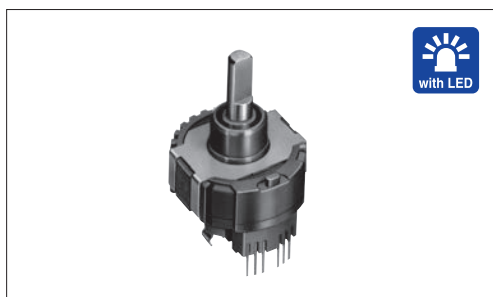


EM20B 20mm Size Metal Shaft Magnetic Type

Highly reliable non-contact type achieving
40-pulse high resolution



■ Typical Specifications

Items	Specifications
Output signal	VHI: +4.0V min. VLO: 0.5V max. (Isink=5mA)
Rating	10mA 5V±5% DC
Operating life	500,000 cycles
Operating temperature range	−10°C to +70°C

■ Product Line

Length of the shaft (mm)	Detent torque (mN·m)	Number of detent	Number of pulse	Operating direction	Push switch	Display function	Response time	Minimum order unit (pcs.)		Product No.
								Japan	Export	
16	8±5	40	40	Vertical	With	Without	1.3μs. (TYP)	480	960	EM20B4014000

Notes

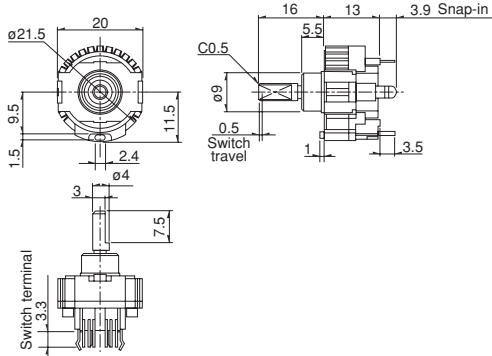
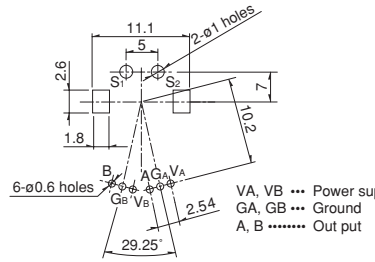
1. This product uses a Hall IC. Be aware of ESD damages.
2. Custom design for shaft configuration are available upon request.

■ Packing Specifications

Tray

Number of packages (pcs.)		Export package measurements (mm)
1 case /Japan	1 case /export packing	
480	960	378×527×262

■ Dimensions

Photo	Style	PC board mounting hole dimensions (Viewed from mounting side)
With push-on switch (travel 0.5mm) 		 VA, VB ... Power supply GA, GB ... Ground A, B Out put

Refer to P.292 for switches.
Refer to P.315 for soldering conditions.

20mm Size Metal Shaft Magnetic Type/Switch Specifications

Switch type		Momentary push switch
Contact arrangement		Single pole and single throw (Push-on)
Travel (mm)		$0.5 \pm \begin{smallmatrix} 0.4 \\ 0.3 \end{smallmatrix}$
Operating force		$6 \pm 3\text{N}$
Operating life		25,000 times
Electrical performance	Rating	3A 16V DC (10mA 16V DC min. ratings)
	Contact resistance	100mΩ max. for initial period, 200mΩ max. after operating life.
	Insulation resistance	100MΩ min. 250V DC
	Voltage proof	300V AC for 1 minute or 360V AC for 2 second

Encoders

Metal Shaft

Insulated Shaft

Hollow Shaft

Ring Type

Encoders

List of Varieties

Type		Metal shaft											
		11mm size						20mm size					
Series		EC111		EC11K		EC11J		EM11B		EC20A		EM20B	
Photo													
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)													
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) 10±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	1,000,000 times		20,000 times		25,000 times	
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Encoders Soldering Conditions	315
Encoders Cautions	316

Note

- Indicates applicability to all products in the series.

Reference for Manual Soldering

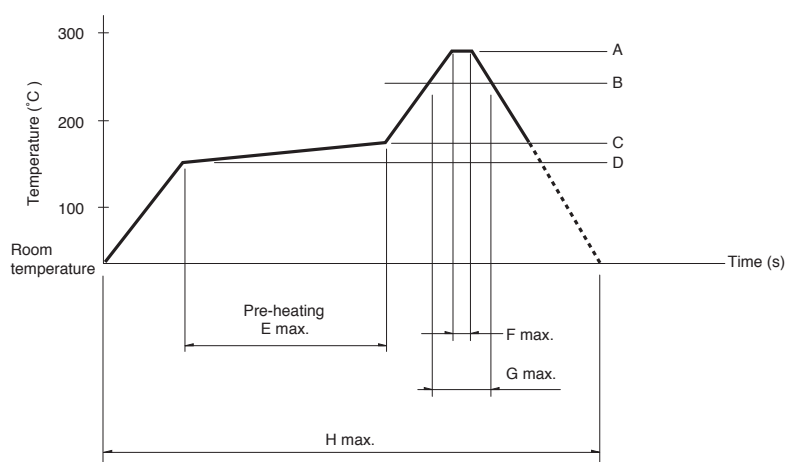
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11B, EC11E, EC11G, EC11K, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC40A, EC45A, EC50A, EC60B, EM11B, EM20B, EC21C, EC28C, EC35CH	350°C max.	3s max.	1 time
EC11J	350±10°C	3 ⁺¹ ₀ s	2 times

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, EC18A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC50A, EC60B	100°C max.	2 min. max.	260±5°C	5±1s	2 times max.
EC10E, EC12D, EC12E, EM11B	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.
EM20B	80°C max.	1 min. max.	260°C max.	3s 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.

注記

- 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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