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**User's Manual**  
**MS3000 Series**  
**Terminal Block Type Signal Conditioners**

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## About the User's Manual (this document)

This User's Manual provides information on handling and installation of the instrument.

To ensure safe and proper operation, we recommend that you carefully read this manual prior to operation. The manual should be retained for future reference.

1. Reproduction of the contents of this manual, in whole or in part, without written permission of MTT, is prohibited.
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## 1 About the Product

The MS3000 Series is a line of compact, space-saving signal conditioners with integrated terminal blocks. They employ modular design based on I/O functions and can be used in a wide range of applications, including signal interfaces between devices, monitoring, and control.

## 2 Features

- 1) Compact and space saving design, with integrated terminal blocks
- 2) Three-way isolation between input, output, and power (except that MS3064 provides isolation only between input and output.)
- 3) Useful for downsizing your control panel
- 4) A wide variety of models available

## 3 General Specifications

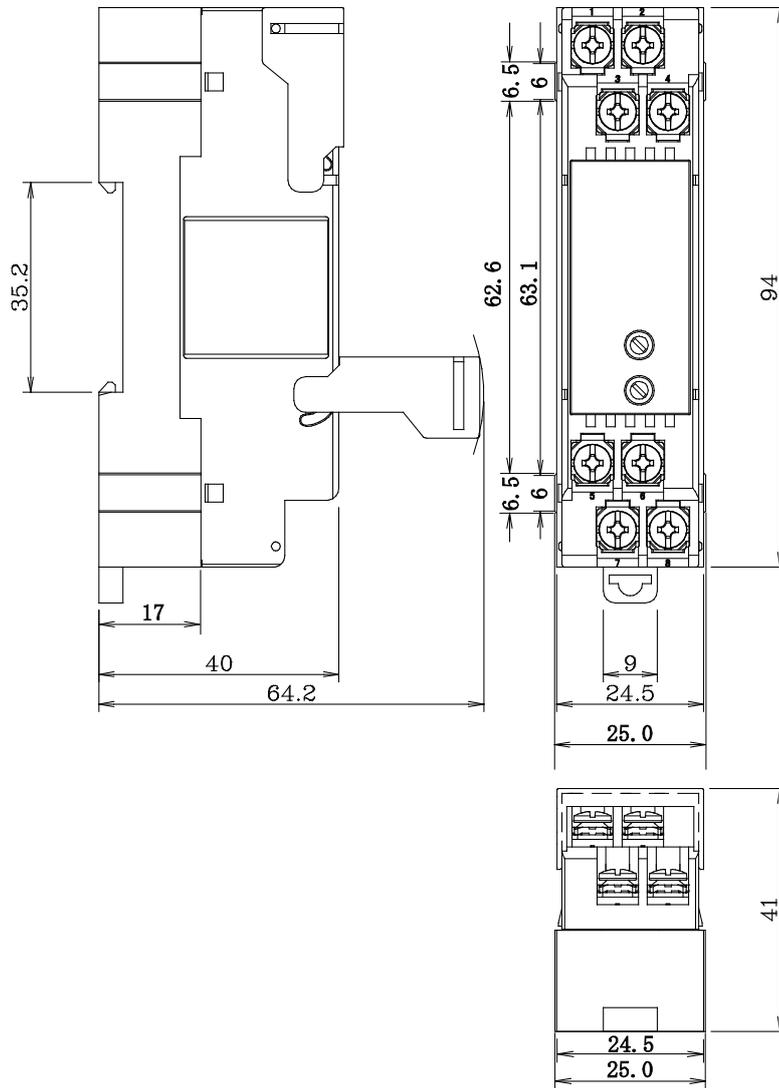
Item	Specifications
Insulation Resistance	100M $\Omega$ min. at 500V DC (between input, output, and power) *
Withstand Strength	1500V AC for one minute (between input, output, and power) *
Rated Operating Conditions	Temperature: -5 to 55°C Humidity: 5 to 90% RH (non-condensing) Vibration: 9.8m/s <sup>2</sup> , 60Hz
Storage and Transportation Conditions	Temperature: -10 to 60°C Humidity: 5 to 90% RH (non-condensing) Vibration: 4.9m/s <sup>2</sup> , 5 to 100Hz
Dimensions	Refer to dimensional drawings.

\* MS3064: only between input and output

MS3000TH and MS3000TH-E: non-isolated

For specific information on each model, refer to the individual product specification sheets.

## 4 Dimensions



NOTE: The MS3000TH and MS3000TH-E have no trimmers on their front panel.

## 5 Installation

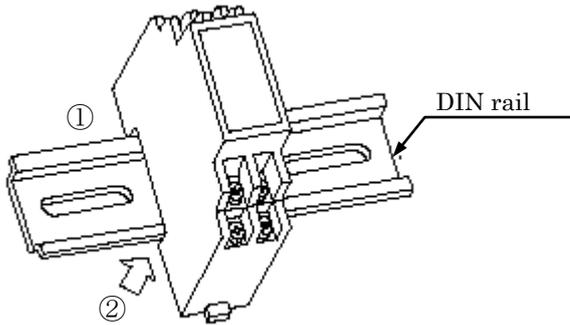
The instrument is designed to be installed on a DIN rail. Follow the steps given in section 5.1 to install the instrument.

### 5.1 Installation Procedure

The instrument should be installed on a DIN rail with the slide clamp side facing down.

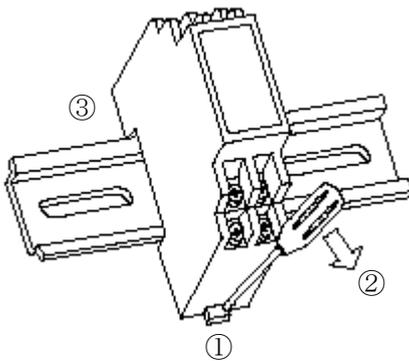
#### 1) Installation

- ① Hook the top groove on the back of the unit over the DIN rail.
- ② While pressing the unit down toward the rail, snap the bottom into place.



#### 2) Removal

- ① Push the slide clamp downward with a screwdriver or the like.
- ② Pull the bottom toward you to disengage it.
- ③ Unhook the top groove from the DIN rail.

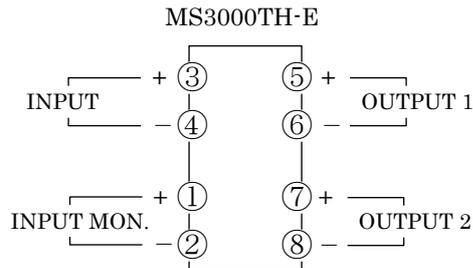
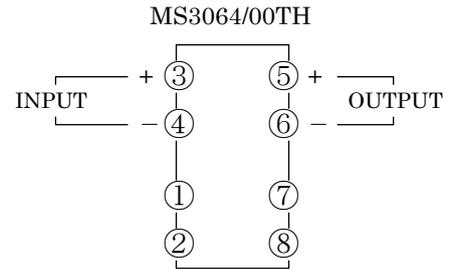
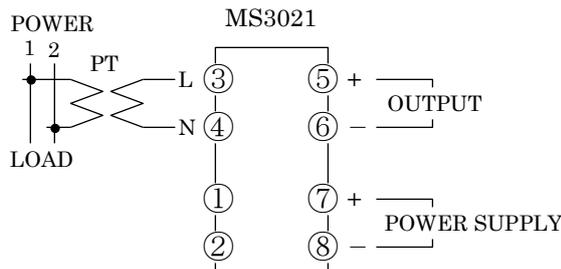
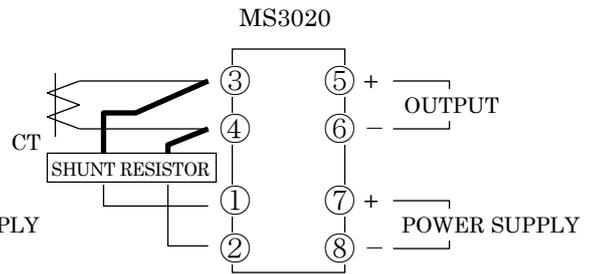
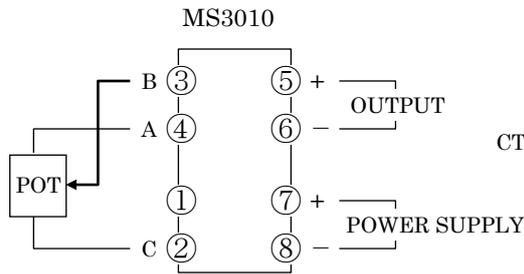
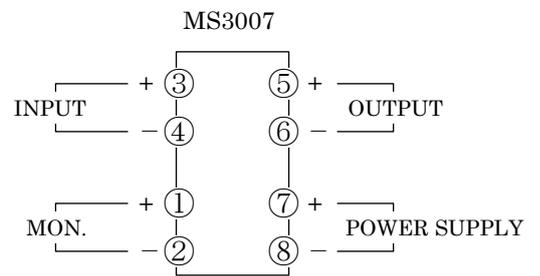
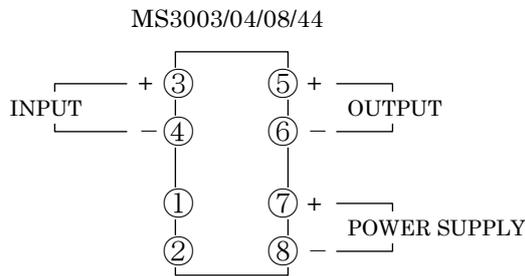
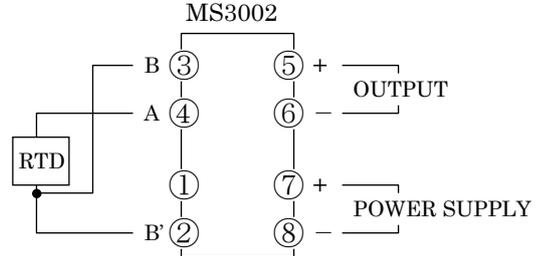
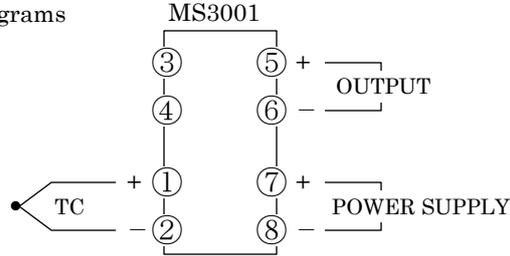
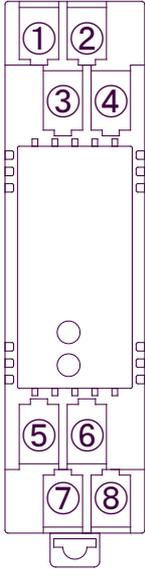


## 6 Connections

To connect wires to the terminals, refer to the appropriate terminal connection diagram below or the wiring diagram on the front panel of the unit.

**⚠ WARNING** Wiring work must be performed with no power applied to the instrument.

### Terminal Connection Diagrams



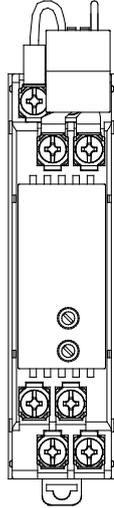
NOTE: If you do not use INPUT MON., short connect terminals ① and ②.

### Shunt Resistor for MS3020

The supplied shunt resistor is not interchangeable. Be sure to check that the serial numbers of the shunt resistor and the unit are exactly the same.

Before using the instrument, attach the shunt resistor as illustrated below. If you use the instrument without the shunt resistor, the secondary circuit of the CT will be opened, which may cause the CT to burn out.

Shunt Resistor Installation Drawing



## 7 Adjustment

Since the unit is precisely factory-adjusted to your requirements before shipment, no further adjustment is needed at the user's side. However, if you attempt to adjust the output to fit with input range of the device to be connected and if adjustment is required as the result of a periodical calibration, you should perform adjustment, referring to the adjustment procedure below.

NOTE: This does not apply to MS3000TH and MS3000TH-E because they have no adjustment function.

### 7.1 Adjustment Procedure

Preparation:

Refer to section 6 to make all the proper wiring connections. For the model MS3007, you need to apply a 4-20 mA input to the terminals ① and ②.

Allow the instrument to warm up for at least 30 minutes after power up.

Note that the accuracy of measuring equipment to be used for calibration must be much higher than that of the instrument to be adjusted.

- (1) Applying a simulated input signal of 0%\*<sup>1</sup>, turn the ZERO trimmer to adjust the output to 0%\*<sup>1</sup>.
- (2) Applying a simulated input signal of 100%, turn the SPAN trimmer to adjust the output to 100%.
- (3) Apply a simulated input signal of 0%\*<sup>1</sup> again, then check if the output is 0%.
- (4) If the output deviates from 0%, repeat steps (1) to (3).

\*<sup>1</sup>: For the models MS3008, MS3020, and MS3021, 0% should be interpreted as 10%.

If your instrument is other than those above and you specify 0-20 mA output, 0% should be interpreted as 0.5%.

### 7.2 Precautions for Adjustment

- (1) When adjusting the front panel trimmers, use a proper screwdriver. Do not attempt to force the trimmer to turn beyond its end points.
- (2) Do not touch any parts other than the trimmers during adjustment.
- (3) Do not move the trimmer locked with threadlocker.

## 8 Maintenance and Inspection

Check the unit for proper characteristics and settings about once every two years.

## 9 For Safe and Proper Operation

Special attention should be given to the following safety instructions and precautions.

### 9.1 Safety Instructions

Be sure to observe the following safety clauses when operating the instrument(s). MTT cannot undertake any responsibility and guarantee for any damage and/or loss caused by improper operation contrary to or neglecting these clauses.


**WARNING**

- All electrical connections must be made to the terminal blocks of the socket. All connections and disconnections must be made with no power applied to the instrument. Otherwise, electric shock may result.
- Do not disassemble or modify the instrument, and do not replace the power fuse. Otherwise, fire or electric shock could result.
- Do not allow any foreign matter (metal chips, water, liquid, etc.) to get into the instrument. Should any foreign matter enter the instrument, immediately unplug the power cable, and contact MTT or its distributor.
- When the instrument is used for applications that require higher reliability and safety, such as transportation, communication, power generation control and medical equipment, special consideration should be taken in safety design to prevent such equipment from malfunctioning as a whole system.
- Do not operate the instrument in an explosive atmosphere containing flammable vapors, gases or dusts. Otherwise, an explosion may result.
- Do not place any combustible materials in the vicinity of the instrument.
- Because no power switch is provided on the instrument, the power supply of the instrument cannot be turned off on the instrument side. So, be sure to provide a power circuit breaker for the power source of the instrument. Note that the breaker should be installed in a location close to the instrument for the convenience of operation. And the breaker should be marked as a “disconnecting device” for the instrument.


**CAUTION**

- Use the instrument within the operating conditions described in the published product specification. Failure to do so may cause fire or damage to the instrument.
- Avoid operating the instrument in locations where extreme temperature changes can cause condensation. Otherwise, it may be damaged.
- Avoid operating or storing the instrument in locations where corrosive gases are present or chemical solvents may splash.
- Hot-swapping may not cause immediate defects in the unit, but this should be avoided as far as possible.
- For the sake of safety, installation and wiring must be performed by qualified personnel with expertise in electronics, electricity or instrumentation engineering.

### 9.2 Operating Precautions

For Handling:

- This is a precision instrument. Do not drop or throw the instrument.
- This product contains electronic parts. Do not splash water on the product and do not dip it in water. For installation, select a place where no condensation occurs.
- Avoid storing or installing the instrument in locations subject to direct sunlight, high temperature, dust, high humidity or vibration.

Special Notes for CE Marking (CE-compliant models only):

- The instrument is designed and manufactured to conform to the following EMC and Low Voltage Directives:  
 EMC Directive (2014/30/EU)  
 - Standard conformity: EN61326-1:2013 Class A

Low Voltage Directive (2014/35/EU) (MS3004, MS3008, and MS3021 only)

- Standard conformity: IEC61010-1

EN61010-1:2010/A1:2019

- Overvoltage Category: II

- Pollution Degree: 2

- The instrument must be installed in a control panel.
- The instrument maintains basic insulation between input and output. Prior to installation, check that the insulation class of the instrument satisfies your system requirements.
- When the instrument is installed in a control panel, the measures to be taken for CE marking conformity may vary with the type of devices connected, wiring to the instrument or structure of the control panel. Therefore, you should check that the control panel as an overall system conforms to the CE marking regulations.

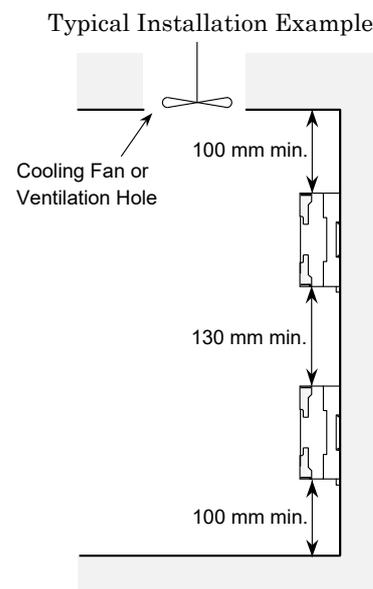
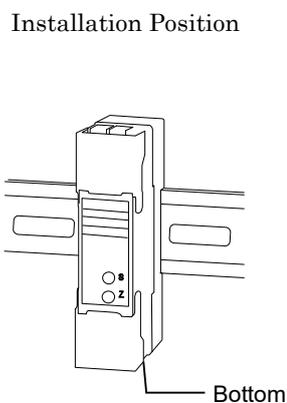
#### On Power Supply:

Check the power rating on the specification label of the unit to ensure you use the correct power supply.

- Rating 24V DC (Input range 24V DC $\pm$ 10%)
- Rating 12V DC (Input range 12V DC $\pm$ 20%) \*Not subject to CE.

#### For Installation:

- The instrument is intended for indoor installation.
- Refer to section 5 "Installation" to install the unit on a DIN rail.
- Operating environmental conditions are as follows:
  - Temperature range: -5 to 55°C
  - Humidity: 5 to 90% RH
  - Altitude up to 2000 meters
- Do not block the vents in the instrument.
- Be careful not to ground the minus (-) terminal of the power supply.
- Use an independent grounding or alternative grounding which does not allow current to flow in.
- The instrument should be installed as shown in the sketch below, namely, in such a position that the label on the panel is readable in the right direction.
- For effective heat dissipation, allow a space of at least 100 mm above and below the unit. When units are used in multiple stacks, they should be spaced at least 130 mm apart from each other. If the required minimum space is not available, take appropriate heat protection measures by, e.g., placing a partition between the units. Install a ventilation hole or a cooling fan to improve airflow. Keep adequate working space in front of and on both sides of the unit.



**On Wiring:**

- Connections to the instrument should be made to the terminal blocks. For terminal assignments, refer to section 6. The recommended screwing torque is 0.8 to 1.0 Nm.
- For lead wires, use a highly flexible stranded conductor. The recommended nominal cross-section of the lead wire conductor is 0.5 to 2.0 mm<sup>2</sup>.

**NOTE:**

For the model MS3020, the conductor for input lines should have a cross-section of at least 2.0 mm<sup>2</sup>.

- The connection of the lead wire to the terminal block should be made with the insulated crimp terminal attached to the end of the wire. Without the insulation, short circuit or electric shock may occur. The recommended thickness of the crimp terminal is 0.7 to 1.0 mm.

Note that only up to two crimp terminals can be connected to one terminal screw. In this case, the thickness of the crimp terminal should be not greater than 0.8 mm.

**NOTES:**

1. As for the input terminals for the model MS3020, only one crimp terminal should be connected.
2. For the models MS3020 and MS3021, it is recommended that ring crimp terminals be used for input wiring to avoid easy removal.

**To Avoid Erroneous Measurements:**

- In order to reduce the influence of noise, the input/output wire and power supply wire should be used in a same bundle or same conduit. They should be installed separately with a minimum distance of 200 mm.
- Avoid wiring the signal lines in the vicinity of equipment generating magnetic fields or electromagnetic waves, such as electric motors and large-scale transformers.
- Allow the instrument to warm up for at least 30 minutes before operation.
- Any sensor or equipment to be connected to the instrument should be selected in consideration of the input/output impedance of the same. (For detailed specifications, refer to section 4 or the relevant specification sheet that can be downloaded from our website at <https://mtt.co.jp>.)

## 10 Warranty Period and Scope

### [Warranty Period]

MTT's hardware products are warranted for a period of seven (7) years from the date of shipment.

### [Warranty Scope]

- 1) MTT warrants that its hardware products are free from defects in materials and workmanship and conform to its product specifications.
- 2) MTT ships the products under its appropriate quality management system and quality control, but does not warrant, expressed or implied, that the operation, output, or indication of the hardware will be uninterrupted or error free. MTT shall not be liable and make no warranty for any damage to or any safety or performance trouble in the customer's or any other third party's equipment if the operation, output, or indication is interrupted or faulty.
- 3) If, during the warranty period, the product proves to be defective when used in accordance with the relevant user's manual, the product will be repaired or replaced.
- 4) This warranty does not apply to any malfunction or failure resulting from the following:
  - a. Improper or incomplete maintenance or calibration,
  - b. Any other cause, which does not relate with the delivered product,
  - c. Modification or repair by any person other than MTT, and
  - d. Natural disasters or other unavoidable accidents, for which MTT is not liable.