

ioThinX 4500 (45M) Module Series User's Manual

Version 3.0, August 2019

www.moxa.com/product



© 2019 Moxa Inc. All rights reserved.

ioThinX 4500 (45M) Module Series User's Manual

The software described in this manual is furnished under a license agreement and may be used only in accordance with the terms of that agreement.

Copyright Notice

© 2019 Moxa Inc. All rights reserved.

Trademarks

The MOXA logo is a registered trademark of Moxa Inc.
All other trademarks or registered marks in this manual belong to their respective manufacturers.

Disclaimer

Information in this document is subject to change without notice and does not represent a commitment on the part of Moxa.

Moxa provides this document as is, without warranty of any kind, either expressed or implied, including, but not limited to, its particular purpose. Moxa reserves the right to make improvements and/or changes to this manual, or to the products and/or the programs described in this manual, at any time.

Information provided in this manual is intended to be accurate and reliable. However, Moxa assumes no responsibility for its use, or for any infringements on the rights of third parties that may result from its use.

This product might include unintentional technical or typographical errors. Changes are periodically made to the information herein to correct such errors, and these changes are incorporated into new editions of the publication.

Technical Support Contact Information

www.moxa.com/support

Moxa Americas

Toll-free: 1-888-669-2872
Tel: +1-714-528-6777
Fax: +1-714-528-6778

Moxa Europe

Tel: +49-89-3 70 03 99-0
Fax: +49-89-3 70 03 99-99

Moxa India

Tel: +91-80-4172-9088
Fax: +91-80-4132-1045

Moxa China (Shanghai office)

Toll-free: 800-820-5036
Tel: +86-21-5258-9955
Fax: +86-21-5258-5505

Moxa Asia-Pacific

Tel: +886-2-8919-1230
Fax: +886-2-8919-1231

Safety Symbols



DANGER

Indicates a high-risk, imminently hazardous situation, which could result in death or serious injury.



WARNING

Indicates a moderate-risk, potentially hazardous situation, which may result in moderate to serious injury.



CAUTION

Indicates a low-risk, potentially hazardous situation, which may result in minor or moderate injury.

NOTE

Indicates a potential malfunction, which will not result in damage to property.

INFORMATION

This information is important for preventing errors.

Table of Contents

1. Preface	1-1
Revision History	1-2
Relevant Models	1-2
Package Contents	1-2
How to Use This Device	1-3
Safety Precautions.....	1-3
Additional Resources	1-4
2. Product Overview	2-1
Technical Data.....	2-2
Common Specifications	2-2
45MR-1600 Specifications	2-2
45MR-1601 Specifications	2-2
45MR-2404 Specifications	2-3
45MR-2600 Specifications	2-3
45MR-2601 Specifications	2-3
45MR-2606 Specifications	2-3
45MR-3800 Specifications	2-4
45MR-3810 Specifications	2-4
45MR-4420 Specifications	2-5
45MR-6600 Specifications	2-5
45MR-6810 Specifications	2-5
45MR-7210 Specifications	2-6
45MR-7820 Specifications	2-6
Appearance.....	2-6
Front View (except for the 45MR-7210).....	2-6
Front View (45MR-7210)	2-7
Dimensions.....	2-7
LED Indicators.....	2-9
All Modules (except for the 45MR-7210).....	2-9
45MR-7210.....	2-10
3. Hardware Installation	3-1
I/O Wiring	3-2
I/O Terminal Blocks	3-2
Power Terminal Blocks	3-2
45MR-1600 (-T) Wiring Guide	3-3
45MR-1601 (-T) Wiring Guide	3-4
45MR-2404 (-T) Wiring Guide	3-5
45MR-2600 (-T) Wiring Guide	3-6
45MR-2601 (-T) Wiring Guide	3-7
45MR-2606 (-T) Wiring Guide	3-8
45MR-3800 (-T) Wiring Guide	3-9
45MR-3810 (-T) Wiring Guide	3-10
45MR-4420 (-T) Wiring Guide	3-11
45MR-6600 (-T) Wiring Guide	3-12
45MR-6810 (-T) Wiring Guide	3-13
45MR-7210(-T) Wiring Guide	3-14
45MR-7820 (-T) Wiring Guide	3-15
Mounting the Module.....	3-16
Installing the I/O Module on the DIN Rail	3-16
Unmounting the I/O Module from the DIN Rail	3-17

1

Preface

In this chapter, we explain the scope of and how to use this document.

The following topics are covered in this chapter:

- ❑ **Revision History**
- ❑ **Relevant Models**
- ❑ **Package Contents**
- ❑ **How to Use This Device**
- ❑ **Safety Precautions**
- ❑ **Additional Resources**

Revision History

Version	Change	Date
v1.0	First release.	2018-11-09
v2.0	Added module 45MR-7210.	2019-03-31
v3.0	Added module 45MR-4420.	2019-08-23

Relevant Models

This document applies to the following 45M modules:

Model Name	Features	Operating Temp.
45MR-1600	16 DIs, 24 VDC, PNP	-20 to 60°C
45MR-1600-T	16 DIs, 24 VDC, PNP	-40 to 75°C
45MR-1601	16 DIs, 24 VDC, NPN	-20 to 60°C
45MR-1601-T	16 DIs, 24 VDC, NPN	-40 to 75°C
45MR-2404	4 relays, form A	-20 to 60°C
45MR-2404-T	4 relays, form A	-40 to 75°C
45MR-2600	16 DOs, 24 VDC, sink	-20 to 60°C
45MR-2600-T	16 DOs, 24 VDC, sink	-40 to 75°C
45MR-2601	16 DOs, 24 VDC, source	-20 to 60°C
45MR-2601-T	16 DOs, 24 VDC, source	-40 to 75°C
45MR-2606	8 DIs, 24 VDC, PNP; 8 DOs, 24 VDC, source	-20 to 60°C
45MR-2606-T	8 DIs, 24 VDC, PNP; 8 DOs, 24 VDC, source	-40 to 75°C
45MR-3800	8 AIs, 0 to 20 mA or 4 to 20 mA	-20 to 60°C
45MR-3800-T	8 AIs, 0 to 20 mA or 4 to 20 mA	-40 to 75°C
45MR-3810	8 AIs, -10 to 10 V or 0 to 10 V	-20 to 60°C
45MR-3810-T	8 AIs, -10 to 10 V or 0 to 10 V	-40 to 75°C
45MR-4420	4 AOs, 0 to 10 V or 0 to 20 mA or 4 to 20 mA	-20 to 60°C
45MR-4420-T	4 AOs, 0 to 10 V or 0 to 20 mA or 4 to 20 mA	-40 to 75°C
45MR-6600	6 RTDs	-20 to 60°C
45MR-6600-T	6 RTDs	-40 to 75°C
45MR-6810	8 TCs	-20 to 60°C
45MR-6810-T	8 TCs	-40 to 75°C
45M4-7210	System and field power input	-20 to 60°C
45M4-7210-T	System and field power input	-40 to 75°C
45MR-7820	Potential distribution module	-20 to 60°C
45MR-7820-T	Potential distribution module	-40 to 75°C

Package Contents

The following items are included in the product package.

- 1 x 45M module
- 1 x quick installation guide (printed)
- 1 x warranty card

How to Use This Device

45M modules cannot be used as standalone devices. The modules must be used with an ioThinx 45xx Series adapter. Refer to the ioThinx 45xx Series User's Manual for details.

Safety Precautions

Observe the following safety precautions when installing or using the devices discussed in this document:

**DANGER**

Never work on the device while the power source is switched on! Disconnect all power sources to the device before performing any installation, repair, or maintenance work.

**DANGER**

To avoid causing electrical arcs, make sure that all power sources have been disconnected before removing or replacing components. Electrical arcs can cause explosions in areas that contain flammable substances. This warning applies when:

- Connecting or disconnecting the removable terminal block.
- Connecting or disconnecting the device from a field-site power source.

**WARNING**

Devices discussed in this document are sensitive to electrostatic discharge, which can cause internal damage to and/or affect normal operation of the devices. Observe the following precautions when handling a device:

- Before touching the device, touch a grounded object with your finger to discharge static electricity.
- Wear an approved grounding wristband.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- Use a static-safe workstation, if available.
- Store the device in appropriate static-safe packaging when not in use.

**WARNING**

Check the voltage supplied by the power source. Make sure the voltage provided by the power source matches the voltage required by the device.

**WARNING**

Check the voltage or current of the sensors or loads. Make sure the voltage and/or current indicated on the sensors or loads corresponds to the specifications of your 45M module before you connect the device.

**WARNING**

Connect your device to an earthed ground.

**CAUTION**

Do not use the device if the device itself is already damaged. Replace defective or damaged devices to ensure that your devices function properly.

**CAUTION**

Do not attempt to repair the device yourself. If your device needs to be repaired, return the device to Moxa's customer service department. Attempting to repair the device yourself could invalidate the device's warranty.

Additional Resources

Refer to following documents for additional information.

- Datasheets for the following products:
 - ioThinx 4510 Series
 - ioThinx 4500 Series (45MR) Modules
- User's Manual for the following product:
 - ioThinx 4510 Series

Product Overview

In this chapter, we give an overview of each of the 45M modules.

The following topics are covered in this chapter:

□ **Technical Data**

- Common Specifications
- 45MR-1600 Specifications
- 45MR-1601 Specifications
- 45MR-2404 Specifications
- 45MR-2600 Specifications
- 45MR-2601 Specifications
- 45MR-2606 Specifications
- 45MR-3800 Specifications
- 45MR-3810 Specifications
- 45MR-4420 Specifications
- 45MR-6600 Specifications
- 45MR-6810 Specifications
- 45MR-7210 Specifications
- 45MR-7820 Specifications

□ **Appearance**

- Front View (except for the 45MR-7210)
- Front View (45MR-7210)
- Dimensions

□ **LED Indicators**

- All Modules (except for the 45MR-7210)
- 45MR-7210

Technical Data

Common Specifications

Physical Characteristics

Connector: Removable terminal block

Wiring: 18 to 24 AWG (except for the 45MR-7210)

Dimensions: 19.5 x 99.0 x 60.5 mm (0.77 x 3.90 x 2.38 in)

Installation: DIN-rail mounting

Environmental Limits

Operating Temperature:

Standard Models: -20 to 60°C (-4 to 140°F)

Wide Temp. Models: -40 to 75°C (-40 to 167°F)

45MR-1600 Specifications

Input/Output Interface

Digital Input Channels: 16

Isolation: 3k VDC or 2k Vrms

Digital Inputs

Sensor Type:

Dry Contact

Wet Contact (PNP)

Dry Contact:

On: short to FP+

Off: open

Wet Contact (DI to FP-):

On: 10 to 30 VDC

Off: 0 to 3 VDC

I/O Mode: DI or event counter

Note: Only the first 4 channels support event counter mode.

45MR-1601 Specifications

Input/Output Interface

Digital Input Channels: 16

Isolation: 3k VDC or 2k Vrms

Digital Inputs

Sensor Type:

Dry Contact

Wet Contact (NPN)

Dry Contact:

On: short to FP-

Off: open

Wet Contact (DI to FP+):

On: 10 to 30 VDC

Off: 0 to 3 VDC

I/O Mode: DI or event counter

Note: Only the first 4 channels support event counter mode.

45MR-2404 Specifications

Input/Output Interface

Relay Channels: 4

Isolation: 3k VDC or 2k Vrms

Relays

Type: Form A (N.O.) power relay

Contact Current Rating: Resistive load: 2 A @ 30 VDC, 250 VAC

Contact Resistance: 100 milli-ohms (max.)

Initial Insulation Resistance: 1000 mega-ohms (min.) @ 500 VDC

I/O Mode: Relay

45MR-2600 Specifications

Input/Output Interface

Digital Output Channels: 16

Isolation: 3k VDC or 2k Vrms

Digital Outputs

I/O Type: Sink

Voltage: 12/24 VDC

Current Rating: 500 mA per channel

Over-voltage Protection: 45 VDC

Short-circuit Protection: Supported

Over-temperature Shutdown: 175°C (typical), 150°C (min.)

I/O Mode: DO or pulse output

Note: Only the first 4 channels support pulse output mode.

45MR-2601 Specifications

Input/Output Interface

Digital Output Channels: 16

Isolation: 3k VDC or 2k Vrms

Digital Outputs

I/O Type: Source

Voltage: 12/24 VDC

Current Rating: 500 mA per channel

Over-voltage Protection: 45 VDC

Short-circuit Protection: Supported

Over-temperature Shutdown: 175°C (typical), 150°C (min.)

I/O Mode: DO or pulse output

Note: Only the first 4 channels support event counter mode.

45MR-2606 Specifications

Input/Output Interface

Digital Input Channels: 8

Digital Output Channels: 8

Isolation: 3k VDC or 2k Vrms

Digital Inputs

Sensor Type:

Dry Contact

Wet Contact (PNP)

Dry Contact:

On: short to FP+

Off: open

Wet Contact (DI to FP-):

On: 10 to 30 VDC

Off: 0 to 3 VDC

I/O Mode: DI or event counter**Note:** Only the first 2 channels support event counter mode.**Digital Outputs****I/O Type:** Source**Voltage:** 12/24 VDC**Current Rating:** 500 mA per channel**Over-voltage Protection:** 45 VDC**Short-circuit Protection:** Supported**Over-temperature Shutdown:** 175°C (typical), 150°C (min.)**I/O Mode:** DO or pulse output**Note:** Only the first 2 channels support pulse output mode.

45MR-3800 Specifications

Input/Output Interface**Analog Input Channels:** 8**Isolation:** 3k VDC or 2k Vrms**Analog Inputs****I/O Type:** Differential**Input Impedance:** 120 ohms**I/O Mode:** Current**Input Range:**

0 to 20 mA

4 to 20 mA

4 to 20 mA (with burn-out detection)

Resolution: 16 bits

45MR-3810 Specifications

Input/Output Interface**Analog Input Channels:** 8**Isolation:** 3k VDC or 2k Vrms**Digital Outputs****I/O Type:** Differential**Input Impedance:** 10 mega-ohms (min.)**Protection:**

Fault and over-voltage protection:

-35 to +35 VDC (power off)

-25 to +30 VDC (power on)

I/O Mode: Voltage**Input Range:**

±10 VDC

0 to 10 VDC

Resolution: 16 bits

45MR-4420 Specifications

Input/Output Interface

Analog Output Channels: 4

Isolation: 3k VDC or 2k Vrms

Analog Outputs

I/O mode: Voltage/Current

Resolution: 12 bits

Output Range:

0 to 10 VDC

0 to 20 mA

4 to 20 mA

Accuracy:

±0.1% FSR @ 25 °C

±0.3% FSR @ -40 to 75 °C

Load (current mode): 500 ohm (max.)

Load (voltage mode): 1,000 ohm (min.)

45MR-6600 Specifications

Input/Output Interface

RTD Channels: 6

Isolation: 3k VDC or 2k Vrms

Digital Outputs

Input Type:

PT50, PT100, PT200, PT500 (-200 to 850°C)

PT1000 (-200 to 350°C)

JPT100, JPT200, JPT500 (-200 to 640°C)

JPT1000 (-200 to 350°C)

NI100, NI200, NI500 (-60 to 250°C)

NI1000 (-60 to 150°C)

NI120 (-80 to 260°C)

Resistance of 310, 620, 1250, and 2200 ohms

Input Impedance: 625 kilo-ohms (min.)

Resolution: 0.1°C or 0.1 ohm

45MR-6810 Specifications

Input/Output Interface

Thermocouple Channels: 8

Isolation: 3k VDC or 2k Vrms

Digital Outputs

Sensor Type: J, K, T, E, R, S, B, N

Millivolt Type:

±19.532 mV

±39.062 mV

±78.126 mV

Input Impedance: 1 mega-ohms (min.)

Resolution: 16 bits

45MR-7210 Specifications

Input/Output Interface

System Power Inputs: 1

Field Power Inputs: 1

Isolation: 3k VDC or 2k Vrms

Wiring: 12 to 26 AWG

Note:

System Power: 12 to 48 V

Field Power: 12/24 VDC

NOTE Click on the following link to see how many 45MR-7210 power modules you need to support your ioThinx 4500 Series project: <http://iothinxcalculator.moxa.com>

45MR-7820 Specifications

Input/Output Interface

Voltage Output Channels: 16

Isolation: 3k VDC or 2k Vrms

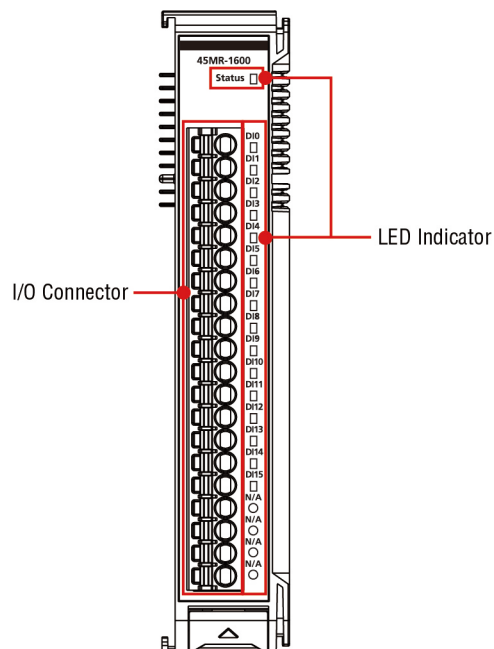
Note:

Field Power, 12/24 VDC: 8 channels

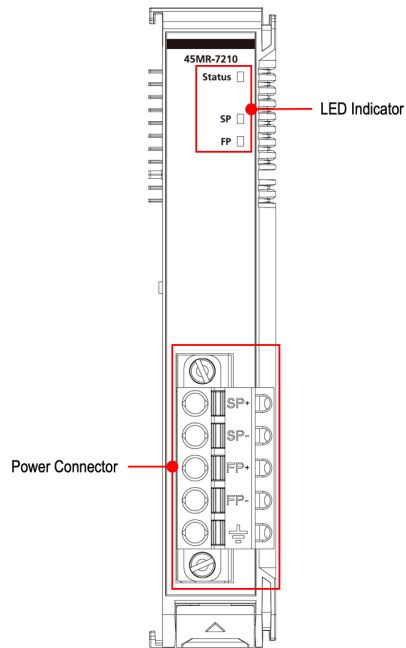
Field Power, 0 VDC: 8 channels

Appearance

Front View (except for the 45MR-7210)



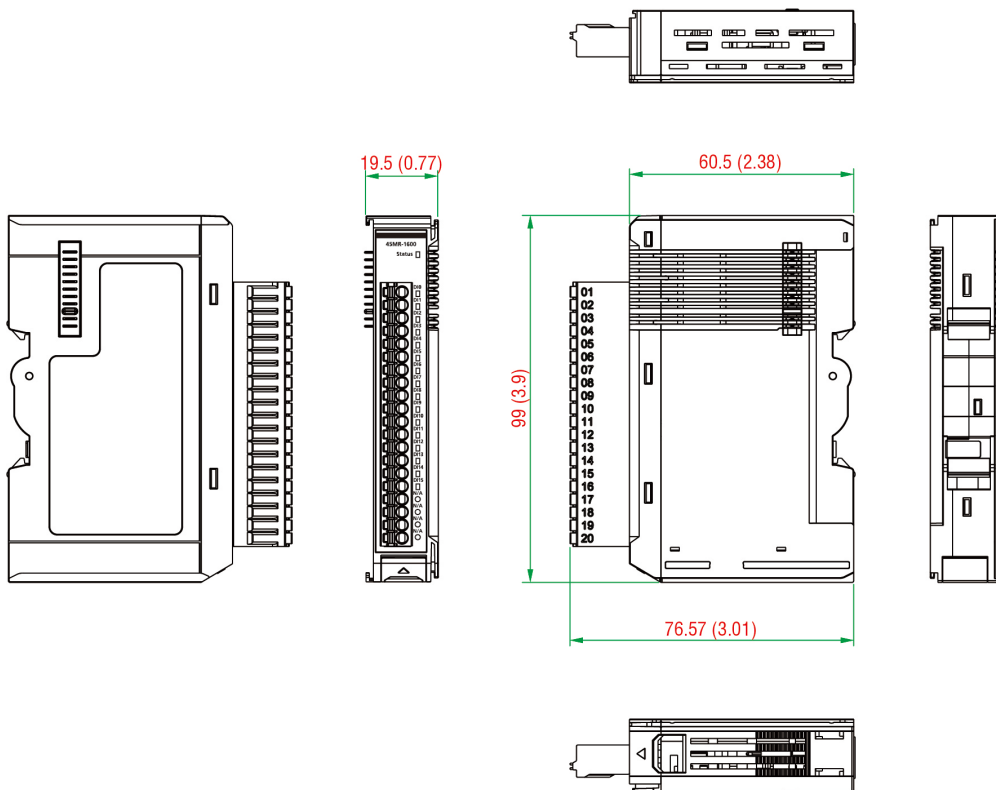
Front View (45MR-7210)



Dimensions

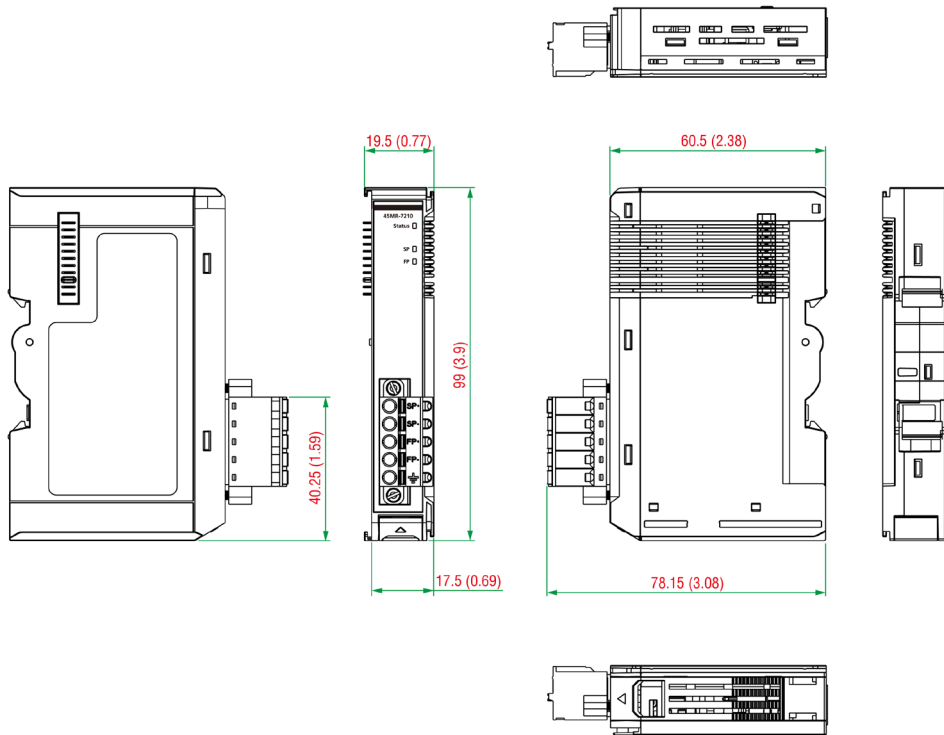
All Modules (except for the 45MR-7210)

Unit: mm (inch)



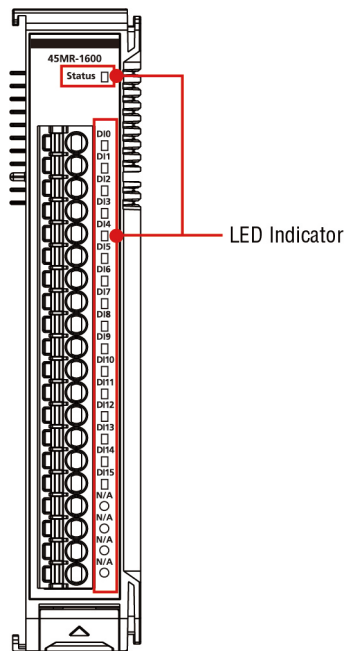
45MR-7210

Unit: mm (inch)



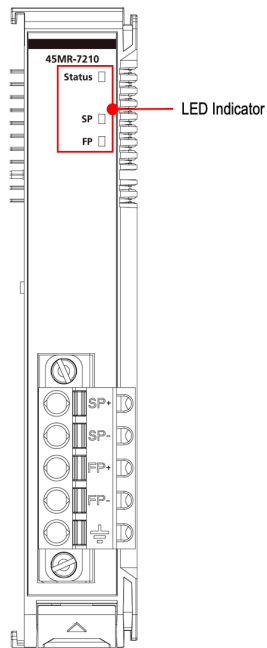
LED Indicators

All Modules (except for the 45MR-7210)



Label	Usage	No. of LEDs	LED Color	Description
Status	Status	1	Green	Steady on: Module Ready Slow blinking: Booting up, module mismatch, or installed incorrectly Fast blinking: Locating
			Red	Steady on: Module error Slow blinking: Firmware is upgrading Fast blinking: Safe mode (output modules only)
DI0, DI1, DI2...	DI	1 of each	Green	Steady on: Channel on Off: Channel off or no counter/pulse signal
DO0, DO1, DO2...	DO	1 of each	Green	Steady on: Channel on Off: Channel off or no counter/pulse signal
RLY0, RLY1, RLY2...	Relay	1 of each	Green	Steady on: Channel on Off: Channel off or no counter/pulse signal
AI0, AI1, AI2...	AI	2 of each	Green	Steady on: Channel enabled
			Red	Steady on: Burn out or wire off when in current mode
VO0, VO1, VO2...	AO	2 of each	Green	Steady on: Channel enabled
IO0, IO1, IO2...			Red	Steady on: Open when in current mode or short when in voltage mode
TCx	TC	2 of each	Green	Steady on: Channel enabled
			Red	Steady on: Burn out or wire off when in current mode
RTD0, RTD2, RTD3...	RTD	2 of each	Green	Steady on: Channel enabled
			Red	Steady on: Burn out or wire off when in current mode

45MR-7210



Label	Usage	No. of LEDs	LED Color	Description
Status	Status	1	Green	Steady on: Module Ready Slow blinking: Booting up, module mismatch, or installed incorrectly Fast blinking: Locating
			Red	Steady on: Module error Slow blinking: Firmware is upgrading
SP	System Power	1	Green	On: power on Off: power off
FP	Field Power	1	Green	On: power on Off: power off

Hardware Installation

In this chapter, we describe how to install the 45M modules.

The following topics are covered in this chapter:

□ I/O Wiring

- I/O Terminal Blocks
- Power Terminal Blocks
- 45MR-1600 (-T) Wiring Guide
- 45MR-1601 (-T) Wiring Guide
- 45MR-2404 (-T) Wiring Guide
- 45MR-2600 (-T) Wiring Guide
- 45MR-2601 (-T) Wiring Guide
- 45MR-2606 (-T) Wiring Guide
- 45MR-3800 (-T) Wiring Guide
- 45MR-3810 (-T) Wiring Guide
- 45MR-4420 (-T) Wiring Guide
- 45MR-6600 (-T) Wiring Guide
- 45MR-6810 (-T) Wiring Guide
- 45MR-7210(-T) Wiring Guide
- 45MR-7820 (-T) Wiring Guide

□ Mounting the Module

- Installing the I/O Module on the DIN Rail
- Unmounting the I/O Module from the DIN Rail

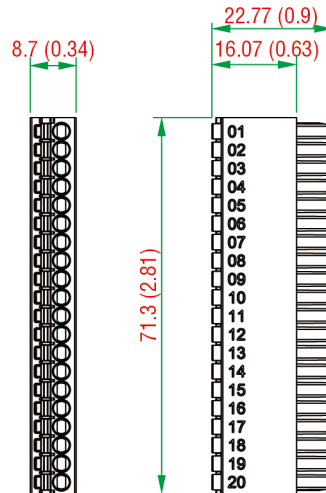
I/O Wiring

I/O Terminal Blocks

Wire range: 18 to 24 AWG

Wire strip length: 9 to 10 mm

Unit: mm (in.)

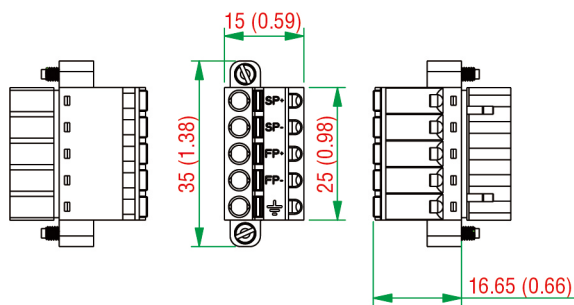


Power Terminal Blocks

Wire range: 12 to 26 AWG (Ferrule diameter: 2.0 to 0.4 mm)

Wire strip length: 10 mm

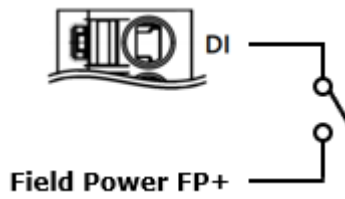
Unit: mm (in.)



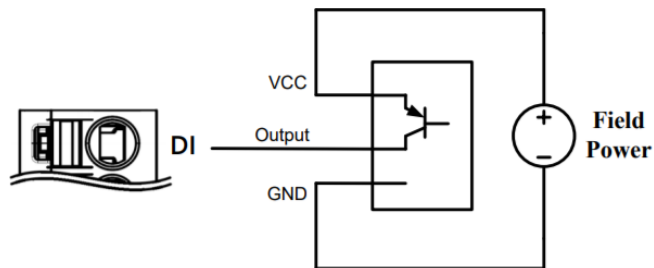
45MR-1600 (-T) Wiring Guide

Description: 16 DIs, 24 VDC, PNP or dry contact

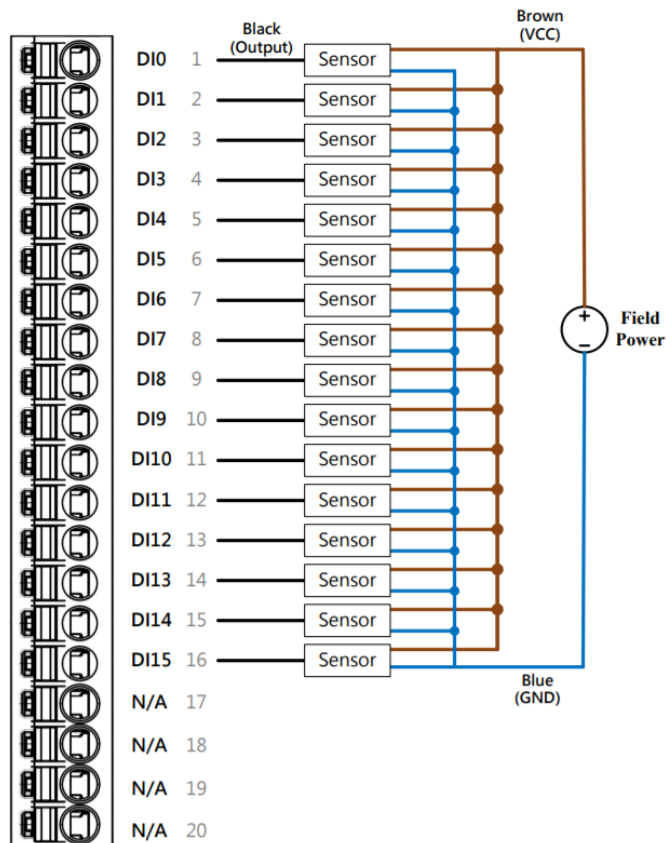
Single Channel (Dry Contact):



Single Channel (PNP):



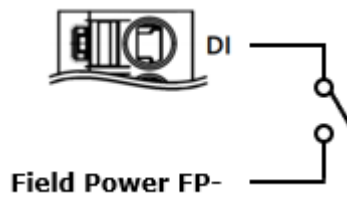
All Channels (PNP):



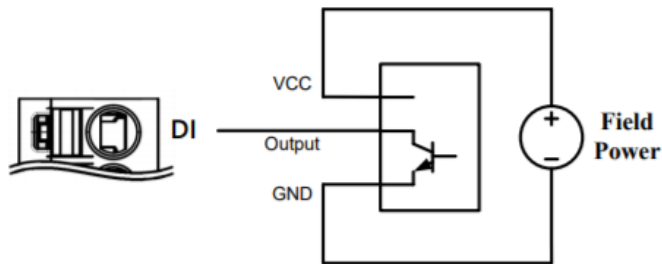
45MR-1601 (-T) Wiring Guide

Description: 16 DIs, 24 VDC, NPN or dry contact

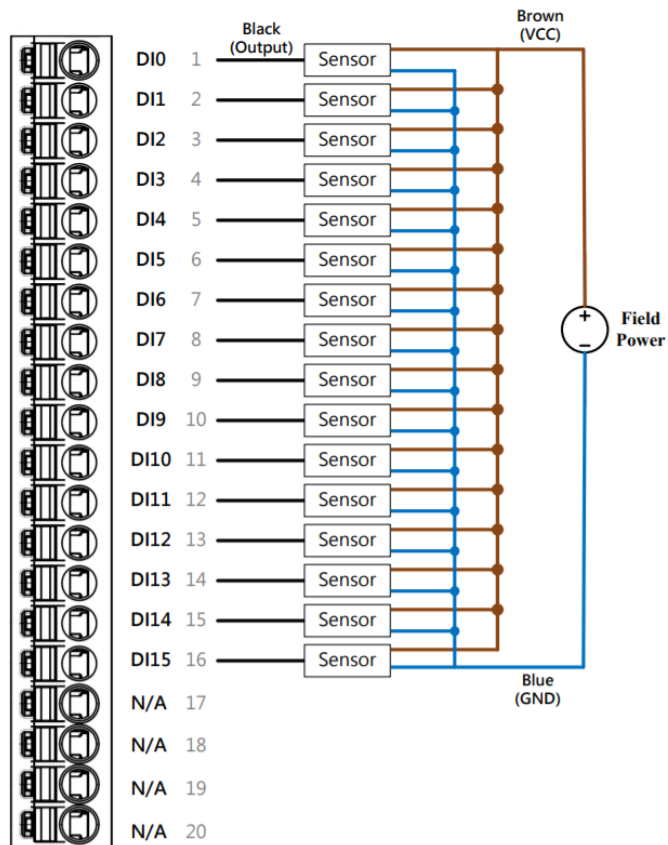
Single Channel (Dry Contact):



Single Channel (NPN):



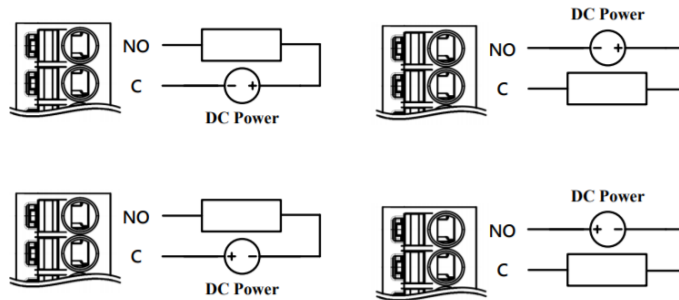
All Channels (NPN):



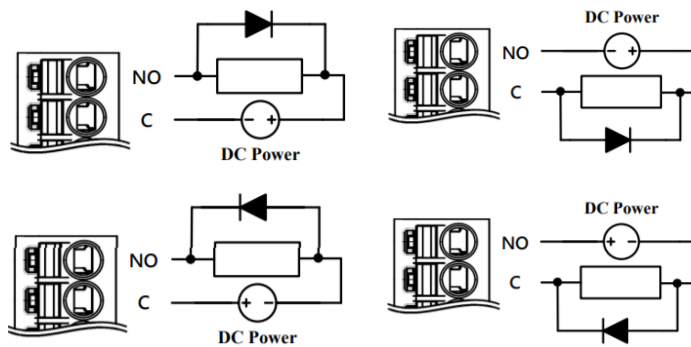
45MR-2404 (-T) Wiring Guide

Description: 4 Relays, form A

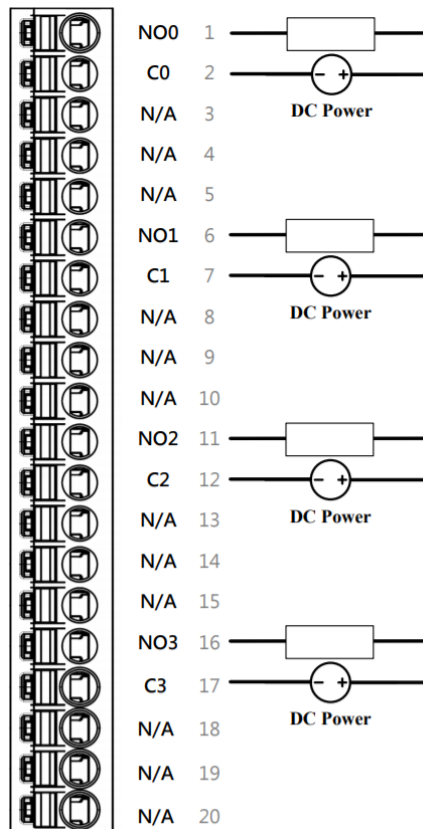
Single Channel (Resistive Load):



Single Channel (Inductive Load):



All Channels:

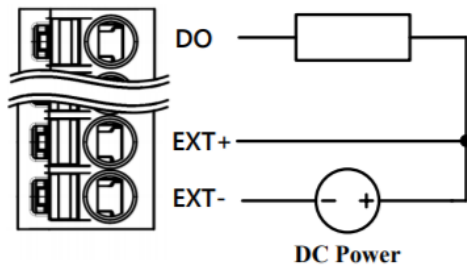


NOTE We recommend using a fuse to avoid over-current damage.

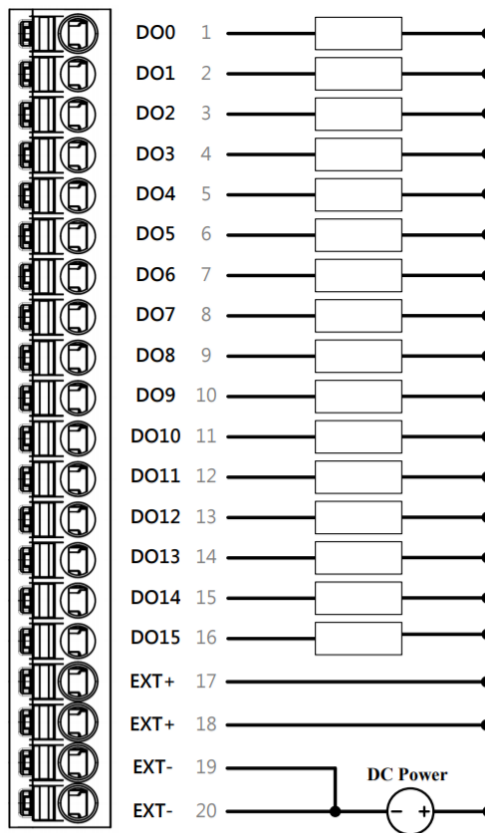
45MR-2600 (-T) Wiring Guide

Description: 16 DOs, 24 VDC, sink

Single Channel:



All Channels:

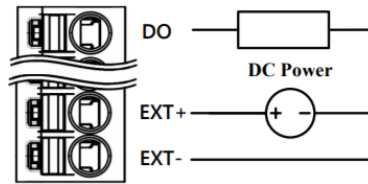


NOTE We recommend using a fuse to avoid damage from current spikes.

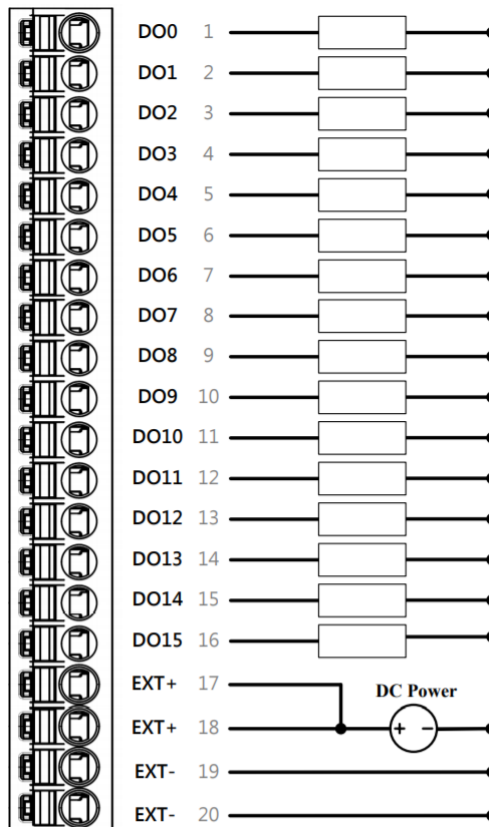
45MR-2601 (-T) Wiring Guide

Description: 16 DOs, 24 VDC, source

Single Channel:



All Channels:

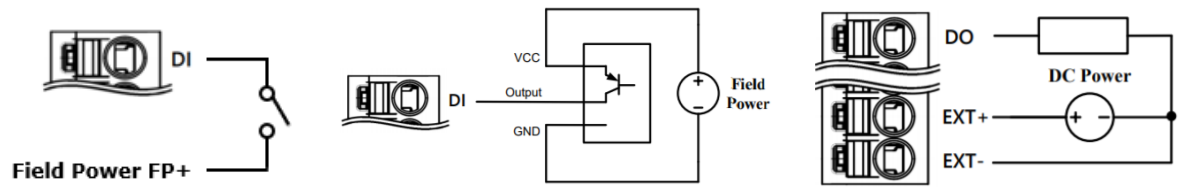


NOTE We recommend using a fuse to avoid damage from current spikes.

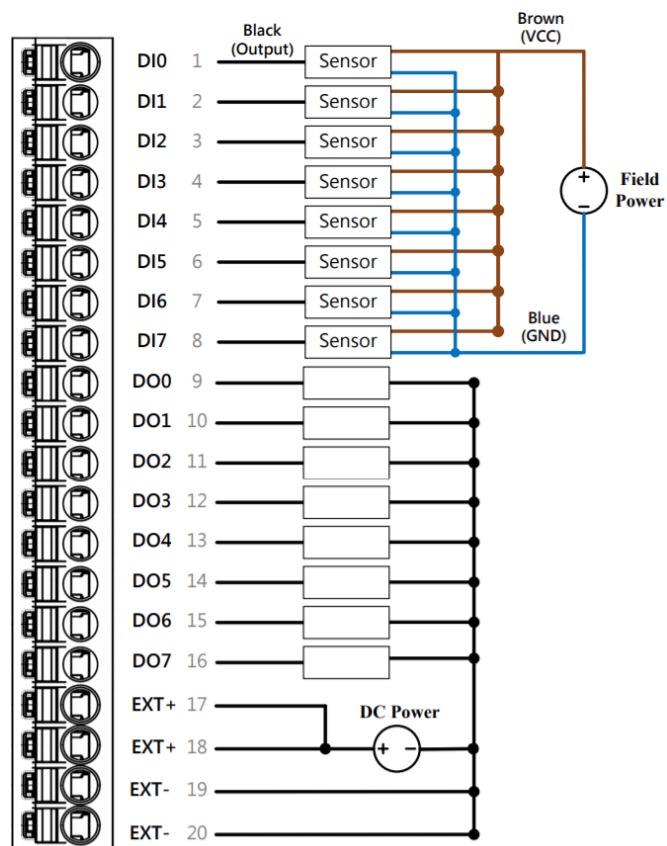
45MR-2606 (-T) Wiring Guide

Description: 8 DIs, 24 VDC, PNP or dry contact, 8 DOs, 24 VDC, source

Single Channel (DI dry contact/DI PNP/DO source):



All Channels:

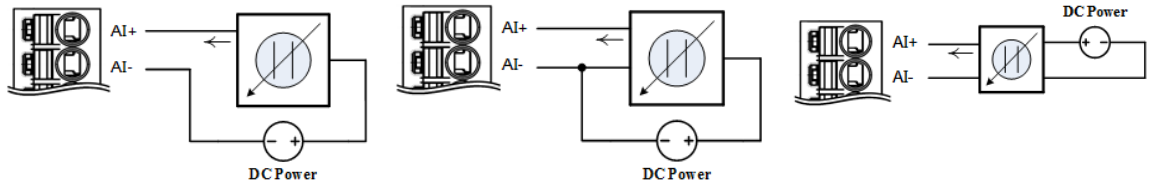


NOTE We recommend using a fuse to avoid damage from current spikes.

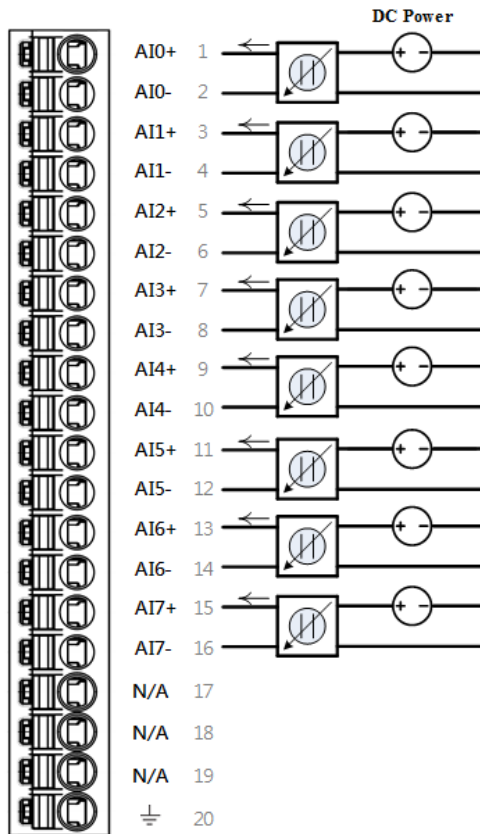
45MR-3800 (-T) Wiring Guide

Description: 8 AIs, 0 to 20 mA or 4 to 20 mA

Single Channel (2-wire/3-wire/4-wire):



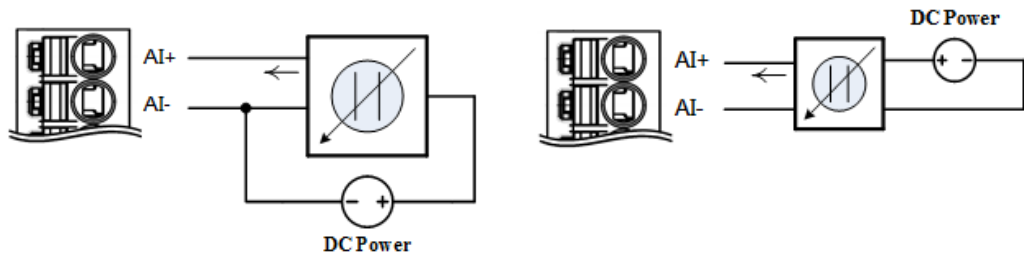
All Channels:



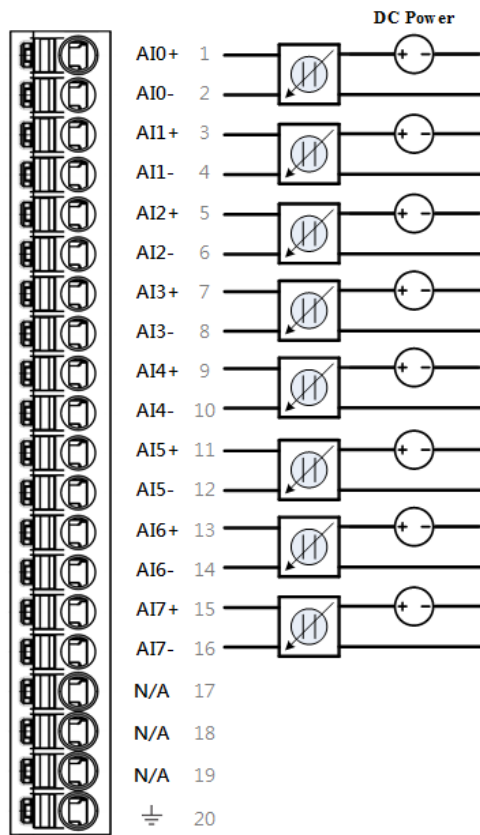
45MR-3810 (-T) Wiring Guide

Description: 8 AIs, -10 to 10 V or 0 to 10 V

Single Channel (3-wire/4-wire):



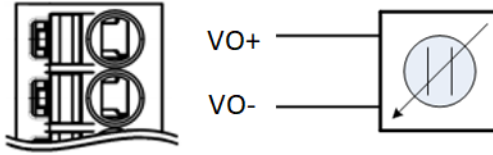
All Channels:



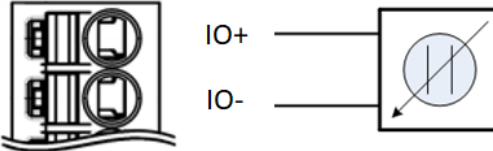
45MR-4420 (-T) Wiring Guide

Description: 4AOs, 0 to 10 VDC or 0 to 20 mA or 4 to 20 mA

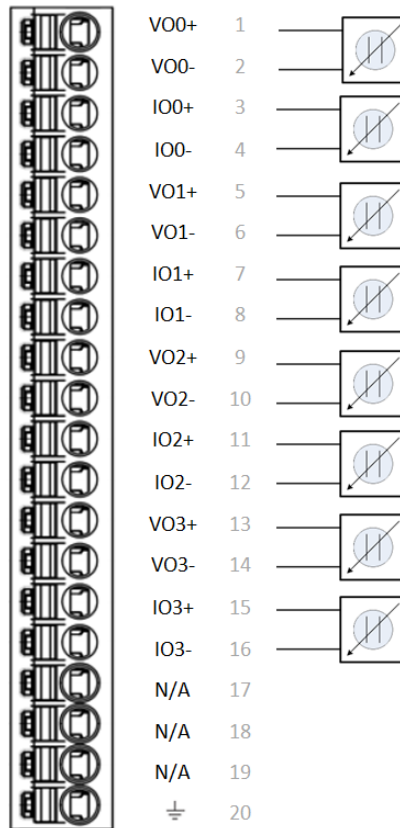
Single Channel (voltage mode):



Single Channel (current mode):



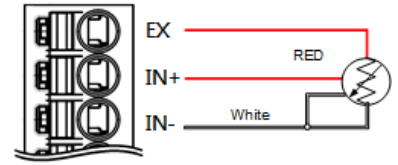
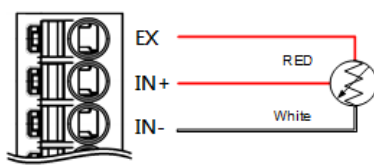
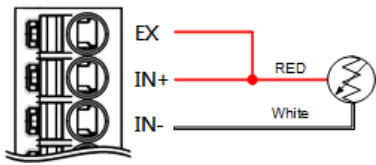
All Channel:



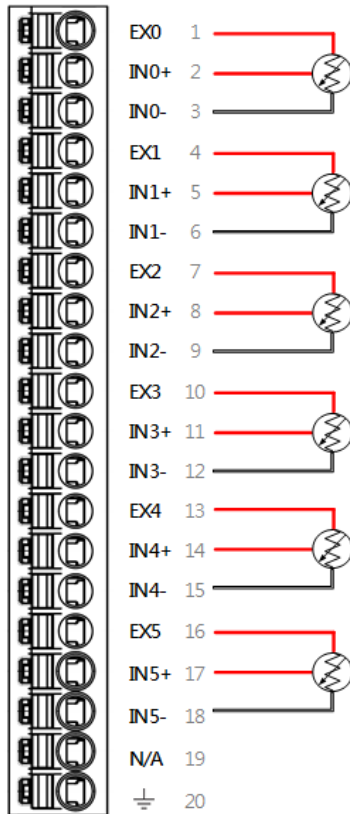
45MR-6600 (-T) Wiring Guide

Description: 6 RTDs

Single Channel (2-wire/3-wire/4-wire):



All Channels:



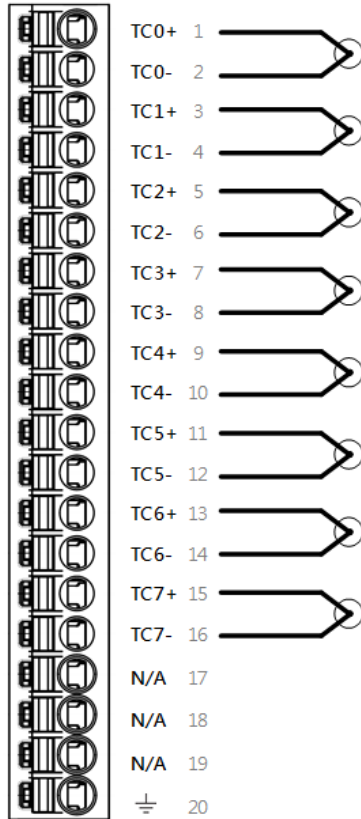
45MR-6810 (-T) Wiring Guide

Description: 8 TCs

Single Channel (TC Sensor/Voltage Source):



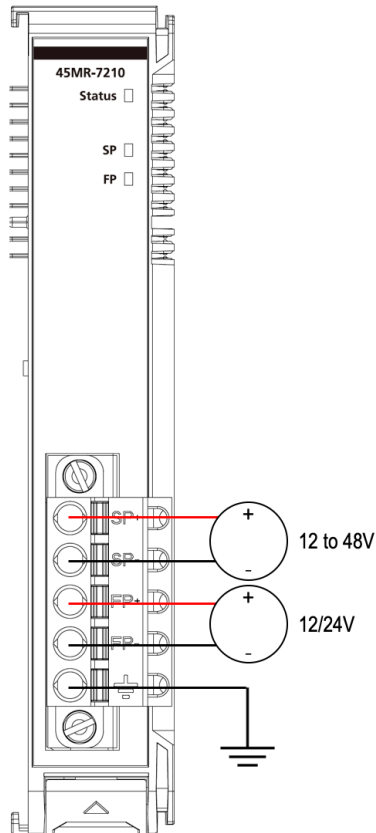
All Channels:



45MR-7210(-T) Wiring Guide

Description: system and field power input

All channels:



Mounting the Module

Take the following steps to mount the device on or unmount the device from a DIN rail.

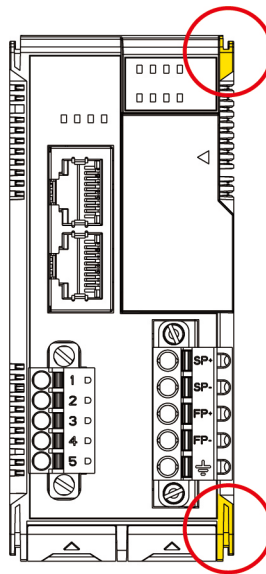


DANGER

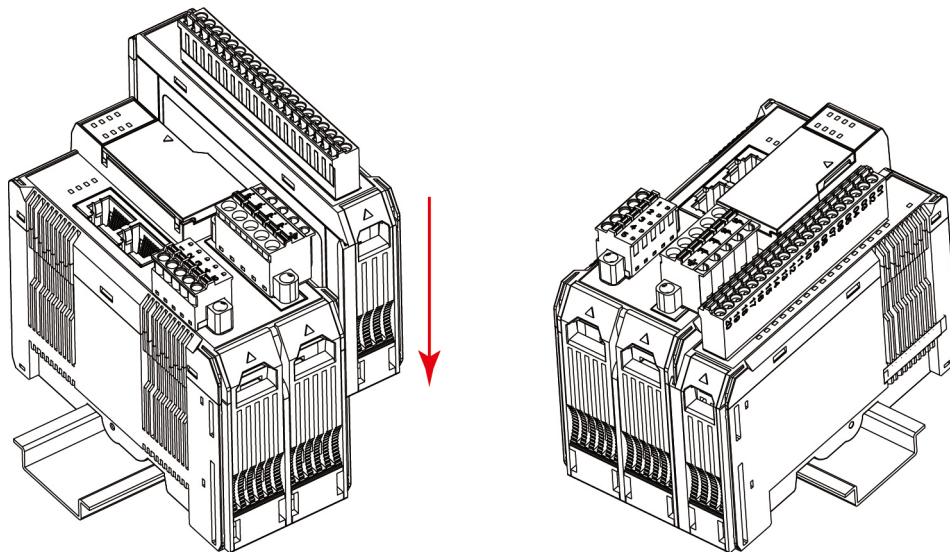
Never install the device when the power source is switched on!

Installing the I/O Module on the DIN Rail

Step 1: Align the I/O module side by side with the head/CPU module, making sure that the upper and lower rails are hooked together.



Step 2: Align the I/O module side by side with the network module and then push the I/O module until it touches the DIN rail. Next, apply more force until the module clips to the DIN rail.

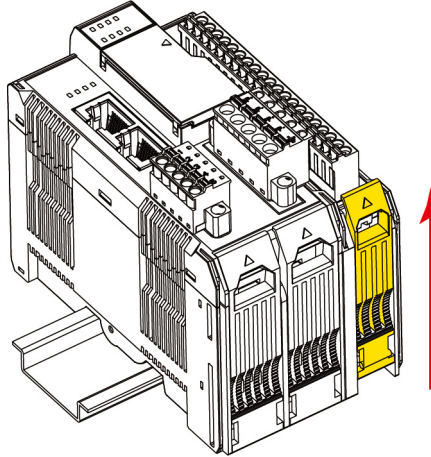


NOTE After the module is firmly attached to the DIN rail, the module connections to the internal bus will be established.

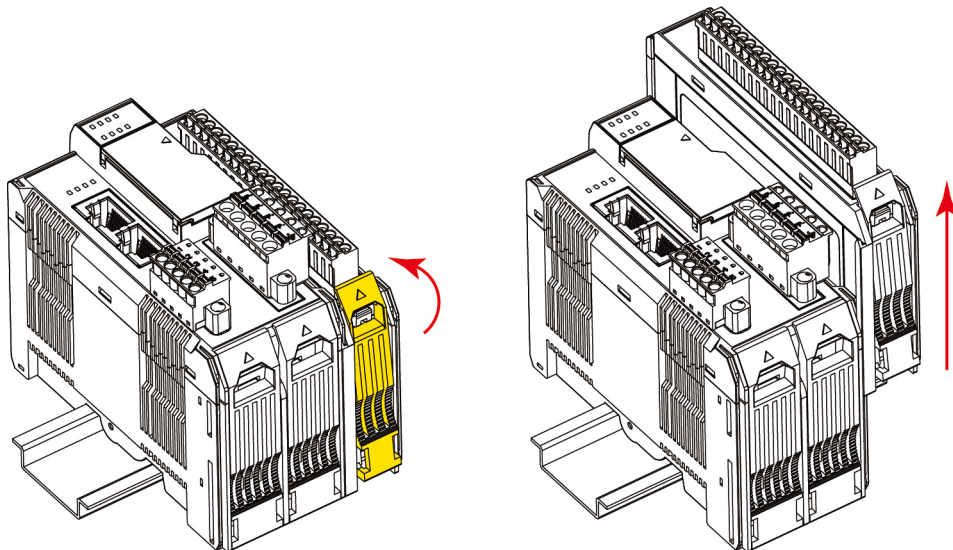
INFORMATION With the I/O module inserted in place, the internal bus will establish a connection through the adjacent module(s).

Unmounting the I/O Module from the DIN Rail

Step 1: Use your finger to lift the release tab on the lower part of the module.



Step 2: Push the top of the release tab to latch it, and then pull the module out.



NOTE Electrical connections for the internal bus will be disconnected when the I/O module is removed.