# 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.

CE

## **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,		Pre-wired (1 m) (See note.)	E6C3-CWZ5GH (resolution) 1M Example: E6C3-CWZ5GH 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	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,			E6C3-CWZ3XH (resolution) 1M Example: E6C3-CWZ3XH 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		

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		
Flanges	E69-FCA03		
i laliges	E69-FCA04	E69-2 Servo Mounting Bracket provided.	
Servo Mounting Bracket	E69-2	Provided with E69-FCA04 Flange.	
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Refer to Accessories for details.

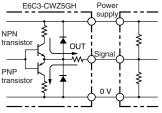
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## **Ratings and Specifications**

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 consum	ption*1	100 mA max.						
Resolution (puls	ses/rotation)	100, 200, 300, 360, 500, 600, 720, 800, 1,0	000, 1,024, 1,200, 1,500, 1,800, 2,000, 2,0	948, 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 respo frequency*4	nse	125 kHz (65 kHz when using phase Z rese	t)					
Phase differenc outputs	e between	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 inert	ia	$2.0 \times 10^{-6} \text{ kg} \cdot \text{m}^2 \text{ max.}$ ; $1.9 \times 10^{-6} \text{ kg} \cdot \text{m}^2 \text{ max.}$ at 500 P/R max.						
Shaft loading	Radial	80 N						
Thrust		50 N						
Maximum permi	ssible speed	000 r/min						
Protection circuits		Power supply reverse polarity protection, C						
Ambient temper	ature 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 M $\Omega$ min. (at 500 VDC) between current-carrying parts and case								
Dielectric streng	jth	500 VAC, 50/60 Hz for 1 min between current-carrying parts and case						
Vibration resista	ance	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	e	Destruction: 1,000 m/s <sup>2</sup> 3 times each in X, Y, and Z directions						
Degree of protection IEC 60529 IP65, in-house standards: oilproof								
Connection met	hod	Pre-wired Models (Standard cable length: 1 m)						
Material		Case: Aluminum, Main unit: Aluminum, Shaft: SUS303						
Weight (packed	state)	Арргох. 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:

Maximum electrical response speed (rpm) = 

Maximum response frequency

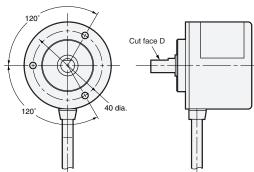
Resolution

× 60

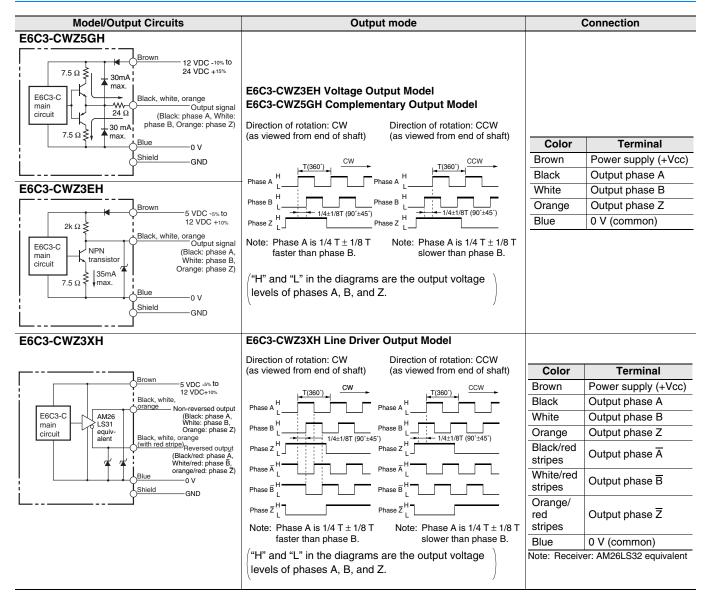
Resolution

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 mm<sup>2</sup>

Spiral shield

Conductor resistance: 92  $\Omega$ /km max. (20°C) Insulation resistance: 5  $\Omega$ /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)

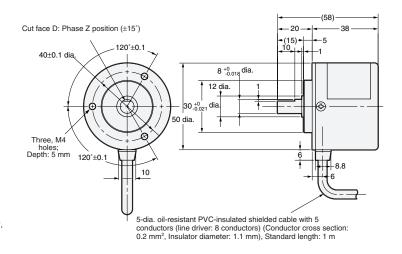
#### **Dimensions**

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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- and (ii) Buyer has no past due amounts.

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