Incremental 60-mm-dia. Rotary Encoder

# E6F-C

CSM_E6F-C_DS_E_5_1

## Rugged Rotary Encoder

- Incremental model
- External diameter of 60 mm.
- Resolution of up to 1000 ppr.
- IP65 oil-resistance with strong shaft.
  Radial: 120 N, Thrust: 50 N

CE

⚠ Be sure to read *Safety Precautions* on page 3.

## Ordering Information

### Encoders [Refer to *Dimensions* on page 4.]

| Power supply voltage | Output configuration | Resolution (pulses/rotation) | Model |
|---|---|---|---|
| 12 to 24 VDC | Complementary output | 100, 200, 360, 500, 600 | **E6F-CWZ5G (resolution) 2M** Example: E6F-CWZ5G (100P/R) 2M |
| | | 1,000 | |
| | NPN open-collector output | 1,000 | **E6F-CWZ5C (1000P/R) 2M** |

### Accessories (Order Separately) [Refer to *Dimensions* on page 4 for servo mounting bracket and to *Accessories* for coupling dimensions.]

| Name | Model | Remarks |
|---|---|---|
| Couplings | **E69-C10B** | --- |
| | **E69-C610B** | Different end diameter |
| | **E69-C10M** | Metal construction |
| Servo Mounting Bracket | **E69-2** | (Three brackets in a set.) |

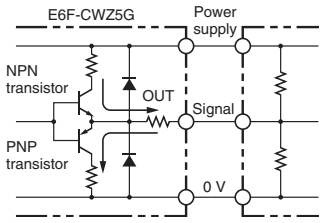
Refer to *Accessories* for details.

## Ratings and Specifications

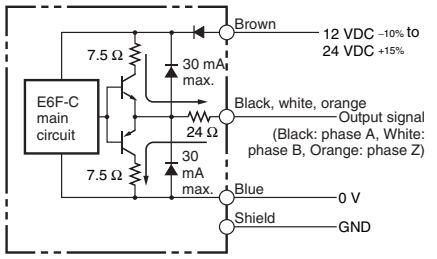
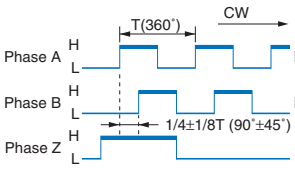
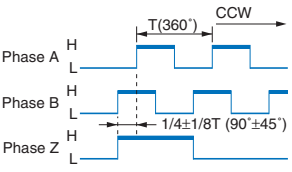
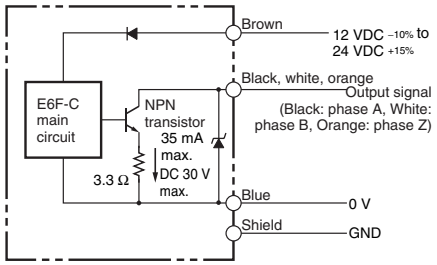
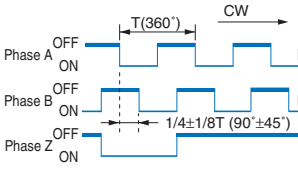
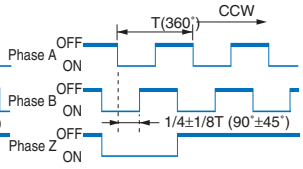
| Item / Model | | E6F-CWZ5G | E6F-CWZ5C |
|---|---|---|---|
| **Power supply voltage** | | 12 VDC −10% to 24 VDC +15%, ripple (p-p): 5% max. | |
| **Current consumption*1** | | 100 mA max. | |
| **Resolution (pulses/rotation)** | | 100, 200, 360, 500, 600, 1,000 | 1,000 |
| **Output configuration** | | Complementary outputs*2 | NPN open-collector output |
| **Output capacity** | | Output voltage: VH = Vcc −3 V min. (Io = 30 mA), VL = 2 V max. (Io = −30 mA)<br>Output current: ±30 mA | Applied voltage: 30 VDC max.<br>Sink current: 35 mA max.<br>Residual voltage: 0.4 V max.<br>(at sink current of 35 mA) |
| **Maximum response frequency** | | 83 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. (Cable length: 2 m, Output current: 30 mA) | 1 μs max.<br>(Cable length: 2 m,<br>Control output voltage: 5 V,<br>Load resistance: 1 kΩ) |
| **Starting torque** | | 10 mN·m max. at room temperature, 15 mN·m max. at low temperature | |
| **Moment of inertia** | | $3 \times 10^{-6}$ kg·m$^2$ max.; $1.5 \times 10^{-6}$ kg·m$^2$ max. at 600 P/R max. | |
| **Shaft loading** | **Radial** | 120 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/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 IP65, 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. 500 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 5 μs when the power is turned ON.

*2. Complementary Outputs
The complementary output has two output transistors (NPN and PNP) as shown at the right. 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).



## I/O Circuit Diagrams

| Output Circuits | Output mode | Connection |
|---|---|---|
| **E6F-CWZ5G**<br>  | Direction of rotation: CW (as viewed from end of shaft)<br>  <br>Note: Phase A is 1/4 T ± 1/8 T faster than phase B.<br>Direction of rotation: CCW (as viewed from end of shaft)<br>  <br>Note: Phase A is 1/4 T ± 1/8 T slower than phase B. | |
| **E6F-CWZ5C**<br>  | Direction of rotation: CW (as viewed from end of shaft)<br>  <br>Note: Phase A is 1/4 T ± 1/8 T faster than phase B.<br>Direction of rotation: CCW (as viewed from end of shaft)<br>  <br>Note: Phase A is 1/4 T ± 1/8 T slower than phase B. | |

| Color | Terminal |
|---|---|
| Brown | Power supply (+Vcc) |
| Black | Output phase A |
| White | Output phase B |
| Orange | Output phase Z |
| 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.

* 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.
- When the complementary output is used, the output will turn OFF when the load short-circuit protection circuit operates. To clear this condition, turn OFF the power supply, check the condition of the load wiring, and then turn ON the power supply again at least 0.2 s after turning it OFF.

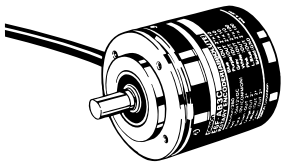
(Unit: mm)

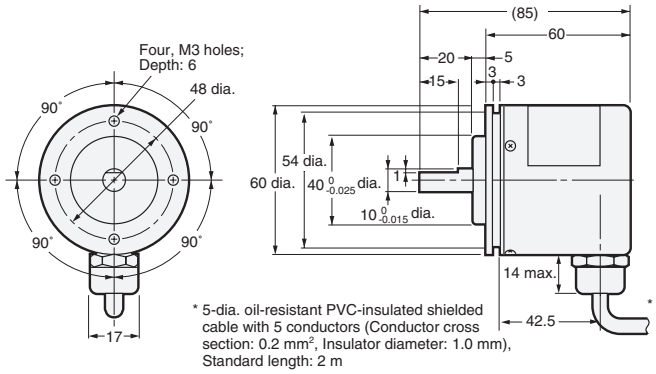
## Dimensions

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

### Encoder

**E6F-CWZ5G**

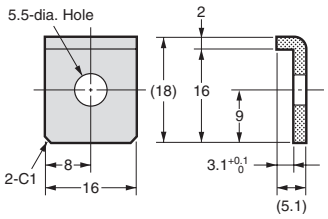




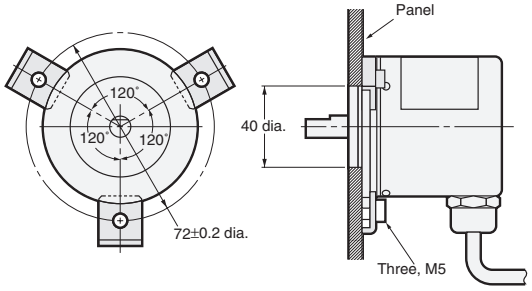

### Accessories (Order Separately)

#### Servo Mounting Bracket

**E69-2**




**Mounting Bracket Installation**




#### Couplings

**E69-C10B**
**E69-C610B**
**E69-C10M**

Refer to *Accessories* for details.

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