

General-purpose Encoder with External Diameter of 40 mm

- Incremental model
- External diameter of 40 mm.
- Resolution of up to 2,000 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 to 24 VDC	NPN open-collector output	10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600	E6B2-CWZ6C (resolution) 0.5M Example: E6B2-CWZ6C 10P/R 0.5M
		720, 800, 1,000, 1,024	
		1,200, 1,500, 1,800, 2,000	
12 to 24 VDC	PNP open-collector output	100, 200, 360, 500, 600	E6B2-CWZ5B (resolution) 0.5M Example: E6B2-CWZ5B 100P/R 0.5M
		1,000	
		2,000	
5 to 12 VDC	Voltage output	10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600	E6B2-CWZ3E (resolution) 0.5M Example: E6B2-CWZ3E 10P/R 0.5M
		1,000	
		1,200, 1,500, 1,800, 2,000	
5 VDC	Line-driver output	10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600	E6B2-CWZ1X (resolution) 0.5M Example: E6B2-CWZ1X 10P/R 0.5M
		1,000, 1,024	
		1,200, 1,500, 1,800, 2,000	

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
Flanges	E69-FBA	---
	E69-FBA02	E69-2 Servo Mounting Bracket provided.
Servo Mounting Bracket	E69-2	---

Refer to *Accessories* for details.

Ratings and Specifications

Item	Model	E6B2-CWZ6C	E6B2-CWZ5B	E6B2-CWZ3E	E6B2-CWZ1X
Power supply voltage		5 VDC −5% to 24 VDC +15%, ripple (p-p): 5% max.	12 VDC −10% to 24 VDC +15%, ripple (p-p): 5% max.	5 VDC −5% to 12 VDC +10%, ripple (p-p): 5% max.	5 VDC ±5%, ripple (p-p): 5% max.
Current consumption *1		80 mA max.	100 mA max.		160 mA max.
Resolution (pulses/rotation)		10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600, 720, 800, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000	100, 200, 360, 500, 600, 1,000, 2,000	10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600, 1,000, 1,200, 1,500, 1,800, 2,000	10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000
Output phases		Phases A, B, and Z			Phases A, $\bar{A}$, B, $\bar{B}$, Z, and $\bar{Z}$
Phase difference between outputs		90°±45° between A and B (1/4 T ± 1/8 T)			
Output configuration		NPN open-collector output	PNP open-collector output	Voltage output (NPN output)	Line driver output *2
Output capacity		Applied voltage: 30 VDC max. Sink current: 35 mA max. Residual voltage: 0.4 V max. (at sink current of 35 mA)	Applied voltage: 30 VDC max. Source current: 35 mA max. Residual voltage: 0.4 V max. (at source current of 35 mA)	Output resistance: 2 kΩ Sink current: 20 mA max. Residual voltage: 0.4 V max. (at sink current of 20 mA)	AM26LS31 equivalent Output current High level: $I_o = -20$ mA Low level: $I_s = 20$ mA Output voltage: $V_o = 2.5$ V min. $V_s = 0.5$ V max.
Maximum response frequency *3		100 kHz	50 kHz	100 kHz	
Rise and fall times of output		1 μs max. (Control output voltage: 5 V, Load resistance: 1 kΩ, Cable length: 2 m max.)	1 μs max. (Cable length: 2 m max., Sink current: 10 mA)		0.1 μs max. (Cable length: 2 m max., $I_o = -20$ mA, $I_s = 20$ mA)
Starting torque		0.98 mN·m max.			
Moment of inertia		1×10 ^{−6} kg·m ² max.; 3 × 10 ^{−7} kg·m ² max. at 600 P/R max.			
Shaft load-ing	Radial	30 N			
	Thrust	20 N			
Maximum permissible speed		6,000 r/min			
Protection circuits		Power supply reverse polarity protection, Load short-circuit protection			---
Ambient temperature range		Operating: −10 to 70°C (with no icing), Storage: −25 to 85°C (with no icing)			
Ambient humidity range		Operating/Storage: 35% to 85% (with no condensation)			
Insulation resistance		20 MΩ min. (at 500 VDC) between current-carrying parts and case			
Dielectric strength		500 VAC, 50/60 Hz for 1 min between current-carrying parts and case			
Vibration resistance		Destruction: 10 to 500 Hz, 150 m/s ² or 2-mm double amplitude for 11 min 3 times each in X, Y, and Z directions			
Shock resistance		Destruction: 1,000m/s ² 3 times each in X, Y, and Z directions			
Degree of protection		IEC 60529 IP50			
Connection method		Pre-wired Models (Standard cable length: 500 mm)			
Materials		Case: ABS, Main unit: Aluminum, Shaft: SUS420J2			
Weight (packed state)		Approx. 100 g			
Accessories		Coupling, Hexagonal wrench, Instruction manual			

*1. An inrush current of approximately 9 A will flow for approximately 0.3 ms when the power is turned ON.

*2. 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.

*3. 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 E6B2-C Rotary Encoder will not operate electrically if its speed exceeds the maximum electrical response speed.

I/O Circuit Diagrams

Model/Output Circuits	Output mode	Connection																		
E6B2-CWZ6C 5 VDC -5% to 24 VDC +15% Black, white, orange Output signal (Black: phase A, White: phase B, Orange: phase Z) Blue 0 V Shield GND 3.3 Ω 35 mA max. at 30 VDC max. NPN transistor E6B2 main circuit	E6B2-CWZ6C NPN Open-collector Output Model E6B2-CWZ5B PNP Open-collector Output Model Direction of rotation: CW (as viewed from end of shaft) Direction of rotation: CCW (as viewed from end of shaft) Phase A ON OFF ON OFF ON OFF ON OFF Phase B ON OFF ON OFF ON OFF ON OFF Phase Z ON OFF ON OFF ON OFF ON OFF $T(360^\circ)$ CW $T(360^\circ)$ CCW $1/4 \pm 1/8 T (90^\circ \pm 45^\circ)$ Note: Phase A is $1/4 T \pm 1/8 T$ faster than phase B. The ONs in the above timing chart mean that the output transistor is ON and the OFFs mean that the output transistor is OFF. Note: Phase A is $1/4 T \pm 1/8 T$ slower than phase B.	<table><tr><th>Color</th><th>Terminal</th></tr><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></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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Brown	Power supply (+Vcc)																			
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E6B2-CWZ5B 12 VDC -10% to 24 VDC +15% Black, white, orange Output signal (Black: phase A, White: phase B, Orange: phase Z) Blue 0 V Shield GND 3.3 Ω 35 mA max. PNP transistor E6B2 main circuit	E6B2-CWZ3E Voltage Output Model Direction of rotation: CW (as viewed from end of shaft) Direction of rotation: CCW (as viewed from end of shaft) Phase A H L H L H L H L Phase B L H L H L H L H Phase Z H L H L H L H L $T(360^\circ)$ CW $T(360^\circ)$ CCW $1/4 \pm 1/8 T (90^\circ \pm 45^\circ)$ Note: Phase A is $1/4 T \pm 1/8 T$ faster than phase B. Note: Phase A is $1/4 T \pm 1/8 T$ slower than phase B.	<table><tr><th>Color</th><th>Terminal</th></tr><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></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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E6B2-CWZ3E 5 VDC -5% to 12 VDC +10% Black, white, orange Output signal (Black: phase A, White: phase B, Orange: phase Z) Blue 0 V Shield GND 2 k Ω 20 mA max. NPN transistor E6B2 main circuit	E6B2-CWZ1X Line Driver Output Model Direction of rotation: CW (as viewed from end of shaft) Direction of rotation: CCW (as viewed from end of shaft) Phase A H L H L H L H L Phase B L H L H L H L H Phase Z H L H L H L H L $T(360^\circ)$ CW $T(360^\circ)$ CCW $1/4 \pm 1/8 T (90^\circ \pm 45^\circ)$ Note: Phase A is $1/4 T \pm 1/8 T$ faster than phase B. Note: Phase A is $1/4 T \pm 1/8 T$ slower than phase B.	<table><tr><th>Color</th><th>Terminal</th></tr><tr><td>Brown</td><td>Power supply (+Vcc)</td></tr><tr><td>Black</td><td>Output phase A</td></tr><tr><td>Black/red stripes</td><td>Output phase A</td></tr><tr><td>White</td><td>Output phase B</td></tr><tr><td>White/red stripes</td><td>Output phase B</td></tr><tr><td>Orange</td><td>Output phase Z</td></tr><tr><td>Orange/red stripes</td><td>Output phase Z</td></tr><tr><td>Blue</td><td>0 V (common)</td></tr></table> Note: Receiver: AM26LS32 equivalent	Color	Terminal	Brown	Power supply (+Vcc)	Black	Output phase A	Black/red stripes	Output phase A	White	Output phase B	White/red stripes	Output phase B	Orange	Output phase Z	Orange/red stripes	Output phase Z	Blue	0 V (common)
Color	Terminal																			
Brown	Power supply (+Vcc)																			
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Orange	Output phase Z																			
Orange/red stripes	Output phase Z																			
Blue	0 V (common)																			
E6B2-CWZ1X 5 VDC $\pm 5\%$ Black, white, orange Non-reversed output (Black: phase A, White: phase B, Orange: phase Z) Black, white, orange (with red stripes) Reversed output (Black/red: Phase A, White/red: Phase B, Orange/red: Phase Z) Blue 0 V Shield GND AM26LS31 equivalent E6B2 main circuit																				

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 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 Safe Use

Incorrect wiring may damage internal circuits.

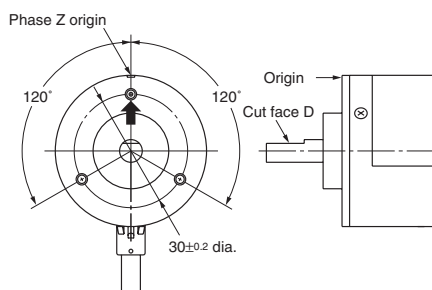
Precautions for Correct Use

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

● Mounting

● Origin Indication

It is easy to adjust the position of phase Z with the origin indication function. The following illustration shows the relationship between phase Z and the origin. Set cut face D to the phase Z origin as shown in the illustration.



- Do not extend the length of the cable to more than 2 m. If the cable must be more than 2 m, use a Model with a Line-driver Output (max. length: 100 m).

● 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.

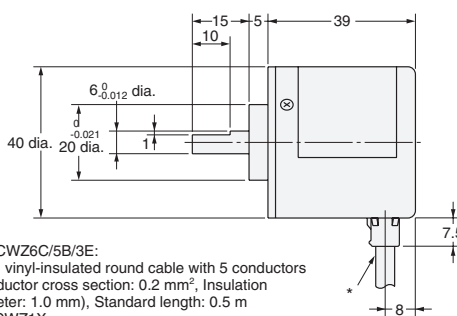
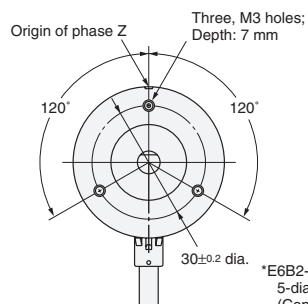
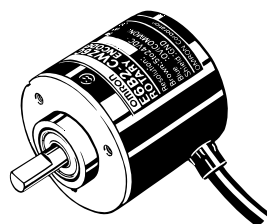
(Unit: mm)

Dimensions

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

Encoder

E6B2-C



*E6B2-CWZ6C/5B/3E:
5-dia. vinyl-insulated round cable with 5 conductors
(Conductor cross section: 0.2 mm², Insulation diameter: 1.0 mm), Standard length: 0.5 m
E6B2-CWZ1X:
5-dia. vinyl-insulated round cable with 8 conductors
(Conductor cross section: 0.2 mm², Insulation diameter: 1.0 mm), Standard length: 0.5 m

Accessories (Order Separately)

Couplings

E69-C06B
E69-C68B
E69-C610B
E69-C06M

Flanges

E69-FBA
E69-FBA02

Servo Mounting Bracket

E69-2

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

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

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OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

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 model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

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

PERFORMANCE DATA

Performance data given in this catalog 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 users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

2010.8

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

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Industrial Automation Company

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[E6B2-CWZ1X 600P/R 2M](#) [E6B2-CWZ6C 1000P/R 2M](#) [E6B2-CWZ6C 100P/R 0.5M](#) [E6B2-CWZ6C 100P/R 2M](#) [E6B2-](#)
[CWZ6C 2000P/R 0.5M](#) [E6B2-CWZ6C 200P/R 2M](#) [E6B2-CWZ6C 300P/R 0.5M](#) [E6B2-CWZ6C 360P/R 0.5M](#) [E6B2-](#)
[CWZ6C 360P/R 2M](#) [E6B2-CWZ6C 500P/R 2M](#) [E6B2-CWZ6C 600P/R 2M](#) [E6C2-CWZ1X 10P/R 2M](#) [E6C2-CWZ1X](#)
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