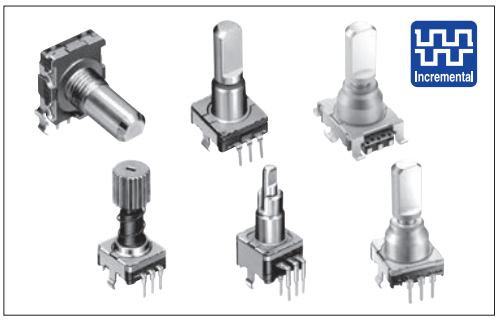
EC11 11mm Size Metal Shaft Type

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℃ to +85℃

Product Line

Structure	Shaft configuration	Length of the shaft L (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.) Japan	Minimum order unit (pcs.) Export	Product No.	Drawing No.
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**	
			10±7	36	18						**EC11E1820402**	
			10±7	18	9	With	0.5				**EC11E09244BS**	5
				30	15						**EC11E15244G1**	
			7^{+3}_{-4}	Without							**EC11E153440D**	
			10±7	36	18						**EC11E18244AU**	
			7^{+3}_{-4}	Without							**EC11E183440C**	
			10±7	18	9		1.5				**EC11E09244AQ**	
				30	15						**EC11E15244B2**	
			7^{+3}_{-4}	Without							**EC11E1534408**	
			10±7	36	18						**EC11E18244A5**	
			7^{+3}_{-4}	Without							**EC11E1834403**	
Less shaft wobble	Serrated	25	12±7	30	15	Without	—		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			**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.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.

Product Line

Structure	Shaft configuration	Length of the shaft L1,L2 (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.) Japan	Minimum order unit (pcs.) Export	Product No.	Drawing No.
Reflow	Flat	20	12±5	18	9	Without	—	100,000	300	600	**EC11J0920404**	11
				30	15						**EC11J152040F**	
				18	9	With	0.5				**EC11J0924411**	12
				30	15						**EC11J1524413**	
				18	9		1.5				**EC11J0925403**	
				30	15						**EC11J1525402**	
Push lock	20-tooth Serrated	25	10±7			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	—		1,200	2,400	**EC1110120005**	15
		20				With	0.5				**EC111012010H**	16
							1.5				**EC1110120201**	
Dual-shaft	Flat	Inner-shaft=25 Outer-shaft=15	10±7	30	15		0.5				**EC11EBB24C03**	17
	Slotted					Without	—	15,000	700	1,400		
	Flat	Inner-shaft=25 Outer-shaft=15				With	1.5				**EC11E0B2LB01**	18
	Slotted		3 to 30	Without	Self-return switch	Without	—					

Note

Other varieties are also available. Please inquire.

Packing Specifications

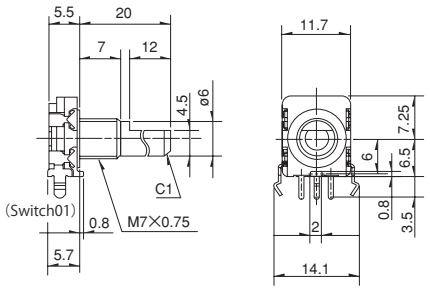
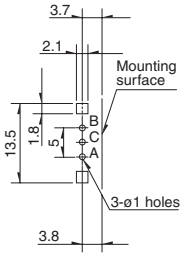
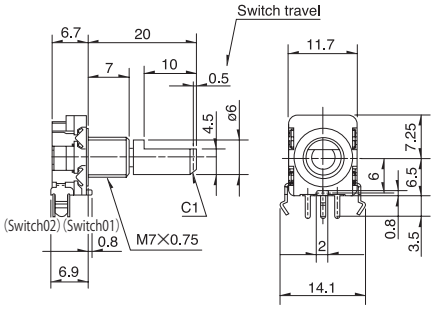
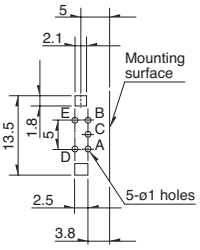
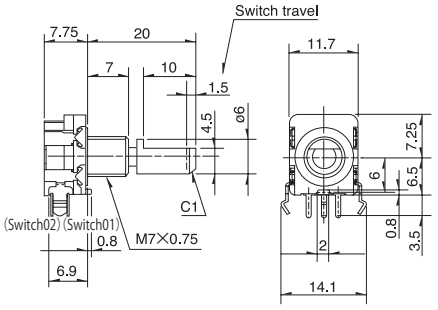
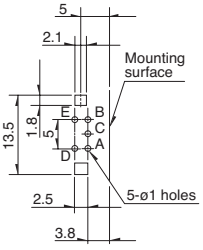
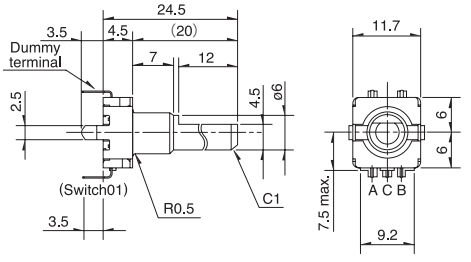
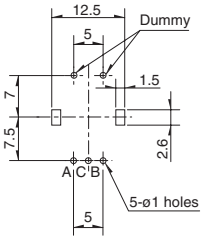
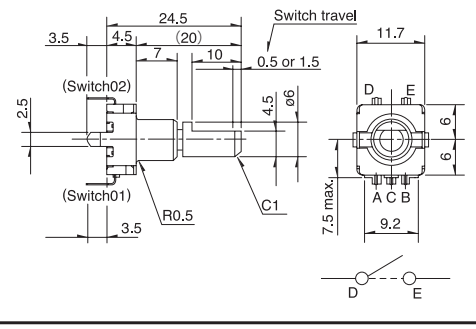
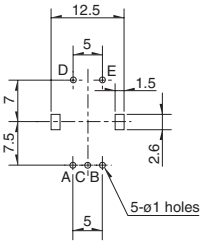
Tray

Product No.	Number of packages (pcs.) 1 case /Japan	Number of packages (pcs.) 1 case /export packing	Export package measurements (mm)
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.

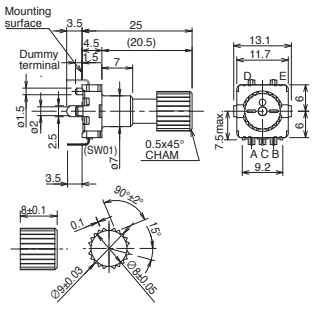
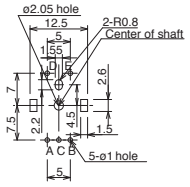
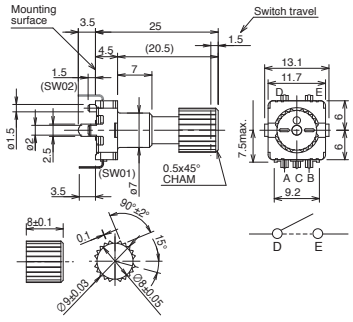
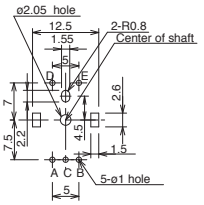
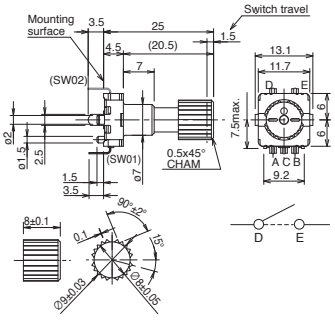
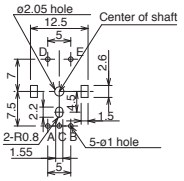
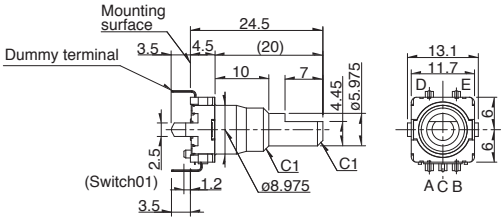
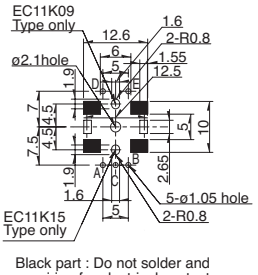
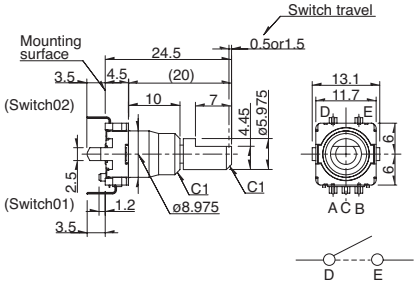
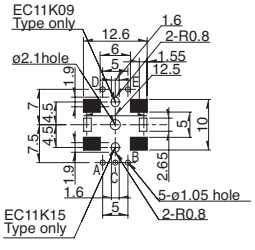
Dimensions

Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
1	**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)**		

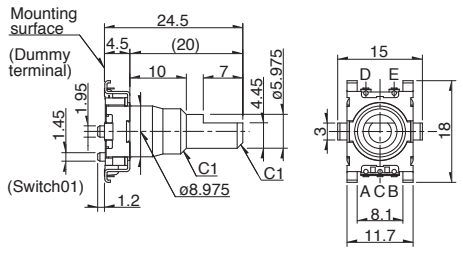
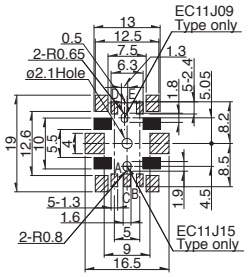
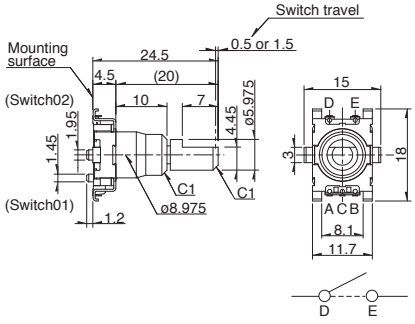
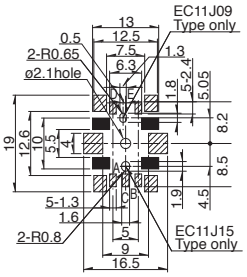
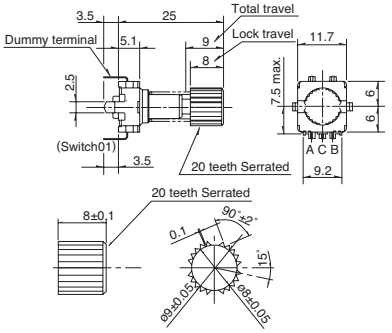
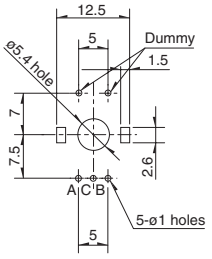
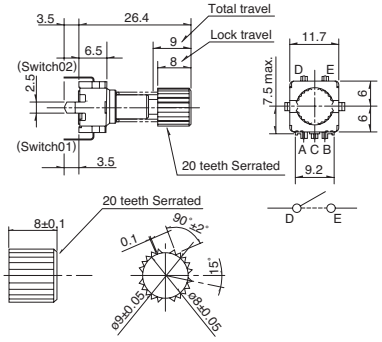
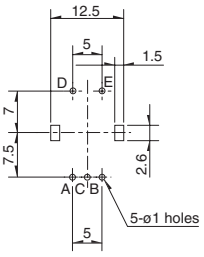
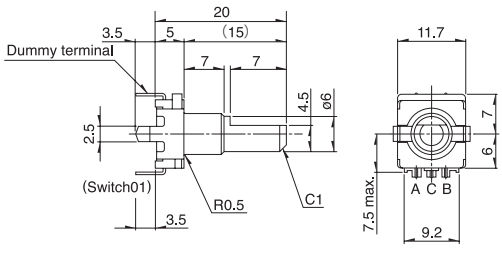
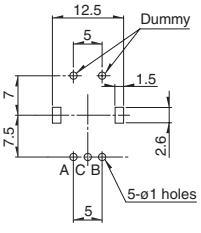
Dimensions

Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
6	**EC11G Vertical** 		
7	**EC11G Vertical with push-on switch (travel 1.5mm)** 		
8	**EC11G Vertical with push-on switch (travel 1.5mm)** 		
9	**EC11K Vertical** 		 Black part : Do not solder and no wiring for electrical contact.
10	**EC11K Vertical with push-on switch (travel 0.5mm / 1.5mm)** 		 Black part : Do not solder and no wiring for electrical contact.

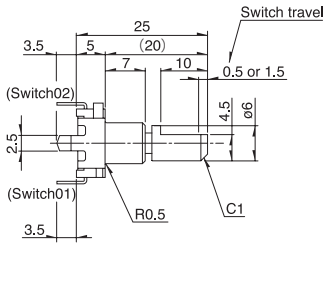
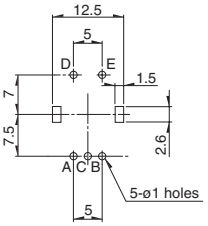
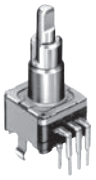
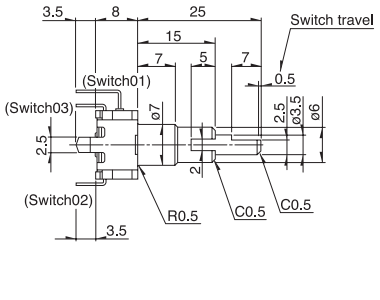
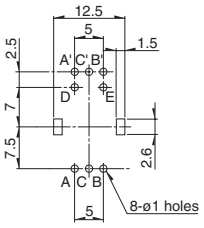
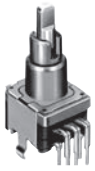
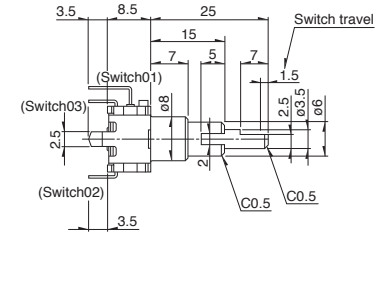
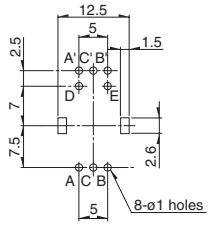
Dimensions

Unit:mm

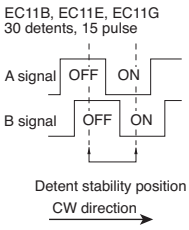
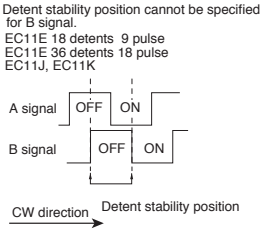
No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
11	**EC11J** **Reflow**		 A slant line part:The solder land Black part: Do not solder and wiring for electrical contact
12	**EC11J** **Reflow** **with push-on switch** **(travel 0.5mm / 1.5mm)**		 A slant line part:The solder 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**		

Dimensions

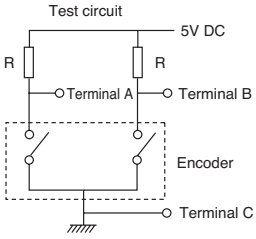
Unit:mm

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	**EC11E** **Dual-shaft type with push-on switch (travel 0.5mm)** **Inner shaft: encoder** **Outer shaft: encoder** 		
18	**EC11E** **Dual-shaft type with push-on switch (travel 1.5mm)** **Inner shaft: encoder** **Outer shaft: self-return switch** 		

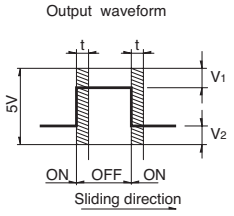
Output Wave

EC11B / EC11E / EC11G	EC11E / EC11J / EC11K
	

Sliding Noise



Measurement condition：Rotation speed 360°/s

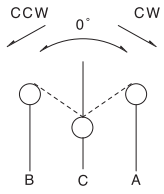


t : Masking time to avoid chattering

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

Circuit Diagram

EC111/EC11EOB

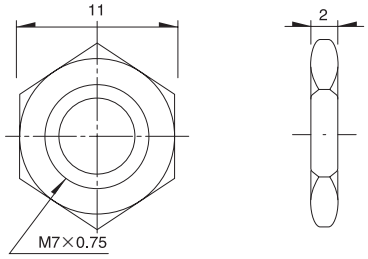
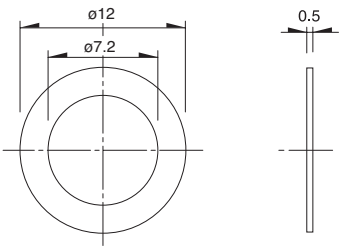


11mm Size Metal Shaft Type / Attached Parts

The following parts are included with the product.

EC11B Series

Unit:mm

Nut	Washer
	

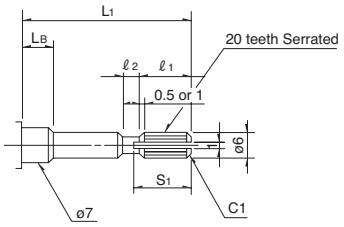
Shaft Dimensions

1. Single-shaft Type

1) Serrated Type

Unit:mm

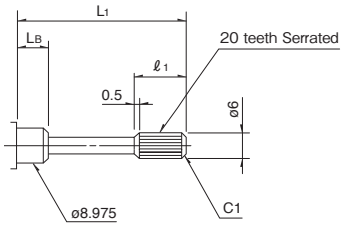
EC11
Configuration (Shaft diameter:φ6)
Not applicable for EC11E and EC11G with push-lock mechanism



● Detailed dimensions

L1	LB	ℓ1	ℓ2	S1
20	7	6	1	7
25	10	10	2	11

EC11K / EC11J
Configuration (Shaft diameter:φ6)



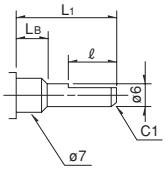
● Detailed dimensions

L1	LB	ℓ1
15	7	5
20	10	6

2) Flat Type

Unit:mm

EC11
Configuration (Shaft diameter:φ6)

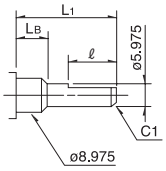


● Detailed dimensions

	L1	LB	ℓ
※1	15	5	7
	15	7	5 (6)
	20	7	10 (12)
※2	25	10	12

※1 Does not comply with EC111
※2 LB=7 for EC11B.
Values in parentheses apply to products without push-on switch.

EC11K / EC11J
Configuration (Shaft diameter:φ5.975)



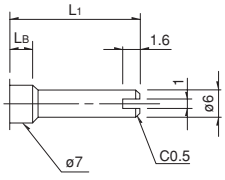
● Detailed dimensions

L1	LB	ℓ
15	7	5
20	10	7

3) Slotted Type

Unit:mm

EC11
Configuration (Shaft diameter:φ6)

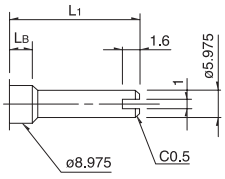


● Detailed dimensions

	L1	LB
	15	7
	20	7
※	25	10

※ LB=7 for EC11B.

EC11K / EC11J
Configuration (Shaft diameter:φ5.975)



● Detailed dimensions

L1	LB
15	7
20	10

Notes

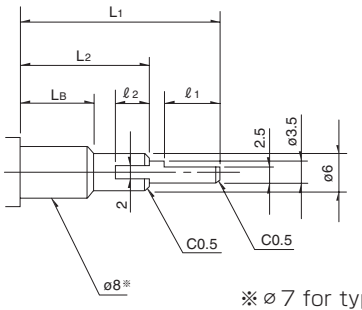
1. The highlighted figures in shaft types refer to Product Specifications in P.269 and P.270.
2. Other varieties are also available. Please inquire.

2. Standard Dimensions and Configuration of Dual-shaft Type

1) Flat Type

Unit:mm

Configuration (Inner-shaft :φ3.5 Outer-shaft :φ6)



● Detailed dimensions

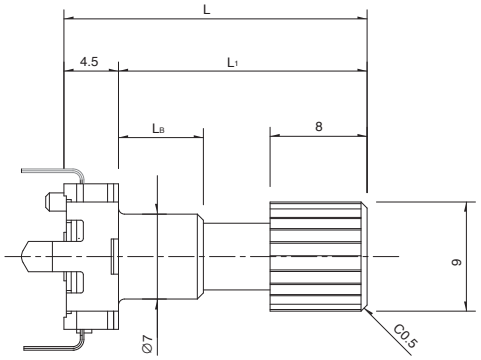
L_1	L_2	L_B	ℓ_1	ℓ_2
20	10		7	4
25	15	7	7	5
30	20	10	7	5

※ø7 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.

11mm 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)		$0.5^{+0.4}_{-0.3}$	1.5±0.5
Operating force		6±3N	5±2N
Operating life		25,000 times	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 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		$6^{+2.5}_{-2}$ 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 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±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 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

Type		Metal shaft									
Type		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							
Dimensions (mm)	D			13.8		12					
Dimensions (mm)	H	4.5		5.5		4.5			8 / 8.5		4.5
Operating temperature range		−40℃ to+85℃									
Operating life		15,000 cycles									
Automotive use		●		●		●					●
Life cycle (availability)											
Electrical performance	Rating	10mA 5V DC									
Electrical performance	Max./min. operating current (Resistive load)	10mA / 1mA									
Electrical performance	Insulation resistance	100MΩ min. 250V DC									
Electrical performance	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
Mechanical performance	Detent torque	8±5mN·m		12±7mN·m		10±7mN·m					12±7mN·m
Mechanical performance	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		
Switch Specifications	Contact arrangement	Single pole and single throw (Push-on)									
Switch Specifications	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
Switch Specifications	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
Switch Specifications	Rating	10mA 5V DC (500μA 5V DC min. ratings)		0.1A 5V DC (500μA 5V DC min. ratings)							
Switch Specifications	Contact resistance	100mΩ max. for initial period; 200mΩ max. after operating life.									
Switch Specifications	Operating life	10,000 times		25,000 times	20,000 times			10,000 times	20,000 times		
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Notes

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

Type		Metal shaft					
		11mm size				20mm size	
Series		EC111	EC11K	EC11J	EM11B	EC20A/RK203	EM20B
Photo					NEW 		
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	—	Magnetic type
Dimensions (mm)	W	11.7			10.8	20.2	20
	D	13	12	14.2	11	19.2	22.25
	H	5	4.5		7.5	10	13
Operating temperature range		−40℃ to +85℃			−30℃ to +85℃	−30℃ to +80℃	−10℃ to +70℃
Operating life		15,000 cycles	100,000 cycles		1,000,000 cycles	30,000 cycles	500,000 cycles
Automotive use		●	●	●	●	●	—
Life cycle (availability)		2	2	2	2	2	2
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	$0.5^{+0.3}_{-0.2}$	1.5±0.5	$0.5^{+0.4}_{-0.3}$
	Operating force (N)	$6^{+2.5}_{-2}$ 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
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Encoders Soldering Conditions 307
Encoders Cautions 308

Note

● Indicates applicability to all products in the series.

Reference for Manual Soldering

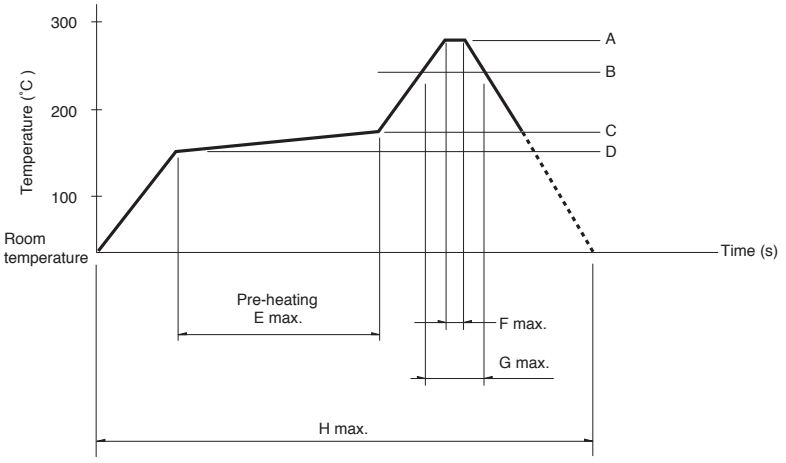
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11B, EC11E, EC11G, EC11K, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC40A, EC45A, EC50A, EC60B, EM11B, EM20B, EC21C	350℃ max.	3s max.	1 time
EC11J	350±10℃	3^{+1}_{0}s	2 time

Reference for Dip Soldering

Series	Preheating		Dip soldering		No. of solders
	Soldering surfacetemperature	Heating time	Soldering temperature	Soldering time	
EC09E, EC11B, EC111, EC11E, EC11G, EC11K, EC18A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC50A, EC60B	100℃ max.	2 min. max.	260±5℃	5±1s	2 time max.
EC10E, EC12D, EC12E, EM11B	100℃ max.	1 min. max.	260±5℃	3±1s	2 time max.
EC40A	110℃ max.	1 min. max.	260℃ max.	10s max.	1 time
EC45A	100℃ max.	2 min. max.	260℃ max.	5s max.	2 time max.
EM20B	80℃ max.	1 min. max.	260℃ 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℃	230℃	180℃	150℃	2 min. max.	3s	40s	4 min. max.	2 time max.
EC05E	250℃ min.	230℃ min.	180℃	150℃	60s to 120s	—	30s to 40s	—	2 time max.
EC21C	230℃ to 245℃	220℃	200℃	150℃	60s to 120s	—	25s to 60s	300 max.	1 time max.

注記

1. When using an infrared reflow oven, solder may sometimes not be applied. Be sure to use a hot air reflow oven or a type that uses infrared rays in combination with hot air.
2. The temperatures given above are the maximum temperatures at the terminals of the encoder when employing a hot air reflow method. The temperature of the PC board and the surface temperature of the encoder may vary greatly depending on the PC board material, its size and thickness. Ensure that the surface temperature of the encoder does not rise to 250℃ or greater.
3. Conditions vary to some extent depending on the type of reflow bath used. Be sure to give due consideration to this prior to use.