

## ■ Typical Specifications

| Items                       | Specifications                                                                                  |
|-----------------------------|-------------------------------------------------------------------------------------------------|
| Output signal               | Two phase of A, B<br>Three phase of A, B and C (EC11EH)<br>Self-return switch (EC111 / EC11E0B) |
| Rating                      | 10mA 5V DC                                                                                      |
| Operating life              | 15,000 cycles<br>30,000 cycles (EC11EH)<br>100,000 cycles (EC11K / EC11J)                       |
| Operating temperature range | − 40°C to + 85°C                                                                                |

Detector

Slide

Push

Rotary

Encoders

Power

Dual-in-line  
Package Type

TACT Switch™

Metal  
ShaftInsulated  
ShaftHollow  
ShaftRing  
Type

## ■ Product Line

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

## Product Line

| 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           |    |  |  |  |  |  |
| Push                      |                    |                     |                                                            |               | 30               | 15                 |                |                               |                         |                           |        | EC11J152040F |              |    |  |  |  |  |  |
| Rotary                    |                    |                     |                                                            |               | 18               | 9                  | With           | 0.5                           |                         |                           |        | 12           | EC11J0924411 |    |  |  |  |  |  |
| Encoders                  |                    |                     |                                                            |               | 30               | 15                 |                |                               |                         |                           |        |              | EC11J1524413 |    |  |  |  |  |  |
|                           |                    |                     |                                                            |               | 18               | 9                  |                | EC11J0925403                  |                         |                           |        |              |              |    |  |  |  |  |  |
|                           |                    |                     |                                                            |               |                  |                    |                | EC11J1525402                  |                         |                           |        |              |              |    |  |  |  |  |  |
| Power                     | Push lock          | 20-tooth Serrated   | 25                                                         | 10 ± 7        | 30               | 15                 | Without        | —                             |                         | 800                       | 1,600  |              | EC11E152T409 | 13 |  |  |  |  |  |
| Dual-in-line Package Type |                    |                     | 26.4                                                       |               |                  |                    | With           | 8                             |                         |                           |        |              | EC11E152U402 | 14 |  |  |  |  |  |
| TACT Switch™              | Self-return switch | Flat                | 15                                                         | 3 to 30       | Without          | Self-return switch | Without        | —                             | 15,000                  | 1,200                     | 2,400  | EC1110120005 | 15           |    |  |  |  |  |  |
|                           |                    |                     |                                                            |               |                  |                    |                | 0.5                           |                         |                           |        | EC111012010H | 16           |    |  |  |  |  |  |
|                           |                    |                     |                                                            |               |                  |                    |                | 1.5                           |                         |                           |        | EC1110120201 |              |    |  |  |  |  |  |
|                           | ABC switch         |                     | 20                                                         | 10 ± 7        | 18               | ABC switch         | With           | 0.5                           | 30,000                  |                           |        | EC11EH124403 | 17           |    |  |  |  |  |  |
|                           |                    |                     |                                                            |               |                  |                    |                |                               |                         |                           |        | EC11EH224403 |              |    |  |  |  |  |  |
|                           |                    |                     |                                                            |               |                  |                    |                | 1.5                           |                         |                           |        | EC11EH124404 |              |    |  |  |  |  |  |
|                           |                    |                     |                                                            |               |                  |                    |                |                               |                         |                           |        | EC11EH224404 |              |    |  |  |  |  |  |
| Metal Shaft               | Dual-shaft         |                     | Inner-shaft=25                                             | 30            | 30               | 15                 | Without        | 0.5                           | 15,000                  | 700                       | 1,400  | EC11EBB24C03 | 18           |    |  |  |  |  |  |
| Insulated Shaft           |                    |                     | Outer-shaft=15                                             |               |                  |                    |                | —                             |                         |                           |        | EC11E0B2LB01 | 19           |    |  |  |  |  |  |
|                           |                    |                     | Inner-shaft=25                                             |               |                  |                    |                | 1.5                           |                         |                           |        |              |              |    |  |  |  |  |  |
| Hollow Shaft              |                    |                     | Outer-shaft=15                                             |               |                  |                    |                | —                             |                         |                           |        |              |              |    |  |  |  |  |  |
| Ring Type                 |                    |                     |                                                            | 3 to 30       | Without          | Self-return switch | Without        | —                             |                         |                           |        |              |              |    |  |  |  |  |  |

Note

Other varieties are also available. Please inquire.

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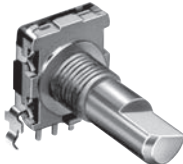
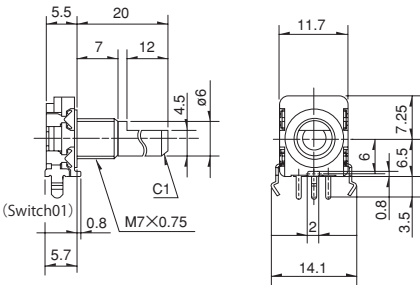
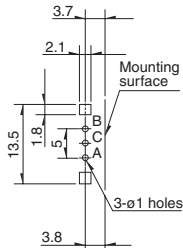
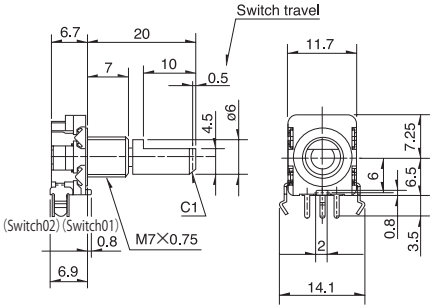
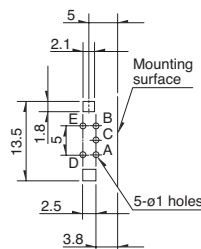
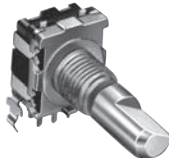
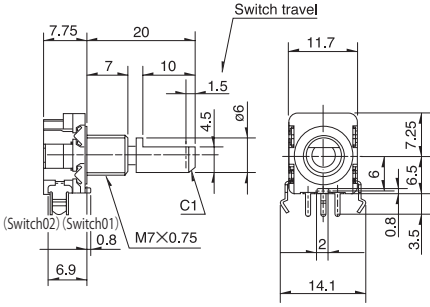
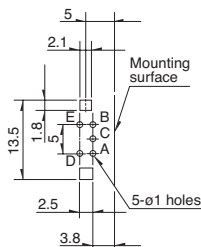
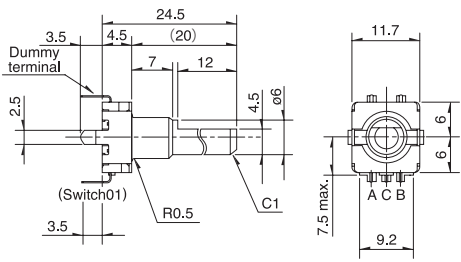
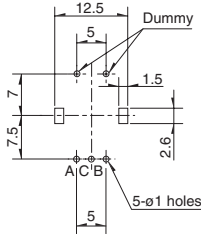
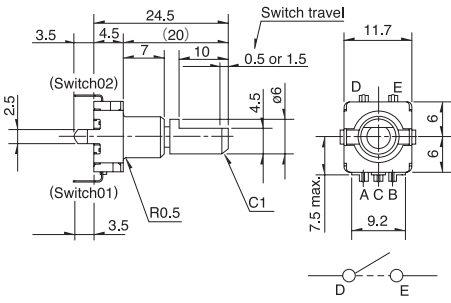
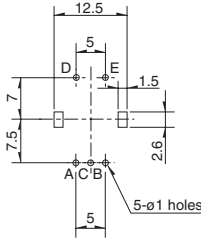
## Packing Specifications

## 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                   |                                  |
| EC11J                      | 300                       | 600                     | 369 × 283 × 263                  |
| EC11E152T / U              | 800                       | 1,600                   | 363 × 507 × 230                  |
| EC111                      | 1,200                     | 2,400                   | 363 × 507 × 216                  |
| EC11E0B / BB               | 700                       | 1,400                   |                                  |

## Dimensions

Unit:mm

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

Detector

Slide

Push

Rotary

Encoders

Power

Dual-in-line  
Package Type

TACT Switch™

**Metal  
Shaft**

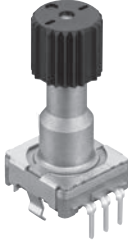
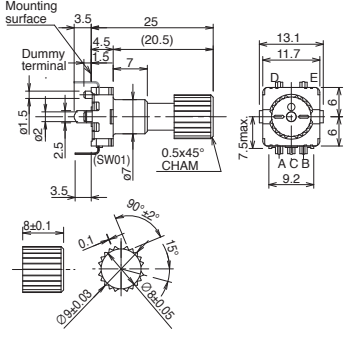
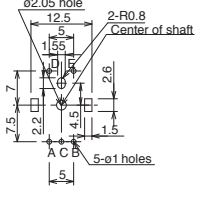
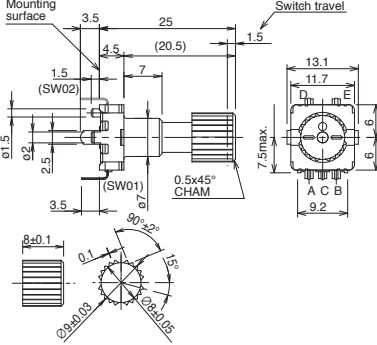
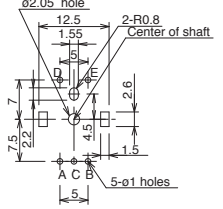
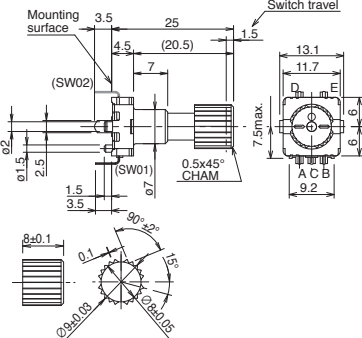
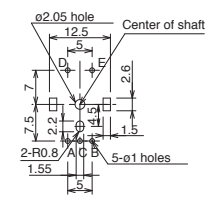
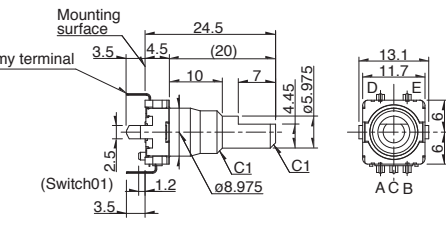
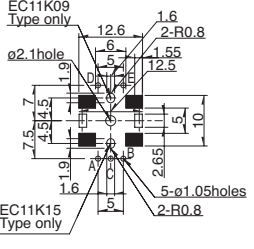
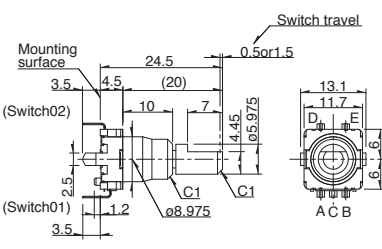
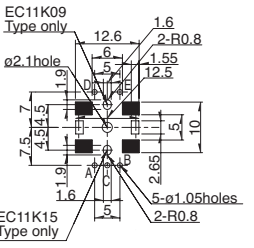
Insulated  
Shaft

Hollow  
Shaft

Ring  
Type

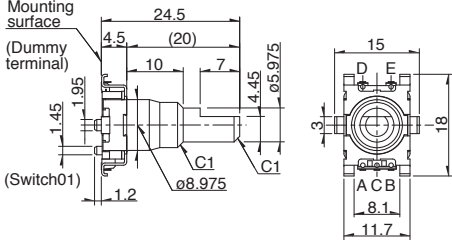
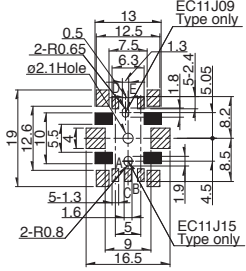
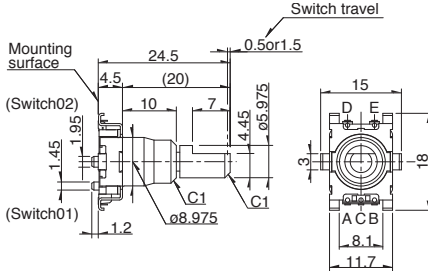
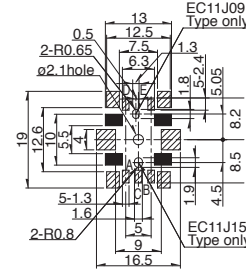
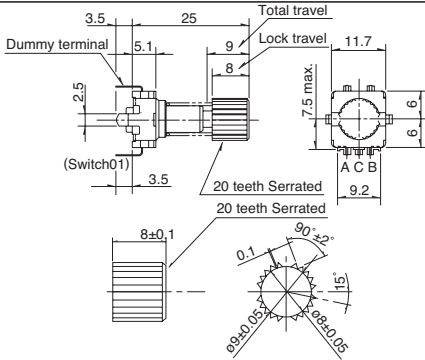
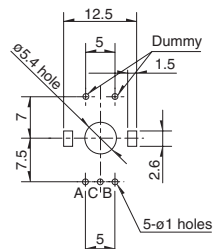
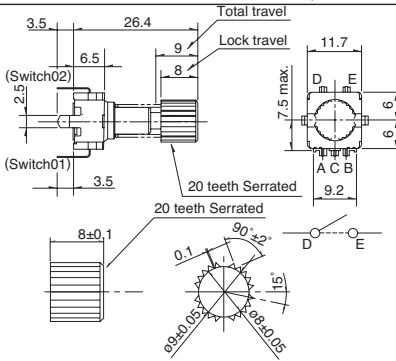
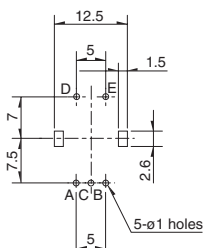
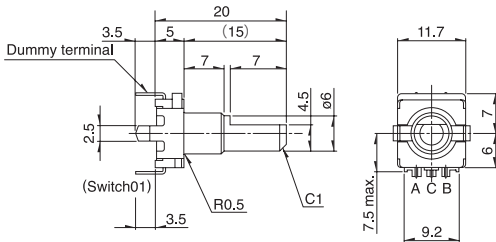
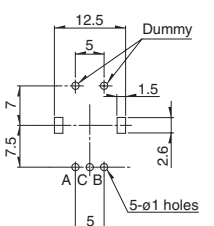
## Dimensions

Unit:mm

| Detector | No. | Photo                                                                               | Style                                                                               | PC board mounting hole dimensions<br>(Viewed from mounting side)                      |
|----------|-----|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|          | 6   |    |    |    |
|          | 7   |   |  |    |
|          | 8   |  |  |  |
|          | 9   |  |  |  |
|          | 10  |  |  |  |

## Dimensions

Unit:mm

| No. | Photo                                                                                                                                                  | Style                                                                                | PC board mounting hole dimensions<br>(Viewed from mounting side)                                                                                                                              |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11  | <b>EC11J<br/>Reflow</b>                                               |     |  <p>A slant line part: The solder land<br/>Black part: Do not solder and wiring for electrical contact</p> |
| 12  | <b>EC11J<br/>with push-on switch<br/>(travel 0.5mm / 1.5mm)</b>       |     |  <p>A slant line part: The solder land<br/>Black part: Do not solder and wiring for electrical contact</p> |
| 13  | <b>EC11E152T<br/>Push-lock mechanism</b>                            |   |                                                                                                          |
| 14  | <b>EC11E152U<br/>Push-lock mechanism<br/>with push-lock switch</b>  |   |                                                                                                          |
| 15  | <b>EC111<br/>Self-return switch</b>                                 |  |                                                                                                          |

Detector

Slide

Push

Rotary

Encoders

Power

Dual-in-line  
Package Type

TACT Switch™

Metal  
Shaft

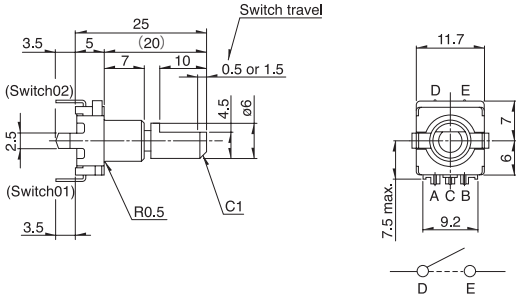
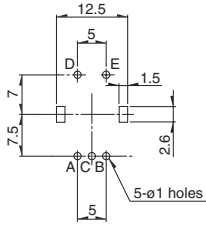
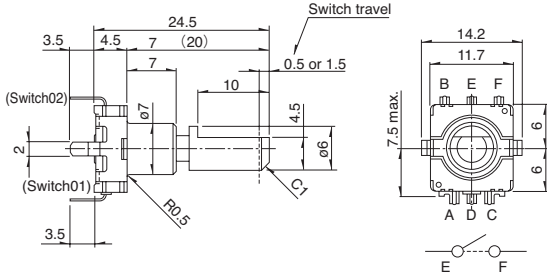
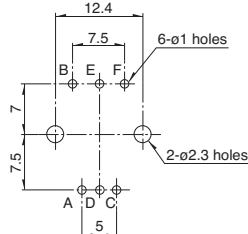
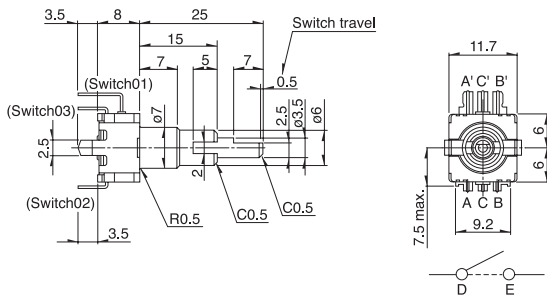
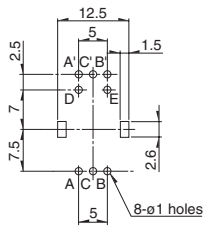
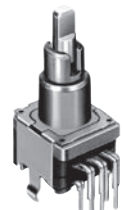
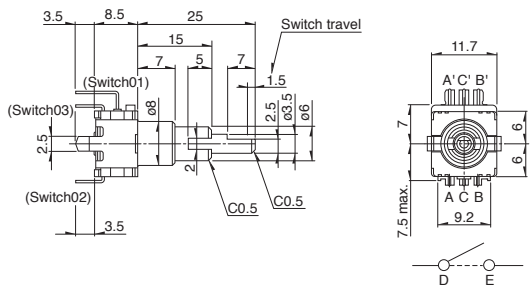
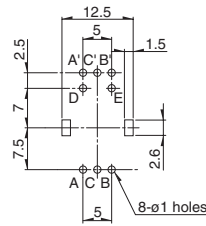
Insulated  
Shaft

Hollow  
Shaft

Ring  
Type

## Dimensions

Unit:mm

| No. | Photo                                                                                                                                                                                                                            | Style                                                                                | PC board mounting hole dimensions<br>(Viewed from mounting side)                      |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 16  | <div>EC111<br/>Self-return switch<br/>with push-on switch<br/>(travel 0.5mm / 1.5mm)</div>                                                      |    |    |
| 17  | <div>EC11EH<br/>ABC switch<br/>with push-on switch<br/>(travel 0.5mm / 1.5mm)</div>                                                            |   |   |
| 18  | <div>EC11E<br/>Dual-shaft type<br/>with push-on switch<br/>(travel 0.5mm)<br/>Inner shaft: encoder<br/>Outer shaft: encoder</div>             |  |  |
| 19  | <div>EC11E<br/>Dual-shaft type<br/>with push-on switch<br/>(travel 1.5mm)<br/>Inner shaft: encoder<br/>Outer shaft: self-return switch</div>  |  |  |

# 11mm Size Metal Shaft Encoders / Product Specifications

## Output Wave

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

## Sliding Noise

Test circuit

5V DC

R

Terminal A

Terminal B

Encoder

Terminal C

Measurement condition : Rotation speed 360°/s t : Masking time to avoid chattering

Output waveform

5V

t

V<sub>1</sub>

V<sub>2</sub>

ON OFF ON

Sliding direction

## ● Detailed dimensions

|               |                                                                                        |
|---------------|----------------------------------------------------------------------------------------|
| EC11B         | $V_1=V_2=1.5V$ max.<br>At $R = 5k\Omega$<br>Chattering : 2ms max.<br>Bounce : 2ms max. |
| EC11E / EC11G | $V_1=V_2=1.5V$ max.<br>At $R = 5k\Omega$<br>Chattering : 3ms max.<br>Bounce : 2ms max. |
| EC11J / EC11K | $V_1=V_2=2.5V$ max.<br>At $R = 5k\Omega$<br>Chattering : 3ms max.<br>Bounce : 2ms max. |

Test circuit

5V DC

R

Terminal A

Terminal B

Terminal C

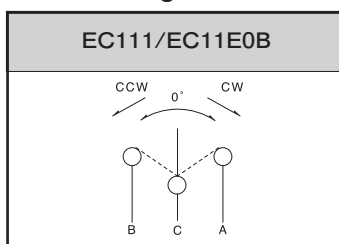
ABC switch

Terminal D

Test condition Rotation speed 360°/s

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

## Circuit Diagram

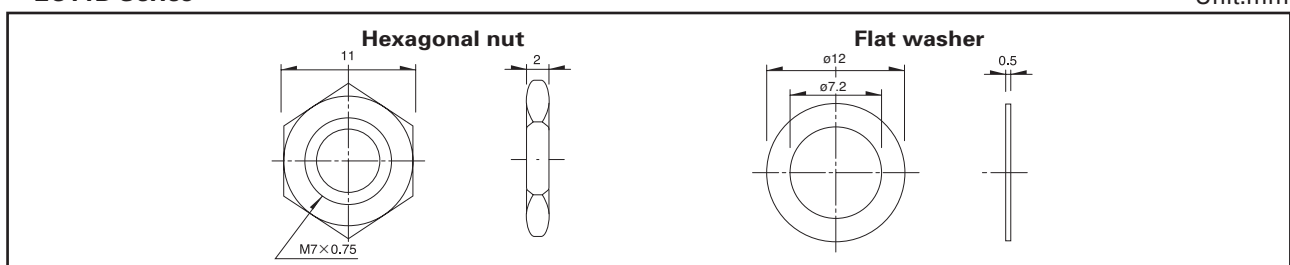


# 11mm Size Metal Shaft Encoders / Attached Parts

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)

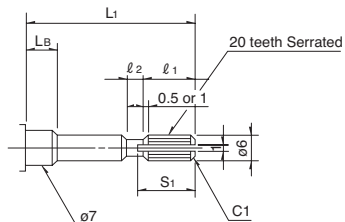
Unit:mm

#### 1) Serrated Type

##### EC11

##### Configuration (Shaft diameter : $\phi 6$ )

Not applicable for EC11E and EC11G with push-lock mechanism

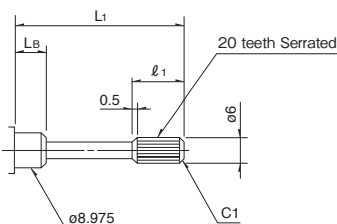


##### Detailed dimensions

| $L_1$ | $L_B$ | $l_1$ | $l_2$ | $S_1$ |
|-------|-------|-------|-------|-------|
| 20    | 7     | 6     | 1     | 7     |
| 25    | 10    | 10    | 2     | 11    |

##### EC11K / EC11J

##### Configuration (Shaft diameter : $\phi 6$ )



##### Detailed dimensions

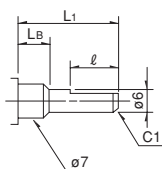
| $L_1$ | $L_B$ | $l_1$ |
|-------|-------|-------|
| 15    | 7     | 5     |
| 20    | 10    | 6     |

#### 2) Flat Type

Unit:mm

##### EC11

##### Configuration (Shaft diameter : $\phi 6$ )



##### Detailed dimensions

| $L_1$ | $L_B$ | $l$     |
|-------|-------|---------|
| ※1 15 | 5     | 7       |
| 15    | 7     | 5 (6)   |
| 20    | 7     | 10 (12) |
| ※2 25 | 10    | 12      |

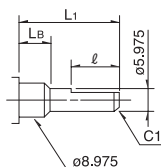
※ 1 Does not comply with EC111

※ 2  $L_B=7$  for EC11B.

Values in parentheses apply to products without push-on switch.

##### EC11K / EC11J

##### Configuration (Shaft diameter : $\phi 5.975$ )



##### Detailed dimensions

| $L_1$ | $L_B$ | $l$ |
|-------|-------|-----|
| 15    | 7     | 5   |
| 20    | 10    | 7   |

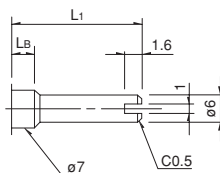
Dimensions marked with ( ) apply to products without push-on switches.

#### 3) Slotted Type

Unit:mm

##### EC11

##### Configuration (Shaft diameter : $\phi 6$ )



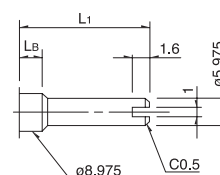
##### Detailed dimensions

| $L_1$ | $L_B$ |
|-------|-------|
| 15    | 7     |
| 20    | 7     |
| ※ 25  | 10    |

※  $L_B=7$  for EC11B.

##### EC11K / EC11J

##### Configuration (Shaft diameter : $\phi 5.975$ )



##### Detailed dimensions

| $L_1$ | $L_B$ |
|-------|-------|
| 15    | 7     |
| 20    | 10    |

## Notes

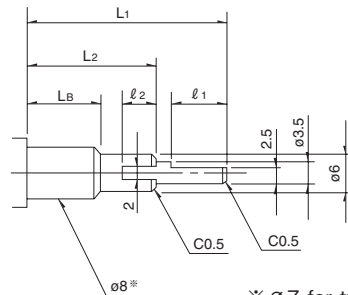
- The highlighted figures in shaft types refer to Product Specifications in P.161 and P.162.
- Other varieties are also available. Please inquire.

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

### 1) Flat Type

Unit:mm

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



#### ● 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     |

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

### Notes

- The highlighted figures in shaft types refer to Product Specifications in P.162
- 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

## 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℃ to + 85℃                                                                     |           |                                                                                   |                   |                                                                                     |           |                                                                                    |                                   |                                                                                     |                   |                                                                                     |  |
| Operating life                     |                                              | 15,000 cycle                                                                      |           |                                                                                   |                   |                                                                                     |           |                                                                                    |                                   |                                                                                     |                   |                                                                                     |  |
| Automotive use                     |                                              |  |           |  |                   |  |           |                                                                                    |                                   |  |                   |                                                                                     |  |
| Life cycle (availability)          |                                              |  |           |  |                   |  |           |                                                                                    |                                   |  |                   |                                                                                     |  |
| 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 ± <sup>3</sup> / <sub>4</sub> mN·m                                                |           |                                                                                    | —                                 |                                                                                     | 8.5 ± 5 mN·m      |                                                                                     |  |
|                                    | Detent torque                                | 8 ± 5mN·m                                                                         |           | 12 ± 7mN·m                                                                        |                   | 10 ± 7mN·m                                                                          |           |                                                                                    |                                   | 12 ± 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 ± 0.3                                                                         | 1.5 ± 0.5 | 0.5 ± <sup>0.4</sup> / <sub>0.3</sub>                                             | 1.5 ± 0.5         | 0.5 ± 0.3                                                                           | 1.5 ± 0.5 | 8 ± 0.8                                                                            | 0.5 ± 0.3                         | 1.5 ± 0.5                                                                           | 1.5 ± 0.35        |                                                                                     |  |
|                                    | Operating force (N)                          | 6 ± <sup>2.5</sup> / <sub>2</sub>                                                 | 4 ± 2     | 6 ± 3                                                                             | 5 ± 2             | 6 ± <sup>2.5</sup> / <sub>2</sub>                                                   | 4 ± 2     | 8 max.                                                                             | 6 ± <sup>2.5</sup> / <sub>2</sub> | 4 ± 2                                                                               | 5 ± 2             |                                                                                     |  |
|                                    | Rating                                       | 10mA 5V DC                                                                        |           | 0.1A 5V DC (500 μA 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.                 |                                                                                     |                   |                                                                                     |  |
| Page                               |                                              | 160                                                                               |           | 161                                                                               |                   |                                                                                     |           |                                                                                    |                                   |                                                                                     |                   |                                                                                     |  |

- Encoders Soldering Conditions . . . . . 193
- Encoders Cautions . . . . . 194

### Notes

- ※ marked specification is only applicable to EC11E152U402.
- indicates applicability to all products in the series.

Detector

Slide

Push

Rotary

Encoders

Power

Dual-in-line  
Package Type

TACT Switch™

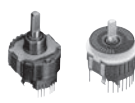
Metal  
Shaft

Insulated  
Shaft

Hollow  
Shaft

Ring  
Type

## List of Varieties

| Type                                  |                                                 | Metal shaft                                                                       |         |                                                                                   |         |                                                                                   |                       |                                                                                     |                                          |                                                                                     |                                           |                                                                                     |  |
|---------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------|---------|-----------------------------------------------------------------------------------|---------|-----------------------------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------|------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------|--|
|                                       |                                                 | 11mm size                                                                         |         |                                                                                   |         |                                                                                   |                       |                                                                                     | 20mm size                                |                                                                                     |                                           |                                                                                     |  |
| Series                                |                                                 | EC111                                                                             |         | EC11EH                                                                            |         | EC11K                                                                             |                       | EC11J                                                                               |                                          | EC20A / RK203                                                                       |                                           | EM20B                                                                               |  |
| Photo                                 |                                                 |  |         |  |         |  |                       |  |                                          |  |                                           |  |  |
| Output                                |                                                 | Self-return switch                                                                |         | Incremental<br>(Three phase A, B and C)                                           |         | Incremental (Two phase A and B )                                                  |                       |                                                                                     |                                          |                                                                                     |                                           |                                                                                     |  |
| Shaft types                           |                                                 | Single-shaft                                                                      |         |                                                                                   |         |                                                                                   |                       |                                                                                     |                                          |                                                                                     |                                           |                                                                                     |  |
| Operating direction                   |                                                 | Vertical                                                                          |         |                                                                                   |         |                                                                                   |                       |                                                                                     |                                          |                                                                                     |                                           |                                                                                     |  |
| Number of pulse /<br>Number of detent |                                                 | —                                                                                 |         | 6×ABC / 18<br>10×ABC / 30                                                         |         | 9 / 18<br>15 / 30                                                                 |                       |                                                                                     | 18 / 18                                  |                                                                                     | 40 / 40                                   |                                                                                     |  |
| Features                              |                                                 | —                                                                                 |         | —                                                                                 |         | —                                                                                 |                       | Surface Mount Type                                                                  |                                          | —                                                                                   |                                           | Magnetic type;<br>LED indicator option                                              |  |
| Dimensions<br>(mm)                    | W                                               | 11.7                                                                              |         |                                                                                   |         |                                                                                   |                       |                                                                                     | 20.2                                     |                                                                                     | 20                                        |                                                                                     |  |
|                                       | D                                               | 13                                                                                |         | 12                                                                                |         |                                                                                   | 14.2                  |                                                                                     | 19.2                                     |                                                                                     | 22.25                                     |                                                                                     |  |
|                                       | H                                               | 5                                                                                 |         | 4.5                                                                               |         |                                                                                   |                       |                                                                                     | 10                                       |                                                                                     | 13                                        |                                                                                     |  |
| Operating temperature range           |                                                 | −40℃ to + 85℃                                                                     |         |                                                                                   |         |                                                                                   |                       |                                                                                     | −30℃ to + 80℃                            |                                                                                     | −10℃ to + 70℃                             |                                                                                     |  |
| Operating life                        |                                                 | 15,000 cycles                                                                     |         | 30,000 cycles                                                                     |         | 100,000 cycles                                                                    |                       |                                                                                     | 30,000 cycles                            |                                                                                     | 500,000 rotations                         |                                                                                     |  |
| Automotive use                        |                                                 |  |         |  |         |  |                       |  |                                          |  |                                           | —                                                                                   |  |
| Life cycle (availability)             |                                                 |  |         |  |         |  |                       |  |                                          |  |                                           |  |  |
| Electrical performance                | Rating                                          | 10mA 5V DC                                                                        |         |                                                                                   |         |                                                                                   |                       |                                                                                     | 1mA 5V DC                                |                                                                                     | 10mA 5V±5% DC                             |                                                                                     |  |
|                                       | Max./min. operating current<br>(Resistive load) | 10mA / 1mA                                                                        |         |                                                                                   |         |                                                                                   |                       |                                                                                     | —                                        |                                                                                     | 15mA / —                                  |                                                                                     |  |
|                                       | Insulation resistance                           | 100M Ω min. 250V DC                                                               |         |                                                                                   |         |                                                                                   |                       |                                                                                     | 10MΩ min. 50V DC                         |                                                                                     | 100MΩ min. 250V DC                        |                                                                                     |  |
|                                       | Voltage proof                                   | 300V AC for 1 minute<br>or 360V AC for 2s                                         |         |                                                                                   |         | 300V AC for 1 minute<br>or 360V AC for 1s                                         |                       |                                                                                     | 50V AC for 1 minute<br>or 60V AC for 2s  |                                                                                     | 300V AC for 1 minute<br>or 360V AC for 2s |                                                                                     |  |
| Mechanical performance                | Rotational torque<br>(Without detent)           | 3 to 30mN·m                                                                       |         | —                                                                                 |         |                                                                                   |                       |                                                                                     |                                          |                                                                                     | 7mN·m max.                                |                                                                                     |  |
|                                       | Detent torque                                   | —                                                                                 |         | 10±7mN·m                                                                          |         | 12 ± 5mN·m                                                                        |                       |                                                                                     | 40±20mN·m                                |                                                                                     | 8±5mN·m                                   |                                                                                     |  |
|                                       | Push-pull strength                              | 100N                                                                              |         |                                                                                   |         |                                                                                   |                       |                                                                                     |                                          |                                                                                     |                                           |                                                                                     |  |
| Shaft configuration                   |                                                 | Flat, Slotted, Serrated                                                           |         |                                                                                   |         |                                                                                   |                       |                                                                                     | Flat                                     |                                                                                     |                                           |                                                                                     |  |
| Terminal type                         |                                                 | Insertion                                                                         |         |                                                                                   |         |                                                                                   | Reflow                |                                                                                     | Insertion                                |                                                                                     |                                           |                                                                                     |  |
| Switch Specifications                 | Switch type                                     | Push-on switch                                                                    |         |                                                                                   |         |                                                                                   |                       |                                                                                     |                                          |                                                                                     |                                           |                                                                                     |  |
|                                       | Contact arrangement                             | Single pole and single throw (Push-on)                                            |         |                                                                                   |         |                                                                                   |                       |                                                                                     |                                          |                                                                                     |                                           |                                                                                     |  |
|                                       | Travel (mm)                                     | 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 <sup>+0.4</sup> <sub>−0.3</sub>       |                                                                                     |  |
|                                       | Operating force (N)                             | 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                                       |                                                                                     |  |
|                                       | Rating                                          | 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                                |                                                                                     |  |
|                                       | Contact resistance                              | 100m Ω max. for initial period; 200m Ω max. after operating life.                 |         |                                                                                   |         |                                                                                   |                       |                                                                                     |                                          |                                                                                     |                                           |                                                                                     |  |
|                                       | Operating life                                  | 20,000 times min.                                                                 |         |                                                                                   |         | 1,000,000<br>times min.                                                           | 100,000<br>times min. | 1,000,000<br>times min.                                                             | 100,000<br>times min.                    | 20,000<br>times min.                                                                |                                           | 25,000<br>times min.                                                                |  |
| Page                                  |                                                 | 161                                                                               |         |                                                                                   |         |                                                                                   |                       |                                                                                     | 170                                      |                                                                                     | 172                                       |                                                                                     |  |

● Encoders Soldering Conditions . . . . . 193

● Encoders Cautions . . . . . 194

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

## Reference for Hand Soldering

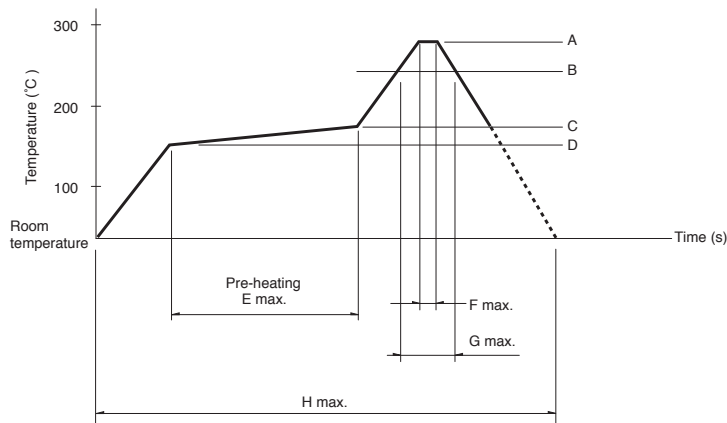
| Series                                                                                                                                                    | Tip temperature | Soldering time                 | No. of solders |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------|----------------|
| EC05E, EC09E, EC10E, EC111, 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, EC111, 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.