E6C3-C

CSM_E6C3-C_DS_E_7_2

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.

CE

Ordering Information

Encoders [Refer to Dimensions on page 4.]

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

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 | | | |
| Coupings | E69-C68B | Different end diameter (6 to 8 mm) | | |
| Flanges | E69-FCA03 | | | |
| i laliges | E69-FCA04 | E69-2 Servo Mounting Bracket provided. | | |
| Servo Mounting Bracket | E69-2 | Provided with E69-FCA04 Flange. | | |
| D (. 4 | | • | | |

Refer to Accessories for details.

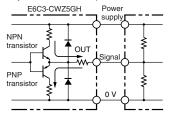
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Ratings and Specifications

| Power supply voltage | 048, 2,500, 3,600 | | | | | | |
|---|---|--|--|--|--|--|--|
| $ \begin{array}{llllllllllllllllllllllllllllllllllll$ | 048, 2,500, 3,600 | | | | | | |
| Output phases Phases A, B, and Z*5 Output configuration Complementary outputs*2 Voltage output (NPN output) Output voltage: VH = Vcc = 3 V min. (IO = 30 mA) VL = 2 V max. (IO = -30 mA) Output resistance: 2 kΩ Output current: 35 mA max. Residual voltage: 0.7 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: 35 mA) | 048, 2,500, 3,600 | | | | | | |
| | | | | | | | |
| | Phases A, \overline{A} , B, \overline{B} , Z, and \overline{Z} | | | | | | |
| $ \begin{array}{c c} \textbf{Output capacity} & \begin{array}{c} \textbf{I} & \textbf{Output resistance: } 2 \text{ k}\Omega \\ \textbf{VL} = 2 \text{ V max.} \\ \textbf{(IO} = -30 \text{ mA}) \\ \textbf{Output current: } 35 \text{ mA} \text{ max.} \\ \textbf{Residual voltage: } 0.7 \text{ V max.} \\ \end{array} \\ \\ \textbf{Maximum response} \\ \textbf{frequency'4} & 125 \text{ kHz } (65 \text{ kHz when using phase Z reset}) \\ \textbf{Phase difference between} \\ \textbf{outputs} & 90^{\circ} \pm 45^{\circ} \text{ between A and B } (1/4 \text{ T} \pm 1/8 \text{ T}) \\ \\ \textbf{Rise and fall times of output} & 1 \mu \text{s max.} \\ \textbf{(Cable length: } 2 \text{ m, Output current: } 30 \text{ mA}) & \begin{array}{c} 1 \mu \text{s max.} \\ \textbf{(Cable length: } 2 \text{ m, Output current: } 35 \\ \textbf{mA}) \\ \end{array} $ | Line driver output*3 | | | | | | |
| frequency*4 125 κHZ (65 κHZ 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: 35 mA) | 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. | | | | | | |
| outputs 90°±45° between A and B (1/4 1 ± 1/8 1) 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) | n using phase Z reset) | | | | | | |
| Rise and fall times of output (Cable length: 2 m, Output current: 30 mA) (Cable length: 2 m, Output current: 35 mA) | | | | | | | |
| Starting torque | 1 μs max. (Cable length: 2 m, IO: –10 mA, IS: 10 mA) | | | | | | |
| To mivin max. at room temperature, 30 mivin max. at low temperature | 10 mN·m max. at room temperature, 30 mN·m max. at low temperature | | | | | | |
| Moment of inertia $2.0 \times 10^{-6} \text{ kg} \cdot \text{m}^2 \text{ max.}$; $1.9 \times 10^{-6} \text{ kg} \cdot \text{m}^2 \text{ max.}$ at 500 P/R max. | 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 | 50 N | | | | | | |
| Maximum permissible speed 5,000 r/min | 5,000 r/min | | | | | | |
| Protection circuits Output load short-circuit protection | | | | | | | |
| Ambient temperature range Operating: -10 to 70°C (with no icing), Storage: -25 to 85°C (with no icing) | 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) | 1 0 0 , | | | | | | |
| nsulation 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 | 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 ea | 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 | 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 | Case: Aluminum, Main unit: Aluminum, Shaft: SUS303 | | | | | | |
| Weight (packed state) Approx. 300 g | Approx. 300 g | | | | | | |
| Accessories Instruction manual Note: Coupling, mounting bracket and hex-head spanner are so | | | | | | | |

*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:

Maximum electrical response speed (rpm) =

Maximum response frequency

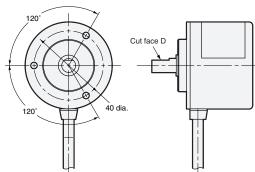
Resolution

× 60

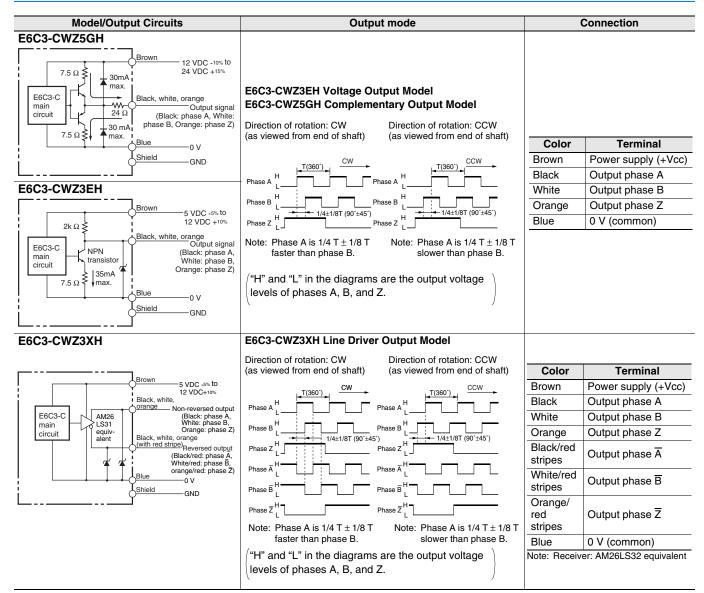
Resolution

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



- 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.

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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)

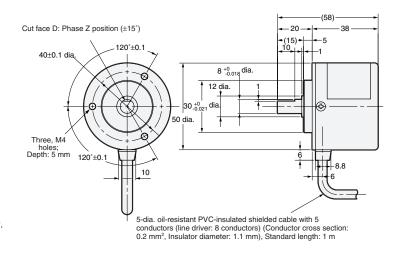
Dimensions

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)

CouplingsFlangesE69-C08BE69-FCA03E69-C68BE69-FCA04

Servo Mounting Bracket

E69-2

Refer to Accessories for details.

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