP64(IEC standard)				
Cable	ø7mm, 15P, Length: 2m, Shield cable(AWG 28, Core wire diameter: 0.08mm, No. of core wire: 40, Insulator out diameter: 0.8mm)				
Accessories	Mounting bracket, Coupling				
Approval	CE				
Weight	Approx. 380g				

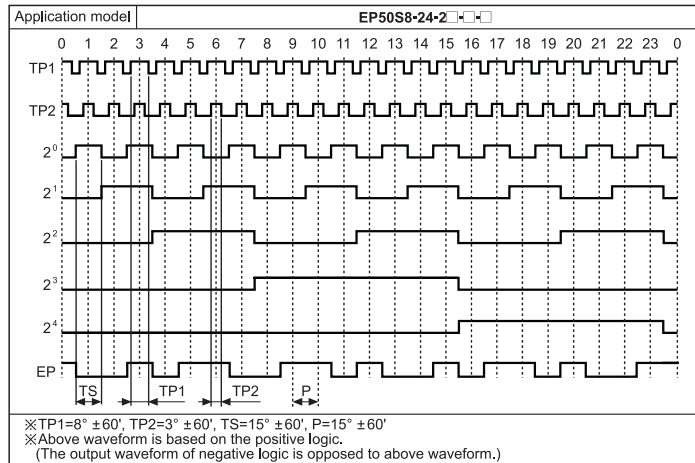
*1: TS=Signal Pulse, TP=Timing Pulse, EP=Even Parity
⊗ Environment resistance is rated at no freezing or condensation.

24division output waveform(BCD code output)



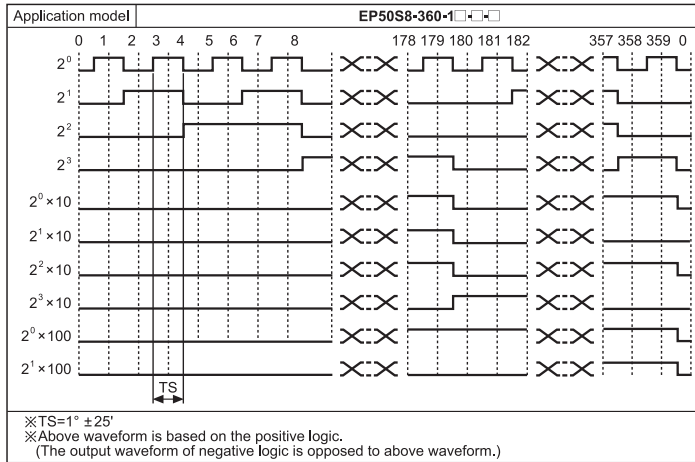
⊗ TP1=8° ± 60', TP2=3° ± 60', TS=15° ± 60', P=15° ± 60'
⊗ Above waveform is based on the positive logic.
(The output waveform of negative logic is opposed to above waveform.)

24division output waveform(Binary code output)



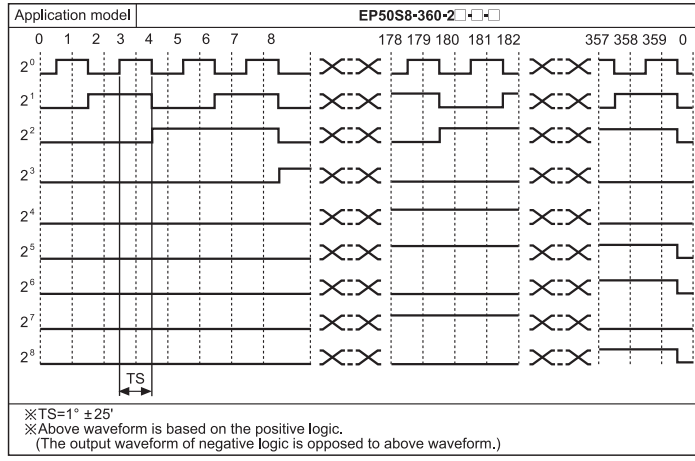
⊗ TP1=8° ± 60', TP2=3° ± 60', TS=15° ± 60', P=15° ± 60'
⊗ Above waveform is based on the positive logic.
(The output waveform of negative logic is opposed to above waveform.)

360division output waveform(BCD code output)



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

360division output waveform(Binary code output)



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

Connections

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

- ⊗ Unused wires must be insulated.
- ⊗ Encoder case and shield wire must be grounded(F.G.).
- ⊗ N.C.: Not Connected.
- ⊗ Output cable must not be short-circuited, because Driver IC is used in output circuit.

Binary Code/Gray Code

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

- ⊗ Unused wires must be insulated.
- ⊗ Encoder case and shield wire must be grounded(F.G.).
- ⊗ N.C.: Not Connected.
- ⊗ Output cable must not be short-circuited, because Driver IC is used in output circuit.

Caution for using

1. Installation
 - ① This unit consists precision components. Therefore please treat this product carefully.
 - ② When you install this unit, if eccentricity and deflection angle are larger, it may shorten the life cycle of this unit or cause damage by overload on the shaft.
 - ③ Do not put strong impact when insert coupling into shaft.
 - ④ Please set zero point with metallic ball for sub-mounting, then use this unit.
 2. For using
 - ① Shield wire must be grounded (F.G.)
 - ② Do not connect and short circuit during power on. It may cause damage to this unit.
 - ③ When the power source is Switching Power, there may be surge. F.G. terminals of power must be grounded and wire should be shorter in order not to be influenced by noise.
 3. Environment
 - Do not use this unit with below environment, it may cause malfunction.
 - ① Place where this unit or component may be damaged by strong vibration or impact.
 - ② Place where there are lots of flammable or corrosive gases.
 - ③ Place where strong magnet field or electric noise are occurred.
 - ④ Place where is beyond of rated temperature or humidity.
 - ⑤ Place where strong acids or alkali near by.
 4. Vibration and Impact
 - ① Be sure that when the strong impact or vibration loads on this unit, the error pulse may occur.
 - ② Encoder with high resolution can be easily affected by vibration, therefore fix the mounting bracket when installing this unit.
 - ③ Please use metallic coupling when the application needs severe acceleration or deceleration frequently.
 5. Wire connection
 - ① Do not draw the wire with over 30N strength after wiring.
 - ② When a high voltage or power line pass near by the encoder cable, be sure to wire the encoder cable in separated conduit to prevent malfunction.
- ⊗ It may cause malfunction if above instructions are not followed.

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, CO₂, Nd:YAG)
- Laser welding/soldering system
- Temperature controllers
- Temperature/humidity transducers
- SSR/Power controllers
- Counters
- Timers
- Panel meters
- Tachometer/Pulse/Rate/meters
- Display units
- Sensor control Iers

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