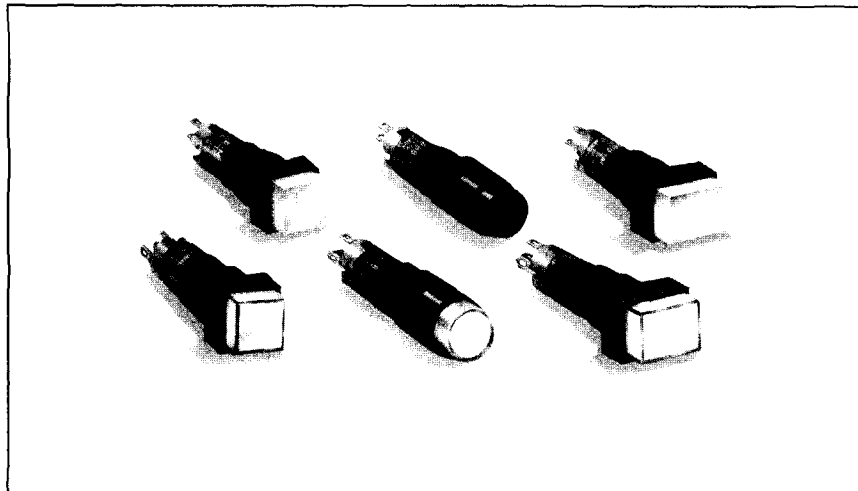


# A SERIES MINIATURE CONTROL UNITS

Ø8

## Short body miniature control unit series with a bright LED illumination face and snap switching.

- Available in illuminated pushbuttons, pilot lights and pushbuttons.
- LED illuminated type.
- Enclosed (IP40) type.
- Rear terminals for increased serviceability.  
All series have terminals on the same plane.
- Many types of accessories are available.



### CONTACT RATINGS

|                   |            |            |      |           |
|-------------------|------------|------------|------|-----------|
| Maximum Voltage   |            | 250V AC/DC |      |           |
| Thermal Current   |            | 3A         |      |           |
| Operating Voltage |            | 24V        | 110V | 220V      |
| Operating Current | AC 50/60Hz | Resistive  | —    | 1.0A 0.5A |
|                   |            | Inductive  | —    | 0.7A 0.5A |
|                   | DC         | Resistive  | 1.0A | 0.2A —    |
|                   |            | Inductive  | 0.7A | 0.1A —    |
| Contact Material  |            | Silver     |      |           |

Note: AC Inductive Load PF = 0.6-0.7  
DC Inductive Load L/R = 7 msec

- Minimum applicable load (reference value): 5V, 1mA AC/DC (Applicable range is subject to the operating condition and load.)

### SPECIFICATIONS

|                                      |                   |   |
|--------------------------------------|-------------------|---|
| Operating Temperature                |                   | -25 to +55°C (no freezing)  |
| Operating Humidity                   |                   | 45 to 85% RH (no condensation)  |
| Contact Resistance                   |                   | 50mΩ maximum (initial value)  |
| Insulation Resistance                |                   | 100MΩ minimum (500V DC megger)  |
| Dielectric Strength                  | Switch Unit       | Between live and dead parts:<br>2,000V AC, 1 minute<br>Between terminals of different poles:<br>2,000V AC, 1 minute<br>Between terminals of the same pole:<br>1,000V AC, 1 minute<br>Between contact and lamp terminals:<br>1,500V AC, 1 minute |
|                                      | Illumination Unit | Between live part and ground:<br>2,000V AC, 1 minute  |
| Vibration Resistance                 |                   | 10 to 55Hz, Amplitude 1.5mm p-p   |
| Shock Resistance                     |                   | Damage limits:<br>500m/sec <sup>2</sup> (Approx. 50G)<br>Operating extremes:<br>200m/sec <sup>2</sup> (Approx. 20G)   |
| Mechanical Life (minimum operations) |                   | Momentary: 200,000<br>Alternate: 100,000  |
| Electrical Life (minimum operations) |                   | Alternate: 50,000<br>Others: 100,000<br>(at 1,200 operations/hour)  |
| Degree of Protection (IEC Pub. 529)  |                   | IP40 (Enclosed Type)  |

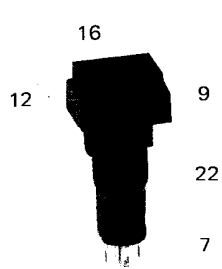
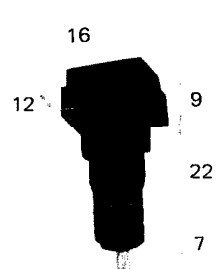
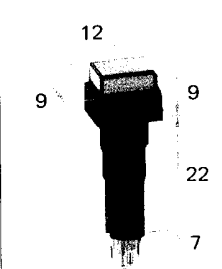
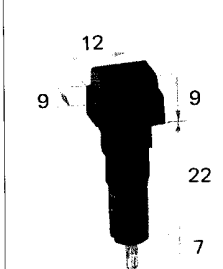
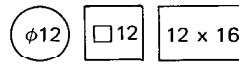
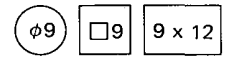
### LED ILLUMINATED UNIT RATINGS




| Lens Color | Built-in LED Lamp |          | Forward Current If | Forward Voltage Vf (Nominal) | Reverse Voltage VR | Operating Voltage & External Current Limiting Resistor (Recommended Value)          | LED Lamp Life (Reference Value)   | Equivalent Circuit |
|------------|-------------------|----------|--------------------|------------------------------|--------------------|---|---|--------------------|
|            | Color             | Type No. |                    |                              |                    |   |   |                    |
| Red        | Red               | LAD-SR   | 20mA               | 1.7V                         | 4V                 | 5V DC: 150Ω, 1/2W<br>6V DC: 200Ω, 1/2W<br>12V DC: 510Ω, 3/4W<br>24V DC: 1.1kΩ, 3/4W | Approx. 50000 hours<br>(The luminance reduces to 50% the initial intensity when used on complete DC.) |                    |
| Green      | Green             | LAD-SG   | 20mA               | 2.1V                         | 4V                 |   |   |                    |
| Amber      | Amber             | LAD-SA   | 20mA               | 2.2V                         | 4V                 |   |   |                    |
| Yellow     | Yellow            | LAD-SY   | 20mA               | 2.2V                         | 4V                 |   |   |                    |
| White      |                   |          |                    |                              |                    |   |   |                    |

Note: When LED lamps are used at voltages other than the above, external resistor value R is determined by the following formula:  
 $R = (Operating\ Voltage - V_f) / I_f$

# A SERIES MINIATURE CONTROL UNITS

## TYPES




| Mounting Hole Size      | $\phi 10$   |  | $\phi 8$  |  |     |
|-------------------------|---|--|---|--|-----|
| Type                    | AL1   | AB1  | AL8   | AB8  |     |
| Shape & Dimensions (mm) |                                        |     |                                       |   |     |
| Unit                    | <ul style="list-style-type: none"> <li>• Illuminated Pushbuttons: Momentary Alternate</li> <li>• Pilot Light</li> </ul> | <ul style="list-style-type: none"> <li>• Pushbuttons: Momentary Alternate</li> </ul> | <ul style="list-style-type: none"> <li>• Illuminated Pushbuttons: Momentary Alternate</li> <li>• Pilot Light</li> </ul> | <ul style="list-style-type: none"> <li>• Pushbuttons: Momentary Alternate</li> </ul> |     |
| Bezel Size (mm)         |                                       |  |                                      |  |     |
| Bezel Color             | Black   |  | Black   |  |     |
| Light Source            | LED Lamp (LAD-S)  | —  | LED Lamp (LAD-S)  | —  |     |
| Lens/Button Color       | LED Illuminated<br><b>R G Y A W</b>   | Non-Illuminated<br><b>B R G Y S W</b>  | LED Illuminated<br><b>R G Y A W</b>   | Non-Illuminated<br><b>B R G Y S W</b>  |     |
| Contact                 | Configuration   | SPDT (Silver Contact)  |   | SPDT (Silver Contact)  |     |
|                         | Ratings   | 110V AC/1A, 24V DC/1A (resistive)  |   | 110V AC/1A, 24V DC/1A (resistive)  |     |
| Life                    | Electrical  | Momentary: 100,000 operations<br>Alternate: 50,000 operations                        |   | Momentary: 100,000 operations<br>Alternate: 50,000 operations                        |     |
|                         | Mechanical  | Momentary: 200,000 operations<br>Alternate: 100,000 operations                       |   | Momentary: 200,000 operations<br>Alternate: 100,000 operations                       |     |
| Degree of Protection    | Enclosed Type (IP40)  |  | Enclosed Type (IP40)  |  |     |
| Terminal Style          | Solder/Tab Terminal   |  | Solder/Tab Terminal   |  |     |
| Accessories             | Switch Guard  | YES  | YES   | YES  | YES |
|                         | Socket  | YES  | YES   | YES  | YES |
|                         | Terminal Cover  | YES  | YES   | YES  | YES |
|                         | Dust Cover  |  |   |  |     |
|                         | Mounting Hole Plug  | YES  | YES   | YES  | YES |
| Remarks                 |   |  |   |  |     |
| See Page                | <b>29</b>   | <b>29</b>  | <b>32</b>   | <b>32</b>  |     |
| Approvals               | UL, CSA   |  | UL, CSA   |  |     |

| AL8 Illuminated Pushbuttons & Pilot Lights   |     |                |         |                          |  |   |         |   |
|--|-----|----------------|---------|--------------------------|--|---|---------|---|
| Shape  | LED | Operation Type | Contact | Type No. (Enclosed Type) | Lens Color (Code)  | Built-in LED Lamp   |         | Operating Voltage & External Resistor (Recommended Value)   |
|  |     |                |         |                          |  | Type No.  | Current |   |
| <b>AL8M (Round)</b><br>       | LED | Momentary      | SPDT    | AL8M-M11*                | Red (R)<br>Green (G)<br>Yellow (Y)<br>Amber (A)<br>White (W) | Red:<br>LAD-SR<br><br>Green:<br>LAD-SG<br><br>Yellow:<br>LAD-SY<br><br>Amber:<br>LAD-SA | 20mA    | 5V DC:<br>150Ω, 1/2W<br><br>6V DC:<br>200Ω, 1/2W<br><br>12V DC:<br>510Ω, 3/4W<br><br>24V DC:<br>1.1kΩ, 3/4W |
|  |     | Alternate      | SPDT    | AL8M-A11*                |  |   |         |   |
|  |     | Pilot Light    | —       | AL8M-P1*                 |  |   |         |   |
| <b>AL8Q (Square)</b><br>      | LED | Momentary      | SPDT    | AL8Q-M11*                |  |   |         |   |
|  |     | Alternate      | SPDT    | AL8Q-A11*                |  |   |         |   |
|  |     | Pilot Light    | —       | AL8Q-P1*                 |  |   |         |   |
| <b>AL8H (Rectangular)</b><br> | LED | Momentary      | SPDT    | AL8H-M11*                | NOTE:<br>White lens (W) is used with a yellow LED lamp.      |   |         |   |
|  |     | Alternate      | SPDT    | AL8H-A11*                |  |   |         |   |
|  |     | Pilot Light    | —       | AL8H-P1*                 |  |   |         |   |

•Specify the lens color code in place of \* in the Type No.  
 An LED lamp is contained.

[Equivalent Circuit (+) o —|— o (-)]

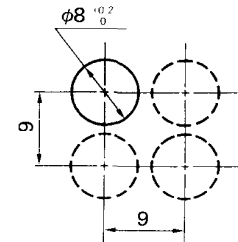
**AB8 Pushbuttons**

| Shape  | Operation Type | Contact | Type No. (Enclosed Type) | Button Color (Code)  |
|--|----------------|---------|--------------------------|--|
| <b>AB8M (Round)</b><br>       | Momentary      | SPDT    | AB8M-M1*                 | Black (B)<br>Red (R)<br>Green (G)<br>Yellow (Y)<br>Blue (S)<br>White (W) |
|  | Alternate      | SPDT    | AB8M-A1*                 |  |
| <b>AB8Q (Square)</b><br>      | Momentary      | SPDT    | AB8Q-M1*                 |  |
|  | Alternate      | SPDT    | AB8Q-A1*                 |  |
| <b>AB8H (Rectangular)</b><br> | Momentary      | SPDT    | AB8H-M1*                 |  |
|  | Alternate      | SPDT    | AB8H-A1*                 |  |

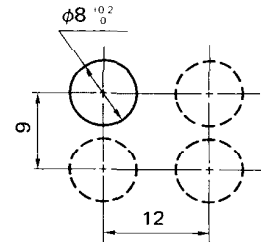
•Specify the button color code in place of \* in the Type No.

**PANEL CUT-OUT**

Round/Square

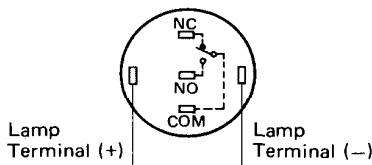


Rectangular



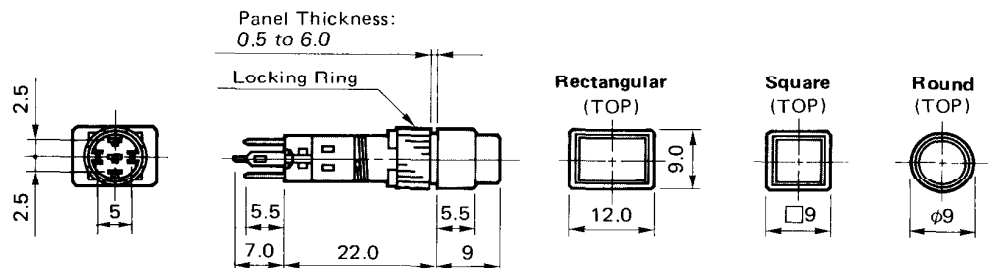
Note: Mounting centers should be determined to ensure easy operation.

**TERMINAL ARRANGEMENT**



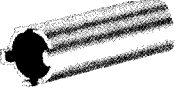

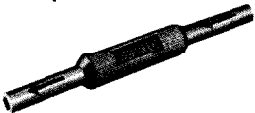


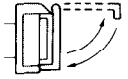
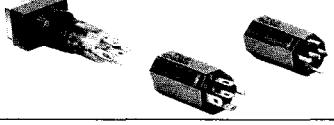
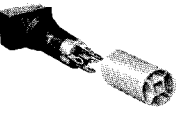

(Bottom View)

**DIMENSIONS (AL8/AB8)**



All dimensions in mm.

## ACCESSORIES

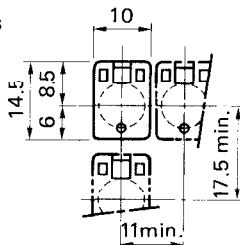
| Name & Shape   |  | Specifications         |               | Type No.   | Remarks  |
|--|--|------------------------|---------------|--|--|
| Tool   | <b>●Ring Wrench</b><br>       | Made of metal          |               | MT-004   | <ul style="list-style-type: none"> <li>Used for tightening the plastic locking ring when installing the Ø8 A series unit on a panel.</li> <li>Tightening torque should not exceed 3kgf-cm when tightening a locking ring.</li> </ul> |
|  | <b>●Lens Removal Tool</b><br> | Made of metal          |               | MT-101   | <ul style="list-style-type: none"> <li>Used for removing the lens or button from the housing.</li> </ul>   |
|  | <b>●Lamp Holder Tool</b><br>  | Made of rubber         |               | OR-66  | <ul style="list-style-type: none"> <li>Used for replacing LED lamps installed in illuminated pushbuttons and pilot lights.</li> </ul>  |
| <b>●LED Lamp</b><br>                    | Luminous Color   | Red                    | LAD-SR        | Applicable Lens Color  | <ul style="list-style-type: none"> <li>An LED lamp is contained in every LED illuminated unit. When ordering additionally, specify the Type No.</li> </ul>   |
| Green  |  | LAD-SG                 | Green         |  |  |
| Amber  |  | LAD-SA                 | Amber         |  |  |
| Yellow   |  | LAD-SY                 | Yellow, White |  |  |
| <b>●Switch Guard</b><br>               | 90° open   | For round/square units | AL-K8         | <ul style="list-style-type: none"> <li>Used for preventing inadvertent operation of the button.</li> </ul>   | (Remains 90° open)<br>   |
| For rectangular units  |  | AL-KI18                |               |  |  |
| <b>●Socket</b><br>                    | Solder Terminals   |                        | AL-C8         | <ul style="list-style-type: none"> <li>Snaps onto the rear of A series units.</li> </ul>   |  |
|  | PC Board Terminals   |                        | AL-C8V        |  |  |
| <b>●Terminal Cover</b><br>            | Made of translucent nylon  |                        | AL-V8         | <ul style="list-style-type: none"> <li>When wiring the terminals, insert the lead wires into the terminal cover holes before soldering.</li> </ul> |  |
| <b>●Mounting Hole Rubber Plug</b><br> | Made of nitrile rubber   |                        | AL-B8         | <ul style="list-style-type: none"> <li>Degree of protection: IP65</li> </ul>   |  |

## ACCESSORY DIMENSIONS

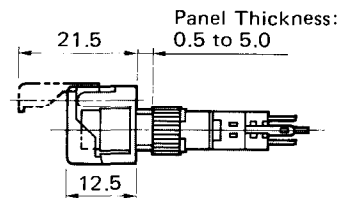
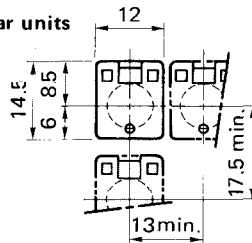
All dimensions in mm.

### ●Switch Guard

For round/square units (AL-K8)

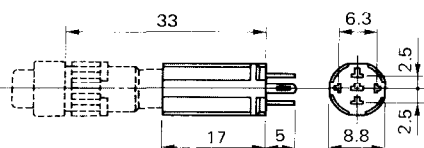


For rectangular units (AL-KH8)



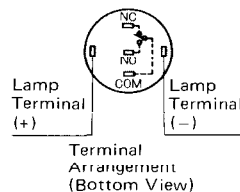
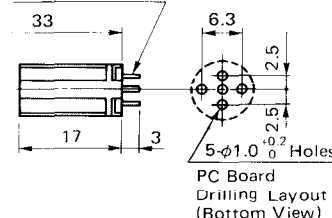
### ●Socket

Solder Terminal Type (AL-C8)

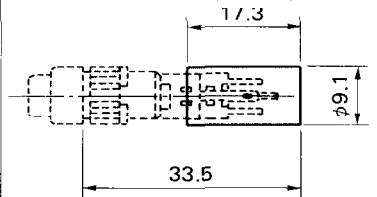


PC Board Terminal Type (AL-C8V)

Terminal 0.3 x 0.8



### ●Terminal Cover (AL-V8)



# A SERIES MINIATURE CONTROL UNITS

## INSTRUCTIONS

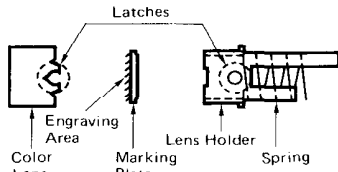
### Replacement of Lens & Marking Plate

#### φ8/φ10 Series

##### • Removal

Remove the operator (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.



**NOTE:** Take care not to lose the spring (except the pilot light). The marking plate must be engraved on the front side as shown above.

##### • 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.

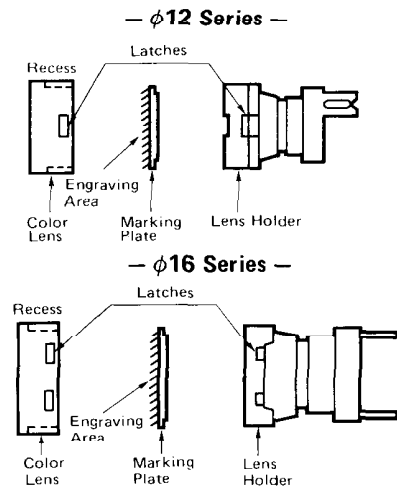
#### φ12/φ16 Series

##### • Removal

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

Remove the marking plate by pushing the color lens from the rear to disengage the latches between the color lens and the lens holder.

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



### Marking Plate & Engraving Area

| Shape      | Round               | Square                     | Rectangular         |                            |                        |                               |
|------------|---------------------|----------------------------|---------------------|----------------------------|------------------------|-------------------------------|
|            |                     |                            |                     |                            |                        |                               |
|            | Dimensions<br>φA mm | Engraving<br>Area<br>φa mm | Dimensions<br>□A mm | Engraving<br>Area<br>□a mm | Dimensions<br>A x B mm | Engraving<br>Area<br>a x b mm |
| φ8 Series  | φ6                  | φ4.5                       | □6                  | □4.5                       | 6 x 9                  | 4.5 x 7.5                     |
| φ10 Series | φ8.5                | φ7                         | □8.5                | □7                         | 8.5 x 12.5             | 7 x 11                        |
| φ12 Series | φ10                 | φ8.2                       | □10                 | □8.2                       | 10 x 14                | 8.2 x 12.2                    |
| φ16 Series | φ13.8               | φ12                        | □13.8               | □12                        | 13.8 x 19.8            | 12 x 18                       |

**NOTE:** Engraving must be made on the engraving area within 0.5 mm deep.

##### • 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. Then, insert the lens holder into the housing in the correct direction.

##### • Notes for Non-illuminated Button

Non-illuminated pushbuttons also contain a marking plate like illuminated units. Be sure to install the marking plate when replacing the button. Large button type non-illuminated pushbuttons, however, do not require a marking plate.

### Replacement of Lamps

##### • Removal

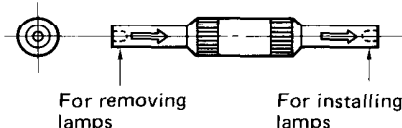
Use the Lamp Holder Tool (OR-66/77) to remove lamps. Do not use pliers.

##### • Installation

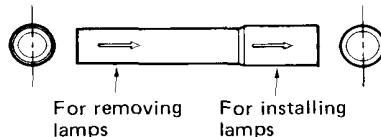
Use the Lamp Holder Tool (OR-66/77) to install lamps. Note the correct side of the tool for removal or installation.

#### Lamp Holder Tool

OR-66 (For φ8/φ10/φ12 series)



OR-77 (For φ16 series)



### Panel Mounting

Use the optional Ring Wrench to mount the control units onto a panel. Do not use pliers. Excessive tightening will damage the locking ring.

Tighten the locking ring within the torque as shown below:

| Unit       | Tightening Torque |
|------------|-------------------|
| φ8 Series  | 3 kgf-cm          |
| φ10 Series | 3 kgf-cm          |
| φ12 Series | 8 kgf-cm          |
| φ16 Series | 9 kgf-cm          |

### Wiring

Solder the terminals within 20W/5 sec or 260°C/3 sec without exerting external force to the terminals.

While soldering, do not touch the soldering iron to the housing. While wiring, prevent tension from being applied to the terminals. Do not bend or raise the terminals, nor exert excessive force to the terminals.

Use a non-corrosive rosin liquid flux.

### LED Lamp Operating Voltage

The operating voltage represents a complete DC value. When using a pulsating voltage such as a full-wave rectification voltage, keep peak currents within the forward current  $I_f$ . Peak currents exceeding the  $I_f$  may shorten the LED lamp life.

# A SERIES MINIATURE CONTROL UNITS

## Incandescent Lamp Operating Voltage

- When a longer life is required for incandescent lamps (approximately 3000 hours), use the lamp within the rated operating voltage of the incandescent illuminated unit. When lighting the lamp at a voltage higher than the operating voltage, keep the ambient temperature below 40°C.
- If an excessive voltage is applied (over 50V), the incandescent lamp may blow and the lens holder pop out.

## Switch Guard

Waterproof/oiltight type (IP65) switch guards must be used with waterproof/oiltight type (IP65) control units only. Even if IP65 type switch guards are installed, enclosed type (IP40) control units are not made waterproof.

| Item         |      | Switch Guard   |                |
|--------------|------|----------------|----------------|
|              |      | IP65           | IP40           |
| Control Unit | IP65 | Waterproof     | Non-waterproof |
|              | IP40 | Non-waterproof | Non-waterproof |

Note:  
IP65 type switch guards are available for  $\phi 16$  series only.

## Other Notes

### • Application of Sockets

When plugging in sockets, check the markings on the rear of the socket and control unit housing to make sure that the socket is oriented correctly. The  $\phi 16$  series has a TOP marking on both sockets and control unit housings. Place the TOP markings of the socket and housing for correct orientation before plugging in the socket.

### • Collective Mounting

When mounting pilot lights or illuminated pushbuttons collectively or lighting them continuously, heating 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 particularly for incandescent lamps.

### • Replacement of Buttons (Illuminated/Non-illuminated)

Do not replace buttons of alternate 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.

- The AL8 ( $\phi 8$ ) and AL1 ( $\phi 10$ ) are for LED illumination only. Incandescent lamps are not applicable.

### • Storage and Environment

1. Make sure that the operating temperature and humidity are within the ratings.
2. Do not use enclosed type units 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 a microswitch to different voltages or different power sources to prevent a dead short-circuit.

### • IP65 Type Units

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

## ORDERING INFORMATION

### • When ordering, specify the Type No. and quantity.

1. LED or incandescent lamps are contained in illuminated units.
2. Sockets, Switch Guards and other accessories are separately ordered.