

# E6D-C

## High-resolution Model for Measurement Instruments and High-precision Positioning

- Resolution of up to 6,000 ppr in Encoders with an external diameter of only 55 mm.
- High-speed response at 200 kHz.
- Wide ambient operating temperature range: -10 to 70°C.
- Rugged construction with radial shaft loading of 50 N and thrust shaft loading of 30 N.



 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> 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> 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 $\Omega$ Sink current: 35 mA max. Residual voltage: 0.7 V max. (at sink current of 10 mA)	Applied voltage: 30 VDC max. Sink current: 35 mA max. Residual voltage: 1 V max. (at sink current of 35 mA) Residual voltage: 0.7 V max. (at sink current of 10 mA)
Maximum response frequency*2		200 kHz	
Phase difference between outputs		90 $^{\circ}$ $\pm$ 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.                  2. The phase A, phase B, and phase Z circuits are all identical.                  3. Normally, connect GND externally to 0 V or to ground.</p> <p><b>Peripheral Device Precautions</b>                  (1) When connecting to a counter, use the 12-VDC Model E6D-CWZ2C.                  (2) For counters with voltage inputs, insert pull-up resistance of 4.7 <math>\Omega</math> 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	
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## 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.

## Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

## Warranty and Limitations of Liability

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А