

## Diameter Ø50mm Shaft Type Incremental Rotary Encoder

### ■ Features

- 12-24VDC power supply of line driver output (line-up)
- Suitable for measuring angle, position, revolution, speed, acceleration and distance
- Power supply: 5VDC, 12-24VDC ±5%

### ■ Applications

- Various tooling machinery, packing machine and general industrial machinery, etc.

**⚠ Please read "Caution for your safety" in operation manual before using.**



### ■ Ordering Information (former name: ENB)

**E50S** - **8** - **8000** - **3** - **N** - **24** -

Series	Shaft diameter	Pulse/1Revolution	Output phase	Control output	Power supply	Cable
Diameter Ø50mm, shaft type	Ø8mm	Refer to resolution	2: A, B 3: A, B, Z 4: A, $\bar{A}$ , B, $\bar{B}$ 6: A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$	T: Totem pole output N: NPN open collector output V: Voltage output L: Line driver output	5: 5VDC ±5% 24: 12-24VDC ±5%	No mark: Axial cable type C: Axial cable connector type CR: Axial connector type CS: Radial connector type

### ■ Specifications

Item	Diameter Ø50mm shaft type of incremental rotary encoder		
Resolution (P/R) <sup>*1</sup>	*1, *2, *5, 10, 12, 15, 20, 23, 25, 30, 35, 40, 45, 50, 60, 75, 100, 120, 125, 150, 192, 200, 240, 250, 256, 300, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 1500, 1800, 2000, 2048, 2500, 3000, 3600, 4000, 5000, 6000, 8000		
Electrical specification	Output phase	A, B, Z phase (line driver: A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$ phase)	
	Phase difference of output	Output between A and B phase: $\frac{T}{4} \pm \frac{T}{8}$ (T=1 cycle of A phase)	
	Control output	Totem pole output	• [Low] - Load current: Max. 30mA, Residual voltage: Max. 0.4VDC • [High] - Load current: Max. 10mA, Output voltage (power voltage 5VDC): Min. (power voltage-2.0)VDC, Output voltage (power voltage 12-24VDC): Min. (power voltage-3.0)VDC
		NPN open collector output	Load current: Max. 30mA, Residual voltage: Max. 0.4VDC
		Voltage output	Load current: Max. 10mA, Residual voltage: Max. 0.4VDC
		Line driver output	• [Low] - Load current: Max. 20mA, Residual: Max. 0.5VDC • [High] - Load current: Max. -20mA, Output voltage (power voltage 5VDC): Min. (power voltage-2.5)VDC, Output voltage (power voltage 12-24VDC): Min. (power voltage-3.0)VDC
	Response time (rise/fall)	Totem pole output	Max. 1µs (cable length: 2m, I sink = 20mA)
		NPN open collector output	
		Voltage output	
	Line driver output	Max. 0.5µs (cable length: 2m, I sink = 20mA)	
	Max. Response frequency	300kHz	
	Power supply	• 5VDC ±5% (ripple P-P: Max. 5%) • 12-24VDC ±5% (ripple P-P: Max. 5%)	
	Current consumption	Max. 80mA (disconnection of the load), Line driver output: Max. 50mA (disconnection of the load)	
Insulation resistance	Over. 100MΩ (at 500VDC megger between all terminals and case)		
Dielectric strength	750VAC 50/60Hz for 1 minute (between all terminals and case)		
Connection	Axial cable type, Axial cable connector type, Axial/Radial connector type		
Mechanical specification	Starting torque	Max. 70gf·cm (0.007N·m) <sup>*2</sup> , Max. 800gf·cm (0.078N·m) <sup>*3</sup>	
	Moment of inertia	Max. 80g·cm <sup>2</sup> (8×10 <sup>-6</sup> kg·m <sup>2</sup> ) <sup>*2</sup> , Max. 400g·cm <sup>2</sup> (4×10 <sup>-5</sup> kg·m <sup>2</sup> ) <sup>*3</sup>	
	Shaft loading	Radial: Max. 10kgf, Thrust: Max. 2.5kgf	
	Max. allowable revolution <sup>*4</sup>	5,000rpm	
Vibration	1.5mm amplitude at frequency of 10 to 55Hz in each X, Y, Z direction for 2 hours		
Shock	Approx. Max. 75G		
Environment	Ambient temperature	-10 to 70°C, Storage: -25 to 85°C	
	Ambient humidity	35 to 85%RH, Storage: 35 to 90%RH	
Protection structure	Axial cable type, Axial cable connector type: IP50 (IEC standards) <sup>*5</sup> , Axial/Radial connector type: IP65 (IEC standards)		
Cable	Ø5mm, 5-wire (line driver output: 8-wire), 2m, Shield cable (AWG 24, core diameter: 0.08mm, number of cores: 40, insulator out diameter: Ø1mm)		
Accessory	Ø8mm coupling, Bracket		
Approval	CE (except for line driver output)		
Weight <sup>*6</sup>	Approx. 363g (approx. 275g), Axial/Radial connector type: Approx. 268g (approx. 180g)		

\*1: \*\* pulse is only for A, B phase (line driver output is for A,  $\bar{A}$ , B,  $\bar{B}$  phase). Not indicated resolutions are customizable.

\*2: This value is for Axial cable type, Axial cable connector type (protection structure: IP50).

\*3: This value is for Axial cable type, Axial cable connector type (protection structure: IP64), Axial/Radial connector type (protection structure: IP65).

\*4: Make sure that Max. response revolution should be lower than or equal to max. allowable revolution when selecting the resolution.

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

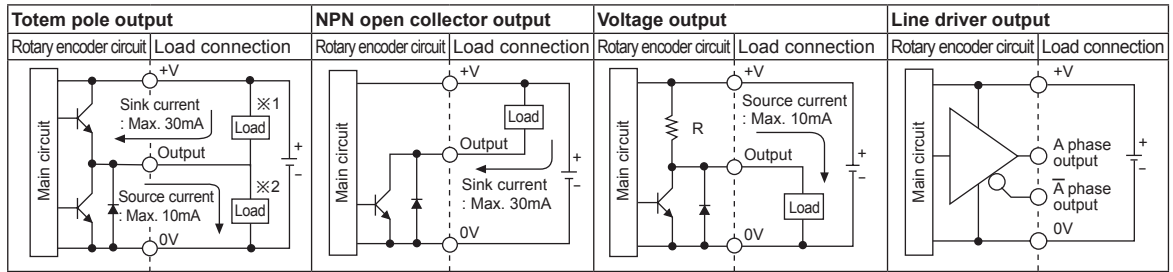
\*5: In case of axial cable type, axial cable connector type, they are available to order the option protection structure IP64.

\*6: The weight includes packaging. The weight in parentheses is for unit only. ※Environment resistance is rated at no freezing or condensation.

(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
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# E50S Series

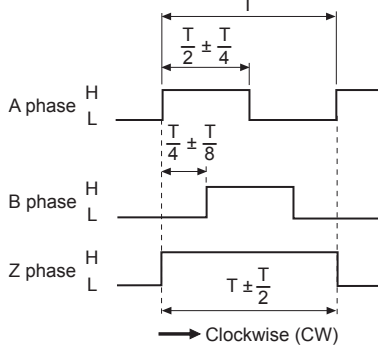
## Control Output Diagram



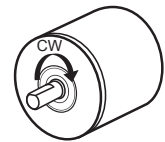
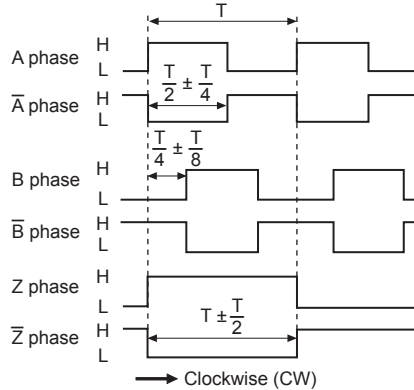
- All output circuits of A, B, Z phase are same. (line driver output is A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$ )
- Totem pole output type can be used for NPN open collector type(×1) or voltage output type(×2).

## Output Waveforms

- Totem pole output / NPN open collector output / Voltage output



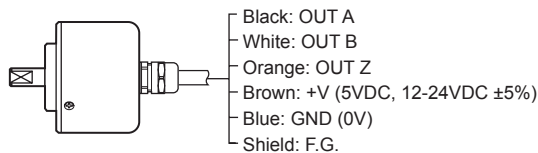
- Line driver output



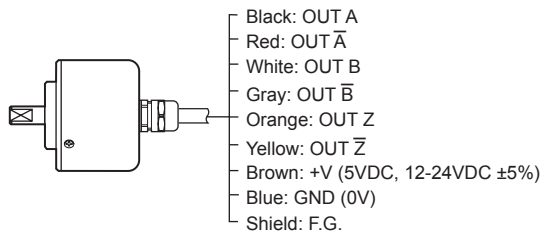
## Connections

### ⊙ Axial cable type

- Totem pole output / NPN open collector output / Voltage output



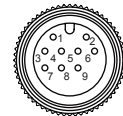
- Line driver output



- × Unused wires must be insulated.
- × The metal case and shield cable of encoder should be grounded (F.G.).

### ⊙ Axial cable connector type / Axial/Radial connector type

- Totem pole output
- NPN open collector output
- Voltage output
- Line driver output



• Totem pole output • NPN open collector output • Voltage output			• Line driver output		
Pin No.	Function	Cable color	Pin No.	Function	Cable color
1	OUT A	Black	1	OUT A	Black
2	OUT B	White	2	OUT $\bar{A}$	Red
3	OUT Z	Orange	3	+V	Brown
4	+V	Brown	4	GND	Blue
5	GND	Blue	5	OUT B	White
6	F.G.	Shield	6	OUT $\bar{B}$	Gray
			7	OUT Z	Orange
			8	OUT $\bar{Z}$	Yellow
			9	F.G.	Shield

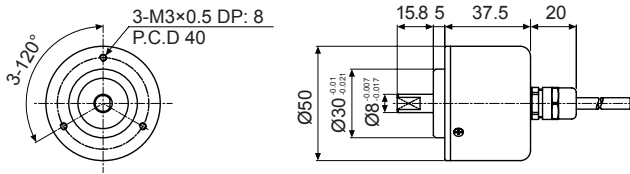
× F.G. (field ground): It should be grounded separately.

# Incremental Ø50mm Shaft Type

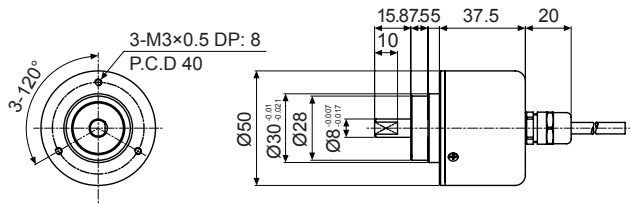
## ■ Dimensions

(unit: mm)

### ◎ Axial cable type, Axial cable connector type (IP50)



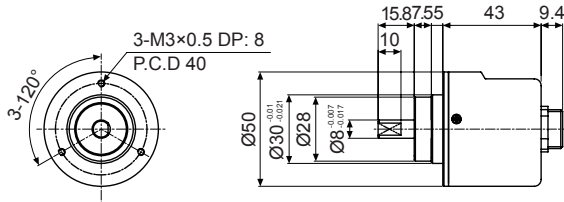
### ◎ Axial cable type, Axial cable connector type (IP64)



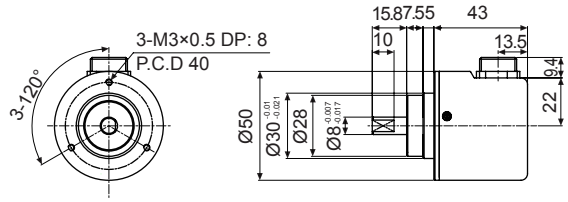
<b>Cable for Axial cable type</b>
Ø5mm, 5-wire (line driver output: 8-wire), 2000mm, Shield cable
<b>Cable for Axial cable connector type</b>
Ø5mm, 5-wire (line driver output: 8-wire), 250mm, Shield cable

※Connector cable is sold separately and refer to page G-10 for specifications.

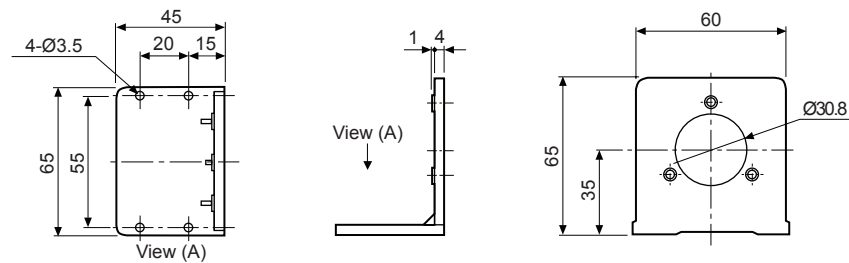
### ◎ Axial connector type



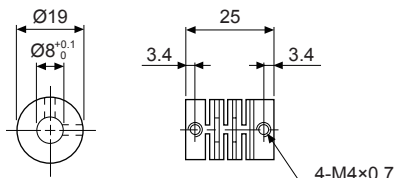
### ◎ Radial connector type



### ● Bracket



### ● Coupling (E50S)



- Parallel misalignment: Max. 0.25mm
- Angular misalignment: Max. 5°
- End-play: Max. 0.5mm

※When mounting the coupling to the encoder shaft, if there is combined misalignment (parallel, angular misalignment) between rotating encoder shaft and mate shaft, it may cause encoder and coupling's life cycle to shorten.

※Do not load overweight on the shaft.

※For parallel misalignment, angular misalignment, end-play terms, refer to page F-71.

※For flexible coupling (ERB series) information, refer to page F-64.

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