


# 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:

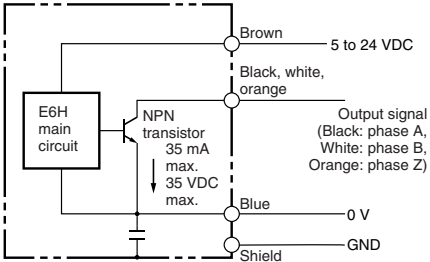
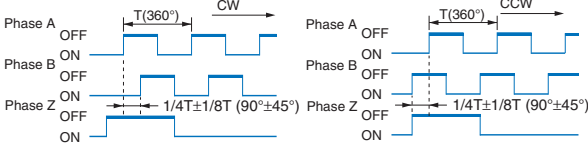
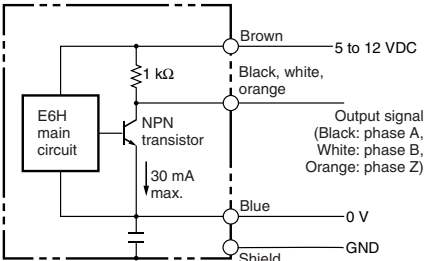
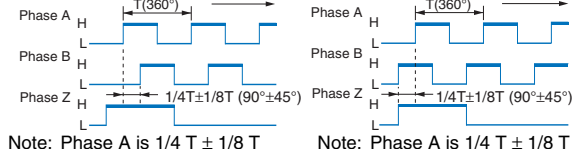
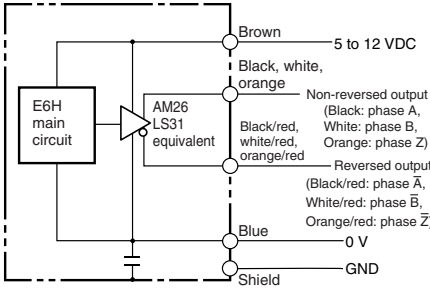
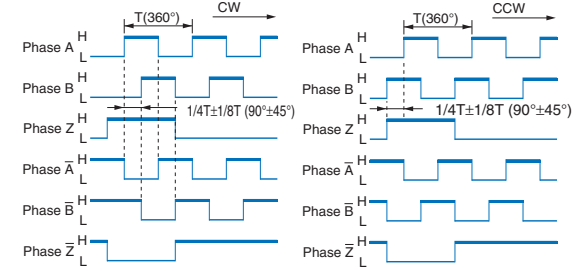
$$\text{Maximum electrical response speed (rpm)} = \frac{\text{Maximum response frequency}}{\text{Resolution}} \times 60$$

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																		
<p><b>E6H-CWZ6C</b></p> 	<p>Open-collector output</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 1/8 T</math> faster than phase B.      Note: Phase A is <math>1/4 T \pm 1/8 T</math> slower than phase B.</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>	<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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<p><b>E6H-CWZ3E</b></p> 	<p>Voltage output</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 1/8 T</math> faster than phase B.      Note: Phase A is <math>1/4 T \pm 1/8 T</math> slower than phase B.</p> <p>(“H” and “L” in the diagrams are the output voltage levels of phases A, B, and Z.)</p>	<table border="1"> <tbody> <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>	Black	Output phase A	White	Output phase B	Orange	Output phase 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.

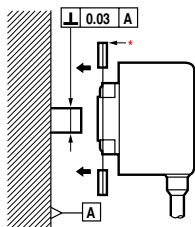


**Precautions for Correct Use**

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.

(Unit: mm)

## Dimensions

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

E6H-C

