


# E6D-C

CSM\_E6D-C\_DS\_E\_4\_1

## High-resolution Encoder

- Incremental model
- External diameter of 55 mm.
- Resolution of up to 6,000 ppr.



 Be sure to read *Safety Precautions* on page 4.

## Ordering Information

**Encoders** [Refer to *Dimensions* on page 4.]

| Power supply voltage | Output configuration  | Resolution (pulses/rotation) | Model   |
|----------------------|-----------------------|------------------------------|---|
| 5 VDC                | Voltage output        | 1,000                        | <b>E6D-CWZ1E (resolution) 0.5M</b><br>Example: E6D-CWZ1E 1000P/R 0.5M |
|                      |                       | 2,000                        |   |
|                      |                       | 3,600                        |   |
|                      |                       | 5,000                        |   |
|                      |                       | 6,000                        |   |
| 12 VDC               | Open-collector output | 1,000                        | <b>E6D-CWZ2C (resolution) 0.5M</b><br>Example: E6D-CWZ2C 1000P/R 0.5M |
|                      |                       | 2,000                        |   |
|                      |                       | 3,600                        |   |
|                      |                       | 5,000                        |   |
|                      |                       | 6,000                        |   |

Note: In addition to the models listed at the left, models with either voltage outputs or open-collector outputs are also available with the following resolutions (pulses/rotation): 720, 800, 1,024, 1,200, 1,500, 1,800, 2,048, 2,500, 3,000, 3,200, and 4,096.

**Accessories (Order Separately)** [Refer to *Dimensions* on *Rotary Encoder Accessories*.]

| Name                   | Model            | Remarks                    |
|------------------------|------------------|----------------------------|
| Couplings              | <b>E69-C06B</b>  | Provided with the product. |
|                        | <b>E69-C68B</b>  | Different end diameter     |
|                        | <b>E69-C610B</b> | Different end diameter     |
|                        | <b>E69-C06M</b>  | Metal construction         |
| Servo Mounting Bracket | <b>E69-2</b>     | Provided with the product. |

Refer to *Accessories* for details.

## Ratings and Specifications

| Item                             | Model  | E6D-CWZ1E  | E6D-CWZ2C  |
|----------------------------------|--------|--|--|
| Power supply voltage             |        | 5 VDC $\pm$ 5%, ripple (p-p): 5% max.  | 12 VDC $\pm$ 10%, ripple (p-p): 5% max.  |
| Current consumption*1            |        | 150 mA max.  |  |
| Resolution (pulses/rotation)     |        | 1,000, 2,000, 3,600, 5,000, 6,000  |  |
| Output phases                    |        | Phases A, B, and Z   |  |
| Output configuration             |        | Voltage output   | Open-collector output  |
| Output capacity                  |        | Output resistance: 1 k $\Omega$<br>Sink current: 35 mA max.<br>Residual voltage: 0.7 V max. (at sink current of 10 mA) | Applied voltage: 30 VDC max.<br>Sink current: 35 mA max.<br>Residual voltage: 1 V max. (at sink current of 35 mA)<br>Residual voltage: 0.7 V max. (at sink current of 10 mA) |
| Maximum response frequency*2     |        | 200 kHz  |  |
| Phase difference between outputs |        | 90 $\pm$ 25 $^\circ$ between A and B (1/4 T $\pm$ 0.07 T)  |  |
| Rise and fall times of output    |        | 1 $\mu$ s max.   |  |
| Starting torque                  |        | 9.8 mN·m max.  |  |
| Moment of inertia                |        | 3 $\times$ 10 <sup>-6</sup> kg·m <sup>2</sup> max.   |  |
| Shaft loading                    | Radial | 50 N (20 N to maintain accuracy)   |  |
|                                  | Thrust | 30 N (10 N to maintain accuracy)   |  |
| Maximum permissible speed        |        | 12,000 r/min   |  |
| Ambient temperature range        |        | Operating: -10 to 70 $^\circ$ C (with no icing), Storage: -25 to 80 $^\circ$ C (with no icing)                         |  |
| Ambient humidity range           |        | Operating/Storage: 35% to 85% (with no condensation)   |  |
| Insulation resistance            |        | Excluded because of capacitor ground.  |  |
| Dielectric strength              |        | Excluded because of capacitor ground.  |  |
| Vibration resistance             |        | Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions                           |  |
| Shock resistance                 |        | Destruction: 500 m/s <sup>2</sup> 3 times each in X, Y, and Z directions   |  |
| Degree of protection*3           |        | IEC 60529 IP50   |  |
| Connection method                |        | Pre-wired Models (Standard cable length: 0.5 m)  |  |
| Material                         |        | Case: Zinc alloy, Main unit: Aluminum, Shaft: SUS303, Mounting Bracket: Galvanized iron                                |  |
| Weight (packed state)            |        | Approx. 280 g  |  |
| Accessories                      |        | E69-C06B Coupling, E69-2 Servo Mounting Bracket, Hexagonal wrench, Instruction manual                                  |  |

\*1. An inrush current of approximately 2 A will flow for approximately 50  $\mu$ s when the power is turned ON.

\*2. The maximum electrical response speed is determined by the resolution and maximum response frequency as follows:

$$\text{Maximum electrical response speed (rpm)} = \frac{\text{Maximum response frequency}}{\text{Resolution}} \times 60$$

This means that the Rotary Encoder will not operate electrically if its speed exceeds the maximum electrical response speed.

\*3. No protection is provided against water or oil.

I/O Circuit Diagrams

| Item Model           | E6D-CWZ1E  | E6D-CWZ2C  |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
|----------------------|--|--|--------------------|-------|-----------|-----------|-------|--|-------------------|--------------------|-------|--|----------------|--|-------|--|----------------|--|--------|--|----------------|--|------|--|--------------|--|--------|--|-----|--|
| Output configuration | Voltage output   | Open-collector output  |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Output Circuits      |  |  |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Output mode          | <p>Direction of rotation: CW (as viewed from end of shaft)</p> <p>Note: Phase A is <math>1/4 T \pm 7/100 T</math> faster than phase B. Phase Z is synced with phase A.</p> <p>Direction of rotation: CCW (as viewed from end of shaft)</p> <p>Note: Phase A is <math>1/4 T \pm 7/100 T</math> slower than phase B. Phase Z is synced with phase A.</p>   | <p>Direction of rotation: CW (as viewed from end of shaft)</p> <p>Note: Phase A is <math>1/4 T \pm 7/100 T</math> faster than phase B. Phase Z is synced with phase A. The ONs in the above timing chart mean that the output transistor is ON and the OFFs mean that the output transistor is OFF.</p> <p>Direction of rotation: CCW (as viewed from end of shaft)</p> <p>Note: Phase A is <math>1/4 T \pm 7/100 T</math> slower than phase B. Phase Z is synced with phase A. The ONs in the above timing chart mean that the output transistor is ON and the OFFs mean that the output transistor is OFF.</p> |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Connection           | <p><b>Wiring</b></p> <table border="1"> <thead> <tr> <th>Color</th> <th>Model</th> <th>E6D-CWZ1E</th> <th>E6D-CWZ2C</th> </tr> </thead> <tbody> <tr> <td>Brown</td> <td></td> <td>Power supply +5 V</td> <td>Power supply +12 V</td> </tr> <tr> <td>Black</td> <td></td> <td>Phase A output</td> <td></td> </tr> <tr> <td>White</td> <td></td> <td>Phase B output</td> <td></td> </tr> <tr> <td>Orange</td> <td></td> <td>Phase Z output</td> <td></td> </tr> <tr> <td>Blue</td> <td></td> <td>0 V (common)</td> <td></td> </tr> <tr> <td>Shield</td> <td></td> <td>GND</td> <td></td> </tr> </tbody> </table> <p>Note: 1. The shielded cable outer core (shield) is not connected to the inner area or to the case.<br/>                 2. The phase A, phase B, and phase Z circuits are all identical.<br/>                 3. Normally, connect GND externally to 0 V or to ground.</p> <p><b>Peripheral Device Precautions</b><br/>                 (1) When connecting to a counter, use the 12-VDC Model E6D-CWZ2C.<br/>                 (2) For counters with voltage inputs, insert pull-up resistance of 4.7 Ω and 1/4 W.</p> |  | Color              | Model | E6D-CWZ1E | E6D-CWZ2C | Brown |  | Power supply +5 V | Power supply +12 V | Black |  | Phase A output |  | White |  | Phase B output |  | Orange |  | Phase Z output |  | Blue |  | 0 V (common) |  | Shield |  | GND |  |
| Color                | Model  | E6D-CWZ1E  | E6D-CWZ2C          |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Brown                |  | Power supply +5 V  | Power supply +12 V |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Black                |  | Phase A output   |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| White                |  | Phase B output   |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Orange               |  | Phase Z output   |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Blue                 |  | 0 V (common)   |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Shield               |  | GND  |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |

## Safety Precautions

Refer to *Warranty and Limitations of Liability*.

### WARNING

This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purposes.



### Precautions for Correct Use

Do not use the Encoder under ambient conditions that exceed the ratings.

#### ● Wiring

Spurious pulses may be generated when power is turned ON and OFF. Wait at least 0.1 s after turning ON the power to the Encoder before using the connected device, and stop using the connected device at least 0.1 s before turning OFF the power to the Encoder. Also, turn ON the power to the load only after turning ON the power to the Encoder.

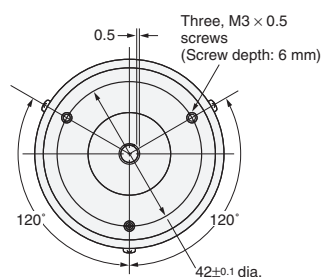
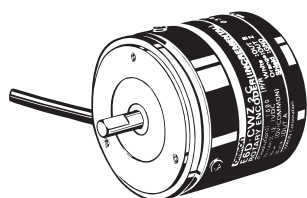
(Unit: mm)

## Dimensions

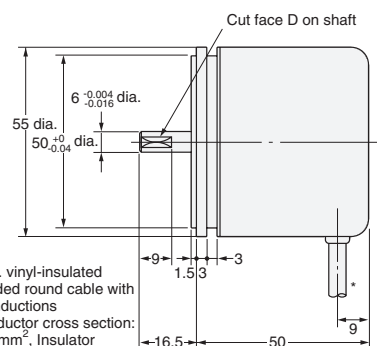
Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

### Encoder

#### E6D



An E69-C06B Coupling and E69-2 Servo Mounting Bracket are provided with the product.



\*5-dia. vinyl-insulated shielded round cable with 5 conductors (Conductor cross section: 0.18 mm<sup>2</sup>, Insulator diameter: 1.1 mm), Standard length: 500 mm

## Accessories (Order Separately)

Refer to *Accessories* for details.

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