

## Rugged Rotary Encoder



- Absolute model.
- External diameter of 50 mm.
- Resolution of up to 1,024 (10-bit).
- IP65 (improved oil-proof protection with sealed bearings)
- Optimum angle control possible in combination with PLC or Cam Positioner.



Be sure to read *Safety Precautions* on page 7.

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

## Ordering Information

### Encoders [Refer to *Dimensions* on page 8.]

| Power supply voltage | Output configuration        | Output code | Resolution (pulses/rotation) | Connection method               | Model                                                                |
|----------------------|-----------------------------|-------------|------------------------------|---------------------------------|----------------------------------------------------------------------|
| 12 to 24 VDC         | Open-collector output (NPN) | Gray        | 256, 360, (720) *2           | Pre-wired Connector Model (1 m) | <b>E6C3-AG5C-C (resolution) 1M</b><br>Example: E6C3-AG5C-C 256P/R 1M |
|                      |                             |             | 256, 360, 720, 1,024         |                                 | <b>E6C3-AG5C (resolution) 1M</b><br>Example: E6C3-AG5C 256P/R 1M     |
|                      |                             | Binary      | 32, 40                       |                                 | <b>E6C3-AN5C (resolution) 1M</b><br>Example: E6C3-AN5C 32P/R 1M      |
|                      |                             | BCD         | 6, 8, 12                     |                                 | <b>E6C3-AB5C (resolution) 1M</b><br>Example: E6C3-AB5C 6P/R 1M       |
|                      | Open-collector output (PNP) | Gray        | 256, 360, 720, 1,024         | Pre-wired Model (1 m) *1        | <b>E6C3-AG5B (resolution) 1M</b><br>Example: E6C3-AG5B 256P/R 1M     |
|                      |                             | Binary      | 32, 40                       |                                 | <b>E6C3-AN5B (resolution) 1M</b><br>Example: E6C3-AN5B 32P/R 1M      |
|                      |                             | BCD         | 6, 8, 12                     |                                 | <b>E6C3-AB5B (resolution) 1M</b><br>Example: E6C3-AB5B 6P/R 1M       |
| 5 VDC                | Voltage output              | Binary      | 256                          |                                 | <b>E6C3-AN1E 256P/R 1M</b>                                           |
| 12 VDC               |                             |             |                              |                                 | <b>E6C3-AN2E 256P/R 1M</b>                                           |

\*1. Standard models are also available with 2-m cables. When ordering, specify the cable length at the end of the model number (example: E6C3-AG5C 360P/R 2M).

\*2. When connecting to the H8PS, use the E6C3-AG5C-C 256, 360, 720P/R. (Only a 2-m cable is available for the 720P/R Model.)

For the 360/720 resolutions, 2-m cables are standard in-stock.

## Accessories (Order Separately)

[Dimensions: Refer to *Accessories* on page 8 for Extension Cable dimensions and *Accessories* for the dimensions of other accessories.]

| Name                   | Model            | Remarks                                |
|------------------------|------------------|----------------------------------------|
| Couplings              | <b>E69-C08B</b>  | ---                                    |
|                        | <b>E69-C68B</b>  | Different end diameter (6 to 8 mm)     |
| Flanges                | <b>E69-FCA03</b> | ---                                    |
|                        | <b>E69-FCA04</b> | E69-2 Servo Mounting Bracket provided. |
| Servo Mounting Bracket | <b>E69-2</b>     | Provided with E69-FCA04 Flange.        |
| Extension Cable        | <b>E69-DF5</b>   | 5 m                                    |
|                        | <b>E69-DF10</b>  | 10 m                                   |
|                        | <b>E69-DF20</b>  | 20 m                                   |

Applicable to the E6C3-AG5C-C.  
Models are also available with 15-m and 98-m cables.

Refer to *Accessories* for details.

## Ratings and Specifications

| Item                           | Model                                                                                                                      | E6C3-AG5C-C                                   | E6C3-AG5C            | E6C3-AN5C        | E6C3-AB5C | E6C3-AG5B                                                                               | E6C3-AN5B        | E6C3-AB5B | E6C3-AN1E                                                                           | E6C3-AN2E                            |  |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|----------------------|------------------|-----------|-----------------------------------------------------------------------------------------|------------------|-----------|-------------------------------------------------------------------------------------|--------------------------------------|--|
| Power supply voltage           | 12 VDC −10% to 24 VDC +15%, ripple (p-p): 5% max.                                                                          |                                               |                      |                  |           |                                                                                         |                  |           | 5 VDC ±5%                                                                           | 12 VDC ±10%                          |  |
| Current consumption*1          | 70 mA max.                                                                                                                 |                                               |                      |                  |           |                                                                                         |                  |           |                                                                                     |                                      |  |
| Resolution*2 (pulses/rotation) | 256, 360, 720                                                                                                              |                                               | 256, 360, 720, 1,024 | 32, 40           | 6, 8, 12  | 256, 360, 720, 1,024                                                                    | 32, 40           | 6, 8, 12  | 256                                                                                 |                                      |  |
| Output code                    | Gray code                                                                                                                  |                                               |                      | Binary           | BCD       | Gray code                                                                               | Binary           | BCD       | Binary                                                                              |                                      |  |
| Output configuration           | NPN open-collector output                                                                                                  |                                               |                      |                  |           | PNP open-collector output                                                               |                  |           | Voltage output                                                                      |                                      |  |
| Output capacity                | Applied voltage: 30 VDC max.<br>Sink current: 35 mA max.<br>Residual voltage: 0.4 V max. (at sink current of 35 mA)        |                                               |                      |                  |           | Source current: 35 mA max.<br>Residual voltage: 0.4 V max. (at source current of 35 mA) |                  |           | Output re-<br>sistance:<br>2.4 kΩ                                                   | Output re-<br>sistance:<br>8.2 kΩ    |  |
|                                |                                                                                                                            |                                               |                      |                  |           |                                                                                         |                  |           | Sink current: 35 mA max.<br>Residual voltage: 0.4 V max. (at sink current of 35 mA) |                                      |  |
| Rise and fall times of output  | 1 μs max. (Cable length: 2 m, Sink current: 35 mA)                                                                         |                                               |                      |                  |           |                                                                                         |                  |           | Rise: 3 μs max.,<br>Fall: 1 μs max.                                                 | Rise: 10 μs max.,<br>Fall: 1 μs max. |  |
| Maximum response frequency*3   | 20 kHz                                                                                                                     |                                               |                      |                  |           |                                                                                         |                  |           | 10 kHz                                                                              |                                      |  |
| Logic                          | Negative logic (high = 0, low = 1)                                                                                         |                                               |                      |                  |           | Positive logic (high = 1, low = 0)                                                      |                  |           |                                                                                     |                                      |  |
| Direction of rotation*4        | Output code increases for CW (as viewed from end of shaft).                                                                |                                               |                      |                  |           |                                                                                         |                  |           | Switched using rotation di-<br>rection input.                                       |                                      |  |
| Strobe signal                  | None                                                                                                                       |                                               |                      | Supported        |           | None                                                                                    | Supported        |           |                                                                                     | None                                 |  |
| Positioning signal             | None                                                                                                                       |                                               |                      |                  | Supported | None                                                                                    |                  | Supported | None                                                                                |                                      |  |
| Parity signal                  | None                                                                                                                       |                                               |                      | Supported (even) | None      |                                                                                         | Supported (even) | None      |                                                                                     |                                      |  |
| Starting torque                | 10 mN·m max. at room temperature, 30 mN·m max. at low temperature                                                          |                                               |                      |                  |           |                                                                                         |                  |           |                                                                                     |                                      |  |
| Moment of inertia              | 2.3 × 10 <sup>−6</sup> kg·m <sup>2</sup>                                                                                   |                                               |                      |                  |           |                                                                                         |                  |           |                                                                                     |                                      |  |
| Shaft loading                  | Radial                                                                                                                     | 80 N                                          |                      |                  |           |                                                                                         |                  |           |                                                                                     |                                      |  |
|                                | Thrust                                                                                                                     | 50 N                                          |                      |                  |           |                                                                                         |                  |           |                                                                                     |                                      |  |
| Maximum permissible speed      | 5,000 r/min                                                                                                                |                                               |                      |                  |           |                                                                                         |                  |           |                                                                                     |                                      |  |
| 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 <sup>2</sup> or 2-mm double amplitude for 11 min 3 times each in X, Y, and Z directions |                                               |                      |                  |           |                                                                                         |                  |           |                                                                                     |                                      |  |
| Shock resistance               | 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 method              | Connector Models *6                                                                                                        | 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 6 A will flow for approximately 0.8 ms when the power is turned ON.

\*2. The code is as follows:

| Output code | Resolu-<br>tion | Code No.                    |
|-------------|-----------------|-----------------------------|
| Binary      | 32              | 1 to 32                     |
|             | 40              | 1 to 40                     |
|             | 256             | 0 to 255                    |
| BCD         | 6               | 0 to 5                      |
|             | 8               | 0 to 7                      |
|             | 12              | 0 to 11                     |
| Gray        | 256             | 0 to 255                    |
|             | 360             | 76 to 435 (gray after 76)   |
|             | 720             | 152 to 871 (gray after 152) |
|             | 1,024           | 0 to 1,023                  |

\*3. 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.

- \*4. For the E6C3-AN1E and E6C3-AN2E, the rotation direction input (wire color: pink) can be connected to high (Vcc) to increase the output code for CW rotation and connected to low (0 V) to decrease the output code for CW rotation.  
E6C3-AN1E: High = 1.5 to 5 V, Low = 0 to 0.8 V  
E6C3-AN2E: High = 2.2 to 12 V, Low = 0 to 1.2 V

Read the code 10 μs or more after the LSB (2°) of the code changes for the E6C3-AN1E or E6C3-AN2E.

- \*5. The minimum address of the absolute code is output when cut face D on the shaft and the cable connection direction are as shown in the diagram at the right (output position range: ±15°).

- \*6. Resolution of 360 or 720: Standard cable length: 2 m  
Resolution of 256: Standard cable length: 1 m

