Rugged Incremental 50-mm-dia. Rotary Encoder

E6C3-C

E6C3-C_DS_E_7_1

Rugged Rotary Encoder

- Incremental model
- External diameter of 50 mm.
- Resolution of up to 3,600 ppr.
- IP65 (improved oil-proof construction with sealed bearings)
- Superior shaft loading performance (radial: 80 N, thrust: 50 N)

⚠ 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)	Connection method	Model
12 to 24 VDC	Complementary output	100, 200, 300, 360, 500, 600, 720, 800, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000, 2,048, 2,500, 3,600	Pre-wired (1 m) (See note.)	**E6C3-CWZ5GH (resolution) 1M** Example: E6C3-CWZ5GH 100P/R 1M
5 to 12 VDC	Voltage output	100, 200, 300, 360, 500, 600, 720, 800, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000, 2,048, 2,500, 3,600		**E6C3-CWZ3EH (resolution) 1M** Example: E6C3-CWZ3EH 100P/R 1M
5 to 12 VDC	Line-driver output	100, 200, 300, 360, 500, 600, 720, 800, 1,000, 1,024, 1,200, 1,500, 1,800, 2,000, 2,048, 2,500, 3,600		**E6C3-CWZ3XH (resolution) 1M** Example: E6C3-CWZ3XH 100P/R 1M

Note: Models with 2-m cable are also available. When ordering, specify the cable length at the end of the model number (example: E6C3-CWZ5GH 300P/R 2M).

Accessories (Order Separately) [Refer to *Dimensions* on *Rotary Encoder Accessories*.]

Name	Model	Remarks
Couplings	**E69-C08B**	---
	E69-C68B	Different end diameter (6 to 8 mm)
Flanges	**E69-FCA03**	---
	E69-FCA04	E69-2 Servo Mounting Bracket provided.
Servo Mounting Bracket	**E69-2**	Provided with E69-FCA04 Flange.

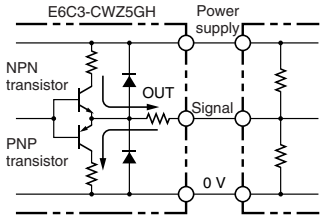
Refer to *Accessories* for details.

Ratings and Specifications

Item / Model		E6C3-CWZ5GH	E6C3-CWZ3EH	E6C3-CWZ3XH
Power supply voltage		12 VDC −10% 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.		
Resolution (pulses/rotation)		100, 200, 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*5		Phases A, $\overline{A}$, B, $\overline{B}$, Z, and $\overline{Z}$
Output configuration		Complementary outputs*2	Voltage output (NPN output)	Line driver output*3
Output capacity		Output voltage: VH = Vcc -3 V min. (IO = 30 mA) VL = 2 V max. (IO = −30 mA) Output current: ±30 mA	Output resistance: 2 kΩ Output current: 35 mA max. Residual voltage: 0.7 V max.	AM26LS31 equivalent Output current: High level: IO = −10 mA Low level: IS = 10 mA Output voltage: VO = 2.5 V min. VS = 0.5 V max.
Maximum response frequency*4		125 kHz (65 kHz when using phase Z reset)		
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. (Cable length: 2 m, Output current: 30 mA)	1 μs max. (Cable length: 2 m, Output current: 35 mA)	1 μs max. (Cable length: 2 m, IO: −10 mA, IS: 10 mA)
Starting torque		10 mN·m max. at room temperature, 30 mN·m max. at low temperature		
Moment of inertia		2.0×10^{-6} kg·m² max.; 1.9×10^{-6} kg·m² max. at 500 P/R max.		
Shaft loading	Radial	80 N		
	Thrust	50 N		
Maximum permissible speed		5,000 r/min		
Protection circuits		Power supply reverse polarity protection, Output 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 IP65, in-house standards: oilproof		
Connection method		Pre-wired Models (Standard cable length: 1 m)		
Material		Case: Aluminum, Main unit: Aluminum, Shaft: SUS303		
Weight (packed state)		Approx. 300 g		
Accessories		Instruction manual Note: Coupling, mounting bracket and hex-head spanner are sold separately.		

*1. An inrush current of approximately 9 A will flow for approximately 0.1 ms when the power is turned ON.

*2. Complementary Output
The complementary output has two output transistors (NPN and PNP) as shown below. These two output transistors alternately turn ON and OFF depending on the high or low output signal. When using them, pull up to the positive power supply voltage level or pull down to 0 V. The complementary output allows flow-in or flow-out of the output current and thus the rising and falling speeds of signals are fast. This allows a long cable distance. They can be connected to open-collector input devices (NPN, PNP).



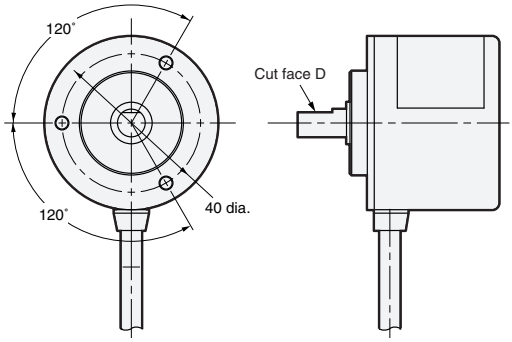
*3. The line driver output is a data transmission circuit compatible with RS-422A and long-distance transmission is possible with a twisted-pair cable. (AM26LS31 equivalent)

*4. The maximum electrical response speed is determined by the resolution and maximum response frequency as follows:

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

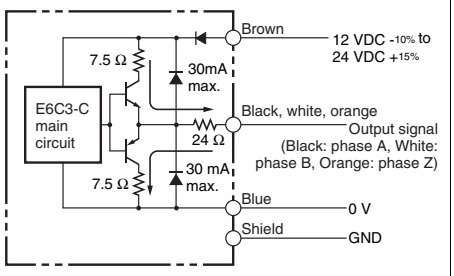
This means that the Rotary Encoder will not operate electrically if its speed exceeds the maximum electrical response speed.

*5. The phase Z signal is output when cut face D on the shaft and the cable connection direction are as shown in the following diagram (output position range: ±15°).

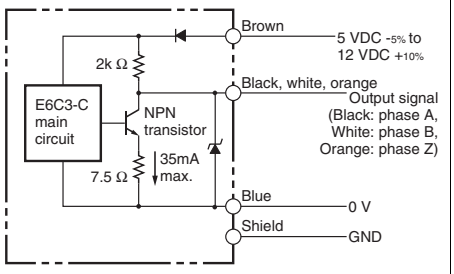


I/O Circuit Diagrams

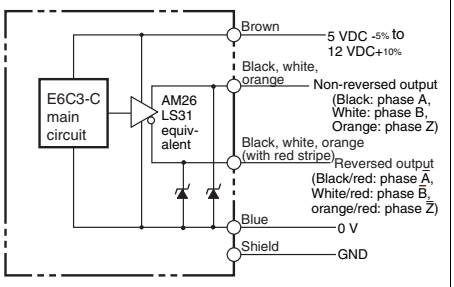
E6C3-CWZ5GH



E6C3-CWZ3EH

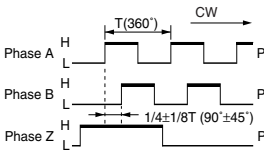


E6C3-CWZ3XH



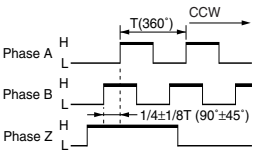
E6C3-CWZ3EH Voltage Output Model
E6C3-CWZ5GH Complementary Output Model

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)



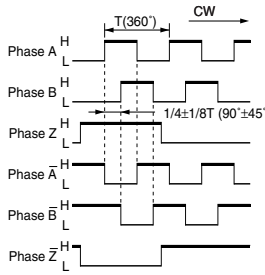
Note: Phase A is 1/4 T ± 1/8 T slower than phase B.

("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
White	Output phase B
Orange	Output phase Z
Blue	0 V (common)

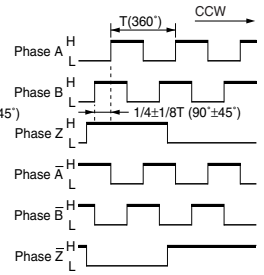
E6C3-CWZ3XH Line Driver Output Model

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.

("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
White	Output phase B
Orange	Output phase Z
Black/red stripes	Output phase $\overline{A}$
White/red stripes	Output phase $\overline{B}$
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

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

Connections

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 10 m, use a Model with a Line-driver Output or Complementary Output.
  (max. length for line-driver output: 100 m,
  max. length for complementary output: 30 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.

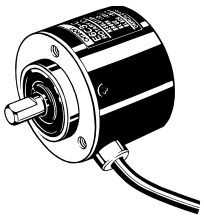
(Unit: mm)

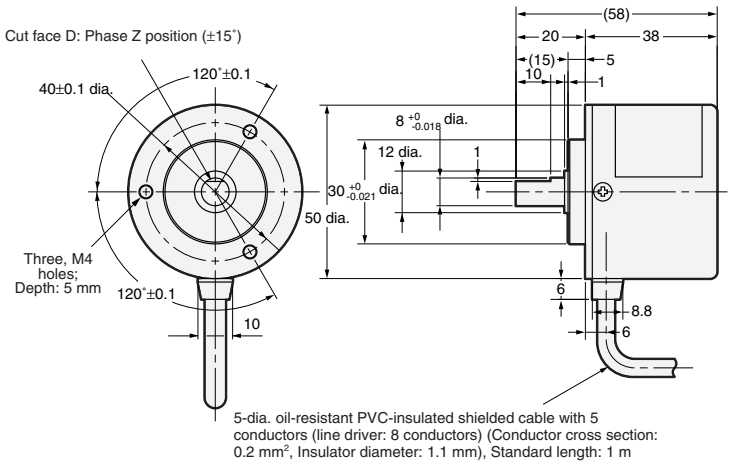
Dimensions

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

Encoder

E6C3-CWZ□□H





The E69-C08B Coupling is sold separately.

Accessories (Order Separately)

Couplings

E69-C08B
E69-C68B

Flanges

E69-FCA03
E69-FCA04

Servo Mounting Bracket

E69-2

Refer to *Accessories* for details.

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