

## Shaft Type Ø50mm Incremental Rotary Encoder

### ■ Features

- 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 "Safety Considerations" in the instruction manual before using.**



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

| <b>E50S</b>       | <b>8</b>       | <b>8000</b>         | <b>3</b>   | <b>N</b>   | <b>24</b>                       |   |
|-------------------|----------------|---------------------|--|--|---------------------------------|---|
| Series            | Shaft diameter | Pulses/revolution   | Output phase   | Control output   | Power supply                    | Cable   |
| Ø50mm, shaft type | Ø8mm           | Refer to resolution | 2: A, B<br>3: A, B, Z<br>4: A, $\bar{A}$ , B, $\bar{B}$<br>6: A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$ | T: Totem pole output<br>N: NPN open collector output<br>V: Voltage output<br>L: Line driver output | 5: 5VDC ±5%<br>24: 12-24VDC ±5% | No mark: Axial cable type<br>C: Axial cable connector type<br>CR: Axial connector type<br>CS: Radial connector type |

### ■ Specifications

|                                |  |  |  |
|--------------------------------|--|--|--|
| Item                           | Shaft Type Ø50mm Incremental Rotary Encoder  |  |  |
| Resolution (PPR) <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=<br>• [High] - Load current: max. 10mA, output voltage (power voltage 5VDC=<br>: min. (power voltage-2.0)VDC=<br>, output voltage (power voltage 12-24VDC=<br>: min. (power voltage-3.0)VDC=<br>= |
|                                |  | NPN open collector output  | Load current: max. 30mA, residual voltage: max. 0.4VDC=<br>Voltage output  |
|                                |  | Voltage output   | Load current: max. 10mA, residual voltage: max. 0.4VDC=<br>Line driver output  |
|                                | Response time (rise/fall)  | Totem pole output  | • [Low] - Load current: max. 20mA, residual voltage: max. 0.5VDC=<br>• [High] - Load current: max. -20mA, Output voltage (power voltage 5VDC=<br>: min.2.5VDC=<br>, Output voltage (power voltage 12-24VDC=<br>: min. (power voltage-3.0)VDC=<br>=                 |
|                                |  | NPN open collector output  |  |
|                                |  | Voltage output   |  |
|                                |  | Line driver output   |  |
|                                | Max. response frequency  | 300kHz   |  |
| Power supply                   | • 5VDC=<br>±5% (ripple P-P: max. 5%)      • 12-24VDC=<br>±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 standard) <sup>*5</sup> , Axial/Radial connector type: IP65 (IEC standard)   |  |  |
| 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.

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

※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 parenthesis is for unit only.

※Environment resistance is rated at no freezing or condensation.

SENSORS

CONTROLLERS

MOTION DEVICES

SOFTWARE

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) LIDAR

(D) Door/Area Sensors

(E) Vision Sensors

(F) Proximity Sensors

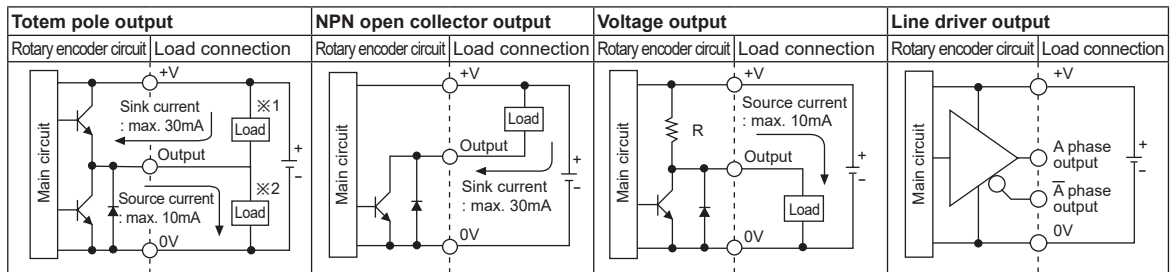
(G) Pressure Sensors

(H) Rotary Encoders

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

# E50S Series

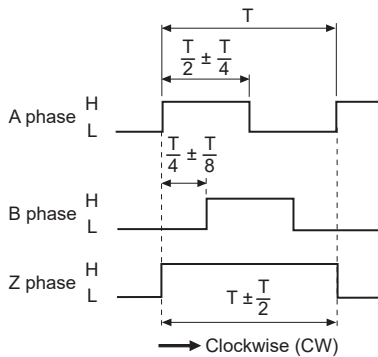
## Control Output Diagram



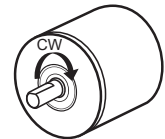
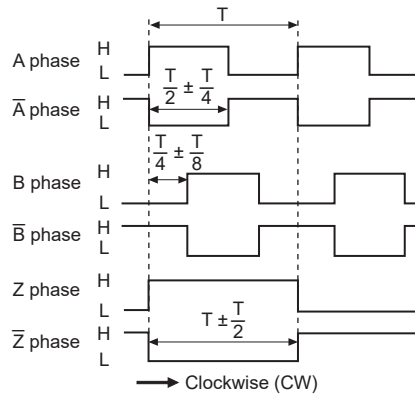
- All output circuits of A, B, Z phase are same. (line driver output is A,  $\bar{A}$ , B,  $\bar{B}$ , Z,  $\bar{Z}$ )
- Totem pole output type can be used for NPN open collector type(×1) or voltage output type(×2).

## Output Waveforms

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



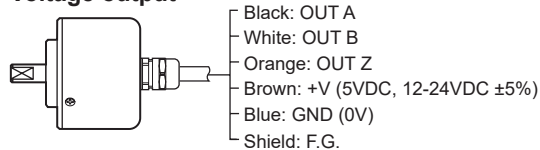
- Line driver output



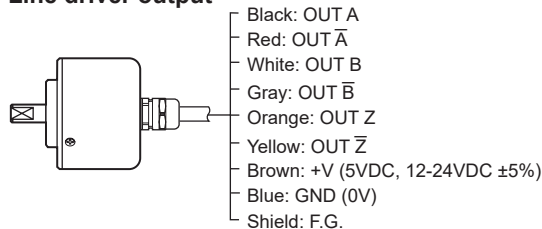
## Connections

### ⊙ 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.).
- ⊗ Do not apply tensile strength over 30N to the cable.

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

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



| Pin No. | Cable color | Function |
|---------|-------------|----------|
| 1       | Black       | OUT A    |
| 2       | White       | OUT B    |
| 3       | Orange      | OUT Z    |
| 4       | Brown       | +V       |
| 5       | Blue        | GND      |
| 6       | Shield      | F.G.     |



| Pin No. | Cable color | Function      |
|---------|-------------|---------------|
| 1       | Black       | OUT A         |
| 2       | Red         | OUT $\bar{A}$ |
| 3       | Brown       | +V            |
| 4       | Blue        | GND           |
| 5       | White       | OUT B         |
| 6       | Gray        | OUT $\bar{B}$ |
| 7       | Orange      | OUT Z         |
| 8       | Yellow      | OUT $\bar{Z}$ |
| 9       | Shield      | F.G.          |

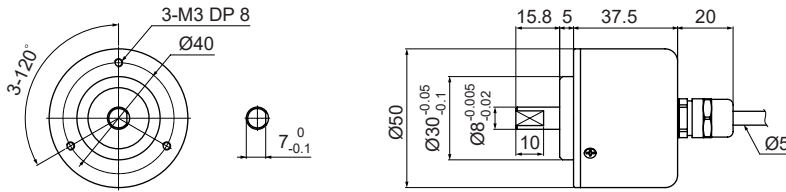
- ⊗ F.G. (field ground): It should be grounded separately.

# Incremental Ø50mm Shaft Type

## ■ Dimensions

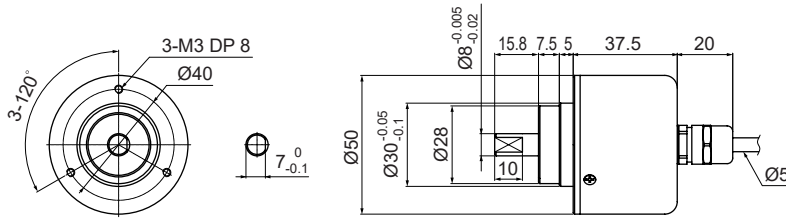
(unit: mm)

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



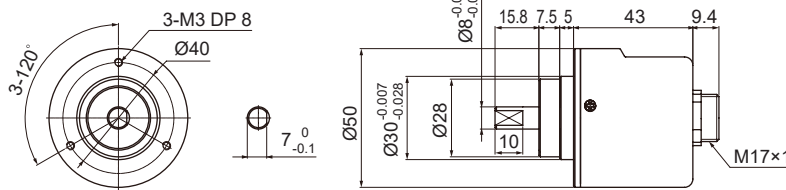
|  |
|--|
| <b>Cable for Axial cable type</b>                                      |
| Ø5mm, 5-wire (line driver output: 8-wire), Length: 2m, Shield cable    |
| <b>Cable for Axial cable connector type (M17×1)</b>                    |
| Ø5mm, 5-wire (line driver output: 8-wire), Length: 250mm, Shield cable |

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

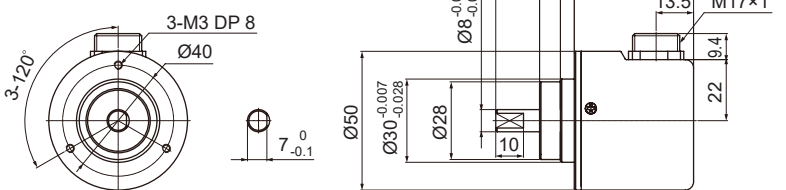


|  |
|--|
| <b>Cable for Axial cable type</b>                                      |
| Ø5mm, 5-wire (line driver output: 8-wire), Length: 2m, Shield cable    |
| <b>Cable for Axial cable connector type (M17×1)</b>                    |
| Ø5mm, 5-wire (line driver output: 8-wire), Length: 250mm, Shield cable |

### ◎ Axial connector type

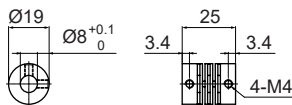


### ◎ Radial connector type



※Connector cable is sold separately and refer to the 'Connectors, Connector Cables, Sensor Distribution Boxes, Sockets' section.

### ◎ Coupling



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

※Do not load overweight on the shaft.

※Do not put strong impact when insert a coupling into shaft.

Failure to follow this instruction may result in product damage.

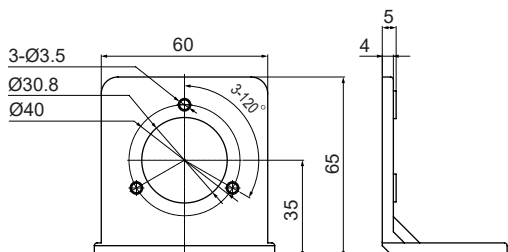
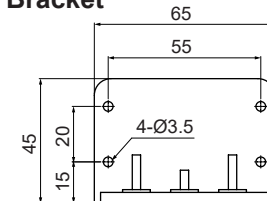
※Fix the unit or a coupling by a wrench under 0.15N·m of torque.

※When you install this unit, if eccentricity and deflection angle are larger, it may shorten the life cycle of this unit.

※For parallel misalignment, angular misalignment, end-play terms, refer to the "Glossary" section of Technical Description.

※For flexible coupling (ERB series) information, refer to the ERB series section.

### ◎ Bracket



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