# Knob-type Selector Switch

## Mounting Aperture of 16 mm

- Modular construction
- Oil-resistant IP65 models
- UL and cUL approved.
- Conforms to EN60947-5-1, IEC947-5-1
- Short mounting depth, less than 28.5 mm below panel
- Wide range of switching capacity from standard to microload
- Lighted and non-lighted models
- 2 and 3-notch models
- · Manual and automatic reset models



**(€ 91** ₀**91** 

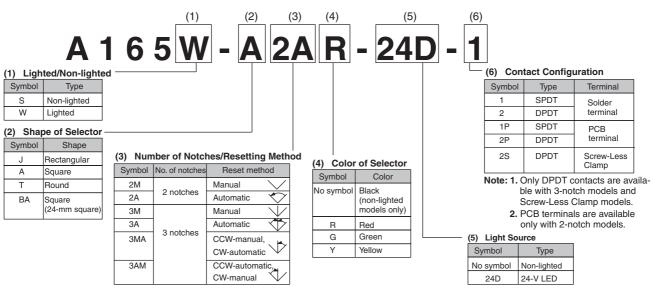
oushbutton Switches

# **Model Number Structure**

# Model Number Legend

## **Completely Assembled**

The model numbers used to order sets of Units are illustrated below. One set comprises the Selector, Lamp (lighted models only), and Switch.



Voltage Reduction Unit (24-V Built-in LED)

 Symbol
 Type
 Operating voltage
 Rated voltage

 T1
 LED
 90 to 121 VAC/VDC
 110 VAC/VDC

 T2
 Value
 180 to 242 VAC/VDC
 220 VAC/VDC

Note: 1. Solder terminals are only available with 100-V models.

 The Voltage Reduction Unit is not available for models with PCB terminals.

## **Subassembled**

#### 1. Selector





#### 1. Lighted/Non-lighted

- S: Non-lighted
- W: Lighted

#### 2. Flange Shape

- J: Rectangular
- A: Square
- T: Round
- BA: Square (24-mm square)

#### 3. Number of Notches/Reset Method

- 2M: 2 notches/Manual
- 2A: 2 notches/Automatic
- 3M: 3 notches/Manual
- 3A: 3 notches/Mixed-operation
- 3MA: 3 notches
- 3AM: 3 notches

#### 2. Switch (Same as for Key-type Selector Switches)





- 1. Number of Notches
  - 2N: 2 notches
  - 3N: 3 notches
- 2. Contacts
  - 1: SPDT
  - 2: DPDT

#### 3. Lamp



1. Operating Voltage (Rated Voltage) LED 5DS: 5 VDC (5 VDC) 12DS:12 VDC (12 VDC) 24DS:24 VDC (24 VDC) 3. Lighted/Non-lighted None: Non-lighted

4. Illumination Color

Red

Green

Yellow

R:

G:

Y:

None: Black (Non-lighted models only)

- L: Lighted
- 4. Terminals None: Solder terminals (tab terminals #110)
- 2. Illumination Color
  - R: Red (LED)
  - G: Green (LED) Y: Yellow (LED)

G-60 Knob-type Selector Switch A165S/W

# ■ List of Models

## Ordering as a Set

The model numbers used to order sets of Units are given in the following tables. One set comprises the Selector, Lamp (lighted models only), and Switch.

#### **Solder Terminals**

#### A165 -J (Rectangular) Models



#### **IP65 Oil-resistant**

| No. of notches | Output | Reset i   | nethod       | Lighting method | Operating voltage | Model            |
|----------------|--------|-----------|--------------|-----------------|-------------------|------------------|
| 2 notches      | SPDT   | Manual    | $\searrow$   | LED             | 24 VDC            | A165W-J2M□-24D-1 |
|                |        |           | ~            | Non-lighted     |                   | A165S-J2M-1      |
|                |        | Automatic | _            | LED             | 24 VDC            | A165W-J2A□-24D-1 |
|                |        |           | $\checkmark$ | Non-lighted     |                   | A165S-J2A-1      |
|                | DPDT   | Manual    |              | LED             | 24 VDC            | A165W-J2M□-24D-2 |
|                |        |           | $\sim$       | Non-lighted     |                   | A165S-J2M-2      |
|                |        | Automatic |              | LED             | 24 VDC            | A165W-J2A□-24D-2 |
|                |        | X         | $\sim$       | Non-lighted     |                   | A165S-J2A-2      |
| 3 notches      | DPDT   | Manual    |              | LED             | 24 VDC            | A165W-J3M□-24D-2 |
|                |        | $\bigvee$ | Non-lighted  |                 | A165S-J3M-2       |                  |

Note: Enter the desired color symbol for the Selector in  $\Box$ : R (red); Y (yellow); G (green). The Selector for non-lighted models is black.

#### A165 - A (Square) Models



#### **IP65 Oil-resistant**

| No. of notches | Output      | Reset me  | thod         | Lighting method | Operating voltage | Model            |
|----------------|-------------|-----------|--------------|-----------------|-------------------|------------------|
| 2 notches      | SPDT        | Manual    | $\mathbf{X}$ | LED             | 24 VDC            | A165W-A2M□-24D-1 |
|                |             |           | ~            | Non-lighted     |                   | A165S-A2M-1      |
|                |             | Automatic |              | LED             | 24 VDC            | A165W-A2A□-24D-1 |
|                |             |           | $\checkmark$ | Non-lighted     |                   | A165S-A2A-1      |
|                | DPDT Manual | Manual    | <b>N</b> (   | LED             | 24 VDC            | A165W-A2M□-24D-2 |
|                |             |           | $\checkmark$ | Non-lighted     |                   | A165S-A2M-2      |
|                |             | Automatic |              | LED             | 24 VDC            | A165W-A2A□-24D-2 |
|                |             |           | $\checkmark$ | Non-lighted     |                   | A165S-A2A-2      |
| 3 notches      | DPDT        | Manual    |              | LED             | 24 VDC            | A165W-A3M□-24D-2 |
|                |             |           | Non-lighted  |                 | A165S-A3M-2       |                  |

Note: Enter the desired color symbol for the Selector in 🗆: R (red); Y (yellow); G (green). The Selector for non-lighted models is black.

#### A165 -T (Round) Models



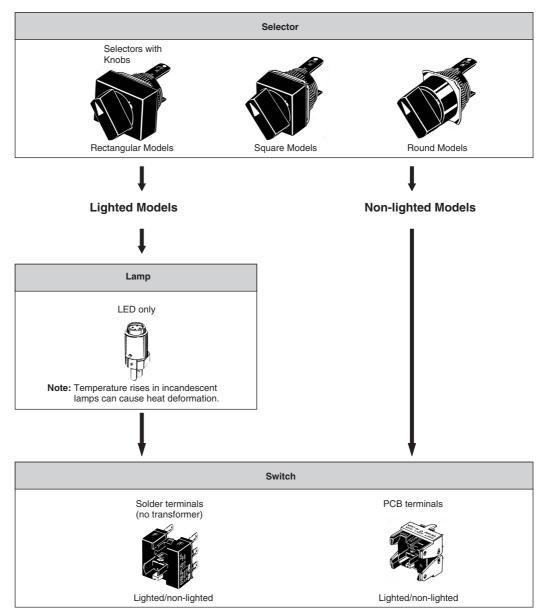
#### **IP65 Oil-resistant**

| No. of notches | Output      | Reset r      | nethod       | Lighting method | Operating voltage | Model            |
|----------------|-------------|--------------|--------------|-----------------|-------------------|------------------|
| 2 notches      | SPDT        | Manual       | $\searrow$   | LED             | 24 VDC            | A165W-T2M□-24D-1 |
|                |             |              | × ×          | Non-lighted     |                   | A165S-T2M-1      |
|                |             | Automatic    |              | LED             | 24 VDC            | A165W-T2A -24D-1 |
|                |             |              | $\checkmark$ | Non-lighted     |                   | A165S-T2A-1      |
|                | DPDT Manual | × /          | LED          | 24 VDC          | A165W-T2M□-24D-2  |                  |
|                | $\sim$      |              | Non-lighted  |                 | A165S-T2M-2       |                  |
|                |             | Automatic <  |              | LED             | 24 VDC            | A165W-T2A -24D-2 |
|                |             |              | $\sim$       | Non-lighted     |                   | A165S-T2A-2      |
| 3 notches      | DPDT        | Manual       |              | LED             | 24 VDC            | A165W-T3M□-24D-2 |
|                |             | $\checkmark$ |              | Non-lighted     |                   | A165S-T3M-2      |

Note: Enter the desired color symbol for the Selector in 
R (red); Y (yellow); G (green). The Selector for non-lighted models is black.

## **Ordering Individually**

Selectors, Lamps, and Switches (Sockets) can be ordered separately. Combinations that are not available as sets can be created using individual Units. Also, store the parts as spares for maintenance and repairs.



## Selectors (Oil-resistant IP65 Models Only)

| Appearance       | Number of notches | Reset m   | ethod                | Lighting method | Operating voltage | Model      | Selector color<br>symbol |
|------------------|-------------------|-----------|----------------------|-----------------|-------------------|------------|--------------------------|
| Rectangular      | 2 notches         | Manual    |                      | LED             | 24 VDC            | A165W-J2M  | R (red),                 |
| (A165□-J)        |                   |           |                      | Non-lighted     |                   | A165S-J2M  | Y (yellow),              |
|                  |                   | Automatic | Ś                    | LED             | 24 VDC            | A165W-J2A  | G (green)                |
|                  |                   |           | $\bigcirc$           | Non-lighted     |                   | A165S-J2A  |                          |
|                  | 3 notches         | Manual    |                      | LED             | 24 VDC            | A165W-J3M  |                          |
|                  |                   |           |                      | Non-lighted     |                   | A165S-J3M  |                          |
| • •              |                   | Fully     | (                    | LED             | 24 VDC            | A165W-J3A  |                          |
|                  |                   | automatic | $\bigcirc$           | Non-lighted     |                   | A165S-J3A  |                          |
|                  | 3 notches         | Mixed-    | $\bigcirc$           | LED             | 24 VDC            | A165W-J3MA |                          |
|                  |                   | operation | $\bigcirc$           | Non-lighted     |                   | A165S-J3MA |                          |
|                  |                   | Mixed-    | $(\mathbf{\hat{T}})$ | LED             | 24 VDC            | A165W-J3AM |                          |
|                  |                   | operation | $\bigcirc$           | Non-lighted     |                   | A165S-J3AM |                          |
| Square (A165⊡-A) | 2 notches         | Manual    |                      | LED             | 24 VDC            | A165W-A2M  | R (red),                 |
| • quai • (••=)   |                   |           |                      | Non-lighted     |                   | A165S-A2M  | Y (yellow),              |
|                  |                   | Automatic | Ś                    | LED             | 24 VDC            | A165W-A2A  | G (green)                |
|                  |                   |           | $\bigcirc$           | Non-lighted     |                   | A165S-A2A  |                          |
|                  | 3 notches         | Manual    |                      | LED             | 24 VDC            | A165W-A3M  |                          |
|                  |                   |           |                      | Non-lighted     |                   | A165S-A3M  |                          |
|                  |                   | Fully     | (                    | LED             | 24 VDC            | A165W-A3A  |                          |
|                  |                   | automatic |                      | Non-lighted     |                   | A165S-A3A  |                          |
|                  | 3 notches         | Mixed-    |                      | LED             | 24 VDC            | A165W-A3MA |                          |
|                  |                   | operation | $\bigcirc$           | Non-lighted     |                   | A165S-A3MA | _                        |
|                  |                   | Mixed-    |                      | LED             | 24 VDC            | A165W-A3AM |                          |
|                  |                   | operation | $\bigcirc$           | Non-lighted     |                   | A165S-A3AM |                          |
| Round (A165□-T)  | 2 notches         | Manual    |                      | LED             | 24 VDC            | A165W-T2M  | R (red),                 |
|                  |                   |           |                      | Non-lighted     |                   | A165S-T2M  | Y (yellow),              |
|                  |                   | Automatic | $(\mathbf{r})$       | LED             | 24 VDC            | A165W-T2A  | G (green)                |
| •                |                   |           | $\bigcirc$           | Non-lighted     |                   | A165S-T2A  |                          |
|                  | 3 notches         | Manual    |                      | LED             | 24 VDC            | A165W-T3M  |                          |
|                  |                   |           |                      | Non-lighted     |                   | A165S-T3M  |                          |
|                  |                   | Fully     |                      | LED             | 24 VDC            | A165W-T3A  |                          |
|                  |                   | automatic | $\bigcirc$           | Non-lighted     |                   | A165S-T3A  |                          |
|                  | 3 notches         | Mixed-    | Ì                    | LED             | 24 VDC            | A165W-T3MA |                          |
|                  |                   | operation | $\bigcirc$           | Non-lighted     |                   | A165S-T3MA |                          |
|                  |                   | Mixed-    |                      | LED             | 24 VDC            | A165W-T3AM |                          |
|                  |                   | operation | $\bigcirc$           | Non-lighted     |                   | A165S-T3AM |                          |

Note: 1. Enter the desired color symbol for the Selector in the  $\Box.$ 

2. The selector for non-lighted models is black.

#### Switches

| Appearance |             |                   | Classificatio | on   |                 | Model       |
|------------|-------------|-------------------|---------------|------|-----------------|-------------|
|            | Lighted     | Socket (without   | 2 notches     | SPDT | Solder terminal | A16S-2N-1L  |
|            |             | voltage-reduction |               | DPDT |                 | A16S-2N-2L  |
| Non-ligh   |             | lighting)         | 3 notches     | DPDT |                 | A16S-3N-2L  |
|            | Non-lighted |                   | 2 notches     | SPDT |                 | A16S-2N-1   |
|            |             |                   |               | DPDT |                 | A16S-2N-2   |
|            |             |                   | 3 notches     | DPDT |                 | A16S-3N-2   |
|            | Lighted     |                   | 2 notches     | SPDT | PCB terminal    | A16S-2N-1LP |
|            |             |                   |               | DPDT |                 | A16S-2N-2LP |
|            | Non-lighted |                   |               | SPDT |                 | A16S-2N-1P  |
| Te         |             |                   |               | DPDT |                 | A16S-2N-2P  |

## Lamps

LED

| Operating voltage | 5 VDC    | 12 VDC    | 24 VDC    |
|-------------------|----------|-----------|-----------|
| Red               | A16-5DSR | A16-12DSR | A16-24DSR |
| Yellow            | A16-5DSY | A16-12DSY | A16-24DSY |
| Green             | A16-5DSG | A16-12DSG | A16-24DSG |

# Accessories (Order Separately)

#### Accessories

| Name        | Appearance | Classification | Model      | Remarks                                 |
|-------------|------------|----------------|------------|---|
| Panel Plugs |            | Rectangular    |            | Used for covering the panel cutouts for |
|             |            | Square         | A102A-3003 | future panel expansion.                 |
|             | P          | Round          | A16ZT-3003 | Degree of protection: IP40              |

## Tools

| Name               | Appearance | Model     | Applicable types     |                                 |                                |                             | Remarks   |   |
|--------------------|------------|-----------|----------------------|---------------------------------|--------------------------------|-----------------------------|-----------|---|
|                    |            |           | Pushbutton<br>Switch | Knob-type<br>Selector<br>Switch | Key-type<br>Selector<br>Switch | Emergency<br>Stop<br>Switch | Indicator |   |
| Screw Fit-<br>ting | G          | A16Z-3004 | Yes                  | Yes                             | Yes                            | Yes                         | Yes       | Convenient for ganged<br>installation.<br>Tighten to a torque of<br>0.39 N·m min. |
| Extractor          |            | A16Z-5080 | Yes                  | Yes                             | Yes                            | Yes                         | Yes       | Convenient for extract-<br>ing the Switches and<br>Lamps.                         |

# **Specifications**

## Approved Standards

| Agency              | Standards   | File No. |
|---------------------|-------------|----------|
| UL, cUL (See note.) | UL508       | E41515   |
|                     | EN60947-5-1 |          |

Note: cUL: CSA, C22.2 No. 14

# Approved Standard Ratings

#### UL, cUL (File No. E41515)

5 A at 125 VAC, 3 A at 250 VAC (general use) 3 A at 30 VDC (resistive)

#### EN60947-5-1 (Low Voltage Directive)

3 A at 250 VAC (AC12), 3 A at 30 VDC (DC12)

## Ratings

#### **Contacts**

| AC resistive load                | DC resistive load |
|----------------------------------|-------------------|
| 3 A at 250 VAC<br>5 A at 125 VAC | 3 A at 30 VDC     |

Minimum applicable load: 1 mA at 5 VDC

Rated values are obtained from tests conducted under the following conditions.

- 1. Load: Resistive load
- 2. Mounting conditions: No vibration and no shock
- 3. Temperature:  $20\pm2^{\circ}C$
- 4. Operating frequency: 20 times/min

# Characteristics

## Super-bright LED

| Rated voltage | Rated current | Operating<br>voltage | Internal limiting<br>resistor |
|---------------|---------------|----------------------|-------------------------------|
| 5 VDC         | 30 mA (15 mA) | 5 VDC±5%             | 33 Ω (68 Ω)                   |
| 12 VDC        | 15 mA         | 12 VDC±5%            | 270 Ω (560 Ω)                 |
| 24 VDC        | 10 mA         | 24 VDC±5%            | 1600 Ω (2,000 Ω)              |

Note: The values in parentheses are for blue Selectors.

| Item                            |             | Knob-type Selector Switch  |  |  |
|---------------------------------|-------------|--|--|--|
| Allowable operating             | Mechanical  | 20 operations/minute max.  |  |  |
| frequency                       | Electrical  | 10 operations/minute max.  |  |  |
| Insulation resistance           |             | 100 MΩ min. (at 500 VDC)   |  |  |
| Dielectric strength             |             | ,000 VAC, 50/60 Hz for 1 min between terminals of same polarity<br>2,000 VAC, 50/60 Hz for 1 min between terminals of different polarity and also between each te<br>ninal and ground<br>1,000 VAC, 50/60 Hz for 1 min between lamp terminals (see note 2) |  |  |
| Vibration resistance            | Malfunction | 10 to 55 Hz, 1.5-mm double amplitude (malfunction within 1 ms)   |  |  |
| Shock resistance                | Mechanical  | 500 m/s <sup>2</sup>   |  |  |
|                                 | Malfunction | 150 m/s <sup>2</sup> max. (malfunction within 1 ms)  |  |  |
| Durability                      | Mechanical  | 250,000 operations min.  |  |  |
|                                 | Electrical  | 100,000 operations min.  |  |  |
| Ambient temperature             |             | Operating: -10°C to 55°C (with no icing or condensation)<br>Storage: -25°C to 65°C (with no icing or condensation)   |  |  |
| Ambient humidity                |             | Operating: 35% to 85%  |  |  |
| Electric shock protection class |             | Class II   |  |  |
| PTI (tracking characteristic)   |             | 175  |  |  |
| Degree of contamination         |             | 3 (IEC947-5-1)   |  |  |
| Weight                          |             | Approx. 13 g (in the case of a lighted DPDT switch)  |  |  |

Note: 1. Set and reset constitute one operation.

2. With LED and incandescent lamp not mounted.

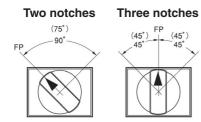
## Screw-less Clamp

| Item                                   |                  | Screw-less Clamp   |                     |                      |                      |  |
|--|------------------|--|---------------------|----------------------|----------------------|--|
| Recommended wire size                  |                  | 0.5 mm <sup>2</sup> twisted wire or 0.8 mm-dia. solid wire |                     |                      |                      |  |
| Usable wires and ten-<br>sile strength | Twisted wire     | 0.3mm <sup>2</sup>   | 0.5 mm <sup>2</sup> | 0.75 mm <sup>2</sup> | 1.25 mm <sup>2</sup> |  |
|  | Solid wire       | 0.5 mm dia.  | 0.8 mm dia.         | 1.0 mm dia.          |                      |  |
|  | Tensile strength | 10 N   | 20 N                | 30 N                 | 40 N                 |  |
| Length of exposed wire                 |                  | 10 ±1 mm   |                     |                      |                      |  |

# ■ Operating Characteristics

| Туре                      | Knob-type Selector Switch |                    |  |  |
|---------------------------|---------------------------|--------------------|--|--|
| Features                  | 2 notches                 | 3 notches          |  |  |
| Operating force (OF) max. | 9.8 N⋅m                   |                    |  |  |
| Set position (SP)         | 90±5°                     | 45 <sup>+10°</sup> |  |  |

# ■ Operation Angle



Note: 1. The angle used for automatic reset is shown in parentheses. 2. FP: Free Position

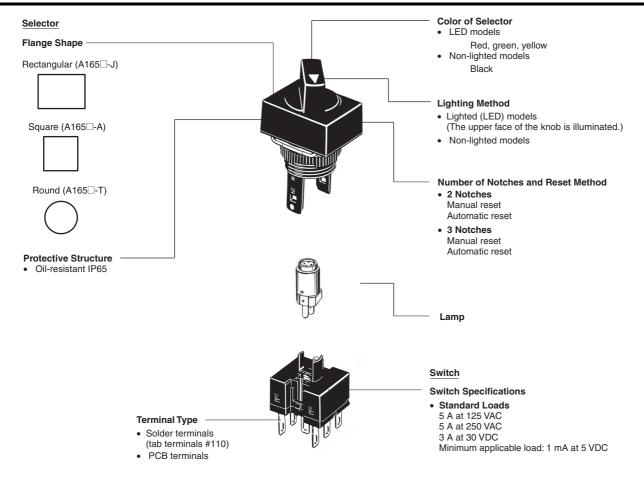
# ■ Contact Form

| Name | Contact |  |  |
|------|---------|--|--|
| SPDT | COM     |  |  |
|      | NO      |  |  |



| Notch     | Contact  |            |           |             |     |  |  |  |
|-----------|----------|------------|-----------|-------------|-----|--|--|--|
|           | SPDT     |            | DPDT      |             |     |  |  |  |
|           | Position | SW         | Position  | SW2         | SW1 |  |  |  |
| 2 notches | $\odot$  | ~~         | $\odot$   | ~           | ••• |  |  |  |
|           | $\odot$  | <i>д</i> . | $\otimes$ | \$ <b>.</b> | \$• |  |  |  |
| 3 notches |          |            | $\odot$   | \$•         | ••• |  |  |  |
|           |          |            | 1         | ~           | ••• |  |  |  |
|           |          |            | $\oslash$ | ~           | \$• |  |  |  |

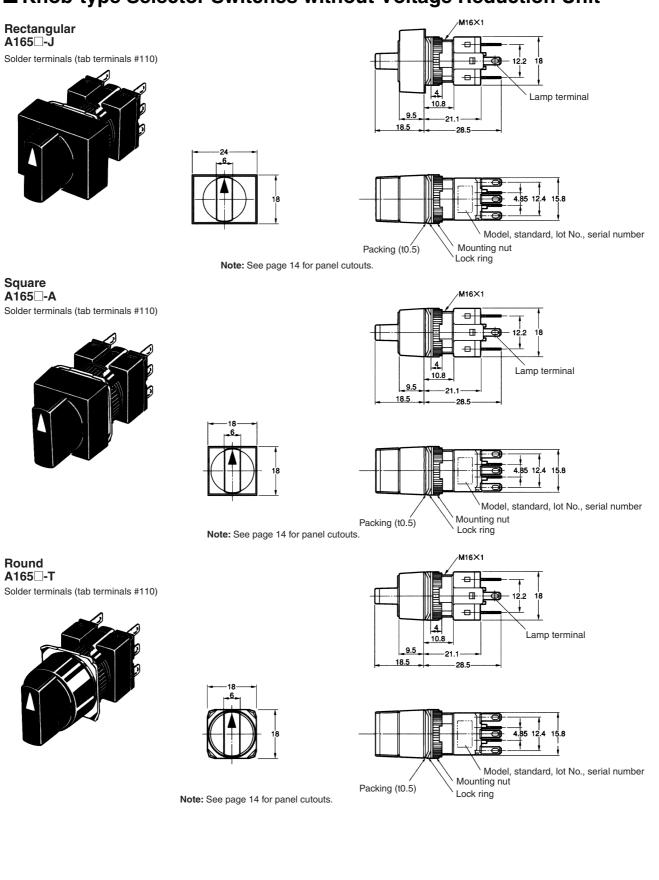
# Nomenclature



# Dimensions

Note: All units are in millimeters unless otherwise indicated.

# ■ Knob-type Selector Switches without Voltage Reduction Unit

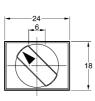


# OMROD

The following diagrams show the rectangular model as a representative example. The lamp terminal is also provided with non-lighted models.





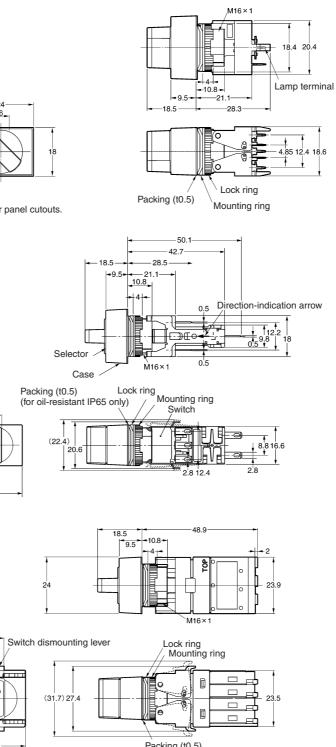


Note: See page 14 for panel cutouts

18

18

24



Reduced-voltage light-ing, solder terminals (tab terminals #110)

Rectangular

A165WŬ-T



Rectangular A165 -2S

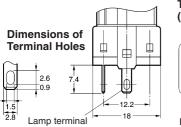
> Packing (t0.5) (for oil-resistant IP65 only)

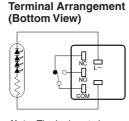
# ■ Terminal Arrangement

## Models with Solder Terminals without Reduced-voltage Lighting

Lamp terminals are not provided with the Non-lighted Knob-type Selector Switches and Key-type Selector Switches.

#### **Lighted SPDT Switches**





Note: The L+ is not shown on the Switch.

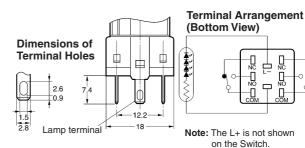
#### **Non-lighted SPDT Switches**

# Dimensions of Terminal Holes

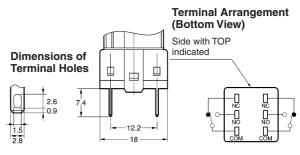
# Models with PCB Terminals

#### **Lighted SPDT Switches**

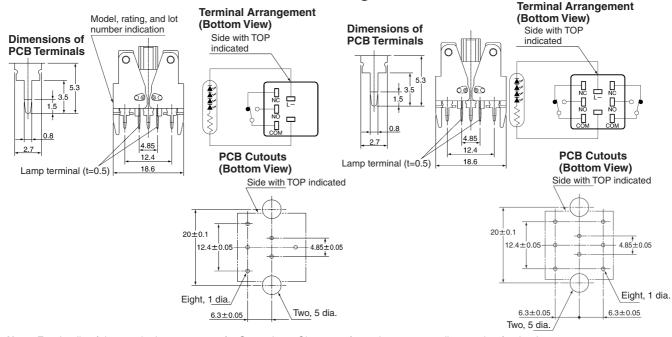
## Lighted DPDT Switches



## Non-lighted DPDT Switches



#### Lighted DPDT Switches



Note: For details of the terminal arrangement for Screw-Less Clamps, refer to the corresponding section for the A16.

## Non-lighted Models with PCB Terminals

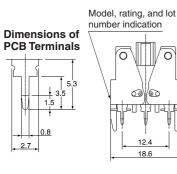
Lamp terminals are not provided with the Non-lighted Knob-type Selector Switches and Key-type Selector Switches.

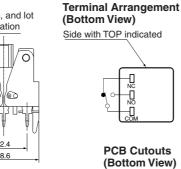
0

Side with TOP indicated

Two, 5 dia.

#### Non-lighted SPDT Switches





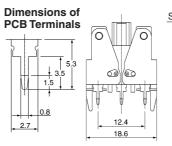
20±0.1

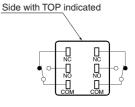
Three, 1 dia

 $12.4 \pm 0.05$ 

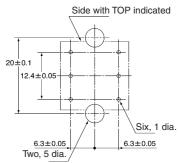
 $6.3 \pm 0.05$ 







**PCB Cutouts** (Bottom View)

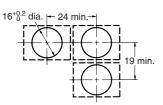


# Panel Cutouts

## **Models with Solder Terminals**

Rectangular A165 -J

(Top View)



Square A165 -A Round A165
-T (Top View) 16<sup>+0.2</sup> dia. 19 miı

min.

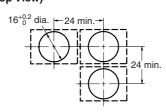
Note: 1. Make sure the thickness of the mounting panel is 0.5 to 3.2 mm.

2. If the panel is to be finished with coating, etc., make sure that the panel meets the specified dimensions after coating.

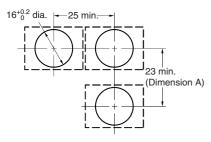
## Models with PCB Terminals

#### Rectangular A165 -J

(Top View)



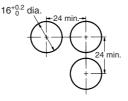
#### Rectangular A165W□-T



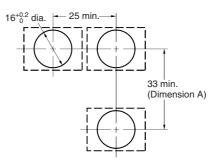
Recommended panel thickness: 0.5 to 3.2 mm

Square A165□-A Round A165□-T

(Top View)



#### Rectangular A165⊡-2S



Recommended panel thickness: 0.5 to 3.2 mm

Note: 1. Ensure that the variation in the distance between the centers of neighboring mounting holes is less than ±0.1 mm.
2. Make sure the thickness of the mounting panel is 0.5 to 3.2 mm. If, however, a Switch Guard or Dust Cover is used, the thickness of the mounting panel must be 0.5 to 2 mm.

3. If the panel is to be finished with coating, etc., make sure that the panel meets the specified dimensions after coating.

# Installation

For details on mounting the Switch to a panel, and mounting and dismounting the Switch, refer to installation details for the A16 Pushbutton Switch.

# Panel Mounting

Refer to the Installation section for the A16.

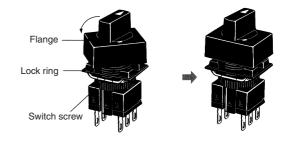
# Mounting and Replacing the Pushbutton

Refer to the Installation section for the A16.

# ■ Flange Rotation

## A165 Knob-type Selector Switch

Fix the Switch screw and rotate the flange in  $45^\circ$  turns.



# **Precautions**

Refer to the Technical Information for Pushbutton Switches (Cat. No. A143) and the Precautions section for the A16.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. A125-E1-02

In the interest of product improvement, specifications are subject to change without notice.

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