

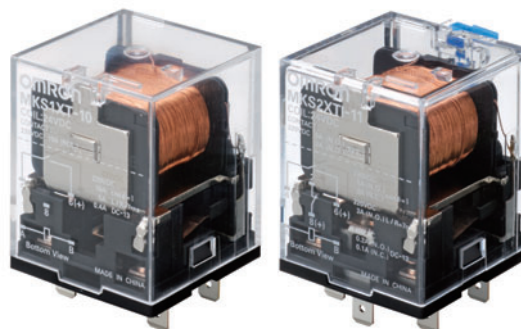
# Power Relays

## MK-S(X)

### MK-S-series Relays with DC-switching Models That Can Switch 220 VDC, 10 A (Resistive Load).



- Switch a DC load of 220 VDC, 10 A (resistive load).
- Models for AC Loads can switch 250 VAC, 15 A (resistive load).
- Lineup includes models with SPST-NO and SPST-NO/SPST-NC contact forms.
- Using a SPST-NO/SPST-NC contact form enables detecting contact welding. (When the NO contacts become welded, the NC contacts will maintain a minimum distance of 0.5 mm.)
- Models available with operation indicators and built-in test buttons.
- RoHS compliant.
- Standards: UL, IEC (TÜV certification)  
(Application for the above standards has been made using the P7MF-06 and P7MF-06-D Sockets (sold separately).)



## Ordering Information

### General-purpose Relays

#### Models for DC Loads

| Contact form                                              | SPST-NO                                   |             | SPST-NO/SPST-NC                           |             |
|-----------------------------------------------------------|-------------------------------------------|-------------|-------------------------------------------|-------------|
|                                                           | Rated coil voltage (V)                    | Model       | Rated coil voltage (V)                    | Model       |
| Standard Models                                           | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS1XT-10   | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS2XT-11   |
|                                                           | DC: 12, 24, 48, 110, 220                  |             | DC: 12, 24, 48, 110, 220                  |             |
| Models with Built-in Operation Indicators                 | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS1XTN-10  | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS2XTN-11  |
|                                                           | DC: 12, 24, 48, 110, 220                  |             | DC: 12, 24, 48, 110, 220                  |             |
| Models with Test Button                                   | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS1XTI-10  | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS2XTI-11  |
|                                                           | DC: 12, 24, 48, 110, 220                  |             | DC: 12, 24, 48, 110, 220                  |             |
| Models with Test Button and Built-in Operation Indicators | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS1XTIN-10 | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS2XTIN-11 |
|                                                           | DC: 12, 24, 48, 110, 220                  |             | DC: 12, 24, 48, 110, 220                  |             |

#### Models for AC Loads

| Contact form                                              | SPST-NO                                   |            | SPST-NO/SPST-NC                           |            |
|-----------------------------------------------------------|-------------------------------------------|------------|-------------------------------------------|------------|
|                                                           | Rated coil voltage (V)                    | Model      | Rated coil voltage (V)                    | Model      |
| Standard Models                                           | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS1T-10   | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS2T-11   |
|                                                           | DC: 12, 24, 48, 110, 220                  |            | DC: 12, 24, 48, 110, 220                  |            |
| Models with Built-in Operation Indicators                 | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS1TN-10  | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS2TN-11  |
|                                                           | DC: 12, 24, 48, 110, 220                  |            | DC: 12, 24, 48, 110, 220                  |            |
| Models with Test Button                                   | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS1TI-10  | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS2TI-11  |
|                                                           | DC: 12, 24, 48, 110, 220                  |            | DC: 12, 24, 48, 110, 220                  |            |
| Models with Test Button and Built-in Operation Indicators | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS1TIN-10 | AC: 24, 100, 110, 120, 200, 220, 230, 240 | MKS2TIN-11 |
|                                                           | DC: 12, 24, 48, 110, 220                  |            | DC: 12, 24, 48, 110, 220                  |            |

### Accessory (Order Separately)

#### Connecting Socket

| Classifications         |                                   | Built-in diode | Model     |
|-------------------------|-----------------------------------|----------------|-----------|
| Back-connecting Socket  | PCB Terminals                     | No             | P7M-06P   |
| Front-connecting Socket | Mounts to DIN Track or via screws | No             | P7MF-06   |
|                         |                                   | Yes            | P7MF-06-D |

## Specifications

## Ratings

## Operating Coil

| Item              |     | Rated current (mA) |       | Coil resistance (Ω) | Must operate voltage (V) | Must release voltage (V)               | Maximum voltage allowable (V) | Power consumption (VA, W)                          |
|-------------------|-----|--------------------|-------|---------------------|--------------------------|----------------------------------------|-------------------------------|----------------------------------------------------|
| Rated voltage (V) |     | 50 Hz              | 60 Hz |                     |                          |                                        |                               |                                                    |
| AC                | 24  | 110                | 96.3  | 48.4                | 80% max.                 | 30% min. at 60 Hz<br>25% min. at 50 Hz | 110%                          | Approx. 2.3 VA at 60 Hz<br>Approx. 2.7 VA at 50 Hz |
|                   | 100 | 26.6               | 23.1  | 760                 |                          |                                        |                               |                                                    |
|                   | 110 | 24.2               | 21.0  | 932                 |                          |                                        |                               |                                                    |
|                   | 120 | 22.2               | 19.3  | 1,130               |                          |                                        |                               |                                                    |
|                   | 200 | 13.3               | 11.6  | 3,160               |                          |                                        |                               |                                                    |
|                   | 220 | 12.1               | 10.5  | 3,550               |                          |                                        |                               |                                                    |
|                   | 230 | 11.5               | 10.0  | 4,250               |                          |                                        |                               |                                                    |
|                   | 240 | 11.0               | 9.6   | 4,480               |                          |                                        |                               |                                                    |
| DC                | 12  | 126                |       | 95                  | 80% max.                 | 15% min.                               | 110%                          | Approx. 1.5 W                                      |
|                   | 24  | 63.2               |       | 380                 |                          |                                        |                               |                                                    |
|                   | 48  | 32.0               |       | 1,500               |                          |                                        |                               |                                                    |
|                   | 110 | 13.6               |       | 8,060               |                          |                                        |                               |                                                    |
|                   | 220 | 6.8                |       | 32,200              |                          |                                        |                               |                                                    |

- Note:** 1. The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of +15%/–20% for AC rated current and ±15% for DC coil resistance.
2. Performance characteristic data are measured at a coil temperature of 23°C.
3. The maximum allowable voltage is the maximum value of the allowable voltage range for the operating power supply for the relay coil. There is no continuous allowance.
4. The rated current is approximately 5 mA higher for Models with Built-in Operation Indicators (DC operating coils).

### Contact Ratings for Models for DC Loads

| Contact form<br>Model<br>Load                |            | SPST-NO         |                |                | SPST-NO/SPST-NC |                |                |
|----------------------------------------------|------------|-----------------|----------------|----------------|-----------------|----------------|----------------|
|                                              |            | MKS1XT(I)(N)-10 |                |                | MKS2XT(I)(N)-11 |                |                |
|                                              |            | Resistive load  | Inductive load |                | Resistive load  | Inductive load |                |
| L/R = 7 ms                                   | DC13 class |                 | L/R = 7 ms     | DC13 class     |                 |                |                |
| Item                                         |            |                 |                |                |                 |                |                |
| Contact configuration                        | NO         | Double-break    |                |                | Double-break    |                |                |
|                                              | NC         | ---             |                |                | Single-break    |                |                |
| Contact material                             |            | AgSnIn          |                |                | AgSnIn          |                |                |
| Rated load                                   | NO         | 10 A, 220 VDC   | 5 A, 220 VDC   | 0.4 A, 220 VDC | 5 A, 220 VDC    | 3 A, 220 VDC   | 0.2 A, 220 VDC |
|                                              | NC         | ---             |                |                | 2 A, 220 VDC    | 0.3 A, 220 VDC | 0.1 A, 220 VDC |
| Rated carry current                          | NO         | 10 A            |                |                | 5 A             |                |                |
|                                              | NC         | ---             |                |                | 2 A             |                |                |
| Max. switching voltage                       | NO         | 220 VDC         |                |                | 220 VDC         |                |                |
|                                              | NC         | ---             |                |                |                 |                |                |
| Max. switching current                       | NO         | 10 A            |                |                | 5 A             |                |                |
|                                              | NC         | ---             |                |                | 2 A             |                |                |
| Max. switching capacity<br>(reference value) | NO         | 2,200 W         | ---            | ---            | 1,100 W         | ---            | ---            |
|                                              | NC         | ---             |                |                | 440 W           | ---            | ---            |

**Note:** If the L/R of an inductive load exceeds 7 ms with a Model for a DC Load, the arc interruption time must be less than approximately 50 ms to use the Relay. Design the circuit so that the arc interruption time is 50 ms or less.

\* These values apply to a switching frequency of 30 times per minute.

### Contact Ratings for Models for AC Loads

| Contact form<br>Model<br>Load                |    | SPST-NO        | SPST-NO/SPST-NC |
|----------------------------------------------|----|----------------|-----------------|
|                                              |    | MKS1T(I)(N)-10 | MKS2T(I)(N)-11  |
|                                              |    | Resistive load | Resistive load  |
| Contact configuration                        | NO | Double-break   | Double-break    |
|                                              | NC | ---            | Single-break    |
| Contact material                             |    | AgSnIn         | AgSnIn          |
| Rated load                                   | NO | 15 A, 250 VAC  | 15 A, 250 VAC   |
|                                              | NC | ---            | 5 A, 250 VAC    |
| Rated carry current                          | NO | 15 A           | 15 A            |
|                                              | NC | ---            | 5 A             |
| Max. switching voltage                       | NO | 250 VAC        | 250 VAC         |
|                                              | NC | ---            |                 |
| Max. switching current                       | NO | 15 A           | 15 A            |
|                                              | NC | ---            | 5 A             |
| Max. switching capacity<br>(reference value) | NO | 3,750 VA       | 3,750 VA        |
|                                              | NC | ---            | 1,250 VA        |

\* These values apply to a switching frequency of 20 times per minute.

## Characteristics

|                                        |                                        |                                                                                                                                           |
|----------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Contact resistance *1                  |                                        | 100 mΩ max.                                                                                                                               |
| Operate time *2                        |                                        | AC: 20 ms max.<br>DC: 30 ms max.                                                                                                          |
| Release time *2                        |                                        | 20 ms max.                                                                                                                                |
| Max. operating frequency               | Mechanical                             | 18,000 operations/h                                                                                                                       |
|                                        | Rated load                             | Models for DC loads: 1,800 times/hour<br>Models for AC loads: 1,200 times/hour                                                            |
| Insulation resistance *3               |                                        | 100 MΩ min.                                                                                                                               |
| Dielectric strength                    | Between coil and contacts              | 2,500 VAC 50/60 Hz for 1 min between                                                                                                      |
|                                        | Between contacts of different polarity | 2,500 VAC 50/60 Hz for 1 min between                                                                                                      |
|                                        | Between contacts of same polarity      | 1,000 VAC 50/60 Hz for 1 min                                                                                                              |
| Vibration resistance                   | Destruction                            | 10 to 55 to 10 Hz, 0.50-mm single amplitude (1.0-mm double amplitude)                                                                     |
|                                        | Malfunction                            | 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)                                                                     |
| Shock resistance                       | Destruction                            | Back-connecting Socket (P7M-06P) mounting: 1,000 m/s <sup>2</sup><br>Front-connecting Socket (P7MF-06(-D)) mounting: 500 m/s <sup>2</sup> |
|                                        | Malfunction                            | 100 m/s <sup>2</sup>                                                                                                                      |
| Endurance                              | Mechanical                             | 1,000,000 operations min. (at 18,000 operations/hr)                                                                                       |
|                                        | Electrical *4                          | 100,000 operations min. (at rated load and maximum switching frequency)                                                                   |
| Failure rate P level (reference value) |                                        | 10 mA at 24 VDC                                                                                                                           |
| Ambient operating temperature          |                                        | -40°C to 60°C (with no icing or condensation)<br><b>Note:</b> The range is -25°C to 60°C for models with built-in operation indicators.   |
| Ambient operating humidity             |                                        | 5% to 85%                                                                                                                                 |
| Weight                                 |                                        | SPST-NO: Approx. 73 g, SPST-NO/SPST-NC: Approx. 82 g                                                                                      |

**Note:** The values given above are initial values.

\*1. The contact resistance was measured for 1 A at 5 VDC using the voltage drop method.

\*2. The operate time was measured with the rated voltage imposed and any contact bounce ignored at an ambient temperature of 23°C.

\*3. The insulation resistance was measured with a 500-VDC insulation resistance tester at the same places as those used for checking the dielectric strength.

\*4. The electrical endurance was measured at an ambient temperature of 23°C.

## Approved Standards

UL508 (File No. E41515)  

| Model     | Coil ratings                   | Contact ratings |                                                                                                                                 | Operations |
|-----------|--------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------|------------|
| MKS1XT□-□ | 12 to 220 VDC<br>24 to 240 VAC | NO contacts     | 10 A, 220 VDC (Resistive)<br>5 A, 220 VDC L/R (T <sub>0.632</sub> ) = 7 ms<br>0.4 A, 220 VDC L/R (T <sub>0.95</sub> ) = 300 ms  | 6,000      |
| MKS2XT□-□ |                                | NO contacts     | 5 A, 220 VDC (Resistive)<br>3 A, 220 VDC L/R (T <sub>0.632</sub> ) = 7 ms<br>0.2 A, 220 VDC L/R (T <sub>0.95</sub> ) = 300 ms   |            |
|           |                                | NC contacts     | 2 A, 220 VDC (Resistive)<br>0.3 A, 220 VDC L/R (T <sub>0.632</sub> ) = 7 ms<br>0.1 A, 220 VDC L/R (T <sub>0.95</sub> ) = 300 ms |            |
| MKS1T□-□  |                                | NO contacts     | 15 A, 250 VAC (Resistive)                                                                                                       |            |
| MKS2T□-□  |                                | NO contacts     | 15 A, 250 VAC (Resistive)                                                                                                       |            |
|           |                                | NC contacts     | 5 A, 250 VAC (Resistive)                                                                                                        |            |

CSA Standard: CSA Certification by   : CSA C22.2 No.14

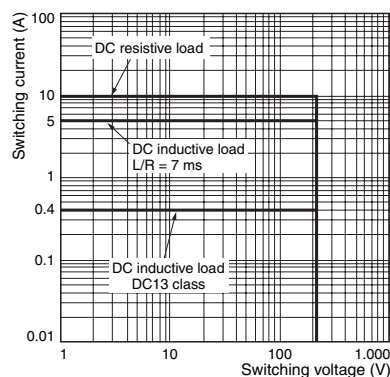
IEC Standard/TÜV Certification: IEC61810-1 (Certification No. R50104853) 

| Model     | Coil ratings                                                          | Contact ratings |                                                                                                | Operations |
|-----------|-----------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|------------|
| MKS1XT□-□ | 12, 24, 48, 110, 220 VDC<br>24, 100, 110, 120, 200, 220, 230, 240 VAC | NO contacts     | DC-1: 10 A, 220 VDC<br>5 A, 220 VDC L/R (T <sub>0.632</sub> ) = 7 ms<br>DC-13: 0.4 A, 220 VDC  | 100,000    |
| MKS2XT□-□ |                                                                       | NO contacts     | DC-1: 5 A, 220 VDC<br>3 A, 220 VDC L/R (T <sub>0.632</sub> ) = 7 ms<br>DC-13: 0.2 A, 220 VDC   |            |
|           |                                                                       | NC contacts     | DC-1: 2 A, 220 VDC<br>0.3 A, 220 VDC L/R (T <sub>0.632</sub> ) = 7 ms<br>DC-13: 0.1 A, 220 VDC |            |
| MKS1T□-□  |                                                                       | NO contacts     | AC-1: 15 A, 250 VAC 50/60 Hz                                                                   |            |
| MKS2T□-□  |                                                                       | NO contacts     | AC-1: 15 A, 250 VAC 50/60 Hz                                                                   |            |
|           |                                                                       | NC contacts     | AC-1: 5 A, 250 VAC 50/60 Hz                                                                    |            |

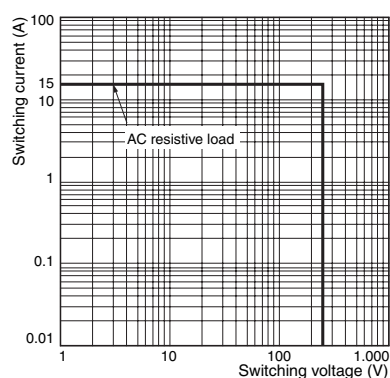
## Engineering Data

### Maximum Switching Power

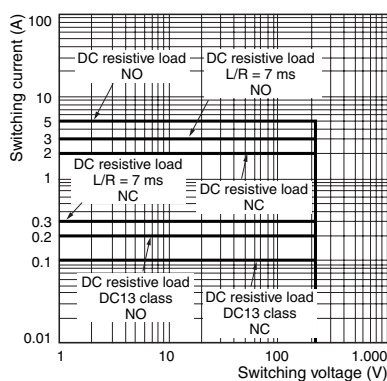
**MKS1XT-10, MKS1XTN-10**  
**MKS1XTI-10, MKS1XTIN-10**



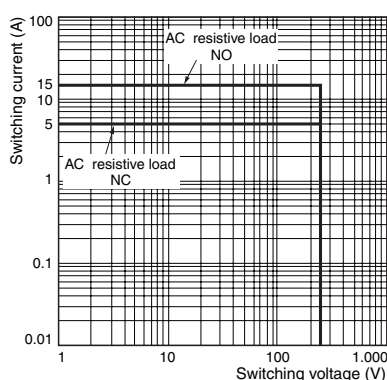
**MKS1T-10, MKS1TN-10**  
**MKS1TI-10, MKS1TIN-10**



**MKS2XT-11, MKS2XTN-11**  
**MKS2XTI-11, MKS2XTIN-11**

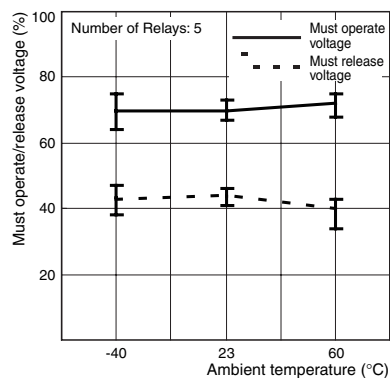


**MKS2T-11, MKS2TN-11**  
**MKS2TI-11, MKS2TIN-11**

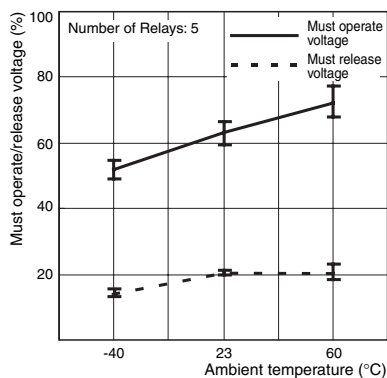


### Ambient Temperature vs. Must Operate Voltage and Must Release Voltage

**MKS2XT-11**  
**AC Specification (60 Hz)**

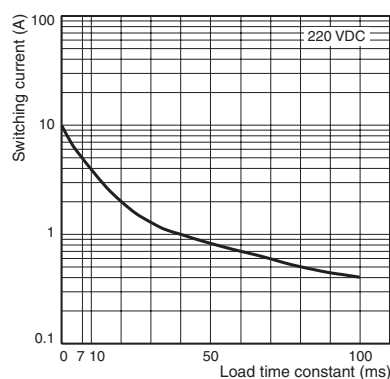


**MKS2XT-11**  
**DC Specification**

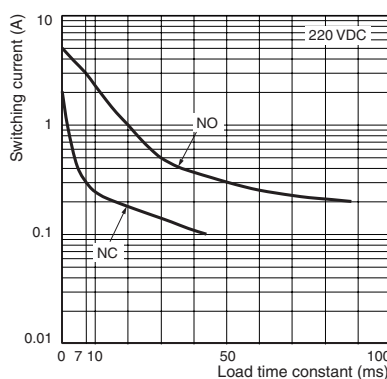


### Inductive Load Switching Power (Models for DC Loads)

**MKS1XT-10, MKS1XTN-10**  
**MKS1XTI-10, MKS1XTIN-10**



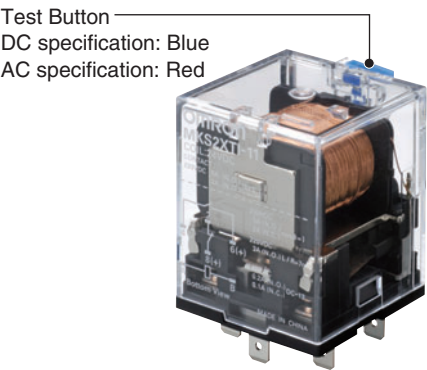
**MKS2XT-11, MKS2XTN-11**  
**MKS2XTI-11, MKS2XTIN-11**



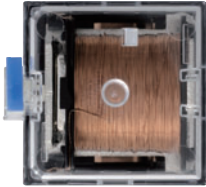
# MK-S(X)

## Test Button

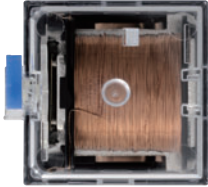
The circuit can be checked using either of two modes.



Normal

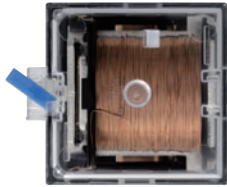


Mode 1  
(momentary)



Press the button  
for operation.  
(No tool is required.)

Mode 2  
(locked)



Lock the contacts by  
pressing down on the  
button and turning it.

## Test Button Applications

Example: Checking operation of Relays and sequence circuits.

## Dimensions

### General-purpose Relays

#### Models for DC Loads

##### Standard Models

MKS1XT-10      MKS2XT-11

##### Models with Built-in Operation Indicators

MKS1XTN-10      MKS2XTN-11

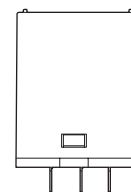
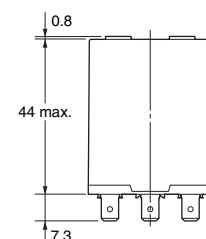
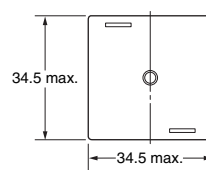
#### Models for AC Loads

##### Standard Models

MKS1T-10      MKS2T-11

##### Models with Built-in Operation Indicators

MKS1TN-10      MKS2TN-11



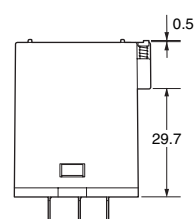
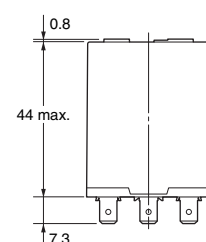
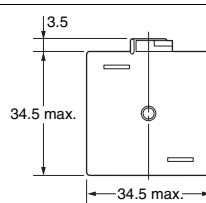
#### Models for DC Loads

##### Models with Test Button

MKS1XTI-10      MKS2XTI-11

##### Models with Test Button and Built-in Operation Indicators

MKS1XTIN-10      MKS2XTIN-11



#### Models for AC Loads

##### Models with Test Button

MKS1TI-10      MKS2TI-11

##### Models with Test Button and Built-in Operation Indicators

MKS1TIN-10      MKS2TIN-11

### Terminal Arrangement/Internal Connection (Bottom View)

| MKS1XT-10<br>MKS1XTI-10 | MKS1XTN-10<br>MKS1XTIN-10 |                  | MKS2XT-11<br>MKS2XTI-11 | MKS2XTN-11<br>MKS2XTIN-11 |                  |
|-------------------------|---------------------------|------------------|-------------------------|---------------------------|------------------|
|                         | DC specification          | AC specification |                         | DC specification          | AC specification |
|                         |                           |                  |                         |                           |                  |
| MKS1T-10<br>MKS1TI-10   | MKS1TN-10<br>MKS1TIN-10   |                  | MKS2T-11<br>MKS2TI-11   | MKS2TN-11<br>MKS2TIN-11   |                  |
|                         | DC specification          | AC specification |                         | DC specification          | AC specification |
|                         |                           |                  |                         |                           |                  |

**Note:** 1. Wire properly using the correct coil polarity.

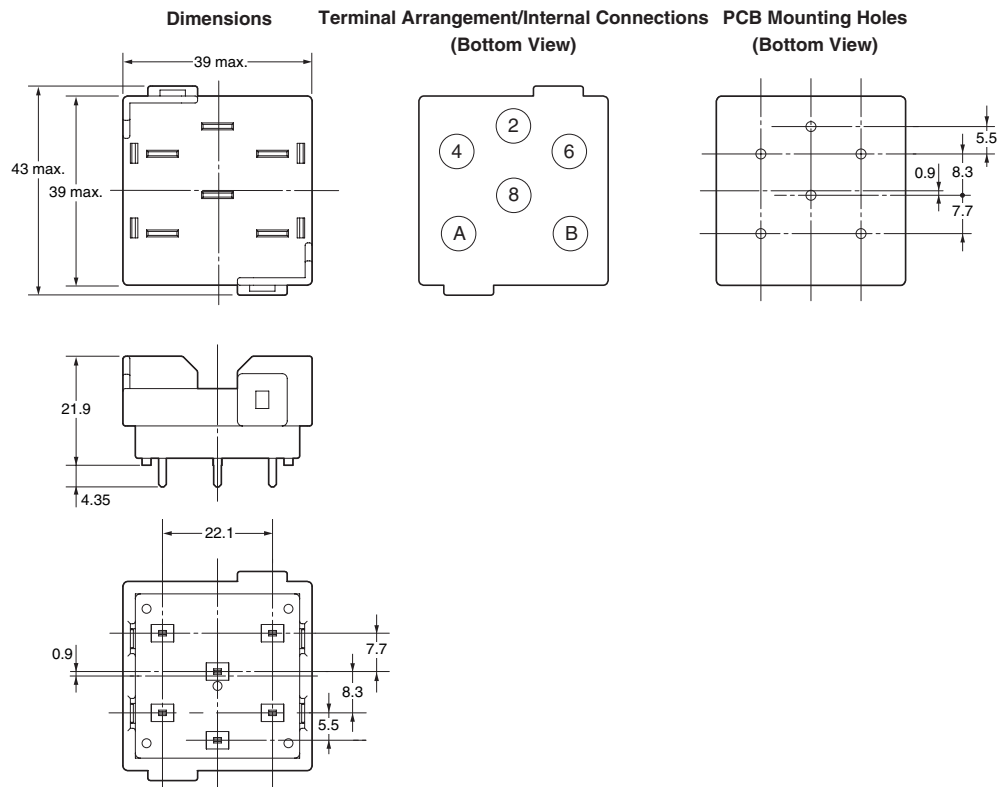
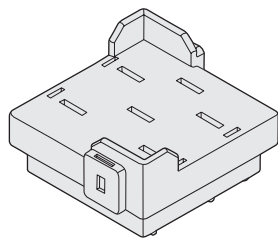
2. The contact terminals on Models for DC Loads have polarity. Wire properly using the correct polarity.

# MK-S(X)

## Connecting Socket

### Back-connecting Socket

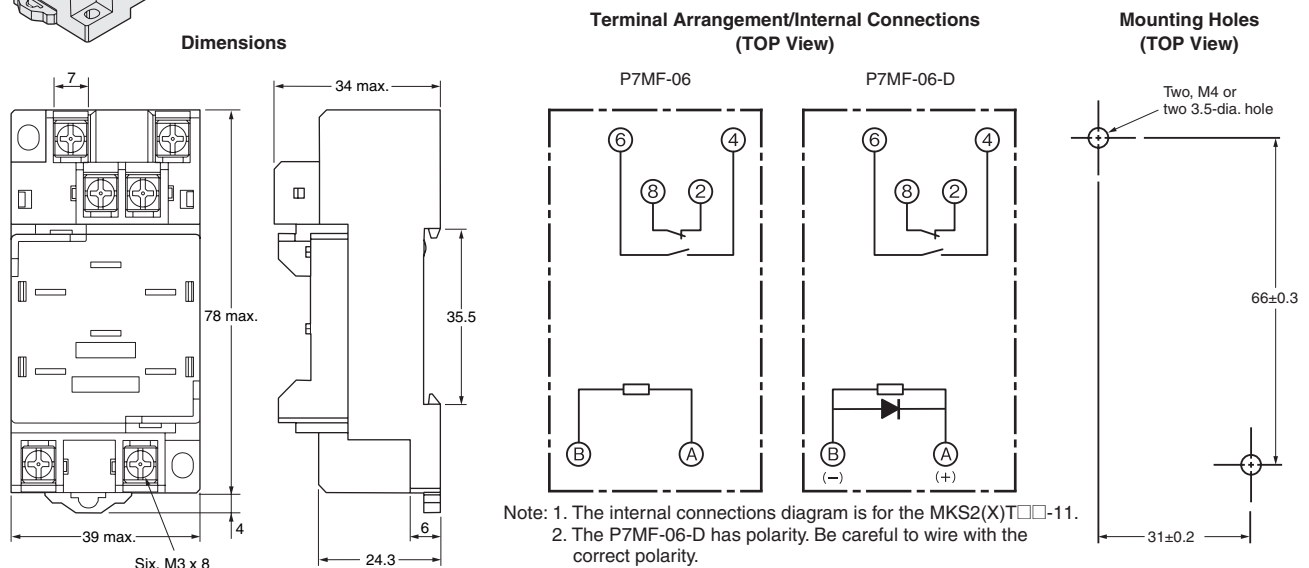
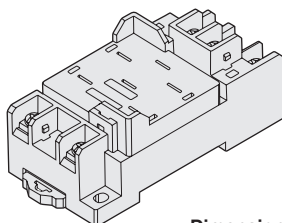
P7M-06P



## Front-connecting Socket

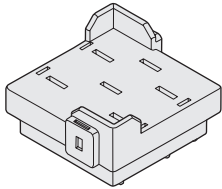
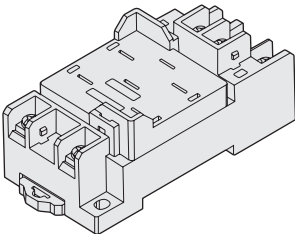
P7MF-06

P7MF-06-D



## Accessory (Order Separately)

### Connecting Socket

| Socket          | Back-connecting Socket                                                                              | Front-connecting Socket                                                                                                  |
|-----------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Number of poles | PCB terminals                                                                                       | Mounts to DIN Track or via screws                                                                                        |
| 2               | <b>P7M-06P</b><br> | <b>P7MF-06</b><br><b>P7MF-06-D</b><br> |

**Note:** 1. The P7M-06P, P7MF-06, and P7MF-06-D can be used with models for DC loads with an SPST-NO or SPST-NO/SPST-NC contact form or with models for AC loads with an SPST-NO or SPST-NO/SPST-NC contact form.

2. The P7MF-06-D has a built-in diode and can thus be used only with Relays with DC operating coils. Do not use it with a Relay with an AC operating coil.

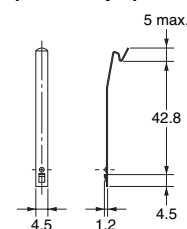
3. Refer to *Gang Mounting* on page 10 for the conditions required for gang mounting.

### Relay Hold-down Clips

Use the Clips to securely mount the Relay and prevent it from falling due to vibration or shock.

| Applicable Relay models |                                   |                      | PYC-A2 |
|-------------------------|-----------------------------------|----------------------|--------|
| Socket                  |                                   |                      |        |
| Back-connecting Socket  | PCB terminals                     | P7M-06P              |        |
| Front-connecting Socket | Mounts to DIN Track or via screws | P7MF-06<br>P7MF-06-D |        |

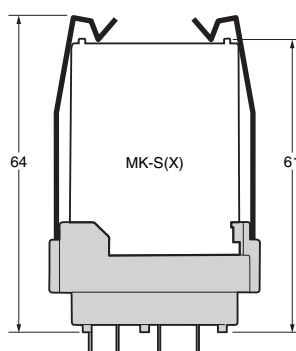
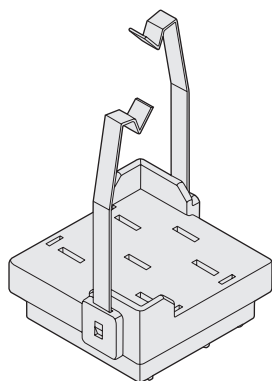
#### PYC-A2 One Set (Two Clips)



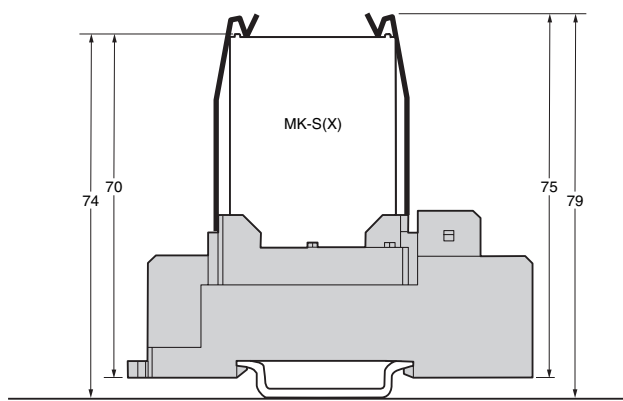
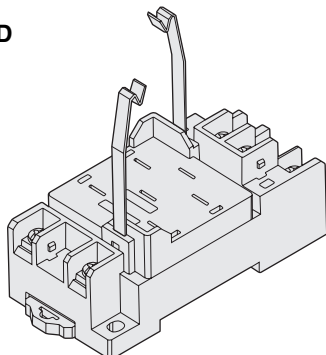
**Note:** The minimum order for the PYC-A2 is ten clips.

### Socket Mounting Height

#### P7M-06P



#### P7MF-06 P7MF-06-D



Safety Precautions

Refer also to *Precautions for All Relays*.

Precautions for Correct Use

Installation

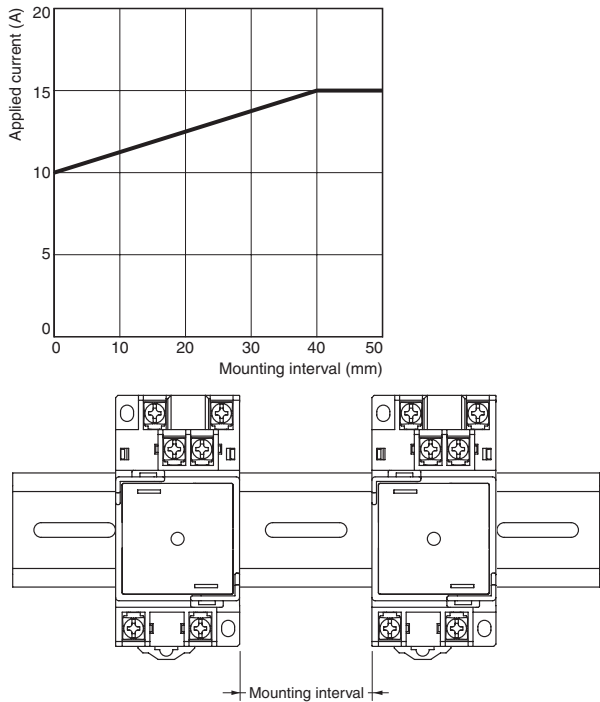
- Models for DC loads (i.e., models with “X” in the model number) have permanent magnets built into the insulating block. If a permanent magnet or other magnetic body comes near the Relay, magnetic interference will occur with the built-in permanent magnet and the contact switching capacity will be decreased.
- Models for AC loads do not contain a permanent magnet.
- When mounting a P7MF-06(-D) Front-mounting Socket to a DIN Track, attach PFP-M End Plates on both sides of the Socket to prevent it from moving.

Gang Mounting

Conditions for Gang Mounting Relays

| Relay               | Rated current of Relay | Socket                 |                         |
|---------------------|------------------------|------------------------|-------------------------|
|                     |                        | Back-Connecting Socket | Front-Connecting Socket |
| Models for DC Loads | 10A                    | ○                      | ○                       |
| Models for AC Loads | 15A                    | ○                      | *                       |

\* Gang mounting of the Front-Mounting Sockets is not possible if the contact carry current exceeds 10A. Provide space on both the right and left sides of the Sockets.  
The mounting pitch is given in the following diagram.



Wiring

- The contact terminals on Models for DC Loads (i.e., models with “X” in the model number) have polarity. Wiring with incorrect polarity may result in inability to turn OFF the Relay or loss of functionality.
- Wire models with built-in operation indicators with the correct coil polarity (DC operating coil).

Test Button

- Turn OFF the power supply before operating the test button.  
Always return the test button to the original position after you use it.
- Do not use the test button as a switch.
- The durability of the test button is 100 operations minimum.

Operating Environment

Do not use the Relay in environments with combustible gas. Doing so may result in explosion due to arcing.

Storage

Models for DC Loads (i.e., models with “X” in the model number) are magnetized because they have a built-in magnet to deflect and extinguish the arc. Do not install the Relay near IC cards or other items that may be adversely affected by magnetism.

Usage

Use the Relay mounted in the P7M-06P or P7MF-06(-D) Socket.

# Warranty and Application Considerations

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**Cat. No. J175-E1-02**

Printed in Japan  
0809



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