

# EC45A 45mm Size Ring Type

Large ring, heavy torque device perfect for large ring knob design



Encoders



## Typical Specifications

| Items                       | Specifications |
|-----------------------------|----------------|
| Rating(max.)                | 0.5mA 5V DC    |
| Operating life              | 30,000 cycles  |
| Operating temperature range | -40°C to +85°C |

## Product Line

| Output code    | Positions | Rotational angle | Detent torque (mN·m) | Minimum order unit (pcs.) |        | Product No.         |
|----------------|-----------|------------------|----------------------|---------------------------|--------|---------------------|
|                |           |                  |                      | Japan                     | Export |                     |
| 5bit Gray code | 31        | 240°             | 36±16                | 280                       | 560    | <b>EC45AG520402</b> |

## Note

Other varieties are also available. Please inquire.

## Packing Specifications

Tray

| Number of packages (pcs.) |                        | Export package measurements (mm) |
|---------------------------|------------------------|----------------------------------|
| 1 case /Japan             | 1 case /export packing |                                  |
| 280                       | 560                    | 525×375×477                      |

## Dimensions

| Style | PC board mounting hole dimensions (Viewed from mounting side) |
|-------|---------------------------------------------------------------|
|       |                                                               |

## Standard Codes (Number of Positions : 31)

| Code | Terminal | Position |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |
|------|----------|----------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|
|      |          | 1        | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |   |
| Gray | 4        | ●        | ● |   |   | ● | ● |   |   | ● | ●  |    |    | ●  | ●  |    |    | ●  | ●  |    |    | ●  | ●  |    |    | ●  | ●  |    |    | ●  | ●  |    |   |
|      | 2        |          | ● | ● | ● | ● |   |   |   |   | ●  | ●  | ●  | ●  |    |    |    |    | ●  | ●  | ●  | ●  |    |    |    |    | ●  | ●  | ●  | ●  |    |    |   |
|      | 3        |          |   |   | ● | ● | ● | ● | ● | ● | ●  | ●  | ●  |    |    |    |    |    |    |    |    | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  |    |   |
|      | 5        |          |   |   |   |   |   |   | ● | ● | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  |   |
|      | 6        |          |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ●  | ● |

- The ● marks shows the ON position.
- The ● marks : Connections between terminals and the common terminal (terminal No. =1) are ON.

| Type                                  |                                                 | Ring type                                                                         |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|---------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                       |                                                 | 35mm size                                                                         |                                                                                   | 40mm size                                                                         | 45mm size                                                                          | 50mm size                                                                           | 60mm size                                                                           |
| Series                                |                                                 | EC35CH                                                                            | EC35B                                                                             | EC40A                                                                             | EC45A                                                                              | EC50A                                                                               | EC60B                                                                               |
| Photo                                 |                                                 |  |  |  |  |  |  |
| Output                                |                                                 | Incremental<br>(Three phase A, B and C)                                           | Incremental<br>(Two phase A and B)<br>/Self-return switch                         | Incremental<br>(Two phase A and B)                                                | Absolute type                                                                      | Incremental<br>(Two phase A and B)                                                  |                                                                                     |
| Shaft types                           |                                                 | Ring type                                                                         |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
| Number of pulse /<br>Number of detent |                                                 | 6×ABC/18                                                                          | 15/30                                                                             | 15/30                                                                             | 31 positions                                                                       | 9/18                                                                                | 15/30                                                                               |
| Dimensions<br>(mm)                    | W                                               | 35.2                                                                              | 35                                                                                | 40.4                                                                              | 44.5                                                                               | 50.8                                                                                | 62.4                                                                                |
|                                       | D                                               | 36                                                                                | 37                                                                                | 43                                                                                | 45                                                                                 | 50                                                                                  | 60                                                                                  |
|                                       | H                                               | 4.5                                                                               | 12.1                                                                              | 9                                                                                 |                                                                                    | 6.5                                                                                 | 7.5                                                                                 |
| Operating temperature range           |                                                 | -40°C to +90°C                                                                    |                                                                                   | -40°C to +85°C                                                                    |                                                                                    |                                                                                     |                                                                                     |
| Operating life                        |                                                 | 50,000 cycles                                                                     |                                                                                   | 30,000 cycles                                                                     |                                                                                    | 40,000 cycles                                                                       |                                                                                     |
| Automotive use                        |                                                 |  |  |  |  |  |  |
| Life cycle (availability)             |                                                 |  |  |  |  |  |  |
| Electrical<br>performance             | Rating                                          | 10mA 5V DC                                                                        |                                                                                   | 0.5mA 5V DC                                                                       |                                                                                    | 1mA 5V DC                                                                           | 10mA 5V DC                                                                          |
|                                       | Max./min. operating<br>current (Resistive load) | 10mA / 1mA                                                                        |                                                                                   | —                                                                                 | —                                                                                  | —                                                                                   | —                                                                                   |
|                                       | Insulation resistance                           | 100MΩ min. 250V DC                                                                |                                                                                   | 10MΩ min. 50V DC                                                                  |                                                                                    | 10MΩ min.<br>250V DC                                                                | 100MΩ min.<br>250V DC                                                               |
|                                       | Voltage proof                                   | 300V AC for 1minute<br>or 360V AC for 1s                                          |                                                                                   | 50V AC for<br>1 minute                                                            | 50V AC for 1 minute<br>or 60V AC for 2s                                            |                                                                                     | 300V AC for 1 minute<br>or 360V AC for 1s                                           |
| Mechanical<br>performance             | Detent torque                                   | 22±11mN·m<br>(Initial)<br>18±7mN·m<br>(After reflow)                              | 20±10mN·m                                                                         | 20±11mN·m<br>40±16mN·m                                                            | 36±16mN·m                                                                          | 40±14mN·m                                                                           | 40±10mN·m                                                                           |
|                                       | Push-pull<br>strength                           | Push                                                                              | 100N                                                                              |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                       |                                                 | Pull                                                                              | 100N                                                                              | 50N                                                                               |                                                                                    | 100N                                                                                |                                                                                     |
| Shaft configuration                   |                                                 | Ring type                                                                         |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
| Terminal type                         |                                                 | Insertion                                                                         |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
| Switch<br>Specifications              | Switch type                                     | —                                                                                 | Self-return switch                                                                | —                                                                                 | —                                                                                  | —                                                                                   | —                                                                                   |
|                                       | Contact<br>arrangement                          | —                                                                                 | Single pole and<br>double throw                                                   | —                                                                                 | —                                                                                  | —                                                                                   | —                                                                                   |
|                                       | Travel (mm)                                     | —                                                                                 | 2.8±0.5                                                                           | —                                                                                 | —                                                                                  | —                                                                                   | —                                                                                   |
|                                       | Operating force (N)                             | —                                                                                 | 3.8±1.5                                                                           | —                                                                                 | —                                                                                  | —                                                                                   | —                                                                                   |
|                                       | Switch ON position                              | —                                                                                 | 15°±5°                                                                            | —                                                                                 | —                                                                                  | —                                                                                   | —                                                                                   |
|                                       | Rotational torque                               | —                                                                                 | 40±25mN·m                                                                         | —                                                                                 | —                                                                                  | —                                                                                   | —                                                                                   |
|                                       | Rating                                          | —                                                                                 | 10mA 5V DC                                                                        | —                                                                                 | —                                                                                  | —                                                                                   | —                                                                                   |
|                                       | Contact resistance                              | —                                                                                 | 200mΩ max.                                                                        | —                                                                                 | —                                                                                  | —                                                                                   | —                                                                                   |
|                                       | Operating life                                  | —                                                                                 | 15,000 cycles                                                                     | —                                                                                 | —                                                                                  | —                                                                                   | —                                                                                   |
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#### Note

● Indicates applicability to all products in the series.

## Reference for Manual Soldering

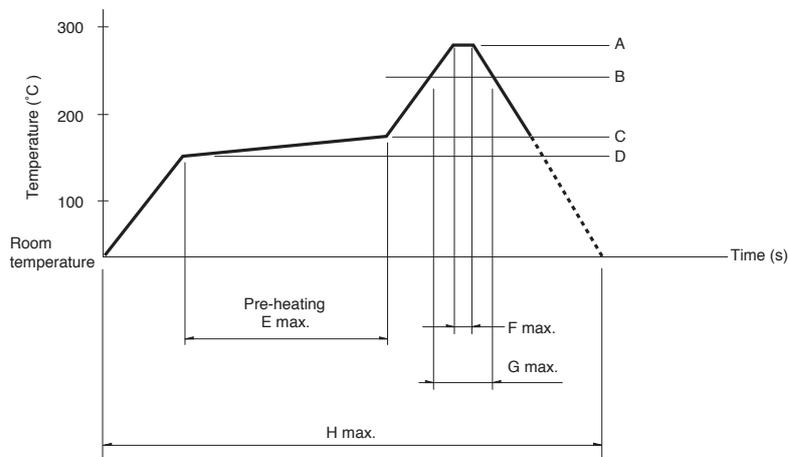
| Series                                                                                                                                                                          | Tip temperature | Soldering time                 | No. of solders |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------|----------------|
| EC05E, EC09E, EC10E, EC111, EC11B, EC11E, EC11G, EC11K, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC40A, EC45A, EC50A, EC60B, EM11B, EM20B, EC21C, EC28C, EC35CH | 350°C max.      | 3s max.                        | 1 time         |
| EC11J                                                                                                                                                                           | 350±10°C        | 3 <sup>+1</sup> <sub>0</sub> s | 2 times        |

## 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, EC21A, EC28A, EC35A, EC35AH, EC35B, EC50A, EC60B | 100°C max.                    | 2 min. max.  | 260±5°C               | 5±1s           | 2 times max.   |
| EC10E, EC12D, EC12E, EM11B                                                                        | 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         |
| EC45A                                                                                             | 100°C max.                    | 2 min. max.  | 260°C max.            | 5s max.        | 2 times max.   |
| EM20B                                                                                             | 80°C max.                     | 1 min. max.  | 260°C max.            | 3s max.        | 2 times max.   |

## Example of Reflow Soldering Condition

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 times max.   |
| 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.    |

### 注記

- 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.

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