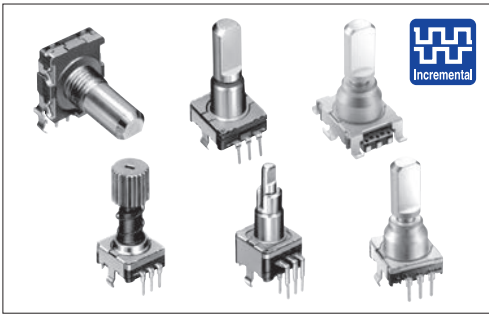


Compact and highly reliable type available in many varieties



Typical Specifications

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

Product Line

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

Note

Other varieties are also available. Please inquire.

Refer to P.275 for product specifications.
 Refer to P.276 for attached parts.
 Refer to P.278 for product varieties.
 Refer to P.307 for soldering conditions.

Encoders
Metal Shaft
Insulated Shaft
Hollow Shaft
Ring Type

EC11 1 1 mm Size Metal Shaft Type

Product Line

Structure	Shaft configuration	Length of the shaft L ₁ , L ₂ (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				
Reflow	Flat	20	12±5	18	9	Without	—	100,000	300	600	EC11J0920404	11		
											EC11J152040F			
											12	EC11J0924411		
												EC11J1524413		
												EC11J0925403		
												EC11J1525402		
Push lock	20-tooth Serrated	25	10±7	30	15	Without	—	15,000	800	1,600	EC11E152T409	13		
		26.4									With	8	EC11E152U402	14
Self-return switch	Flat	15	3 to 30	Without	Self-return switch	Without	—	15,000	1,200	2,400	EC1110120005	15		
		20									With	0.5	EC111012010H	16
												1.5	EC1110120201	
Dual-shaft	Slotted	Inner-shaft=25	10±7	30	15	Without	—	15,000	700	1,400	EC11EBB24C03	17		
		Outer-shaft=15									With	1.5	EC11E0B2LB01	18
	Flat	Inner-shaft=25	3 to 30	Without	Self-return switch	Without	—							
	Slotted	Outer-shaft=15												

Note

Other varieties are also available. Please inquire.

Packing Specifications


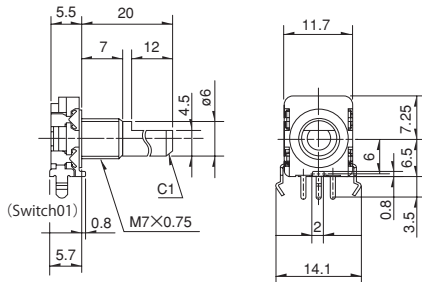
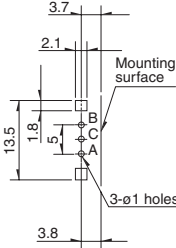

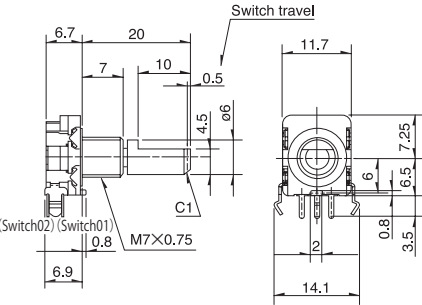
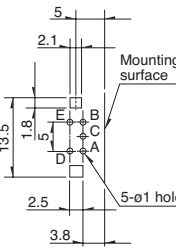

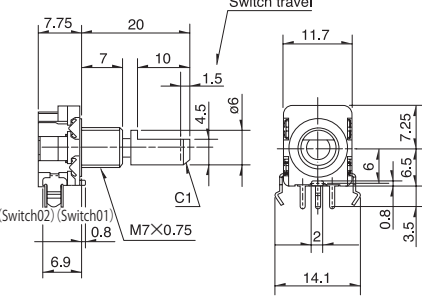
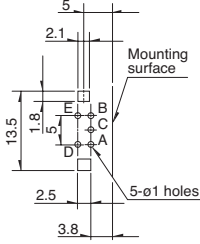

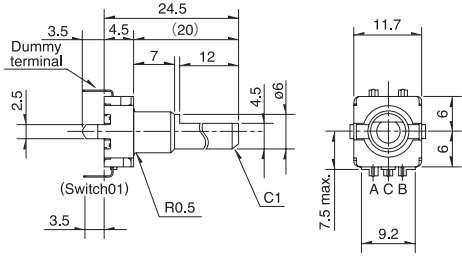
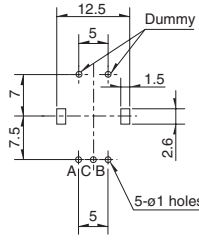

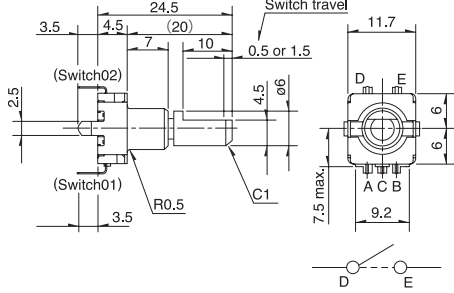
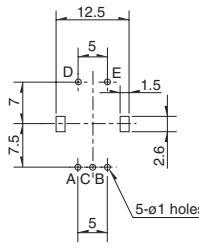
Tray

Product No.	Number of packages (pcs.)		Export package measurements (mm)
	1 case / Japan	1 case / export packing	
EC11B	700	1,400	370×520×201
EC11E09 / 15 / 18	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	

Refer to P.275 for product specifications.
 Refer to P.276 for attached parts.
 Refer to P.278 for product varieties.
 Refer to P.307 for soldering conditions.

■ Dimensions

Unit:mm


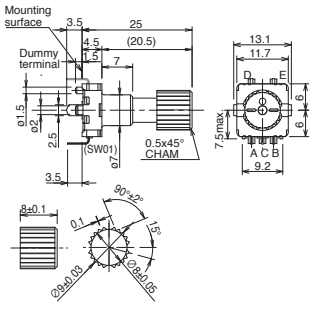
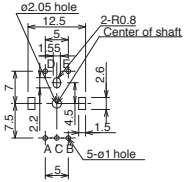

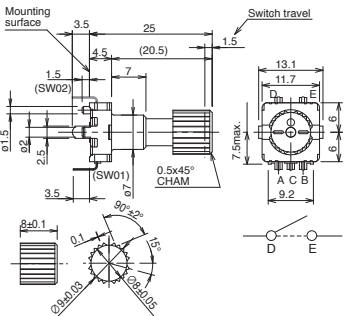
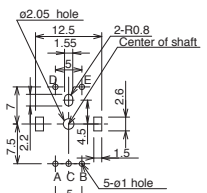

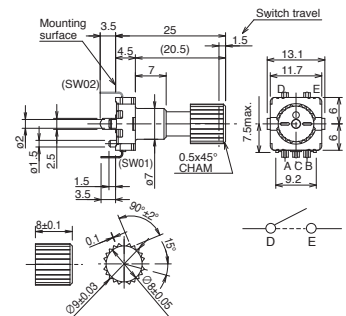
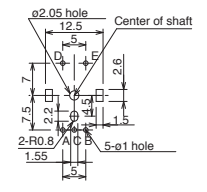

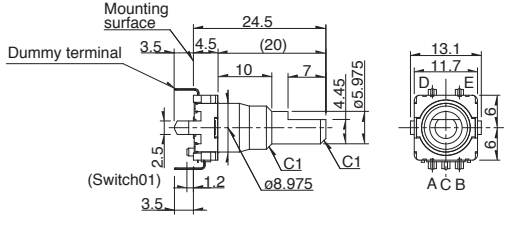
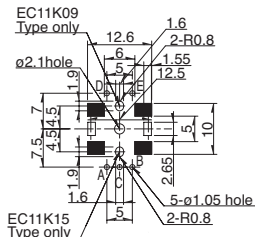

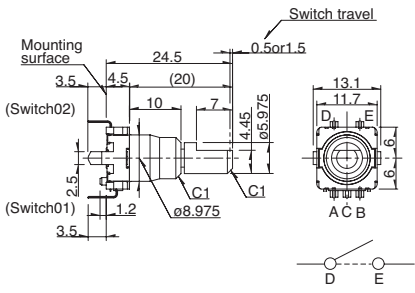
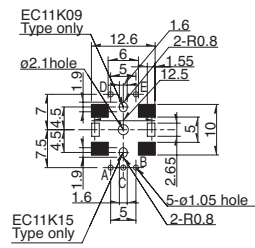
No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
1	 <p>EC11B Horizontal</p>	 <p>5.5 20 7 12 4.5 0.6 11.7 14.1 7.25 6 0.8 3.5 6 0.8 3.5 5.7 0.8 M7X0.75 C1 (Switch01)</p>	 <p>3.7 2.1 13.5 1.8 5 5 3 3 3 3.8 3-ø1 holes Mounting surface</p>
2	 <p>EC11B Horizontal with push-on switch (travel 0.5mm)</p>	 <p>6.7 20 7 10 0.5 0.6 11.7 14.1 7.25 6 0.8 3.5 6 0.8 3.5 6.9 0.8 M7X0.75 C1 (Switch02) (Switch01) Switch travel</p>	 <p>5 2.1 13.5 1.8 5 5 3 3 3 3.8 5-ø1 holes Mounting surface</p>
3	 <p>EC11B Horizontal with push-on switch (travel 1.5mm)</p>	 <p>7.75 20 7 10 1.5 0.6 11.7 14.1 7.25 6 0.8 3.5 6 0.8 3.5 6.9 0.8 M7X0.75 C1 (Switch02) (Switch01) Switch travel</p>	 <p>5 2.1 13.5 1.8 5 5 3 3 3 3.8 5-ø1 holes Mounting surface</p>
4	 <p>EC11E Vertical</p>	 <p>3.5 4.5 24.5 (20) 7 12 4.5 0.6 11.7 9.2 7.5 max. 6 6 3.5 2.5 3.5 R0.5 C1 (Switch01) Dummy terminal</p>	 <p>12.5 5 7.5 7 1.5 2.6 5 5-ø1 holes Dummy</p>
5	 <p>EC11E Vertical with push-on switch (travel 0.5 / 1.5mm)</p>	 <p>3.5 4.5 24.5 (20) 7 10 0.5 or 1.5 0.6 11.7 9.2 7.5 max. 6 6 3.5 2.5 3.5 R0.5 C1 (Switch02) (Switch01) Switch travel</p>	 <p>12.5 5 7.5 7 1.5 2.6 5 5-ø1 holes</p>

Encoders
Metal Shaft
Insulated Shaft
Hollow Shaft
Ring Type

EC11 11 mm Size Metal Shaft Type


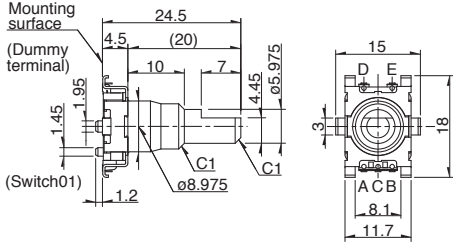
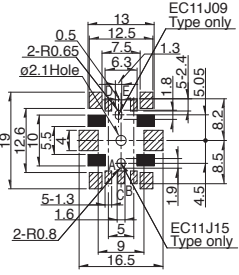

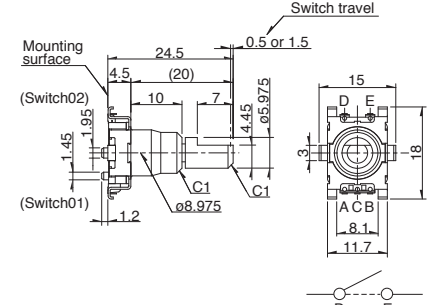
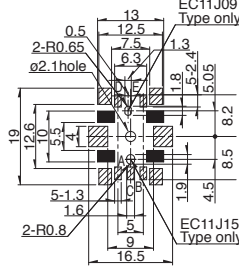

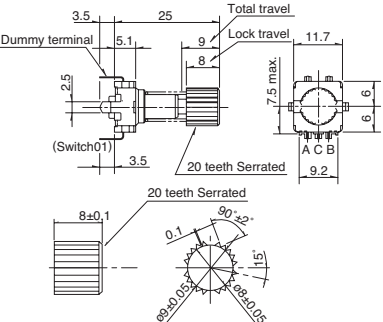
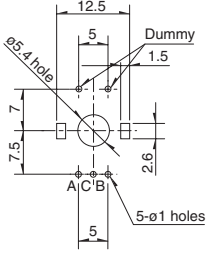

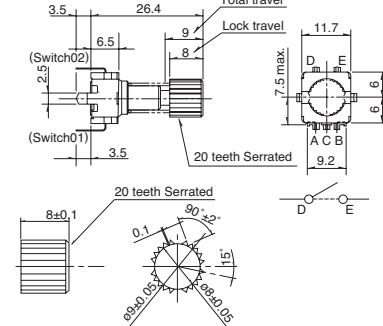
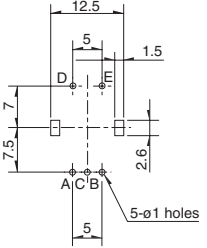

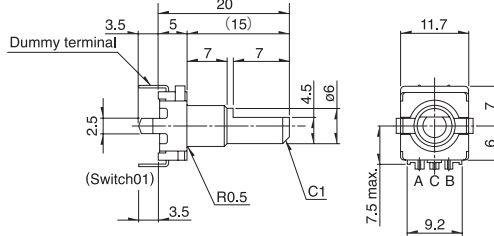
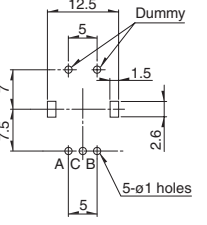
Dimensions

Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
6	 <p>EC11G Vertical</p>	 <p>Mounting surface 3.5 25 4.5 (20.5) 7 13.1 11.7 6 6 7.5max. 0.5x45° CHAM A C B 9.2 0.15 0.2 2.5 0.1 0.15 8±0.1 0.1 90°±2° 1.5 2.6±0.05</p>	 <p>ø2.05 hole 12.5 1.55 2-R0.8 Center of shaft 7.5 7 2.2 4.5 1.5 5 A C B 5-ø1 hole</p>
7	 <p>EC11G Vertical with push-on switch (travel 1.5mm)</p>	 <p>Mounting surface 3.5 25 4.5 (20.5) 1.5 19.1 11.7 6 6 7.5max. 0.5x45° CHAM A C B 9.2 0.15 0.2 2.5 0.1 0.15 8±0.1 0.1 90°±2° 1.5 2.6±0.05 Switch travel D E</p>	 <p>ø2.05 hole 12.5 1.55 2-R0.8 Center of shaft 7.5 7 2.2 4.5 1.5 5 A C B 5-ø1 hole</p>
8	 <p>EC11G Vertical with push-on switch (travel 1.5mm)</p>	 <p>Mounting surface 3.5 25 4.5 (20.5) 1.5 19.1 11.7 6 6 7.5max. 0.5x45° CHAM A C B 9.2 0.15 0.2 2.5 0.1 0.15 8±0.1 0.1 90°±2° 1.5 2.6±0.05 Switch travel D E</p>	 <p>ø2.05 hole 12.5 1.55 2-R0.8 Center of shaft 7.5 7 2.2 4.5 1.5 5 A C B 5-ø1 hole</p>
9	 <p>EC11K Vertical</p>	 <p>Mounting surface 24.5 3.5 4.5 (20) 10 7 4.45 0.5.975 13.1 11.7 6 6 1.2 ø8.975 C1 C1 A C B Dummy terminal (Switch01)</p>	 <p>EC11K09 Type only 1.6 12.6 2-R0.8 1.55 12.5 ø2.1hole 1.9 7 4.5 1.9 5 10 A C B 5-ø1.05 hole 2-R0.8 EC11K15 Type only</p> <p>Black part : Do not solder and no wiring for electrical contact.</p>
10	 <p>EC11K Vertical with push-on switch (travel 0.5mm / 1.5mm)</p>	 <p>Mounting surface 24.5 3.5 4.5 (20) 10 7 4.45 0.5.975 13.1 11.7 6 6 1.2 ø8.975 C1 C1 A C B Switch travel 0.5or1.5 (Switch02) (Switch01) D E</p>	 <p>EC11K09 Type only 1.6 12.6 2-R0.8 1.55 12.5 ø2.1hole 1.9 7 4.5 1.9 5 10 A C B 5-ø1.05 hole 2-R0.8 EC11K15 Type only</p> <p>Black part : Do not solder and no wiring for electrical contact.</p>

Dimensions

Unit:mm


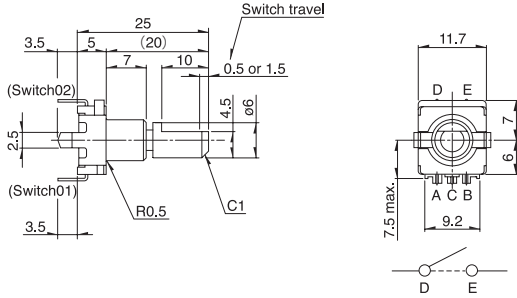
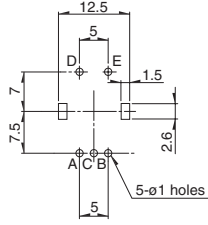
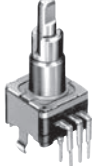
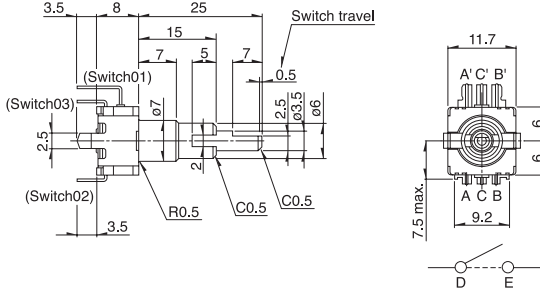
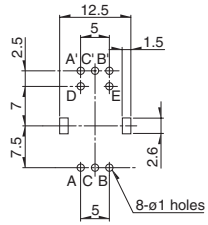

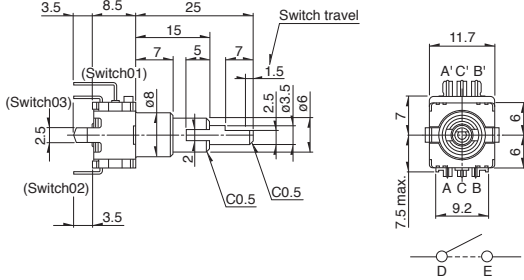
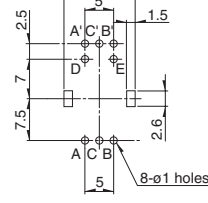
No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
11	 <p>EC11J Reflow</p>	 <p>Mounting surface (Dummy terminal) (Switch01) 24.5 (20) 4.5 10 7 4.45 ø5.975 1.45 1.95 1.2 ø8.975 C1 C1 15 D E 18 A C B 8.1 11.7</p>	 <p>EC11J09 Type only EC11J15 Type only 2-R0.65 ø2.1Hole 13 12.5 7.5 6.3 1.3 1.8 5.2 5.05 19 12.6 10 5-1.3 1.6 2-R0.8 5 9 16.5 1.9 4.5 8.5 8.2</p> <p>A slant line part: The solder land Black part: Do not solder and wiring for electrical contact</p>
12	 <p>EC11J Reflow with push-on switch (travel 0.5mm / 1.5mm)</p>	 <p>Mounting surface (Switch02) (Switch01) 24.5 (20) 4.5 10 7 4.45 ø5.975 1.45 1.95 1.2 ø8.975 C1 C1 Switch travel 0.5 or 1.5 15 D E 18 A C B 8.1 11.7</p>	 <p>EC11J09 Type only EC11J15 Type only 2-R0.65 ø2.1hole 13 12.5 7.5 6.3 1.3 1.8 5.2 5.05 19 12.6 10 5-1.3 1.6 2-R0.8 5 9 16.5 1.9 4.5 8.5 8.2</p> <p>A slant line part: The solder land Black part: Do not solder and wiring for electrical contact</p>
13	 <p>EC11E152T Push-lock mechanism</p>	 <p>Dummy terminal (Switch01) 3.5 5.1 2.5 3.5 20 teeth Serrated 8±0.1 0.1 90°±2° 15° ø9±0.05 ø8±0.05 Total travel Lock travel 11.7 7.5 max. 9 6 6 A C B 9.2</p>	 <p>EC11J09 Type only EC11J15 Type only 12.5 5 1.5 Dummy ø5.4 hole 7 7.5 2.6 5 5-ø1 holes A C B</p>
14	 <p>EC11E152U Push-lock mechanism with push-lock switch</p>	 <p>(Switch02) (Switch01) 3.5 6.5 2.5 3.5 20 teeth Serrated 8±0.1 0.1 90°±2° 15° ø9±0.05 ø8±0.05 Total travel Lock travel 11.7 7.5 max. 9 6 6 A C B 9.2</p>	 <p>EC11J09 Type only EC11J15 Type only 12.5 5 1.5 Dummy 7 7.5 2.6 5 5-ø1 holes A C B</p>
15	 <p>EC111 Self-return switch</p>	 <p>Dummy terminal (Switch01) 3.5 5 7 7 4.5 ø6 R0.5 C1 15 D E 11.7 6 7 A C B 9.2 7.5 max.</p>	 <p>EC11J09 Type only EC11J15 Type only 12.5 5 1.5 Dummy 7 7.5 2.6 5 5-ø1 holes A C B</p>

Encoders
Metal Shaft
Insulated Shaft
Hollow Shaft
Ring Type

EC11 11 mm Size Metal Shaft Type

Dimensions

Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
16	 <p>EC111 Self-return switch with push-on switch (travel 0.5mm / 1.5mm)</p>		
17	 <p>EC111E Dual-shaft type with push-on switch (travel 0.5mm) Inner shaft: encoder Outer shaft: encoder</p>		
18	 <p>EC111E Dual-shaft type with push-on switch (travel 1.5mm) Inner shaft: encoder Outer shaft: self-return switch</p>		

Encoders

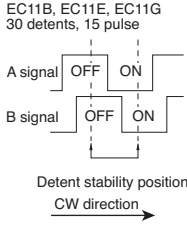
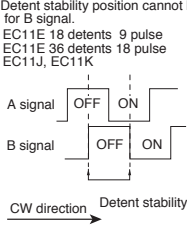
Metal Shaft

Insulated Shaft

Hollow Shaft

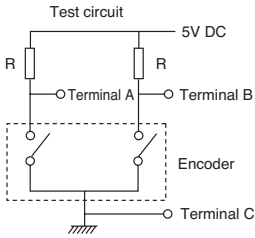
Flange Type

Output Wave

EC11B / EC11E / EC11G	EC11E / EC11J / EC11K
<p>EC11B, EC11E, EC11G 30 detents, 15 pulse</p> 	<p>Detent stability position cannot be specified for B signal. EC11E 18 detents 9 pulse EC11E 36 detents 18 pulse EC11J, EC11K</p> 

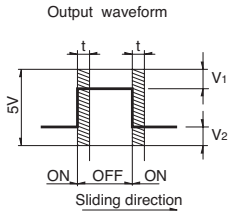
Sliding Noise

Test circuit



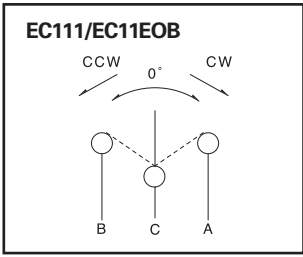
Measurement condition : Rotation speed 360°/s t : Masking time to avoid chattering

Output waveform



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

Circuit Diagram

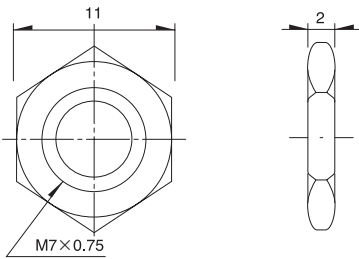
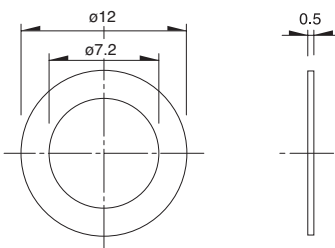


11 mm Size Metal Shaft Type / Attached Parts

The following parts are included with the product.

EC11B Series

Unit:mm

Nut	Washer
	

Encoders
Metal Shaft
Insulated Shaft
Hollow Shaft
Ring Type

1 1 mm Size Metal Shaft Type / Product Varieties

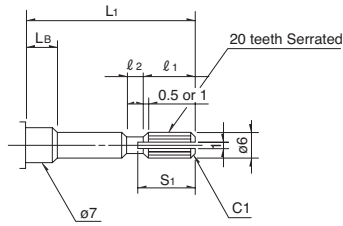
Shaft Dimensions

1. Single-shaft Type

1) Serrated Type

Unit:mm

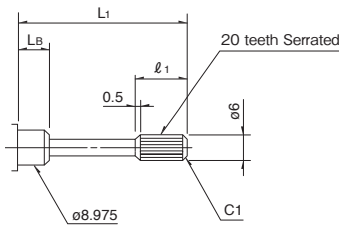
EC11
Configuration (Shaft diameter: $\phi 6$)
Not applicable for EC11E
and EC11G with push-lock
mechanism



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: $\phi 6$)



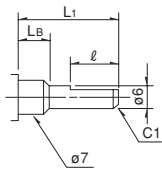
Detailed dimensions

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

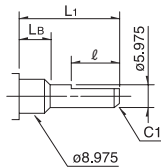
	L_1	L_B	l
*1	15	5	7
	15	7	5 (6)
	20	7	10 (12)
*2	25	10	12

*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: $\phi 5.975$)



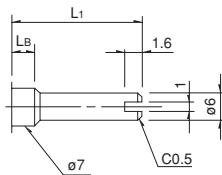
Detailed dimensions

L_1	L_B	l
15	7	5
20	10	7

3) Slotted Type

Unit:mm

EC11
Configuration (Shaft diameter: $\phi 6$)

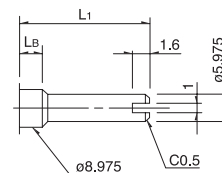


Detailed dimensions

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.269 and P.270.
- Other varieties are also available. Please inquire.

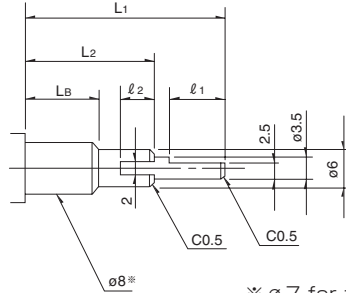
1 1 mm Size Metal Shaft Type / Product Varieties

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

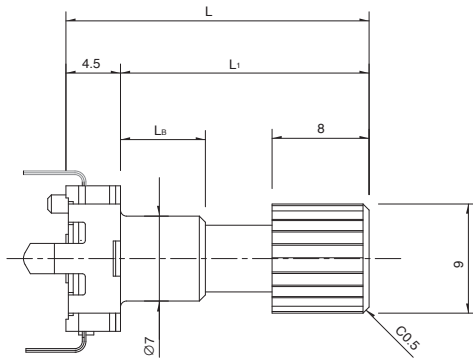
L_1	L_2	L_B	l_1	l_2
20	10		7	4
25	15	7	7	5
30	20	10	7	5

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

■ Type of Shaft Length

Unit:mm

EC11G



● Detailed dimensions

L	L_1	L_B
18	13.5	5
25	20.5	7
28	23.5	10

Notes

1. The highlighted figures in shaft types refer to Product Specifications in P.270.
2. Other varieties are also available. Please inquire.

1 1 mm Size Metal Shaft Type/Switch Specifications

1. EC11B Series

Switch type		Momentary push switch	
Contact arrangement		Single pole and single throw (Push-on)	
Travel (mm)		$0.5 \begin{smallmatrix} +0.4 \\ -0.3 \end{smallmatrix}$	1.5 ± 0.5
Operating force		$6 \pm 3\text{N}$	$5 \pm 2\text{N}$
Operating life		25,000 times	20,000 times
Electrical performance	Rating	0.1A 5V DC (500 μ A 5V DC min. ratings)	
	Contact resistance	100m Ω max. for initial period, 200m Ω max. after operating life.	
	Insulation resistance	100M Ω min. 250V DC	
	Voltage proof	300V AC for 1 minute or 360V AC for 2s	

2. EC11E/EC111 Series

Switch type		Momentary push switch	
Contact arrangement		Single pole and single throw (Push-on)	
Travel (mm)		0.5 ± 0.3	1.5 ± 0.5
Operating force		$6 \begin{smallmatrix} +2.5 \\ -2 \end{smallmatrix} \text{N}$	$4 \pm 2\text{N}$
Operating life		20,000 times	
Electrical performance	Rating	0.1A 5V DC (500 μ A 5V DC min. ratings)	
	Contact resistance	100m Ω max. for initial period, 200m Ω max. after operating life.	
	Insulation resistance	100M Ω min. 250V DC	
	Voltage proof	300V AC for 1 minute or 360V AC for 2s	

3. EC11G Series

Switch type		Momentary push switch	
Contact arrangement		Single pole and single throw (Push-on)	
Travel (mm)		1.5 ± 0.35	
Operating force		$5 \pm 2\text{N}$	
Operating life		20,000 times	
Electrical performance	Rating	0.15A 5V DC (500 μ A 5V DC min. ratings)	
	Contact resistance	100m Ω max. for initial period, 200m Ω max. after operating life.	
	Insulation resistance	100M Ω min. 250V DC	
	Voltage proof	300V AC for 1 minute or 360V AC for 2s	

4. EC11K/EC11J Series











Switch type		Momentary push switch	
Contact arrangement		Single pole and single throw (Push-on)	
Travel (mm)		0.5±0.3	1.5±0.5
Operating force		5±2N	4±2N
Operating life		1,000,000 times	100,000 times
Electrical performance	Rating	0.1A 5V DC (0.1mA 5V DC min. 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 1s	

5. EC11E152U Series

Switch type		Push lock mechanism switch	
Contact arrangement		Single pole and single throw (Push-on)	
Travel (mm)		8±0.8	
Operating force		8N max.	
Operating life		10,000 times	
Electrical performance	Rating	0.1A 5V DC (500μA 5V DC min. 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 2s	

Encoders













List of Varieties

Type		Metal shaft																					
		9mm size		11mm size																			
Series		EC09E		EC11B		EC11E				EC11G													
Photo																							
Output		Incremental (Two phase A and B)																					
Shaft types		Single-shaft						Dual-shaft		Single-shaft													
Operating direction		Vertical		Horizontal		Vertical																	
Number of pulse / Number of detent		15 / 30				9 / 18 15 / 30 or without 18 / 36 or without				15 / 30 or without													
Features		—		—		Without detent Push-lock mechanism		—		Less shaft wobble													
Dimensions (mm)		W		9.5		11.7																	
		D		13.8		12																	
		H		4.5		5.5		4.5		8 / 8.5		4.5											
Operating temperature range		-40°C to+85°C																					
Operating life		15,000 cycles																					
Automotive use		●		●		●				●													
Life cycle (availability)																							
Electrical performance		Rating		10mA 5V DC																			
		Max./min. operating current (Resistive load)		10mA / 1mA																			
		Insulation resistance		100MΩ 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 ⁺³ / ₋₄ mN·m		—		8.5±5mN·m													
		Detent torque		8±5mN·m		12±7mN·m		10±7mN·m		12±7mN·m													
		Push-pull strength		100N																			
Shaft configuration		Flat		Flat, Slotted, Serrated				Inner-shaft : Flat 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 ^{+0.4} / _{-0.3}		1.5±0.5		0.5±0.3		1.5±0.5		1.5±0.35							
		Operating force (N)		6 ^{+2.5} / ₋₂		4±2		6±3		5±2		6 ^{+2.5} / ₋₂		4±2		8 max.		6 ^{+2.5} / ₋₂		4±2		5±2	
		Rating		10mA 5V DC (500μA 5V DC min. ratings)		0.1A 5V DC (500μA 5V DC min. ratings)																	
		Contact resistance		100mΩ max. for initial period; 200mΩ max. after operating life.																			
Operating life		10,000 times		25,000 times		20,000 times				10,000 times		20,000 times											
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Encoders Cautions	308

Notes

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

Type		Metal shaft														
		11mm size					20mm size									
Series		EC111		EC11K		EC11J		EM11B	EC20A/RK203		EM20B					
Photo																
Output		Self-return switch			Incremental (Two phase A and B)											
Shaft types		Single-shaft														
Operating direction		Vertical														
Number of pulse / Number of detent		—		9/18 15/30			16/16		18/18		40/40					
Features		—		—		Surface Mount type		Magnetic type		—						
Dimensions (mm)		W		11.7					10.8		20.2					
		D		13		12		14.2		11		19.2				
		H		5		4.5			7.5		10		13			
Operating temperature range		-40°C to +85°C						-30°C to +85°C	-30°C to +80°C		-10°C to +70°C					
Operating life		15,000 cycles		100,000 cycles			1,000,000 cycles		30,000 cycles		500,000 cycles					
Automotive use		●		●		●		●	●		—					
Life cycle (availability)																
Electrical performance		Rating		10mA 5V DC					10mA 5V±5% DC		1mA 5V DC		10mA 5V±5% DC			
		Max./min. operating current (Resistive load)		10mA / 1mA					15mA / —		—		15mA / —			
		Insulation resistance		100MΩ min. 250V DC						100MΩ min.100V DC		10MΩ min. 50V DC		100MΩ min. 250V DC		
		Voltage proof		300V AC for 1 minute or 360V AC for 2s		300V AC for 1 minute or 360V AC for 1s			250V AC for 1 minute or 300V AC for 2s		50V AC for 1 minute or 60V AC for 2s		300V AC for 1 minute or 360V AC for 2s			
Mechanical performance		Rotational torque (Without detent)		3 to 30mN·m		—		—		—		7mN·m max.				
		Detent torque		—		12±5mN·m		12±5mN·m (Initial) 12±4mN·m (After reflow)		10±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 ± _{0.2} ^{0.3}	1.5±0.5	0.5 ± _{0.3} ^{0.4}	
		Operating force (N)		6 ± ₂ ^{2.5}	4±2		5±2	4±2		5±2	4±2		5.5±3	4±2		6±3
		Rating		0.1A 5V DC (500μA 5V DC min. ratings)		0.1A 5V DC (0.1mA 5V DC min. ratings)			5mA 5V DC (50mA 12V DC max. ratings)		0.5A 16V DC (1mA 16V DC min. ratings)		3A 16V DC (10mA 16V DC min. ratings)			
		Contact resistance		100mΩ max. for initial period, 200mΩ max. after operating life.						500mΩ max. for initial period, 5mΩ max. after operating life.		100mΩ max. for initial period, 200mΩ max. after operating life.				
		Operating life		20,000 times		1,000,000 times	100,000 times	1,000,000 times	100,000 times	1,000,000 times		20,000 times		25,000 times		
Page		269						280		282		285				

Encoders

Metal Shaft

Insulated Shaft

Hollow Shaft

Ring Type

Encoders Soldering Conditions 307
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Note

● Indicates applicability to all products in the series.

Reference for Manual Soldering

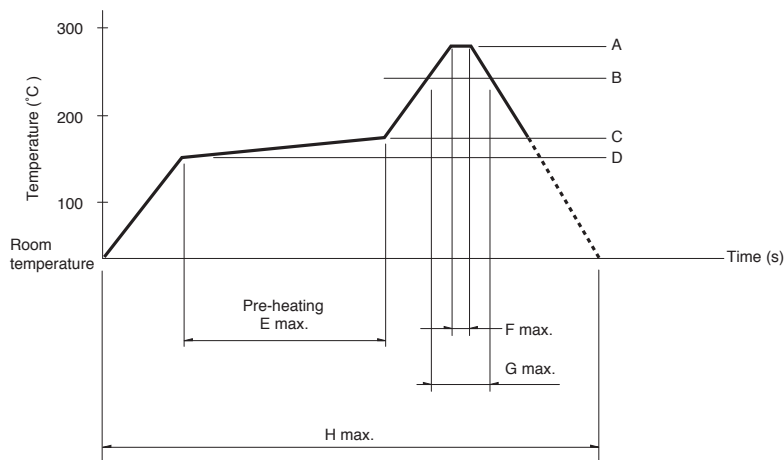
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11B, EC11E, EC11G, EC11K, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC40A, EC45A, EC50A, EC60B, EM11B, EM20B, EC21C	350°C max.	3s max.	1 time
EC11J	350±10°C	3 ⁺¹ ₀ s	2 time

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, EC21A, EC28A, EC35A, EC35AH, EC35B, EC50A, EC60B	100°C max.	2 min. max.	260±5°C	5±1s	2 time max.
EC10E, EC12D, EC12E, EM11B	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	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.

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 time max.
EC05E	250°C min.	230°C min.	180°C	150°C	60s to 120s	—	30s to 40s	—	2 time max.
EC21C	230°C to 245°C	220°C	200°C	150°C	60s to 120s	—	25s to 60s	300 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.