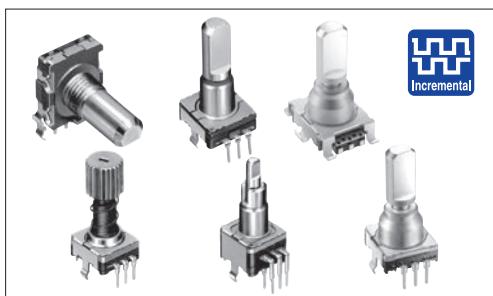


EC11

## 11mm Size Metal Shaft Type



Compact and highly reliable type available in many varieties.



## ■ Typical Specifications

| Items                              | Specifications   |
|------------------------------------|--|
| <b>Output signal</b>               | Two phase of A, B<br>Three phase of A, B and C (EC11EH)<br>Self-return switch (EC11 / EC11E0B) |
| <b>Rating</b>                      | 10mA 5V DC   |
| <b>Operating life</b>              | 15,000 cycles<br>30,000 cycles (EC11EH)<br>100,000 cycles (EC11K / EC11J)                      |
| <b>Operating temperature range</b> | − 40°C to + 85°C   |

## ■ Product Line

| Structure         | Shaft configuration | Length of the shaft ( $L_1$ ) (mm) | Torque (mN·m)                   | Number of detent                | Number of pulse | Push-on switch | Travel of push-on switch (mm) | Operating life (cycles) | Minimum order unit (pcs.) |        | Product No.  | Drawing No. |  |  |  |  |  |  |  |
|-------------------|---------------------|------------------------------------|---------------------------------|---------------------------------|-----------------|----------------|-------------------------------|-------------------------|---------------------------|--------|--------------|-------------|--|--|--|--|--|--|--|
|                   |                     |                                    |                                 |                                 |                 |                |                               |                         | Japan                     | Export |              |             |  |  |  |  |  |  |  |
| Horizontal        |                     | 20                                 | 12 ± 7                          | 30                              | 15              | Without        | —                             | 15,000                  | 700                       | 1,400  | EC11B15202AA | 1           |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 |                                 |                 |                | 0.5                           |                         |                           |        | EC11B15242AE | 2           |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 |                                 |                 |                | 1.5                           |                         |                           |        | EC11B15242AF | 3           |  |  |  |  |  |  |  |
|                   |                     |                                    | 10 ± 7                          | 18                              | 9               | Without        | —                             |                         | 1,200                     | 2,400  | EC11E09204A4 | 4           |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 30                              | 15              |                |                               |                         |                           |        | EC11E15204A3 |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 7 <sup>+3</sup> / <sub>-4</sub> | Without         |                |                               |                         |                           |        | EC11E1530401 |             |  |  |  |  |  |  |  |
| Vertical          |                     | 20                                 | 10 ± 7                          | 36                              | 18              | With           | 0.5                           |                         |                           |        | EC11E1820402 | 5           |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 7 <sup>+3</sup> / <sub>-4</sub> | Without         |                |                               |                         |                           |        | EC11E1830401 |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 18                              | 9               |                |                               |                         |                           |        | EC11E09244BS |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 30                              | 15              |                |                               |                         |                           |        | EC11E15244G1 |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 7 <sup>+3</sup> / <sub>-4</sub> | Without         |                |                               |                         |                           |        | EC11E153440D |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 10 ± 7                          | 36              |                | 1.5                           |                         |                           |        | EC11E18244AU |             |  |  |  |  |  |  |  |
|                   |                     |                                    | 7 <sup>+3</sup> / <sub>-4</sub> | Without                         | 18              | With           |                               |                         |                           |        | EC11E183440C |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 18                              | 9               |                |                               |                         |                           |        | EC11E09244AQ |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 30                              | 15              |                |                               |                         |                           |        | EC11E15244B2 |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 7 <sup>+3</sup> / <sub>-4</sub> | Without         |                |                               |                         |                           |        | EC11E1534408 |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 10 ± 7                          | 36              |                |                               |                         |                           |        | EC11E18244A5 |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 7 <sup>+3</sup> / <sub>-4</sub> | Without         |                |                               |                         |                           |        | EC11E1834403 |             |  |  |  |  |  |  |  |
| Less shaft wobble | Serrated            | 25                                 | 12 ± 7                          | 30                              | 15              | Without        | —                             | 100,000                 | 1,000                     | 2,000  | EC11G1560414 | 6           |  |  |  |  |  |  |  |
|                   |                     |                                    | 8.5 ± 5                         | Without                         |                 | With           | 1.5                           |                         |                           |        | EC11G1574402 | 7           |  |  |  |  |  |  |  |
|                   |                     |                                    | 12 ± 7                          | 30                              |                 | With           | 1.5                           |                         |                           |        | EC11G1564411 | 8           |  |  |  |  |  |  |  |
| Vertical          | Flat                | 20                                 | 12 ± 5                          | 18                              | 9               | Without        | —                             |                         | 1,000                     | 2,000  | EC11K0920401 | 9           |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 30                              | 15              |                |                               |                         |                           |        | EC11K1520401 |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 18                              | 9               | With           | 0.5                           |                         |                           |        | EC11K0924401 |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 30                              | 15              |                |                               |                         |                           |        | EC11K1524402 | 10          |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 18                              | 9               |                |                               |                         |                           |        | EC11K0925401 |             |  |  |  |  |  |  |  |
|                   |                     |                                    |                                 | 30                              | 15              |                |                               |                         |                           |        | EC11K1525401 |             |  |  |  |  |  |  |  |

## Note

Other varieties are also available. Please inquire.

Refer to P.167 for product specifications.

Refer to P.167 for attached parts.

Refer to P.168 for product varieties.

Refer to P.193 for soldering conditions.

Detector

Slide

Push

Rotary

Encoders

Power

Dual-in-line  
Package Type

TACT Switch™

Metal  
ShaftInsulated  
ShaftHollow  
ShaftRing  
Type

# EC11 11mm Size Metal Shaft Type

## ■ Product Line

| Detector        | Structure  | Shaft configuration  | Length of the shaft (L <sub>1</sub> , L <sub>2</sub> ) (mm) | Torque (mN·m) | Number of detent | Number of pulse    | Push-on switch | Travel of push-on switch (mm) | Operating life (cycles) | Minimum order unit (pcs.) |              | Product No.  | Drawing No. |  |  |  |
|-----------------|------------|--|---|---------------|------------------|--------------------|----------------|-------------------------------|-------------------------|---------------------------|--------------|--------------|-------------|--|--|--|
|                 |            |  |   |               |                  |                    |                |                               |                         | Japan                     | Export       |              |             |  |  |  |
| Slide           | Reflow     | Flat   | 20  | 12 ± 5        | 18               | 9                  | Without        | —                             | 100,000                 | 300                       | 600          | EC11J0920404 | 11          |  |  |  |
|                 |            |  |   |               | 30               | 15                 |                |                               |                         |                           |              | EC11J152040F |             |  |  |  |
|                 |            |  |   |               | 18               | 9                  | With           | 0.5                           |                         |                           |              | EC11J0924411 | 12          |  |  |  |
|                 |            |  |   |               | 30               | 15                 |                |                               |                         |                           |              | EC11J1524413 |             |  |  |  |
|                 |            |  |   |               | 18               | 9                  |                | 1.5                           |                         |                           |              | EC11J0925403 | 12          |  |  |  |
|                 |            |  |   |               | —                | —                  |                |                               |                         |                           |              | EC11J1525402 |             |  |  |  |
| Push            | Push lock  | 20-tooth Serrated  | 25  | 10 ± 7        | 30               | 15                 | Without        | —                             | 800                     | 1,600                     | EC11E152T409 | 13           |             |  |  |  |
|                 |            |  |   |               |                  |                    | With           | 8                             |                         |                           |              | EC11E152U402 |             |  |  |  |
|                 |            |  |   |               |                  |                    | Without        | —                             |                         |                           |              | EC1110120005 | 15          |  |  |  |
|                 |            |  |   |               |                  |                    | With           | 0.5                           | 15,000                  | 2,400                     | EC111012010H | 16           |             |  |  |  |
|                 |            |  |   |               |                  |                    | With           | 1.5                           |                         |                           |              | EC1110120201 |             |  |  |  |
|                 |            |  |   |               |                  |                    | With           | 0.5                           |                         |                           |              | EC11EH124403 | 17          |  |  |  |
| Rotary          | ABC switch | Flat   | 20  | 10 ± 7        | 30               | 18                 | ABC switch     | 0.5                           | 30,000                  | 1,200                     | EC11EH224403 | 17           |             |  |  |  |
|                 |            |  |   |               |                  |                    |                |                               |                         |                           |              | EC11EH124404 |             |  |  |  |
|                 |            |  |   |               |                  |                    |                |                               |                         |                           |              | EC11EH224404 |             |  |  |  |
|                 |            |  |   |               |                  |                    |                |                               |                         |                           |              | EC11EBB24C03 | 18          |  |  |  |
|                 |            |  |   |               |                  |                    |                |                               |                         |                           |              | EC11E0B2LB01 | 19          |  |  |  |
|                 |            |  |   |               |                  |                    |                |                               |                         |                           |              | —            |             |  |  |  |
| Metal Shaft     | Dual-shaft | Inner-shaft=25<br>Outer-shaft=15<br>Inner-shaft=25<br>Outer-shaft=15 | 3 to 30   | Without       | 15               | Self-return switch | Without        | —                             | 15,000                  | 700                       | 1,400        | —            | 18          |  |  |  |
| Insulated Shaft |            |  |   |               |                  |                    |                |                               |                         |                           |              | —            |             |  |  |  |
| Hollow Shaft    |            |  |   |               |                  |                    |                |                               |                         |                           |              | —            |             |  |  |  |
| Ring Type       |            |  |   |               |                  |                    |                |                               |                         |                           |              | —            |             |  |  |  |

## Note

Other varieties are also available. Please inquire.

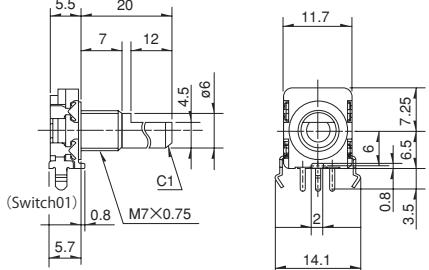
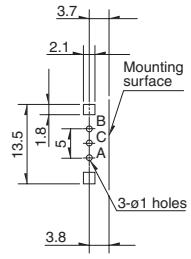
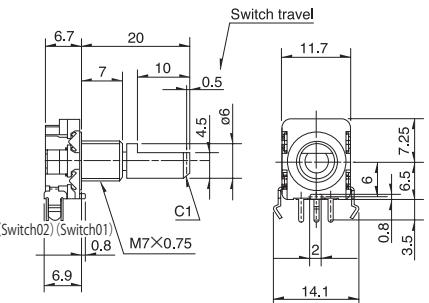
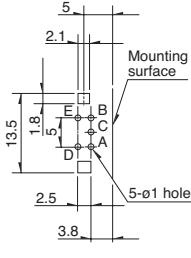
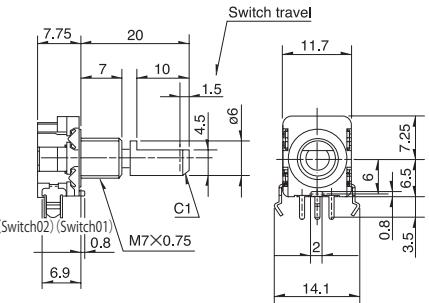
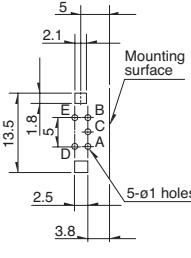
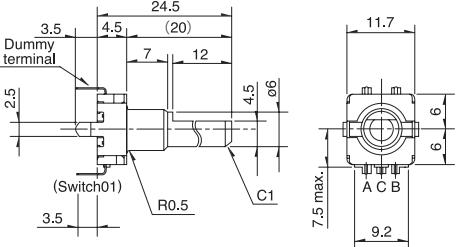
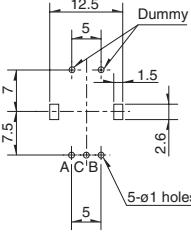
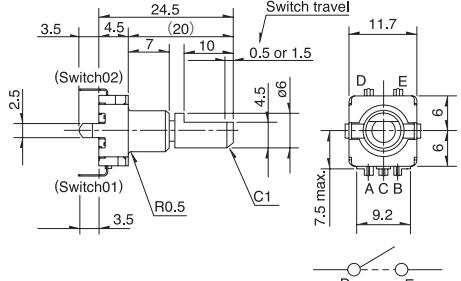
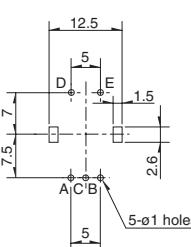
## ■ Packing Specifications

### Tray

| Product No.                | Number of packages (pcs.) |                         | Export package measurements (mm) |
|----------------------------|---------------------------|-------------------------|----------------------------------|
|                            | 1 case / Japan            | 1 case / export packing |                                  |
| EC11B                      | 700                       | 1,400                   | 370 × 520 × 201                  |
| EC11E09 / 15 / 18 / EC11EH | 1,200                     | 2,400                   | 540 × 360 × 250                  |
| EC11G / EC11K              | 1,000                     | 2,000                   | 540 × 360 × 250                  |
| EC11J                      | 300                       | 600                     | 369 × 283 × 263                  |
| EC11E152T / U              | 800                       | 1,600                   | 363 × 507 × 230                  |
| EC11I                      | 1,200                     | 2,400                   | 363 × 507 × 216                  |
| EC11E0B / BB               | 700                       | 1,400                   | 363 × 507 × 216                  |

**Dimensions**

Unit:mm

| No. | Photo  | Style  | PC board mounting hole dimensions<br>(Viewed from mounting side)                      |
|-----|--|--|---|
| 1   | EC11B<br>Horizontal  |    |    |
| 2   | EC11B<br>Horizontal<br>with push-on switch<br>(travel 0.5mm)     |   |   |
| 3   | EC11B<br>Horizontal<br>with push-on switch<br>(travel 1.5mm)     |  |  |
| 4   | EC11E<br>Vertical  |  |  |
| 5   | EC11E<br>Vertical<br>with push-on switch<br>(travel 0.5 / 1.5mm) |  |  |

- Detector
- Slide
- Push
- Rotary
- Encoders
- Power
- Dual-in-line Package Type
- TACT Switch™
- Metal Shaft
- Insulated Shaft
- Hollow Shaft
- Ring Type

Unit:mm

**Dimensions**

|                              |
|------------------------------|
| Detector                     |
| Slide                        |
| Push                         |
| Rotary                       |
| Encoders                     |
| Power                        |
| Dual-in-line<br>Package Type |
| TACT Switch™                 |
| Metal<br>Shaft               |
| Insulated<br>Shaft           |
| Hollow<br>Shaft              |
| Ring<br>Type                 |

| No. | Photo  | Style   | PC board mounting hole dimensions<br>(Viewed from mounting side) |
|-----|--|---|--|
| 6   | EC11G  |   |  |
| 7   | EC11G<br>with push-on switch<br>(travel 1.5mm)                     |   |  |
| 8   | EC11G<br>with push-on switch<br>(travel 1.5mm)                     |   |  |
| 9   | EC11K<br>Vertical  | <p>Black part : Do not solder and no wiring for electrical contact.</p> |  |
| 10  | EC11K<br>Vertical<br>with push-on switch<br>(travel 0.5mm / 1.5mm) | <p>Black part : Do not solder and no wiring for electrical contact.</p> |  |

## Dimensions

Unit:mm

| No. | Photo   | Style   | PC board mounting hole dimensions<br>(Viewed from mounting side)  |
|-----|---|---|---|
| 11  | EC11J<br>Reflow   | <p>Mounting surface (Dummy terminal) 24.5 (20)<br/> (Switch01) 1.45 1.95 4.5 10 7 4.45 0.5 0.975 C1 C1<br/> A slant line part: The solder land<br/> Black part: Do not solder and wiring for electrical contact</p> | <p>EC11J09 Type only<br/> 13 12.5 7.5 6.3 1.3 1.8 1.5 2.4 5.05<br/> 2-R0.65 ø2.1Hole 1.9 1.8 1.5 2.4 5.05<br/> 19 12.6 10 5.5 4 1.6 1.9 4.5 8.5<br/> 5-1.3 1.6 1.9 4.5 8.5<br/> 2-R0.8 16.5 9 16.5<br/> EC11J15 Type only</p> |
| 12  | EC11J<br>with push-on switch<br>(travel 0.5mm / 1.5mm)    | <p>Mounting surface (Switch02) 24.5 (20)<br/> (Switch01) 1.45 1.95 4.5 10 7 4.45 0.5 0.975 C1 C1<br/> Switch travel 0.5 or 1.5</p>  | <p>EC11J09 Type only<br/> 13 12.5 7.5 6.3 1.3 1.8 1.5 2.4 5.05<br/> 2-R0.65 ø2.1Hole 1.9 1.8 1.5 2.4 5.05<br/> 19 12.6 10 5.5 4 1.6 1.9 4.5 8.5<br/> 5-1.3 1.6 1.9 4.5 8.5<br/> 2-R0.8 16.5 9 16.5<br/> EC11J15 Type only</p> |
| 13  | EC11E152T<br>Push-lock mechanism                          | <p>Dummy terminal 3.5 25 Total travel<br/> (Switch01) 2.5 5.1 9 8 11.7<br/> 20 teeth Serrated 20 teeth Serrated<br/> 8±0.1 0.1 90° 15° 99.0 0.05 98.0 0.05<br/> Lock travel 7.5 max</p>                             | <p>12.5<br/> ø5.4 hole 1.5<br/> 7 5<br/> 2.6<br/> A/C'B 5-ø1 holes</p>  |
| 14  | EC11E152U<br>Push-lock mechanism<br>with push-lock switch | <p>Dummy terminal 3.5 26.4 Total travel<br/> (Switch02) 2.5 6.5 9 8 11.7<br/> (Switch01) 3.5 20 teeth Serrated 20 teeth Serrated<br/> 8±0.1 0.1 90° 15° 99.0 0.05 98.0 0.05<br/> Lock travel 7.5 max</p>            | <p>12.5<br/> 7 5<br/> 2.6<br/> A/C'B 5-ø1 holes</p>   |
| 15  | EC11<br>Self-return switch                                | <p>Dummy terminal 3.5 5 20 (15) 7 7 4.5 0.5 C1<br/> (Switch01) 3.5 7.5 max 11.7 6 7<br/> A/C'B 9.2</p>  | <p>12.5<br/> 7 5<br/> 2.6<br/> A/C'B 5-ø1 holes</p>   |

- Detector
- Slide
- Push
- Rotary
- Encoders
- Power
- Dual-in-line Package Type
- TACT Switch™
- Metal Shaft
- Insulated Shaft
- Hollow Shaft
- Ring Type

# EC11 11mm Size Metal Shaft Type

| Dimensions                   |     |  |         |
|------------------------------|-----|--|---------|
|                              | No. | Photo  | Style   |
| Detector                     | 16  | EC11<br>Self-return switch<br>with push-on switch<br>(travel 0.5mm / 1.5mm)  |         |
| Slide                        | 17  | EC11EH<br>ABC switch<br>with push-on switch<br>(travel 0.5mm / 1.5mm)  |         |
| Push                         | 18  | EC11E<br>Dual-shaft type<br>with push-on switch<br>(travel 0.5mm)<br>Inner shaft: encoder<br>Outer shaft: encoder            |         |
| Rotary                       | 19  | EC11E<br>Dual-shaft type<br>with push-on switch<br>(travel 1.5mm)<br>Inner shaft: encoder<br>Outer shaft: self-return switch |         |
| Encoders                     |     |  | Unit:mm |
| Power                        |     |  |         |
| Dual-in-line<br>Package Type |     |  |         |
| TACT Switch™                 |     |  |         |
| Metal<br>Shaft               |     |  |         |
| Insulated<br>Shaft           |     |  |         |
| Hollow<br>Shaft              |     |  |         |
| Ring<br>Type                 |     |  |         |

# 11mm Size Metal Shaft Encoders / Product Specifications

Detector  
Slide  
Push  
Rotary  
Encoders

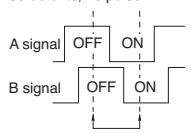
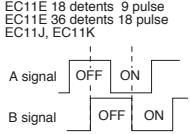
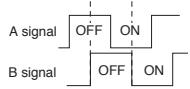
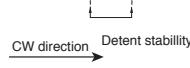
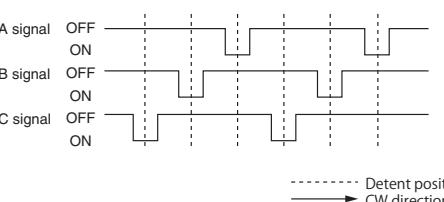
Power

Dual-in-line  
Package Type

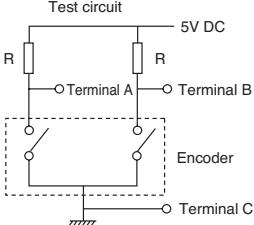
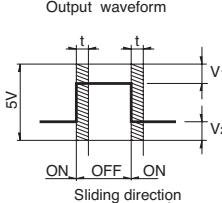
TACT Switch™

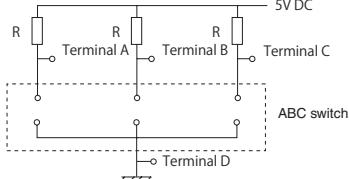
Metal  
Shaft  
Insulated  
Shaft  
Hollow  
Shaft  
Ring  
Type

## Output Wave

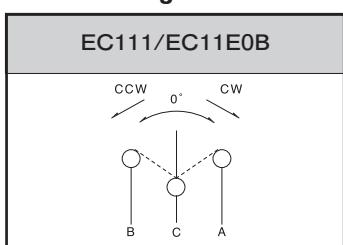
| EC11B / EC11E / EC11G  | EC11E / EC11J / EC11K   | EC11EH  |
|--|---|---|
| EC11B, EC11E, EC11G<br>30 detents, 15 pulse<br><br><br>Detent stability position<br>CW direction → | Detent stability position cannot be specified for B signal.<br>EC11E 18 detents 9 pulse<br>EC11E 36 detents 18 pulse<br>EC11J, EC11K<br><br><br>Detent stability position<br>CW direction → | <br>A signal OFF ON<br>B signal OFF ON<br>C signal OFF ON<br>Detent position CW direction → |

## Sliding Noise

| Test circuit  |  | Output waveform  | Detailed dimensions  |
|---|--|--|--|
|  |  | <br>Measurement condition : Rotation speed 360°/s      t : Masking time to avoid chattering | <b>EC11B</b><br>$V_1=V_2=1.5V$ max.<br>At $R = 5k\Omega$<br>Chattering : 2ms max.<br>Bounce : 2ms max.         |
|   |  |  | <b>EC11E / EC11G</b><br>$V_1=V_2=1.5V$ max.<br>At $R = 5k\Omega$<br>Chattering : 3ms max.<br>Bounce : 2ms max. |
|   |  |  | <b>EC11J / EC11K</b><br>$V_1=V_2=2.5V$ max.<br>At $R = 5k\Omega$<br>Chattering : 3ms max.<br>Bounce : 2ms max. |

| Test circuit  | EC11EH  |
|---|---|
|  | At $R = 5k\Omega$<br>Chattering : 5ms max.<br>Bounce : 5ms max. |

## Circuit Diagram

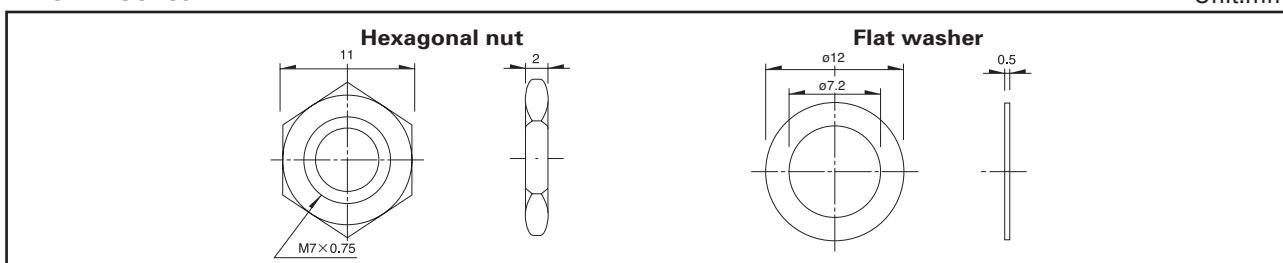


# 11mm Size Metal Shaft Encoders / Attached Parts

The following parts are included with the product.

## EC11B Series

Unit:mm

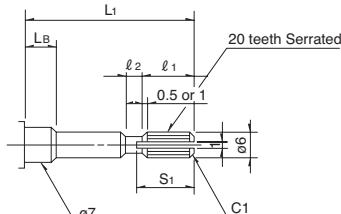


## ■ Shaft Dimensions

1. Single-shaft Type (EC11K is excluded. Refer to P.212 for EC11K)

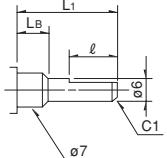
### 1) Serrated Type

Unit:mm

| EC11                                     |   | Detailed dimensions   |       |          |          |       |   |
|--|---|---|-------|----------|----------|-------|---|
|  | Configuration (Shaft diameter: $\phi$ 6)                    | $L_1$   | $L_B$ | $\ell_1$ | $\ell_2$ | $S_1$ |   |
| Detector                                 | Not applicable for EC11E and EC11G with push-lock mechanism |  | 20    | 7        | 6        | 1     | 7 |
| Slide                                    |   | 25  | 10    | 10       | 2        | 11    |   |
| Detailed dimensions                      |   |   |       |          |          |       |   |
| EC11K / EC11J                            |   | Detailed dimensions   |       |          |          |       |   |
| Configuration (Shaft diameter: $\phi$ 6) |   | $L_1$   | $L_B$ | $\ell_1$ |          |       |   |
|  |   | 15  | 7     | 5        |          |       |   |
|  |   | 20  | 10    | 6        |          |       |   |

### 2) Flat Type

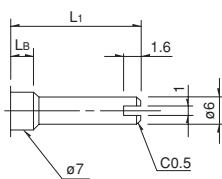
Unit:mm

| EC11   |  | Detailed dimensions |       |         |
|--|--|---------------------|-------|---------|
|  | Configuration (Shaft diameter: $\phi$ 6)   | $L_1$               | $L_B$ | $\ell$  |
| Metal Shaft                                  |  | 15                  | 5     | 7       |
| Insulated Shaft                              |  | 15                  | 7     | 5 (6)   |
| Hollow Shaft                                 |  | 20                  | 7     | 10 (12) |
| Ring Type                                    |  | 25                  | 10    | 12      |
| Detailed dimensions                          |  |                     |       |         |
| EC11K / EC11J                                |  | Detailed dimensions |       |         |
| Configuration (Shaft diameter: $\phi$ 5.975) |  | $L_1$               | $L_B$ | $\ell$  |
|  |  | 15                  | 7     | 5       |
|  |  | 20                  | 10    | 7       |

Dimensions marked with ( ) apply to products without push-on switches.

### 3) Slotted Type

Unit:mm

| EC11   |   | Detailed dimensions |       |  |
|--|---|---------------------|-------|--|
|  | Configuration (Shaft diameter: $\phi$ 6)  | $L_1$               | $L_B$ |  |
| Metal Shaft                                  |  | 15                  | 7     |  |
| Insulated Shaft                              |   | 20                  | 7     |  |
| Hollow Shaft                                 |   | 25                  | 10    |  |
| Detailed dimensions                          |   |                     |       |  |
| EC11K / EC11J                                |   | Detailed dimensions |       |  |
| Configuration (Shaft diameter: $\phi$ 5.975) |   | $L_1$               | $L_B$ |  |
|  |   | 15                  | 7     |  |
|  |   | 20                  | 10    |  |

#### Notes

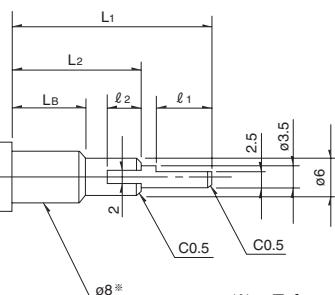
- The highlighted figures in shaft types refer to Product Specifications in P.161 and P.162.
- Other varieties are also available. Please inquire.

## 2. Standard Dimensions and configuration of Dual-shaft Type

### 1) Flat Type

Unit:mm

Configuration (Inner-shaft :  $\phi$  3.5 Outer-shaft :  $\phi$  6)



\*  $\phi 7$  for type with inner / outer shaft encoders (EC11EBB)

### Detailed dimensions

| $L_1$ | $L_2$ | $L_B$ | $l_1$ | $l_2$ |
|-------|-------|-------|-------|-------|
| 20    | 10    | 5     | 7     | 4     |
| 25    | 15    | 7     | 7     | 5     |
| 30    | 20    | 10    | 7     | 5     |

### Notes

1. The highlighted figures in shaft types refer to Product Specifications in P.162
2. Other varieties are also available. Please inquire.

Detector

Slide

Push

Rotary

Encoders

Power

Dual-in-line  
Package Type

TACT Switch™

Metal  
Shaft

Insulated  
Shaft

Hollow  
Shaft

Ring  
Type

# Encoders

## ■ List of Varieties

| Type                               |  | Metal shaft   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------------|--|---|---|--|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|
|                                    |  | 9mm size  |   | 11mm size  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
| Series                             |  | EC09E   |   | EC11B  |   | EC11E   |   |   |   | EC11G   |   |  |  |  |  |  |  |  |  |  |  |  |
| Photo                              |  |    |   |     |   |      |   |     |   |    |   |  |  |  |  |  |  |  |  |  |  |  |
| Output                             |  | Incremental (Two phase A and B )  |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
| Shaft types                        |  | Single-shaft  |   |  |   | Dual-shaft  |   |   |   | Single-shaft  |   |  |  |  |  |  |  |  |  |  |  |  |
| Operating direction                |  | Vertical  |   | Horizontal   |   | Vertical  |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
| Number of pulse / Number of detent |  | 15 / 30   |   |  |   | 9 / 18<br>15 / 30 or Without<br>18 / 36 or Without                                    |   |   |   | 15 / 30 or Without  |   |  |  |  |  |  |  |  |  |  |  |  |
| Features                           |  | —   |   | —  |   | Without detent<br>Push-lock mechanism   |   | —   |   | Less shaft wobble   |   |  |  |  |  |  |  |  |  |  |  |  |
| Dimensions (mm)                    | W  | 9.5   | 11.7  |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
|                                    | D  |   | 13.8  |  | 12  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
|                                    | H  | 4.5   | 5.5   |  | 4.5   |   | 8 / 8.5   |   | 4.5   |   |   |  |  |  |  |  |  |  |  |  |  |  |
| Operating temperature range        |  | -40°C to + 85°C   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
| Operating life                     |  | 15,000 cycle  |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
| Automotive use                     |  | ●   | ●   | ●  | ●   | ●   | ●   | ●   | ●   | ●   | ●   |  |  |  |  |  |  |  |  |  |  |  |
| Life cycle (availability)          |  |  2 |  2 |  2 |  2 |  2 |  2 |  2 |  2 |  2 |  2 |  |  |  |  |  |  |  |  |  |  |  |
| Electrical performance             | Rating                                       | 10mA 5V DC  |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
|                                    | Max./min. operating current (Resistive load) | 10mA / 1mA  |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
|                                    | Insulation resistance                        | 100M Ω min. 250V DC   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
|                                    | Voltage proof                                | 300V AC for 1 minute or 360V AC for 1s  |   | 300V AC for 1 minute or 360V AC for 2s   |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
| Mechanical performance             | Rotational torque (Without detent)           | —   |   | —  |   | 7 $\pm$ 3 mN·m  |   | —   |   | 8.5 $\pm$ 5 mN·m  |   |  |  |  |  |  |  |  |  |  |  |  |
|                                    | Detent torque                                | 8 $\pm$ 5mN·m   |   | 12 $\pm$ 7mN·m   |   | 10 $\pm$ 7mN·m  |   |   |   | 12 $\pm$ 7 mN·m   |   |  |  |  |  |  |  |  |  |  |  |  |
|                                    | Push-pull strength                           | 100N  |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
| Shaft configuration                |  | Flat  |   | Flat, Slotted, Serrated  |   |   |   | Inner-shaft:Flat<br>Outer-shaft:Slotted   |   | Serrated  |   |  |  |  |  |  |  |  |  |  |  |  |
| Terminal type                      |  | Insertion   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
| Switch Specifications              | Switch type                                  | Push-on switch  |   |  |   |   |   | Push-lock mechanism switch※   |   | Push-on switch  |   |  |  |  |  |  |  |  |  |  |  |  |
|                                    | Contact arrangement                          | Single pole and single throw (Push-on)  |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
|                                    | Travel (mm)                                  | 0.5 $\pm$ 0.3   | 1.5 $\pm$ 0.5   | 0.5 $\pm$ 0.4<br>0.5 $\pm$ 0.3   | 1.5 $\pm$ 0.5   | 0.5 $\pm$ 0.3   | 1.5 $\pm$ 0.5   | 8 $\pm$ 0.8   | 0.5 $\pm$ 0.3   | 1.5 $\pm$ 0.5   | 1.5 $\pm$ 0.35  |  |  |  |  |  |  |  |  |  |  |  |
|                                    | Operating force (N)                          | 6 $\pm$ 2.5   | 4 $\pm$ 2   | 6 $\pm$ 3  | 5 $\pm$ 2   | 6 $\pm$ 2.5<br>6 $\pm$ 2  | 4 $\pm$ 2   | 8 max.  | 6 $\pm$ 2.5<br>6 $\pm$ 2  | 4 $\pm$ 2   | 5 $\pm$ 2   |  |  |  |  |  |  |  |  |  |  |  |
|                                    | Rating                                       | 10mA 5V DC  |   | 0.1A 5V DC (500 $\mu$ A 5V DC min. ratings)  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
|                                    | Contact resistance                           | 100m Ω max. for initial period; 200m Ω max. after operating life.                   |   |  |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |
|                                    | Operating life                               | 10,000 times min.   |   | 25,000 times min.  |   | 20,000 times min.   |   | 10,000 times min.   |   | 20,000 times min.   |   |  |  |  |  |  |  |  |  |  |  |  |



## Notes

1. \* marked specification is only applicable to EC11E152U402.
  2. ● indicates applicability to all products in the series.

- Detector
- Slide
- Push
- Rotary
- Encoders**
- Power
- Dual-in-line  
Package Type
- TACT Switch™

- Metal Shaft
- Insulated Shaft
- Hollow Shaft
- Ring Type

# Encoders

## ■ List of Varieties

| Type                                      |  | Metal shaft  |  |  |  |  |  |  |   |                   |  |  |  |  |  |
|---|--|--|--|--|--|--|--|--|---|-------------------|--|--|--|--|--|
|   |  | 11mm size  |  |  |  | 20mm size  |  |  |   |                   |  |  |  |  |  |
| Series                                    |  | EC11   | EC11EH   | EC11K  | EC11J  | EC20A / RK203  |  | EM20B  |   |                   |  |  |  |  |  |
| <b>Photo</b>                              |  |   |   |   |  |   |   |   |  |                   |  |  |  |  |  |
| <b>Output</b>                             |  | Self-return switch   | Incremental<br>(Three phase A, B and C)  | Incremental (Two phase A and B )   |  |  |  |  |   |                   |  |  |  |  |  |
| <b>Shaft types</b>                        |  | Single-shaft   |  |  |  |  |  |  |   |                   |  |  |  |  |  |
| <b>Operating direction</b>                |  | Vertical   |  |  |  |  |  |  |   |                   |  |  |  |  |  |
| <b>Number of pulse / Number of detent</b> |  | —  | 6×ABC / 18<br>10×ABC / 30  | 9 / 18<br>15 / 30  |  |  | 18 / 18  | 40 / 40  |   |                   |  |  |  |  |  |
| <b>Features</b>                           |  | —  | —  | —  | Surface Mount Type   |  | —  | Magnetic type;<br>LED indicator option   |   |                   |  |  |  |  |  |
| <b>Dimensions (mm)</b>                    | <b>W</b>                                     | 11.7   |  |  |  |  |  | 20.2   | 20  |                   |  |  |  |  |  |
|   | <b>D</b>                                     | 13   | 12   |  | 14.2   |  |  | 19.2   | 22.25   |                   |  |  |  |  |  |
|   | <b>H</b>                                     | 5  | 4.5  |  |  |  | 10   | 13   |   |                   |  |  |  |  |  |
| <b>Operating temperature range</b>        |  | -40°C to + 85°C  |  |  |  |  |  | -30°C to + 80°C  | -10°C to + 70°C   |                   |  |  |  |  |  |
| <b>Operating life</b>                     |  | 15,000 cycles  | 30,000 cycles  | 100,000 cycles   |  |  | 30,000 cycles  | 500,000 rotations  |   |                   |  |  |  |  |  |
| <b>Automotive use</b>                     |  | ●  | ●  | ●  | ●  | ●  | —  | —  |   |                   |  |  |  |  |  |
| <b>Life cycle (availability)</b>          |  |  |  |  |  |  |  |  |   |                   |  |  |  |  |  |
| <b>Electrical performance</b>             | <b>Rating</b>                                | 10mA 5V DC   |  |  |  |  |  | 1mA 5V DC  | 10mA 5V±5% DC   |                   |  |  |  |  |  |
|   | Max./min. operating current (Resistive load) | 10mA / 1mA   |  |  |  |  |  | —  | 15mA / —  |                   |  |  |  |  |  |
|   | Insulation resistance                        | 100M Ω min. 250V DC  |  |  |  |  |  | 10MΩ min. 50V DC   | 100MΩ min. 250V DC  |                   |  |  |  |  |  |
|   | <b>Voltage proof</b>                         | 300V AC for 1 minute or 360V AC for 2s   |  |  | 300V AC for 1 minute or 360V AC for 1s   |  |  | 50V AC for 1 minute or 60V AC for 2s   | 300V AC for 1 minute or 360V AC for 2s  |                   |  |  |  |  |  |
| <b>Mechanical performance</b>             | Rotational torque (Without detent)           | 3 to 30mN·m  | —  |  |  |  |  |  | 7mN·m max.  |                   |  |  |  |  |  |
|   | <b>Detent torque</b>                         | —  | 10±7mN·m   | 12 ± 5mN·m   |  |  | 40±20mN·m  | 8±5mN·m  |   |                   |  |  |  |  |  |
|   | Push-pull strength                           | 100N   |  |  |  |  |  |  |   |                   |  |  |  |  |  |
| <b>Shaft configuration</b>                |  | Flat, Slotted, Serrated  |  |  |  |  |  | Flat   |   |                   |  |  |  |  |  |
| <b>Terminal type</b>                      |  | Insertion  |  |  |  | Reflow   |  | Insertion  |   |                   |  |  |  |  |  |
| <b>Switch Specifications</b>              | <b>Switch type</b>                           | Push-on switch   |  |  |  |  |  |  |   |                   |  |  |  |  |  |
|   | <b>Contact arrangement</b>                   | Single pole and single throw (Push-on)   |  |  |  |  |  |  |   |                   |  |  |  |  |  |
|   | <b>Travel (mm)</b>                           | 0.5 ± 0.3  | 1.5 ± 0.5  | 0.5 ± 0.3  | 1.5 ± 0.5  | 0.5 ± 0.3  | 1.5 ± 0.5  | 0.5 ± 0.3  | 1.5 ± 0.5   | 0.5 ± 0.4         |  |  |  |  |  |
|   | <b>Operating force (N)</b>                   | 6 <sup>+2.5</sup> <sub>-2</sub>  | 4 ± 2  | 6 <sup>+2.5</sup> <sub>-2</sub>  | 4 ± 2  | 5±2  | 4±2  | 5±2  | 4±2   | 6±3               |  |  |  |  |  |
|   | <b>Rating</b>                                | 0.1A 5V DC<br>(500 μA 5V DC min. ratings)  |  |  | 0.1A 5V DC<br>(0.1mA 5V DC min. ratings)   |  |  | 0.5A 16V DC<br>(1mA 16V DC min. ratings)   |   | 0.1A 5V DC        |  |  |  |  |  |
|   | <b>Contact resistance</b>                    | 100m Ω max. for initial period; 200m Ω max. after operating life.                  |  |  |  |  |  |  |   |                   |  |  |  |  |  |
|   | <b>Operating life</b>                        | 20,000 times min.  |  |  | 1,000,000 times min.   | 100,000 times min.   | 1,000,000 times min.   | 100,000 times min.   | 20,000 times min.   | 25,000 times min. |  |  |  |  |  |



**Note** ● indicates applicability to all products in the series.

## Encoders Soldering Conditions

### ■ Reference for Hand Soldering

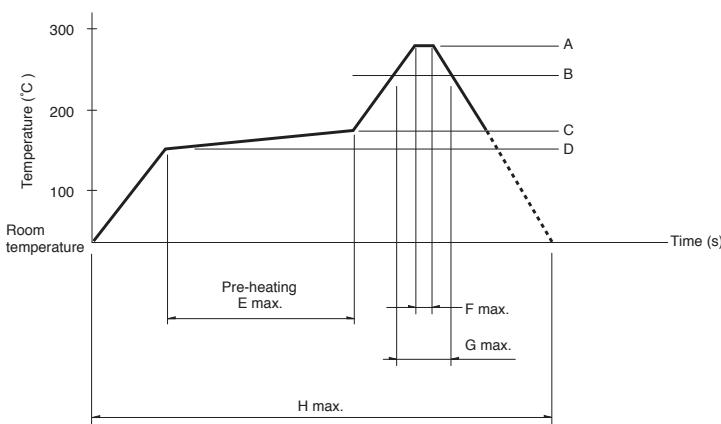
| Series  | Tip temperature | Soldering time                 | No. of solders |
|---|-----------------|--------------------------------|----------------|
| EC05E, EC09E, EC10E, EC11I, EC11B, EC11E, EC11G, EC11K, EC12D, EC12E, EC18A, EC20A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC40A, EC45A, EC50A, EC60A, EM20B | 350°C max.      | 3s max.                        | 1 time         |
| EC11J   | 350±10°C        | 3 <sup>+1</sup> <sub>0</sub> s | 2 time         |

### ■ Reference for Dip Soldering

| Series  | Preheating                    |              | Dip soldering         |                | No. of solders |
|---|-------------------------------|--------------|-----------------------|----------------|----------------|
|   | Soldering surface temperature | Heating time | Soldering temperature | Soldering time |                |
| EC09E, EC11B, EC11I, EC11E, EC11G, EC11K, EC18A, EC20A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC50A | 100°C max.                    | 2 min. max.  | 260±5°C               | 5±1s           | 2 time max.    |
| EC10E, EC12D, EC12E   | 100°C max.                    | 1 min. max.  | 260±5°C               | 3±1s           | 2 time max.    |
| EC40A   | 110°C max.                    | 1 min. max.  | 260°C max.            | 10s max.       | 1 time         |
| EC45A, EC60A  | 100°C max.                    | 2 min. max.  | 260°C max.            | 5s max.        | 2 time max.    |
| EM20B   | 80°C max.                     | 1 min. max.  | 260°C max.            | 3s max.        | 2 time max.    |

### ■ Condition for Reflow

#### Temperature profile



| Series | A          | B          | C     | D     | E           | F  | G          | H          | No. of reflows |
|--------|------------|------------|-------|-------|-------------|----|------------|------------|----------------|
| EC11J  | 260°C      | 230°C      | 180°C | 150°C | 2 min.max.  | 3s | 40s        | 4 min. max | 2 time max.    |
| EC05E  | 250°C min. | 230°C min. | 180°C | 150°C | 60s to 120s | —  | 30s to 40s | —          | 2 time max.    |

### Notes

- When using an infrared reflow oven, solder may sometimes not be applied. Be sure to use a hot air reflow oven or a type that uses infrared rays in combination with hot air.
- The temperatures given above are the maximum temperatures at the terminals of the potentiometer when employing a hot air reflow method. The temperature of the PC board and the surface temperature of the potentiometer may vary greatly depending on the PC board material, its size and thickness. Ensure that the surface temperature of the potentiometer does not rise to 250°C or greater.
- Conditions vary to some extent depending on the type of reflow bath used. Be sure to give due consideration to this prior to use.

Detector  
 Slide  
 Push  
 Rotary  
**Encoders**  
 Power  
 Dual-in-line  
 Package Type  
 TACT Switch™

Metal  
 Shaft  
 Insulated  
 Shaft  
 Hollow  
 Shaft  
 Ring  
 Type