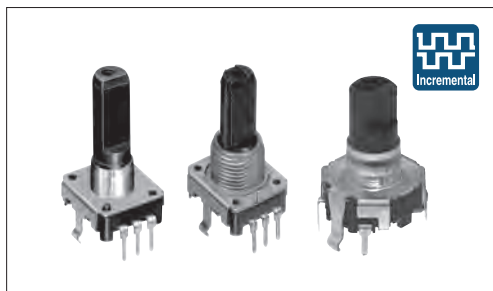


Typical Specifications



| Items | | Specifications |
|-----------------------------|----------------|--|
| Rating | | Each lead 0.5mA 5V DC Common lead 1mA 5V DC |
| Operating life | Without detent | Heavy: 15,000 cycles, Standard: 30,000 cycles |
| | With detent | 30,000 cycles |
| Operating temperature range | | EC12E: -10°C to +70°C EC12D: -40°C to +85°C |

Product Line

Standard Type

| Length of the shaft LM ₁ (mm) | Torque (mN·m) | Number of detent | Number of pulse | Minimum order unit (pcs.) | | Product No. | Drawing No. |
|---|-----------------------|------------------|-----------------|---------------------------|--------|--------------|----------------|
| | | | | Japan | Export | | |
| 15 | Standard 3 to 20 | 12 | 12 | 2,400 | 2,400 | EC12E1220407 | 2 |
| 20 | | | | | | EC12E1220406 | 1 |
| 25 | | | | | | EC12E1220405 | |
| 8.5 (Through shaft) | Lightest (jog) 3±2 | | | 3,000 | 3,000 | EC12E1220301 | 3 |
| 20 | | 2,400 | 2,400 | EC12E1240405 | 1 | | |
| 25 | | | | EC12E1240406 | | | |
| 8.5 (Through shaft) | | | | 3,000 | 3,000 | EC12E1240301 | 3 |
| 15 | Standard 3 to 20 | 24 | 24 | 2,400 | 2,400 | EC12E24204A2 | 2 |
| 17.5 | | | | | | EC12E24204A7 | 1 |
| 20 | | | | | | EC12E24204A8 | |
| 25 | | | | | | EC12E24204A9 | |
| 8.5 (Through shaft) | Lightest (jog) 3±2 | 3,000 | 3,000 | EC12E2420301 | 3 | | |
| 20 | | 2,400 | 2,400 | EC12E24404A8 | 1 | | |
| 25 | | | | EC12E24404A6 | | | |
| 8.5 (Through shaft) | | | | 3,000 | 3,000 | EC12E2440301 | 3 |
| 20 | Standard 10 max. | Without | 24 | 2,400 | 2,400 | EC12E24104A6 | 1 |
| 25 | Heavy 25±15 | | | | | EC12E2430404 | |
| | | | | | | EC12E2430401 | |

With Bushing Type

| Length of the shaft LM ₁ (mm) | Torque (mN·m) | Number of detent | Number of pulse | Minimum order unit (pcs.) | | Product No. | Drawing No. |
|---|---------------------|---------------------|-----------------|---------------------------|--------|--------------|----------------|
| | | | | Japan | Export | | |
| 25 | Standard 3 to 20 | 12 | 12 | 1,900 | 1,900 | EC12E1220813 | 4 |
| 20 | | 24 | 24 | | | EC12E2420802 | |
| 25 | | | | | | EC12E2420801 | |
| 30 | | | | | | EC12E2420803 | |
| 20 | Heavy 25±15 | Without | | | | EC12E2430804 | |
| 25 | | | | | | EC12E2430803 | |
| 30 | Heavy 40±15 | | | | | | |

Nuts and washers are not included. If required, please contact us.

Product Line

With Switch Type

| Length of the shaft LM ₁ (mm) | Detent torque (mN·m) | Number of detent | Number of pulse | Operating force of switch (N) | Travel of push-on switch (mm) | Minimum order unit (pcs.) | | Product No. | Drawing No. |
|--|----------------------|------------------|-----------------|-------------------------------|-------------------------------|---------------------------|--------|--------------|-------------|
| | | | | | | Japan | Export | | |
| 17.5 | 5±3 | 30 | 15 | 3 | 0.5 | 1,280 | 2,560 | EC12D1524403 | 5 |
| | 10±5 | | | EC12D1564402 | | | | | |
| | 5±3 | | | EC12D1524406 | | | | | |
| | 10±5 | | | EC12D1564404 | | | | | |

Notes

EC12D is suitable for automotive use.


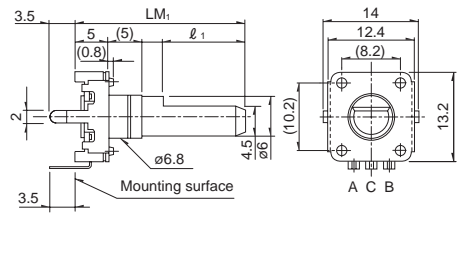
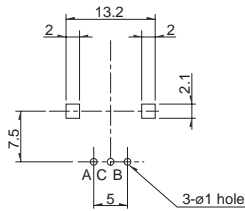

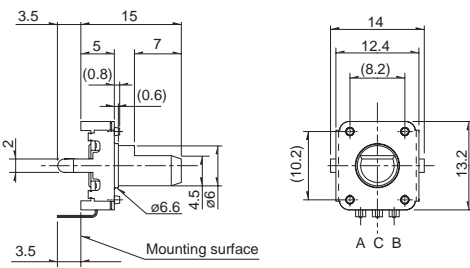
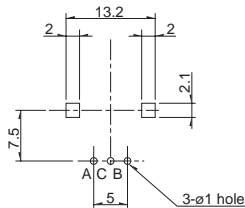

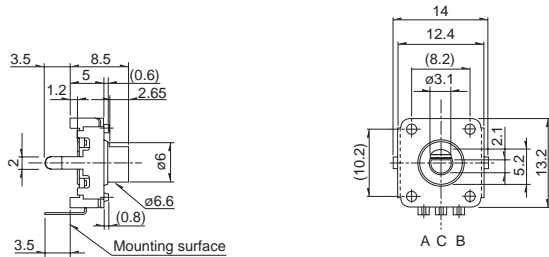
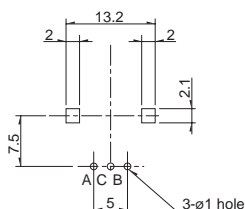
Packing Specifications

Tray

| Product No. | Number of packages (pcs.) | | Export package measurements (mm) |
|--------------|---------------------------|-------------------------|----------------------------------|
| | 1 case / Japan | 1 case / export packing | |
| EC12E □□□ 03 | 3,000 | 3,000 | 525×369×204 |
| EC12E □□□ 04 | 2,400 | 2,400 | |
| EC12E □□□ 08 | 1,900 | 1,900 | |
| EC12D | 1,280 | 2,560 | 540×360×290 |

Dimensions


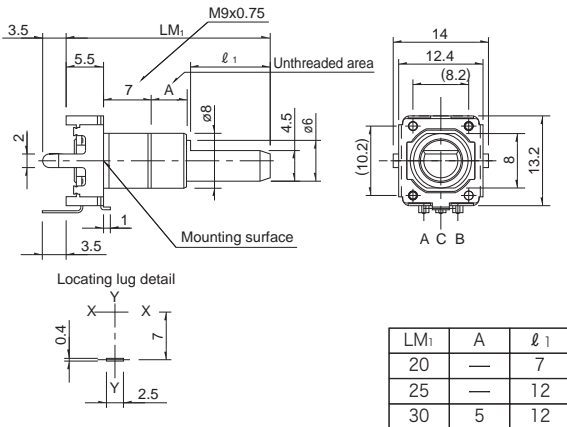
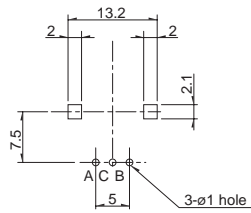


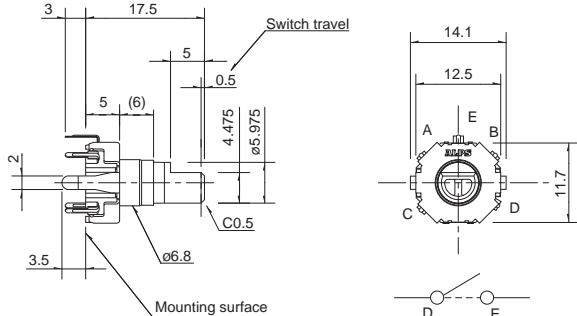
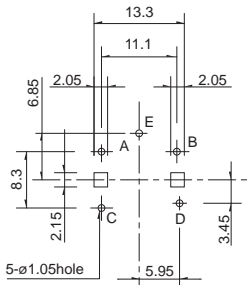
Unit:mm

| No. | Photo | Style | PC board mounting hole dimensions (Viewed from mounting side) | | | | | | | | |
|-----------------|---|---|---|----------------|------|---|----|---|----|----|---|
| 1 |  |  <table data-bbox="981 1339 1104 1435"><tr><th>LM₁</th><th>ℓ₁</th></tr><tr><td>17.5</td><td>5</td></tr><tr><td>20</td><td>7</td></tr><tr><td>25</td><td>12</td></tr></table> | LM ₁ | ℓ ₁ | 17.5 | 5 | 20 | 7 | 25 | 12 |  |
| LM ₁ | ℓ ₁ | | | | | | | | | | |
| 17.5 | 5 | | | | | | | | | | |
| 20 | 7 | | | | | | | | | | |
| 25 | 12 | | | | | | | | | | |
| 2 |  |  |  | | | | | | | | |
| 3 |  |  |  | | | | | | | | |

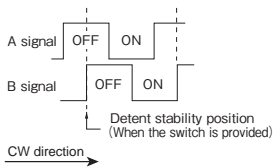
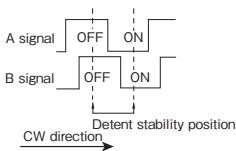
Refer to P.257 for switch specifications.
Refer to P.275 for soldering conditions.

Dimensions

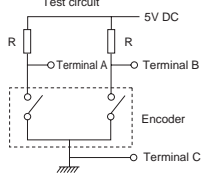
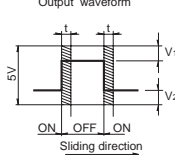
Unit:mm

| No. | Photo | Style | PC board mounting hole dimensions (Viewed from mounting side) | | | | | | | | | | | | |
|-----------------|---|---|---|---|----------------|----|---|---|----|---|----|----|---|----|--|
| 4 | <div>With bushing type</div>  | <div></div> <table><tr><th>LM₁</th><th>A</th><th>ℓ₁</th></tr><tr><td>20</td><td>—</td><td>7</td></tr><tr><td>25</td><td>—</td><td>12</td></tr><tr><td>30</td><td>5</td><td>12</td></tr></table> | LM ₁ | A | ℓ ₁ | 20 | — | 7 | 25 | — | 12 | 30 | 5 | 12 | <div></div> |
| LM ₁ | A | ℓ ₁ | | | | | | | | | | | | | |
| 20 | — | 7 | | | | | | | | | | | | | |
| 25 | — | 12 | | | | | | | | | | | | | |
| 30 | 5 | 12 | | | | | | | | | | | | | |
| 5 | <div>With push-on switch type</div> <div></div>  | <div></div> | <div></div> | | | | | | | | | | | | |

Output Wave

| | |
|---|---|
| <p>EC12E</p>  <p>CW direction →</p> <p>*Detent position cannot be specified for B signal.</p> | <p>EC12D</p>  <p>CW direction →</p> |
|---|---|

Sliding Noise

| | | |
|--|---|--|
| <p>Test circuit</p>  <p>Measurement condition : Rotation speed 360°/s</p> | <p>Output waveform</p>  <p>Sliding direction</p> <p>t : Masking time to avoid chattering</p> | <p>EC12E</p> <p>$V_1 = V_2 = 1.5V$ max. At $R = 10k\Omega$ Chattering : 3ms max. Bounce : 2ms max.</p> <p>EC12D</p> <p>$V_1 = V_2 = 2.5V$ max. At $R = 5k\Omega$ Chattering : 3ms max. Bounce : 2ms max.</p> |
|--|---|--|

12mm Size Insulated Shaft Type / Product Varieties

■ Shaft Dimensions

Flat Type: EC12E

Unit:mm











| High collar type | | Detailed dimensions <table border="1"> <thead> <tr> <th></th><th>LM_1</th><th>l_1</th></tr> </thead> <tbody> <tr> <td>※</td><td>17.5</td><td>5</td></tr> <tr> <td></td><td>20</td><td>7</td></tr> <tr> <td>※</td><td>22.5</td><td>7</td></tr> <tr> <td></td><td>25</td><td>12</td></tr> <tr> <td></td><td>30</td><td>12</td></tr> </tbody> </table> <p>※ Not available for types without detents</p> | | LM_1 | l_1 | ※ | 17.5 | 5 | | 20 | 7 | ※ | 22.5 | 7 | | 25 | 12 | | 30 | 12 |
|--------------------------|--------|---|--------|--------|-------|----|------|---|----|----|----|----|------|----|----|----|----|--|----|----|
| | LM_1 | l_1 | | | | | | | | | | | | | | | | | | |
| ※ | 17.5 | 5 | | | | | | | | | | | | | | | | | | |
| | 20 | 7 | | | | | | | | | | | | | | | | | | |
| ※ | 22.5 | 7 | | | | | | | | | | | | | | | | | | |
| | 25 | 12 | | | | | | | | | | | | | | | | | | |
| | 30 | 12 | | | | | | | | | | | | | | | | | | |
| With bushing type | | Detailed dimensions <table border="1"> <thead> <tr> <th>LM_1</th><th>A</th><th>l_1</th></tr> </thead> <tbody> <tr> <td>20</td><td>—</td><td>7</td></tr> <tr> <td>25</td><td>—</td><td>12</td></tr> <tr> <td>30</td><td>5</td><td>12</td></tr> <tr> <td>35</td><td>5</td><td>12</td></tr> </tbody> </table> <p>Excluding the 12 detent type</p> | LM_1 | A | l_1 | 20 | — | 7 | 25 | — | 12 | 30 | 5 | 12 | 35 | 5 | 12 | | | |
| LM_1 | A | l_1 | | | | | | | | | | | | | | | | | | |
| 20 | — | 7 | | | | | | | | | | | | | | | | | | |
| 25 | — | 12 | | | | | | | | | | | | | | | | | | |
| 30 | 5 | 12 | | | | | | | | | | | | | | | | | | |
| 35 | 5 | 12 | | | | | | | | | | | | | | | | | | |

12mm Size Insulated Shaft Type / Switch Specifications

| | | |
|------------------------|-----------------------|---|
| Switch type | | Momentary push switch |
| Contact arrangement | | Single pole and single throw (Push-on) |
| Travel (mm) | | 0.5±0.3 |
| Operating force | | 3 ± 1.5 N, 6 ± 2.5 N |
| Operating life | | 30,000 times |
| Electrical performance | Rating | 1 mA 5V DC (10mA 5V DC max. ratings) |
| | Contact resistance | 100mΩ max. for initial period, 200mΩ max. after operating life. |
| | Insulation resistance | 100MΩ min. 250V DC |
| | Voltage proof | 300V AC for 1 minute or 360V AC for 1 second |

Encoders

List of Varieties

| Type | | Metal shaft | Insulated shaft | | |
|------------------------------------|--|---|---|---|---|
| | | 11mm size | 12mm size | | 18mm size |
| Series | | EM11B | EC12E | EC12D | EC18A |
| Photo | |  |  |  |  |
| Output | | Incremental (Two phase A and B) | | | Absolute type |
| Shaft types | | Single-shaft | | | |
| Control part orientation | | Vertical | | | |
| Number of pulse / Number of detent | | 16/16 | 12/12 24/24 24/without | 15/30 | 12 positions 15 positions 16 positions |
| Features | | Magnetic type | — | With push-on switch | Water resisting performance (IPX7) |
| Dimensions (mm) | W | 10.8 | 12.4 | 12.5 | 18.8 |
| | D | 11 | 13.2 | 11.7 | 18 |
| | H | 7.5 | 5 | | 8.75 |
| Operating temperature range | | −30℃ to +85℃ | −10℃ to +70℃ | −40℃ to +85℃ | −20℃ to +60℃ |
| Operating life | | 1,000,000 cycles | 15,000 cycles 30,000 cycles | 30,000 cycles | |
| Automotive use | |  | — |  | — |
| Life cycle (availability) | |  |  |  |  |
| Electrical performance | Rating | 10mA 5V±5% DC | 0.5mA 5V DC | 1mA 5V DC | 1mA 10V DC |
| | Max./min. operating current (Resistive load) | 15mA / — | 5mA / 0.5mA | 10mA / 1mA | — |
| | Insulation resistance | 100MΩ min.100V DC | 10MΩ min. 50V DC | 100MΩ min. 250V DC | 10MΩ min. 250V DC |
| | Voltage proof | 250V AC for 1 minute or 300V AC for 2s | 50V AC for 1 minute | 300V AC for 1 minute or 360V AC for 1s | 50V AC for 1 minute or 60V AC for 2s |
| Mechanical performance | Rotational torque (Without detent) | — | 10mN·m max. 25±15mN·m 40±15mN·m | — | — |
| | Detent torque | 10±5mN·m | 3±2mN·m 3 to 20mN·m | 5±3mN·m 10±5mN·m | 60±20mN·m |
| | Push-pull strength | 100N | 80N | 100N | Push 100N / Pull 50N |
| Shaft configuration | | Flat | Flat, Through shaft | Flat | |
| Terminal type | | Insertion | | | |
| Switch Specifications | Switch type | Push-on switch | — | Push-on switch | — |
| | Contact arrangement | Single pole and single throw (Push-on) | — | Single pole and single throw (Push-on) | — |
| | Travel (mm) | 0.5 ± ^{0.3} _{0.2} | — | 0.5±0.3 | — |
| | Operating force (N) | 5.5±3 | — | 3 ± ^{1.5} ₁ 6 ± ^{2.5} ₂ | — |
| | Rating | 5mA 5V DC (50mA 12V DC max. ratings) | — | 1mA 5V DC (10mA 5V DC max. ratings) | — |
| | Contact resistance | 500mΩ max. for initial period, 5mΩ max. after operating life. | — | 100mΩ max. for initial period; 200mΩ max. after operating life. | — |
| | Operating life | 1,000,000 times | — | 30,000 times | — |
| Page | | 252 | 254 | 255 | 258 |

| | |
|-------------------------------|-----|
| Encoders Soldering Conditions | 275 |
| Encoders Cautions | 276 |

Notes

●Indicates applicability to all products in the series.

Reference for Manual Soldering

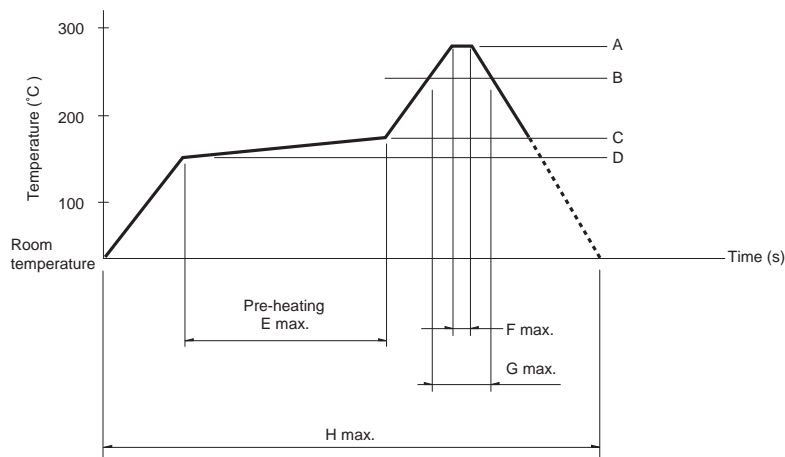
| Series | Tip temperature | Soldering time | No. of solders |
|--|-----------------|----------------|----------------|
| EC05E, EC09E, EC10E, EC111, EC11E, EC11M, EC11N, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC40A, EC50A, EM11B, EC21C, EC28C, EC35CH | 350°C max. | 3s max. | 1 time |

Reference for Dip Soldering

| Series | Preheating | | Dip soldering | | No. of solders |
|--|-------------------------------|--------------|-----------------------|----------------|----------------|
| | Soldering surface temperature | Heating time | Soldering temperature | Soldering time | |
| EC09E, EC111, EC11E, EC11M, EC11N, EC18A, EC21A, EC28A, EC35A, EC35AH, EC50A | 100°C max. | 2 min. max. | 260±5°C | 5±1s | 2 times max. |
| EM11B | 100°C max. | 1 min. max. | 260°C max. | 3s max. | 2 times max. |
| EC10E, EC12D, EC12E | 100°C max. | 1 min. max. | 260±5°C | 3±1s | 2 times max. |
| EC40A | 110°C max. | 1 min. max. | 260°C max. | 10s max. | 1 time |

Example of Reflow Soldering Condition

Temperature profile



| Series | A | B | C | D | E | F | G | H | No. of reflows |
|---------------|----------------|------------|-------|-------|-------------|----|------------|-----------|----------------|
| EC05E | 250°C min. | 230°C min. | 180°C | 150°C | 60s to 120s | — | 30s to 40s | — | 2 times max. |
| EC21C | 230°C to 245°C | 220°C | 200°C | 150°C | 60s to 120s | — | 25s to 60s | 300s max. | 1 time max. |
| EC28C, EC35CH | 260°C | 230°C | 180°C | 150°C | 2 min. min. | 3s | 40s | 230s max. | 1 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 encoder when employing a hot air reflow method. The temperature of the PC board and the surface temperature of the encoder may vary greatly depending on the PC board material, its size and thickness. Ensure that the surface temperature of the encoder 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.

Mouser Electronics

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[EC12E2440301](#) [EC12E2430404](#) [EC12E2430401](#) [EC12E2430804](#) [EC12E2430803](#) [EC12E24204A7](#) [EC12E24104A6](#)
[EC12E1220813](#) [EC12E2420803](#) [EC12E2460802](#) [EC12D1564402](#) [EC12D1524403](#) [EC12E2420801HARD](#)
[EC12E2420301](#) [EC12E1220405](#) [EC12E1220407](#) [EC12E1220406](#) [EC12D1564404](#) [EC12E24204A8](#) [EC12E24204A9](#)
[EC12D1524406](#) [EC12E2420802](#) [EC12E24204A2](#) [EC12E2420801](#)