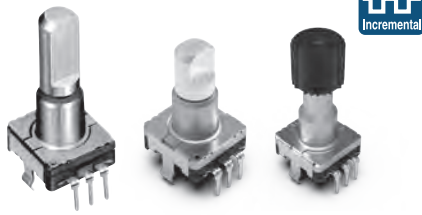


Compact and highly reliable type available in many varieties



Typical Specifications

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

Product Line

Structure	Shaft configuration	Length of the shaft (mm)	Torque (mN·m)	Number of detent	Number of pulse	Push-on switch	Travel of push-on switch (mm)	Minimum order unit (pcs.)		Product No.	Drawing No.		
								Japan	Export				
Vertical	Flat	20	10±7	18	9	Without	—	1,200	2,400	EC11E09204A4	1		
				30	15					EC11E15204A3			
				36	18					EC11E1820402			
			10±7	18	9	With	0.5			EC11E09244BS	2		
				30	15					EC11E15244G1			
				36	18					EC11E18244AU			
				10±7	18		9			1.5		EC11E09244AQ	
					30		15					EC11E15244B2	
					36		18					EC11E18244A5	
		15	10±7	30	15	Without	—			EC11N1520401	3		
						With	0.5			EC11N1524402	4		
							1.5			EC11N1525404			
						20	Without			—	EC11N1520402	3	
										With	0.5	EC11N1524403	4
											1.5	EC11N1525405	
Less shaft wobble	Serrated	25	12±7	30	With	1.5	1,000	2,000	EC11M1565403	5			
			8.5±5	Without					EC11M1575403	6			
Self-return switch	Flat	15	3 to 30	Without	Self-return switch	Without	—	1,200	2,400	EC1110120005	7		
		20				With	0.5			EC111012010H	8		
							1.5			EC1110120201			

Note

Other varieties are also available. Please inquire.

Packing Specifications

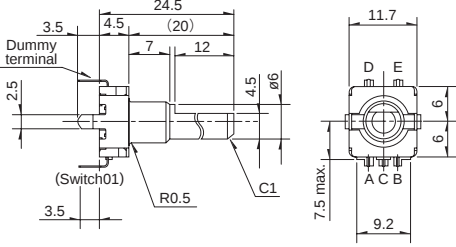
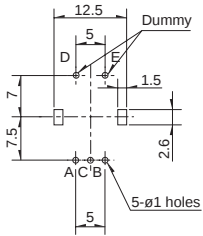
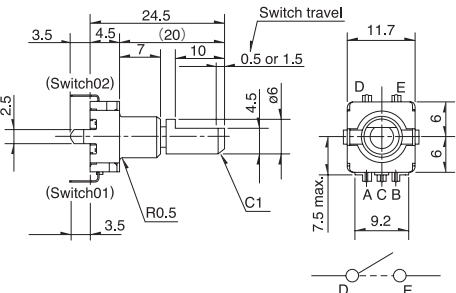
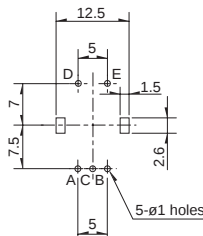
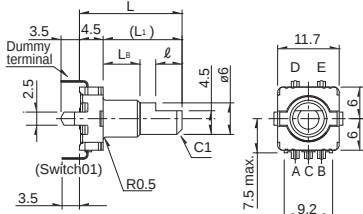
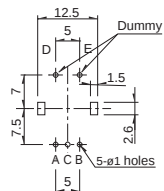
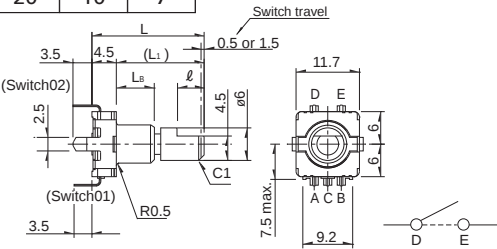
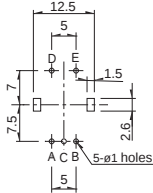
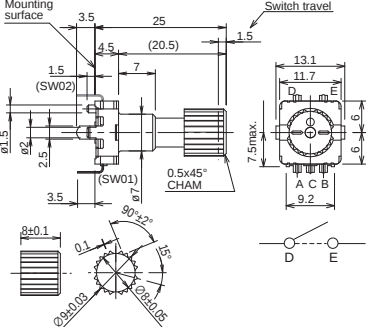
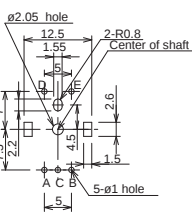
Tray

Product No.	Number of packages (pcs.)		Export package measurements (mm)
	1 case / Japan	1 case / export packing	
EC11E/EC11N	1,200	2,400	540×360×254
EC11M	1,000	2,000	
EC111	1,200	2,400	507×363×216

Refer to P.250 for product varieties.
Refer to P.251 for switch specifications.
Refer to P.275 for soldering conditions.

■ Dimensions

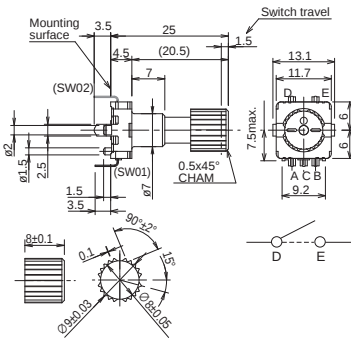
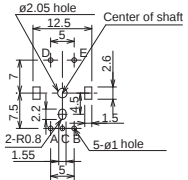
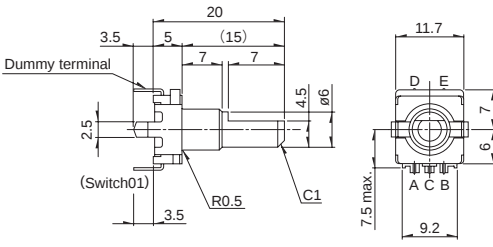
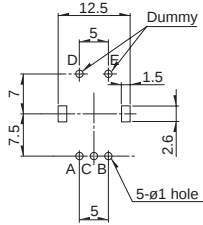
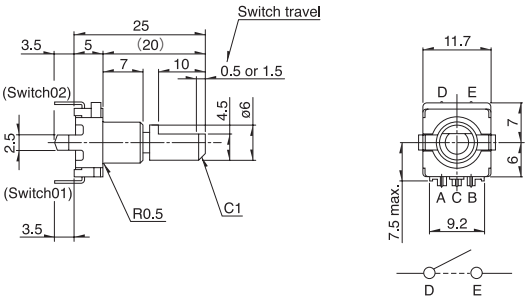
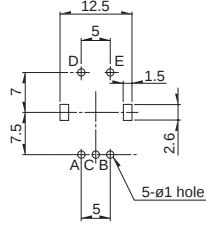
Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)												
1	EC11E Vertical 	 EC11E Vertical dimensions: Side view shows a dummy terminal, switch01, R0.5, C1, and dimensions 3.5, 4.5, 24.5, 7, 12, 4.5, 2.5, 3.5, 11.7, 7.5 max., 9.2, 6, 6. Top view shows terminals D, E, A, C, B with dimensions 12.5, 5, 1.5, 7.5, 2.6, 5, 5-ø1 holes.	 EC11E Vertical PC board mounting: Dimensions 12.5, 5, 1.5, 7.5, 2.6, 5, 5-ø1 holes.												
2	EC11E Vertical with push-on switch (travel 0.5mm / 1.5mm) 	 EC11E Vertical with push-on switch dimensions: Side view shows switch02, switch01, R0.5, C1, and dimensions 3.5, 4.5, 24.5, 7, 10, 0.5 or 1.5, 4.5, 2.5, 3.5, 11.7, 7.5 max., 9.2, 6, 6. Top view shows terminals D, E, A, C, B with dimensions 12.5, 5, 1.5, 7.5, 2.6, 5, 5-ø1 holes. A switch symbol is shown with terminals D and E.	 EC11E Vertical with push-on switch PC board mounting: Dimensions 12.5, 5, 1.5, 7.5, 2.6, 5, 5-ø1 holes.												
3	EC11N Vertical 	<table border="1"><thead><tr><th>L</th><th>L₁</th><th>L_B</th><th>ℓ</th></tr></thead><tbody><tr><td>19.5</td><td>15</td><td>7</td><td>5</td></tr><tr><td>24.5</td><td>20</td><td>10</td><td>7</td></tr></tbody></table>  EC11N Vertical dimensions: Side view shows dummy terminal, switch01, R0.5, C1, and dimensions 3.5, 4.5, L, (L₁), L_B, ℓ, 4.5, 2.5, 3.5, 11.7, 7.5 max., 9.2, 6, 6. Top view shows terminals D, E, A, C, B with dimensions 12.5, 5, 1.5, 7.5, 2.6, 5, 5-ø1 holes.	L	L ₁	L _B	ℓ	19.5	15	7	5	24.5	20	10	7	 EC11N Vertical PC board mounting: Dimensions 12.5, 5, 1.5, 7.5, 2.6, 5, 5-ø1 holes.
L	L ₁	L _B	ℓ												
19.5	15	7	5												
24.5	20	10	7												
4	EC11N Vertical with push-on switch (travel 0.5mm / 1.5mm) 	<table border="1"><thead><tr><th>L</th><th>L₁</th><th>L_B</th><th>ℓ</th></tr></thead><tbody><tr><td>19.5</td><td>15</td><td>7</td><td>5</td></tr><tr><td>24.5</td><td>20</td><td>10</td><td>7</td></tr></tbody></table>  EC11N Vertical with push-on switch dimensions: Side view shows switch02, switch01, R0.5, C1, and dimensions 3.5, 4.5, L, (L₁), L_B, ℓ, 0.5 or 1.5, 4.5, 2.5, 3.5, 11.7, 7.5 max., 9.2, 6, 6. Top view shows terminals D, E, A, C, B with dimensions 12.5, 5, 1.5, 7.5, 2.6, 5, 5-ø1 holes. A switch symbol is shown with terminals D and E.	L	L ₁	L _B	ℓ	19.5	15	7	5	24.5	20	10	7	 EC11N Vertical with push-on switch PC board mounting: Dimensions 12.5, 5, 1.5, 7.5, 2.6, 5, 5-ø1 holes.
L	L ₁	L _B	ℓ												
19.5	15	7	5												
24.5	20	10	7												
5	EC11M Vertical with push-on switch (travel 1.5mm) 	 EC11M Vertical with push-on switch dimensions: Side view shows mounting surface, switch02, switch01, R0.5, C1, and dimensions 3.5, 25, 20.5, 1.5, 7, 1.5, 0.5x45° CHAM, 90°±2°, 15°, 8±0.1, 0.1, 2.5, 11.7, 7.5 max., 9.2, 6, 6. Top view shows terminals D, E, A, C, B with dimensions 13.1, 11.7, 1.55, 1.5, 1.5, 2-R0.8, Center of shaft, 5-ø1 hole.	 EC11M Vertical with push-on switch PC board mounting: Dimensions 12.5, 5, 1.5, 7.5, 2.6, 5, 5-ø1 hole.												

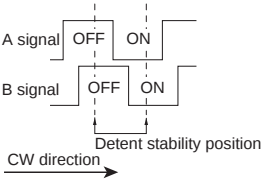
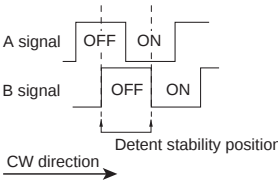
EC11 11 mm Size Metal Shaft Type

Dimensions

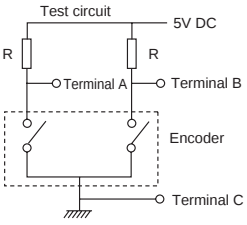
Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
6	EC11M Vertical with push-on switch (travel 1.5mm) 		
7	EC111 Self-return switch 		
8	EC111 Self-return switch with push-on switch (travel 0.5mm / 1.5mm) 		

Output Wave

EC11E, EC11N, EC11M	EC11E
EC11E 30 detents, 15 pulse EC11N, EC11M 	Detent stability position cannot be specified for B signal EC11E 18 detents 9 pulse EC11E 36 detents 18 pulse 

Sliding Noise



Test circuit

5V DC

R

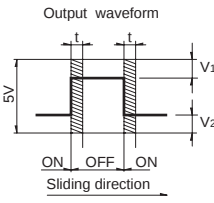
Terminal A

Terminal B

Encoder

Terminal C

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



Output waveform

5V

V₁

V₂

t

t

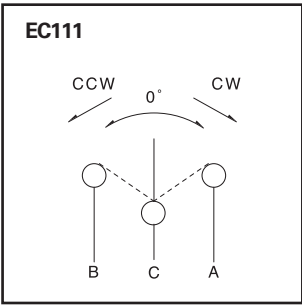
ON OFF ON

Sliding direction

**EC11E/EC11N/
EC11M**

V₁=V₂=1.5V max.
At R = 5kΩ
Chattering : 3ms max.
Bounce : 2ms max.

Circuit Diagram



1 1 mm Size Metal 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.

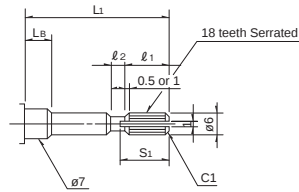
■ Shaft Dimensions

1. Single-shaft Type

1) Serrated Type

Unit:mm

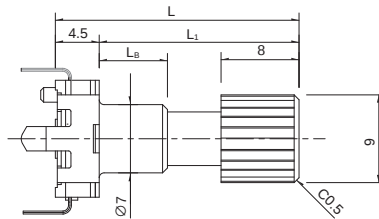
EC11 (Except EC11M) Style (Shaft diameter: $\phi 6$)



● Detailed dimensions

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

EC11M Style (Shaft diameter: $\phi 9$)



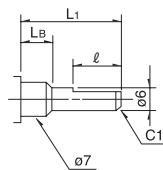
● Detailed dimensions

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

2) Flat Type

Unit:mm

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



● Detailed dimensions

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

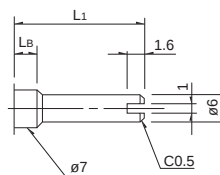
※1 Does not comply with EC111

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

3) Slotted Type

Unit:mm

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



● Detailed dimensions

L_1	L_B
15	7
20	7
25	10

Notes

1. Shaded areas in shaft type details indicate specifications included in the product lineup on P.246
2. Other varieties are also available. Please inquire.

11 mm Size Metal Shaft Type / Switch Specifications

1. EC11E/EC11N/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 ^{+2.5} ₋₂ N	4±2N
Operating life		20,000 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 2 second	

2. EC11M Series

Switch type		Momentary push switch	
Contact arrangement		Single pole and single throw (Push-on)	
Travel (mm)		1.5±0.35	
Operating force		5±2N	
Operating life		20,000 times	
Electrical performance	Rating	0.15A 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 2 second	

Encoders

Metal Shaft

Insulated Shaft

Through Shaft Type

Ring Type

Encoders

List of Varieties

Type		Metal shaft										
		9mm size		11mm size								
Series		EC09E		EC11E		EC11N		EC11M		EC111		
Photo												
Output		Incremental (Two phase A and B)									Self-return switch	
Shaft types		Single-shaft										
Control part orientation		Vertical										
Number of pulse / Number of detent		15/30		9/18 15/30 18/36		15/30		15/30 15/without		—		
Features		—		—		—		Less shaft wobble		—		
Dimensions (mm)	W	9.5		11.7								
	D			12						13		
	H			4.5						5		
Operating temperature range		−40℃ to +85℃										
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)	—		—		—		8.5±5mN·m		3 to 30mN·m		
	Detent torque	8±5mN·m		10±7mN·m				12±7mN·m		—		
	Push-pull strength	100N										
Shaft configuration		Flat		Flat, Slotted, Serrated		Flat		Serrated		Flat, Slotted, Serrated		
Terminal type		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	1.5±0.35	0.5±0.3	1.5±0.5		
	Operating force (N)	6 ± ^{2.5} ₂	4±2	6 ± ^{2.5} ₂	4±2	6 ± ^{2.5} ₂	4±2	5±2	6 ± ^{2.5} ₂	4±2		
	Rating	10mA 5V DC (1mA 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		20,000 times								
Page		244		246								

Encoders Soldering Conditions	275
Encoders Cautions	276

Notes

- Indicates applicability to all products in the series.

Reference for Manual Soldering

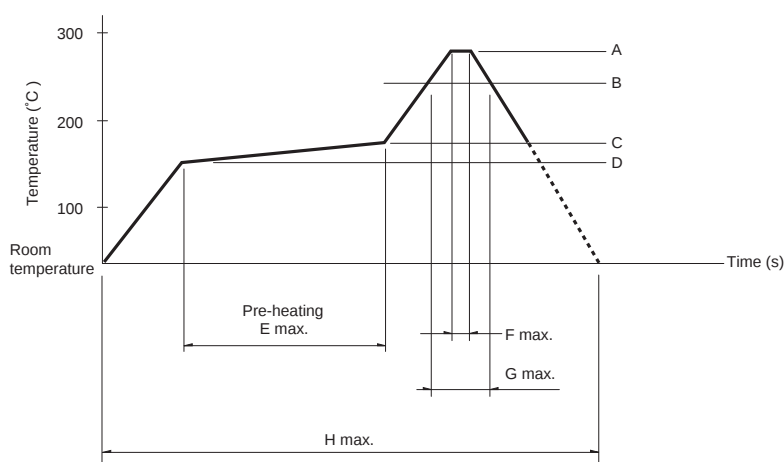
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11E, EC11M, EC11N, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC40A, EC50A, EM11B, EC21C, EC28C, EC35CH	350°C max.	3s max.	1 time

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.