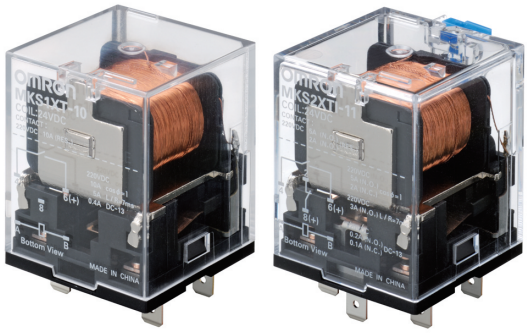
# General Purpose Power Relays
# MKS-X

### MK-S-series Relays with AC and DC Load switching Models

- Models for DC Loads can switch 220 VDC, 10 A (resistive).
- Models for AC Loads can switch 250 VAC, 15 A (resistive).
- Lineup includes models with 1FormA and 1FormA+1FormB contact arrangements.
- Models available with operation indicators and built-in test buttons.
- Standards: UL/CSA, IEC (TÜV certification)
- RoHS compliant.



## Ordering Information

### ■ List of Models

| Contact form | Models for DC Loads | | Models for AC Loads | |
|---|---|---|---|---|
| | SPST-NO | SPST-NO/SPST-NC | SPST-NO | SPST-NO/SPST-NC |
| Type | Model | Model | Model | Model |
| Standard | **MKS1XT-10** | **MKS2XT-11** | **MKS1T-10** | **MKS2T-11** |
| Built-in Operation Indicators | **MKS1XTN-10** | **MKS2XTN-11** | **MKS1TN-10** | **MKS2TN-11** |
| Test Button | **MKS1XTI-10** | **MKS2XTI-11** | **MKS1TI-10** | **MKS2TI-11** |
| Test Button and Built-in Operation Indicators | **MKS1XTIN-10** | **MKS2XTIN-11** | **MKS1TIN-10** | **MKS2TIN-11** |

**Note: 1.** When ordering, add the rated voltage to the model number. Rated voltages are given in the coil ratings table in the specifications.
Example: MKS2XTIN-11 AC240
Rated voltage

**2.** Refer to *Terminal Arrangement and Internal Connections* for all wiring diagrams.

### ■ Accessory (Order Separately)

#### Connecting Socket and Hold-down Clips

| Classifications | | Built-in diode | Socket | Hold-down Clip |
|---|---|---|---|---|
| **Back-connecting Socket** | PCB Mount | No | **P7M-06P** | **PYC-A2** |
| **Front-connecting Socket** | DIN Track or Panel Mount | No | **P7MF-06** | |
| | | Yes | **P7MF-06-D** | |

**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* in the *Safety Precautions* section for the conditions required to gang mounti multiple relays side-by-side.

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

# Specifications

## ■ Contact Ratings

### Models for DC Loads

| Item | | Contact form | SPST-NO | | | SPST-NO/SPST-NC | | |
|---|---|---|---|---|---|---|---|---|
| | | Model | MKS1XT(I)(N)-10 | | | MKS2XT(I)(N)-11 | | |
| | | Load | Resistive load | Inductive load | | Resistive load | Inductive load | |
| | | | | L/R = 7 ms | DC13 class | | L/R = 7 ms | DC13 class |
| 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 (reference value) | NO | | 2,200 W | --- | --- | 1,100 W | --- | --- |
| | NC | | --- | | | 440 W | --- | --- |

**Note: 1.** 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.

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

### Models for AC Loads

| Item | | Contact form | SPST-NO | SPST-NO/SPST-NC |
|---|---|---|---|---|
| | | Model | MKS1T(I)(N)-10 | MKS2T(I)(N)-11 |
| | | Load | 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 (reference value) | NO | | 3,750 VA | 3,750 VA |
| | NC | | --- | 1,250 VA |

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

## ■ Coil Ratings

| Item | | Rated current (mA) | | Coil resistance (Ω) | Must operate voltage (V) | Must release voltage (V) | Max. voltage (V) | Power consumption (VA, W) |
|---|---|---|---|---|---|---|---|---|
| Rated voltage (V) | | 50 Hz | 60 Hz | | | | | |
| AC | 24 | 110 | 96.3 | 48.4 | 80% max. of rated voltage | 30% min. of rated voltage at 60 Hz<br>25% min. of rated voltage at 50 Hz | 110% of rated voltage | 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 | | 15% min. of rated voltage | | 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 Voltage is the highest voltage that can be applied to the coil temporarily, not continuously.

**4.** The rated current is approximately 5 mA higher for Models with Built-in Operation Indicators (DC operating coils).

## ■ Characteristics

| | | |
|---|---|---|
| **Contact resistance (See note 2)** | | 100 mΩ max. |
| **Operate time (See note 3)** | | AC: 20 ms max.<br>DC: 30 ms max. |
| **Release time (See note 3)** | | 20 ms max. |
| **Max. operating frequency** | **Mechanical** | 18,000 operations/h |
| | **Electrical** | Models for DC loads: 1,800 times/hour<br>Models for AC loads: 1,200 times/hour |
| **Insulation resistance (See note 4)** | | 100 MΩ min. |
| **Dielectric strength** | | 2,500 VAC 50/60 Hz for 1 min. between coil and contacts |
| | | 2,500 VAC 50/60 Hz for 1 min. between contacts of different polarity |
| | | 1,000 VAC 50/60 Hz for 1 min. between contacts of same polarity |
| **Vibration resistance** | | Destruction: 10 to 55 Hz, 1.0-mm double amplitude<br>Malfunction: 10 to 55 Hz, 1.5-mm double amplitude |
| **Shock resistance** | | Destruction: 1,000 m/s$^2$ when relay is properly mounted into P7M-06P PCB socket<br>500m/s$^2$ when relay is properly mounted into P7MF-06(-D) socket<br>Malfunction 100 m/s$^2$ |
| **Life expectancy** | **Mechanical** | 1,000,000 operations min. (at 18,000 operations/hr) |
| | **Electrical (See note 5)** | 100,000 operations min. (at rated load and maximum switching frequency) |
| **Minimum permissible load (Reference value. See note 6)** | | 10 mA at 24 VDC |
| **Ambient operating temperature** | | −40°C to 60°C (with no icing or condensation)<br>**Note:** 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: 1.** The values given above are initial values.

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

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

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

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

**6.** P level: $\lambda_{60}$=0.1 x 10$^{-6}$/operations

# ■ Approved Standards

## UL Recognized
## CSA Certified

| 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 ($T_{0.632}$) = 7 ms<br>0.4 A, 220 VDC L/R ($T_{0.95}$) = 300 ms | 6,000 |
| **MKS2XT□-□** | | **NO contacts** | 5 A, 220 VDC (Resistive)<br>3 A, 220 VDC L/R ($T_{0.632}$) = 7 ms<br>0.2 A, 220 VDC L/R ($T_{0.95}$) = 300 ms | |
| | | **NC contacts** | 2 A, 220 VDC (Resistive)<br>0.3 A, 220 VDC L/R ($T_{0.632}$) = 7 ms<br>0.1 A, 220 VDC L/R ($T_{0.95}$) = 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) | |

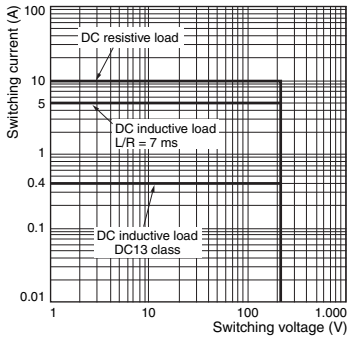
## IEC Standard/TÜV Certification: IEC61810-1 (Certification No. R50104853)

| 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 ($T_{0.632}$) = 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 ($T_{0.632}$) = 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 ($T_{0.632}$) = 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 | |

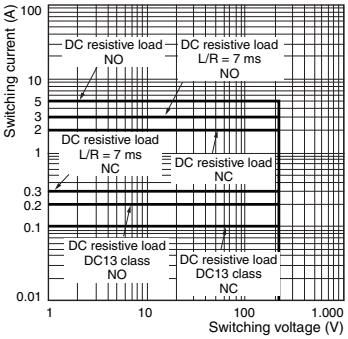
# Engineering Data

## Maximum Switching Power

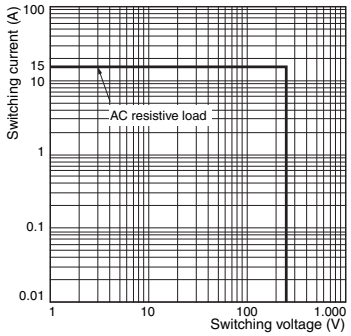
**MKS1XT□-10**



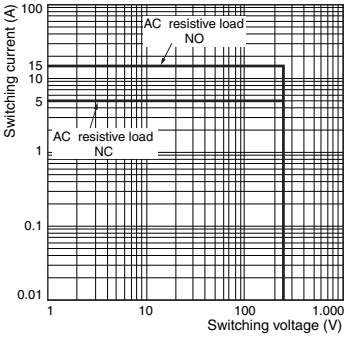

**MKS2XT□-11**




**MKS1T□-10**

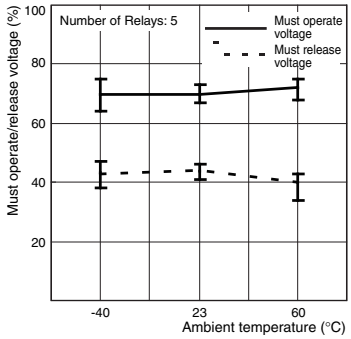



**MKS2T□-11**

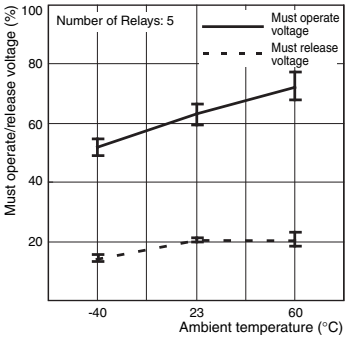



## Ambient Temperature vs. Pick-up and Drop out Voltage

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

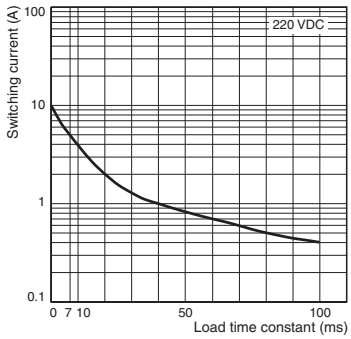



**MKS2XT-11**
**DC Specification**

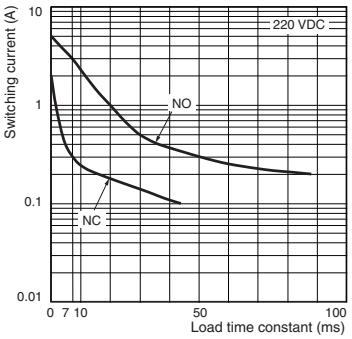



## Inductive Load Switching Power (Models for DC Loads)

**MKS1XT□-10**




**MKS2XT□-11**



# Dimensions

(Unit: mm)

## Models for DC Loads

**Standard Models**

**MKS1XT-10** **MKS2XT-11**

**Models with Built-in Operation Indicators**

**MKS1XTN-10** **MKS2XTN-11**

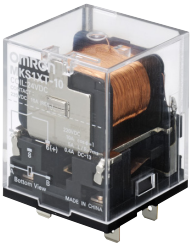
## Models for AC Loads

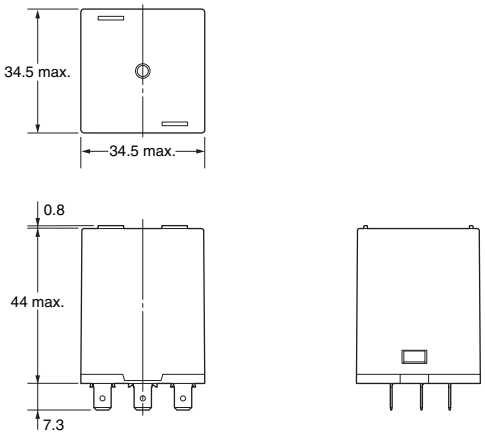
**Standard Models**

**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**

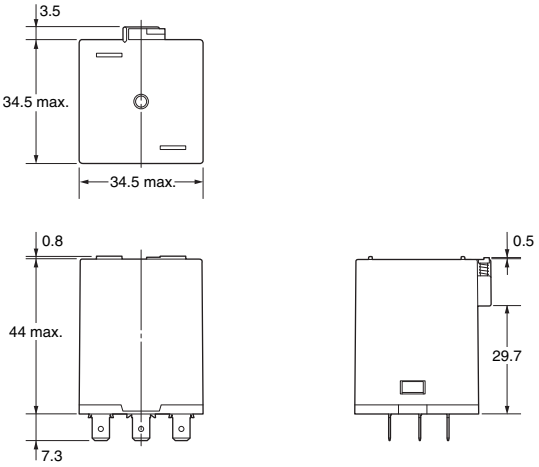
## Models for AC Loads

**Models with Test Button**

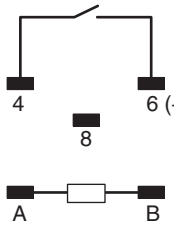
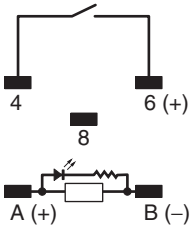
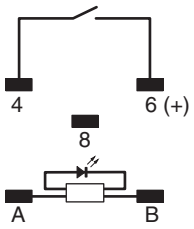
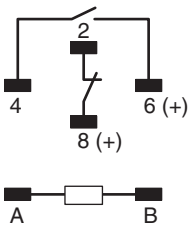
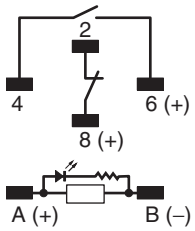
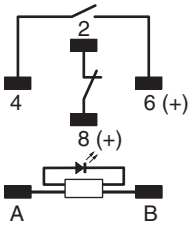
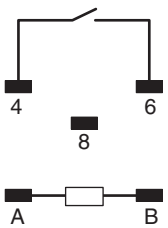
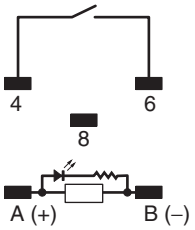
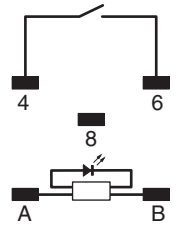
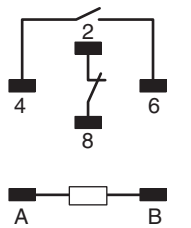
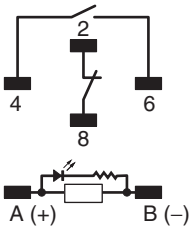
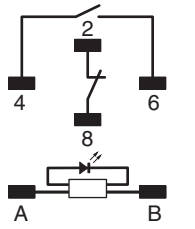
**MKS1TI-10** **MKS2TI-11**

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

**MKS1TIN-10** **MKS2TIN-11**




## Terminal Arrangement and 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 |
|  |  |  |  |  |  |

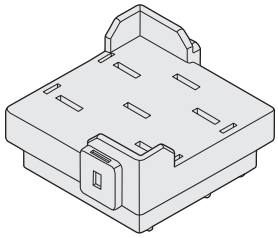
**Note: 1.** Wire properly using the correct coil polarity.

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

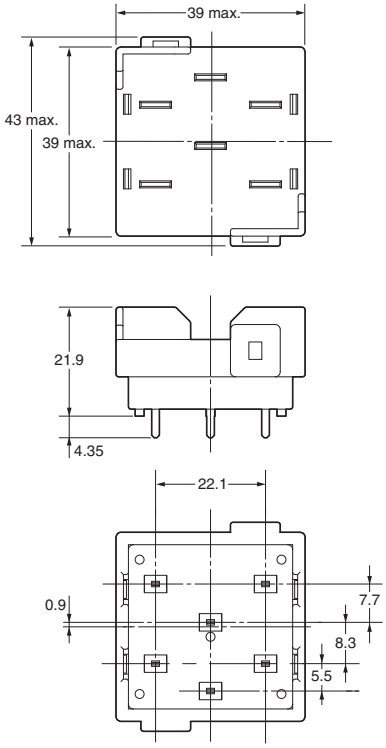
# Connecting Socket

## Back-connecting Socket

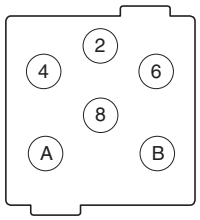
**P7M-06P**



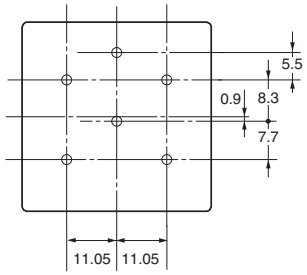
**Dimensions**




**Terminal Arrangement/Internal Connections (Bottom View)**

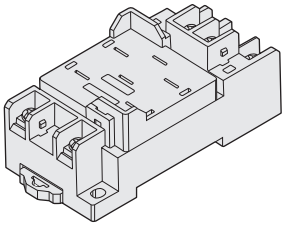



**PCB Mounting Holes (Bottom View)**

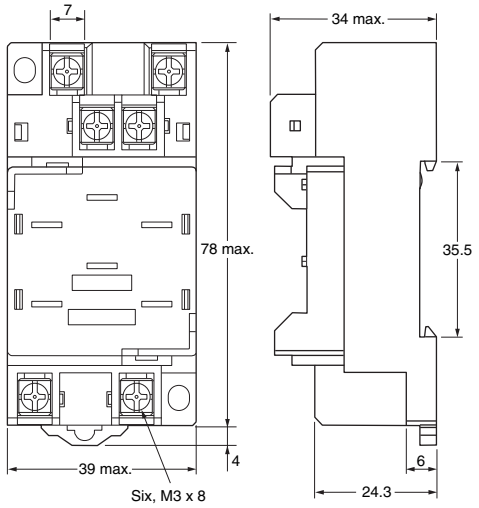



## Front-connecting Socket

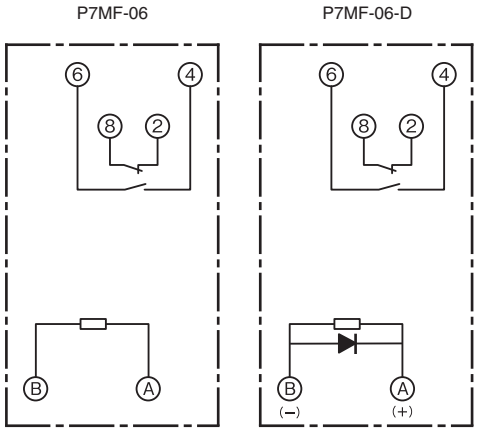
**P7MF-06**
**P7MF-06-D**



**Dimensions**

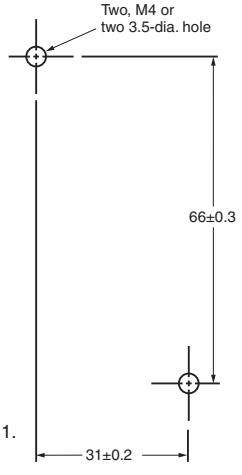



**Terminal Arrangement/Internal Connections (TOP View)**



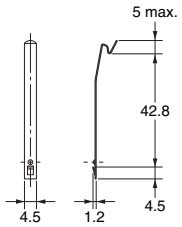

Note: 1. The internal connections diagram is for the MKS2(X)T□□-11.
2. The P7MF-06-D has polarity. Be careful to wire with the correct polarity.

**Mounting Holes (TOP View)**



## Hold-down Clip

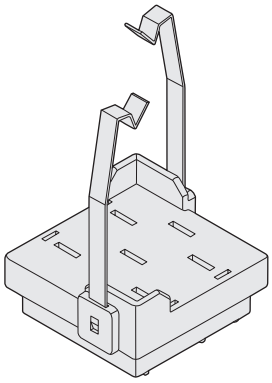
**PYC-A2**
**One Set (Two Clips)**

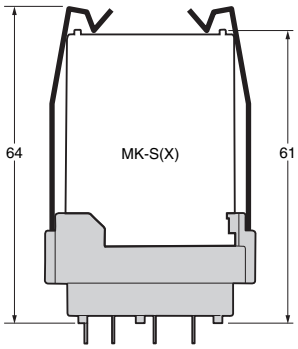



**Note:** The minimum order for the PYC-A2 is ten clips.

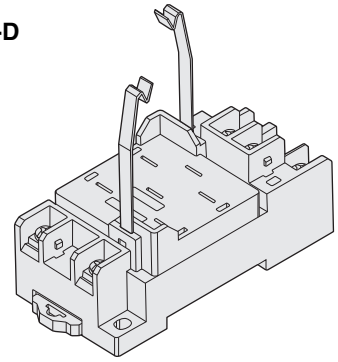
## Socket Mounting Height

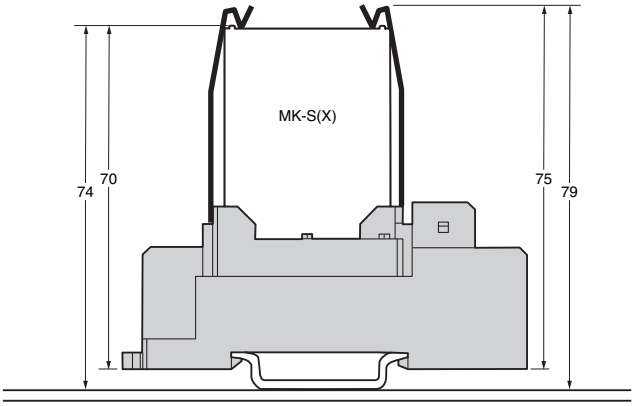
**P7M-06P**






**P7MF-06**
**P7MF-06-D**





# Safety Precautions

Be sure to read the precautions and information common to all electromechanical relays, contained in the Technical User's Guide, "Electromechanical Relays, Technical Information" for correct use.

## Precautions for Correct Use

### Installation

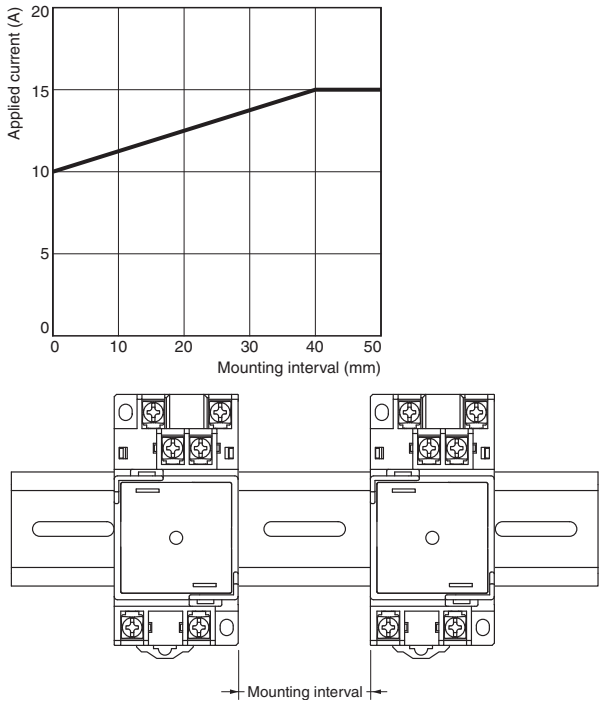
- Models for DC loads (i.e., models with "X" in the model number) have permanent magnets built into the insulating block. If a permanent magnet or other magnetic body comes near the Relay, magnetic interference will occur with the built-in permanent magnet and the contact switching capacity will be decreased.
- 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 mounting multiple MKS-X relays on the same DIN rail.

| | | Socket | |
|---|---|---|---|
| Relay | Rated current of Relay | 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.
- Be sure to check plarity when wiring DC coil MKS-X relays with built-in operation indicators.

### 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.

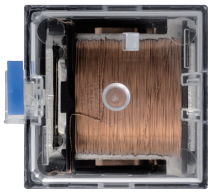
### Test Button

- 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.

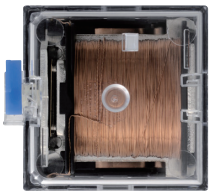
The circuit can be checked using either of two modes.

**Test Button**
DC specification: Blue
AC specification: Red

Normal

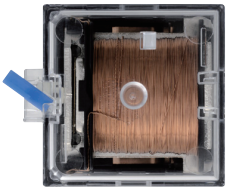


Mode 1
(momentary)



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

Mode 2
(locked)

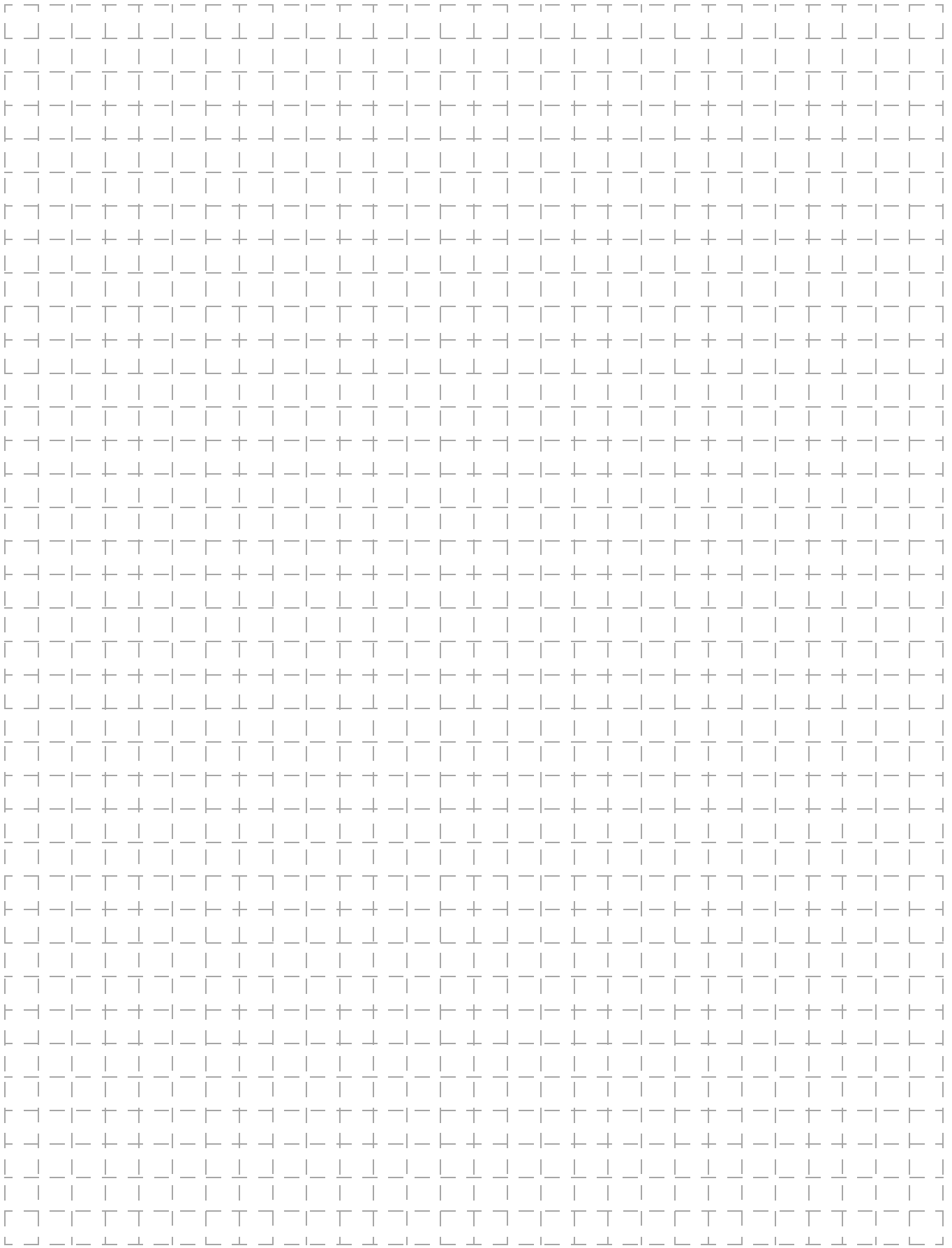


Lock the contacts by pressing down on the button and turning it.

### Test Button Applications

Example: Checking operation of Relays and sequence circuits.

**MEMO**



# Omron Electronic Components, LLC

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   (e) Including: Including without limitation
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