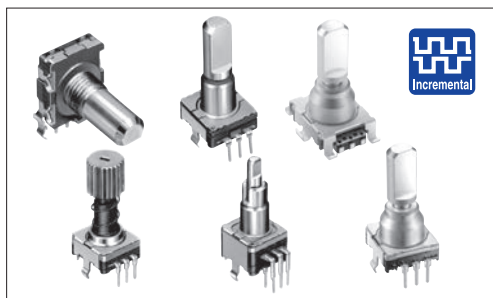




Compact and highly reliable type available in many varieties.



Typical Specifications

Items	Specifications
Output signal	Two phase of A, B Three phase of A, B and C (EC11EH) Self-return switch (EC111 / EC11E0B)
Rating	10mA 5V DC
Operating life	15,000 cycles 30,000 cycles (EC11EH) 100,000 cycles (EC11K / EC11J)
Operating temperature range	− 40°C to + 85°C

Detector

Slide

Push

Rotary

Encoders

Power

Dual-in-line
Package Type

TACT Switch™

Metal
ShaftInsulated
ShaftHollow
ShaftRing
Type

Product Line

Structure	Shaft onfiguration	Length of the shaft (L ₁) (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	Flat	20	12 ± 7	30	15	Without	—	15,000	700	1,400	EC11B15202AA	1		
						With	0.5				EC11B15242AE	2		
							1.5				EC11B15242AF	3		
Vertical			10 ± 7	18	9	Without	—		1,200	2,400	EC11E09204A4	4		
				30	15						EC11E15204A3			
				7 $\pm \frac{3}{4}$							Without		EC11E1530401	
			10 ± 7	36	18						EC11E1820402			
			7 $\pm \frac{3}{4}$	Without							EC11E1830401			
			10 ± 7	18	9	With	0.5	15,000			1,200	2,400	EC11E09244BS	5
				30	15								EC11E15244G1	
				7 $\pm \frac{3}{4}$									Without	
			10 ± 7	36	18				EC11E18244AU					
			7 $\pm \frac{3}{4}$	Without					EC11E183440C					
			10 ± 7	18	9		1.5		EC11E09244AQ					
				30	15					EC11E15244B2				
				7 $\pm \frac{3}{4}$						Without			EC11E1534408	
			10 ± 7	36	18					EC11E18244A5				
			7 $\pm \frac{3}{4}$	Without						EC11E1834403				
Less shaft wabble	Serrated	25	12 ± 7	30	15	Without	—	15,000		1,000	2,000	EC11G1560414	6	
			8.5 ± 5	Without		With	1.5					EC11G1574402	7	
			12 ± 7	30								EC11G1564411	8	
Vertical	Flat	20	12 ± 5	18	9	Without	—	100,000	1,000	2,000	EC11K0920401	9		
				30	15						EC11K1520401			
				18	9	With	0.5				EC11K0924401	10		
				30	15						EC11K1524402			
				18	9		1.5				EC11K0925401			
				30	15						EC11K1525401			

Note

Other varieties are also available. Please inquire.

Refer to P.167 for product specifications.

Refer to P.167 for attached parts.

Refer to P.168 for product varieties.

Refer to P.193 for soldering conditions.

Product Line

Product Line																				
Detector	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									
Slide	Reflow	Flat	20	12 ± 5	18	9	Without	—	100,000	300	600	EC11J0920404	11							
Push					30	15						EC11J152040F								
Rotary					18	9	With	0.5				15,000	800	1,600	EC11J0924411	12				
					Encoders	30									15		EC11J1524413			
Power					18	9		1.5							EC11J0925403					
															EC11J1525402					
Dual-in-line Package Type	Push lock	20-tooth Serrated	25	10 ± 7	30	15	Without	—		800	1,600				EC11E152T409	13				
TACT Switch™			26.4				With	8							EC11E152U402	14				
Metal Shaft	Self-return switch	Flat	15	3 to 30	Without	Self-return switch	Without	—	15,000	1,200	2,400	EC1110120005	15							
			20				10 ± 7	18				ABC switch	With	0.5	30,000	EC111012010H	16			
																		30	15	Without
	18			1.5	EC1110120201															
	Insulated Shaft			Dual-shaft	Inner-shaft=25	20			10 ± 7								30	15	Without	—
			Slotted		Outer-shaft=15		With	1.5												
Hollow Shaft		Flat	Inner-shaft=25		Without		—													
Ring Type		Slotted	Outer-shaft=15	3 to 30	Without	Self-return switch	Without	—												

NoteOther varieties are also available. Please inquire.

Note

Other varieties are also available. Please inquire.


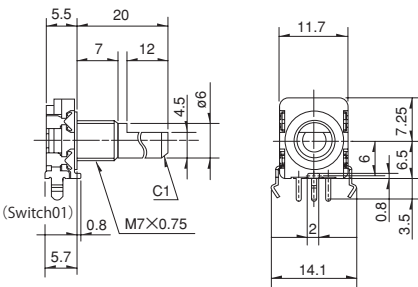
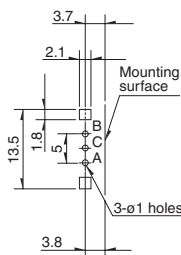

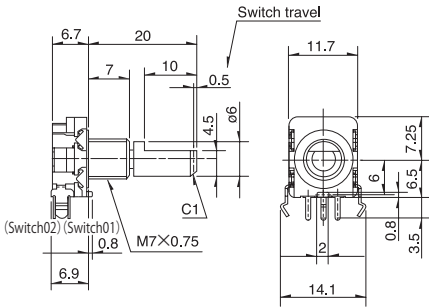
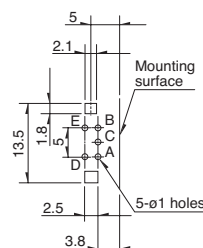
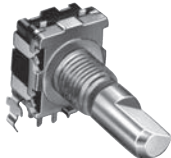
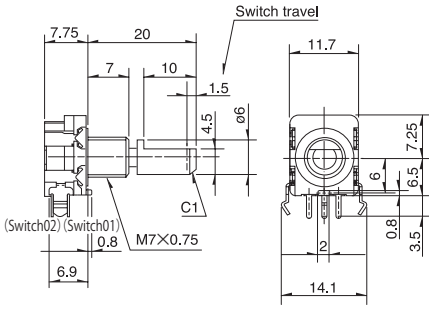
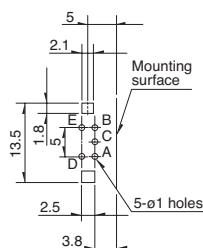

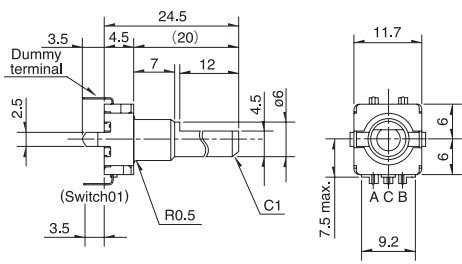
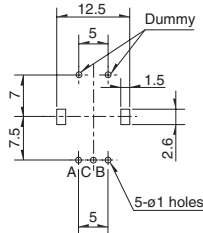

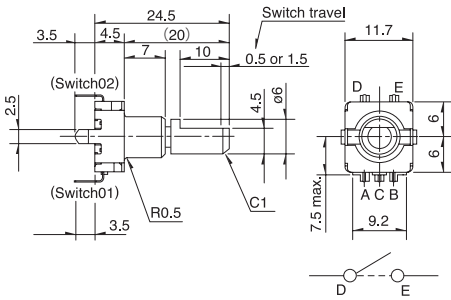
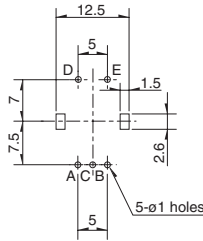
Packing Specifications

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 / EC11EH	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	

Dimensions

Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
1	EC11B Horizontal 		
2	EC11B Horizontal with push-on switch (travel 0.5mm) 		
3	EC11B Horizontal with push-on switch (travel 1.5mm) 		
4	EC11E Vertical 		
5	EC11E Vertical with push-on switch (travel 0.5 / 1.5mm) 		

Detector

Slide

Push

Rotary

Encoders

Power

Dual-in-line
Package Type

TACT Switch™

Metal
Shaft

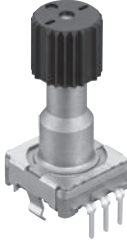
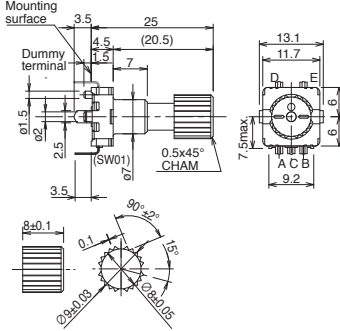
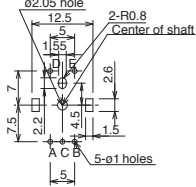
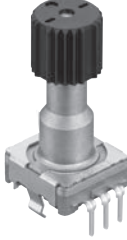
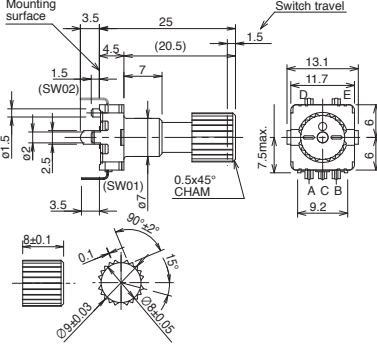
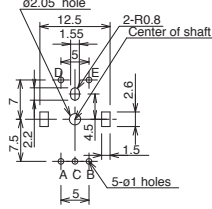
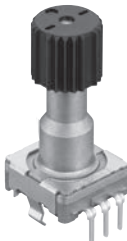
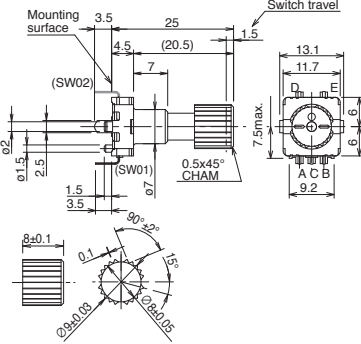
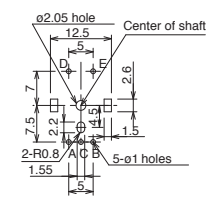

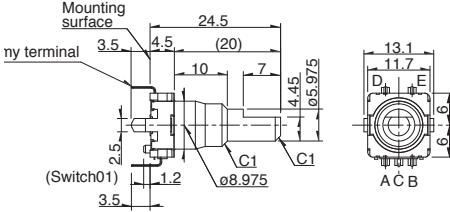
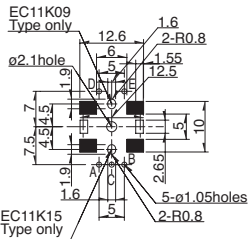

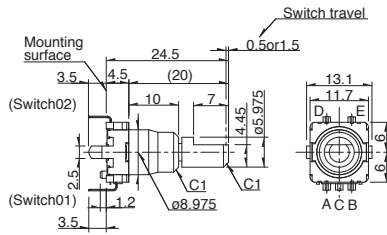
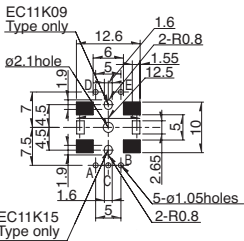
Insulated
Shaft

Hollow
Shaft

Ring
Type


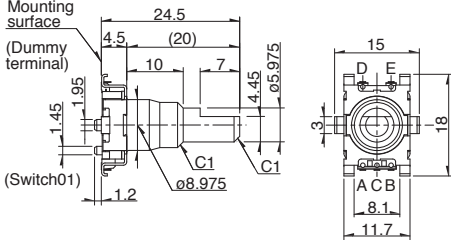
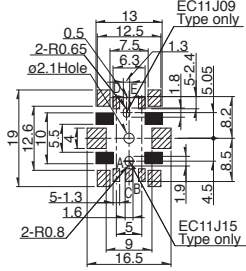

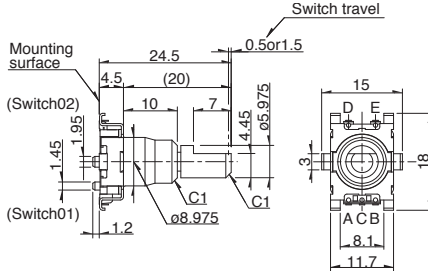
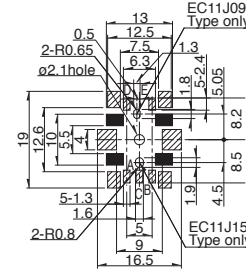

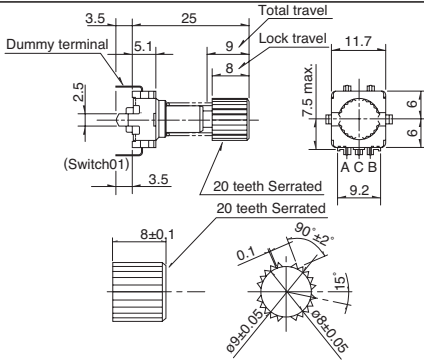
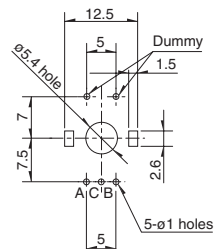

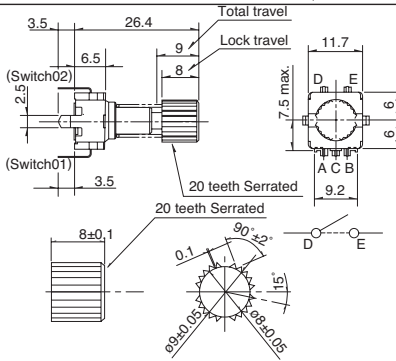
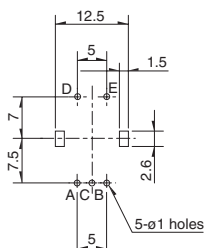

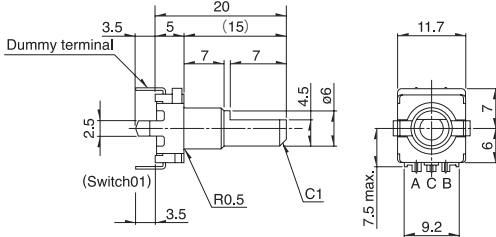
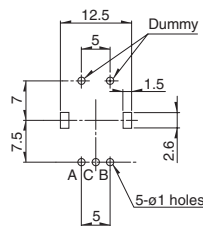
Dimensions

Unit:mm

Detector	No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
Slide				
Push				
Rotary				
Encoders	6			
Power				
Dual-in-line Package Type				
TACT Switch™				
	7			
Metal Shaft				
Insulated Shaft				
Hollow Shaft				
Ring Type	8			
	9			
	10			

Dimensions

Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
11	EC11J Reflow 		 <p>A slant line part: The solder land Black part: Do not solder and wiring for electrical contact</p>
12	EC11J with push-on switch (travel 0.5mm / 1.5mm) 		 <p>A slant line part: The solder land Black part: Do not solder and wiring for electrical contact</p>
13	EC11E152T Push-lock mechanism 		
14	EC11E152U Push-lock mechanism with push-lock switch 		
15	EC111 Self-return switch 		

Detector

Slide

Push

Rotary

Encoders

Power

Dual-in-line
Package Type

TACT Switch™

Metal
Shaft


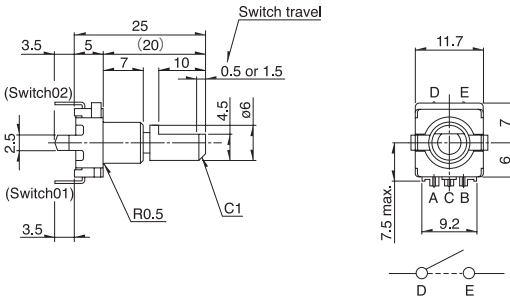
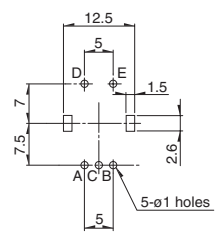

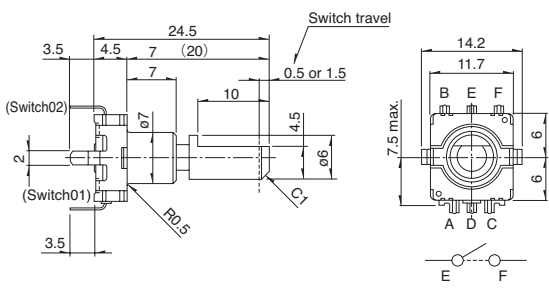
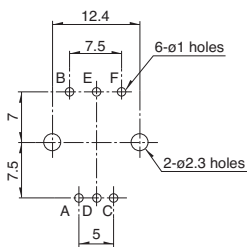
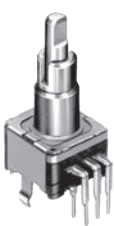
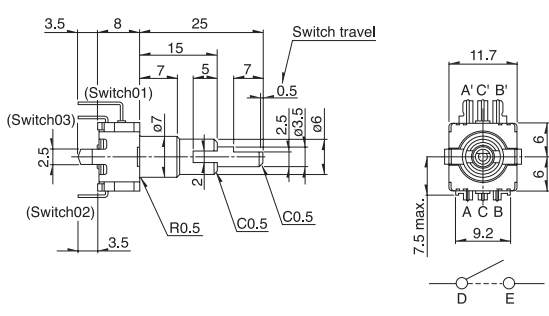
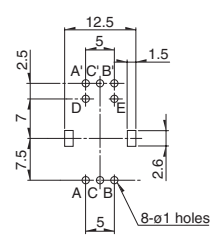
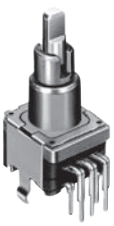
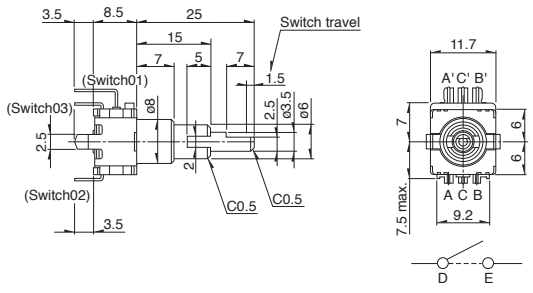
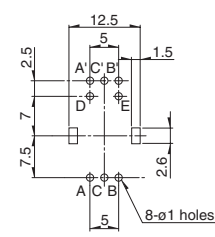
Insulated
Shaft

Hollow
Shaft

Ring
Type

Dimensions

Unit:mm

Detector	No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
	16	EC111 Self-return switch with push-on switch (travel 0.5mm / 1.5mm) 		
	17	EC11EH ABC switch with push-on switch (travel 0.5mm / 1.5mm) 		
	18	EC11E Dual-shaft type with push-on switch (travel 0.5mm) Inner shaft: encoder Outer shaft: encoder 		
	19	EC11E Dual-shaft type with push-on switch (travel 1.5mm) Inner shaft: encoder Outer shaft: self-return switch 		

11mm Size Metal Shaft Encoders / Product Specifications

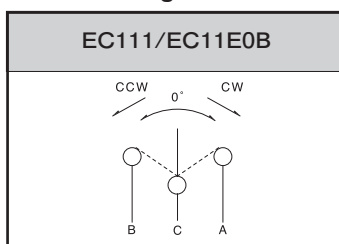
Output Wave

EC11B / EC11E / EC11G	EC11E / EC11J / EC11K	EC11EH
<p>EC11B, EC11E, EC11G 30 detents, 15 pulse</p> <p>Detent stability position CW direction</p>	<p>Detent stability position cannot be specified for B signal. EC11E 18 detents 9 pulse EC11E 36 detents 18 pulse EC11J, EC11K</p> <p>Detent stability position CW direction</p>	<p>A signal OFF ON B signal OFF ON C signal OFF ON</p> <p>Detent position CW direction</p>

Sliding Noise

<p>Measurement condition : Rotation speed 360°/s t : Masking time to avoid chattering</p>	<p>Detailed dimensions</p> <table> <tr> <td>EC11B</td><td> $V_1=V_2=1.5V$ max. At $R = 5k\Omega$ Chattering : 2ms max. Bounce : 2ms max. </td></tr> <tr> <td>EC11E / EC11G</td><td> $V_1=V_2=1.5V$ max. At $R = 5k\Omega$ Chattering : 3ms max. Bounce : 2ms max. </td></tr> <tr> <td>EC11J / EC11K</td><td> $V_1=V_2=2.5V$ max. At $R = 5k\Omega$ Chattering : 3ms max. Bounce : 2ms max. </td></tr> </table>	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.
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.						
<p>Test condition : Rotation speed 360°/s</p>	<table> <tr> <td>EC11EH</td><td> At $R = 5k\Omega$ Chattering : 5ms max. Bounce : 5ms max. </td></tr> </table>	EC11EH	At $R = 5k\Omega$ Chattering : 5ms max. Bounce : 5ms max.				
EC11EH	At $R = 5k\Omega$ Chattering : 5ms max. Bounce : 5ms max.						

Circuit Diagram

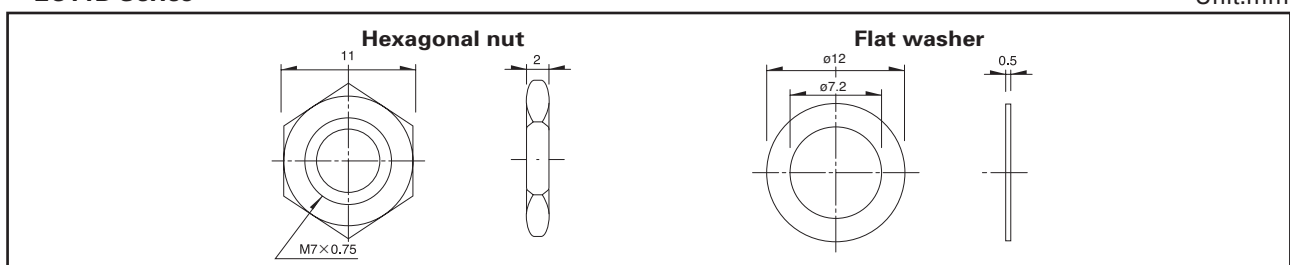


11mm Size Metal Shaft Encoders / Attached Parts

The following parts are included with the product.

EC11B Series

Unit:mm



Shaft Dimensions

1. Single-shaft Type (EC11K is excluded. Refer to P.212 for EC11K)

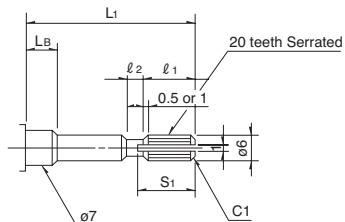
Unit:mm

1) Serrated Type

EC11

Configuration (Shaft diameter : $\phi 6$)

Not applicable for EC11E and EC11G with push-lock mechanism

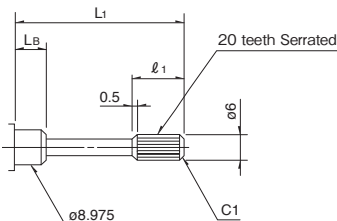


Detailed dimensions

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

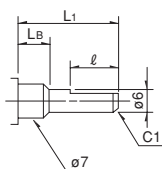
L_1	L_B	l_1
15	7	5
20	10	6

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

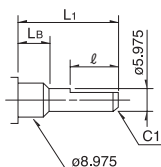
※ 1 Does not comply with EC111

※ 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

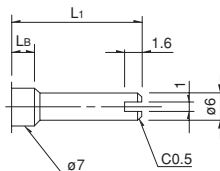
Dimensions marked with () apply to products without push-on switches.

3) Slotted Type

Unit:mm

EC11

Configuration (Shaft diameter : $\phi 6$)



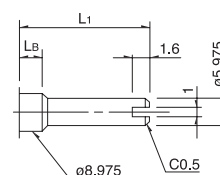
Detailed dimensions

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

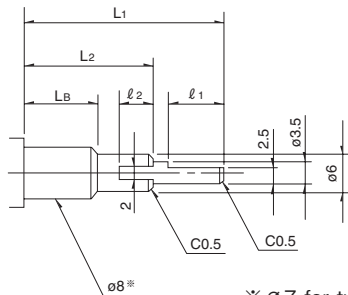
- The highlighted figures in shaft types refer to Product Specifications in P.161 and P.162.
- Other varieties are also available. Please inquire.

2. Standard Dimensions and configuration of Dual-shaft Type

1) Flat Type

Unit:mm

Configuration (Inner-shaft : ϕ 3.5 Outer-shaft : ϕ 6)



● Detailed dimensions

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

Notes

- 1. The highlighted figures in shaft types refer to Product Specifications in P.162
- 2. Other varieties are also available. Please inquire.

Detector

Slide

Push

Rotary

Encoders

Power

Dual-in-line
Package Type

TACT Switch™















Metal
Shaft

Insulated
Shaft

Hollow
Shaft

Ring
Type

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℃ to + 85℃									
Operating life		15,000 cycle									
Automotive use											
Life cycle (availability)											
Electrical performance	Rating	10mA 5V DC									
	Max./min. operating current (Resistive load)	10mA / 1mA									
	Insulation resistance	100M Ω 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 ± 5 mN·m
	Detent torque	8 ± 5mN·m		12 ± 7mN·m		10 ± 7mN·m				12 ± 7 mN·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	8 ± 0.8	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		0.1A 5V DC (500 μA 5V DC min. ratings)							
	Contact resistance	100m Ω max. for initial period; 200m Ω max. after operating life.									
	Operating life	10,000 times min.		25,000 times min.	20,000 times min.			10,000 times min.	20,000 times min.		
Page		160		161							

- Encoders Soldering Conditions 193
- Encoders Cautions 194

Notes

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

Detector

Slide

Push

Rotary

Encoders

Power

Dual-in-line
Package Type

TACT Switch™

Metal
Shaft






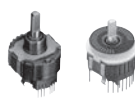











Insulated
Shaft

Hollow
Shaft

Ring
Type

Encoders

List of Varieties

Type		Metal shaft											
		11mm size							20mm size				
Series		EC111		EC11EH		EC11K		EC11J		EC20A / RK203		EM20B	
Photo													
Output		Self-return switch		Incremental (Three phase A, B and C)		Incremental (Two phase A and B)							
Shaft types		Single-shaft											
Operating direction		Vertical											
Number of pulse / Number of detent		—		6×ABC / 18 10×ABC / 30		9 / 18 15 / 30			18 / 18			40 / 40	
Features		—		—		—		Surface Mount Type		—		Magnetic type; LED indicator option	
Dimensions (mm)	W	11.7							20.2		20		
	D	13		12			14.2		19.2		22.25		
	H	5		4.5					10		13		
Operating temperature range		−40℃ to + 85℃							−30℃ to + 80℃		−10℃ to + 70℃		
Operating life		15,000 cycles		30,000 cycles		100,000 cycles			30,000 cycles		500,000 rotations		
Automotive use												—	
Life cycle (availability)													
Electrical performance	Rating	10mA 5V DC							1mA 5V DC		10mA 5V±5% DC		
	Max./min. operating current (Resistive load)	10mA / 1mA							—		15mA / —		
	Insulation resistance	100M Ω min. 250V 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			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	—		10±7mN·m		12 ± 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±0.3	1.5±0.5		0.5± ^{0.4} _{0.3}		
	Operating force (N)	6± ^{2.5} ₂	4±2	6± ^{2.5} ₂	4±2	5±2	4±2	5±2	4±2		6±3		
	Rating	0.1A 5V DC (500 μA 5V DC min. ratings)					0.1A 5V DC (0.1mA 5V DC min. ratings)			0.5A 16V DC (1mA 16V DC min. ratings)		0.1A 5V DC	
	Contact resistance	100m Ω max. for initial period; 200m Ω max. after operating life.											
	Operating life	20,000 times min.				1,000,000 times min.	100,000 times min.	1,000,000 times min.	100,000 times min.	20,000 times min.		25,000 times min.	
Page		161							170		172		

● Encoders Soldering Conditions 193

● Encoders Cautions 194

Note ● indicates applicability to all products in the series.

Reference for Hand Soldering

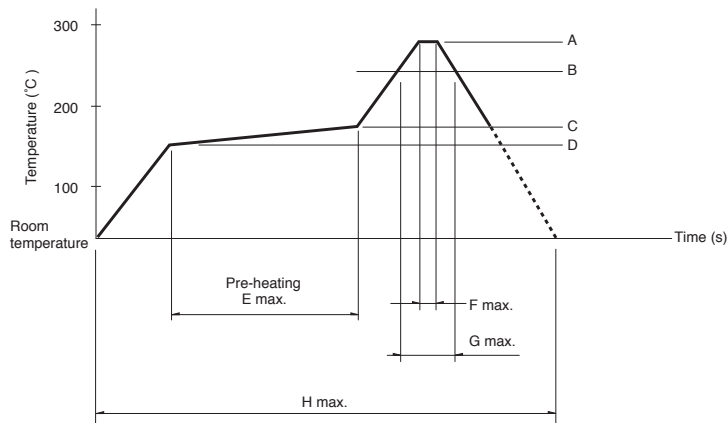
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11B, EC11E, EC11G, EC11K, EC12D, EC12E, EC18A, EC20A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC40A, EC45A, EC50A, EC60A, EM20B	350°C max.	3s max.	1 time
EC11J	350±10°C	3 ⁺¹ ₀ s	2 time

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, EC20A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC50A	100°C max.	2 min. max.	260±5°C	5±1s	2 time max.
EC10E, EC12D, EC12E	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, EC60A	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.

Condition for Reflow

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.

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 potentiometer when employing a hot air reflow method. The temperature of the PC board and the surface temperature of the potentiometer may vary greatly depending on the PC board material, its size and thickness. Ensure that the surface temperature of the potentiometer 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.