E6B2-C

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.

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

Ordering Information

Encoders [Refer to *Dimensions* on page 5.]

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**	---

Note: 1. Refer to *Rotary Encoders Accessories* on your OMRON website for details.
    2. Refer to *Precautions For Correct Use of Rotary Encoders* on your OMRON website when using the Rotary Encoders together with a Coupling.

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	0.6 W max. (80 mA max.)	0.8 W max. (100 mA max.)	0.6 W 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, $\overline{A}$, B, $\overline{B}$, Z, and $\overline{Z}$
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 loading　Radial	30 N			
Shaft loading　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			

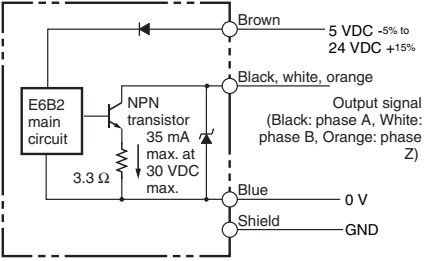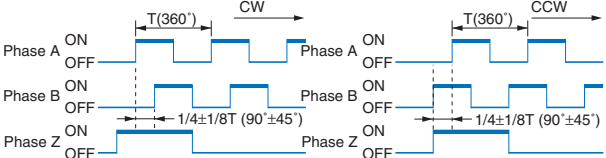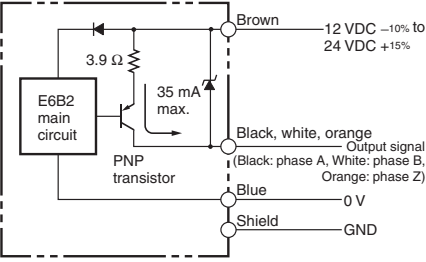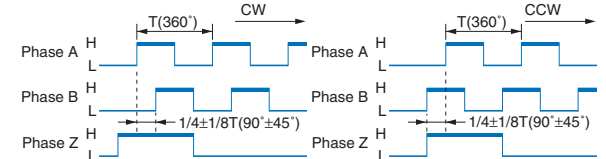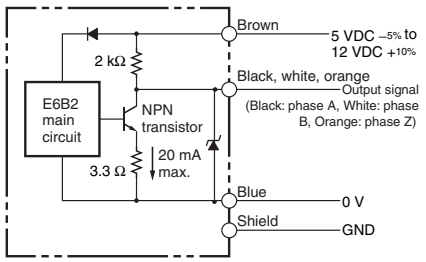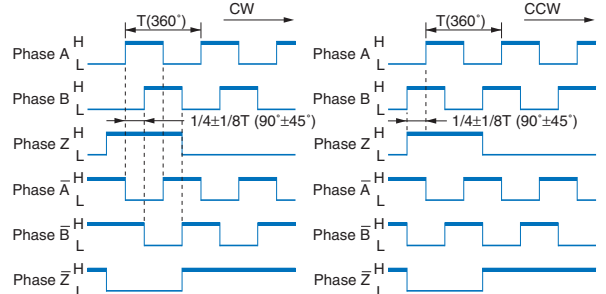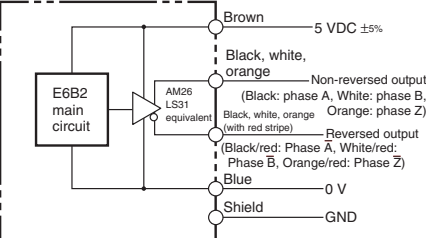*1. An inrush current of approximately 9 A will flow for approximately 0.3 ms when the power is turned ON.
*2. The line driver output is a data transmission circuit compatible with RS-422A and long-distance transmission is possible with a twisted-pair cable. The quality is equivalent to AM26LS31.
*3. 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.

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I/O Circuit Diagrams

Model/Output Circuits	Output mode	Connection

E6B2-CWZ6C

Brown — 5 VDC −5% to 24 VDC +15%
Black, white, orange
E6B2 main circuit / NPN transistor 35 mA max. at 30 VDC max. / 3.3 Ω
Output signal (Black: phase A, White: phase B, Orange: phase Z)
Blue — 0 V
Shield — GND

E6B2-CWZ5B

Brown — 12 VDC −10% to 24 VDC +15%
3.9 Ω
E6B2 main circuit / 35 mA max. / PNP transistor
Black, white, orange
Output signal (Black: phase A, White: phase B, Orange: phase Z)
Blue — 0 V
Shield — GND

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 Phase B ON/OFF Phase Z ON/OFF T(360°) CW 1/4±1/8T (90°±45°)
Phase A ON/OFF Phase B ON/OFF Phase Z ON/OFF T(360°) CCW 1/4±1/8T (90°±45°)

Note: Phase A is 1/4 T ± 1/8 T faster than phase B.
Note: Phase A is 1/4 T ± 1/8 T slower 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.

Color	Terminal
Brown	Power supply (+Vcc)
Black	Output phase A
White	Output phase B
Orange	Output phase Z
Blue	0 V (common)

E6B2-CWZ3E

Brown — 5 VDC −5% to 12 VDC +10%
2 kΩ
Black, white, orange
E6B2 main circuit / NPN transistor / 20 mA max. / 3.3 Ω
Output signal (Black: phase A, White: phase B, Orange: phase Z)
Blue — 0 V
Shield — GND

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 Phase B H/L Phase Z H/L T(360°) CW 1/4±1/8T(90°±45°)
Phase A H/L Phase B H/L Phase Z H/L T(360°) CCW 1/4±1/8T(90°±45°)

Note: Phase A is 1/4 T ± 1/8 T faster than phase B.
Note: Phase A is 1/4 T ± 1/8 T slower than phase B.

"H" and "L" in the diagrams are the output voltage levels of phases A, B, and Z.

E6B2-CWZ1X

Brown — 5 VDC ±5%
Black, white, orange
E6B2 main circuit / AM26 LS31 equivalent
Non-reversed output (Black: phase A, White: phase B, Orange: phase Z)
Black, white, orange (with red stripe)
Reversed output (Black/red: Phase $\overline{A}$, White/red: Phase $\overline{B}$, Orange/red: Phase $\overline{Z}$)
Blue — 0 V
Shield — GND

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 Phase B H/L Phase Z H/L Phase $\overline{A}$ H/L Phase $\overline{B}$ H/L Phase $\overline{Z}$ H/L T(360°) CW 1/4±1/8T (90°±45°)
Phase A H/L Phase B H/L Phase Z H/L Phase $\overline{A}$ H/L Phase $\overline{B}$ H/L Phase $\overline{Z}$ H/L T(360°) CCW 1/4±1/8T (90°±45°)

Note: Phase A is 1/4 T ± 1/8 T faster than phase B.
Note: Phase A is 1/4 T ± 1/8 T slower than phase B.

"H" and "L" in the diagrams are the output voltage levels of phases A, B, and Z.

Color	Terminal
Brown	Power supply (+Vcc)
Black	Output phase A
Black/red stripes	Output phase $\overline{A}$
White	Output phase B
White/red stripes	Output phase $\overline{B}$
Orange	Output phase Z
Orange/red stripes	Output phase $\overline{Z}$
Blue	0 V (common)

Note: Receiver: AM26LS32 equivalent

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

Be sure to read the precautions for all models in the website at: http://www.ia.omron.com/.

⚠ 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

1. Do not use the product in excess of the rated voltage. Applying voltages beyond the rated voltage range may cause the product to break or burn.
2. Avoid wiring the product's cables parallel to power lines or high voltage lines. Doing so may cause the product to malfunction due to induction or may cause the damage the product.
3. If surge occurs in the power supply, connect a surge absorber between the power supply terminals to absorb the surge. Minimize the wiring length to prevent the product from being affected by noise, etc.
4. Since improper pulses may occur when the power is turned on or off, use the devices connected to this product at least 1.0 seconds before or after the power is turned on or off.
5. Be careful when wiring, such as being careful with the polarities of the power supply. Incorrect wiring may break or burn the product.
6. Do not short-circuit the load. Doing so may break or burn the product. In case of load short-circuit (except E6B2-CWZ1X), the product will shut down the output. At that time, please solve the short-circuit and restart the power.
7. Do not use the encoder under the environment with explosive or ignition gas.
8. Never disassemble, repair nor tamper with the product.

Precautions for Correct Use

1. Since the product consists of high-precision components, handle it with utmost care.
2. Be careful not to expose the product to water or oil.
3. Be sure to turn off the power supply before wiring. If the output line contacts the power supply line while the power is being supplied, the output circuit may be damaged.
4. If the product is mounted and wired with a cord, do not pull the cord with force greater than 29.4 N.
5. Be careful not to apply excessive load to the shaft. Excessive load may cause the product break. Especially when linking with a chain, timing belt, or gears, connect a separate bearing before the coupling to the product.
6. If an installation error such as misalignment is too large, (in case using the coupling or without coupling) the shaft will be subjected to an excessive load which will damage it or shorten its service life. Be careful when installing.
7. When inserting the shaft in the coupling, do not use excessive force (by striking it with hammer, for example).
8. When installing or removing the coupling, do not apply an excessive being, compressing, or tensile force.

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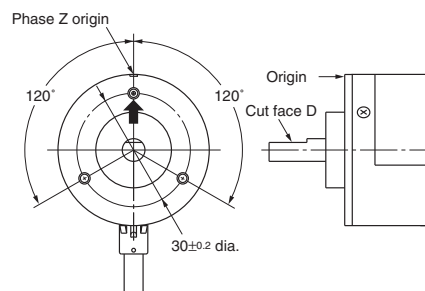
• Do not extend the length of the cable to more than 2 m. If the cable must be more than 2 m, use a Model with a Line-driver Output (max. length: 100 m).
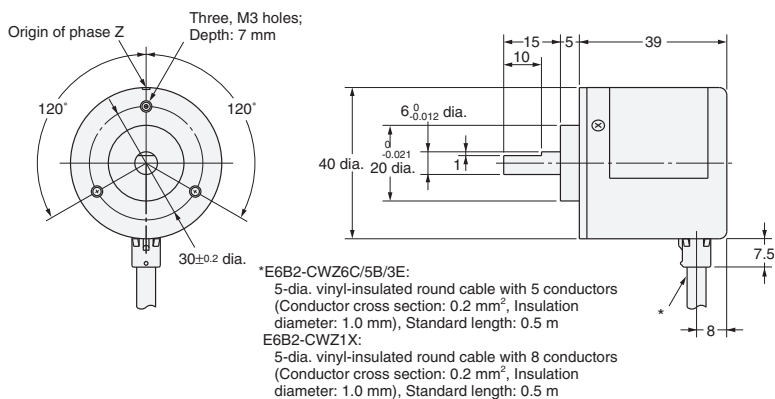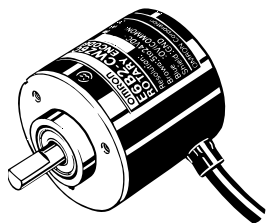
● **Wiring**

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.

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Dimensions

Encoder

E6B2-C

Origin of phase Z

Three, M3 holes;
Depth: 7 mm

120° 120°

30±0.2 dia.

15 — 5 — 39

10

$6_{-0.012}^{0}$ dia.

40 dia.

$20_{-0.021}^{0}$ dia.

1

7.5

8

*E6B2-CWZ6C/5B/3E:
  5-dia. vinyl-insulated round cable with 5 conductors
  (Conductor cross section: 0.2 mm^2, 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 mm^2, Insulation
  diameter: 1.0 mm), Standard length: 0.5 m

Accessories (Order Separately)

Couplings	**Flanges**	**Servo Mounting Bracket**
E69-C06B	**E69-FBA**	**E69-2**
E69-C68B	**E69-FBA02**	
E69-C610B		
E69-C06M		

Refer to *Rotary Encoders Accessories* on your OMRON website for details.

Terms and Conditions Agreement

2023.1

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

OMRON Corporation
Industrial Automation Company

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