

# E6A2-C

## Compact Encoder (External Diameter: 25 mm)

- Models with origin output (phase Z) for positioning applications.
- Resolution of 500 ppr in an Encoder with an external diameter of only 25 mm.



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

## Ordering Information

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

| Output phases         | Power supply voltage  | Output configuration  | Resolution (pulses/rotation)   | Model   |
|-----------------------|-----------------------|-----------------------|--|---|
| Phase A               | 5 to 12 VDC           | Voltage output        | 10, 20, 60, 100, 200, 300, 360<br>500                                  | <b>E6A2-CS3E (resolution) 0.5M</b><br>Example: E6A2-CS3E 10P/R 0.5M |
|                       |                       | Open-collector output | 10, 20, 60, 100, 200, 300, 360<br>500                                  | <b>E6A2-CS3C (resolution) 0.5M</b><br>Example: E6A2-CS3C 10P/R 0.5M |
|                       | 12 to 24 VDC          |                       | Open-collector output  | 10, 20, 60, 100, 200, 300, 360<br>500                               |
|                       |                       | Phases A and B        |  | 5 to 12 VDC   |
| Open-collector output | 100, 200, 360<br>500  |                       | <b>E6A2-CW3C (resolution) 0.5M</b><br>Example: E6A2-CW3C 100P/R 0.5M   |   |
|                       | 12 to 24 VDC          |                       | Open-collector output  | 100, 200, 360<br>500  |
| Phases A, B, and Z    |                       |                       |  | 5 to 12 VDC   |
|                       | Open-collector output | 100, 200, 360<br>500  | <b>E6A2-CWZ3C (resolution) 0.5M</b><br>Example: E6A2-CWZ3C 100P/R 0.5M |   |
|                       |                       | 12 to 24 VDC          | Open-collector output  | 100, 200, 360<br>500  |

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

| Name                   | Model           | Remarks                      |
|------------------------|-----------------|------------------------------|
| Coupling               | <b>E69-C04B</b> | Provided with the product.   |
| Servo Mounting Bracket | <b>E69-1</b>    | Provided with the E6A2-CWZ□. |

Refer to *Accessories* for details.

## Ratings and Specifications

| Item                             | Model  | E6A2-CS3E   | E6A2-CS3C  | E6A2-CS5C   | E6A2-CW3E   | E6A2-CW3C  | E6A2-CW5C   | E6A2-CWZ3E  | E6A2-CWZ3C   | E6A2-CWZ5C  |
|----------------------------------|--------|---|--|---|---|--|---|---|--|---|
| Power supply voltage             |        | 5 VDC -5% to 12 V +10%, ripple (p-p): 5% max.   |  | 12 VDC -10% to 24 VDC +15%, ripple (p-p): 5% max. | 5 VDC -5% to 12 V +10%, ripple (p-p): 5% max.   |  | 12 VDC -10% to 24 VDC +15%, ripple (p-p): 5% max. | 5 VDC -5% to 12 V +10% ripple (p-p): 5% max.  |  | 12 VDC -10% to 24 VDC +15%, ripple (p-p): 5% max. |
| Current consumption*1            |        | 30 mA max.  | 20 mA max.   |   | 30 mA max.  | 20 mA max.   |   | 50 mA max.  | 30 mA max.   |   |
| Resolution (pulses/rotation)     |        | 10, 20, 60, 100, 200, 300, 360, 500   |  |   | 100, 200, 360, 500  |  |   |   |  |   |
| Output phases                    |        | Phase A   |  |   | Phases A and B  |  |   | Phases A, B, and Z  |  |   |
| Output configuration             |        | Voltage output  | Open-collector output  |   | Voltage output  | Open-collector output  |   | Voltage output  | Open-collector output  |   |
| Output capacity                  |        | Output resistance: 2 kΩ<br>Output current: 20 mA max.<br>Residual voltage: 0.4 V max.<br>(Output current: 20 mA max.) | Applied voltage: 30 VDC max.<br>Sink current: 30 mA max.<br>Residual voltage: 0.4 V max.<br>(at sink current of 30 mA) |   | Output resistance: 2 kΩ<br>Output current: 20 mA max.<br>Residual voltage: 0.4 V max.<br>(Output current: 20 mA max.) | Applied voltage: 30 VDC max.<br>Sink current: 30 mA max.<br>Residual voltage: 0.4 V max.<br>(at sink current of 30 mA) |   | Output resistance: 2 kΩ<br>Output current: 20 mA max.<br>Residual voltage: 0.4 V max.<br>(Output current: 20 mA max.) | Applied voltage: 30 VDC max.<br>Sink current: 30 mA max.<br>Residual voltage: 0.4 V max.<br>(at sink current of 30 mA) |   |
| Maximum response frequency*2     |        | 30 kHz  |  |   |   |  |   |   |  |   |
| Phase difference between outputs |        | ---   |  |   | Phase difference between phases A and B: 90°±45°  |  |   |   |  |   |
| Output duty factor               |        | 50±25%  |  |   | ---   |  |   |   |  |   |
| Rise and fall times of output    |        | 1.0 μs max.<br>(Cable length: 500 mm, Sink current: 10 mA)  | 1.0 μs max. (Cable length: 500 mm, Control output voltage: 5 V, Load resistance: 1 kΩ)                                 |   | 1.0 μs max.<br>(Cable length: 500 mm, Sink current: 10 mA)  | 1.0 μs max. (Cable length: 500 mm, Control output voltage: 5 V, Load resistance: 1 kΩ)                                 |   | 1.0 μs max.<br>(Cable length: 500 mm, Sink current: 10 mA)  | 1.0 μs max. (Cable length: 500 mm, Control output voltage: 5 V, Load resistance: 1 kΩ)                                 |   |
| Starting torque                  |        | 1 mN·m max.   |  |   |   |  |   |   |  |   |
| Moment of inertia                |        | 1 × 10 <sup>-7</sup> kg·m <sup>2</sup> max.   |  |   |   |  |   |   |  |   |
| Shaft loading                    | Radial | 10 N  |  |   |   |  |   |   |  |   |
|                                  | Thrust | 50 N  |  |   |   |  |   |   |  |   |
| Maximum permissible speed        |        | 5,000 r/min   |  |   |   |  |   |   |  |   |
| Ambient temperature range        |        | Operating: -10 to 55°C (with no icing), Storage: -25 to 80°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 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions                          |  |   |   |  |   |   |  |   |
| Shock resistance                 |        | Destruction: 500m/s <sup>2</sup> 3 times each in X, Y, and Z directions   |  |   |   |  |   |   |  |   |
| Degree of protection*3           |        | IEC 60529 IP50  |  |   |   |  |   |   |  |   |
| Connection method                |        | Pre-wired Models (Standard cable length: 500 mm)  |  |   |   |  |   |   |  |   |
| Material                         |        | Case: Aluminum alloy, Main unit: Aluminum, Shaft: SUS420J2, Mounting Bracket: Galvanized iron                         |  |   |   |  |   |   |  |   |
| Weight (packed state)            |        | Approx. 35 g  |  |   |   |  |   |   |  |   |
| Accessories                      |        | Coupling, Servo Mounting Bracket (provided with the E6A2-CWZ□), Hexagonal wrench, Instruction manual                  |  |   |   |  |   |   |  |   |

\*1. An inrush current of approximately 9 A will flow for approximately 0.3 ms when the power is turned ON.

\*2. 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 E6A2-C Rotary Encoder will not operate electrically if its speed exceeds the maximum electrical response speed.

\*3. No protection is provided against water or oil.

## I/O Circuit Diagrams

| Model                    | Output circuits  | Output mode  | Connection  |       |        |       |     |       |         |       |         |        |         |      |              |
|--------------------------|--|--|---|-------|--------|-------|-----|-------|---------|-------|---------|--------|---------|------|--------------|
| E6A2-CS3C<br>E6A2-CS5C   |  | <p>Output transistor</p>   | <table border="1"> <thead> <tr> <th>Color</th> <th>Signal</th> </tr> </thead> <tbody> <tr> <td>Brown</td> <td>Vcc</td> </tr> <tr> <td>Black</td> <td>Phase A</td> </tr> <tr> <td>White</td> <td>Phase B</td> </tr> <tr> <td>Orange</td> <td>Phase Z</td> </tr> <tr> <td>Blue</td> <td>0 V (common)</td> </tr> </tbody> </table> | Color | Signal | Brown | Vcc | Black | Phase A | White | Phase B | Orange | Phase Z | Blue | 0 V (common) |
| Color                    |  | Signal   |   |       |        |       |     |       |         |       |         |        |         |      |              |
| Brown                    |  | Vcc  |   |       |        |       |     |       |         |       |         |        |         |      |              |
| Black                    | Phase A  |  |   |       |        |       |     |       |         |       |         |        |         |      |              |
| White                    | Phase B  |  |   |       |        |       |     |       |         |       |         |        |         |      |              |
| Orange                   | Phase Z  |  |   |       |        |       |     |       |         |       |         |        |         |      |              |
| Blue                     | 0 V (common)   |  |   |       |        |       |     |       |         |       |         |        |         |      |              |
| E6A2-CW3C<br>E6A2-CW5C   | <p>Direction of rotation: CW<br/>(as viewed from end of shaft)</p> <p>Output transistor</p>  |  |   |       |        |       |     |       |         |       |         |        |         |      |              |
| E6A2-CWZ3C<br>E6A2-CWZ5C | <p>Direction of rotation: CCW<br/>(as viewed from end of shaft)</p> <p>Output transistor</p> |  |   |       |        |       |     |       |         |       |         |        |         |      |              |
| E6A2-CW3E                |  | <p>Direction of rotation: CCW<br/>(as viewed from end of shaft)</p> <p>Output transistor</p> | <p>Note: 1. The white and orange wires of Single Models (E6A2-CS□□) do not output signals (no connection).</p> <p>2. The white and orange wires of Single Models (E6A2-CS□□) do not output signals (no connection).</p> <p>3. Voltage Output Models are capable of sinking a maximum current of 20 mA.</p>                      |       |        |       |     |       |         |       |         |        |         |      |              |
| E6A2-CWZ3E               |  | <p>Output transistor</p>   |   |       |        |       |     |       |         |       |         |        |         |      |              |
| E6A2-CS3E                |  | <p>Output transistor</p>   |   |       |        |       |     |       |         |       |         |        |         |      |              |

Note: 1. \*(H) and (L) indicate the output levels of Voltage Output Models.

2. Output A leads B by  $1/4 T \pm 1/8 T$  when the shaft revolves clockwise, while A lags behind B by  $1/4 T \pm 1/8 T$  when the shaft revolves counterclockwise.

## 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

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

### E6A2-C



## Accessories (Order Separately)

**Coupling**

**Servo Mounting Bracket**

**E69-C04B**

**E69-1**

Refer to *Accessories* for details.

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