Encoders

Metal shaft Encoder

List of Varieties

Series		EC09E	EC111	EC11E	EC11M
Photo					
Dimensions		9mm size	11mm size		
Output		Incremental (Two phase A and B)	Self-return switch	Incremental (Two phase A and B)	
Actuator configuration		Flat			Serrated
Number of detent		30	Without	18 30 36	30 Without
Number of pulse		15	Self-return switch	9 15 18	15
Operating temperature range		-40℃ to +85℃			
Operating life		15,000 cycles			
Electrical performance	Ratings	10mA 5V DC			
	Max./min. operating current (Resistive load)	10mA/1mA			
	Insulation resistance	100MΩ 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	—	3 ~ 30mN·m	—	8.5±5mN·m
	Detent torque	8±5mN·m	—	10±7mN·m	12±7mN·m
	Push-pull strength	10ON			
Push-on switch specifications	Contact arrangement	Single pole single throw (Push-on)			
	Travel (mm)	0.5±0.3 1.5±0.5			1.5±0.35
	Operating force (N)	4±2 6(+2.5, -2)			5±2
	Rating	10mA 5V DC (1mA 5V DC min. ratings)	0.1A 5V DC (500μA 5V DC min. ratings)		
	Contact resistance (Initial performance/ After lifetime)	100mΩ max./200mΩ max.			
	Operating life (times)	10,000	20,000		
Automotive		●	●	●	●

⚠Note

● Indicates applicability to all products in the series, while ○ indicates applicability to some products in the series.

Encoders Metal shaft Encoder

9mm Size Metal Shaft Type
EC09E Series

Compact, round type with a 9.5mm body size, contributing to reduced mounting area.

Automotive

- Output signal:Two phase A and B
- Ratings:10mA 5V DC
- Operating life:15,000 cycles

Applications:Automotive:Navigation/audio systems, HVAC

■ Product List

Products No.	Control part orientation	Actuator configuration	Actuator length (mm)	Detent torque	Number of detent	Number of pulse	Push-on switch	Travel of push-on switch (mm)	Automotive	Drawing No.
EC09E1520407	Vertical	Flat	15	8±5mN·m	30	15	Without	—	●	1
EC09E1524417	Vertical	Flat	20	8±5mN·m	30	15	With	0.5	●	2
EC09E1524418	Vertical	Flat	20	8±5mN·m	30	15	With	1.5	●	3

⚠Note

1. This catalog shows only outline specifications. When using the products, please obtain formal specifications for supply.
2. Please place purchase orders per minimum order unit (integer).
3. Products other than those listed in the above chart are also available. Please contact us for details.

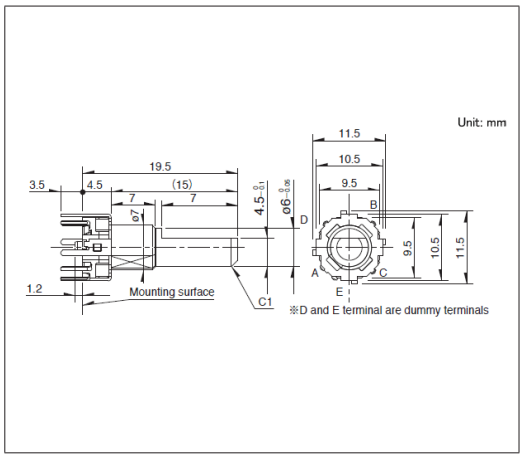
■ Packing Specifications

Tray

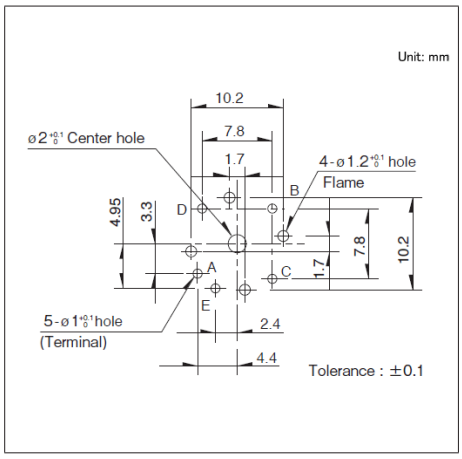
Number of packages(pcs.)		Export package measurements (mm)
1 case / Japan	1 case / export packing	
700	1,400	529 x 374 x 213

Drawing No.1

■ Dimensions



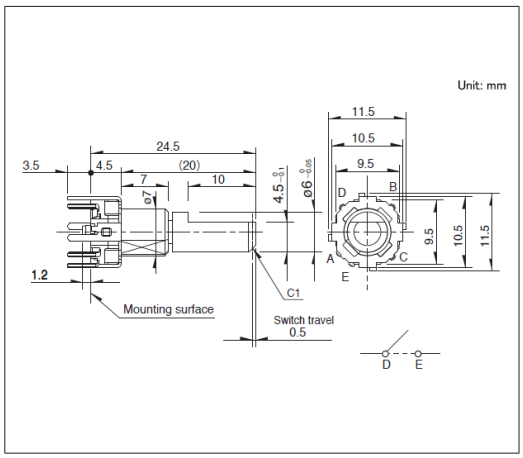
■ Mounting Hole Dimensions



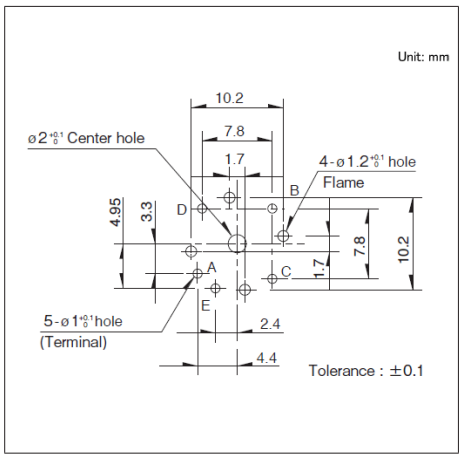
Viewed from mounting side.

Drawing No.2

■ Dimensions



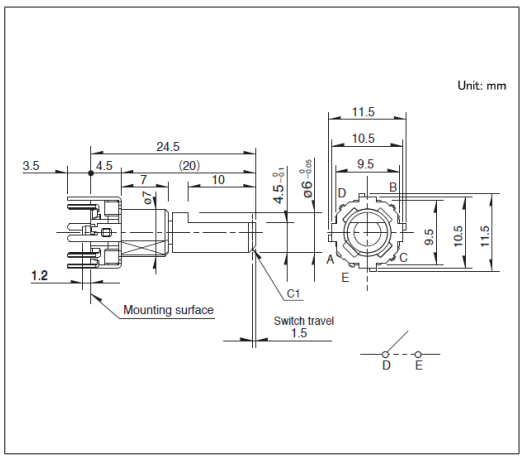
■ Mounting Hole Dimensions



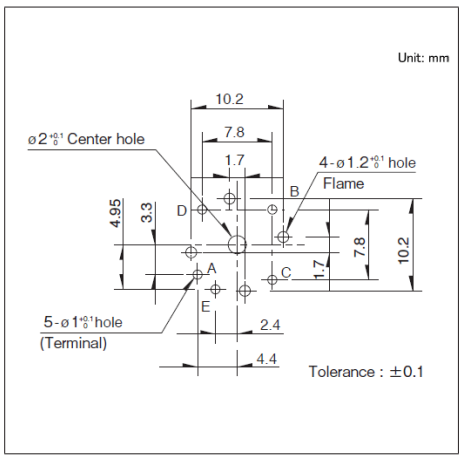
Viewed from mounting side.

Drawing No.3

■ Dimensions



■ Mounting Hole Dimensions

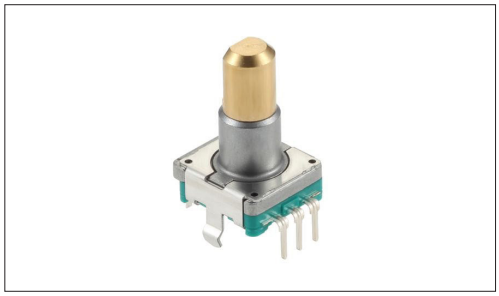


Viewed from mounting side.

Encoders Metal shaft Encoder

11mm Size Metal Shaft Type
EC111 Series

Compact and highly reliable with a diverse product variety.



Automotive

- Output signal:Self-return switch
- Ratings:10mA 5V DC
- Operating life:15,000 cycles

Applications:Energy_Industrial:Industrial equipment, Converters
Home:Major home appliances
Audio_TV:Visual,Audio
Automotive:Navigation/audio systems, HVAC

■ Product List

Products No.	Control part orientation	Actuator configuration	Actuator length (mm)	Rotational torque	Number of detent	Number of pulse	Push-on switch	Travel of push-on switch (mm)	Automotive	Drawing No.
EC1110120005	Vertical	Flat	15	3 ~ 30mN·m	Without	Self-return switch	Without	—	●	1
EC111012010H	Vertical	Flat	20	3 ~ 30mN·m	Without	Self-return switch	With	0.5	●	2
EC1110120201	Vertical	Flat	20	3 ~ 30mN·m	Without	Self-return switch	With	1.5	●	

Note

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2. Please place purchase orders per minimum order unit (integer).
3. Products other than those listed in the above chart are also available. Please contact us for details.

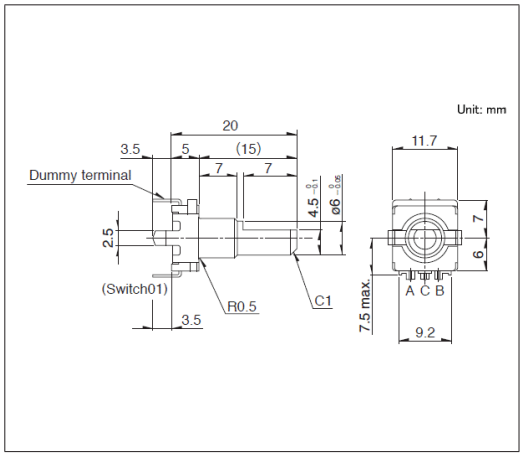
■ Packing Specifications

Tray

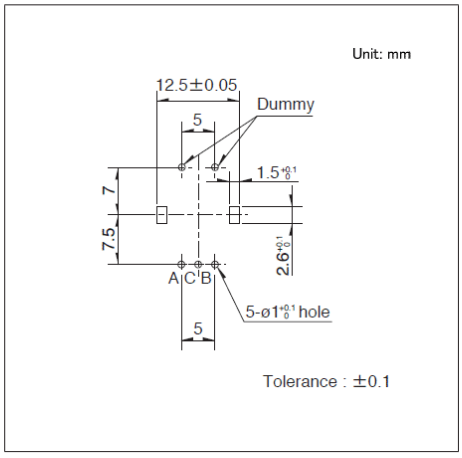
Number of packages(pcs.)		Export package measurements (mm)
1 case / Japan	1 case / export packing	
1,200	2,400	507 x 363 x 216

Drawing No.1

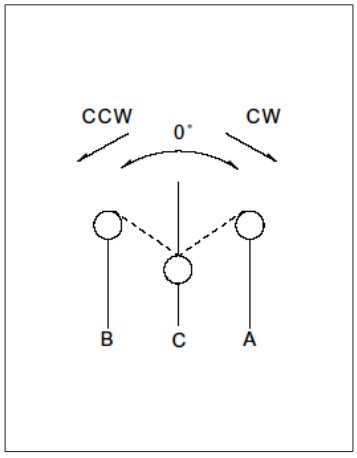
■ Dimensions



■ Mounting Hole Dimensions



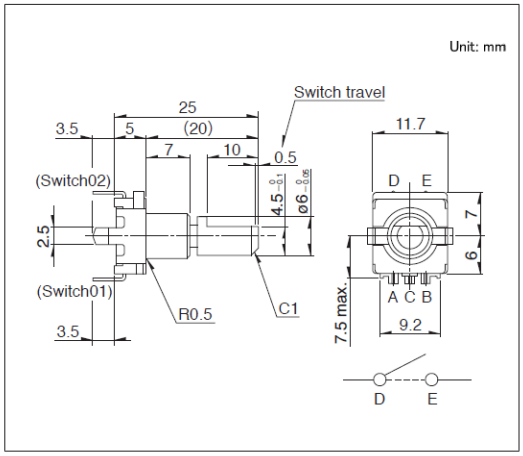
■ Circuit Diagram



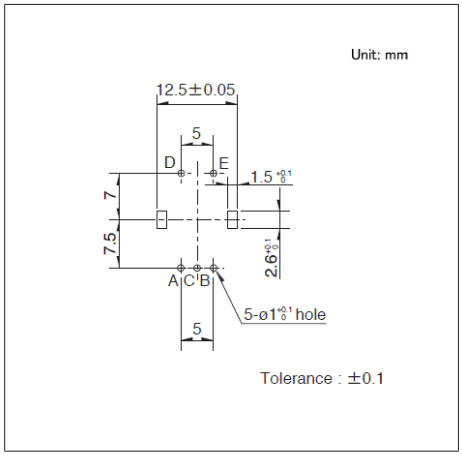
Viewed from mounting side.

Drawing No.2

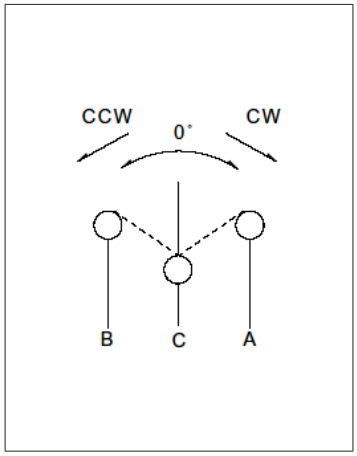
■ Dimensions



■ Mounting Hole Dimensions



■ Circuit Diagram

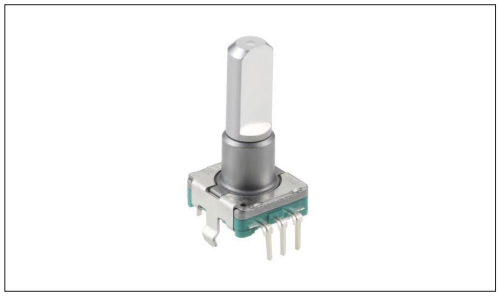


Viewed from mounting side.

Encoders Metal shaft Encoder

11mm Size Metal Shaft Type
EC11E Series

Compact and highly reliable with a diverse product variety.



Automotive

- Output signal:Two phase A and B
- Ratings:10mA 5V DC
- Operating life:15,000 cycles

Applications:Energy_Industrial:Industrial equipment, Converters
Home:Major home appliances
Audio_TV:Visual,Audio
Automotive:Navigation/audio systems, HVAC

■ Product List

Products No.	Control part orientation	Actuator configuration	Actuator length (mm)	Detent torque	Number of detent	Number of pulse	Push-on switch	Travel of push-on switch (mm)	Automotive	Drawing No.
EC11E09204A4	Vertical	Flat	20	10±7mN·m	18	9	Without	—	●	1
EC11E15204A3	Vertical	Flat	20	10±7mN·m	30	15	Without	—	●	
EC11E1820402	Vertical	Flat	20	10±7mN·m	36	18	Without	—	●	
EC11E09244BS	Vertical	Flat	20	10±7mN·m	18	9	With	0.5	●	2
EC11E15244G1	Vertical	Flat	20	10±7mN·m	30	15	With	0.5	●	
EC11E18244AU	Vertical	Flat	20	10±7mN·m	36	18	With	0.5	●	
EC11E09244AQ	Vertical	Flat	20	10±7mN·m	18	9	With	1.5	●	3
EC11E15244B2	Vertical	Flat	20	10±7mN·m	30	15	With	1.5	●	
EC11E18244A5	Vertical	Flat	20	10±7mN·m	36	18	With	1.5	●	

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3. Products other than those listed in the above chart are also available. Please contact us for details.

■ Packing Specifications

Tray

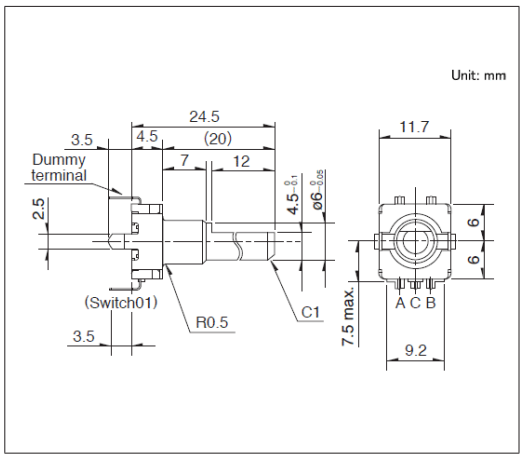
Number of packages(pcs.)		Export package measurements (mm)
1 case / Japan	1 case / export packing	
1,200	2,400	540 x 360 x 250

11mm Size Metal Shaft Type

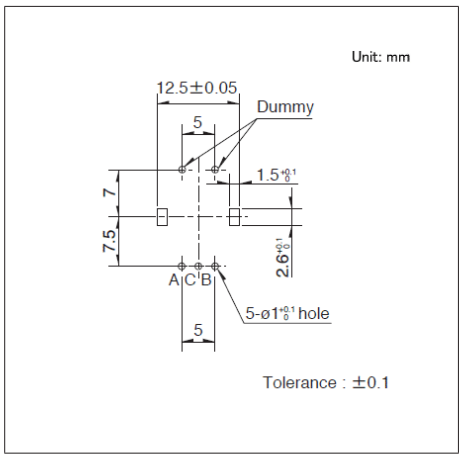
EC11E Series

Drawing No.1

■ Dimensions



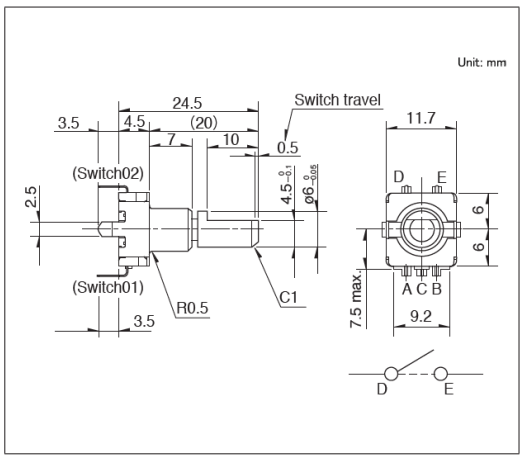
■ Mounting Hole Dimensions



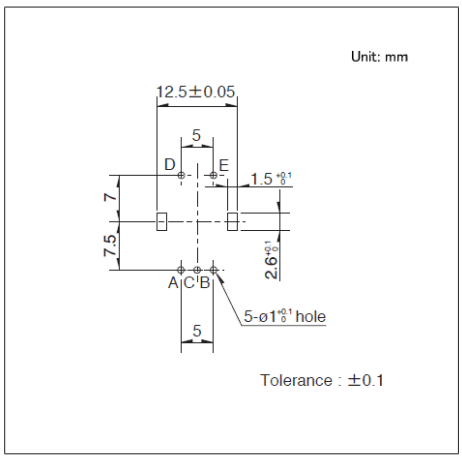
Viewed from mounting side.

Drawing No.2

■ Dimensions



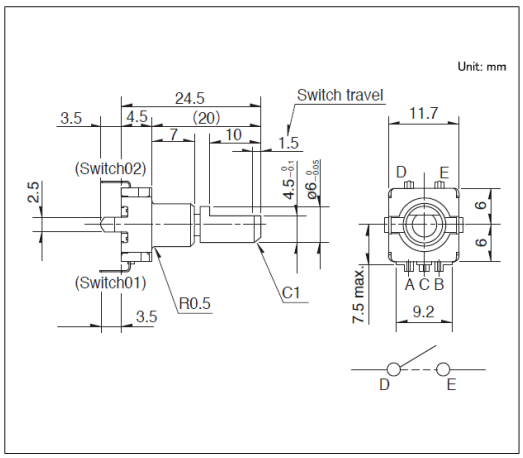
■ Mounting Hole Dimensions



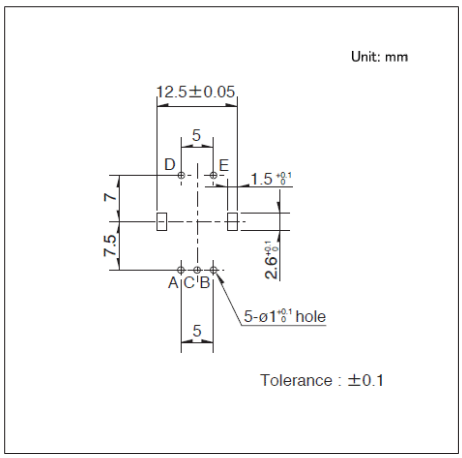
Viewed from mounting side.

Drawing No.3

■ Dimensions



■ Mounting Hole Dimensions



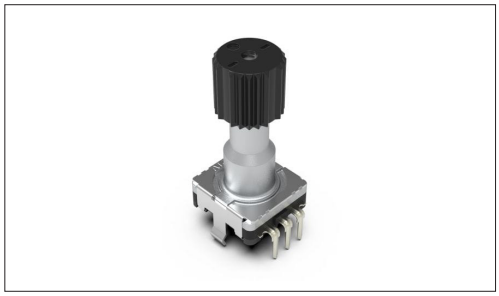
Viewed from mounting side.

Encoders | Metal shaft Encoder

11mm Size Metal Shaft Type

EC11M Series

Compact and highly reliable with a diverse product variety.



Automotive

- Output signal:Two phase A and B
- Ratings:10mA 5V DC
- Operating life:15,000 cycles

Applications:Energy_Industrial:Industrial equipment, Converters
Home:Major home appliances
Audio_TV:Visual,Audio
Automotive:Navigation/audio systems, HVAC

■ Product List

Products No.	Control part orientation	Actuator configuration	Actuator length (mm)	Rotational torque	Detent torque	Number of detent	Number of pulse	Push-on switch	Travel of push-on switch (mm)	Automotive	Drawing No.
EC11M1565403	Vertical	Serrated	25	—	12±7mN·m	30	15	With	1.5	●	1
EC11M1575403	Vertical	Serrated	25	8.5±5mN·m	—	Without	15	With	1.5	●	2

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3. Products other than those listed in the above chart are also available. Please contact us for details.

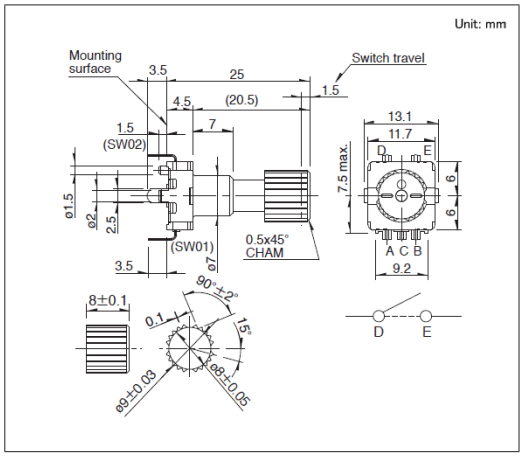
■ Packing Specifications

Tray

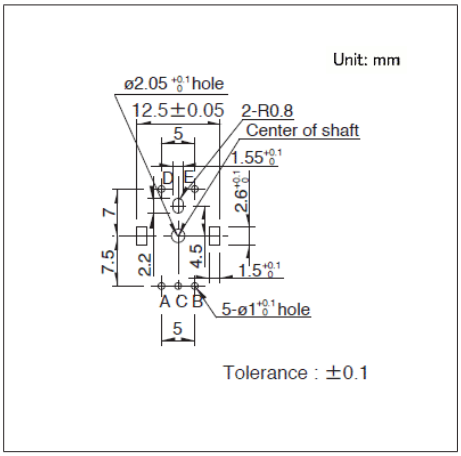
Number of packages(pcs.)		Export package measurements (mm)
1 case / Japan	1 case / export packing	
1,000	2,000	540 x 360 x 250

Drawing No.1

■ Dimensions



■ Mounting Hole Dimensions



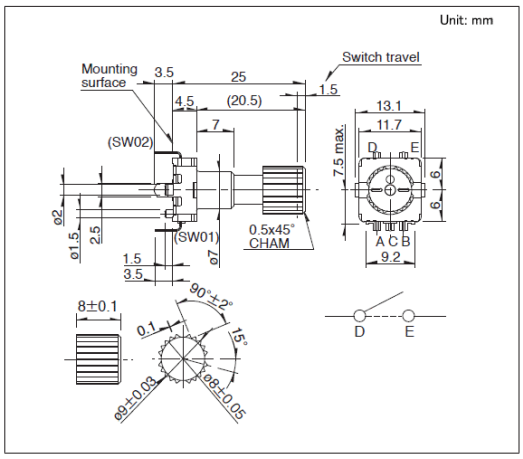
Viewed from mounting side.

11mm Size Metal Shaft Type

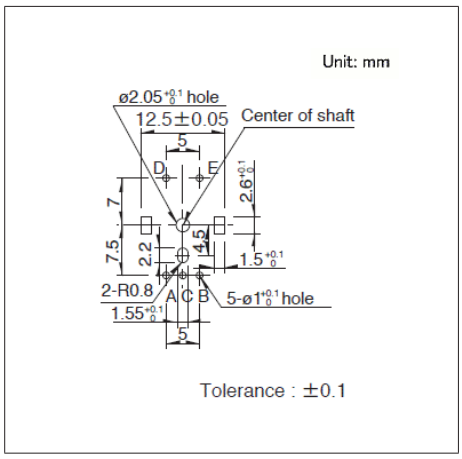
EC11M Series

Drawing No.2

■ Dimensions



■ Mounting Hole Dimensions



Viewed from mounting side.

Encoders / Soldering Conditions

■ Reference for Manual Soldering

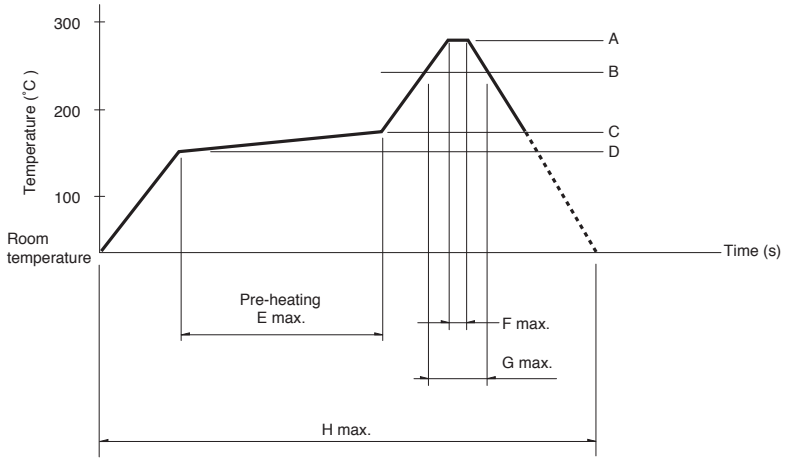
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11E, EC11M, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC40A, EC50A, EC21C, EC28C, EC35CH	350℃ max.	3s max.	1 time

■ Reference for Dip Soldering

Series	Preheating		Dip soldering		No. of solders
	Soldering surfacetemperature	Heating time	Soldering temperature	Soldering time	
EC09E, EC111, EC11E, EC11M, EC18A, EC21A, EC28A, EC35A, EC35AH, EC50A	100℃ max.	2 min. max.	260±5℃	5±1s	2 times max.
EC10E, EC12D, EC12E	100℃ max.	1 min. max.	260±5℃	3±1s	2 times max.
EC40A	110℃ max.	1 min. max.	260℃ max.	10s max.	1 time

■ Example of Reflow Soldering Condition

Temperature profile



Series	A	B	C	D	E	F	G	H	No. of reflows
EC05E	250℃ min.	230℃ min.	180℃	150℃	60s to 120s	—	30s to 40s	—	2 times max.
EC21C	230℃ to 245℃	220℃	200℃	150℃	60s to 120s	—	25s to 60s	300s max.	1 time max.
EC28C, EC35CH	260℃	230℃	180℃	150℃	2 min. min.	3s	40s	230s max.	1 time max.

⚠Note

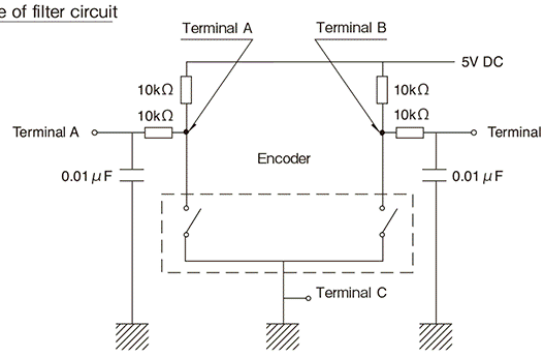
1. When using an infrared reflow oven, solder may sometimes not be applied. Be sure to use a hot air reflow oven or a type that uses infrared rays in combination with hot air.
2. The temperatures given above are the maximum temperatures at the terminals of the encoder when employing a hot air reflow 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.

Encoders / Cautions

Pulse count process

With respect to pulse count design of encoders, operational speed, sampling time, and masking time, etc. should be taken into consideration. Be sure to confirm these factors before using the encoder. For your pulse count design, consider adding C/R filters on your circuit as shown below.

Example of filter circuit

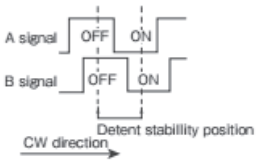


(Example of circuit for use)

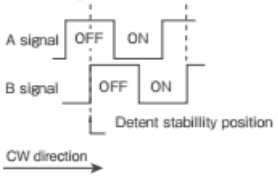
Output Specifications

Depending on the product, output at encoder detent positions can be specified either for both signals A and B, or for signal A only. Specifications vary according to the number of detents and other factors.

Example where both signal A and B output can be specified



Example where only signal A output can be specified



※On / off status of signal B at detent stability point is not specified

Dew Condensation

Do not use this product where dew or water drops might occur on the pattern surface of the encoder, etc. Insulation deterioration or shorting may occur.

Usage Environment

Use of the encoders in a dusty environment may lead the dusts entering through the openings and cause imperfect contact or malfunction. Take this into account for set design. Corrosive gas if generated by peripheral parts of a set, malfunction such as imperfect contact may occur. Thorough investigation shall be required before hand.

Operation

The encoders will be break if you apply a greater stress than that specified. Take great care not to let the encoders be subject to greater stress than specified.

Looseness of the Shaft

When long shafts are being employed, the looseness (deviation) tends to grow in proportion to the shaft length. Checking shaft looseness under actual operational conditions is recommended.

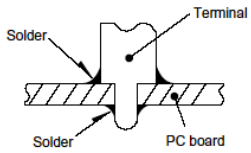
Installation

Insert these encoders to the specified mounting surface and mount them horizontally. If not mounted horizontally, these encoders will malfunction. Tighten the mounting screws by applying the specified torque. Tightening with larger torque than the specified one will result in malfunction or breakage of screws. Protect small and thin encoders from external forces in the set mounting process.

Encoders / Cautions

Soldering

1. To avoid potential contact issues, please do not solder wires to the top surface of the printed circuit board as shown in the diagram.
   Solder all metal lugs into a substrate before use.



2. Appling load to terminals during soldering under certain conditions may cause deformation and electrical property degradation.
3. Avoid use of water-soluble soldering flux, since it may corrode the switches.
4. Check and conform to soldering requirements under actual mass production conditions.
5. When soldering twice, wait until the first soldered portion cools to normal temperature. Continuous heating will deform the external portions, loosen or dislodge terminals, or may deteriorate their electrical characteristics.
6. Flux from around and above the PC board should not adhere to the switches.
7. After mounting the switches, if you intend to put the board into an oven in order to harden adhesive for other parts, please consult with Alps Alpine.
8. If you use a through-hole PC board or a PC board thinner or thicker than the recommendation, here may be greater heat stress. Verify the soldering conditions thoroughly before use.
9. Solder the switches with detent at the detent position. Soldering switches fixed at the center of the detent may deform the detent mechanisms.
10. No washing.

Use of Chemicals

Since synthetic resins such as polycarbonate are being used as the material for the insulated type shafts, avoid using this product under gassy environments containing such chemicals as ammonia, amines, alkaline water solutions, aromatic hydrocarbons, ketones, esters and halogenated hydrocarbons, especially under intensive gas environments.

Operation at Low Temperature

When these products are expected to be used under low temperature environments such as applications for car radios and car stereos, we can customize them for easier and more smooth rotary movements. When placing orders, indicate whether the low temperature specification is necessary or not.

Storage

1. Store the products as delivered, at a normal temperature and humidity, without direct sunshine and corrosive gas ambient. Use them at an earliest possible timing, not later than six months upon receipt.
2. After breaking the seal, keep the products in a plastic bag to shut out ambient air, store them in the same environment as above, and use them up as soon as possible.
3. Do not stack too many switches.