


# E6H-C

## Hollow-shaft Encoder

- Incremental model.
- External diameter of 40 mm.
- Resolution of up to 3,600 ppr.
- Slim design at only 26 mm thick.



 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 to 24 VDC	Open-collector output	300, 360, 500, 600, 720, 800, 1,000, 1,024	<b>E6H-CWZ6C (resolution) 0.5M</b> Example: E6H-CWZ6C 300P/R 0.5M
		1,200, 1,500, 1,800, 2,000, 2,048	
		2,500, 3,600	
5 to 12 VDC	Voltage output	300, 360, 500, 600, 720, 800, 1,000, 1,024	<b>E6H-CWZ3E (resolution) 0.5M</b> Example: E6H-CWZ3E 300P/R 0.5M
		1,200, 1,500, 1,800, 2,000, 2,048	
		2,500, 3,600	
5 to 12 VDC	Line-driver output	300, 360, 500, 600, 720, 800, 1,000, 1,024	<b>E6H-CWZ3X (resolution) 0.5M</b> Example: E6H-CWZ3X 300P/R 0.5M
		1,200, 1,500, 1,800, 2,000, 2,048	
		2,500, 3,600	

## Ratings and Specifications

Item	Model	E6H-CWZ6C	E6H-CWZ3E	E6H-CWZ3X
Power supply voltage		5 VDC -5% to 24 VDC +15%, ripple (p-p): 5% max.	5 VDC -5% to 12 VDC +10%, ripple (p-p): 5% max.	
Current consumption*1		100 mA max.		150 mA max.
Resolution (pulses/rotation)		300, 360, 500, 600, 720, 800, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000, 2,048, 2,500, 3,600		
Output phases		Phases A, B, and Z		Phases A, $\bar{A}$ , B, $\bar{B}$ , Z, and $\bar{Z}$
Output configuration		Open-collector output	Voltage output	Line-driver output*4
Output capacity		Applied voltage: 35 VDC max. Sink current: 35 mA max. Residual voltage: 0.7 V max. (at sink current of 35 mA)	Output resistance: 1 k $\Omega$ Sink current: 30 mA max. Residual voltage: 0.7 V max. (at sink current of 30 mA)	Output current: High level: $I_o = -10$ mA Low level: $I_s = 10$ mA Output voltage: $V_o = 2.5$ V min. $V_s = 0.5$ V
Maximum response frequency*2		100 kHz		
Phase difference between outputs		$90^\circ \pm 45^\circ$ between A and B ( $1/4$ T $\pm$ $1/8$ T)		
Rise and fall times of output		1 $\mu$ s max. (Control output voltage: 5 V, Load resistance: 1 k $\Omega$ , Output cable: 500 mm)	1 $\mu$ s max. ( $I_o = -10$ mA, $I_s = 10$ mA, Output cable: 500 mm)	
Starting torque		1.5 mN·m max.		
Moment of inertia		$2 \times 10^{-6}$ kg·m <sup>2</sup> max.		
Shaft loading	Radial	29.4 N		
	Thrust	4.9 N		
Maximum permissible speed		10,000 r/min		
Ambient temperature range		Operating: -10 to 70°C (at 90% humidity max.), Storage: -30 to 85°C (with no icing)		
Ambient humidity range		Operating/Storage: 90% max. (with no condensation)		
Insulation resistance		Excluded because of capacitor ground.		
Dielectric strength		Excluded because of capacitor ground.		
Vibration resistance		Destruction: 10 to 500 Hz, 100 m/s <sup>2</sup> or 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions		
Shock resistance		300 m/s <sup>2</sup> for 11 ms 3 times each in X, Y, and Z directions (excluding shock to the shaft)		
Degree of protection*3		IEC 60529 IP50		
Connection method		Pre-wired Models (Standard cable length: 0.5 m)		
Material		Case: Iron, Main unit: Aluminum, Pressboard panel: SUS304		
Weight (packed state)		Approx. 120 g		
Accessories		Instruction manual		

\*1. An inrush current of approximately 6 A will flow for approximately 0.3 ms 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.

\*4. The line driver output is a data transmission circuit compatible with RS-422A and long-distance transmission is possible with a twisted-pair cable. The quality is equivalent to AM26LS31.

## I/O Circuit Diagrams

Model	Output Circuits	Output mode	Connection																		
E6H-CWZ6C	<p>5 to 24 VDC</p> <p>Black, white, orange</p> <p>Output signal (Black: phase A, White: phase B, Orange: phase Z)</p> <p>Blue 0 V</p> <p>Shield GND</p> <p>E6H main circuit</p> <p>NPN transistor 35 mA max. 35 VDC max.</p>	<p>Open-collector output Direction of rotation: CW (as viewed from end of shaft)</p> <p>Phase A OFF ON OFF</p> <p>Phase B OFF ON OFF</p> <p>Phase Z OFF ON OFF</p> <p>Direction of rotation: CCW (as viewed from end of shaft)</p> <p>Phase A ON OFF ON</p> <p>Phase B ON OFF ON</p> <p>Phase Z ON OFF ON</p>	<table border="1"> <thead> <tr> <th>Color</th> <th>Terminal</th> </tr> </thead> <tbody> <tr> <td>Brown</td> <td>Power supply (+Vcc)</td> </tr> <tr> <td>Black</td> <td>Output phase A</td> </tr> <tr> <td>White</td> <td>Output phase B</td> </tr> <tr> <td>Orange</td> <td>Output phase Z</td> </tr> <tr> <td>Blue</td> <td>0 V (common)</td> </tr> </tbody> </table>	Color	Terminal	Brown	Power supply (+Vcc)	Black	Output phase A	White	Output phase B	Orange	Output phase Z	Blue	0 V (common)						
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E6H-CWZ3E	<p>5 to 12 VDC</p> <p>Black, white, orange</p> <p>Output signal (Black: phase A, White: phase B, Orange: phase Z)</p> <p>Blue 0 V</p> <p>Shield GND</p> <p>E6H main circuit</p> <p>NPN transistor 30 mA max.</p> <p>1 kΩ</p>	<p>Voltage output Direction of rotation: CW (as viewed from end of shaft)</p> <p>Phase A H L H</p> <p>Phase B H L H</p> <p>Phase Z H L H</p> <p>Direction of rotation: CCW (as viewed from end of shaft)</p> <p>Phase A L H L</p> <p>Phase B L H L</p> <p>Phase Z L H L</p>	<table border="1"> <thead> <tr> <th>Color</th> <th>Terminal</th> </tr> </thead> <tbody> <tr> <td>Brown</td> <td>Power supply (+Vcc)</td> </tr> <tr> <td>Black</td> <td>Output phase A</td> </tr> <tr> <td>White</td> <td>Output phase B</td> </tr> <tr> <td>Orange</td> <td>Output phase Z</td> </tr> <tr> <td>Blue</td> <td>0 V (common)</td> </tr> </tbody> </table>	Color	Terminal	Brown	Power supply (+Vcc)	Black	Output phase A	White	Output phase B	Orange	Output phase Z	Blue	0 V (common)						
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E6H-CWZ3X	<p>5 to 12 VDC</p> <p>Black, white, orange</p> <p>Non-reversed output (Black: phase A, White: phase B, Orange: phase Z)</p> <p>Black/red, white/red, orange/red</p> <p>Reversed output (Black/red: phase <math>\bar{A}</math>, White/red: phase <math>\bar{B}</math>, Orange/red: phase <math>\bar{Z}</math>)</p> <p>Blue 0 V</p> <p>Shield GND</p> <p>E6H main circuit</p> <p>AM26LS31 equivalent</p>	<p>Line-driver output Direction of rotation: CW (as viewed from end of shaft)</p> <p>Phase A H L H</p> <p>Phase B H L H</p> <p>Phase Z H L H</p> <p>Phase <math>\bar{A}</math> L H L</p> <p>Phase <math>\bar{B}</math> L H L</p> <p>Phase <math>\bar{Z}</math> L H L</p> <p>Direction of rotation: CCW (as viewed from end of shaft)</p> <p>Phase A L H L</p> <p>Phase B L H L</p> <p>Phase Z L H L</p> <p>Phase <math>\bar{A}</math> H L H</p> <p>Phase <math>\bar{B}</math> H L H</p> <p>Phase <math>\bar{Z}</math> H L H</p>	<table border="1"> <thead> <tr> <th>Color</th> <th>Terminal</th> </tr> </thead> <tbody> <tr> <td>Brown</td> <td>Power supply (+Vcc)</td> </tr> <tr> <td>Black</td> <td>Output phase A</td> </tr> <tr> <td>Black/red</td> <td>Output phase <math>\bar{A}</math></td> </tr> <tr> <td>White</td> <td>Output phase B</td> </tr> <tr> <td>White/red</td> <td>Output phase <math>\bar{B}</math></td> </tr> <tr> <td>Orange</td> <td>Output phase Z</td> </tr> <tr> <td>Orange/red</td> <td>Output phase <math>\bar{Z}</math></td> </tr> <tr> <td>Blue</td> <td>0 V (common)</td> </tr> </tbody> </table> <p>Note: 1. Receiver: AM26LS32 equivalent 2. "Black/red" indicates a red strip.</p>	Color	Terminal	Brown	Power supply (+Vcc)	Black	Output phase A	Black/red	Output phase $\bar{A}$	White	Output phase B	White/red	Output phase $\bar{B}$	Orange	Output phase Z	Orange/red	Output phase $\bar{Z}$	Blue	0 V (common)
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Note: Normally connect GND to 0 V or to an external ground.

## 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.

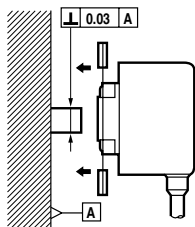


**Precautions for Correct Use**

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

● **Mounting**

- The diameter of the mating shaft must be  $8_{-0.004}^{-0.012}$  mm and 8 to 11 mm long from the mounting surface.
- The allowable displacement in the mating shaft must 0.05 mm in the radial direction and 0.3 mm in the thrust direction.
- The mounting surface and shaft must be perpendicular to within 0.03 mm.
- When securing the Encoder, do not allow force to be applied to the leaf spring.



Eccentricity will develop in the Encoder if the above values are not satisfied, and the mounting leaf spring may be destroyed.

- When securing the Encoder, use two M3 screws to secure the leaf spring to the mounting surface.
- Use the Allen set screw provided with the hollow shaft to secure the shaft. Use a tightening torque of 0.4 N·m and apply screw lock glue to the screw to prevent it from becoming loose.
- If wiring after securing the Encoder, do not pull on the cable. Also, do not apply shock to the Encoder or hollow shaft.
- If the Encoder phase Z must be aligned with the origin of the installation device, mount the Encoder while checking the phase Z output.

● **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.

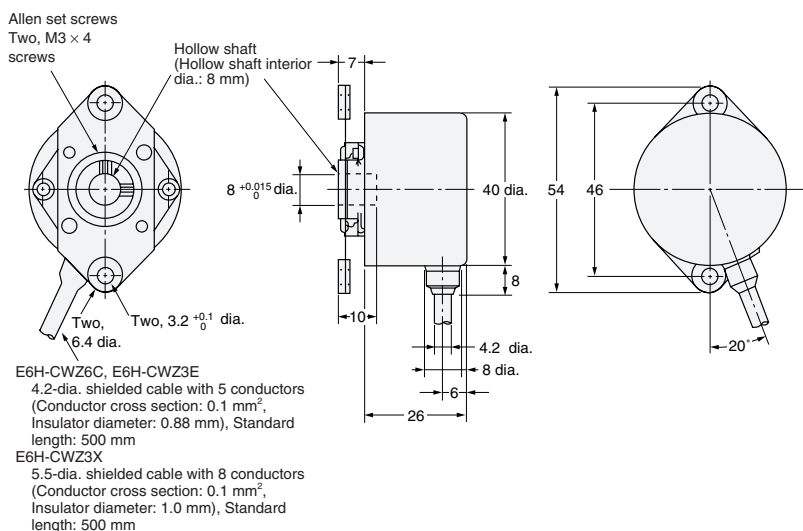
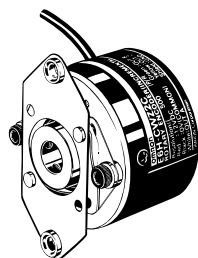
**Rotary Encoder Recommended Power Supplies:** Consult your OMRON representative for details.

(Unit: mm)

## Dimensions

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

E6H-C



## Read and Understand This Catalog

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2010.8

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[E6H-CWZ6C 500P/R 0.5M](#) [E6H-CWZ6C 720P/R 0.5M](#)

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