Encoders

Ring Encoder

List of Varieties

Series			EC21A/EC21C	EC28A/EC28C	EC35A	EC35AH/ EC35CH	EC40A	EC50A
Photo								
Dimensions			21mm size	28mm size	35mm size		40mm size	50mm size
Output			Incremental (Two phase A and B)			Incremental (Three phase A, B and C)	Incremental (Two phase A and B)	
Detent torque			7±5mN·m 12±5mN·m 16±7mN·m 17±8mN·m (Initial) 12(+7, -4)mN·m (After reflow)	7±5mN·m 12±7mN·m 20±10mN·m 22±11mN·m (Initial) 16±7mN·m (After reflow)	18±7mN·m 22±8mN·m 30±15mN·m	12±5mN·m 18±7mN·m 22±11mN·m (Initial) 18±7mN·m (After reflow) 30±15mN·m	20±11mN·m 40±16mN·m	40±14mN·m
Number of detent			18 30				30	18
Number of pulse			9 15	15 18	9 15	6 10	15	9
Operating temperature range			-40℃ to +85℃	-40℃ to +85℃ -40℃ to +90℃	-40℃ to +85℃	-40℃ to +85℃ -40℃ to +90℃	-40℃ to +85℃	
Operating life			50,000 cycles				30,000 cycles	40,000 cycles
Electrical performance	Ratings		10mA 5V DC				0.5mA 5V DC	1mA 5V DC
	Max./min. operating current (Resistive load)		10mA/1mA				—	
	Insulation resistance		100MΩ min. 250V DC				10MΩ min. 50V DC	10MΩ 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		300V AC for 1 minute or 360V AC for 2s	300V AC for 1 minute or 360V AC for 1s 300V AC for 1 minute or 360V AC for 2s	50V AC for 1 minute	50V AC for 1 minute or 60V AC for 2s
Mechanical performance	Actuator strength	Pushing direction	100N					
		Pulling direction	100N				50N	
Automotive			●	●	●	●	●	●

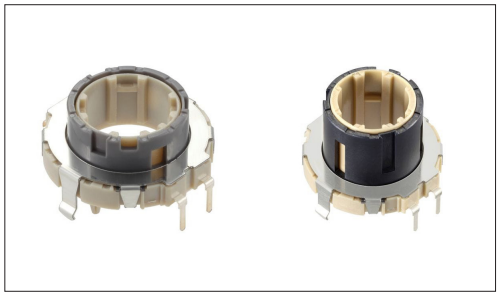
⚠Note

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

Encoders | Ring Encoder

21mm Size Ring Type
EC21A/EC21C Series

Hollow type suited for multifunctionality, offering a thin 4.0mm thickness for space savings.



Automotive

- Output signal:Two phase A and B
- Ratings:10mA 5V DC
- Operating life:50,000 cycles

Applications:Home:Major home appliances,Office equipment
Audio_TV:Visual
Automotive:Navigation/audio systems, HVAC

■ Product List

Products No.	Actuator length (mm)	Detent torque	Number of detent	Number of pulse	Automotive	Drawing No.
EC21A1540401	9.0	7±5mN·m	30	15	●	1
EC21A1520401	9.0	16±7mN·m	30	15	●	
EC21A0920401	9.0	16±7mN·m	18	9	●	2
EC21A1520407	15.0	16±7mN·m	30	15	●	3
EC21A0950402	15.0	12±5mN·m	18	9	●	4
EC21C1520402	12.0	17±8mN·m (Initial) 12(+7, -4)mN·m (After reflow)	30	15	●	5

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).

■ Packing Specifications

Tray

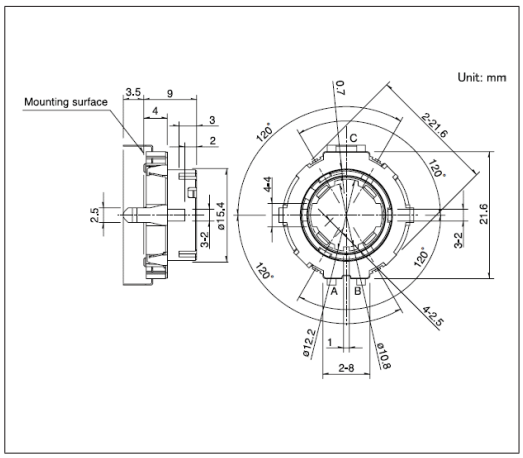
Products No.	Number of packages(pcs.)		Export package measurements (mm)
	1 case / Japan	1 case / export packing	
EC21A1540401 **EC21A1520401**	600	1,200	508 x 364 x 192
EC21A0920401	240	480	375 x 285 x 223
EC21A1520407 **EC21A0950402**	600	1,200	540 x 360 x 290
EC21C1520402	640	640	400 x 310 x 185

21mm Size Ring Type

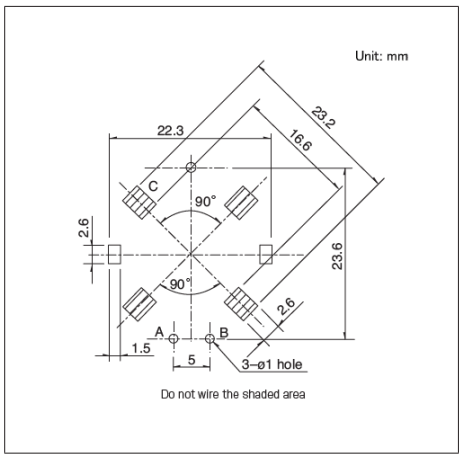
EC21A/EC21C Series

Drawing No.1

■ Dimensions



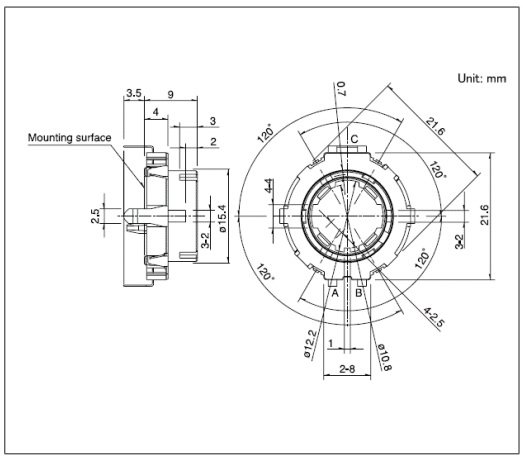
■ Mounting Hole Dimensions



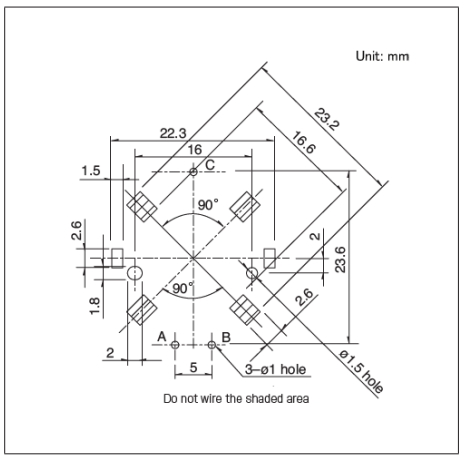
Viewed from mounting side

Drawing No.2

■ Dimensions



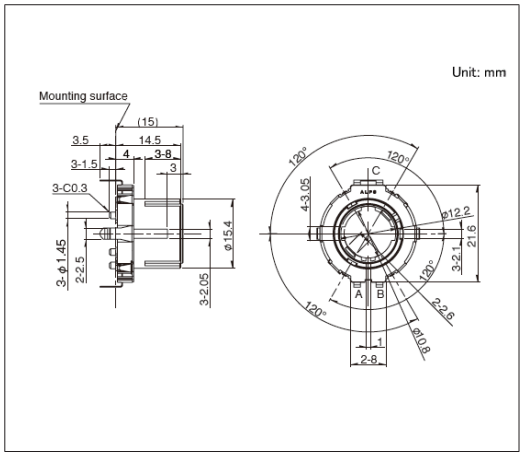
■ Mounting Hole Dimensions



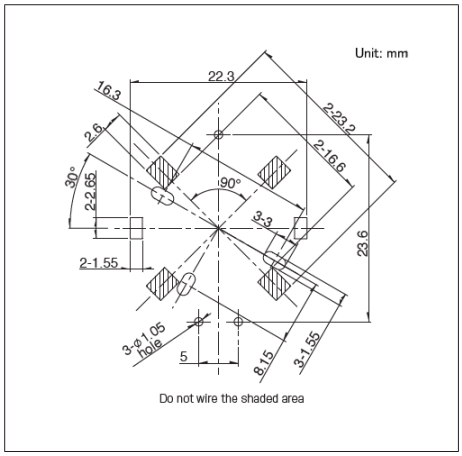
Viewed from mounting side

Drawing No.3

■ Dimensions



■ Mounting Hole Dimensions



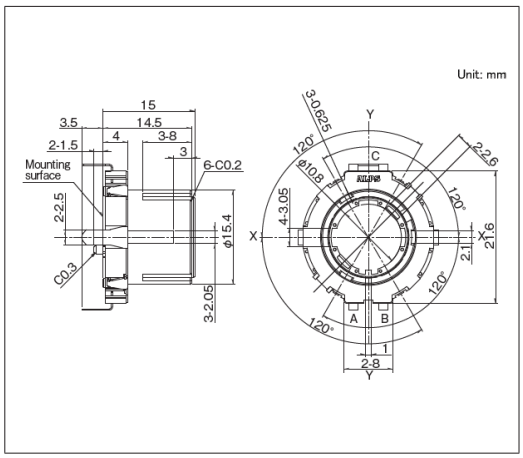
Viewed from mounting side

21mm Size Ring Type

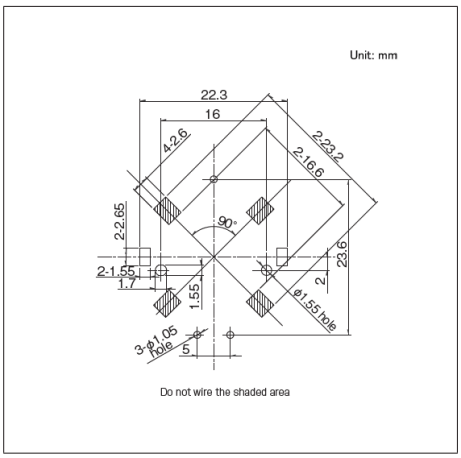
EC21A/EC21C Series

Drawing No.4

■ Dimensions



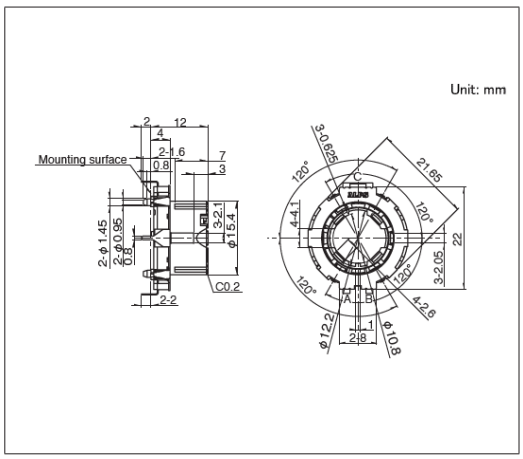
■ Mounting Hole Dimensions



Viewed from mounting side

Drawing No.5

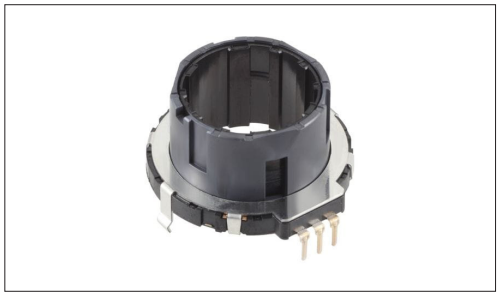
■ Dimensions



Encoders | Ring Encoder

28mm Size Ring Type
EC28A/EC28C Series

Thin-profile design with a 4.0mm body thickness and excellent operation feel.



Automotive

- Output signal:Two phase A and B
- Ratings:10mA 5V DC
- Operating life:50,000 cycles

Applications:Home:Major home appliances,Office equipment
Audio_TV:Visual
Automotive:Navigation/audio systems, HVAC

■ Product List

Products No.	Actuator length (mm)	Detent torque	Number of detent	Number of pulse	Automotive	Drawing No.
EC28A1520401	15.0	7±5mN·m	30	15	●	1
EC28A1550401	15.0	12±7mN·m	30	15	●	
EC28A1560401	15.0	20±10mN·m	30	15	●	
EC28A1850402	15.0	12±7mN·m	18	18	●	
EC28A1870401	15.0	20±10mN·m	18	18	●	
EC28A1560501	25.0	20±10mN·m	30	15	●	2
EC28C1540403	15.0	22±11mN·m (Initial) 16±7mN·m (After reflow)	30	15	●	3

⚠Note

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

■ Packing Specifications

Tray

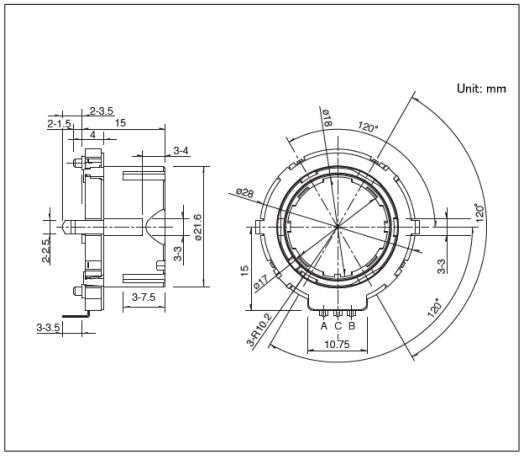
Products No.	Number of packages(pcs.)		Export package measurements (mm)
	1 case / Japan	1 case / export packing	
EC28A1520401 **EC28A1550401** **EC28A1560401** **EC28A1850402** **EC28A1870401**	400	800	509 x 366 x 287
EC28A1560501	420	840	540 x 360 x 380
EC28C1540403	480	480	440 x 290 x 205

28mm Size Ring Type

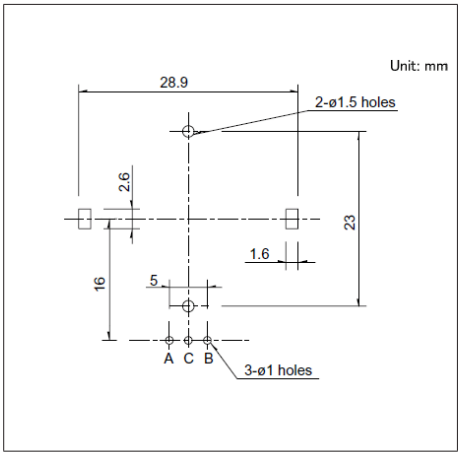
EC28A/EC28C Series

Drawing No.1

■ Dimensions



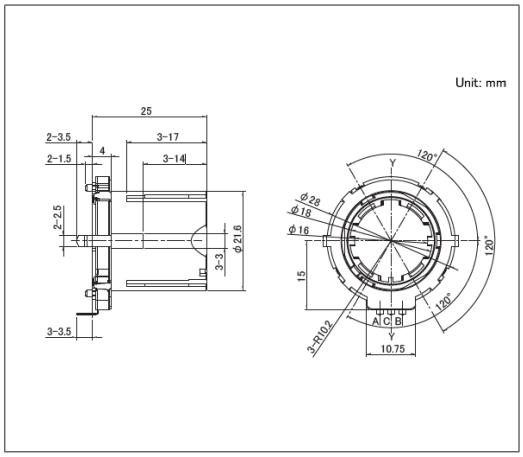
■ Mounting Hole Dimensions



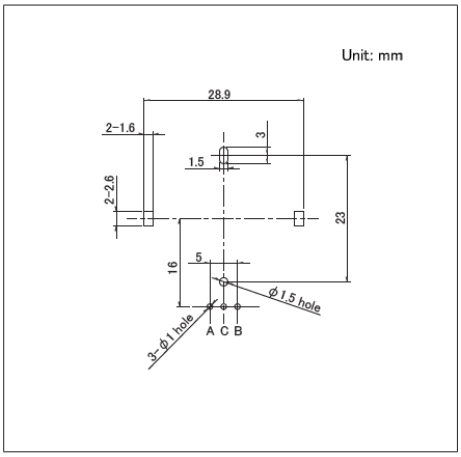
Viewed from mounting side

Drawing No.2

■ Dimensions



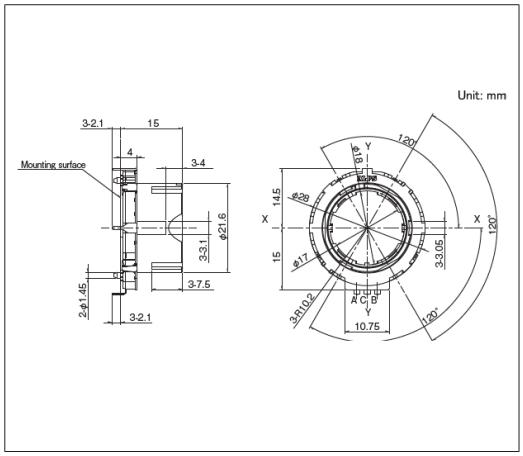
■ Mounting Hole Dimensions



Viewed from mounting side

Drawing No.3

■ Dimensions



Encoders | Ring Encoder

35mm Size Ring Type
EC35A Series

Thin-profile design with a 4.5mm body thickness and excellent operation feel.

Automotive

- Output signal:Two phase A and B
- Ratings:10mA 5V DC
- Operating life:50,000 cycles

Applications:Home:Office equipment
Audio_TV:Visual
Automotive:Navigation/audio systems, HVAC

■ Product List

Products No.	Actuator length (mm)	Detent torque	Number of detent	Number of pulse	Automotive	Drawing No.
EC35A1520402	20.0	18±7mN·m	30	15	●	1
EC35A0930401	20.0	22±8mN·m	18	9	●	2
EC35A1550502	25.0	30±15mN·m	30	15	●	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).

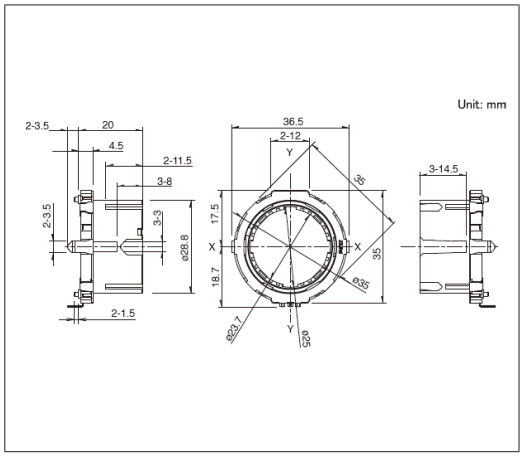
■ Packing Specifications

Tray

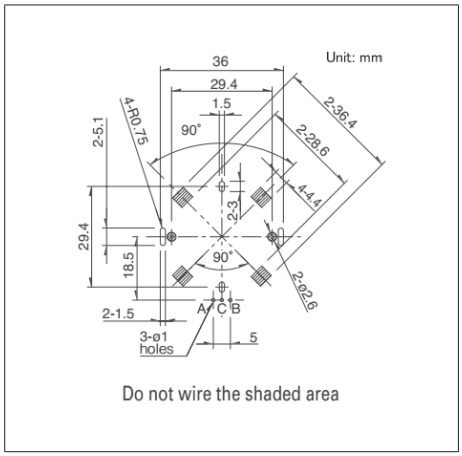
Products No.	Number of packages(pcs.)		Export package measurements (mm)
	1 case / Japan	1 case / export packing	
EC35A1520402 EC35A0930401	420	840	540 x 360 x 380
EC35A1550502	350	700	540 x 360 x 380

Drawing No.1

■ Dimensions



■ Mounting Hole Dimensions



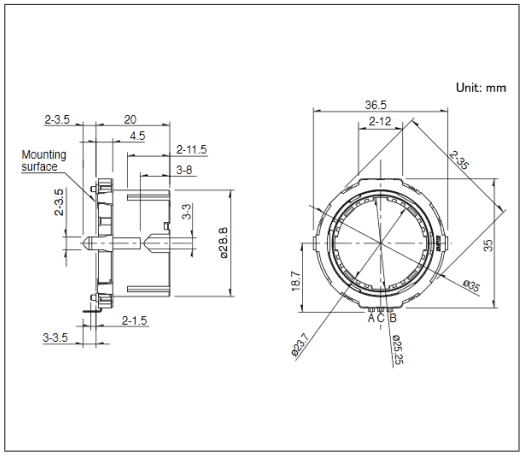
Viewed from mounting side

35mm Size Ring Type

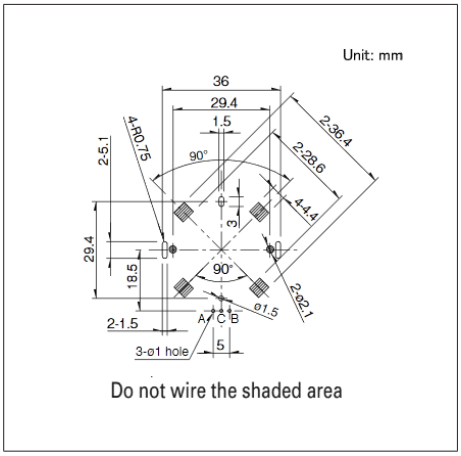
EC35A Series

Drawing No.2

■ Dimensions



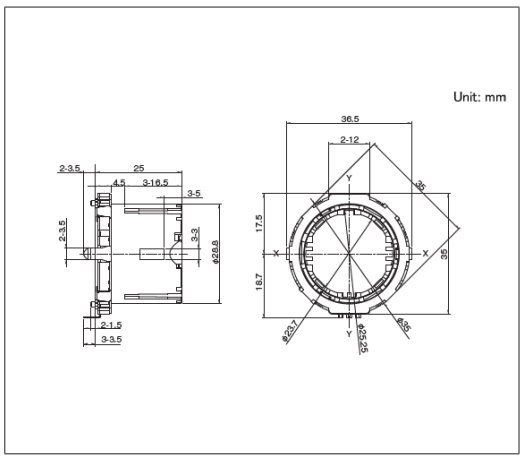
■ Mounting Hole Dimensions



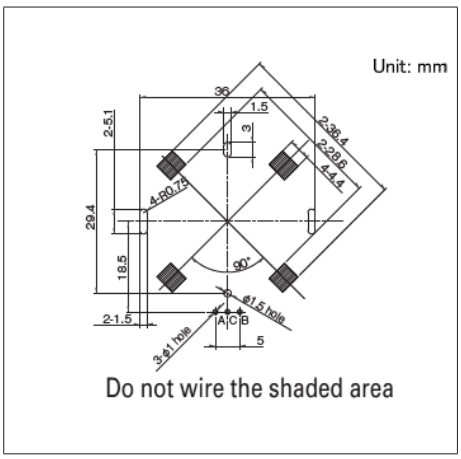
Viewed from mounting side

Drawing No.3

■ Dimensions



■ Mounting Hole Dimensions

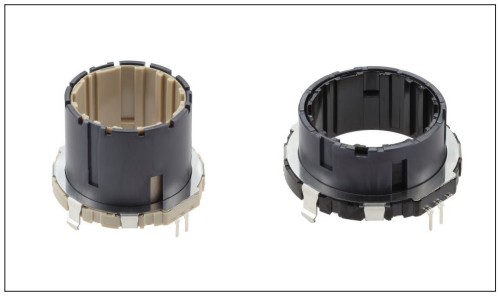


Viewed from mounting side

Encoders | Ring Encoder

35mm Size ABC Switch Type
EC35AH/EC35CH Series

Hollow-shaft encoder capable of three-phase output for composite applications.



Automotive

- Output signal:Three phase A, B and C
- Ratings:10mA 5V DC
- Operating life:50,000 cycles

Applications:Automotive:Navigation/audio systems, HVAC

■ Product List

Products No.	Actuator length (mm)	Detent torque	Number of detent	Number of pulse	Automotive	Drawing No.
EC35AH240403	15.0	12±5mN·m	30	10	●	1
EC35AH220403	15.0	18±7mN·m	30	10	●	
EC35AH260403	15.0	30±15mN·m	30	10	●	
EC35AH240502	25.0	12±5mN·m	30	10	●	2
EC35AH220502	25.0	18±7mN·m	30	10	●	
EC35AH260502	25.0	30±15mN·m	30	10	●	
EC35AH120401	15.0	18±7mN·m	18	6	●	3
EC35CH120401	14.9	22±11mN·m (Initial) 18±7mN·m (After reflow)	18	6	●	4

⚠Note

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

■ Packing Specifications

Tray

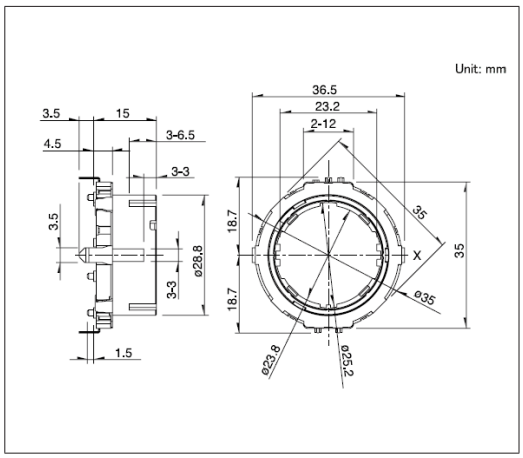
Products No.	Number of packages(pcs.)		Export package measurements (mm)
	1 case / Japan	1 case / export packing	
EC35AH240403 **EC35AH220403** **EC35AH260403** **EC35AH120401**	800	800	540 x 360 x 290
EC35AH240502 **EC35AH220502** **EC35AH260502**	350	700	540 x 360 x 380
EC35CH120401	384	384	440 x 290 x 205

35mm Size ABC Switch Type

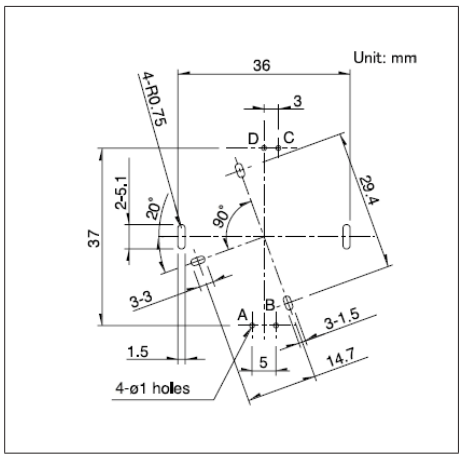
EC35AH/EC35CH Series

Drawing No.1

■ Dimensions



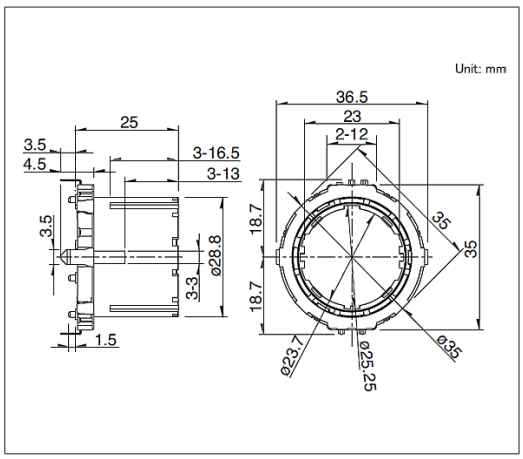
■ Mounting Hole Dimensions



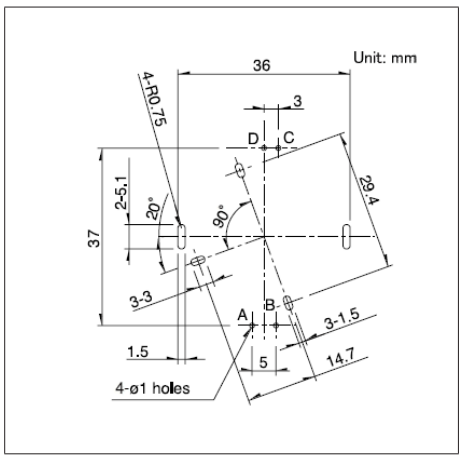
Viewed from mounting side

Drawing No.2

■ Dimensions



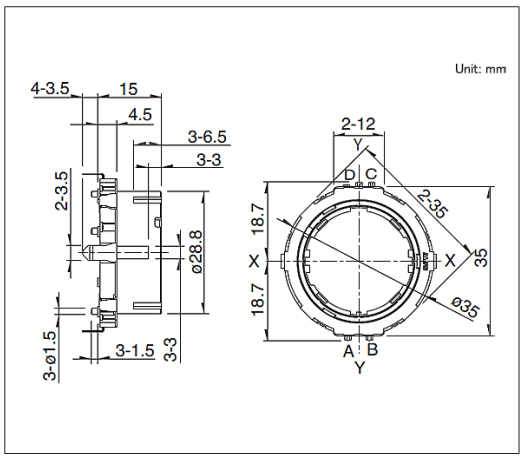
■ Mounting Hole Dimensions



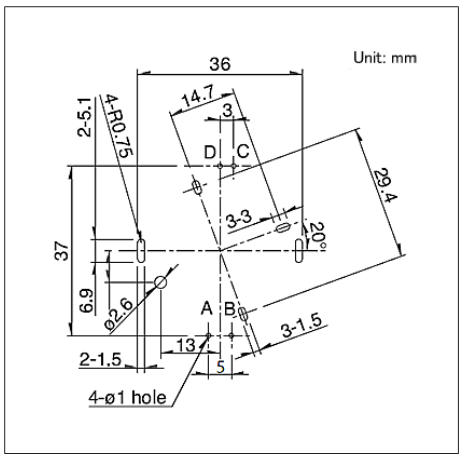
Viewed from mounting side

Drawing No.3

■ Dimensions



■ Mounting Hole Dimensions



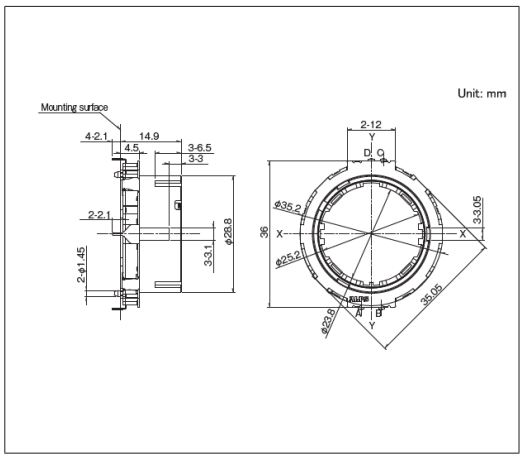
Viewed from mounting side

35mm Size ABC Switch Type

EC35AH/EC35CH Series

Drawing No.4

■ Dimensions



Update:2510

Encoders | Ring Encoder

40mm Size Ring Type
EC40A Series

Delivers excellent operation feel with minimized shaft play.

Automotive

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

Applications:Automotive:Navigation/audio systems, HVAC

■ Product List

Products No.	Actuator length (mm)	Detent torque	Number of detent	Number of pulse	Automotive	Drawing No.
EC40A1520403	22.0	20±11mN·m	30	15	●	1
EC40A1520405	22.0	40±16mN·m	30	15	●	

⚠Note

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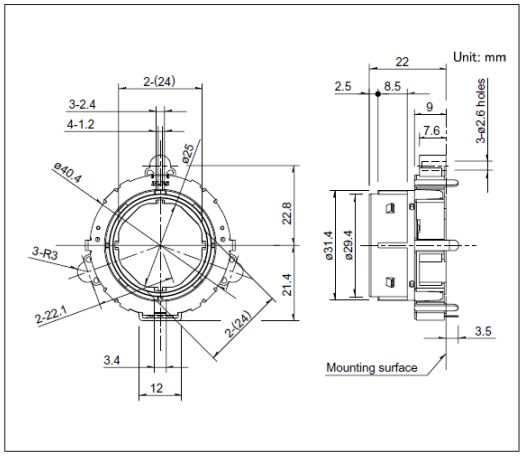
■ Packing Specifications

Tray

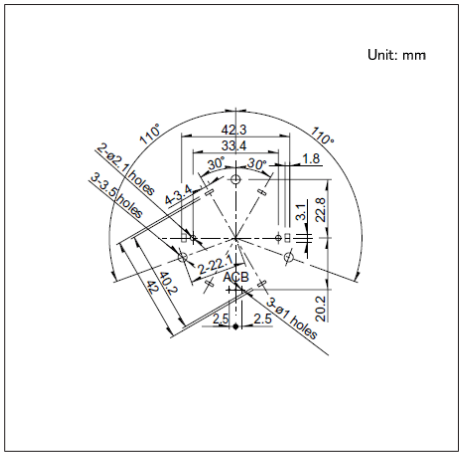
Number of packages(pcs.)		Export package measurements (mm)
1 case / Japan	1 case / export packing	
200	400	540 x 360 x 380

Drawing No.1

■ Dimensions



■ Mounting Hole Dimensions



Viewed from mounting side

Encoders | Ring Encoder

50mm Size Ring Type
EC50A Series

Large design with an inner diameter of ϕ37mm, capable of housing a small LCD.

Automotive

- Output signal:Two phase A and B
- Ratings:1mA 5V DC
- Operating life:40,000 cycles

Applications:Automotive:Navigation/audio systems, HVAC

■ Product List

Products No.	Actuator length (mm)	Detent torque	Number of detent	Number of pulse	Automotive	Drawing No.
EC50A0920404	14.5	40±14mN·m	18	9	●	1

⚠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).

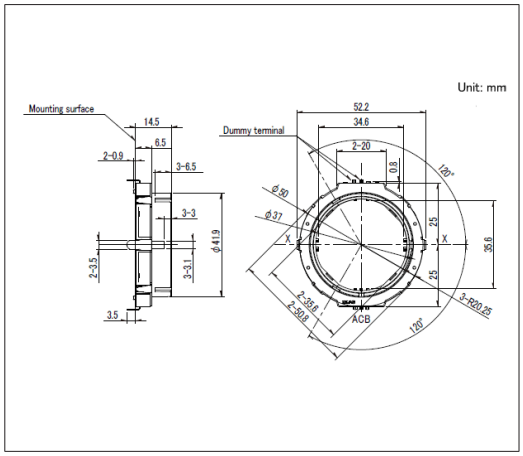
■ Packing Specifications

Tray

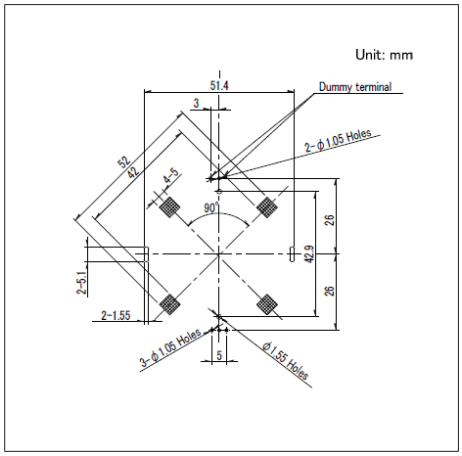
Number of packages(pcs.)		Export package measurements (mm)
1 case / Japan	1 case / export packing	
200	400	540 x 360 x 290

Drawing No.1

■ Dimensions



■ Mounting Hole Dimensions



Viewed from mounting side
Wiring prohibited on hatched area

Encoders / Soldering Conditions

■ Reference for Manual Soldering

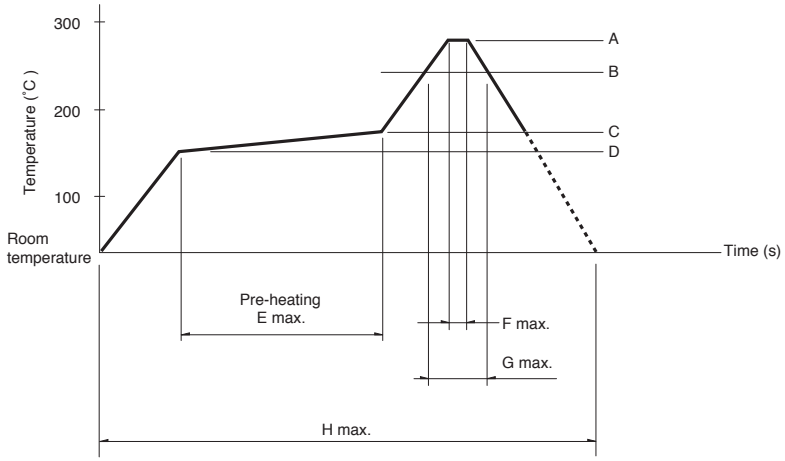
Series	Tip temperature	Soldering time	No. of solders
EC05E, EC09E, EC10E, EC111, EC11E, EC11M, EC12D, EC12E, EC18A, EC21A, EC28A, EC35A, EC35AH, EC40A, EC50A, EC21C, EC28C, EC35CH	350℃ max.	3s max.	1 time

■ 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

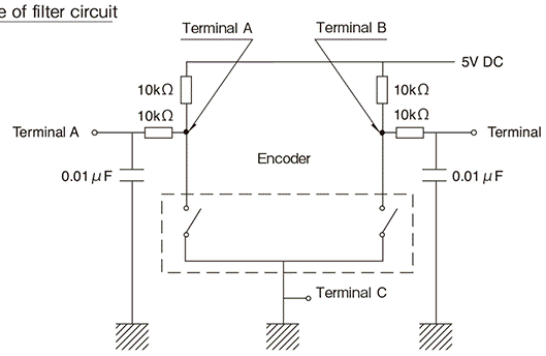
1. When using an infrared reflow oven, solder may sometimes not be applied. Be sure to use a hot air reflow oven or a type that uses infrared rays in combination with hot air.
2. The temperatures given above are the maximum temperatures at the terminals of the encoder when employing a hot air reflow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

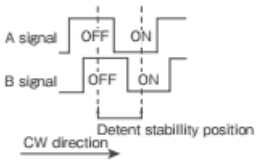


(Example of circuit for use)

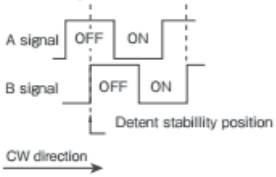
Output Specifications

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.

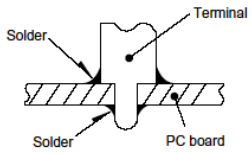
Installation

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.