

# Autonics Multi-Channel Modular Type High Performance Temperature Controller [Control Module] TMH2/TMH4 Series

## INSTRUCTION MANUAL



Thank you for choosing our Autonics product. Please read the following safety considerations before use.

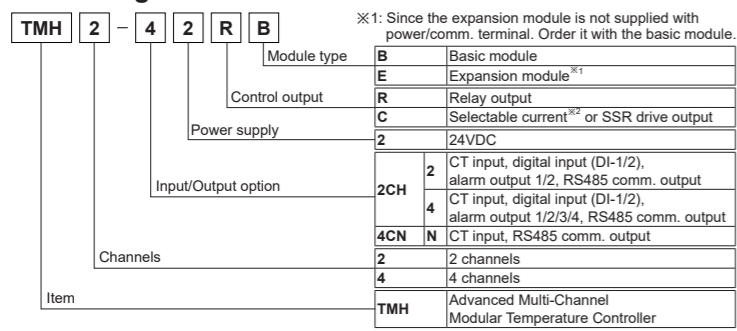
### Safety Considerations

- Please observe all safety considerations for safe and proper product operation to avoid hazards.
- Warning Failure to follow these instructions may result in serious injury or death.
- Caution Failure to follow these instructions may result in personal injury or product damage.
- Warning
- Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.) Failure to follow this instruction may result in personal injury, fire, or economic loss.
- Install on a device panel to use. Failure to follow this instruction may result in fire.
- Do not connect, repair, or inspect the unit while connected to a power source. Failure to follow this instruction may result in fire.
- Check 'Connections' before wiring. Failure to follow this instruction may result in fire or malfunction due to contact failure.
- Do not disassemble or modify the unit. Failure to follow this instruction may result in fire or product damage.

### Caution

- When connecting the power input and relay output, use AWG 20 (0.50mm<sup>2</sup>) cable or over and tighten the terminal screw with a tightening torque of 0.74 to 0.90Nm. When connecting the sensor input and communication cable without dedicated cable, use AWG 28 to 16 cable and tighten the terminal screw with a tightening torque of 0.74 to 0.90Nm. Failure to follow this instruction may result in fire or malfunction due to contact failure.
- Use the unit within the rated specifications. Failure to follow this instruction may result in fire or product damage.
- Use dry cloth to clean the unit, and do not use water or organic solvent. Failure to follow this instruction may result in fire.
- Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present. Failure to follow this instruction may result in explosion or fire.
- Keep metal chip, dust, and wire residue from flowing into the unit. Failure to follow this instruction may result in fire or product damage.

### Ordering Information

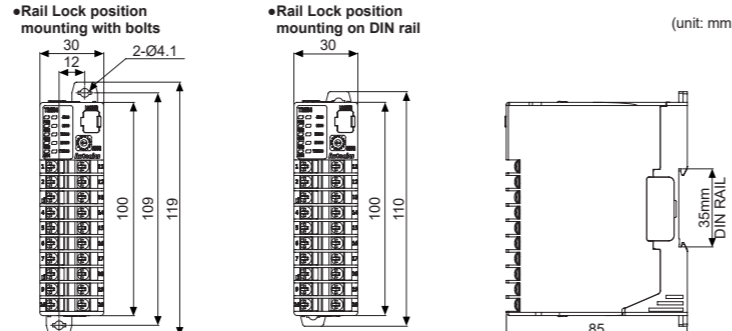


### Specifications

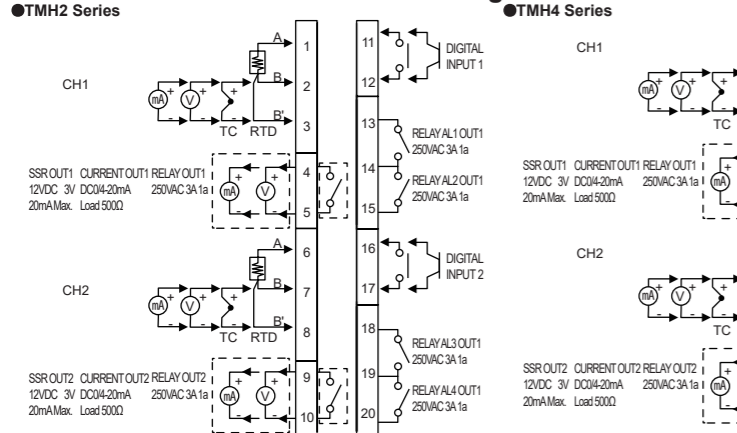
Series	TMH2	TMH4
No. of channels	2 channels	4 channels
Power supply	24VDC	24VDC
Permissible voltage range	90 to 110% of rated voltage	90 to 110% of rated voltage
Power consumption	Max. 5W (for max. load)	Max. 5W (for max. load)
Display method	None: parameter setting and monitoring is available at external devices (PC, PLC, etc.)	None: parameter setting and monitoring is available at external devices (PC, PLC, etc.)
Input type	Thermocouple K(CA), J(IC), E(CR), T(CC), B(PR), R(PR), S(PR), N(NN), C(TT), G(TT), L(LC), U(CC), Platinum II DP1100Q, JP1100Q, DP150Q, Cu100Q, Cu50Q, Nickel 120Q 3-wire type (permissible line resistance max. 50)	Thermocouple K(CA), J(IC), E(CR), T(CC), B(PR), R(PR), S(PR), N(NN), C(TT), G(TT), L(LC), U(CC), Platinum II DP1100Q, JP1100Q, DP150Q, Cu100Q, Cu50Q, Nickel 120Q 3-wire type (permissible line resistance max. 50)
Sampling cycle	50ms (2CH or 4CH synchronous sampling)	50ms (2CH or 4CH synchronous sampling)
Measured accuracy	Thermocouple • At room temperature (23°C±5°C): (PV ±0.3% or ±1°C, higher one) ±1-digit • Out of room temperature range: (PV ±0.5% or ±2°C, higher one) ±1-digit Analog • At room temperature (23°C±5°C): ±0.3% F.S. ±1-digit • Out of room temperature range: ±0.5% F.S. ±1-digit	Thermocouple • At room temperature (23°C±5°C): (PV ±0.3% or ±1°C, higher one) ±1-digit • Out of room temperature range: (PV ±0.5% or ±2°C, higher one) ±1-digit Analog • At room temperature (23°C±5°C): ±0.3% F.S. ±1-digit • Out of room temperature range: ±0.5% F.S. ±1-digit
Option input	CT input 0.0-50.0A (primary current measurement range) ※CT ratio=1/1000 Measured accuracy: ±5% F.S. ±1-digit	CT input 0.0-50.0A (primary current measurement range) ※CT ratio=1/1000 Measured accuracy: ±5% F.S. ±1-digit
Control method	Heating, Cooling Heating&Cooling ON/OFF control, P, PI, PD, P D control	Heating, Cooling Heating&Cooling ON/OFF control, P, PI, PD, P D control
Control output	Relay 250VAC~ 3A 1a SSR Max. 12VDC= ±3V 20mA Current <sup>※3</sup> Selectable DC 4-20mA or DC 0-20mA (load resistance max. 500Ω)	Relay 250VAC~ 3A 1a SSR Max. 12VDC= ±3V 20mA Current <sup>※3</sup> Selectable DC 4-20mA or DC 0-20mA (load resistance max. 500Ω)
Option output	Alarm 250VAC~ 3A 1a	Alarm 250VAC~ 3A 1a
Communication	Master RS485 (Modbus RTU protocol) PC loader TTL (Modbus RTU protocol)	Master RS485 (Modbus RTU protocol) PC loader TTL (Modbus RTU protocol)
Hysteresis	RTD/Thermocouples: 1 to 100°C/°F (0.1 to 100.0°C/°F), analog: 1 to 100 digit	RTD/Thermocouples: 1 to 100°C/°F (0.1 to 100.0°C/°F), analog: 1 to 100 digit
Proportional band (P)	RTD/Thermocouples: 1 to 999°C/°F (0.1 to 999.9°C/°F), analog: 0.1 to 999.9 digit	RTD/Thermocouples: 1 to 999°C/°F (0.1 to 999.9°C/°F), analog: 0.1 to 999.9 digit
Integral time (I)	0 to 9999 sec	0 to 9999 sec
Derivative time (D)	0 to 9999 sec	0 to 9999 sec
Control period (T)	Relay output: 0.1 to 120.0 sec, SSR output: 1.0 to 120.0 sec	Relay output: 0.1 to 120.0 sec, SSR output: 1.0 to 120.0 sec
Manual reset	0 to 100% (0.0 to 100.0%)	0 to 100% (0.0 to 100.0%)
Relay life cycle	Mechanical Min. 10,000,000 operations Electrical Min. 100,000 operations (250VAC 3A resistance load)	Mechanical Min. 10,000,000 operations Electrical Min. 100,000 operations (250VAC 3A resistance load)
Memory retention	Approx. 10 years (non-volatile semiconductor memory type)	Approx. 10 years (non-volatile semiconductor memory type)
Insulation resistance	100MΩ (at 500VDC megger)	100MΩ (at 500VDC megger)
Insulation type	Double insulation or reinforced insulation (mark: □ dielectric strength between the measuring input part and the power part: 1kV)	Double insulation or reinforced insulation (mark: □ dielectric strength between the measuring input part and the power part: 1kV)
Dielectric strength	1,000VAC 50/60Hz for 1 min (between input terminals and power terminals)	1,000VAC 50/60Hz for 1 min (between input terminals and power terminals)
Vibration	0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours	0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours
Noise immunity	±0.5kV the square wave noise (pulse width: 1μs) by the noise simulator	±0.5kV the square wave noise (pulse width: 1μs) by the noise simulator
Environment	Ambient temp. -10 to 50°C, storage: -20 to 60°C Ambient humi. 35 to 85%RH storage: 35 to 85%RH	Ambient temp. -10 to 50°C, storage: -20 to 60°C Ambient humi. 35 to 85%RH storage: 35 to 85%RH
Protection structure	IP20 (IEC standard)	IP20 (IEC standard)
Accessories	Expansion connector: 1, module lock connector: 2	Expansion connector: 1, module lock connector: 2
Approval	CE, RoHS, etc.	CE, RoHS, etc.
Weight <sup>※4</sup>	Basic module Approx. 250.8g (approx. 177.7g) Expansion module Approx. 245.7g (approx. 172.6g)	Basic module Approx. 250.4g (approx. 177.3g) Expansion module Approx. 245.1g (approx. 172.2g)

- ※1: Connecting 1 or more expansion module can vary measurement accuracy about ±1°C, regardless of the number of connected expansion module.
- ※2: At room temperature (23°C±5°C)
  - Thermocouple K, J, N, E below -100°C, L, U, LLI and RTD Cu50Q, DP150Q: (PV ±0.3% or ±2°C, higher one) ±1-digit
  - Thermocouple C, G and R, S below 200°C: (PV ±0.3% or ±3°C, higher one) ±1-digit
  - Thermocouple B below 400°C: There is no accuracy standards.
- ※3: Out of room temperature range
  - RTD Cu50Q, DP150Q: (PV ±0.5% or ±3°C, higher one) ±1-digit
  - Thermocouple R, S, B, C, G: (PV ±0.5% or ±5°C, higher one) ±1-digit
  - Others blow -100°C: within ±5°C
- ※4: The weight includes packaging. The weight in parenthesis is for unit only.
- ※Environment resistance is rated at no freezing or condensation.

### Dimensions

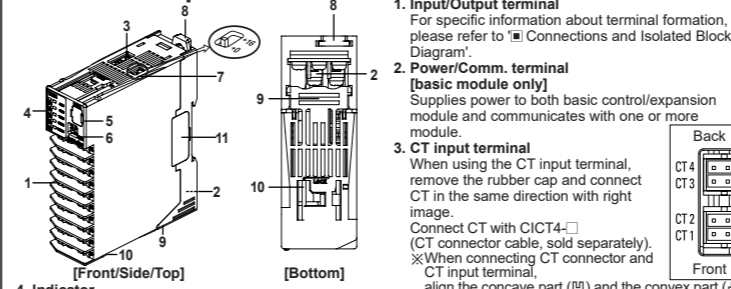


### Connections and Isolated Block Diagram



※The above specifications are subject to change and some models may be discontinued without notice. ※Be sure to follow cautions written in the instruction manual, user manual and the technical description (catalog, homepage).

### Unit Description



#### 4. Indicator

##### TMH2 Series

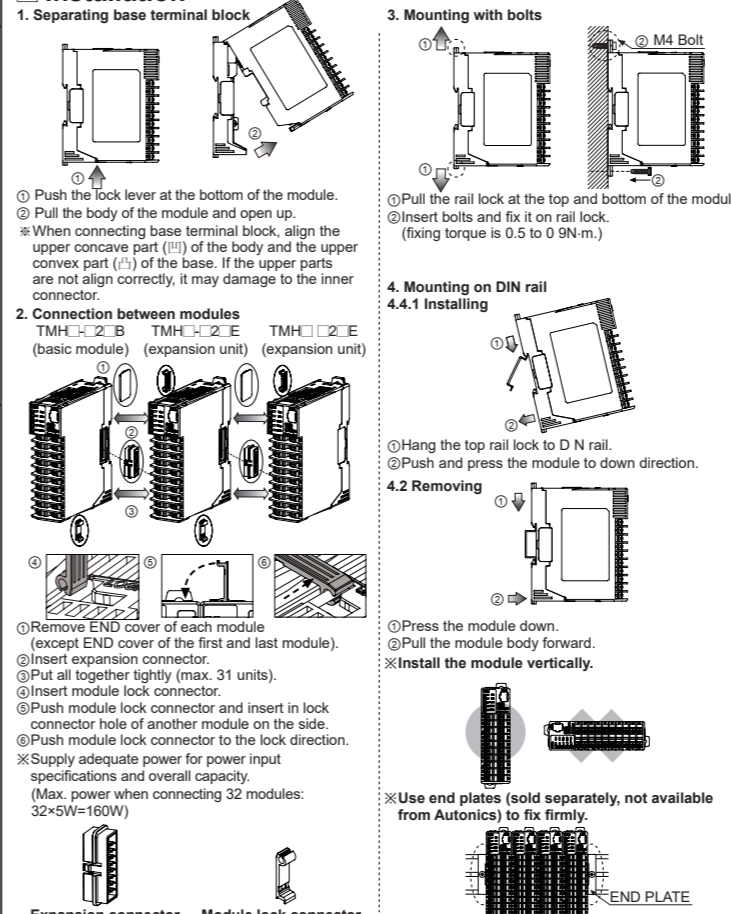
Indicator	Status	Initial power ON <sup>※1</sup>	Control output	Auto tuning <sup>※2</sup>	Alarm output
LED 1 LED 2	PWR (green) <sup>※3</sup>	ON	ON	ON	N.O. (Normally Open) / N.C. (Normally Closed)
LED 1	CH1 (red)	ON	Flash	Flash	OFF (OPEN) / ON (CLOSE) / OFF (CLOSE) / ON (OPEN)
LED 1	CH2 (red)	ON	Flash	Flash	OFF (OPEN) / ON (CLOSE) / OFF (CLOSE) / ON (OPEN)
CH1 AL1	(red)	ON <sup>※5</sup>	OFF	OFF	OFF (OPEN) / ON (CLOSE) / OFF (CLOSE) / ON (OPEN)
CH2 AL2	(yellow)	Flash (4,800bps)	Module comm. status <sup>※6</sup>	Module comm. status <sup>※6</sup>	OFF (OPEN) / ON (CLOSE) / OFF (CLOSE) / ON (OPEN)
LED 2	AL1 (yellow)	Flash (9,600bps)	—	—	OFF (OPEN) / ON (CLOSE) / OFF (CLOSE) / ON (OPEN)
LED 2	AL2 (yellow)	Flash (19,200bps)	—	—	OFF (OPEN) / ON (CLOSE) / OFF (CLOSE) / ON (OPEN)
LED 2	AL3 (yellow)	Flash (38,400bps)	—	—	OFF (OPEN) / ON (CLOSE) / OFF (CLOSE) / ON (OPEN)
LED 2	AL4 (yellow)	Flash (115,200bps)	—	—	OFF (OPEN) / ON (CLOSE) / OFF (CLOSE) / ON (OPEN)

##### TMH4 Series

Indicator	Status	Initial power ON <sup>※1</sup>	Control output	Auto tuning <sup>※2</sup>
LED 1 LED 2	PWR (green) <sup>※3</sup>	ON	ON	ON
LED 1	CH1 (red)	ON	Flash	Flash
LED 1	CH2 (red)	ON	Flash	Flash
CH1	CH3 (red)	ON	Flash	Flash
CH1	CH4 (red)	ON	Flash	Flash
CH2	(yellow)	Flash (4,800bps)	Module comm. status <sup>※6</sup>	Module comm. status <sup>※6</sup>
CH2	(yellow)	Flash (9,600bps)	—	—
CH3	(yellow)	Flash (19,200bps)	—	—
CH3	(yellow)	Flash (38,400bps)	—	—
CH4	(yellow)	Flash (115,200bps)	—	—

- ※1: At the moment when power is on, the indicator of set communication speed flashes for 5 sec.
- ※2: Indicator of the channel, which is in the process of auto-tuning, flashes at 1 sec interval.
- ※3: When communicating with external device, PWR indicator flashes.
- ※4: Turns on, when CH1 outputs cooling control in the heating&cooling control method.
- ※5: Turns on, when CH2 outputs cooling control in the heating&cooling control method.
- ※6: Displays communication status in control output, auto-tuning or operating RUN mode. ON: normal / flash: abnormal / OFF: not communicating
- 5. PC loader port PC loader port supports serial communication between single module and PC. It needs EXT-US (converter cable)+SCM-US (Serial converter, sold separately) for communicating.
- 6. Communication address setting switch (SW1) Set the communication address. If changing the communication address by setting switch, use the flat head driver which is 2mm size or plastic driver. If not, it may cause product damage.
- 7. Communication address group switch (SW2) When setting the communication address over 16, select +16.
- 8. Rail lock Rail lock helps installing the device to DIN rail or with bolts.
- 9. Lock lever Lock lever holds module body and base tightly.
- 10. Module lock connector hole When connect modules, insert module lock connector in the hole in order to enhance coherence between modules.
- 11. END cover When connect modules, remove END cover in order to connect expansion connector.

### Installation

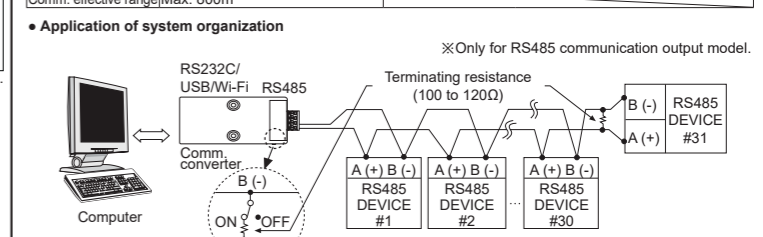


### Communication Setting

It is for parameter setting and monitoring via external devices (PC, PLC, etc.).

#### Interface

Comm. protocol	Modbus RTU	Comm. speed	4800, 9600 (default), 19200, 38400, 115200 bps
Connection type	RS485	Response waiting time	5 to 99ms (default: 20ms)
Application standard	EIA RS485 Compliance with	Start bit	1-bit (fixed)
Max. connection	32 units (address: 01 to 32) (in case connecting TMHC module: 16 units (address: 01 to 16))	Data bit	8-bit (fixed)
Synchronous method	Asynchronous	Parity bit	None (default), Odd, Even
Comm. method	Two-wire half duplex	Stop bit	1-bit, 2-bit (default)
Comm. effective range	Max. 800m		



※It is recommended to use Autonics communication converter: SCM-WF48 (Wi-Fi to RS485 USB wireless communication converter, sold separately), SCM-US48I (USB to RS485 converter, sold separately), SCM-38I (RS232C to RS485 converter, sold separately), SCM-US (USB to Serial converter, sold separately). Please use twisted pair wire, which is suitable for RS485 communication, for SCM-WF48, SCM-US48I and SCM-38I.

#### Communication address setting

Set the communication address with the communication address setting switch (SW1) and communication address group switch (SW2) (default: [SW1] 1, [SW2] +0).

SW1	SW2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
+0	+16	16	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
+0	+16	32	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

Caution for communication address setting After changing communication address via the power/comm. terminal, reboot the device.

### Comprehensive Device Management Program[DAQMaster]

DAQMaster is a comprehensive device management software for setting parameters and monitoring processes.

Item	Minimum specifications
System	IBM PC compatible computer with Pentium III or above
Operations	Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024x768 or higher
Others	RS232C serial port (9-pin), USB port

### Error Display

Indicator	Status	Input error <sup>※1</sup>	Remote SV error <sup>※2</sup>
PRW	ON (red)	ON (red)	ON (green)
CH <sup>※3</sup>	Flash (red)	Flash (red)	Flash (red)

※1: Input error: input value is below the input range (LLLL) / input value exceeds input range (HHHH) / input sensor wire is down or input sensor is disconnected (OPEN).  
 ※2: Remote SV error: communication error of Remote SV master and internal communication / input of master channel is LLLL/HHHH/OPEN when the channel is subjected to display PV.  
 ※3: An indicator of relative channel flashes. After main cause of the error is solved, error status is cleared and the device is returned to the normal operation automatically.

### Manuals

For the detail information and instructions, please refer to user manual and user manual for communication, and be sure to follow cautions written in the technical description (catalog, homepage).

### Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor. For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length. For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire. Keep away from high voltage lines or power lines to prevent inductive noise. In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line. Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Do not apply excessive power when connecting or disconnecting the connectors of the product.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- When changing the input sensor, turn off the power first before changing. After changing the input sensor, modify the value of the corresponding parameter.
- Power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Do not overlap communication line and power line. Use twisted pair wire for communication line and connect ferrite bead at each end of line to reduce the effect of external noise.
- Make a required space around the unit for radiation of heat. For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- Mounting multiple devices in any way other than the specified mounting method may cause heat to build up inside, which will shorten their service life. If there is a possibility of the ambient temperature rising to a temperature above the specified temperature range, take steps, such as installing fans, to cool the device. Be sure that the cooling method in not cooling just the terminal block. If only the terminal block is cooled, measurement errors may occur.
- Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- Do not wire to terminals which are not used.
- Install DIN rail vertically from the ground.
  - Indoors (in the environment condition rated in 'Specifications')
  - Altitude max. 2,000m
  - Pollution degree 2
  - Installation category II