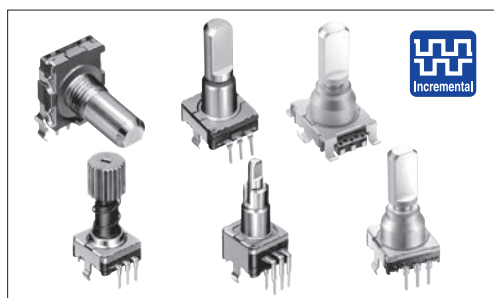


Compact and highly reliable type available in many varieties.



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

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	EC11E15204A3										
			7 $\pm\frac{3}{4}$	Without	15						EC11E1530401				
			10 ± 7	36	18						EC11E1820402				
			7 $\pm\frac{3}{4}$	Without	EC11E1830401										
			10 ± 7	18	9						EC11E09244BS				
			30	15	EC11E15244G1										
				7 $\pm\frac{3}{4}$	Without	18	EC11E153440D								
			10 ± 7	36	18	EC11E18244AU									
			7 $\pm\frac{3}{4}$	Without	EC11E183440C										
			10 ± 7	18	9	With	0.5				1,200	2,400	EC11E09244AQ	5	
				30	15								EC11E15244B2		
			7 $\pm\frac{3}{4}$	Without	18								EC11E1534408		
			10 ± 7	36	18								EC11E18244A5		
			7 $\pm\frac{3}{4}$	Without	EC11E1834403										
10 ± 7	36	18	EC11G1560414												
Less shaft wobble	Serrated	25	12 ± 7	30	15	Without	—	1,000	2,000	EC11G1574402			6		
			8.5 ± 5	Without		With	1.5			EC11G1564411			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				EC11J0924411	12					
					30	15						EC11J1524413						
					18	9		1.5				EC11J0925403						
												EC11J1525402						
Encoders	Push lock	20-tooth Serrated	25	10 ± 7	30	15	Without	—	15,000	800	1,600	EC11E152T409	13					
Power			26.4				With	8				EC11E152U402	14					
Dual-in-line Package Type	Self-return switch	Flat	15	3 to 30	Without	Self-return switch	Without	—	30,000	1,200	2,400	EC1110120005	15					
TACT Switch™			20				10 ± 7	ABC switch				0.5	1.5	EC111012010H	16			
														18		30	1.5	EC1110120201
																		18
											EC11EH224403							
										EC11EH124404								
							EC11EH224404											
Metal Shaft	Dual-shaft	Inner-shaft=25	30	15	Without	Self-return switch	Without	—	15,000	700	1,400	EC11EBB24C03	18					
Insulated Shaft		Slotted										Outer-shaft=15	With	1.5	EC11E0B2LB01			
Hollow Shaft		Flat										Inner-shaft=25	Without	—				
Ring Type												Slotted	Outer-shaft=15	3 to 30	Without	Self-return switch	Without	—
Note Other varieties are also available. Please inquire.																		

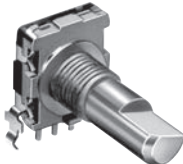
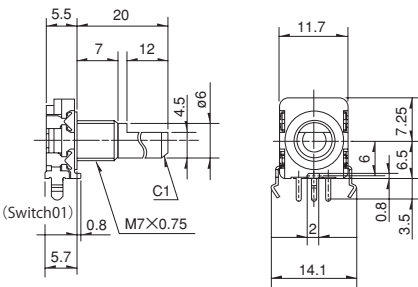
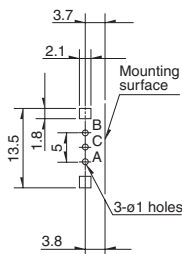
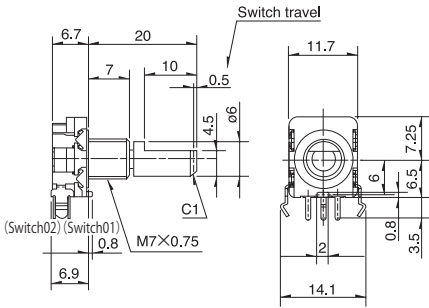
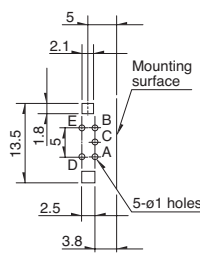
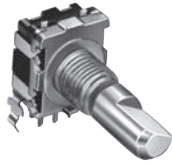
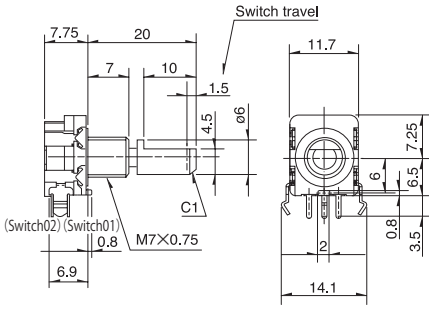
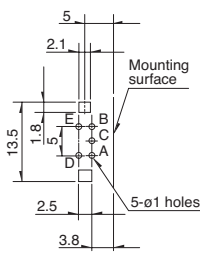
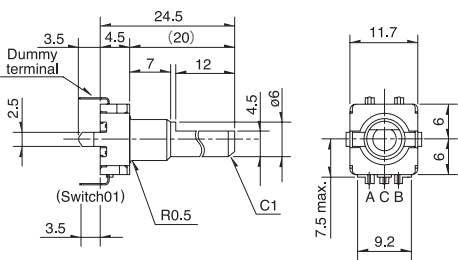
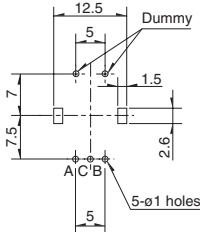
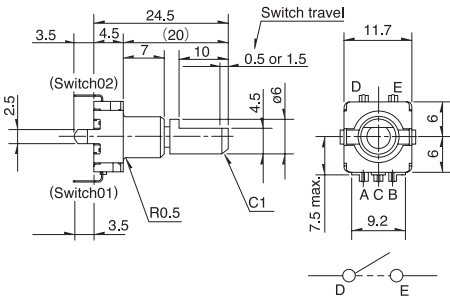
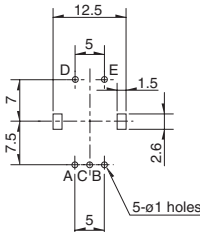
Packing Specifications

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
EC11I	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

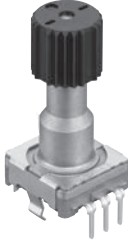
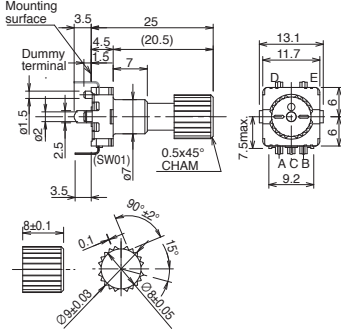
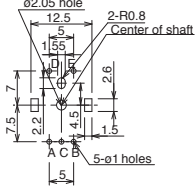
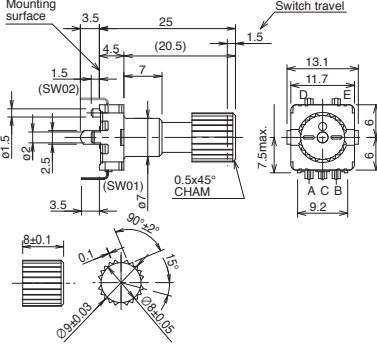
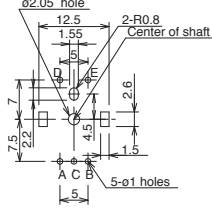
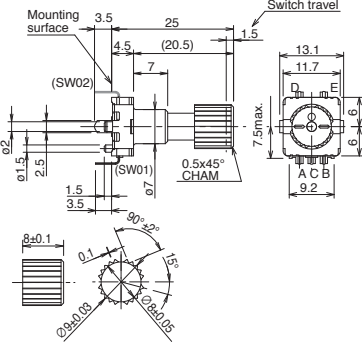
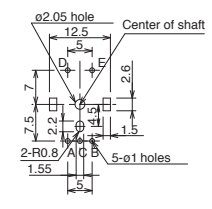
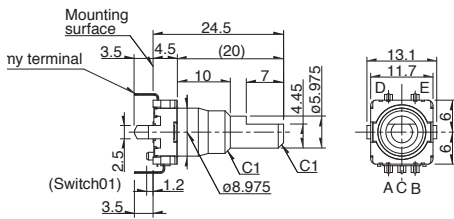
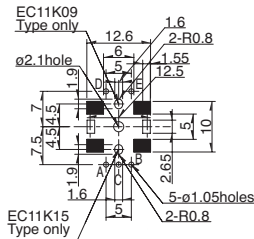
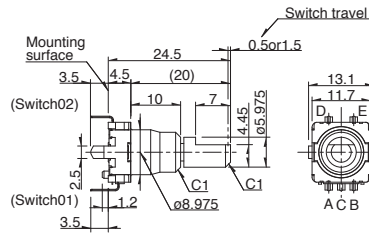
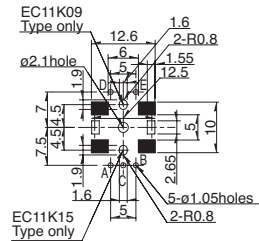
Insulated
Shaft

Hollow
Shaft

Ring
Type

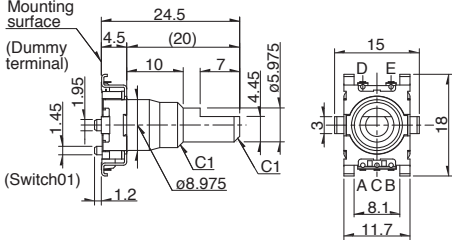
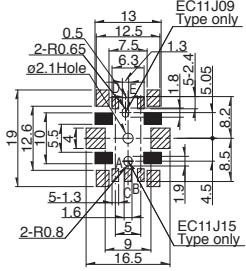
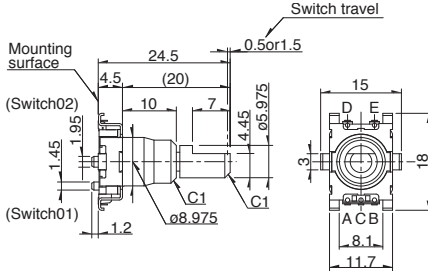
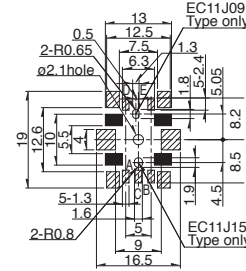
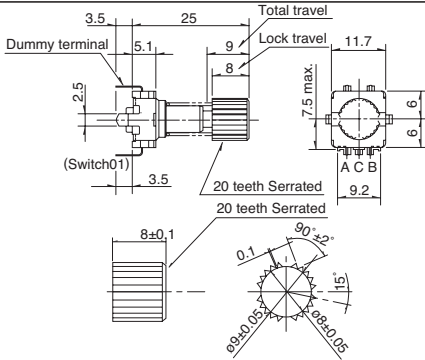
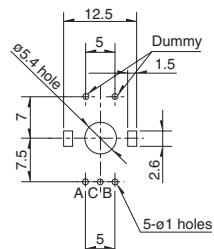
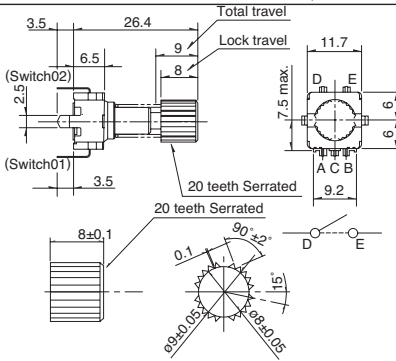
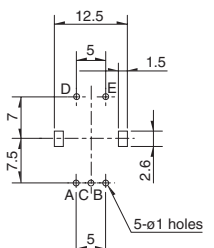
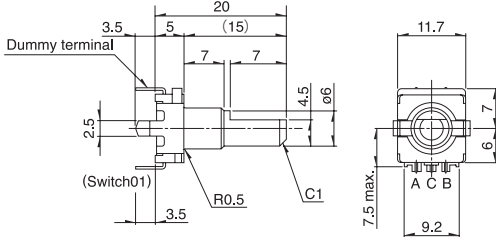
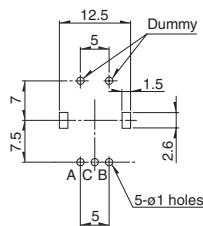
Dimensions

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 		 A slant line part: The solder land Black part: Do not solder and wiring for electrical contact
12	EC11J with push-on switch (travel 0.5mm / 1.5mm) 		 A slant line part: The solder land Black part: Do not solder and wiring for electrical contact
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**

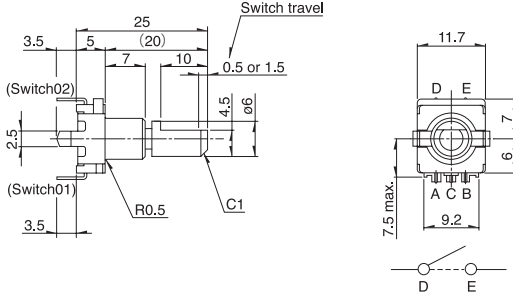
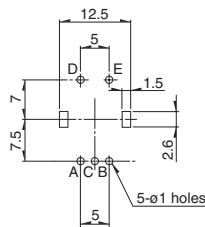
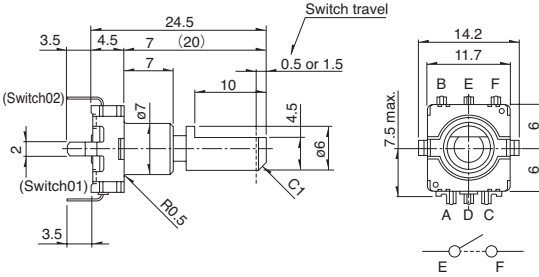
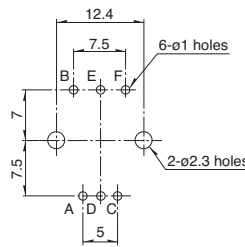
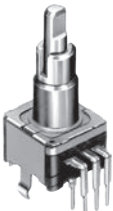
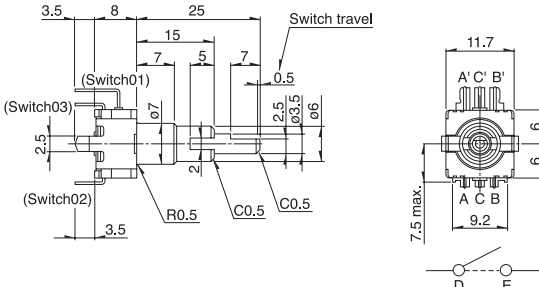
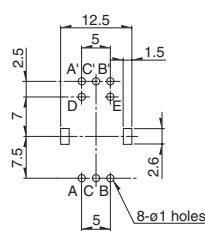
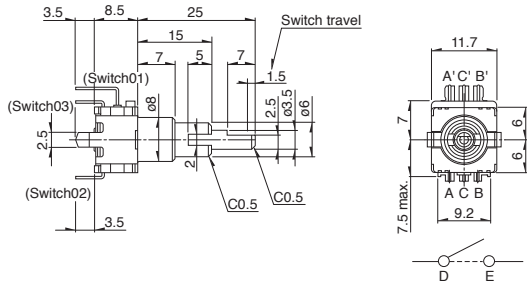
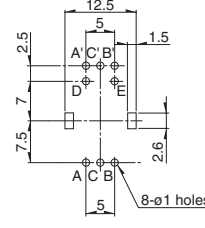
Insulated
Shaft

Hollow
Shaft

Ring
Type

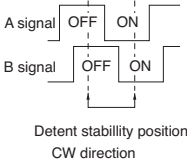
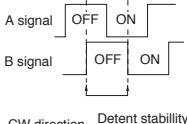
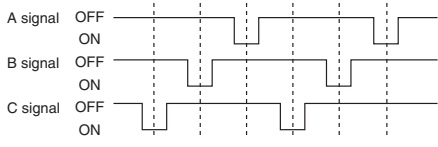
■ Dimensions

Unit:mm

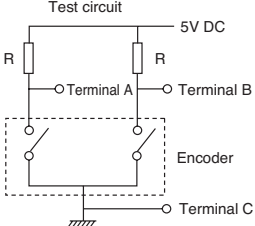
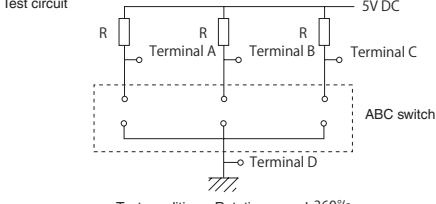
No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
16	EC111 Self-return switch with push-on switch (travel 0.5mm / 1.5mm) 		
17	EC11EH ABC switch with push-on switch (travel 0.5mm / 1.5mm) 		
18	EC11E Dual-shaft type with push-on switch (travel 0.5mm) Inner shaft: encoder Outer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

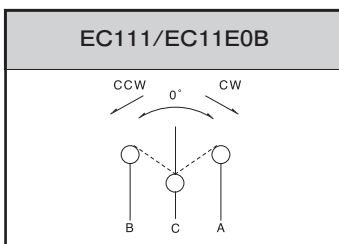
Output Wave

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

Sliding Noise

 Measurement condition : Rotation speed 360°/s t : Masking time to avoid chattering	Detailed dimensions <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.						
 Test condition : Rotation speed 360°/s	<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

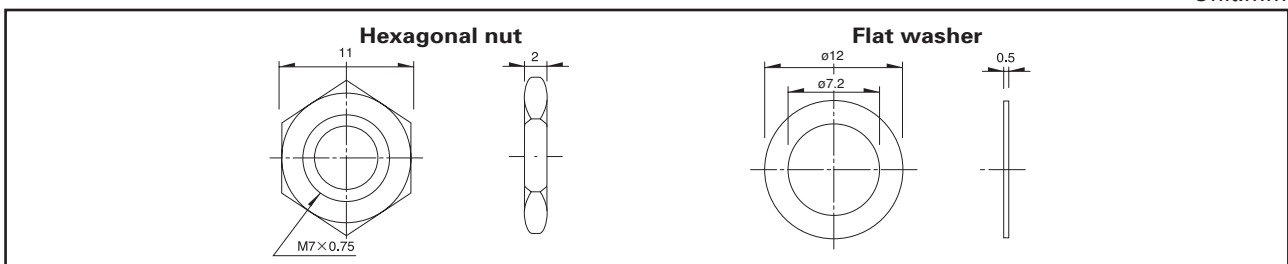


11mm Size Metal Shaft Encoders / Attached Parts

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)

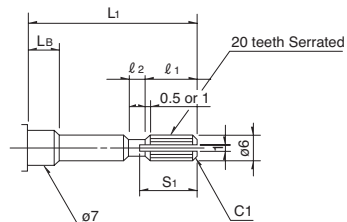
Unit:mm

1) Serrated Type

EC11

Configuration (Shaft diameter : $\phi 6$)

Not applicable for EC11E and EC11G with push-lock mechanism

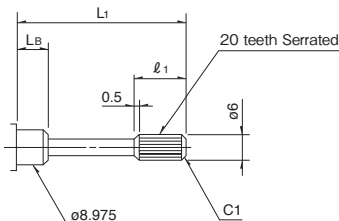


● Detailed dimensions

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

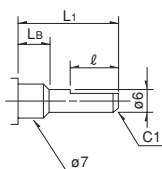
L_1	L_B	l_1
15	7	5
20	10	6

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

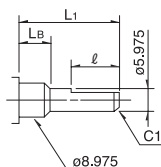
※ 1 Does not comply with EC111

※ 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

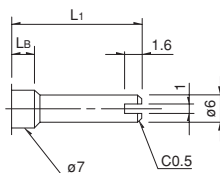
Dimensions marked with () apply to products without push-on switches.

3) Slotted Type

Unit:mm

EC11

Configuration (Shaft diameter : $\phi 6$)



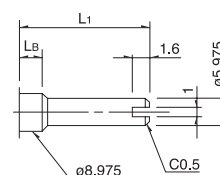
● Detailed dimensions

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

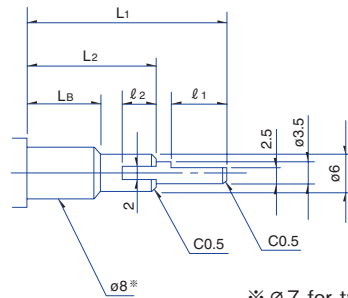
- The highlighted figures in shaft types refer to Product Specifications in P.161 and P.162.
- Other varieties are also available. Please inquire.

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

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

Notes

- The highlighted figures in shaft types refer to Product Specifications in P.162
- 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™

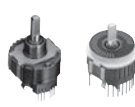
Metal
Shaft

Insulated
Shaft

Hollow
Shaft

Ring
Type

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

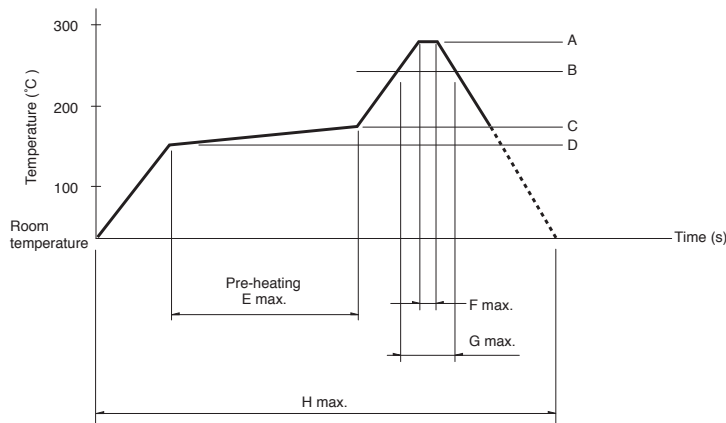
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11B, EC11E, EC11G, EC11K, EC12D, EC12E, EC18A, EC20A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC40A, EC45A, EC50A, EC60A, EM20B	350°C max.	3s max.	1 time
EC11J	350±10°C	3 ⁺¹ ₀ s	2 time

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.