



ø12 A2 series Miniature Control Units

Short 22-mm-long body miniature control unit series with bright LED illumination face and snap-action switching.

- Degree of protection: IP40 and IP65 (IEC 60529)
- All series have terminals on the same plane.
- UL recognized, CSA certified

Applicable Standards	Mark	File No. or Organization
UL508		UL Recognition File No. E55996
CSA C22.2 No.14		CSA File No. LR 21451



Contact Ratings (Contact Block)

Rated Insulation Voltage	250V			
Rated Thermal Current	3A			
Operating Voltage (AC/DC)	24V	110V	220V	
AC 50/60 Hz	Resistive Load	—	1.0A	0.5A
	Inductive Load	—	0.7A	0.5A
DC	Resistive Load	1.0A	0.2A	—
	Inductive Load	0.7A	0.1A	—
Contact Material	Silver			

- Minimum applicable load: 5V AC/DC, 3 mA
(applicable range may vary with operating conditions and load types)


Weight

Weight (approx.)	AL2M-M11: 4g
	AL2M-P1: 4g
	AB2M-M1: 4g

Specifications

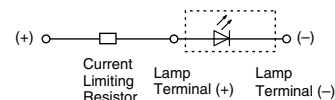
Operating Temperature	-25 to +55°C (no freezing)	
Storage Temperature	-30 to +80°C (no freezing)	
Operating Humidity	45 to 85% RH (no condensation)	
Contact Resistance	50 mΩ maximum (initial value)	
Insulation Resistance	100 MΩ minimum (500V DC megger)	
Dielectric Strength	Switch Unit	Between live and dead metal parts: 2,000V AC, 1 minute Between terminals of different poles: 2,000V AC, 1 minute Between terminals of the same pole: 1,000V AC, 1 minute Between contact and lamp terminals: 1,500V AC, 1 minute
	Illumination Unit	Between live part and ground: 2,000V AC, 1 minute
Vibration Resistance	Damage limits, Operating extremes: 5 to 55 Hz, amplitude 0.75 mm	
Shock Resistance	Damage limits: 500 m/s ² (50G) Operating extremes: 200 m/s ² (20G)	
Mechanical Durability (minimum operations)	Momentary: 200,000 operations Maintained: 100,000 operations	
Electrical Durability (minimum operations)	Momentary: 100,000 operations Maintained: 50,000 operations (Switching frequency 1200 operations/h)	
Degree of Protection	IP40, IP65 (IEC 60529)	

LED Lamp Ratings (LAD-S)

Built-in LED Part No.	LAD-SA	LAD-SG	LAD-SR	LAD-SY
Lamp Base	Exclusive for A series control units			
Forward Current (If)	20 mA			
Forward Voltage (Vf) (nominal)	2.2V	2.1V	1.7V	2.2V
Reverse Voltage (Vr)	4V			
Illumination Color	A	G	R	Y
LED Lamp Color	Amber Clear	Yellow Diffused	Red Clear	Yellow Clear
Applicable Lens Color	Amber	Green	Red	Yellow and White
Base Plastic Color	Red			
LED Lamp Life (reference value)	Approx. 50,000 hours (The illuminance reduces to 50% of the initial intensity when used on complete DC.)			
Operating Voltage & External Current-limiting Resistor (recommended value) (Note)	5V DC: 150Ω, 1/2W 6V DC: 200Ω, 1/2W 12V DC: 510Ω, 1W 24V DC: 1.1 kΩ, 1W			
Internal Circuit				

Note: When LED lamps are used on voltages other than the above, external resistor value R is determined by the following formula:
 $R = (\text{operating voltage} - V_f) / I_f$







- LED lamps do not have a current-limiting resistor, and external resistors of recommended values for each voltage must be provided. Connect a current-limiting resistor in series, otherwise LED lamps will be damaged. Because no protection diode is contained, ensure the correct polarity is observed.



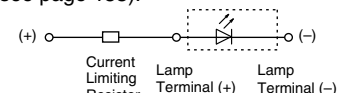
A2 series Illuminated Pushbuttons & Pilot Lights ø12

Illuminated Pushbuttons & Pilot Lights

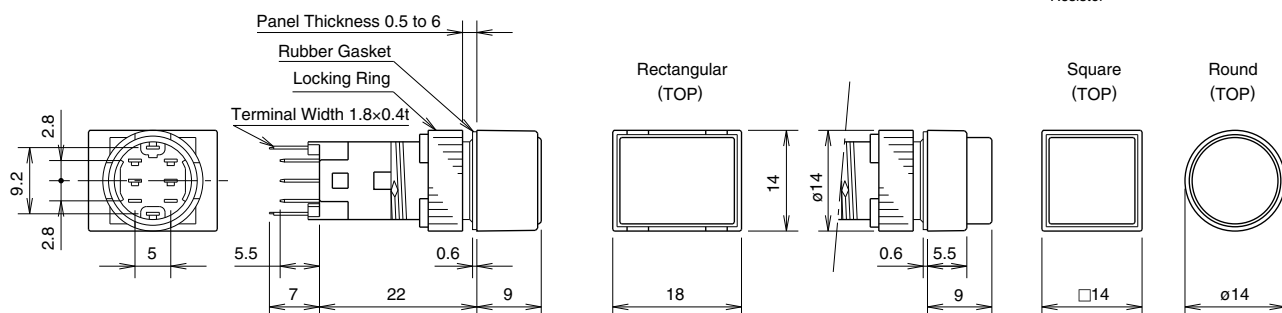
Package Quantity: 1

Shape	Operation	Contact	Part No.		② Lens Color Code	LED Lamp
			IP40	IP65		Part No., Rated Current (External Resistor Recommended Value)
Round AL2M  	Momentary	SPDT	AL2M-M11②	AL2M-M11P②	Specify a color code in place of ② in the Part No. A: amber G: green R: red W: white Y: yellow	A: LAD-SA G: LAD-SG R: LAD-SR W/Y: LAD-SY Rated Current: 20 mA 5V DC: 150Ω, 1/2W 6V DC: 200Ω, 1/2W 12V DC: 510Ω, 1W 24V DC: 1.1 kΩ, 1W
		DPDT	AL2M-M21②	AL2M-M21P②		
	Maintained	SPDT	AL2M-A11②	AL2M-A11P②		
		DPDT	AL2M-A21②	AL2M-A21P②		
	Pilot Light	—	AL2M-P1②	AL2M-P1P②		
Square AL2Q  	Momentary	SPDT	AL2Q-M11②	AL2Q-M11P②		
		DPDT	AL2Q-M21②	AL2Q-M21P②		
	Maintained	SPDT	AL2Q-A11②	AL2Q-A11P②		
		DPDT	AL2Q-A21②	AL2Q-A21P②		
	Pilot Light	—	AL2Q-P1②	AL2Q-P1P②		
Rectangular AL2H  	Momentary	SPDT	AL2H-M11②	AL2H-M11P②		
		DPDT	AL2H-M21②	AL2H-M21P②		
	Maintained	SPDT	AL2H-A11②	AL2H-A11P②		
		DPDT	AL2H-A21②	AL2H-A21P②		
	Pilot Light	—	AL2H-P1②	AL2H-P1P②		

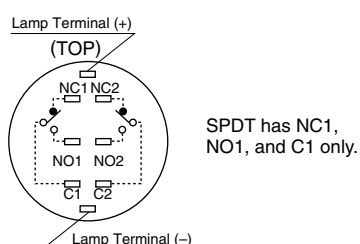
- LED lamps do not have a current-limiting resistor. Connect a current-limiting resistor in series, otherwise LED lamps will be damaged.
- External current-limiting resistor is not necessary when an optional socket with built-in resistor is used (see page 153).
- AP2M series pilot lights (round bezel only) with built-in current-limiting resistors are also available.



Dimensions

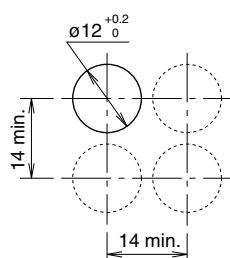


Terminal Arrangement

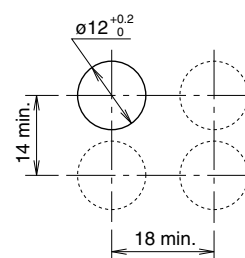


Mounting Hole Layout

Round/Square Units



Rectangular Units









Note: Determine mounting centers to ensure easy operation.

All dimensions in mm.

Ø12 A2 Series Pushbuttons

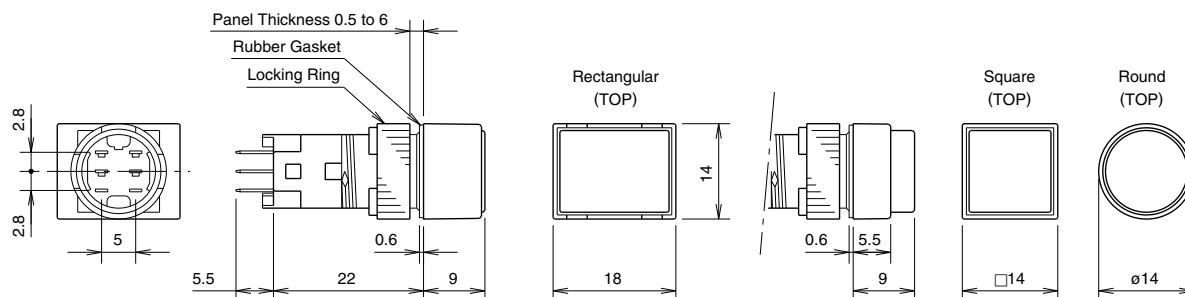
Pushbuttons

Package Quantity: 1

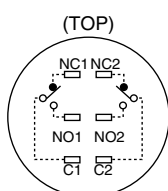
Shape	Button Style	Operation	Contact	Part No.		Color Code ①②
				IP40	IP65	
Round AB2M  	Button	Momentary	SPDT	AB2M-M1 ①	AB2M-M1P ①	B: black G: green R: red S: blue W: white Y: yellow
			DPDT	AB2M-M2 ①	AB2M-M2P ①	
		Maintained	SPDT	AB2M-A1 ①	AB2M-A1P ①	
			DPDT	AB2M-A2 ①	AB2M-A2P ①	
	Lens	Momentary	SPDT	AB2M-M1L ②	AB2M-M1PL ②	A: amber G: green R: red W: white Y: yellow
			DPDT	AB2M-M2L ②	AB2M-M2PL ②	
		Maintained	SPDT	AB2M-A1L ②	AB2M-A1PL ②	
			DPDT	AB2M-A2L ②	AB2M-A2PL ②	
Square AB2Q  	Button	Momentary	SPDT	AB2Q-M1 ①	AB2Q-M1P ①	B: black G: green R: red S: blue W: white Y: yellow
			DPDT	AB2Q-M2 ①	AB2Q-M2P ①	
		Maintained	SPDT	AB2Q-A1 ①	AB2Q-A1P ①	
			DPDT	AB2Q-A2 ①	AB2Q-A2P ①	
	Lens	Momentary	SPDT	AB2Q-M1L ②	AB2Q-M1PL ②	A: amber G: green R: red W: white Y: yellow
			DPDT	AB2Q-M2L ②	AB2Q-M2PL ②	
		Maintained	SPDT	AB2Q-A1L ②	AB2Q-A1PL ②	
			DPDT	AB2Q-A2L ②	AB2Q-A2PL ②	
Rectangular AB2H  	Button	Momentary	SPDT	AB2H-M1 ①	AB2H-M1P ①	B: black G: green R: red S: blue W: white Y: yellow
			DPDT	AB2H-M2 ①	AB2H-M2P ①	
		Maintained	SPDT	AB2H-A1 ①	AB2H-A1P ①	
			DPDT	AB2H-A2 ①	AB2H-A2P ①	
	Lens	Momentary	SPDT	AB2H-M1L ②	AB2H-M1PL ②	A: amber G: green R: red W: white Y: yellow
			DPDT	AB2H-M2L ②	AB2H-M2PL ②	
		Maintained	SPDT	AB2H-A1L ②	AB2H-A1PL ②	
			DPDT	AB2H-A2L ②	AB2H-A2PL ②	

- Specify a color code in place of ① or ② in the Part No.

Dimensions



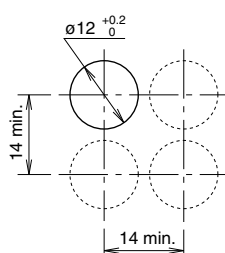
Terminal Arrangement



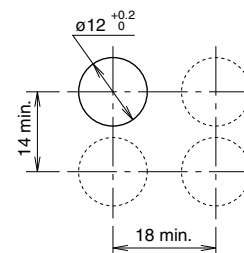
SPDT has NC1, NO1, and C1 only.

Mounting Hole Layout

Round/Square Units



Rectangular Units



Note: Determine mounting centers to ensure easy operation.

All dimensions in mm.

Accessories

Shape	Material		Part No.	Ordering Part No.	Package Quantity	Remarks		
Locking Ring Wrench 	Metal (nickel-plated brass)		MT-002	MT-002	1	• Used to tighten the locking ring when installing the A2 control units into a panel.		
Lens Removal Tool 	Stainless Steel		MT-101	MT-101	1	• Used to remove lens and button.		
Lamp Holder Tool 	Rubber		OR-66	OR-66	1	• Used to remove and install LED lamps.		
Switch Guard 	90° open	For round/ square unit	AL-K2	AL-K2	1			• Degree of protection: IP40 • Used to protect pushbuttons from inadvertent operation. • See page 154 for dimensions.  (remains 90° open)
		For rectangular unit	AL-KH2	AL-KH2	1			
Socket 	Solder Terminal		AL-C2	AL-C2	1	• Snaps on the rear of the A2 series control units. (see page 154 for dimensions)		
	PC Board Terminal		AL-C2V	AL-C2V	1			
Socket with Built-in Resistor 	Solder Terminal	5V DC	AL-C21	AL-C21	1	Socket Bottom Color	Blue	• A current limiting resistor is contained, eliminating the need for external resistors. • When using the socket with a built-in resistor, make sure that the continuous current is 1A maximum and the operating temperature is -25 to +40°C. In collective mounting, keep center-to-center-spacing of 20 mm or more between adjacent units in consideration of built-in resistor heating. • See page 154 for dimensions.
		6V DC	AL-C22	AL-C22	1		Green	
		12V DC	AL-C23	AL-C23	1		Yellow	
		24V DC	AL-C24	AL-C24	1		Red	
	PC Board Terminal	5V DC	AL-C21V	AL-C21V	1		Blue	
		6V DC	AL-C22V	AL-C22V	1		Green	
		12V DC	AL-C23V	AL-C23V	1		Yellow	
		24V DC	AL-C24V	AL-C24V	1		Red	
Terminal Cover 	Nylon		AL-V2	AL-V2PN10	10	• When wiring the terminals, insert the lead wires into the terminal cover holes before soldering. • Terminal cover is not attached and must be ordered separately.		
Dust Cover 	For round units		AL-D2	AL-D2	1	• When mounting the control units with the dust covers installed, refer to mounting hole layout on page 154. • Operating temperature: -10 to +55°C • Material Front part: Elastomer (transparent) Rear part: Polypropylene (black) • See page 154 for dimensions and mounting hole layout.		
	For square units		AL-DQ2	AL-DQ2	1			
	For rectangular units		AL-DH2	AL-DH2	1			
Mounting Hole Plug 	Nitril rubber (black)		AL-B2	AL-B2PN05	5	• Degree of protection: IP65		

Flush Silhouette

Switches & Pilot Lights

Display Lights

LED Illumination Units

Display Units

Safety Products

Terminal Blocks

Comm. Terminals

AS-Interface

Relays & Timers

Sockets

Circuit Protectors

Power Supplies

PLCs & SmartRelay

Operator Interfaces

Sensors

Control Stations

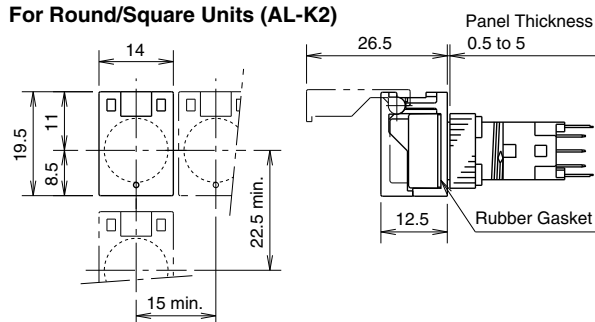
Explosion Protection

References

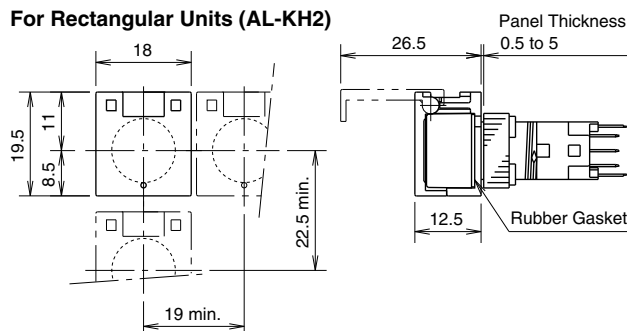
Dimensions

Switch Guard

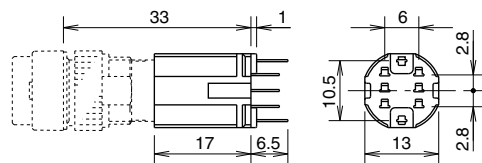
For Round/Square Units (AL-K2)



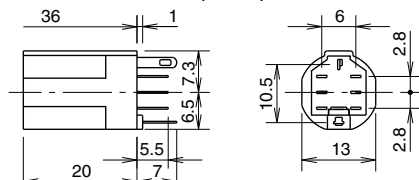
For Rectangular Units (AL-KH2)



Socket (AL-C2, AL-C2V, AL-C2□)

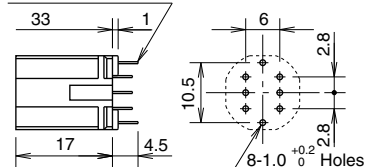


Solder Terminal
(AL-C2)

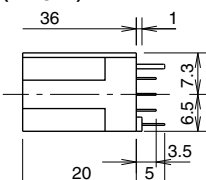


Solder Terminal with Built-in Resistor
(AL-C2□)

Terminal 0.8 × 0.3t



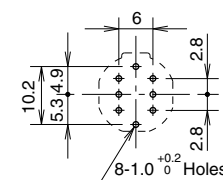
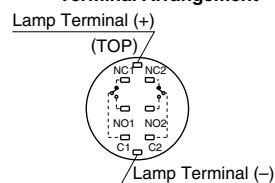
PC Board Terminal
(AL-C2V)



PC Board Terminal
with Built-in Resistor (AL-C2□V)

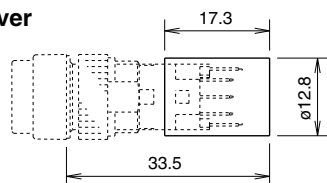
Panel Cut-out
Bottom View

Terminal Arrangement



Panel Cut-out
Bottom View

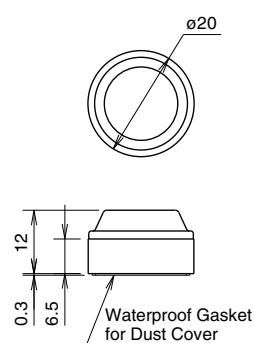
Terminal Cover (AL-V2)



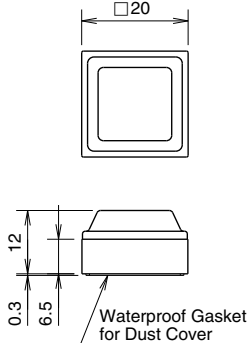
Note: When wiring the terminals, insert the lead wires into the terminal cover holes before soldering.

Dust Cover

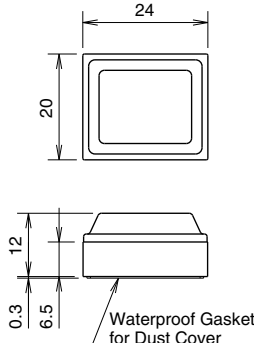
For Round Units (AL-D2)



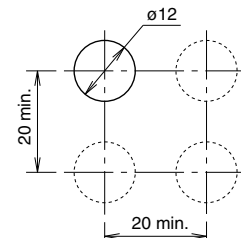
For Square Units (AL-DQ2)



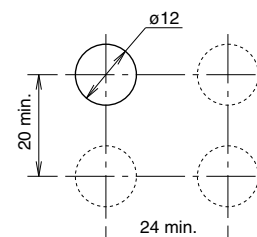
For Rectangular Units (AL-DH2)



Mounting Hole Centers (Round Units, Square Units)



(Rectangular Units)








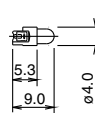


Note: Determine mounting centers to ensure easy operation.

All dimensions in mm.

A2 Series Maintenance Parts ø12

Maintenance Parts

Shape	Specification		Part No.	Ordering Part No.	Package Quantity	Color Code ①②		
<div>Marking Plate</div> <div></div>	Round		AL2M-W	AL2M-WPN05	5	White		
	Square		AL2Q-W	AL2Q-WPN05				
	Rectangular		AL2H-W	AL2H-WPN05				
<div>Lens Unit</div> <div>  </div>	For IP40 units	Round	AL2M-LK1-②	AL2M-LK1-②PN02	2	• Specify a color code in place of ② in the Part No. A: amber G: green R: red W: white Y: yellow		
		Square	AL2Q-LK1-②	AL2Q-LK1-②PN02				
		Rectangular	AL2H-LK1-②	AL2H-LK1-②PN02				
	For IP65 illuminated pushbuttons	Round	AL2M-LK2-②	AL2M-LK2-②	1			
		Square	AL2Q-LK2-②	AL2Q-LK2-②				
		Rectangular	AL2H-LK2-②	AL2H-LK2-②				
	For IP65 pilot lights	Round	AL2M-LK3-②	AL2M-LK3-②				
		Square	AL2Q-LK3-②	AL2Q-LK3-②				
		Rectangular	AL2H-LK3-②	AL2H-LK3-②				
<div>Button Unit</div> <div> </div>	For IP40 pushbuttons	Round	AB2M-BK1-①	AB2M-BK1-①PN02	2	• Specify a color code in place of ① in the Part No. B: black G: green R: red S: blue W: white Y: yellow		
		Square	AB2Q-BK1-①	AB2Q-BK1-①PN02				
		Rectangular	AB2H-BK1-①	AB2H-BK1-①PN02				
	For IP65 pushbuttons	Round	AB2M-BK2-①	AB2M-BK2-①	1			
		Square	AB2Q-BK2-①	AB2Q-BK2-①				
		Rectangular	AB2H-BK2-①	AB2H-BK2-①				
<div>LED Lamp</div> <div> Current-limiting resistor is not contained.  All dimensions in mm.</div>	Illumination color: amber		LAD-SA	LAD-SA	1	Lens color	Amber	LED color: amber clear
				LAD-SAPN10	10			
	Illumination color: green		LAD-SG	LAD-SG	1		Green	LED color: yellow diffused
				LAD-SGPN10	10			
	Illumination color: red		LAD-SR	LAD-SR	1		Red	LED color: clear red
				LAD-SRPN10	10			
	Illumination color: yellow		LAD-SY	LAD-SY	1		White/ Yellow	LED color: yellow clear
				LAD-SYPN10	10			

Flush Silhouette

Switches & Pilot Lights

Display Lights

LED Illumination Units

Display Units

Safety Products

Terminal Blocks

Comm. Terminals

AS-Interface

Relays & Timers

Sockets

Circuit Protectors

Power Supplies

PLCs & SmartRelay

Operator Interfaces

Sensors

Control Stations

Explosion Protection

References

Safety Precautions

- Turn off the power to A series control units before starting installation, removal, wiring, maintenance, and inspection of the control units. Failure to turn power off may cause electrical shocks or fire hazard.
- To avoid burning your hand, use the lamp holder tool when replacing lamps.
- For wiring, use wires of a proper gauge to meet the voltage and current requirements. Failure to tighten terminal screws may cause overheating and create a fire hazard.

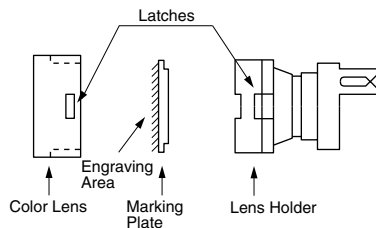
Operating Instructions

Replacement of Lens and Marking Plate

Removal

Remove the lens assembly (color lens, marking plate, lens holder, and spring) by holding the color lens recesses with the Lens Removal Tool (MT-101) and pulling it out. Remove the marking plate by disengaging the latches between the color lens and lens holder.

The marking plate must be engraved on the front side as shown below.



Installation

Place the marking plate on the lens holder in the correct direction, and press the color lens onto the lens holder to engage the latches. Put the spring on the lens holder and insert the lens holder into the housing in the correct direction.

Installing Non-illuminated Button

Non-illuminated pushbuttons contain a marking plate like illuminated units. Be sure to install the marking plate when replacing the button.

Marking

For A series illuminated pushbuttons, legends and symbols can be engraved on the built-in marking plates, or printed film can be inserted under the lens.

Marking Plate & Engraving Area

Lens	Round	Square	Rectangular
Built-in Marking Plate	<p>Size: ø10</p>	<p>Size: □10</p>	<p>Size: 14 x 10</p>
	<ul style="list-style-type: none"> • Engraving must be made on the engraving area less than 0.5mm deep. • The marking plate is made of white acrylic resin. 		

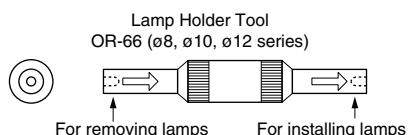
Replacing the LED Lamp

Removal

Use the lamp holder tool (OR-66) to remove lamps. Do not use pliers.

Installation

Use the lamp holder tool (OR-66) to install lamps. Note the correct side of the tool for removal or installation.



Panel Mounting

When mounting the control units onto a panel, use the optional locking ring wrench (MT-002) to tighten the locking ring. Do not use pliers. Tightening torque must not exceed 0.78 N·m. Excessive tightening will damage the locking ring.

Wiring

Solder the terminal at 350°C within 3 seconds using a 60W soldering iron. Sn-Ag-Cu is recommended when using lead-free solder. When soldering, do not touch the control unit with the soldering iron. Also ensure that no tensile force is applied to the terminal. Do not bend the terminal or apply excessive force to the terminal.

Use non-corrosive rosin flux.

Installing the Socket

Install the socket on the control unit with the TOP markings on the control unit and the socket placed in the same direction.

Operating Voltage of LED Lamps

The operating voltage is measured at complete DC. When using a pulsating voltage such as a full-wave rectification voltage, keep peak currents within the forward current If. Peak currents exceeding the If may shorten the LED lamp life.

Other Notes

Close Proximity Mounting

When mounting pilot lights or illuminated pushbuttons collectively or lighting them continuously, heat may cause the ambient temperature to rise above the rated operating temperature. When the mounting panel is not made of metal or when the control units are mounted in an enclosed panel, provide for ventilation or lower the operating voltage.

Replacement of Buttons (Illuminated/Non-illuminated)

Do not replace buttons of maintained action units while the button is in the locked position. Replacing the button in the locked position may damage the internal mechanism. Be sure to release the button before replacing.

Operating and Storage Environment

1. Make sure that the operating/storage temperature and humidity are within the ratings.
2. Do not use enclosed units (IP40) in an environment subject to oil, water or dust accumulation. In such an area, use the waterproof/oiltight units (IP65).

Microswitch Contacts

Do not connect NO and NC contacts of the microswitch to different voltages or different power sources to prevent a dead short-circuit.

IP65 Units

IP65 units are evaluated by conventional cutting and cooling oils, and can not be used with some special oils. Contact IDEC for resistance against special oils.

Mouser Electronics

Authorized Distributor

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