



ø10 A1 series Miniature Control Units

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

- Bright and clear LED illumination.
- 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)

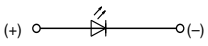
Weight

Weight (approx.)	AL1M-M11: 3g
	AL1M-P1: 3g
	AB1M-M1: 3g

Specifications

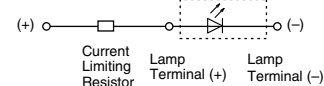
Operating Temperature	-25 to +55°C (no freezing)	
Storage Temperature	-30 to +80°C (no freezing)	
Operating Humidity	45 to 85% RH (no condensation)	
Contact Resistance	50 mΩ maximum (initial value)	
Insulation Resistance	100 MΩ minimum (500V DC megger)	
Dielectric Strength	Switch Unit	Between live and 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 (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.



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Pilot Lights

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Lights

LED
Illumination
Units

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Explosion
Protection

References

ø10 A1 Series Illuminated Pushbuttons & Pilot Lights

Illuminated Pushbuttons & Pilot Lights

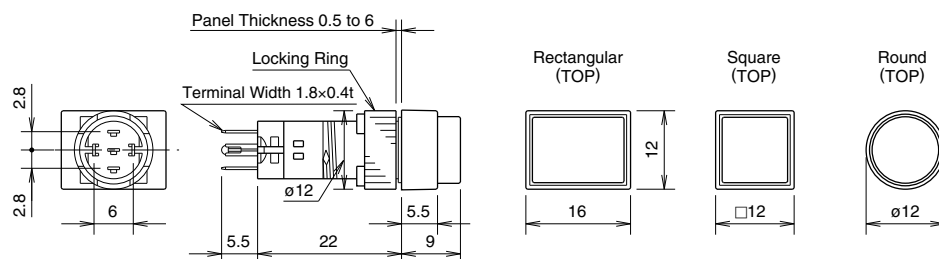
Package Quantity: 1

Shape	Operation	Contact	Part No.	② Lens Color Code	LED Lamp
			IP40		Part No., Rated Current (External Resistor Recommended Value)
Round AL1M  	Momentary	SPDT	AL1M-M11②	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
	Maintained	SPDT	AL1M-A11②		
	Pilot Light	—	AL1M-P1②		
Square AL1Q  	Momentary	SPDT	AL1Q-M11②		
	Maintained	SPDT	AL1Q-A11②		
	Pilot Light	—	AL1Q-P1②		
Rectangular AL1H  	Momentary	SPDT	AL1H-M11②		
	Maintained	SPDT	AL1H-A11②		
	Pilot Light	—	AL1H-P1②		

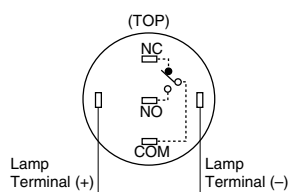
- LED lamps do not have a current-limiting resistor. Connect a current-limiting resistor in series, otherwise LED lamps will be damaged.
- AP1M series pilot lights (round bezel only) with built-in current-limiting resistor are also available.



Dimensions

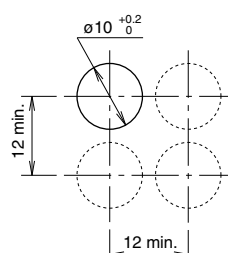


Terminal Arrangement (bottom view)

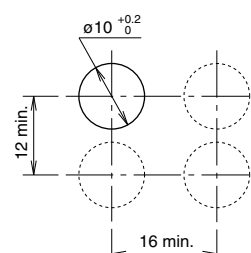


Mounting Hole Layout

Round/Square Units



Rectangular Units









Note: Determine mounting centers to ensure easy operation.

All dimensions in mm.

A1 Series Pushbuttons ø10

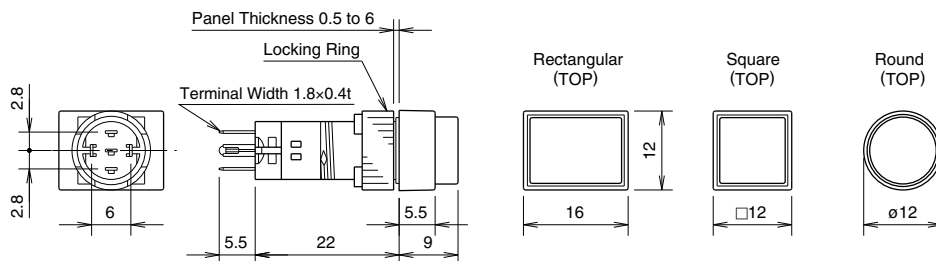
Pushbuttons

Package Quantity: 1

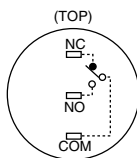
Shape	Button Style	Operation	Contact	Part No.	Color Code ①②
				IP40	
Round AB1M  	Button	Momentary	SPDT	AB1M-M1 ①	B: black G: green R: red S: blue W: white Y: yellow
		Maintained	SPDT	AB1M-A1 ①	
	Lens	Momentary	SPDT	AB1M-M1L ②	A: amber G: green R: red W: white Y: yellow
		Maintained	SPDT	AB1M-A1L ②	
Square AB1Q  	Button	Momentary	SPDT	AB1Q-M1 ①	B: black G: green R: red S: blue W: white Y: yellow
		Maintained	SPDT	AB1Q-A1 ①	
	Lens	Momentary	SPDT	AB1Q-M1L ②	A: amber G: green R: red W: white Y: yellow
		Maintained	SPDT	AB1Q-A1L ②	
Rectangular AB1H  	Button	Momentary	SPDT	AB1H-M1 ①	B: black G: green R: red S: blue W: white Y: yellow
		Maintained	SPDT	AB1H-A1 ①	
	Lens	Momentary	SPDT	AB1H-M1L ②	A: amber G: green R: red W: white Y: yellow
		Maintained	SPDT	AB1H-A1L ②	

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

Dimensions

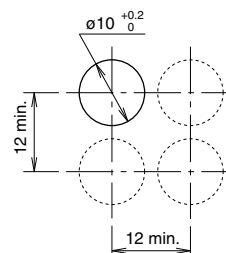


Terminal Arrangement (bottom view)

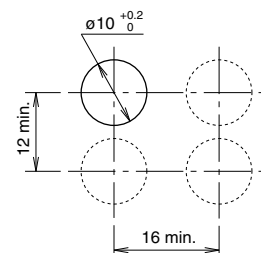


Mounting Hole Layout

Round/Square Units



Rectangular Units



Note: Determine mounting centers to ensure easy operation.

All dimensions in mm.

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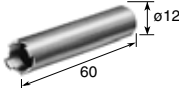
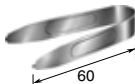
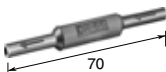

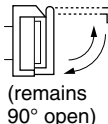



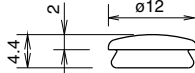
Control
Stations

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References

ø10 A1 Series Accessories

Accessories

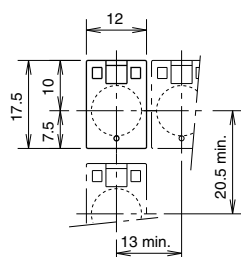
Shape	Material		Part No.	Ordering No.	Package Quantity	Remarks
Locking Ring Wrench 	Metal (nickel-plated brass)		MT-003	MT-003	1	<ul style="list-style-type: none">Used to tighten the locking ring when installing the A1 control units into a panel.
Lens Removal Tool 	Stainless Steel		MT-101	MT-101	1	<ul style="list-style-type: none">Used to remove lens and button.
Lamp Holder Tool 	Rubber		OR-66	OR-66	1	<ul style="list-style-type: none">Used to remove and install LED lamps.
Switch Guard 	90° open	For round/square unit	AL-K1	AL-K1	1	<ul style="list-style-type: none">Used to protect pushbuttons from inadvertent operation.See page 161 for dimensions. 
		For rectangular unit	AL-KH1	AL-KH1	1	
Socket 	Solder Terminal		AL-C1	AL-C1	1	<ul style="list-style-type: none">Snaps on the rear of the A1 series control units. (see page 161 for dimensions)
	PC Board Terminal		AL-C1V	AL-C1V	1	
Terminal Cover 	Nylon		AL-V1	AL-V1PN10	10	<ul style="list-style-type: none">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.
Mounting Hole Plug 	Nitril rubber (black)		AL-B1	AL-B1PN05	5	<ul style="list-style-type: none">Degree of protection: IP65 

A1 Series Maintenance Parts ø10

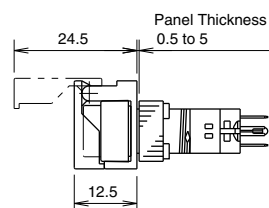
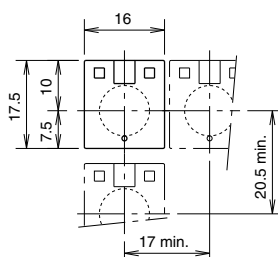
Dimensions

Switch Guard

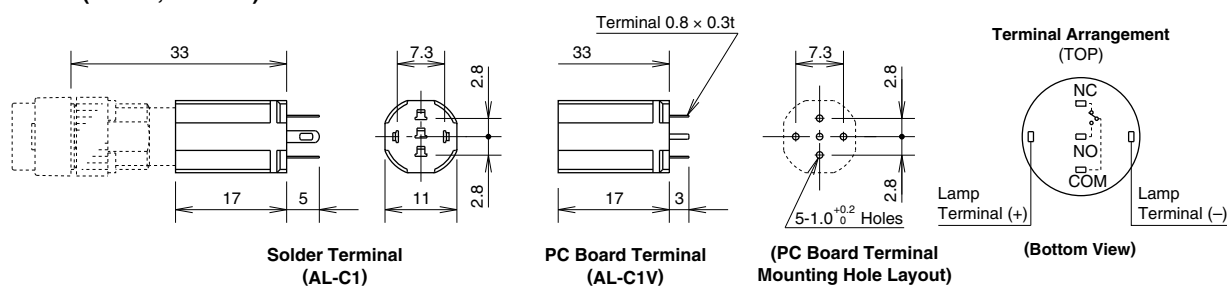
For Round/Square Units (AL-K1)



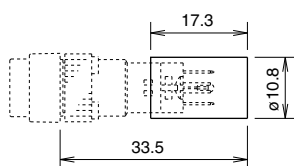
For Rectangular Units (AL-KH1)



Socket (AL-C1, AL-C1V)







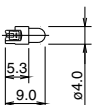
Terminal Cover



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

All dimensions in mm.

Maintenance Parts

Shape		Part No.	Ordering No.	Package Quantity	Color Code ①②		
<div>Marking Plate</div> <div></div>	Round	AL1M-W	AL1M-WPN05	5	• White		
	Square	AL1Q-W	AL1Q-WPN05				
	Rectangular	AL1H-W	AL1H-WPN05				
<div>Lens Unit</div> <div></div>	Round	AL1M-LK1-②	AL1M-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	AL1Q-LK1-②	AL1Q-LK1-②PN02				
	Rectangular	AL1H-LK1-②	AL1H-LK1-②PN02				
<div>Button Unit</div> <div></div>	Round	AB1M-BK1-①	AB1M-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	AB1Q-BK1-①	AB1Q-BK1-①PN02				
	Rectangular	AB1H-BK1-①	AB1H-BK1-①PN02				
<div>LED Lamp</div> <div></div> <div>Current-limiting resistor is not contained.</div> <div></div> <div>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			

ø10 A1 Series Instructions

Safety Precautions

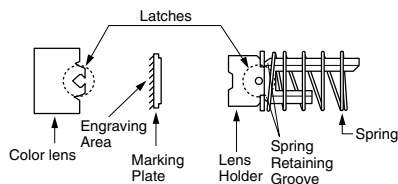
- Turn off the power to A series control units before starting installation, removal, wiring, maintenance, and inspection of the control units. Failure to turn power off may cause electrical shocks or fire hazard.
- To avoid burning your hand, use the lamp holder tool when replacing lamps.
- For wiring, 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.



Note: Make sure that the spring is inserted in the correct direction. The base of spring must fit the groove in the holder.

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.

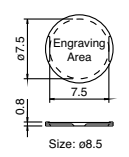
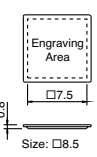
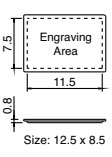
Installing Non-illuminated Button

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			
	<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.		

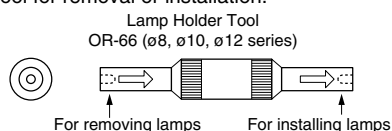
Replacing the LED Lamp

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 into a panel, use the optional locking ring wrench (MT-003) to tighten the locking ring. Do not use pliers. Tightening torque must not exceed 0.29 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 type units in an environment subject to oil, water or dust accumulation.

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.