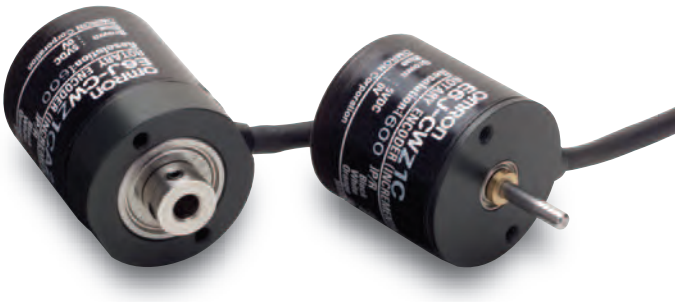
Ultracompact 20-mm-dia. Incremental Rotary Encoder

E6J-C

CSM_E6J-C_DS_E_4_1

Ultracompact Rotary Encoder with External Diameter of 20 mm

- Incremental model
- External diameter of 20 mm.
- Resolution of up to 1,000 ppr.
- Both Solid-shaft Models and Hollow-shaft Models are available.



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)	Shaft	Model
5 VDC	NPN open-collector output	100, 200, 360, 600	Shaft model	**E6J-CWZ1C (resolution) 1M** Example: E6J-CWZ1C 100P/R 1M
		1000		
	Voltage output	100, 200, 360, 600	Shaft model	**E6J-CWZ1E (resolution) 1M** Example: E6J-CWZ1E 100P/R 1M
		1000		
	Voltage output	360, 600	Hollow shaft	**E6J-CWZ1EA2 (resolution) 1M** Example: E6J-CWZ1EA2 360P/R 1M
		1000		

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

Name	Model	Remarks
Coupling	**E69-C02B**	Included in the shaft model.

Refer to *Accessories* for details.

Ratings and Specifications

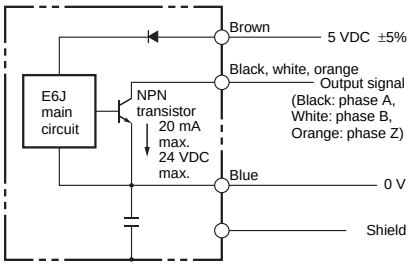
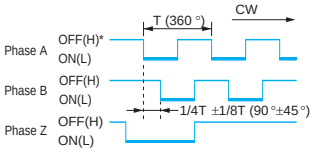
Item	Model	E6J-CWZ1C	E6J-CWZ1E	E6J-CWZ1EA2
Shaft		Shaft Shaft dia. 2 mm, Length 10 mm		Hollow shaft Hollow shaft dia. 2 mm, Depth 10 mm
Rated voltage		5 VDC ±5%		
Current consumption*1		40 mA max.		
Resolution (pulses/rotation)		100, 200, 360, 600, 1000		360, 600, 1000
Output phases		Phases A, B, and Z		
Output configuration		NPN open-collector output	Voltage output (NPN)	
Output capacity		Applied voltage: 24 VDC max. Load current: 20 mA max. Residual voltage: 0.5 V max. (at load current of 20 mA)	Output resistance: 2.2 kΩ Load current: 20 mA max. Residual voltage: 0.5 V max. (at load current of 20 mA)	
Rise and fall times of output		2 μs max. (Cable length: 1 m, Load current: 20 mA)		
Maximum response frequency*2		100 kHz (50 kHz when using phase Z reset)		
Phase difference between outputs		90°±45° between A and B		
Direction of rotation		Phase A precedes in CW (as viewed from end of shaft).		
Starting torque		1 mN·m max.		
Moment of inertia	**100P/R**	0.034×10^{-7} kg·m^2		---
	200P/R min.	0.045×10^{-7} kg·m^2		0.351×10^{-7} kg·m^2
Shaft loading	**Radial**	1.9 N		
	Thrust	1.9 N		
Maximum permissible speed		6,000 r/min		
Protective circuits		Power supply reverse polarity protection		
Ambient temperature range		Operating: –10 to 70°C (with no icing and condensation), Storage: –20 to 80°C (with no icing and condensation)		
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^2 3 times each in X, Y and Z directions		
Degree of protection		IEC 60529 IP40		
Connection method		Pre-wired Models (Standard cable length: 1 m)		
Material	**Case**	Aluminum		
	Encoder	Aluminum		
	Shaft	SUS404		SUS304
Weight (packed state)		Approx. 40 g		
Accessories		Instruction manual, Coupling, L-shaped wrench (M0.9)		Instruction manual, L-shaped wrench (M0.9)

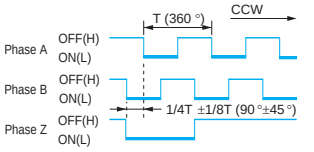
*1. An inrush current of approximately 3 A will flow for approximately 10 μs when the power is turned ON.
*2. The maximum electrical response speed is determined by the resolution and maximum response frequency as follows:

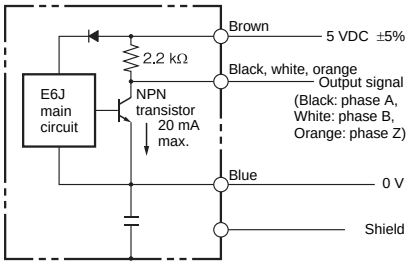
$$\text{Maximum electrical response speed (rpm)} = \frac{\text{Maximum response frequency}}{\text{Resolution}} \times 60$$

This means that the E6J-C Rotary Encoder will not operate electrically if its speed exceeds the maximum electrical response speed.

I/O Circuit Diagrams

<table>
<tr><th>Model</th><th>Output circuit</th><th>Output mode</th><th>Connection</th></tr>
<tr>
<td>E6J-CWZ1C</td>
<td> 
</td>
<td rowspan="2">Direction of rotation: CW
(as viewed from end of shaft)
 

Direction of rotation: CCW
(as viewed from end of shaft)
 

*(H) and (L) indicate the output levels of Voltage Output Models.</td>
<td rowspan="2"><table>
<tr><th>Color</th><th>Terminal</th></tr>
<tr><td>Brown</td><td>5 VDC ±5%</td></tr>
<tr><td>Blue</td><td>0 V (common)</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>
</table></td>
</tr>
<tr>
<td>E6J-CWZ1E
E6J-CWZ1EA2</td>
<td> 
</td>
</tr>
</table>

Note: 1. The shielded cable outer core (shield) is not connected to the inner area or to the case.
2. The capacitor (0.1μF, 100 V) is connected between 0 V and FG (frame ground) of a circuit.
3. Normally, connect shield 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 Safe Use

Installation Environment

- Do not use in an environment where combustible or explosive gas is present.
- Do not keep or use in an environment where the E6J-C is exposed to water, oil, chemicals, steam or dust. The E6J-C is damaged or burned out due to an internal circuit disconnection or short.
- To ensure safe operation and maintenance of the product, install it away from high-voltage devices and power devices.

Power Supply and Wiring

- Never apply the voltage and AC power that exceed the rated voltage (5 VDC ±5%). This may damage or burn out the product.
- Do not make the wiring while it is supplying power. This may damage the product or cause an electric shock.
- Do not short the load. This may damage or burn out the product.

Others

- Do not attempt to disassemble, repair, or modify the product.
- When disposing of the product, treat it as industrial waste.

Precautions for Correct Use

Do not use the product in atmospheres or environments that exceed product ratings.

Mounting

- The Rotary Encoder is composed of high-precision parts. Dropping the Rotary Encoder may damage some of its functions. Care should be taken when handling.
- When securing this product with screws, do not exceed 0.15 N·m for tightening torque.
- If wiring after securing the Encoder, do not pull on the cable with a force exceeding 12 N. Also, do not apply shock to the Encoder or shaft (hollow shaft).
- When a mounting error (eccentricity, declination) is wide, excessive load is applied (as 1.9 N both for shaft loading radial and thrust), and the E6J-C is damaged and the life of that will be extremely shorten.

Mounting of Hollow Shaft

- The diameter of the mating shaft must be $2^{-0.004}_{-0.012}$ mm, and the insert length must be 4 to 9.5 mm.
- Prepare leaf spring of flanges not to apply the load that exceeds a shaft permissible load.
- Use the Allen set screw provided with the hollow shaft to secure the shaft. Use a tightening torque of 0.15 N·m and apply screw lock glue to the screw to prevent it from becoming loose.

Wiring

- If a surge occurs in the power supply used, connect a surge absorber between power supplies and suppress the surge. To avoid a noise or other errors, shorten the wiring for the encoder as much as possible.
- When the length of the rotary encoder cable is extended, check the cable type and response frequency. There is a tendency that the residual voltage increases or a waved distortion occurs, due to changes in the cable resistance and the capacity between cables.
- Do not lay the cables in parallel with high-voltage lines or power lines. Doing so may result in damage or malfunction due to induction interference.

● Connection

Spurious pulses may be generated when power is turned ON and OFF. Wait at least 0.1 s after turning ON the power to the Encoder before using the connected device, and stop using the connected device at least 0.1 s before turning OFF the power to the Encoder. Also, turn ON the power to the load only after turning ON the power to the Encoder.

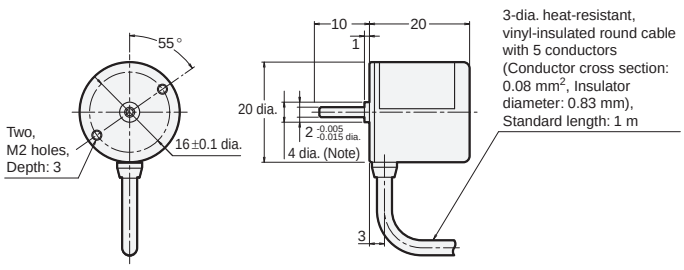
(Unit: mm)

Dimensions

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

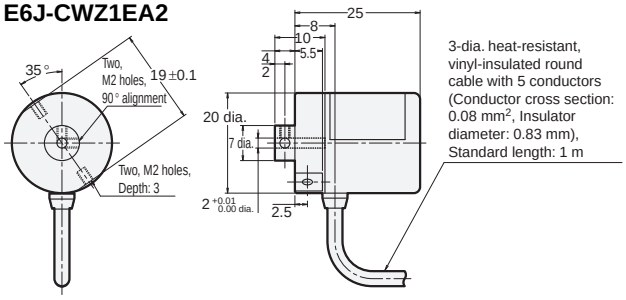
Encoder

E6J-CWZ1□



Note: The protrusion is a part of the shaft.

E6J-CWZ1EA2



Accessories (Order Separately)

Coupling

E69-C02B

Refer to *Accessories* for details.

Terms and Conditions Agreement

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.

Warranties.
(a) Exclusive Warranty. Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.
(b) Limitations. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE
PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE.
Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) Buyer Remedy. Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses 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. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty.
See http://www.omron.com/global/ or contact your Omron representative for published information.

Limitation on Liability; Etc.
OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.
Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

Suitability of Use.
Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.
NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Programmable Products.
Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

Performance Data.
Data presented in Omron Company websites, catalogs and other materials 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 user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.

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 part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions.
Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

2015.7

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

OMRON Corporation
Industrial Automation Company

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