E50S Series  Incremental Ø50mm Shaft Type

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


■ Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Diameter Ø50mm shaft type of incremental rotary encoder</th>
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</table>

Resolution (P/R)°1
°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

Output phase  A, B, Z phase (line driver: A, A, B, B, Z, Z phase)

Phase difference of output  Output between A and B phase: 1/4φ (T=1 cycle of A phase)

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 12-24VDC): Min. (power voltage-2.5)VDC

Output voltage (power voltage 12-24VDC): Min. (power voltage-3.0)VDC

Response time (rise/fall)  NPN open collector output  Max. 1µs (cable length: 2m, l sink = 20mA)

Voltage output  Line driver output  Max. 0.5µs (cable length: 2m, l sink = 20mA)

Max. Response frequency 300Hz

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
- NPN open collector output
- Voltage output (power voltage 5VDC): Min. (power voltage-2.0)VDC
- Output voltage (power voltage 12-24VDC): Min. (power voltage-3.0)VDC

Motorization specification

Starting torque  Max. 70gf·cm (0.007N·m)°3, Max. 800gf·cm (0.078N·m)°3

Moment of inertia  Max. 80g·cm² (8×10⁻⁶ kg·m²)°3, Max. 400g·cm² (4×10⁻⁶ kg·m²)°3

Shaft loading  Radial: Max. 10kgf, Thrust: Max. 2.5kgf

Max. allowable revolution°4  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 connector type: IP50 (IEC standards)°4, 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°5  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, A, B, 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.
°5: In case of axial cable type, axial cable connector type, they are available to order the option protection structure IP64.
## Control Output Diagram

<table>
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<tr>
<th>Totem pole output</th>
<th>NPN open collector output</th>
<th>Voltage output</th>
<th>Line driver output</th>
</tr>
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<tbody>
<tr>
<td>Rotary encoder circuit</td>
<td>Load connection</td>
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<td>Load connection</td>
</tr>
<tr>
<td><img src="image1.png" alt="Totem pole output diagram" /></td>
<td><img src="image2.png" alt="NPN open collector output diagram" /></td>
<td><img src="image3.png" alt="Voltage output diagram" /></td>
<td><img src="image4.png" alt="Line driver output diagram" /></td>
</tr>
</tbody>
</table>

- All output circuits of A, B, Z phase are same. (line driver output is A, A, B, B, Z, 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**

![Totem pole output waveform](image5.png)

- **Line driver output**

![Line driver output waveform](image6.png)

### Connections

#### Axial cable type

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

![Axial cable type](image7.png)

- **Line driver output**

![Line driver output](image8.png)

※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**

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Function</th>
<th>Cable color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OUT A</td>
<td>Black</td>
</tr>
<tr>
<td>2</td>
<td>OUT B</td>
<td>White</td>
</tr>
<tr>
<td>3</td>
<td>OUT Z</td>
<td>Orange</td>
</tr>
<tr>
<td>4</td>
<td>+V</td>
<td>Brown</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Blue</td>
</tr>
<tr>
<td>6</td>
<td>F.G.</td>
<td>Shield</td>
</tr>
<tr>
<td>7</td>
<td>OUT Z</td>
<td>Orange</td>
</tr>
<tr>
<td>8</td>
<td>OUT Z</td>
<td>Yellow</td>
</tr>
<tr>
<td>9</td>
<td>F.G.</td>
<td>Shield</td>
</tr>
</tbody>
</table>

※F.G. (field ground): It should be grounded separately.
Incremental Ø50mm Shaft Type

Dimensions

© Axial cable type, Axial cable connector type (IP50)

© Axial cable type, Axial cable connector type (IP64)

© Axial connector type

© Radial connector type

● Bracket

● Coupling (E50S)

※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.

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

Cable for Axial cable type
Ø5mm, 5-wire (line driver output: 8-wire), 2000mm, Shield cable

Cable for Axial cable connector type
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 cable type, Axial cable connector type (IP64)

Axial connector type

Radial connector type

Bracket

Coupling (E50S)