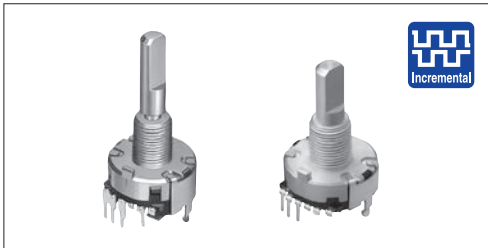


Heavy torque and comfortable operation feel for encoder and potentiometer applications



Typical Specifications



Items	Specifications	
	Encoder	Potentiometer
Rating	1 mA 5V DC	0.05W
Operating life	30,000 cycles	
Operating temperature range	-30°C to +80°C	-40°C to +85°C

Product Line

Encoders

Shaft configuration	Length of the shaft (mm)	Detent torque (mN·m)	Number of detent	Number of pulse	Operating direction	Push-on switch	Travel of push-on switch (mm)	Minimum order unit (pcs.)		Product No.	Drawing No.
								Japan	Export		
Flat	30	40±20	18	18	Vertical	With	1.5	400	800	EC20A1824401	1
						Without	—			EC20A1820401	2

Potentiometer

Shaft configuration	Length of the shaft (mm)	Detent torque (mN·m)	Number of detent	Rotational angle	Mounting direction	Number of resistor elements	Total resistance (kΩ)	Resistance taper	Minimum order unit (pcs.)		Product No.	Drawing No.
									Japan	Export		
Flat	30	40±20	17	220°	Vertical	Single-unit	10	1B	800	800	RK203111000V	3

Notes

- Only the encoder type can be supplied with a push-on switch.
- Shaft design and other features are customizable.

Packing Specifications

Tray

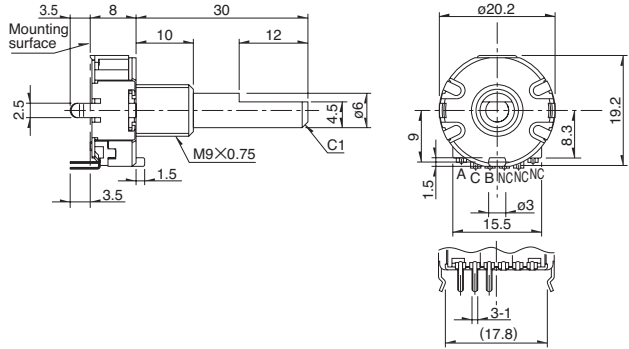
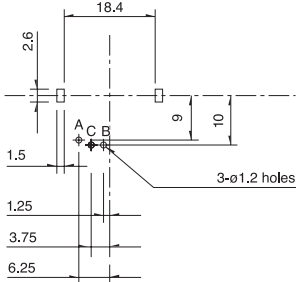
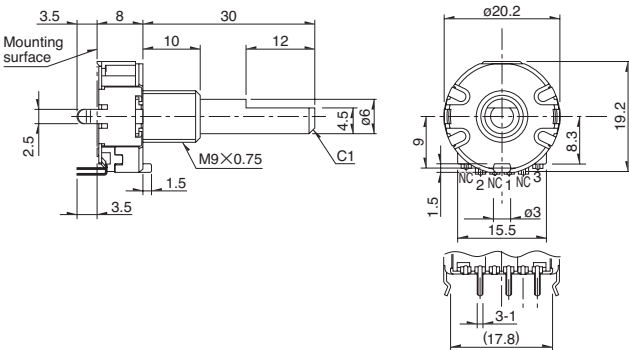
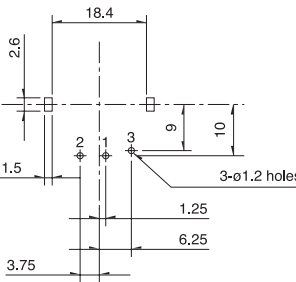
Number of packages (pcs.)		Export package measurements (mm)
1 case /Japan	1 case /export packing	
400	800	374×508×272

Dimensions

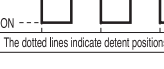
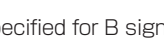
No.	Photo	Style	Unit:mm
1	EC20A with push-on switch (travel 1.5mm) Encoder type		

Refer to P.284 for attached parts.
Refer to P.284 for switches.
Refer to P.307 for soldering conditions.

Dimensions

No.	Photo	Style	PC board mounting hole dimensions (View from mounting side)
2	EC20A without switch type Encoder type 		
3	RK203 without switch type Potentiometer type 		

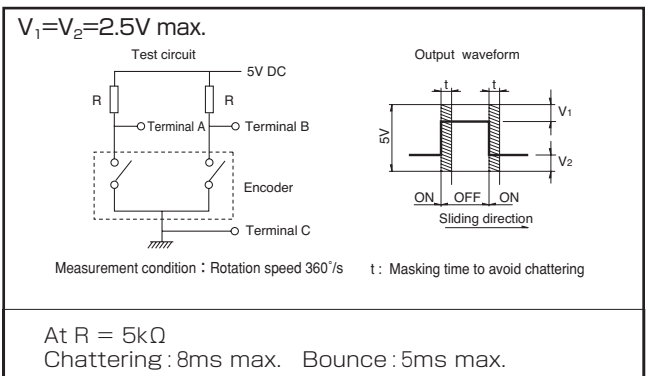
Output Wave (EC20A)

Shaft rotational Direction	Signal	Output
Clockwise	A (Terminal A-C)	
	B (Terminal B-C)	
Counter-clockwise	A (Terminal A-C)	
	B (Terminal B-C)	

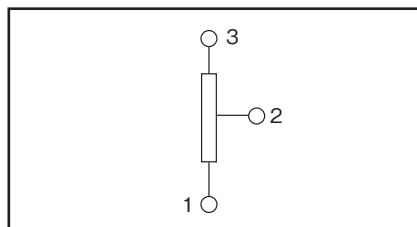
The dotted lines indicate detent positions.

※Detent position cannot be specified for B signal.

Output Wave (EC20A)



■ Circuit Diagram (RK203)



20mm Size Metal Shaft Type / Attached Parts

The following parts are included with the product.

Nut		Washer	

20mm Size Metal Shaft Type / Switch Specifications

Switch type		Momentary push switch
Contact arrangement		Single pole and single throw (Push-on)
Travel (mm)		1.5±0.5
Operating force		4±2N
Operating life		20,000 times
Electrical performance	Rating	0.5A 16V DC (1mA 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 2s

Type		Metal shaft											
		11mm size						20mm size					
Series		EC111		EC11K		EC11J		EM11B		EC20A/RK203		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) 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	1,000,000 times		20,000 times	25,000 times		
Page		269						280		282		285	

Encoders Soldering Conditions	307
Encoders Cautions	308

Note

- Indicates applicability to all products in the series.

Reference for Manual Soldering

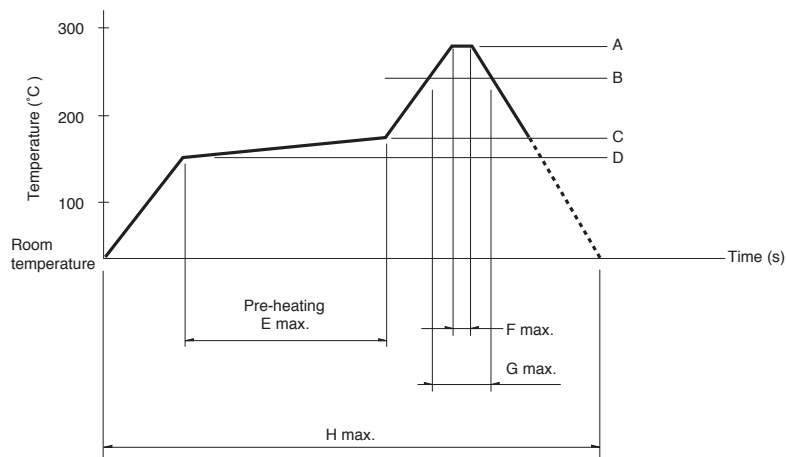
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11B, EC11E, EC11G, EC11K, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC35B, EC40A, EC45A, EC50A, EC60B, EM11B, EM20B, EC21C	350°C max.	3s max.	1 time
EC11J	350±10°C	3 ⁺¹ ₀ s	2 time

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

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 time max.
EC05E	250°C min.	230°C min.	180°C	150°C	60s to 120s	—	30s to 40s	—	2 time max.
EC21C	230°C to 245°C	220°C	200°C	150°C	60s to 120s	—	25s to 60s	300 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.