


# E6D-C

## 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> 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 $\pm$ 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

Model/Output Circuits	Output mode	Connection																					
<p><b>E6D-CWZ1E</b></p> <p>Output (Black: phase A, White: phase B, Orange: phase Z)</p>	<p><b>E6D-CWZ1E Voltage output</b></p> <p>Direction of rotation: CW (as viewed from end of shaft)      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> faster than phase B. Phase Z is synced with phase A.</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>(“H” and “L” in the diagrams are the output voltage levels of phases A, B, and Z.)</p>	<table border="1"> <thead> <tr> <th>Model Color</th> <th>E6D-CWZ1E</th> <th>E6D-CWZ2C</th> </tr> </thead> <tbody> <tr> <td>Brown</td> <td>Power supply +5 V</td> <td>Power supply +12 V</td> </tr> <tr> <td>Black</td> <td>Phase A output</td> <td></td> </tr> <tr> <td>White</td> <td>Phase B output</td> <td></td> </tr> <tr> <td>Orange</td> <td>Phase Z output</td> <td></td> </tr> <tr> <td>Blue</td> <td>0 V (common)</td> <td></td> </tr> <tr> <td>Shield</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>	Model Color	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	
Model Color	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																						
<p><b>E6D-CWZ2C</b></p> <p>Output (Black: phase A, White: phase B, Orange: phase Z)</p>	<p><b>E6D-CWZ2C Open-collector output</b></p> <p>Direction of rotation: CW (as viewed from end of shaft)      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> faster than phase B. Phase Z is synced with phase A.</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>(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><b>Peripheral Device Precautions</b></p> <p>(1) When connecting to a counter, use the 12-VDC Model E6D-CWZ2C.</p> <p>(2) For counters with voltage inputs, insert pull-up resistance of <math>4.7 \Omega</math> and <math>1/4 W</math>.</p>																					

## 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.

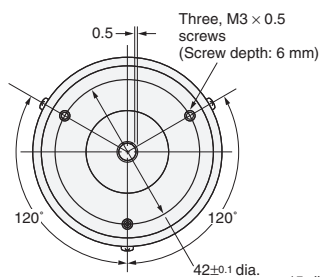
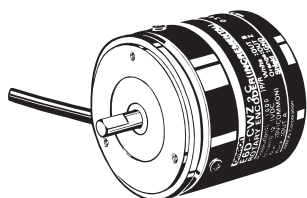
(Unit: mm)

## Dimensions

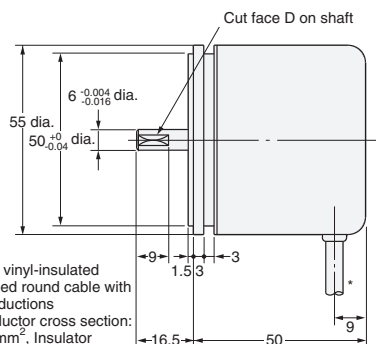
Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

### 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 conduction (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.

## Terms and Conditions Agreement

### 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.

### Warranties.

(a) Exclusive Warranty. Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.

(b) Limitations. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE.

Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) Buyer Remedy. Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty.

See <http://www.omron.com/global/> or contact your Omron representative for published information.

### Limitation on Liability; Etc.

OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.

Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

### Suitability of Use.

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

### Programmable Products.

Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

### Performance Data.

Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.

### Change in Specifications.

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

### Errors and Omissions.

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

2014.1

In the interest of product improvement, specifications are subject to change without notice.

**OMRON Corporation**  
Industrial Automation Company

<http://www.ia.omron.com/>

(c)Copyright OMRON Corporation 2014 All Right Reserved.