



## ■ 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 <sub>1</sub> (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	<b>EC12E1220407</b>	2
20						<b>EC12E1220406</b>	1
25				3,000	3,000	<b>EC12E1220405</b>	
8.5 (Through shaft)						<b>EC12E1220301</b>	3
20				2,400	2,400	<b>EC12E1240405</b>	1
25						<b>EC12E1240406</b>	
8.5 (Through shaft)	Lightest (jog) 3±2	24	24	2,400	2,400	<b>EC12E1240301</b>	3
15						<b>EC12E24204A2</b>	2
17.5				3,000	3,000	<b>EC12E24204A7</b>	1
20						<b>EC12E24204A8</b>	
25				2,400	2,400	<b>EC12E24204A9</b>	1
8.5 (Through shaft)						<b>EC12E2420301</b>	
20	Standard 3 to 20	24	24	2,400	2,400	<b>EC12E24404A8</b>	1
25						<b>EC12E24404A6</b>	
8.5 (Through shaft)				3,000	3,000	<b>EC12E2440301</b>	3
20						<b>EC12E24104A6</b>	1
25				2,400	2,400	<b>EC12E2430404</b>	
25						<b>EC12E2430401</b>	1

## With Bushing Type

Length of the shaft LM <sub>1</sub> (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	<b>EC12E1220813</b>	4		
20						<b>EC12E2420802</b>			
25		24	24			<b>EC12E2420801</b>			
30						<b>EC12E2420803</b>			
20		Heavy 25±15	Without			<b>EC12E2430804</b>			
25						<b>EC12E2430803</b>			
30	Heavy 40±15					<b>EC12E2460802</b>			

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

Refer to P.257 for product varieties.  
Refer to P.275 for soldering conditions.

## ■ Product Line

### With Switch Type

Length of the shaft LM <sub>1</sub> (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			6				EC12D1524406	
	10±5							EC12D1564404	

## Notes

EC12D is suitable for automotive use.

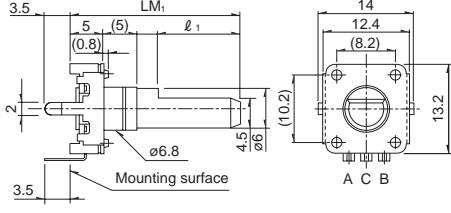
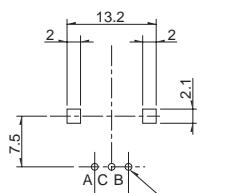
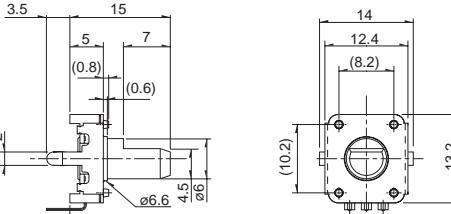
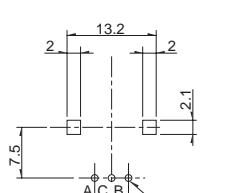
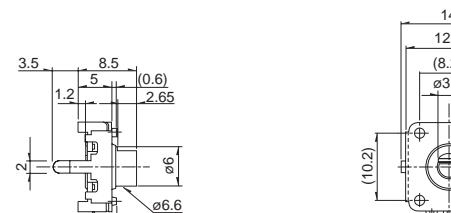
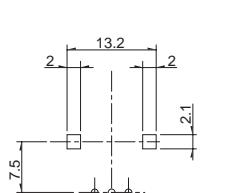
## Packing Specifications

Tray

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

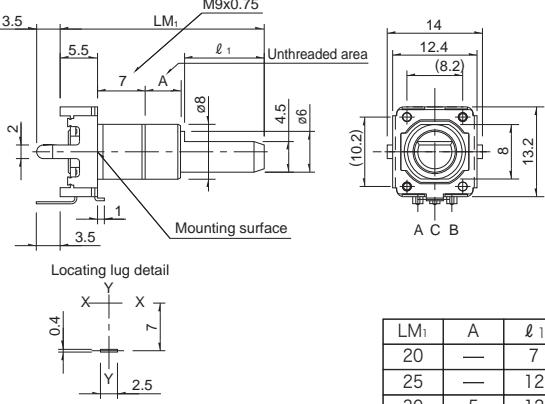
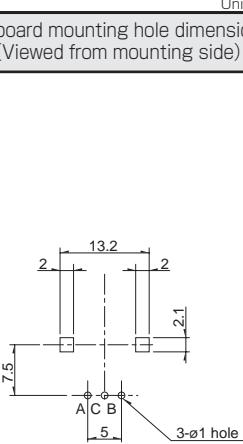
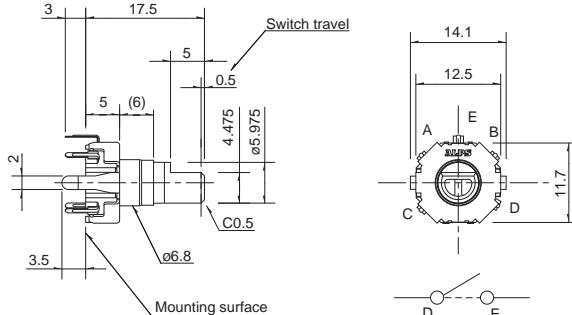
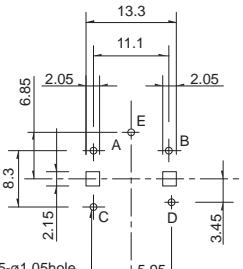
## Dimensions

Unit:mm

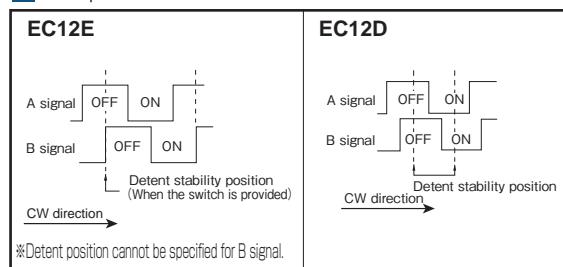
No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)								
1	<b>High collar type</b> 	 <table border="1"> <tr><td>LM<sub>1</sub></td><td><math>l_1</math></td></tr> <tr><td>17.5</td><td>5</td></tr> <tr><td>20</td><td>7</td></tr> <tr><td>25</td><td>12</td></tr> </table>	LM <sub>1</sub>	$l_1$	17.5	5	20	7	25	12	
LM <sub>1</sub>	$l_1$										
17.5	5										
20	7										
25	12										
2	<b>Short shaft type</b> 										
3	<b>Through shaft type</b> 										

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

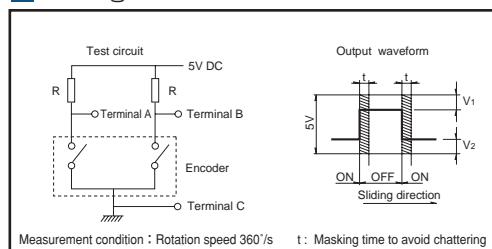
## Dimensions

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)												
4	<b>With bushing type</b> 	 <table border="1" data-bbox="917 698 1108 804"> <tr><th>LM<sub>1</sub></th><th>A</th><th>ℓ<sub>1</sub></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 <sub>1</sub>	A	ℓ <sub>1</sub>	20	—	7	25	—	12	30	5	12	<p>Unit:mm</p> 
LM <sub>1</sub>	A	ℓ <sub>1</sub>													
20	—	7													
25	—	12													
30	5	12													
5	<b>With push-on switch type</b> 														

## Output Wave



## Sliding Noise



<b>EC12E</b>
$V_1 = V_2 = 1.5V$ max. At $R = 10k\Omega$ Chattering : 3ms max. Bounce : 2ms max.
<b>EC12D</b>

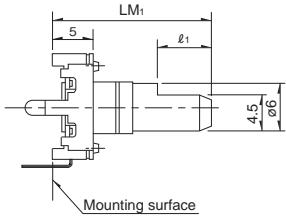
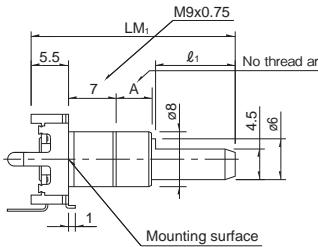
<b>EC12D</b>
$V_1 = V_2 = 2.5V$ max. At $R = 5k\Omega$ Chattering : 3ms max. Bounce : 2ms max.

# 12mm Size Insulated Shaft Type / Product Varieties

In addition to the Product Line, we accommodate the following specifications. Combinations not included in the Product Line are treated as semi-standard products.

## Shaft Dimensions

Flat Type: EC12E

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

Encoders

Metal Shaft  
Insulated  
Shaft

Through  
Shaft Type  
Ring Type

# 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 <sup>+1.5</sup> <sub>-1</sub> N, 6 <sup>+2.5</sup> <sub>-2</sub> N	
Operating life	30,000 times	
Electrical performance	Rating	1mA 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

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°C to +85°C	−10°C to +70°C	−40°C to +85°C	−20°C to +60°C
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 <sup>+0.3</sup> <sub>-0.2</sub>	—	0.5±0.3	—
	Operating force (N)	5.5±3	—	3 <sup>+1.5</sup> <sub>-1</sub> 6 <sup>+2.5</sup> <sub>-2</sub>	—
	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	—

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## Notes

- Indicates applicability to all products in the series.

# Encoders / Soldering Conditions

## ■ Reference for Manual Soldering

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

Encoders

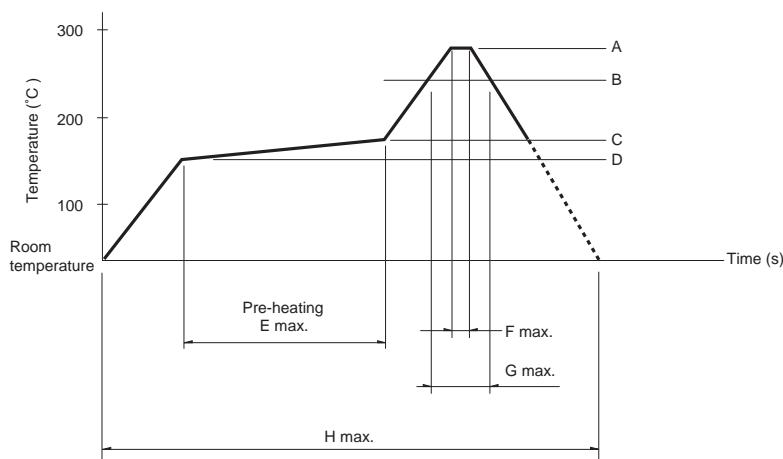
## ■ Reference for Dip Soldering

Series	Preheating		Dip soldering		No. of solders
	Soldering surface temperature	Heating time	Soldering temperature	Soldering time	
<b>EC09E, EC11, EC11E, EC11M, EC11N, EC18A, EC21A, EC28A, EC35A, EC35AH, EC50A</b>	100°C max.	2 min. max.	260±5°C	5±1s	2 times max.
<b>EM11B</b>	100°C max.	1 min. max.	260°C max.	3s max.	2 times max.
<b>EC10E, EC12D, EC12E</b>	100°C max.	1 min. max.	260±5°C	3±1s	2 times max.
<b>EC40A</b>	110°C max.	1 min. max.	260°C max.	10s max.	1 time

Metal Shaft  
Insulated Shaft  
Through Shaft Type  
Ring Type

## ■ Example of Reflow Soldering Condition

Temperature profile



Series	A	B	C	D	E	F	G	H	No. of reflows
<b>EC05E</b>	250°C min.	230°C min.	180°C	150°C	60s to 120s	—	30s to 40s	—	2 times max.
<b>EC21C</b>	230°C to 245°C	220°C	200°C	150°C	60s to 120s	—	25s to 60s	300s max.	1 time max.
<b>EC28C, EC35CH</b>	260°C	230°C	180°C	150°C	2 min. min.	3s	40s	230s max.	1 time max.

### Notes

1. 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.
2. 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.
3. Conditions vary to some extent depending on the type of reflow bath used. Be sure to give due consideration to this prior to use.