Slim Incremental 50-mm-dia. Rotary Encoder

E6C2-C

CSM_E6C2-C_DS_E_5_1

General-purpose Encoder with External Diameter of 50 mm

- Incremental model
- External diameter of 50 mm.
- Resolution of up to 2,000 ppr.
- IP64 (improved oil-proof construction with sealed bearings)
- Side or back connections are possible. Pre-wired Models with cable connected at an angle.

CE

⚠ 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*.]

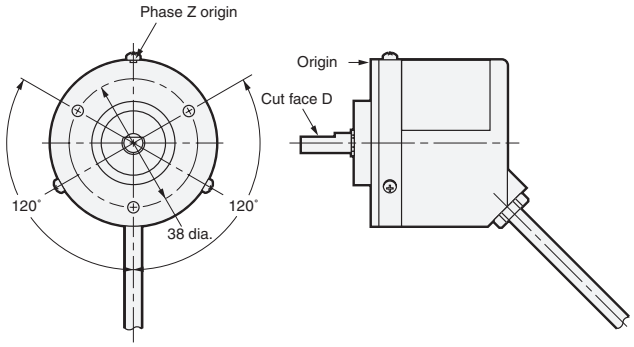
Name	Model	Remarks
Couplings	**E69-C06B**	---
	E69-C68B	Different end diameter
	E69-C610B	Different end diameter
	E69-C06M	Metal construction
Flanges	**E69-FCA**	---
	E69-FCA02	E69-2 Servo Mounting Bracket provided.
Servo Mounting Bracket	**E69-2**	Provided with E69-FCA02 Flange.

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, $\overline{A}$, B, $\overline{B}$, Z, and $\overline{Z}$
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·m² max.; 3×10^{-7} kg·m² max. at 600 P/R max.			
Shaft loading Radial	50 N			
Shaft loading 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/s² or 2-mm double amplitude for 11 min 3 times each in X, Y, and Z directions			
Shock resistance	Destruction: 1,000 m/s² 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: Coupling, mounting bracket and hex-head spanner are sold separately.			

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:

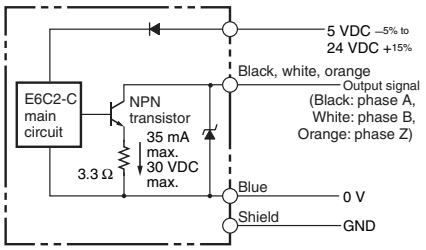
$$\text{Maximum electrical response speed (rpm)} = \frac{\text{Maximum response frequency}}{\text{Resolution}} \times 60$$

This means that the E6C2-C Rotary Encoder will not operate electrically if its speed exceeds the maximum electrical response speed.

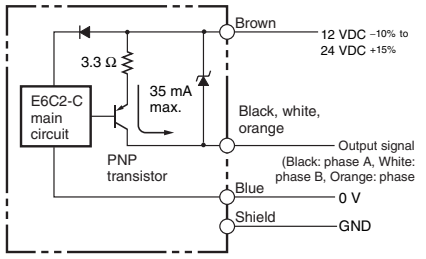
I/O Circuit Diagrams

Model/Output Circuits	Output mode	Connection

E6C2-CWZ6C

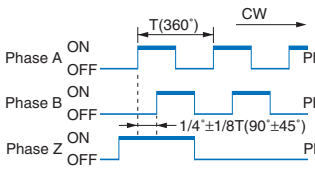


E6C2-CWZ5B



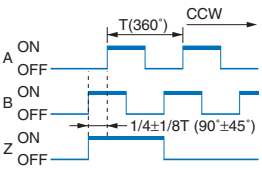
E6C2-CWZ6C NPN Open-collector Output Model
E6C2-CWZ5B PNP Open-collector Output Model

Direction of rotation: CW (as viewed from end of shaft)



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

Direction of rotation: CCW (as viewed from end of shaft)

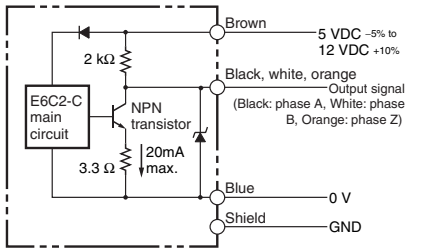


Note: Phase A is 1/4 T ± 1/8 T slower than phase B.

(The ONs in the above timing chart mean that the output transistor is ON and the OFFs mean that the output transistor is OFF.)

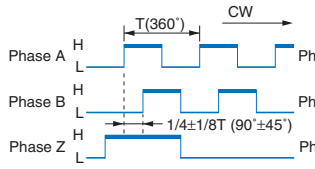
Color	Terminal
Brown	Power supply (+Vcc)
Black	Output phase A
White	Output phase B
Orange	Output phase Z
Blue	0 V (common)

E6C2-CWZ3E



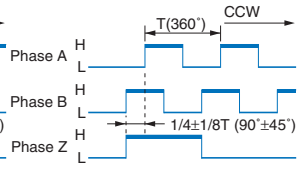
E6C2-CWZ3E Voltage Output Model

Direction of rotation: CW (as viewed from end of shaft)



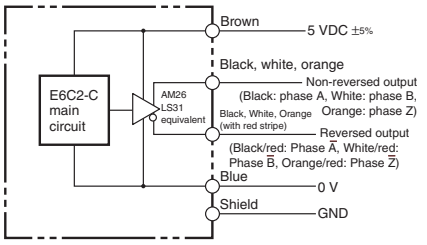
Note: Phase A is 1/4 T ± 1/8 T faster than phase B.

Direction of rotation: CCW (as viewed from end of shaft)



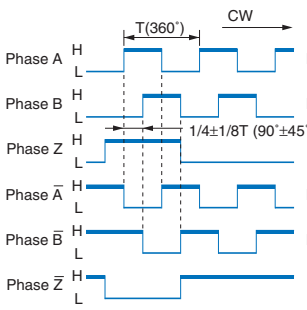
Note: Phase A is 1/4 T ± 1/8 T slower than phase B.

E6C2-CWZ1X

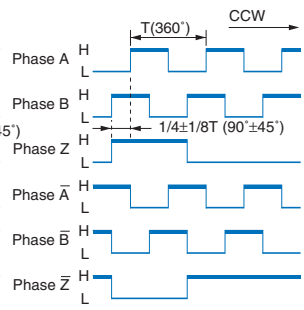


E6C2-CWZ1X Line Driver Output Model

Direction of rotation: CW (as viewed from end of shaft)



Direction of rotation: CCW (as viewed from end of shaft)



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)

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

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 mm^2
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.

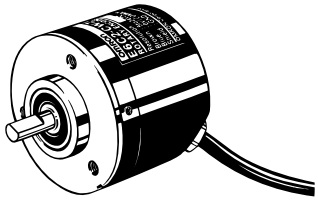
(Unit: mm)

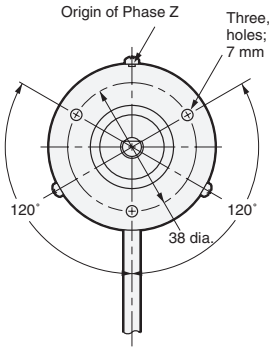
Dimensions

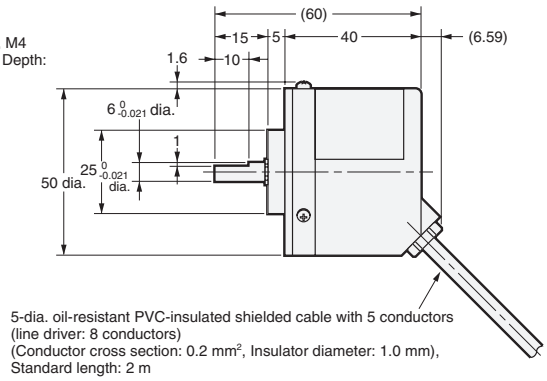
Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

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.

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- Systems, machines, and equipment that could present a risk to life or property.

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2011.4

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LifeElectronics
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