Encoders

Insulated shaft Encoder

List of Varieties

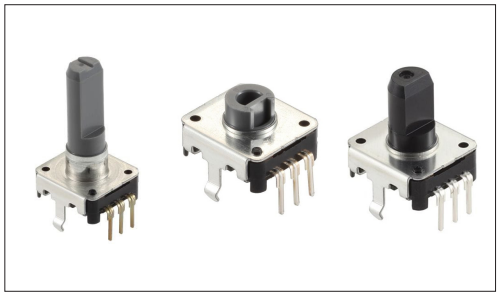
Series		EC12E	EC12D	EC18A
Photo				
Dimensions		12mm size		18mm size
Output		Incremental (Two phase A and B)		Absolute
Water-proof		—	—	●
Dust-proof		—	—	—
IP standard		—	—	IPX7 equivalent
Actuator configuration		—	—	Flat
Number of detent		12 24 Without	30	—
Detent torque		12 24	15	—
Operating temperature range		-10℃ to +70℃	-40℃ to +85℃	-20℃ to +60℃
Operating life		30,000 cycles		
Electrical performance	Ratings	0.5mA 5V DC	1mA 5V DC	1mA 10V DC
	Max./min. operating current (Resistive load)	5mA/0.5mA	10mA/1mA	—
	Insulation resistance	10MΩ min. 50V DC	100MΩ min. 250V DC	10MΩ min. 250V DC
	Voltage proof	50V AC for 1 minute	300V AC for 1 minute or 360V AC for 1s	50V AC for 1 minute or 60V AC for 2s
Mechanical performance	Rotational torque	10mN·m max. 40±15mN·m	—	
	Detent torque	3 to 20mN·m 3±2mN·m	10±5mN·m 5±3mN·m	—
	Push-pull strength	80N	100N	Push 100N / Pull 50N
Push-on switch specifications	Contact arrangement	—	Single pole single throw (Push-on)	—
	Travel (mm)	—	0.5±0.3	—
	Operating force (N)	—	3(+1.5, -1) 6(+2.5, -2)	—
	Rating	—	1mA 5V DC (10mA 5V DC max. ratings)	—
	Contact resistance (Initial performance/ After lifetime)	—	100mΩ max./200mΩ max.	—
	Operating life (times)	—	30,000	—
Automotive		—	●	—

⚠Note

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

12mm Size Insulated Shaft Type
EC12E Series

Insulated shaft type with a diverse product variety.



- Output signal:Two phase A and B
- Ratings:0.5mA 5V DC
- Operating life:30,000 cycles

Applications:Energy_Industrial: Converters
Home:Major home appliances
Audio_TV:Visual,Audio,Pro audio

■ Product List

Products No.	Type	Actuator length (mm)	Torque	Number of detent	Number of pulse	Automotive	Drawing No.
EC12E1220407	Standard Type	15.0	Standard 3 to 20mN·m	12	12	—	1
EC12E1220406		20.0	Standard 3 to 20mN·m	12	12	—	2
EC12E1220405		25.0	Standard 3 to 20mN·m	12	12	—	3
EC12E1220301		8.5 (Hollow shaft)	Standard 3 to 20mN·m	12	12	—	4
EC12E1240405		20.0	Lightest (jog) 3±2mN·m	12	12	—	2
EC12E1240406		25.0	Lightest (jog) 3±2mN·m	12	12	—	3
EC12E1240301		8.5 (Hollow shaft)	Lightest (jog) 3±2mN·m	12	12	—	4
EC12E24204A2		15.0	Standard 3 to 20mN·m	24	24	—	1
EC12E24204A7		17.5	Standard 3 to 20mN·m	24	24	—	5
EC12E24204A8		20.0	Standard 3 to 20mN·m	24	24	—	2
EC12E24204A9		25.0	Standard 3 to 20mN·m	24	24	—	3
EC12E2420301		8.5 (Hollow shaft)	Standard 3 to 20mN·m	24	24	—	4
EC12E24404A8		20.0	Lightest (jog) 3±2mN·m	24	24	—	2
EC12E24404A6		25.0	Lightest (jog) 3±2mN·m	24	24	—	3
EC12E2440301		8.5 (Hollow shaft)	Lightest (jog) 3±2mN·m	24	24	—	4
EC12E24104A6		20.0	Lightest (jog) 10mN·m max	Without	24	—	2
EC12E1220813	With Bushing Type	25.0	Standard 3 to 20mN·m	12	12	—	6
EC12E2420802		20.0	Standard 3 to 20mN·m	24	24	—	7
EC12E2420801		25.0	Standard 3 to 20mN·m	24	24	—	6
EC12E2420803		30.0	Standard 3 to 20mN·m	24	24	—	8
EC12E2460802		30.0	Heavy 40±15mN·m	Without	24	—	

⚠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.
4. Nuts and washers are not included. If required, please contact us.

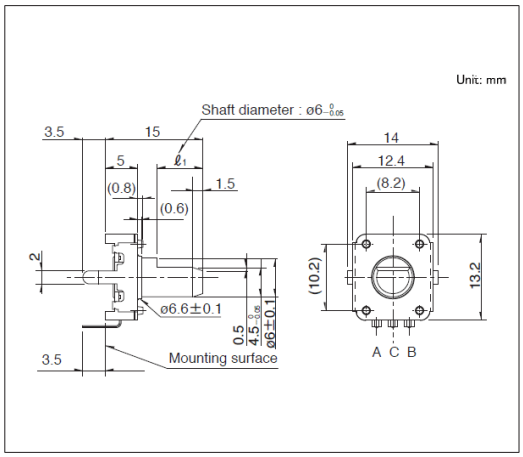
■ Packing Specifications

Tray

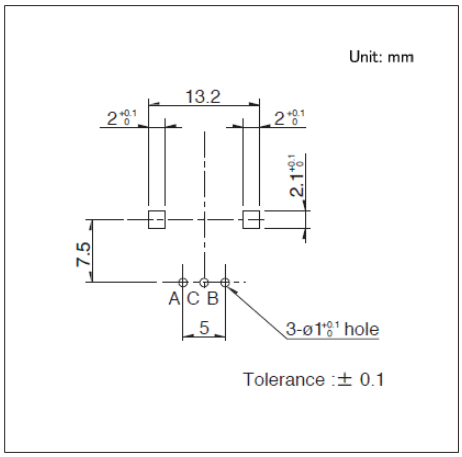
Products No.	Number of packages(pcs.)		Export package measurements (mm)
	1 case / Japan	1 case / export packing	
EC12E1220407 EC12E1220406 EC12E1220405 EC12E1240405 EC12E1240406 EC12E24204A2 EC12E24204A7 EC12E24204A8 EC12E24204A9 EC12E24404A8 EC12E24404A6 EC12E24104A6	2,400	2,400	525 x 369 x 204
EC12E1220301 EC12E1240301 EC12E2420301 EC12E2440301	3,000	3,000	525 x 369 x 204
EC12E1220813 EC12E2420802 EC12E2420801 EC12E2420803 EC12E2460802	1,900	1,900	525 x 369 x 204

Drawing No.1

■ Dimensions



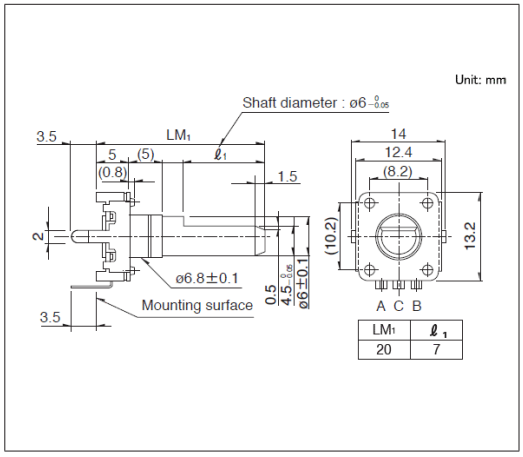
■ Mounting Hole Dimensions



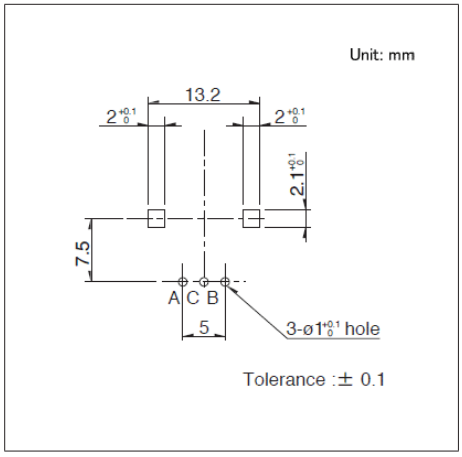
Viewed from mounting face.

Drawing No.2

■ Dimensions



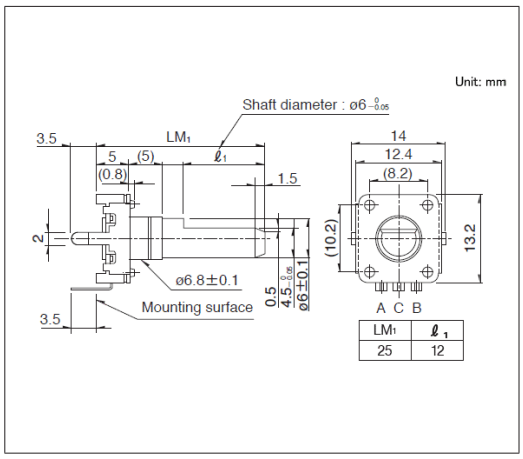
■ Mounting Hole Dimensions



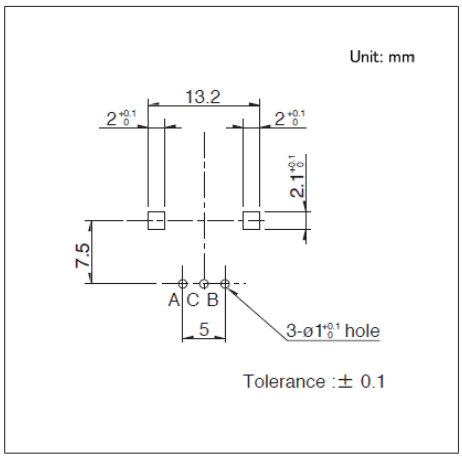
Viewed from mounting face.

Drawing No.3

■ Dimensions



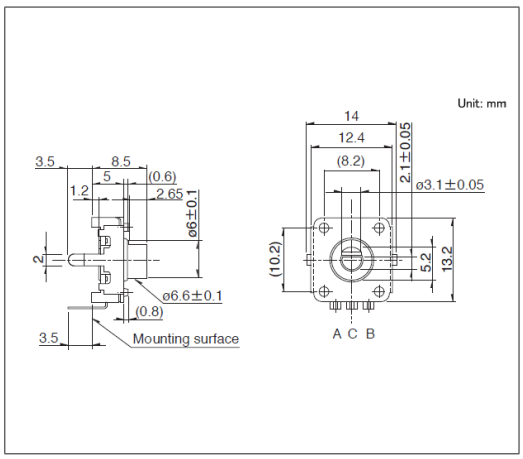
■ Mounting Hole Dimensions



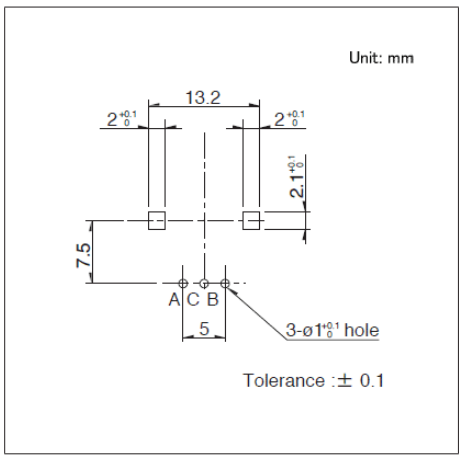
Viewed from mounting face.

Drawing No.4

■ Dimensions



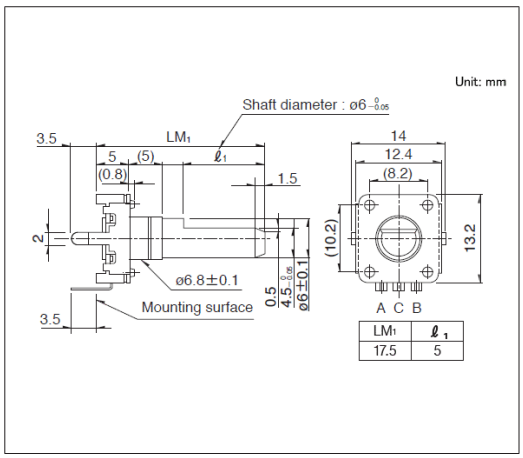
■ Mounting Hole Dimensions



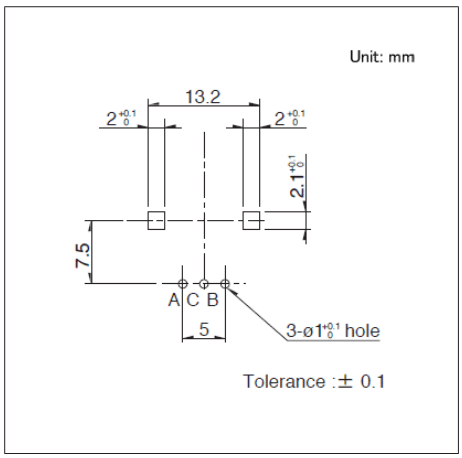
Viewed from mounting face.

Drawing No.5

■ Dimensions



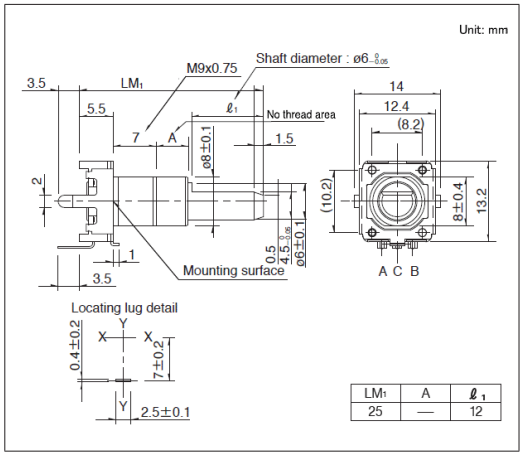
■ Mounting Hole Dimensions



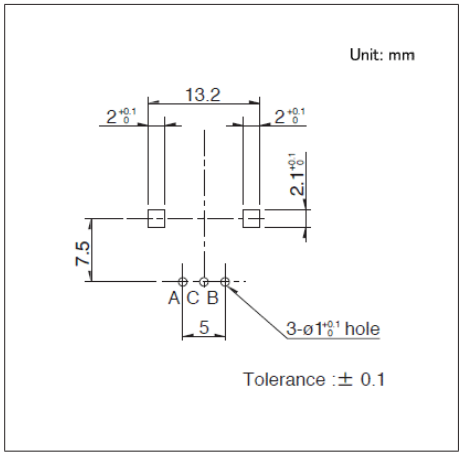
Viewed from mounting face.

Drawing No.6

■ Dimensions



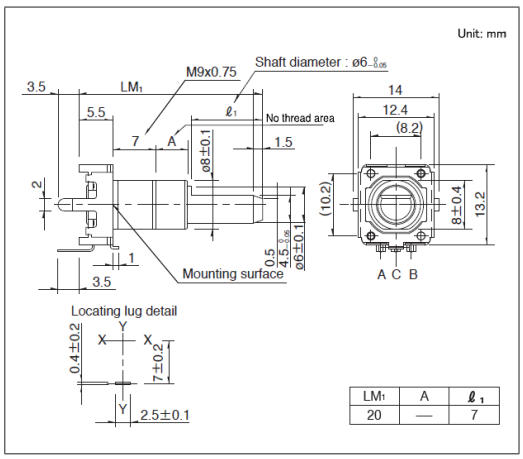
■ Mounting Hole Dimensions



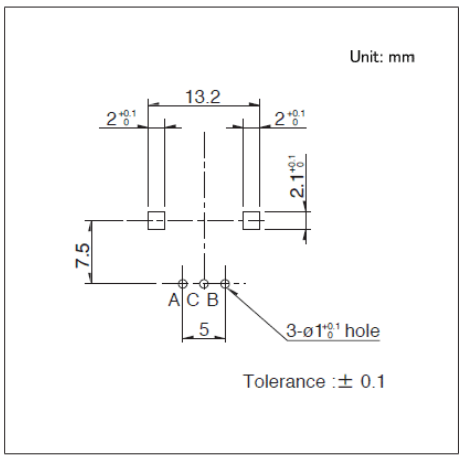
Viewed from mounting face.

Drawing No.7

■ Dimensions



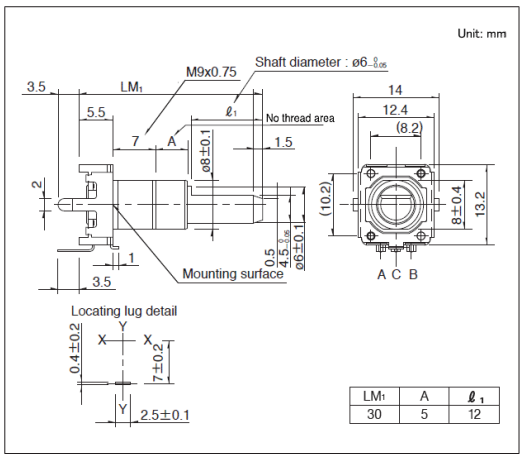
■ Mounting Hole Dimensions



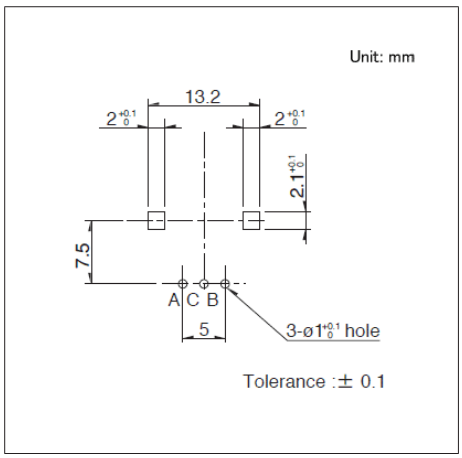
Viewed from mounting face.

Drawing No.8

■ Dimensions



■ Mounting Hole Dimensions



Viewed from mounting face.

Encoders | Insulated shaft Encoder

12mm Size Insulated Shaft Type
EC12D Series

Automotive-compatible with push-on feature.

Automotive

- Output signal:Two phase A and B
- Ratings:1mA 5V DC
- Operating life:30,000 cycles

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

■ Product List

Products No.	Type	Actuator length (mm)	Detent torque	Number of detent	Number of pulse	Automotive	Drawing No.
EC12D1524403	With Switch Type	17.5	5±3mN·m	30	15	●	1
EC12D1564402		17.5	10±5mN·m	30	15	●	
EC12D1524406		17.5	5±3mN·m	30	15	●	
EC12D1564404		17.5	10±5mN·m	30	15	●	

Note

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

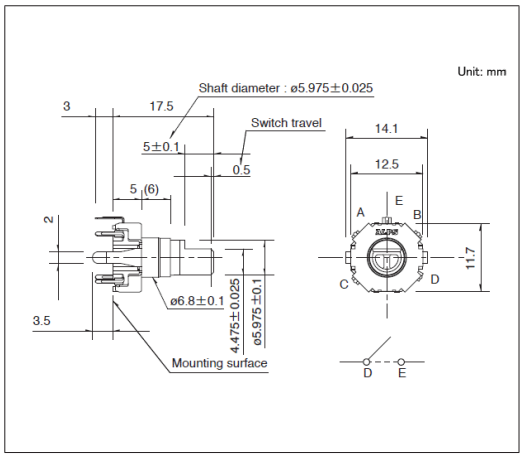
■ Packing Specifications

Tray

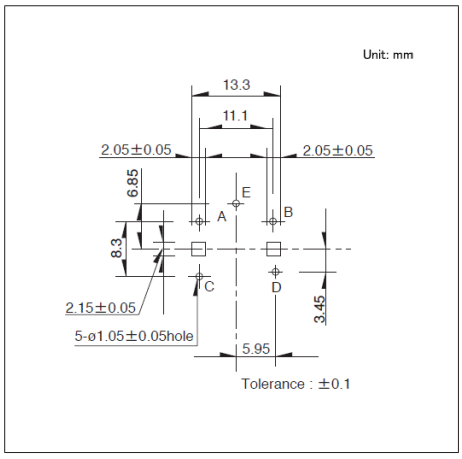
Number of packages(pcs.)		Export package measurements (mm)
1 case / Japan	1 case / export packing	
1,280	2,560	540 x 360 x 290

Drawing No.1

■ Dimensions



■ Mounting Hole Dimensions



Viewed from mounting face.

Encoders Insulated shaft Encoder

18mm Size Insulated Shaft Type
EC18A Series

Absolute type with high water resistance and heavy torque.

- Ratings:1mA 10V DC
- Operating life:30,000 cycles

Applications:Home:Major home appliances

■ Product List

Products No.	Actuator length (mm)	Detent torque	Positions	Automotive	Drawing No.
EC18AGA20402	30.72	60±20mN·m	12	—	1
EC18AGB20407	32.56	60±20mN·m	15	—	2
EC18AGB20401	38.06	60±20mN·m	16	—	3

⚠Note

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2. Please place purchase orders per minimum order unit (integer).

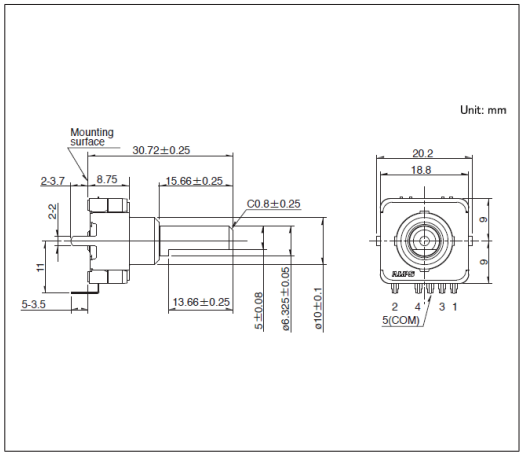
■ Packing Specifications

Tray

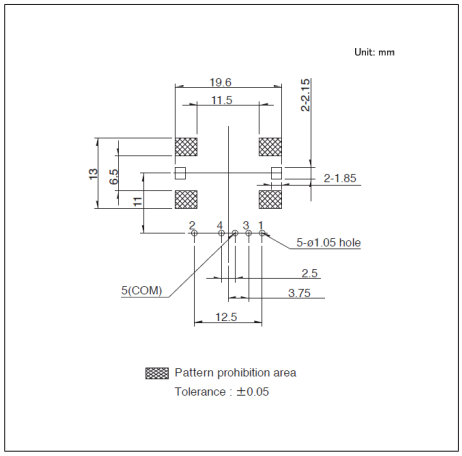
Number of packages(pcs.)		Export package measurements (mm)
1 case / Japan	1 case / export packing	
450	900	540 x 360 x 270

Drawing No.1

■ Dimensions



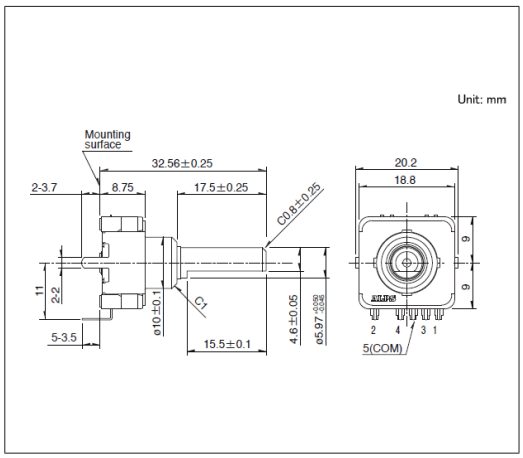
■ Mounting Hole Dimensions



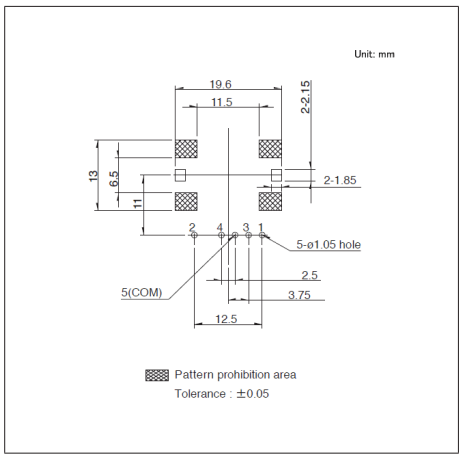
Viewed from mounting face.

Drawing No.2

■ Dimensions



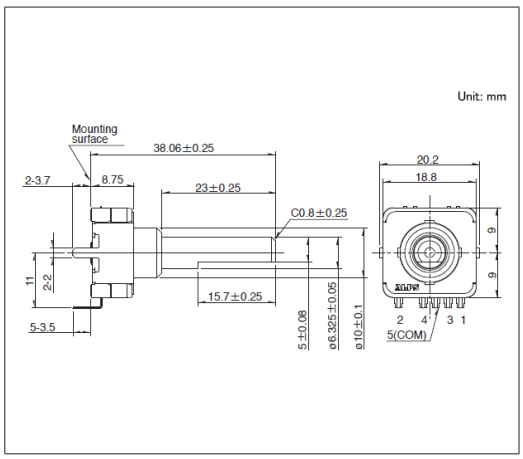
■ Mounting Hole Dimensions



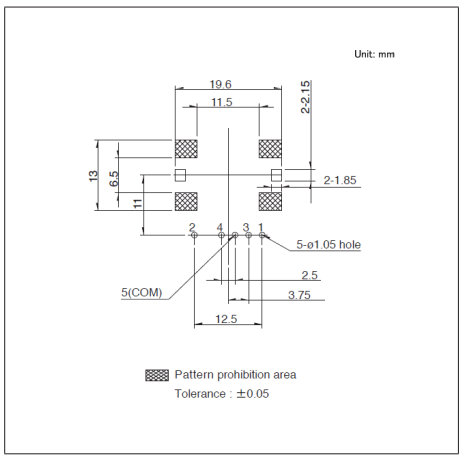
Viewed from mounting face.

Drawing No.3

■ Dimensions



■ Mounting Hole Dimensions



Viewed from mounting face.

EC18A /18mm Size Insulated Shaft Type

■ Standard Codes

EC18AGA

Position No.		1	2	3	4	5	6	7	8	9	10	11	12
Rotation angle (°)		0	30	60	90	120	150	180	210	240	270	300	330
TERMINAL NO.	1		●	●			●	●			●	●	
	2			●	●	●	●						
	3					●	●	●	●	●	●		
	4									●	●	●	●
	5 (COM)	●	●	●	●	●	●	●	●	●	●	●	●

EC18AGB20407

Position No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Rotation angle (°)		0	24	48	72	96	120	144	168	192	216	240	264	288	312	336
TERMINAL NO.	1	●	●			●	●			●	●			●	●	
	2		●	●	●	●					●	●	●	●		
	3				●	●	●	●	●	●	●	●				
	4								●	●	●	●	●	●	●	●
	5 (COM)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

EC18AGB20401

Position No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Rotation angle (°)		0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5
TERMINAL NO.	1		●	●			●	●			●	●			●	●	
	2			●	●	●	●					●	●	●	●		
	3					●	●	●	●	●	●	●	●				
	4									●	●	●	●	●	●	●	●
	5 (COM)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

1. The ● marks shows the ON position.
2. The ● marks:Connections between terminals and the 5(COM)are ON.

■ Water-proof Property

Immersion of encoder, not in operation, in water at depth of 1m at normal temperature for 30 minutes.

Encoders / Soldering Conditions

■ Reference for Manual Soldering

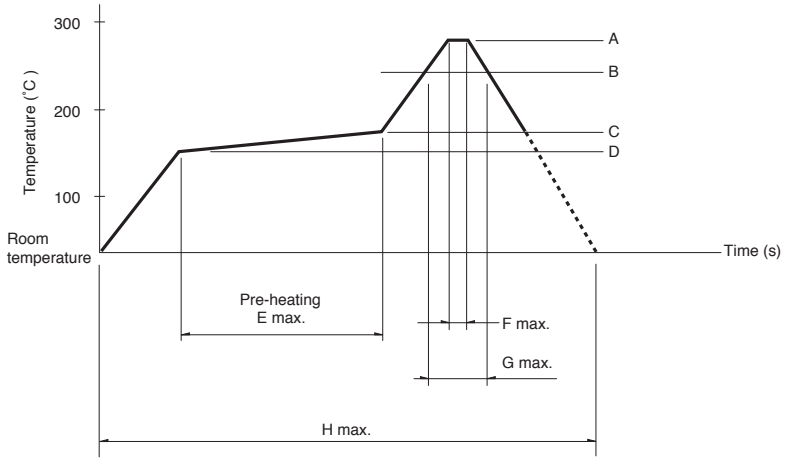
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11E, EC11M, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC40A, EC50A, EC21C, EC28C, EC35CH	350℃ max.	3s max.	1 time

■ 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

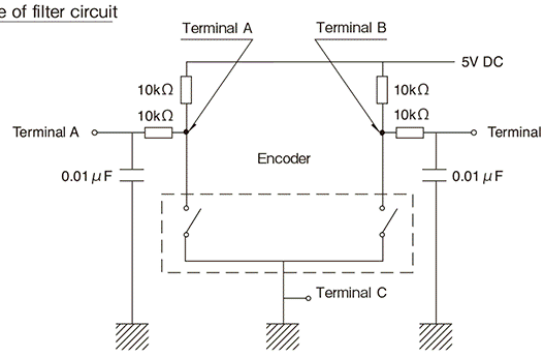
1. When using an infrared reflow oven, solder may sometimes not be applied. Be sure to use a hot air reflow oven or a type that uses infrared rays in combination with hot air.
2. The temperatures given above are the maximum temperatures at the terminals of the encoder when employing a hot air reflow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

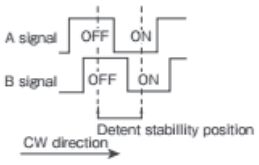


(Example of circuit for use)

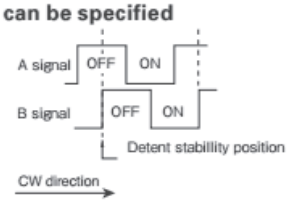
Output Specifications

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.

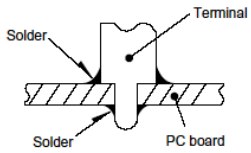
Installation

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.