


# E6D-C

## High-resolution Model for Measurement Instruments and High-precision Positioning

- Resolution of up to 6,000 ppr in Encoders with an external diameter of only 55 mm.
- High-speed response at 200 kHz.
- Wide ambient operating temperature range: -10 to 70°C.
- Rugged construction with radial shaft loading of 50 N and thrust shaft loading of 30 N.



 Be sure to read *Safety Precautions* on page 4.

### Ordering Information

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

| Power supply voltage | Output configuration  | Resolution (pulses/rotation) | Model                                                                 |
|----------------------|-----------------------|------------------------------|-----------------------------------------------------------------------|
| 5 VDC                | Voltage output        | 1,000                        | <b>E6D-CWZ1E (resolution) 0.5M</b><br>Example: E6D-CWZ1E 1000P/R 0.5M |
|                      |                       | 2,000                        |                                                                       |
|                      |                       | 3,600                        |                                                                       |
|                      |                       | 5,000                        |                                                                       |
|                      |                       | 6,000                        |                                                                       |
| 12 VDC               | Open-collector output | 1,000                        | <b>E6D-CWZ2C (resolution) 0.5M</b><br>Example: E6D-CWZ2C 1000P/R 0.5M |
|                      |                       | 2,000                        |                                                                       |
|                      |                       | 3,600                        |                                                                       |
|                      |                       | 5,000                        |                                                                       |
|                      |                       | 6,000                        |                                                                       |

Note: In addition to the models listed at the left, models with either voltage outputs or open-collector outputs are also available with the following resolutions (pulses/rotation): 720, 800, 1,024, 1,200, 1,500, 1,800, 2,048, 2,500, 3,000, 3,200, and 4,096.

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

| Name                   | Model            | Remarks                    |
|------------------------|------------------|----------------------------|
| Couplings              | <b>E69-C06B</b>  | Provided with the product. |
|                        | <b>E69-C68B</b>  | Different end diameter     |
|                        | <b>E69-C610B</b> | Different end diameter     |
|                        | <b>E69-C06M</b>  | Metal construction         |
| Servo Mounting Bracket | <b>E69-2</b>     | Provided with the product. |

Refer to *Accessories* for details.

## Ratings and Specifications

| Item                             | Model  | E6D-CWZ1E                                                                                                              | E6D-CWZ2C                                                                                                                                                                    |
|----------------------------------|--------|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power supply voltage             |        | 5 VDC $\pm$ 5%, ripple (p-p): 5% max.                                                                                  | 12 VDC $\pm$ 10%, ripple (p-p): 5% max.                                                                                                                                      |
| Current consumption*1            |        | 150 mA max.                                                                                                            |                                                                                                                                                                              |
| Resolution (pulses/rotation)     |        | 1,000, 2,000, 3,600, 5,000, 6,000                                                                                      |                                                                                                                                                                              |
| Output phases                    |        | Phases A, B, and Z                                                                                                     |                                                                                                                                                                              |
| Output configuration             |        | Voltage output                                                                                                         | Open-collector output                                                                                                                                                        |
| Output capacity                  |        | Output resistance: 1 k $\Omega$<br>Sink current: 35 mA max.<br>Residual voltage: 0.7 V max. (at sink current of 10 mA) | Applied voltage: 30 VDC max.<br>Sink current: 35 mA max.<br>Residual voltage: 1 V max. (at sink current of 35 mA)<br>Residual voltage: 0.7 V max. (at sink current of 10 mA) |
| Maximum response frequency*2     |        | 200 kHz                                                                                                                |                                                                                                                                                                              |
| Phase difference between outputs |        | 90 $^{\circ}$ $\pm$ 25 $^{\circ}$ between A and B (1/4 T $\pm$ 0.07 T)                                                 |                                                                                                                                                                              |
| Rise and fall times of output    |        | 1 $\mu$ s max.                                                                                                         |                                                                                                                                                                              |
| Starting torque                  |        | 9.8 mN·m max.                                                                                                          |                                                                                                                                                                              |
| Moment of inertia                |        | 3 $\times$ 10 <sup>-6</sup> kg·m <sup>2</sup> max.                                                                     |                                                                                                                                                                              |
| Shaft loading                    | Radial | 50 N (20 N to maintain accuracy)                                                                                       |                                                                                                                                                                              |
|                                  | Thrust | 30 N (10 N to maintain accuracy)                                                                                       |                                                                                                                                                                              |
| Maximum permissible speed        |        | 12,000 r/min                                                                                                           |                                                                                                                                                                              |
| Ambient temperature range        |        | Operating: -10 to 70 $^{\circ}$ C (with no icing), Storage: -25 to 80 $^{\circ}$ C (with no icing)                     |                                                                                                                                                                              |
| Ambient humidity range           |        | Operating/Storage: 35% to 85% (with no condensation)                                                                   |                                                                                                                                                                              |
| Insulation resistance            |        | Excluded because of capacitor ground.                                                                                  |                                                                                                                                                                              |
| Dielectric strength              |        | Excluded because of capacitor ground.                                                                                  |                                                                                                                                                                              |
| 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: 500 m/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: 0.5 m)                                                                        |                                                                                                                                                                              |
| Material                         |        | Case: Zinc alloy, Main unit: Aluminum, Shaft: SUS303, Mounting Bracket: Galvanized iron                                |                                                                                                                                                                              |
| Weight (packed state)            |        | Approx. 280 g                                                                                                          |                                                                                                                                                                              |
| Accessories                      |        | E69-C06B Coupling, E69-2 Servo Mounting Bracket, Hexagonal wrench, Instruction manual                                  |                                                                                                                                                                              |

\*1. An inrush current of approximately 2 A will flow for approximately 50  $\mu$ s 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 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

| Item Model           | E6D-CWZ1E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | E6D-CWZ2C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------|-----------|-----------|-------|--|-------------------|--------------------|-------|--|----------------|--|-------|--|----------------|--|--------|--|----------------|--|------|--|--------------|--|--------|--|-----|--|
| Output configuration | Voltage output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Open-collector output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Output Circuits      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Output mode          | <p>Direction of rotation: CW (as viewed from end of shaft)</p> <p>Note: Phase A is <math>1/4 T \pm 7/100 T</math> faster than phase B. Phase Z is synced with phase A.</p> <p>Direction of rotation: CCW (as viewed from end of shaft)</p> <p>Note: Phase A is <math>1/4 T \pm 7/100 T</math> slower than phase B. Phase Z is synced with phase A.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>Direction of rotation: CW (as viewed from end of shaft)</p> <p>Note: Phase A is <math>1/4 T \pm 7/100 T</math> faster than phase B. Phase Z is synced with phase A. The ONs in the above timing chart mean that the output transistor is ON and the OFFs mean that the output transistor is OFF.</p> <p>Direction of rotation: CCW (as viewed from end of shaft)</p> <p>Note: Phase A is <math>1/4 T \pm 7/100 T</math> slower than phase B. Phase Z is synced with phase A. The ONs in the above timing chart mean that the output transistor is ON and the OFFs mean that the output transistor is OFF.</p> |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Connection           | <p><b>Wiring</b></p> <table border="1"> <thead> <tr> <th>Color</th> <th>Model</th> <th>E6D-CWZ1E</th> <th>E6D-CWZ2C</th> </tr> </thead> <tbody> <tr> <td>Brown</td> <td></td> <td>Power supply +5 V</td> <td>Power supply +12 V</td> </tr> <tr> <td>Black</td> <td></td> <td>Phase A output</td> <td></td> </tr> <tr> <td>White</td> <td></td> <td>Phase B output</td> <td></td> </tr> <tr> <td>Orange</td> <td></td> <td>Phase Z output</td> <td></td> </tr> <tr> <td>Blue</td> <td></td> <td>0 V (common)</td> <td></td> </tr> <tr> <td>Shield</td> <td></td> <td>GND</td> <td></td> </tr> </tbody> </table> <p>Note: 1. The shielded cable outer core (shield) is not connected to the inner area or to the case.<br/>                 2. The phase A, phase B, and phase Z circuits are all identical.<br/>                 3. Normally, connect GND externally to 0 V or to ground.</p> <p><b>Peripheral Device Precautions</b><br/>                 (1) When connecting to a counter, use the 12-VDC Model E6D-CWZ2C.<br/>                 (2) For counters with voltage inputs, insert pull-up resistance of 4.7 Ω and 1/4 W.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Color              | Model | E6D-CWZ1E | E6D-CWZ2C | Brown |  | Power supply +5 V | Power supply +12 V | Black |  | Phase A output |  | White |  | Phase B output |  | Orange |  | Phase Z output |  | Blue |  | 0 V (common) |  | Shield |  | GND |  |
| Color                | Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | E6D-CWZ1E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | E6D-CWZ2C          |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Brown                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Power supply +5 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Power supply +12 V |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Black                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Phase A output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| White                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Phase B output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Orange               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Phase Z output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Blue                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0 V (common)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |
| Shield               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | GND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |       |           |           |       |  |                   |                    |       |  |                |  |       |  |                |  |        |  |                |  |      |  |              |  |        |  |     |  |

## 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.

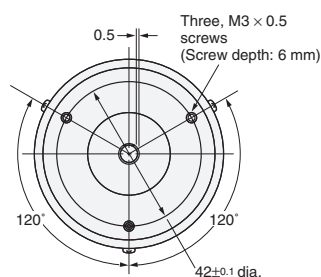
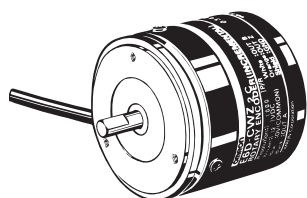
(Unit: mm)

## Dimensions

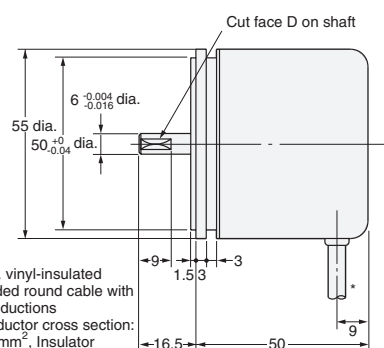
Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

### Encoder

#### E6D



An E69-C06B Coupling and E69-2 Servo Mounting Bracket are provided with the product.



\*5-dia. vinyl-insulated shielded round cable with 5 conductors  
(Conductor cross section: 0.18 mm<sup>2</sup>, Insulator diameter: 1.1 mm),  
Standard length: 500 mm

## Accessories (Order Separately)

Refer to *Accessories* for details.

## Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

## Warranty and Limitations of Liability

### WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

### LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

## Application Considerations

### SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

### PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

## Disclaimers

### CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

### DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

### PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

### ERRORS AND OMISSIONS

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

2008.11

In the interest of product improvement, specifications are subject to change without notice.

**OMRON Corporation**  
Industrial Automation Company

<http://www.ia.omron.com/>

(c)Copyright OMRON Corporation 2008 All Right Reserved.

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А