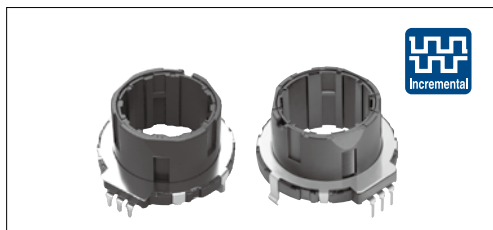


A low-profile unit with 4mm height and good operation feel



■ Typical Specifications



Items	Specifications
Rating	10mA 5V DC
Operating life	50,000 cycles
Operating temperature range	-40°C to +85°C (EC28A) -40°C to +90°C (EC28C)

■ Product Line

Structure	Actuator length (mm)	Detent torque (mN·m)	Number of detent	Number of pulse	Minimum order unit (pcs.)		Product No.	Drawing No.
					Japan	Export		
DIP	15	7±5	30	15	400	800	EC28A1520401	1
		12±7					EC28A1550401	
		20±10					EC28A1560401	
		12±7	EC28A1850402					
		20±10	EC28A1870401					
	25	20±10	18	18	420	840	EC28A1560501	2
Reflow	15	30 ± 15 (Initial) 20 ± 10 (After reflow)			30	15	480	480
		22 ± 11 (Initial) 16 ± 7 (After reflow)	EC28C1540403					

■ Packing Specifications

Tray

Product No.	Number of packages (pcs.)		Export package measurements (mm)
	1 case /Japan	1 case /export packing	
EC28A15, EC28A18	400	800	509×366×287
EC28A1560501	420	840	540×360×380
EC28C	480	480	440×290×205

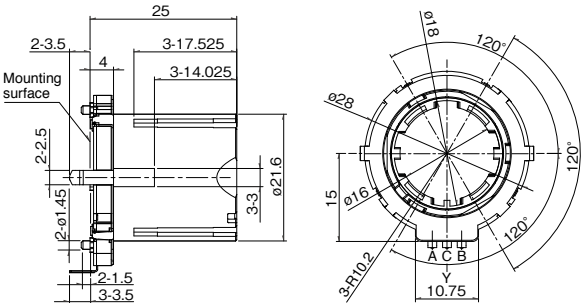
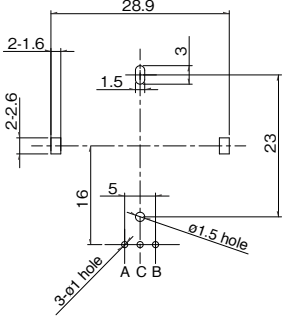
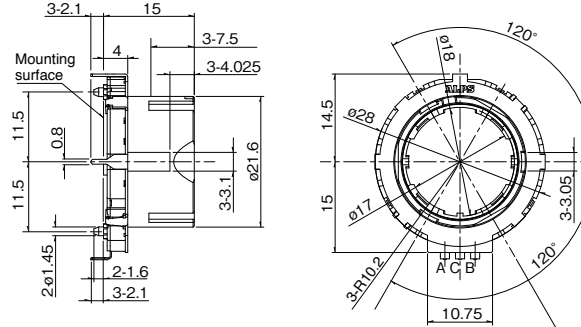
■ Dimensions

Unit:mm

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

Dimensions

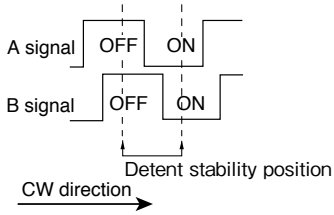
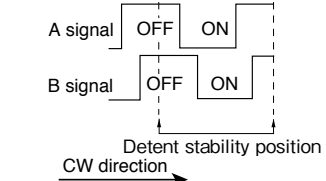
Unit:mm

No.	Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
2	EC28A Actuator length 25mm 		
3	EC28C Reflow type Actuator length 15mm 		

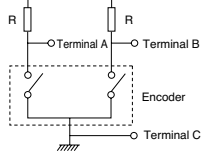
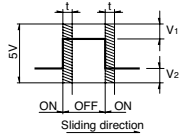
Encoders

Metal
ShaftInsulated
ShaftThrough
Shaft TypeRing
Type

Output Wave

EC28A15 EC28C15 	EC28A18  *Signal A and signal B output at detent positions cannot be specified.
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Sliding Noise

Test circuit $V_1 = V_2 = 2.5V \text{ max.}$  Measurement condition : Rotation speed 360°/s t : Masking time to avoid chattering	Output waveform 
At R = 5kΩ Chattering : 5ms max. Bounce : 5ms max.	

Type		Ring type				
		28mm size		35mm size		
Series		EC28A	EC28C	EC35A	EC35AH	EC35CH
Photo						
Output		Incremental (Two phase A and B)			Incremental (Three phase A, B and C)	
Shaft types		Ring type				
Number of pulse / Number of detent		15/30 18/18	15/30	9/18 15/30	6×ABC/18 10×ABC/30	6×ABC/18
Dimensions (mm)	W	28		35		35.2
	D	29	29.5			36
	H	4		4.5		
Operating temperature range		−40℃ to +85℃	−40℃ to +90℃	−40℃ to +85℃		−40℃ to +90℃
Operating life		50,000 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 1minute or 360V AC for 2s	300V AC for 1minute or 360V AC for 1s	300V AC for 1minute or 360V AC for 2s		300V AC for 1minute or 360V AC for 1s
Mechanical performance	Detent torque	7±5mN·m 12±7mN·m 20±10mN·m	22±11mN·m (Initial) 16±7mN·m (After reflow) 30±15mN·m (Initial) 20±10mN·m (After reflow)	18±7mN·m 22±8mN·m 30±15mN·m	12±5mN·m 18±7mN·m 30±15mN·m	30±15mN·m (Initial) 20±10mN·m (After reflow)
	Push-pull strength	100N				
Shaft configuration		Ring type				
Terminal type		Insertion				
Switch Specifications	Switch type	—	—	—	—	—
	Contact arrangement	—	—	—	—	—
	Travel (mm)	—	—	—	—	—
	Operating force (N)	—	—	—	—	—
	Switch ON position	—	—	—	—	—
	Rotational torque	—	—	—	—	—
	Rating	—	—	—	—	—
	Contact resistance	—	—	—	—	—
	Operating life	—	—	—	—	—
Page		288		290	292	

Encoders Soldering Conditions	299
Encoders Cautions	300

Note

● Indicates applicability to all products in the series.

Reference for Manual Soldering

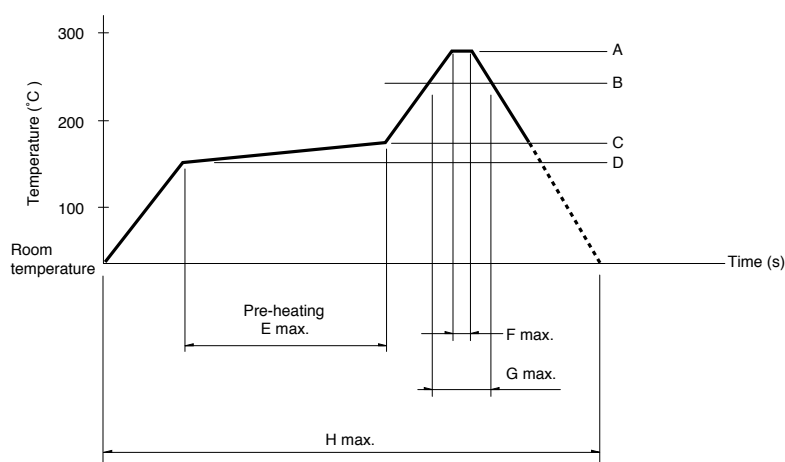
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11B, EC11E, EC11G, EC11K, EC11M, EC11N, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC40A, EC45A, EC50A, EC60B, EM11B, EC21C, EC28C, EC35CH	350°C max.	3s max.	1 time
EC11J	350±10°C	3 ⁺¹ ₀ s	2 times

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, EC11M, EC11N, EC18A, EC21A, EC28A, EC35A, EC35AH, EC50A, EC60B	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
EC45A	100°C max.	2 min. max.	260°C max.	5s max.	2 times max.

Example of Reflow Soldering Condition

Temperature profile



Series	A	B	C	D	E	F	G	H	No. of reflows
EC11J	260°C	230°C	180°C	150°C	2 min. max.	3s	40s	4 min. max.	2 times max.
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.

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