Autonics

Multi-Channel Modular Type High Performance Temperature Controller [Option Module]

TMHA/TMHE/TMHCT 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.
※⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠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

1. **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.
2. **Install on a device panel to use.**
   Failure to follow this instruction may result in fire.
3. **Do not connect, repair, or inspect the unit while connected to a power source.**
   Failure to follow this instruction may result in fire.
4. **Check 'Connections' before wiring.**
   Failure to follow this instruction may result in fire.
5. **Do not disassemble or modify the unit.**
   Failure to follow this instruction may result in fire.

⚠ Caution

1. **When connecting the power input and relay output, use AWG 20 (0.50mm²) cable or over and tighten the terminal screw with a tightening torque of 0.74 to 0.90N·m.**
   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 0.90N·m.
   Failure to follow this instruction may result in fire or malfunction due to contact failure.
2. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in fire or product damage.
3. **Use dry cloth to clean the unit, and do not use water or organic solvent.**
   Failure to follow this instruction may result in fire.
4. **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.
5. **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

Type	Analog input/output	Digital input, alarm output	CT input
Model	TMHA-42AE	TMHE-82RE	TMHCT-82NE
Input	Temperature sensor/Analog input 1 to 4	Digital input 1 to 8	CT input 1 to 8
Output	Transmission output(0/4-20mA) 1 to 4	Alarm output 1 to 8	—

▣ Comprehensive Device Management Program[DAQMaster]

DAQMaster is a comprehensive device management software for setting parameters and monitoring processes. DAQMaster can be downloaded from our website at www.autonics.com.

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: 1024×768 or higher
Others	RS232C serial port (9-pin), USB port

▣ Specifications

Model		TMHA-42AE			TMHE-82RE	TMHCT-82NE
No. of channels		4 channels			8 points	8 points
Power supply※1		24VDC⎓				
Permissible voltage range		90 to 110% of rated voltage				
Power consumption		Max. 5W (for max. load)				
Display method		None- parameter setting and monitoring is available at external devices (PC, PLC, etc.)				
Input type		Thermocouple	RTD	Analog	Digital	CT
		K(CA), J(IC), E(CR), T(CC), B(PR), R(PR), S(PR), N(NN), C(TT), G(TT), L(IC), U(CC), Platinel II	DPt100Ω, JPt100Ω, DPt50Ω, Cu100Ω, Cu50Ω, Nikel 120Ω 3-wire type (permissible line resistance max. 5Ω per line)	• Voltage: 0-100mVDC⎓, 0-5VDC⎓, 1-5VDC⎓, 0-10VDC⎓ • Current: 0-20mA, 4-20mA	• Connect input: ON - max. 1kΩ, OFF - min. 100kΩ • Solid-state input: ON - max. residual voltage 0.9V, OFF - max. leakage current 0.5mA • Outflow current : approx. 0.3mA per input	0.0-50.0A (primary current measurement range) ※CT ratio=1/1000
Sampling cycle		50ms (4CH synchronous sampling)			—	
Measured accuracy※2		• At room temperature (23°C±5°C): (PV ±0.3% or ±1°C, higher one) ±1-digit※3 • Out of room temperature range: (PV ±0.5% or ±2°C, higher one) ±1-digit		• At room temperature (23°C±5°C): ±0.3% F.S. ±1-digit • Out of room temperature range: ±0.5% F.S. ±1-digit	—	±5% F.S. ±1-digit
Output	Alarm	—			250VAC~ 3A 1a	—
	Transmission	DC 4-20mA or DC 0-20mA (load resistance max. 500Ω)			—	
Communi-cation	Master	RS485 (Modbus RTU protocol)				
	PC loader	TTL (Modbus RTU protocol)				
Relay life cycle	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)				
Insulation resistance		Over 100MΩ (500VDC megger)				
Insulation type		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 power source terminal and input terminal)				
Vibration		0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours				
Noise immunity		Square shaped noise by noise simulator (pulse width 1μs) ±0.5kV R-phase, S-phase				
Environ-ment	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)				
Accessories		Expansion connector: 1, module lock connector: 2				
Approval		CE, cULus, KC				
Weight※4		Approx. 233.8g (approx. 160.7g)			Approx. 239g (approx. 165.9g)	Approx. 220.6g (approx. 147.5g)

※1: Voltage of power supply/communication terminal placed in the backside of TMH2/4 Series (basic control module)
※2: In case of TMHA, connecting 1 or more expansion module can vary measurement accuracy about ±1°C, regardless of the number of connected expansion module.
※3: **At room temperature (23°C±5°C)**
• Thermocouple K, J, N, E below -100°C, L, U, PLII and RTD Cu50Ω, DPt50Ω: (PV ±0.3% or ±2°C, higher one) ±1-digit
• Thermocouple C, G and S below 200°C: (PV ±0.3% or ±3°C, higher one) ±1-digit
• Thermocouple B below 400°C: there is no accuracy standards.
Out of room temperature range
• RTD Cu50Ω, DPt50Ω: (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.

▣ 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 descriptions (catalog, homepage).
Visit our homepage (www.autonics.com) to download manuals.

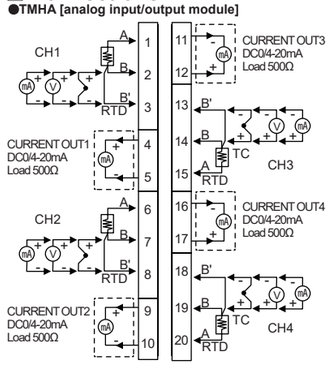
▣ Error Display

Status / Indicator	Input error※1
PRW	ON (red)
CH□※2	Flash (red)

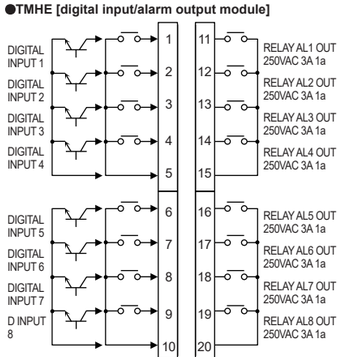
※1: Input error: input value is below the input range (LLLL) / input value exceeds input range (HHHH) / input sensor wire is down/input sensor is disconnected (OPEN).
※2: An indicator of relative channel flashes.
After main cause of the error is solved, error status is cleared and the device is returned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

▣ Connections

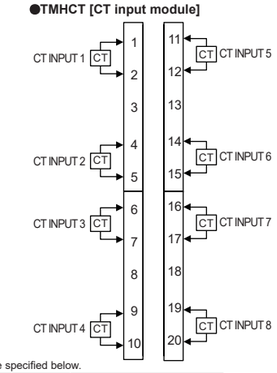
●TMHA [analog input/output module]



●TMHE [digital input/alarm output module]



●TMHCT [CT input module]

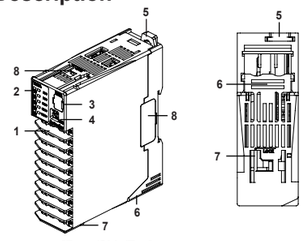


※Use terminals of size specified below.

	<Round>	<Forked>
a	Min. 3.0mm	Min. 3.0mm
b	Max. 5.8mm	Max. 5.8mm

※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 descriptions (catalog, homepage).

▣ Unit Description



1. Input/Output terminal
For specific information about terminal formation, please refer to '▣ Connections and Isolated Block Diagram'.

2. Indicator

●TMHA [analog input/output module]

Indicator			Status	Initial power ON※1	Internal comm.	Transmission output
LED 1	LED 2					
PWR		LED 1	PWR (green)※2	—	ON	ON
			CH1 (red)		—	ON
			CH2 (red)		—	ON
CH 1			CH3 (red)		—	ON
			CH4 (red)		—	ON
CH 2		LED 2	(yellow)	Flash (4,800bps)	Module comm. status※3	
			(yellow)	Flash (9,600bps)	ON (CH1)	—
CH 3			(yellow)	Flash (19,200bps)	ON (CH2)	—
			(yellow)	Flash (38,400bps)	ON (CH3)	—
CH 4			(yellow)	Flash (115,200bps)	ON (CH4)	—

●TMHE [digital input, alarm output module]

Indicator			Status	Initial power ON※1	Internal comm.	Alarm output			
						N.O.(Normally Open)		N.C. (Normally Closed)	
LED 1	LED 2					OFF (OPEN)	ON (CLOSE)	OFF (CLOSE)	ON (OPEN)
PWR		LED 1	PWR (green)※2	—	ON	ON			
			CH1 (red)		—	OFF	ON	OFF	ON
			CH2 (red)		—	OFF	ON	OFF	ON
AL1	AL5		CH3 (red)		—	OFF	ON	OFF	ON
			CH4 (red)		—	OFF	ON	OFF	ON
AL2	AL6	LED 2	(yellow)	Flash (4,800bps)	Module comm. status※3	Module comm. status※3			
			AL5 (yellow)	Flash (9,600bps)	—	OFF	ON	OFF	ON
AL3	AL7		AL6 (yellow)	Flash (19,200bps)	—	OFF	ON	OFF	ON
			AL7 (yellow)	Flash (38,400bps)	—	OFF	ON	OFF	ON
AL4	AL8		AL8 (yellow)	Flash (115,200bps)	—	OFF	ON	OFF	ON

●TMHCT [CT input module]

Indicator			Status	Initial power ON※1	CT input※4	Internal comm.
LED 1	LED 2					
PWR		LED 1	PWR (green)※2	—	ON	ON
			(red)		ON (40.1 to 50.0A)	—
			(red)		ON (30.1 to 40.0A)	—
			(red)		ON (20.1 to 30.0A)	—
			(red)		ON (10.1 to 20.0A)	—
		LED 2	(yellow)	Flash (4,800bps)	Module comm. status※3	Module comm. status※3
			(yellow)	Flash (9,600bps)	ON (40.1 to 50.0A)	—
			(yellow)	Flash (19,200bps)	ON (30.1 to 40.0A)	—
			(yellow)	Flash (38,400bps)	ON (20.1 to 30.0A)	—
			(yellow)	Flash (115,200bps)	ON (10.1 to 20.0A)	—

※1: At the moment when power is on, the indicator of set communication speed flashes for 5 sec.
※2: When communicating with external device, PWR indicator flashes.
※3: Displays internal communication status between modules.
ON: normal / flash: abnormal / OFF: not communicating
※4: The indicator corresponding to the certain setting value of CT input flashes according to the parameter [CT Input Value Indication Lamp □].
LED 1: CT Input Value Indication Lamp1 / LED 2: CT Input Value Indication Lamp2

3. PC loader port: PC loader port supports serial communication between single module and PC. It needs EXT-US (converter cable)+SCM-US (USB/Serial converter, sold separately) for communicating.
4. 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.
5. Rail lock: Rail lock helps installing the device to DIN rail or with bolts.
6. Lock lever: Lock lever holds module body and base tightly.
7. Module lock connecter hole: When connect modules, insert module lock connector in the hole in order to enhance coherence between modules.
8. END cover: When connect modules, remove END cover in order to connect expansion connector.

▣ 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	Each module 16 units	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		

• Communication address setting

Set the communication address with the communication address setting switch (SW1). (default: [SW1] 1)

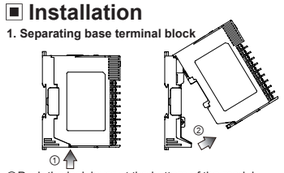
Series \ SW1	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
TMHA	48	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
TMHE	64	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
TMHCT	80	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79

• Caution for communication address setting

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

▣ Installation

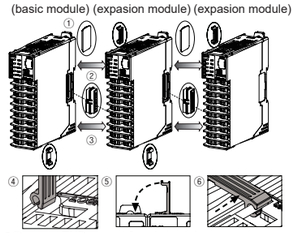
1. Separating base terminal block



①Push the lock lever at the bottom of the module.
②Pull the body of the module and open up.
※When connecting base terminal block, align the upper concave part (▯) of the body and the upper convex part (▯) of the base. If the upper parts are not align correctly, it may damage to the inner connector.

2. Connection between modules

TMH□-□2□B (basic module) TMH□-□2□E (expasion module) TMH□-□2□E (expasion module)

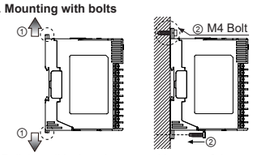


①Remove END cover of each module (except END cover of the first and last module).
②Insert expansion connector.
③Put all together tightly (max. 31 units).
④Insert module lock connector.
⑤Push module lock connector and insert in lock connector hole of another module on the side.
⑥Push module lock connector to the lock direction.
※Supply adequate power for power input specifications and overall capacity.
(Max. power when connecting 32 modules: 32×5W=160W)

Expansion connector

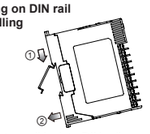
Module lock connector

3. Mounting with bolts



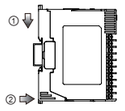
4. Mounting on DIN rail

4.4.1 Installing



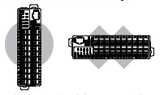
①Hang the top rail lock to DIN rail.
②Push and press the module to down direction.

4.2 Removing

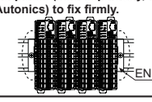


①Press the module down.
②Pull the module body forward.

※Install the module vertically.



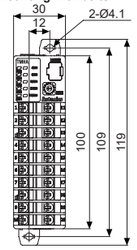
※Use end plates (sold separately, not available from Autonics) to fix firmly.



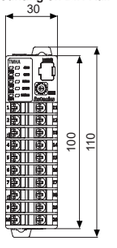
▣ Dimensions

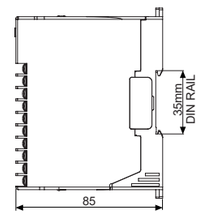
(unit: mm)

●Rail Lock position: mounting with bolts



●Rail Lock position: mounting on DIN Rail





▣ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
2. 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.
3. 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.
4. Do not apply excessive power when connecting or disconnecting the connectors of the product.
5. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
6. Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
7. When changing the input sensor, turn off the power first before changing.
   After changing the input sensor, modify the value of the corresponding parameter.
8. Power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
9. Do not overlapping 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.
10. 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.
11. 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.
12. Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
13. Do not wire to terminals which are not used.
14. Install DIN rail vertically from the ground.
15. This unit may be used in the following environments.
    ①Indoors (in the environment condition rated in 'Specifications')
    ②Altitude max. 2,000m
    ③Pollution degree 2
    ④Installation category II

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