

Tough and Easy

- Sealed bearings with IP64 oilproof construction.
- Improved shaft loading performance.
Radial: 50 N, Thrust: 30 N
- Pre-wired Models with cable connected at an angle.
Side or back cable connections also possible.
- Improved reliability with reverse connection and load short-circuit protection (except for line-driver outputs).



 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 (NPN)	10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600	E6C2-CWZ6C (resolution) 2M Example: E6C2-CWZ6C 10P/R 2M
		720, 800, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000	
12 to 24 VDC	Open-collector output (PNP)	100, 200, 360, 500, 600	E6C2-CWZ5B (resolution) 2M Example: E6C2-CWZ5B 100P/R 2M
		1,000, 2,000	
5 to 12 VDC	Voltage output	10, 20, 30, 40, 50, 60, 100, 200, 300, 360, 400, 500, 600	E6C2-CWZ3E (resolution) 2M Example: E6C2-CWZ3E 10P/R 2M
		720, 800, 1,000, 1,024, 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	E6C2-CWZ1X (resolution) 2M Example: E6C2-CWZ1X 10P/R 2M
		720, 800, 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	---
	E69-C68B	Different end diameter
	E69-C610B	Different end diameter
	E69-C06M	Metal construction
Flanges	E69-FCA	---
	E69-FCA02	E69-2 Servo Mounting Bracket provided.
Servo Mounting Bracket	E69-2	Provided with E69-FCA02 Flange.

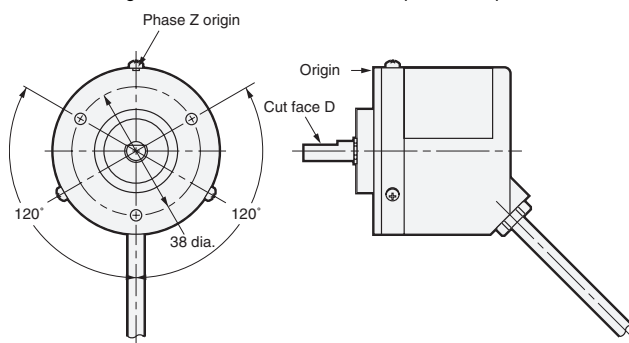
Refer to *Accessories* for details.

Ratings and Specifications

Item	Model	E6C2-CWZ6C	E6C2-CWZ5B	E6C2-CWZ3E	E6C2-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, 720, 800, 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 $\bar{Z}$
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 Output current: 20 mA max. Residual voltage: 0.4 V max. (at sink current of 20 mA)	AM26LS31 equivalent Output voltage: 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	
Phase difference between outputs		90°±45° between A and B (1/4 T ± 1/8 T)			
Rise and fall times of output		1 μs max. (Control output voltage: 5 V, Load resistance: 1 kΩ, Cable length: 2 m)	1 μs max. (Cable length: 2 m, Sink current: 10 mA)		0.1 μs max. (Cable length: 2 m, $I_o = -20$ mA, $I_s = 20$ mA)
Starting torque		10 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	50 N			
	Thrust	30 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: 1,000 m/s ² 3 times each in X, Y, and Z directions			
Degree of protection		IEC 60529 IP64, in-house standards: oilproof			
Connection method		Pre-wired Models (Standard cable length: 2 m)			
Material		Case: Zinc alloy, Main unit: Aluminum, Shaft: SUS420J2			
Weight (packed state)		Approx. 400 g			
Accessories		Instruction manual			

Note: Origin Indication

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.



*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. (AM26LS31 equivalent)

*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 E6C2-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																		
E6C2-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 E6C2-C main circuit NPN transistor 35 mA max. 30 VDC max. 3.3 Ω	E6C2-CWZ6C NPN Open-collector Output Model E6C2-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 OFF ON Phase Z ON OFF ON OFF OFF ON 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. Note: Phase A is $1/4 T \pm 1/8 T$ 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.)	<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)						
Color	Terminal																			
Brown	Power supply (+Vcc)																			
Black	Output phase A																			
White	Output phase B																			
Orange	Output phase Z																			
Blue	0 V (common)																			
E6C2-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 E6C2-C main circuit PNP transistor 35 mA max. 3.3 Ω																				
E6C2-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 E6C2-C main circuit NPN transistor 20 mA max. 2 kΩ 3.3 Ω	E6C2-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 ON OFF OFF ON 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. Note: Phase A is $1/4 T \pm 1/8 T$ slower than phase B.																			
E6C2-CWZ1X 5 VDC ±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 Ā, White/red: Phase B̄, Orange/red: Phase Z̄) Blue 0 V Shield GND E6C2-C main circuit AM26LS31 equivalent 3.3 Ω	E6C2-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 Ā L H Phase B̄ L H Phase Z̄ L H ON OFF OFF ON ON OFF OFF ON ON OFF OFF ON $T(360^\circ)$ CW $T(360^\circ)$ CCW $1/4 \pm 1/8 T (90^\circ \pm 45^\circ)$	<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>Black/red stripes</td><td>Output phase Ā</td></tr><tr><td>White/red stripes</td><td>Output phase B̄</td></tr><tr><td>Orange/red stripes</td><td>Output phase Z̄</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	White	Output phase B	Orange	Output phase Z	Black/red stripes	Output phase Ā	White/red stripes	Output phase B̄	Orange/red stripes	Output phase Z̄	Blue	0 V (common)
Color	Terminal																			
Brown	Power supply (+Vcc)																			
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White/red stripes	Output phase B̄																			
Orange/red stripes	Output phase Z̄																			
Blue	0 V (common)																			

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 Correct Use

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

● Wiring

Cable Extension Characteristics

- When the cable length is extended, the output waveform startup time is lengthened and it affects the phase difference characteristics of phases A and B. Conditions will change according to frequency, noise, and other factors. As a guideline, use a cable length of 10 m* or less. If the cable must be more than 2 m, use a Model with a Line-driver Output (max. length for line-driver output: 100 m).

* Recommended Cable
 Conductor cross section: 0.2 mm²
 Spiral shield
 Conductor resistance: 92 Ω/km max. (20°C)
 Insulation resistance: 5 Ω/km min. (20°C)

- The output waveform startup time changes not only according to the length of the cable, but also according to the load resistance and the cable type.
- Extending the cable length not only changes the startup time, but also increases the output residual voltage.

● Connection

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.

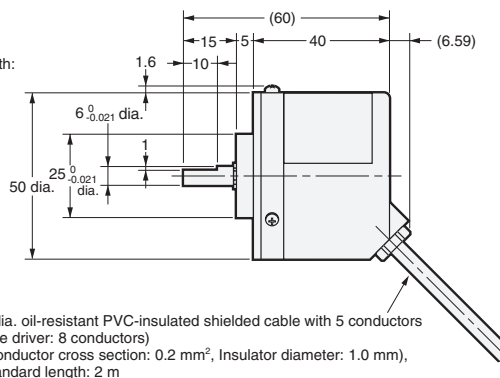
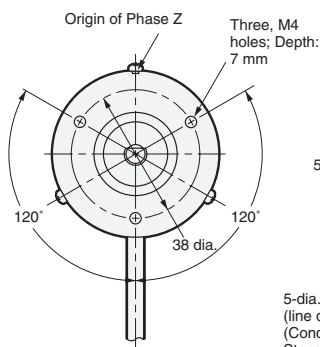
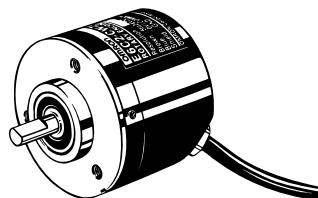
(Unit: mm)

Dimensions

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

Encoder

E6C2-CWZ□□



Accessories (Order Separately)

Couplings

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

Flanges

E69-FCA
 E69-FCA02

Servo Mounting Bracket

E69-2 (Three brackets in a set.)

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

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Application Considerations

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- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

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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.

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