

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	E6D-CWZ1E (resolution) 0.5M Example: E6D-CWZ1E 1000P/R 0.5M
		2,000	
		3,600	
		5,000	
		6,000	
12 VDC	Open-collector output	1,000	E6D-CWZ2C (resolution) 0.5M 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	E69-C06B	Provided with the product.
	E69-C68B	Different end diameter
	E69-C610B	Different end diameter
	E69-C06M	Metal construction
Servo Mounting Bracket	E69-2	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 Ω 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 μ s max.	
Starting torque		9.8 mN·m max.	
Moment of inertia		3 \times 10 ⁻⁶ kg·m ² 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 ² 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 μ 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 $1/4 T \pm 7/100 T$ 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 $1/4 T \pm 7/100 T$ 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 $1/4 T \pm 7/100 T$ 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 $1/4 T \pm 7/100 T$ 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>Wiring</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>Peripheral Device Precautions (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 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	
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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 mm², Insulator diameter: 1.1 mm), Standard length: 500 mm

Accessories (Order Separately)

Refer to *Accessories* for details.

Read and Understand This Catalog

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- Systems, machines, and equipment that could present a risk to life or property.

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Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

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2008.11

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