Multi-Channel Modular Type High Performance Temperature Controller

▣ Feature

[Common]

- Easy maintenance with separated body/base parts
- No communication and power supply for expansion modules required using module connectors: Up to 32 modules
- PC parameter setting via PC (USB cable and RS485 communication):
  Supports comprehensive device management program (DAQMaster)

※ Communication converter, sold separately: SCM-US (USB/Serial converter), SCM-38I (RS232C/RS485 converter), SCM-US48I (USB/RS485 converter), SCM-WF48 (Wi-Fi/RS485·USB wireless communication converter), EXT-US (converter cable)

[TMH2/4 Series (control module)]

- One module supports multi channels (2 channels/4 channels) for input/output control : connecting TMH2/4, up to 32 modules (2 channels: 64 channels/4 channels: 128 channels)
- High-speed sampling with 50ms and ±0.3% measuring accuracy
- Simultaneous heating/cooling control and auto/manual control for high-performance control
- Selectable current output or SSR drive output
- Each channel insulated (dielectric strength 1,000VAC)

※CT input terminal for measuring load current
(※CT, sold separately: CSTC-E80LN, CSTC-E200LN, CSTS-E80PP)

- Multi input/Multi range

[TMHA (analog input/output option module)]

- 4 channels, multi input/multi range/transmission output (DC0-20mA or 4-20mA)
- Each channel insulated (dielectric strength 1,000VAC)
- High-speed sampling with 50ms and ±0.3% measuring accuracy

[TMHE (digital input/alarm output option module)]

- Digital input (8 types)/Alarm output (8 types)

[TMHCT (CT input option module)]

- 8 CT inputs
- CT input status indicators

[TMHC (communication module)]

- Connection expansion to master devices (PC, PLC, etc) with TMH2/4 (control module) and TMHA/E/CT (option module) (up to 16 modules)
- One module connects up to 32 control/option modules (16 control modules and 16 option modules)
- PLC ladderless (RS422/RS485), Ethernet communication supported

Please read "Safety Considerations" in the instruction manual before using.

▣ Manuals

- For the detail information and instructions, please refer to the user manual and the user manual for communication, and be sure to follow cautions written in the technical descriptions (catalog, website).
  Visit our website (www.autonics.com) to download manuals.
- User manual describes for specifications and function, and communication manual describes for RS485 communincation (protocol Modbus RTU) and parameter address map data.

▣ Ordering Information

◎ Control module

TMH | 2 | − | 4 | 2 | R | B

Module type	B		Basic module
	E		Expansion module※1
Control output	R		Relay output
	C		Selectable current or SSR drive output
Power supply	2		24VDC
Input/Output option	2CH	2	CT input, digital input (DI-1/2), alarm output 1/2, RS485 comm. output
		4	CT input, digital input (DI-1/2), alarm output 1/2/3/4, RS485 comm. output
	4CH	N	CT input, RS485 comm. output
Channels	2		2 channels
	4		4 channels
Item	TMH		Advanced Multi-Channel Modular Temperature Controller

※1: Since the expansion module is not supplied with power/comm. terminal. Order it with the basic module.

◎ Option module

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	—

◎ Communication module

Type			PLC ladderless communication	Ethernet communication
Model			TMHC-22LE	TMH-22EE
Commu-nication	COM1 (Master, PLC)	Connection method	RS422, RS485	10BaseT
		Protocol	Modbus RTU, PLC ladderless comm.	Modbus/TCP
	COM2 (Master, Group)	Connection method	RS422, RS485	10BaseT
		Protocol	Modbus RTU	Modbus/TCP

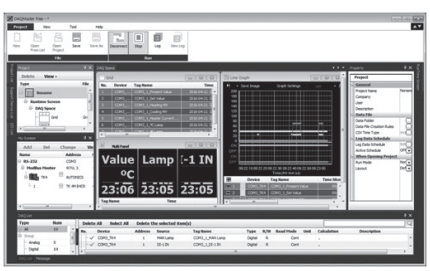
▣ Comprehensive Device Management Program (DAQMaster)

- DAQMaster is comprehensive device management program. It is available for parameter setting, monitoring.
- Visit our website (www.autonics.com) to download user manual and comprehensive device management program.

< Computer specification for using software >

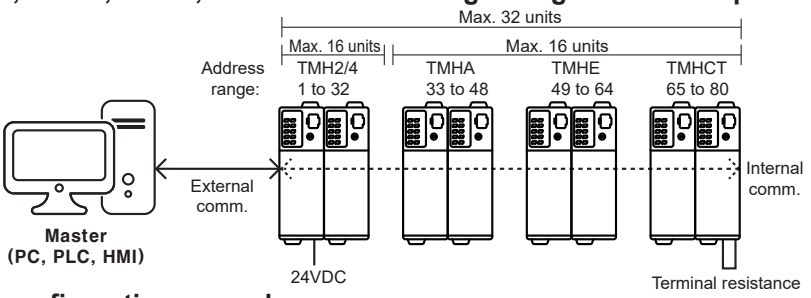
Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operating system	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB or more
Hard disk	More than 1GB of free hard disk space
VGA	1024×768 or higher resolution display
Others	RS-232 serial port (9-pin), USB port

< DAQMaster screen >



▣ Connection Examples

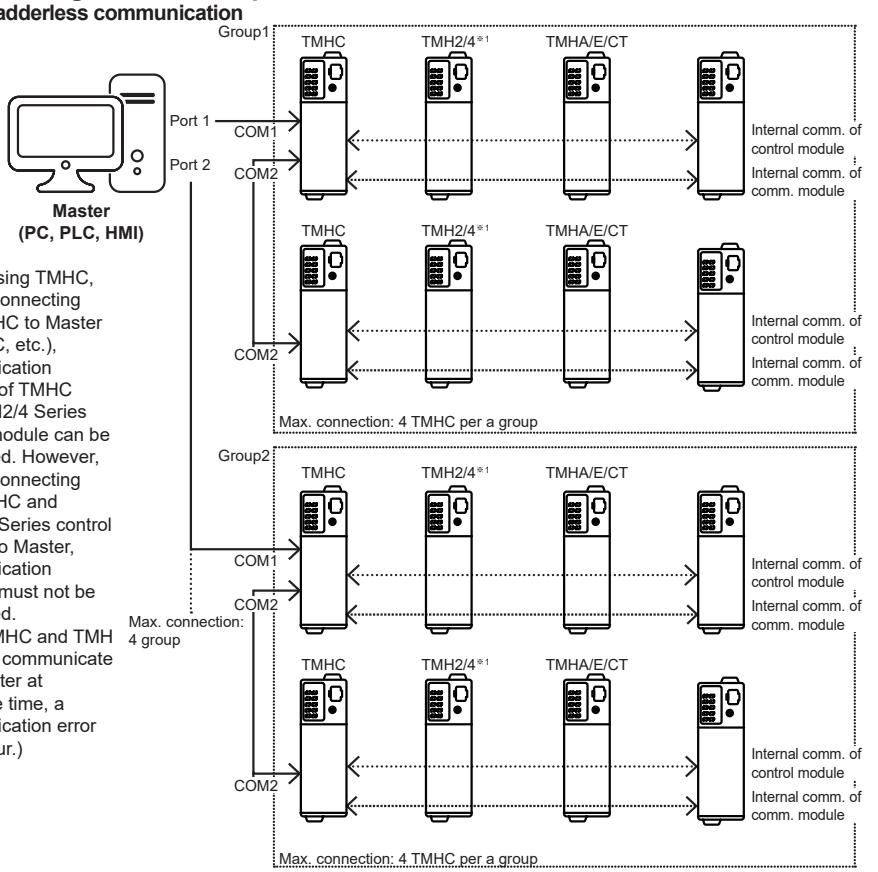
◎ TMH2/4, TMHA, TMHE, TMHCT inter-working configuration example



※ Internal communication: Receiving/Sending data between TMH2/4 and TMHA/E/CT
※ External communication: Communication with Master for controlling
※ Each module is available to monitoring at DAQMatser via PC loader

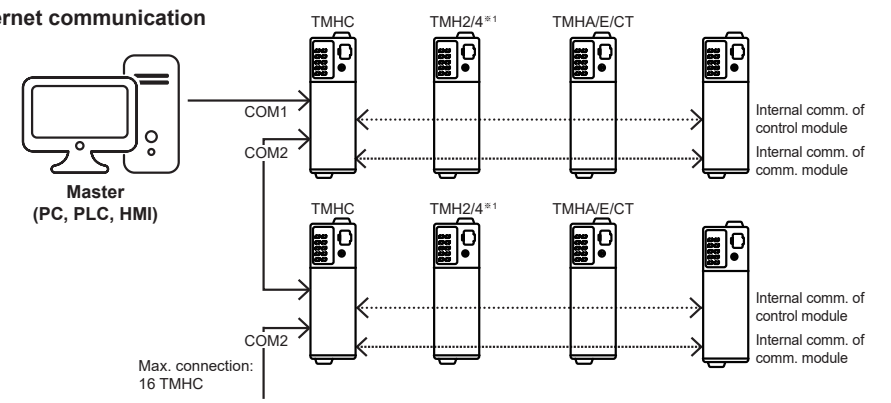
◎ TMHC configuration example

● PLC ladderless communication



※1. When using TMHC, in case connecting only TMHC to Master (PC, PLC, etc.), communication address of TMHC and TMH2/4 Series control module can be duplicated. However, in case connecting both TMHC and TMH2/4 Series control module to Master, communication address must not be duplicated.
(If the TMHC and TMH modules communicate with Master at the same time, a communication error may occur.)

● Ethernet communication



▣ Specifications

◎ Control module

Series		TMH2	TMH4
No. of channels		2 channels	4 channels
Power supply		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	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	
	RTD	DPt100Ω, JPt100Ω, DPt50Ω, Cu100Ω, Cu50Ω, Nikel 120Ω 3-wire type (permissible line resistance max. 5Ω)	
	Analog	• Voltage: 0-100mVDC⎓, 0-5VDC⎓, 1-5VDC⎓, 0-10VDC⎓ • Current: 0-20mA, 4-20mA	
Sampling cycle		50ms (2 channel or 4 channel synchronous sampling)	
Measured accuracy	Thermocouple※1	• At room temperature (23℃±5℃): (PV ±0.3% or ±1℃, higher one) ±1-digit※2 • Out of room temperature range: (PV ±0.5% or ±2℃, higher one) ±1-digit	
	RTD		
	Analog	• At room temperature (23℃±5℃): ±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	
	Digital input	• 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	—
Control method	Heating, Cooling	ON/OFF control, P, PI, PD, PID control	
	Heating&Cooling		
Control output	Relay	250VAC~ 3A 1a	
	SSR	Max. 12VDC⎓ ±3V 20mA	
	Current	Selectable DC 4-20mA or DC 0-20mA (load resistance max. 500Ω)	
Option output	Alarm	250VAC~ 3A 1a	—
Communi-cation	Comm. terminal	RS485 (Modbus RTU protocol)	
	PC loader	TTL (Modbus RTU protocol)	
Hysteresis		RTD/Thermocouples: 1 to 100℃/℉ (0.1 to 100.0℃/℉), analog: 1 to 100 digit	
Proportional band (P)		RTD/Thermocouples: 1 to 999℃/℉ (0.1 to 999.9℃/℉), analog: 0.1 to 999.9 digit	
Integral time (I)		0 to 9999 sec	
Derivative time (D)		0 to 9999 sec	
Control period (T)		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%)	
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		100MΩ (at 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 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	
Noise immunity		±0.5kV the square wave noise (pulse width: 1μs) by the noise simulator	
Environ-ment	Ambient temp.	-10 to 50℃, storage: -20 to 60℃	
	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 c UL us K	
Weight※3	Basic module	Approx. 250.8g (approx. 177.7g)	Approx. 250.4g (approx. 177.3g)
	Expansion module	Approx. 245.7(approx. 172.6g)	Approx. 245.1g(approx. 172.2g)

※1: Connecting 1 or more expansion module can vary measurement accuracy about ±1℃, regardless of the number of connected expansion module.

※2: **At room temperature (23℃±5℃)**
- Thermocouple K, J, N, E below -100℃, L, U, PLII and RTD Cu50Ω, DPt50Ω: (PV ±0.3% or ±2℃, higher one) ±1-digit
- Thermocouple C, G and R, S below 200℃: (PV ±0.3% or ±3℃, higher one) ±1-digit
- Thermocouple B below 400℃: there is no accuracy standards.

Out of room temperature range
- RTD Cu50Ω, DPt50Ω: (PV ±0.5% or ±3℃, higher one) ±1-digit
- Thermocouple R, S, B, C, G: (PV ±0.5% or ±5℃, higher one) ±1-digit
- Others blow -100℃: within ±5℃

※3: The weight includes packaging. The weight in parenthesis is for unit only. ※Environment resistance is rated at no freezing or condensation.

▣ Specifications

◎ Option module

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℃±5℃): (PV ±0.3% or ±1℃, higher one) ±1-digit※3 • Out of room temperature range: (PV ±0.5% or ±2℃, higher one) ±1-digit		• At room temperature (23℃±5℃): ±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)			—	
Comm.	Comm. terminal	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				
Environment	Ambient temp.	-10 to 50℃, storage: -20 to 60℃				
	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 c UL us 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℃, regardless of the number of connected expansion module.

※3: **At room temperature (23℃±5℃)**
- Thermocouple K, J, N, E below -100℃, L, U, PLII and RTD Cu50Ω, DPt50Ω: (PV ±0.3% or ±2℃, higher one) ±1-digit
- Thermocouple C, G and S below 200℃: (PV ±0.3% or ±3℃, higher one) ±1-digit
- Thermocouple B below 400℃: there is no accuracy standards.

Out of room temperature range
- RTD Cu50Ω, DPt50Ω: (PV ±0.5% or ±3℃, higher one) ±1-digit
- Thermocouple R, S, B, C, G: (PV ±0.5% or ±5℃, higher one) ±1-digit
- Others blow -100℃: within ±5℃

※4: The weight includes packaging. The weight in parenthesis is for unit only.

※Environment resistance is rated at no freezing or condensation.

▣ Specifications

◎ Communication module

Model			TMHC-22LE	TMHC-22EE
Communication port			COM1/2	
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.)	
Comm.	COM1 (Master, PLC)	Connection method	RS485/RS422	10BaseT (Modbus/TCP)
		Protocol	Modbus RTU, PLC ladderless comm.	
	COM2 (Master, Group)	Connection method	RS485/RS422	10BaseT (Modbus/TCP)
		Protocol	Modbus RTU	
	PC loader		TTL (Modbus RTU protocol)	
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 1㎲) ±0.5kV R-phase, S-phase	
Environ-ment	Ambient temp.		-10 to 50℃, storage: -20 to 60℃	
	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 c UL us KC	
Weight※2			approx. 219g (approx. 147g)	approx. 200g (approx. 129g)

※1: Voltage of power supply/communication terminal placed in the backside of TMH2/4 Series (basic control module)
※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

▣ Error Display

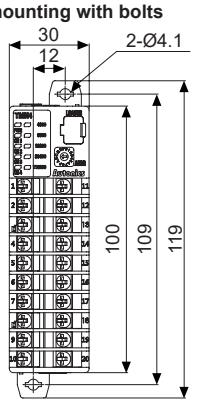
Status / Indicator	Input error※1	Remote SV error※2
PRW	ON (red)	ON (green)
CH※3	Flash (red)	Flash (red)

※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

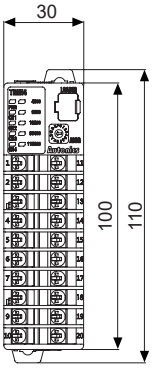
▣ Dimensions

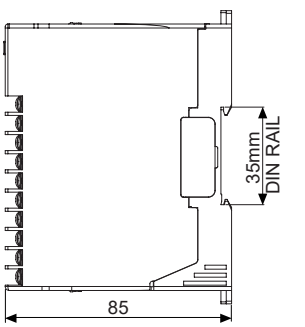
(unit: mm)

●**Rail Lock position: mounting with bolts**



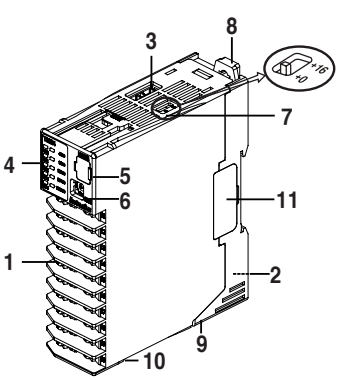
●**Rail Lock position: mounting on DIN Rail**





▣ Unit Description

◎ Control module



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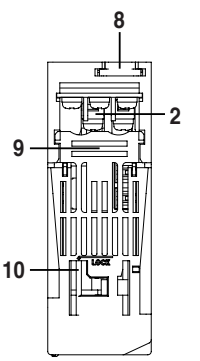
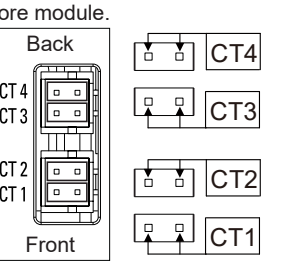


[Bottom]

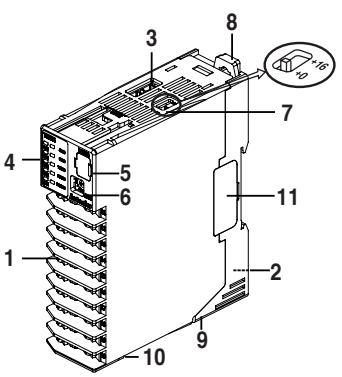
1. Input/Output terminal
For specific information about terminal formation, please refer to '▣ Connections and Isolated Block Diagram'.

2. Power/Comm. terminal [basic module only]
Supplies power to both basic control/expansion module and communicates with one or more module.

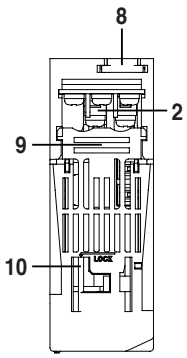
3. CT input terminal
When using the CT input terminal, remove the rubber cap and connect CT in the same direction with right image.
Connect CT with CICT4-□ (CT connector cable, sold separately).
※When connecting CT connector and CT input terminal, align the concave part (凹) and the convex part (凸).



◎ Control module



[Front/Side/Top]



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4. Indicator

●TMH2 Series

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

●TMH4 Series

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

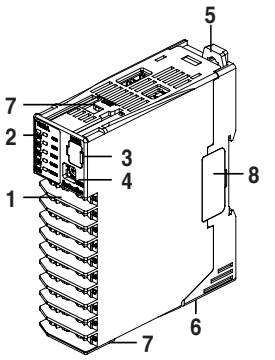
8. Rail lock: Rail lock helps installing the device to DIN rail or with bolts.

9. Lock lever: Lock lever holds module body and base tightly.

10. Module lock connecter 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.

◎ Option module



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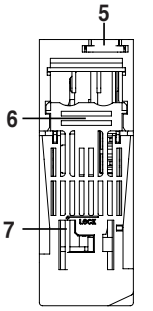


[Bottom]

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 CH 1 CH 2 CH 3 CH 4	LED 1	PWR (green)※2	—	ON	ON
		CH1 (red)		—	ON
		CH2 (red)		—	ON
		CH3 (red)		—	ON
		CH4 (red)		—	ON
	LED 2	(yellow)	Flash (4,800bps)	Module comm. status※3	
		(yellow)	Flash (9,600bps)	ON (CH1)	—
		(yellow)	Flash (19,200bps)	ON (CH2)	—
		(yellow)	Flash (38,400bps)	ON (CH3)	—
		(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)	
					OFF (OPEN)	ON (CLOSE)	OFF (CLOSE)	ON (OPEN)
LED 1 LED 2 PWR AL 1 AL 5 AL 2 AL 6 AL 3 AL 7 AL 4 AL 8	LED 1	PWR (green)※2	—	ON	ON			
		CH1 (red)		—	OFF	ON	OFF	ON
		CH2 (red)		—	OFF	ON	OFF	ON
		CH3 (red)		—	OFF	ON	OFF	ON
		CH4 (red)		—	OFF	ON	OFF	ON
	LED 2	(yellow)	Flash (4,800bps)	Module comm. status※3				
		AL5 (yellow)	Flash (9,600bps)	—	OFF	ON	OFF	ON
		AL6 (yellow)	Flash (19,200bps)	—	OFF	ON	OFF	ON
		AL7 (yellow)	Flash (38,400bps)	—	OFF	ON	OFF	ON
		AL8 (yellow)	Flash (115,200bps)	—	OFF	ON	OFF	ON

●TMHCT [CT input module]

Indicator \ Status			Initial power ON※1	CT input※3	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	
		(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: 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.

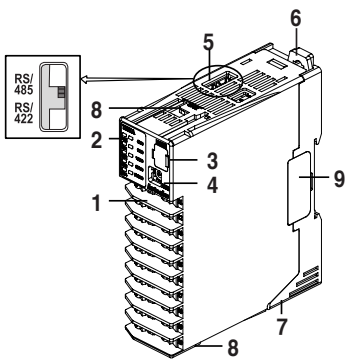
5. Rail lock: Rail lock helps installing the device to DIN rail or with bolts.

6. Lock lever: Lock lever holds module body and base tightly.

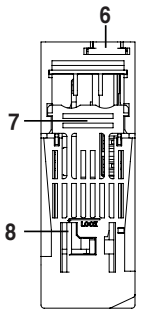
7. Module lock connecter hole: When connect modules, insert module lock connector in the hole in order to enhance coherence between modules.

8. END cover: When connect modules, remove END cover in order to connect expansion connector.

◎ Communication module



[Front/Side/Top]



[Bottom]

1. Communication port
Communication ports are varied by model specification.
Please refer to '▣ Connections and Isolated Block Diagram' for more detail information.

2. Indicator

●TMHC-22LE [RS422/RS485 ladderless communication module]

Indicator \ Status			Initial power ON※1	Internal comm.	Connection	PLC ladderless comm.
LED 1 LED 2 PWR	LED1	PWR	Flash (4,800bps)	Flash (green)	–	Flash (red, Reading)
		(red)	Flash (9,600bps)	Flash (TMH2/4)	–	–
		(red)	Flash (19,200bps)	Flash (TMHA)	–	–
		(red)	Flash (38,400bps)	Flash (TMHE)	–	–
		(red)	Flash (115,200bps)	Flash (TMHCT)	–	–
	LED2	(yellow)	Flash (4,800bps)	–	ON	Flash (Sending)
		(yellow)	Flash (9,600bps)	–	ON (TMH2/4)	–
		(yellow)	Flash (19,200bps)	–	ON (TMHA)	–
		(yellow)	Flash (38,400bps)	–	ON (TMHE)	–
		(yellow)	Flash (115,200bps)	–	ON (TMHCT)	–

※1: At the moment when power is on, the indicator of set communication speed flashes for 5 sec.

●TMHC-22EE [Ethernet communication module]

Indicator \ Status			Initial power ON	Internal comm.	Connection
LED 1 LED 2 PWR	LED1	PWR(green)	ON	Flash (external device)	–
		(red)	–	Flash (TMH2/4)	–
		(red)	–	Flash (TMHA)	–
		(red)	–	Flash (TMHE)	–
		(red)	–	Flash (TMHCT)	–
	LED2	(yellow)	–	ON	Flash (Ethernet comm.)
		(yellow)	Sequence-flashing vertically for 5 sec	–	ON (TMH2/4)
		(yellow)		–	ON (TMHA)
		(yellow)		–	ON (TMHE)
		(yellow)		–	ON (TMHCT)

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. Communication mode switch (SW2): Select communication mode between RS485 and RS422. (TMHC-22LE only)
6. Rail lock: Rail lock helps installing the device to DIN rail or with bolts.
7. Lock lever: Lock lever holds module body and base tightly.
8. Module lock connecter hole: When connect modules, insert module lock connector in the hole in order to enhance coherence between modules.
9. END cover: When connect modules, remove END cover in order to connect expansion connector.

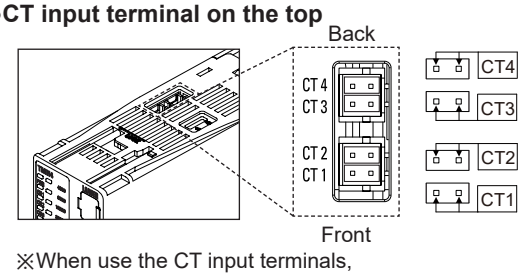
▣ Connections and Isolated Block Diagram

※Use terminals of size specified below.

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

◎ Control module

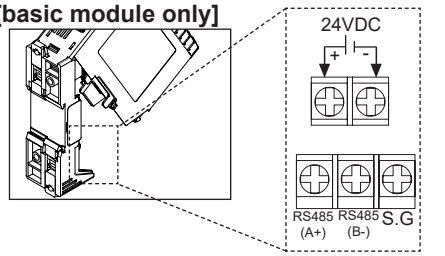
●CT input terminal on the top



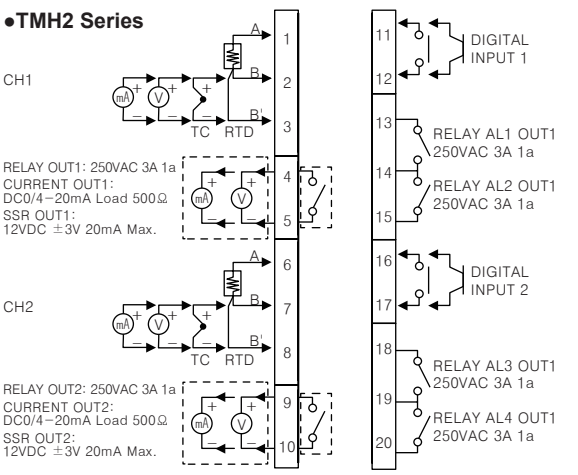
※When use the CT input terminals, remove the robber cap.

※Connect CT with CICT4-□(CT connector cable, sold separately).

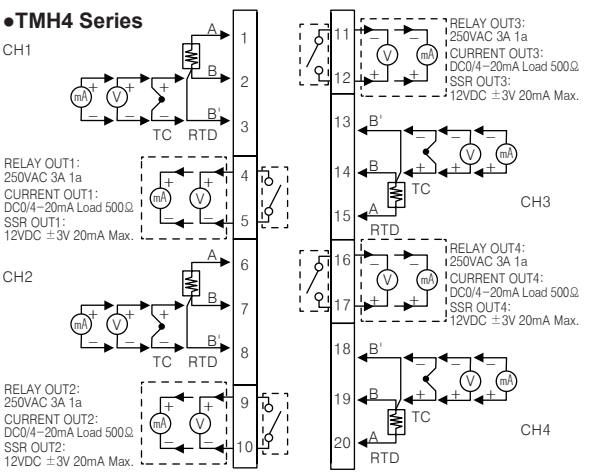
●Power/Comm. terminal on the back [basic module only]



●TMH2 Series

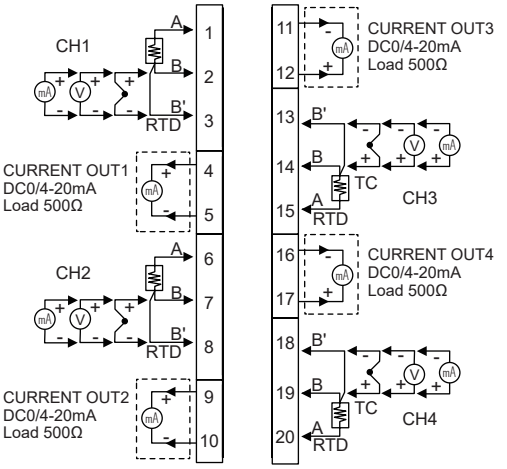


●TMH4 Series

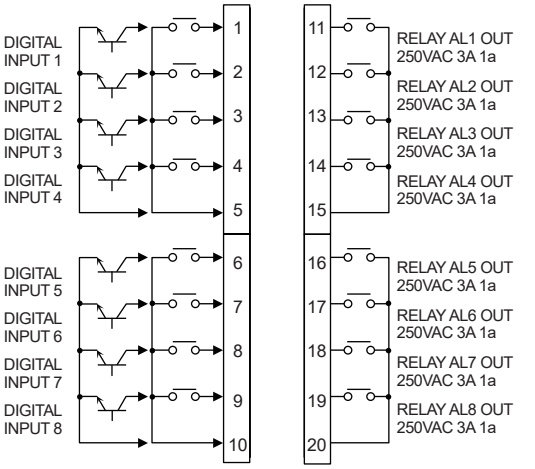


◎ Option module

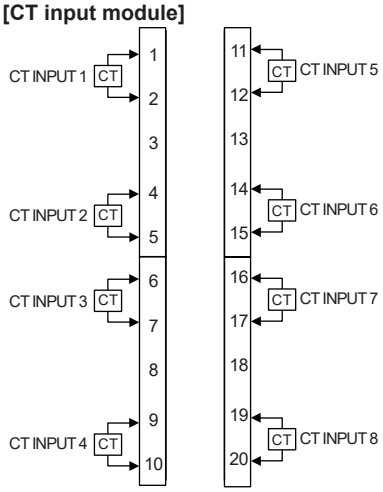
●TMHA [analog input/output module]



●TMHE [digital input, alarm output module]

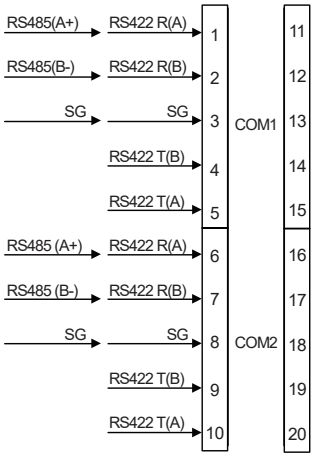


●TMHCT [CT input module]

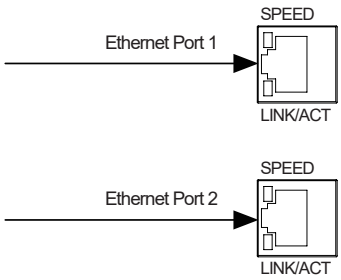


◎ Communication module

●TMHC-22LE [RS422/RS485 ladderless communication module]



●TMHC-22EE [Ethernet communication module]



▣ Sold Separately

◎ Communication converter

• SCM-WF48
(Wi-Fi to RS485·USB wireless communication converter)

• SCM-US48I
(USB to RS485 converter)

• SCM-38I
(RS232C to RS485 converter)

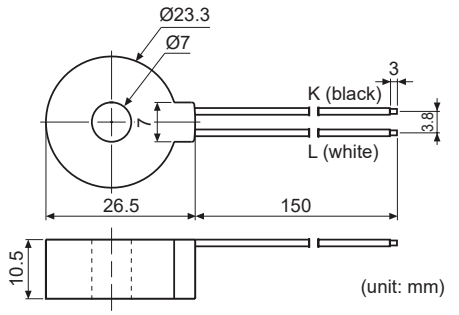
• SCM-US
(USB to Serial converter)

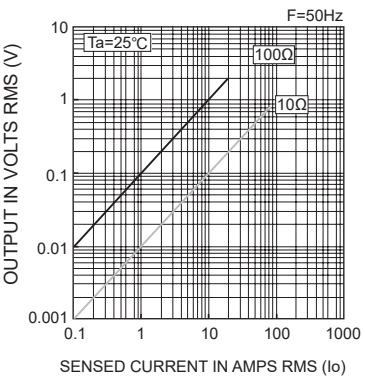
• EXT-US
(converter cable)

▣ Sold Separately

◎ Current transformer (CT)

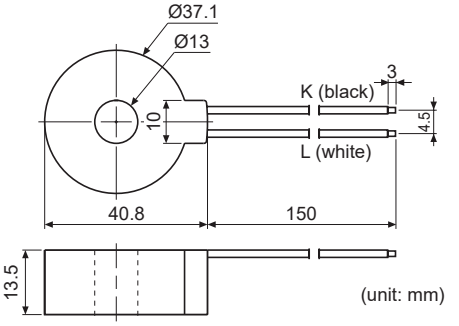
- **CSTC-E80LN**

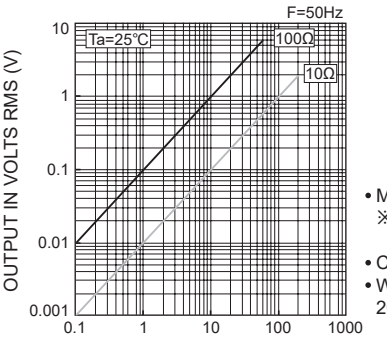




- Max. load current: 80A (50/60Hz)
  ※Max. load current for TMH Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance: 31Ω±10%

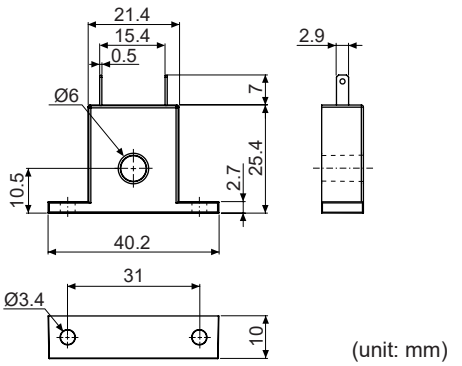
- **CSTC-E200LN**

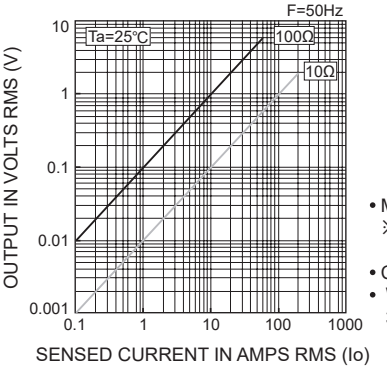




- Max. load current: 200A (50/60Hz)
  ※Max. load current for TMH Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance: 20Ω±10%

- **CSTS-E80PP**



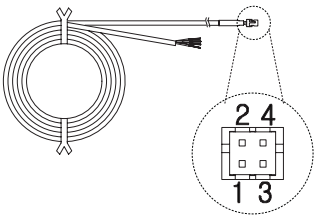


- Max. load current: 80A (50/60Hz)
  ※Max. load current for TMH Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance 31Ω±10%

※Do not supply primary current in case that CT output is open. High voltage will be generated in CT output.
※The current for above CTs is 50A same but inner hole sizes are different. Please use this for your environment.

◎ CT connector cable

- **CICT4-1 (cable length: 1m)**
- **CICT4-3 (cable length: 3m)**

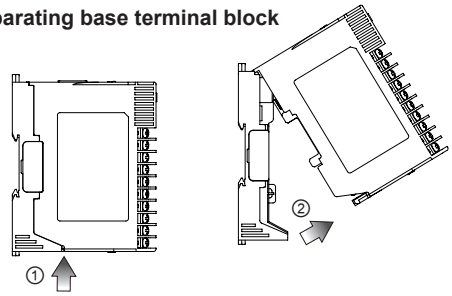


Pin number	Cable color	CT connection
1	Brown	CT1/3
2	Blue	CT1/3
3	White	CT2/4
4	Black	CT2/4

※When connecting CT connector and CT input terminal, align the concave part (凹) and the convex part (凸).

▣ Installation

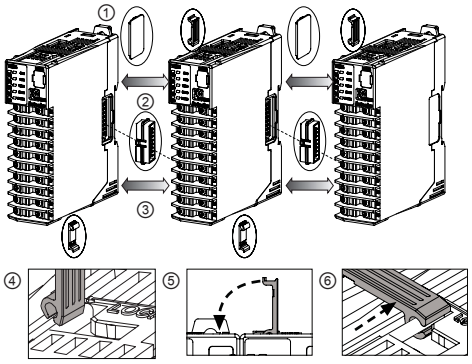
1. Separating base terminal block



① Push the lock lever at the bottom of the module.
② Pull the body of the module and open up.
※When connecting base terminal block, align the upper concave part (凹) of the body and the upper convex part (凸) 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)

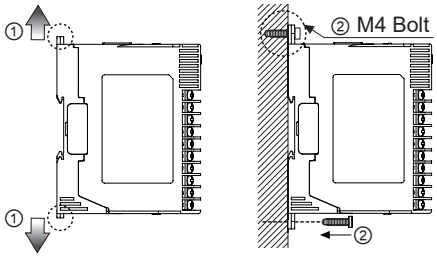


①Remove END cover of each module (except END cover of the first and last module).
②Insert expansion connector.
③Put all together tightly (max. 31 units).
④Insert module lock connector.
⑤Push module lock connector and insert in lock connector hole of another module on the side.
⑥Push module lock connector 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

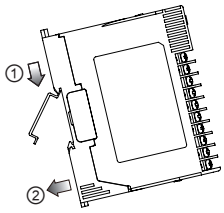

Module lock connector

3. Mounting with bolts



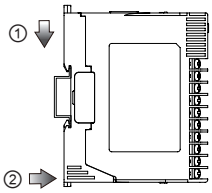
①Pull the rail lock at the top and bottom of the module.
②Insert bolts and fix it on rail lock.
(fixing torque is 0.5 to 0.9N·m.)

4. Mounting on DIN rail
4.1 Installing



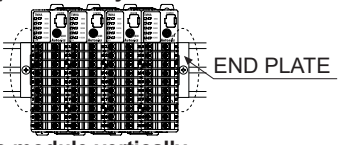
①Hang the top rail lock to DIN rail.
②Push and press the module to down direction.

4.2 Removing

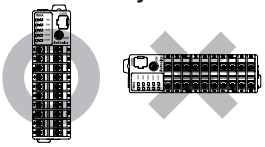


①Press the module down.
②Pull the module body forward.

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



※Install the module vertically.



▣ Input Type and Range

Input type			Decimal point	Display	Temperature range(℃)	Temperature range(℉)
Thermo-couple	K(CA)		1	K(CA).H	-200 to 1350	-328 to 2463
			0.1	K(CA).L	-200.0 to 1350.0	-328.0 to 2463.0
	J(IC)		1	J(IC).H	-200 to 800	-328 to 1472
			0.1	J(IC).L	-200.0 to 800.0	-328.0 to 1472.0
	E(CR)		1	E(CR).H	-200 to 800	-328 to 1472
			0.1	E(CR).L	-200.0 to 800.0	-328.0 to 1472.0
	T(CC)		1	T(CC).H	-200 to 400	-328 to 752
			0.1	T(CC).L	-200.0 to 400.0	-328.0 to 752.0
	B(PR)		1	B(PR)	0 to 1800	32 to 3272
	R(PR)		1	R(PR)	0 to 1750	32 to 3182
	S(PR)		1	S(PR)	0 to 1750	32 to 3182
	N(NN)		1	N(NN)	-200 to 1300	-328 to 2372
	C(TT)		1	C(TT)	0 to 2300	32 to 4172
	G(TT)		1	G(TT)	0 to 2300	32 to 4172
	L(IC)		1	L(IC).H	-200 to 900	-328 to 1652
			0.1	L(IC).L	-200.0 to 900.0	-328.0 to 1652.0
	U(CC)		1	U(CC).H	-200 to 400	-328 to 752
			0.1	U(CC).L	-200.0 to 400.0	-328.0 to 752.0
	Platinel II		1	PLII	0 to 1390	32 to 2534
RTD	Cu 50Ω		0.1	CU 50	-200.0 to 200.0	-200.0 to 392.0
	Cu 100Ω		0.1	CU 100	-200.0 to 200.0	-200.0 to 392.0
	JIS standard	JPt 100Ω	1	JPt100.H	-200 to 650	-328 to 1202
		JPt 100Ω	0.1	JPt100.L	-200.0 to 650.0	-328.0 to 1202.0
	DIN standard	DPt 50Ω	0.1	DPt50.L	-200.0 to 600.0	-328.0 to 1202.0
		DPt 100Ω	1	DPt100.H	-200 to 650	-328 to 1202
		DPt 100Ω	0.1	DPt100.L	-200.0 to 650.0	-328.0 to 1202.0
	Nickel 120Ω		1	NI12	-80 to 200	-112 to 392
Analog	Voltage	0 to 10V	—	AV1	0 to 1000	
		0 to 5V	—	AV2	0 to 5000	
		1 to 5V	—	AV3	1000 to 5000	
		0 to 100mV	—	AMV1	0 to 1000	
	Current	0 to 20mA	—	AMA1	0 to 2000	
		4 to 20mA	—	AMA2	400 to 2000	

▣ Functions

1. Analog input special function TMH2/4 TMHA

In case of analog input, it displays the applied measured value of the set special function.

1) Linear

It applies low-limit scale and high-limit scale to low-limit input value and high-limit input value and displays this values.

E.g.) In case of input type: 0-10V, low-limit input value: 0V, high-limit input value: 10V, low-limit scale: 0, high-limit scale: 1000, present input value is 2V and the display value is 200.

2) Root

In case of voltage, current (shunt) input, this mode is used when input value is calculated by Root(√) for the desired display value. Differential pressure signal of differential pressure flow meter is calculated Root(√) for the to-be measured flux. This function is used to measure flux by input value.

E.g.) In case of input type: 0-10V, low-limit input value: 0V, high-limit input value: 10V, low-limit scale: 0, high-limit scale: 1000, present input value is 2V and the display value is 447.

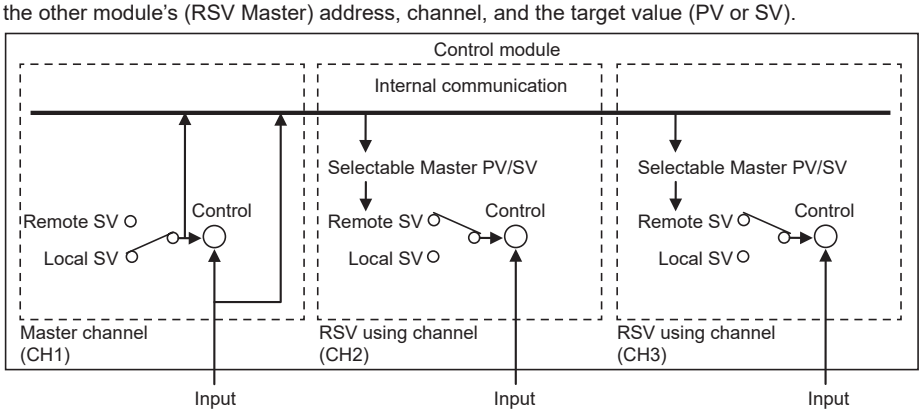
3) Square

In case of voltage, current (shunt) input, this mode is used when input value is calculated by square for the desired display value.

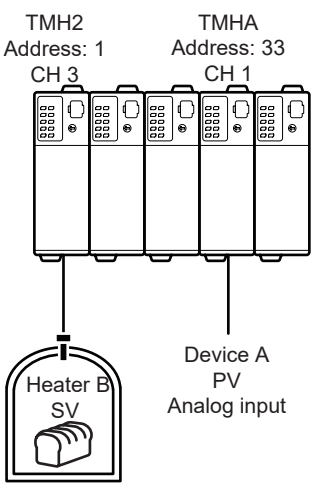
E.g.) In case of input type: 0-10V, low-limit input value: 0V, high-limit input value: 10V, low-limit scale: 0, high-limit scale: 1000, present input value is 2V and the display value is 40.

2. Remote SV TMH2/4

SV setting is available to set using PV or SV of the other module/channel not the direct setting of the module/channel. Set the other module's (RSV Master) address, channel, and the target value (PV or SV).



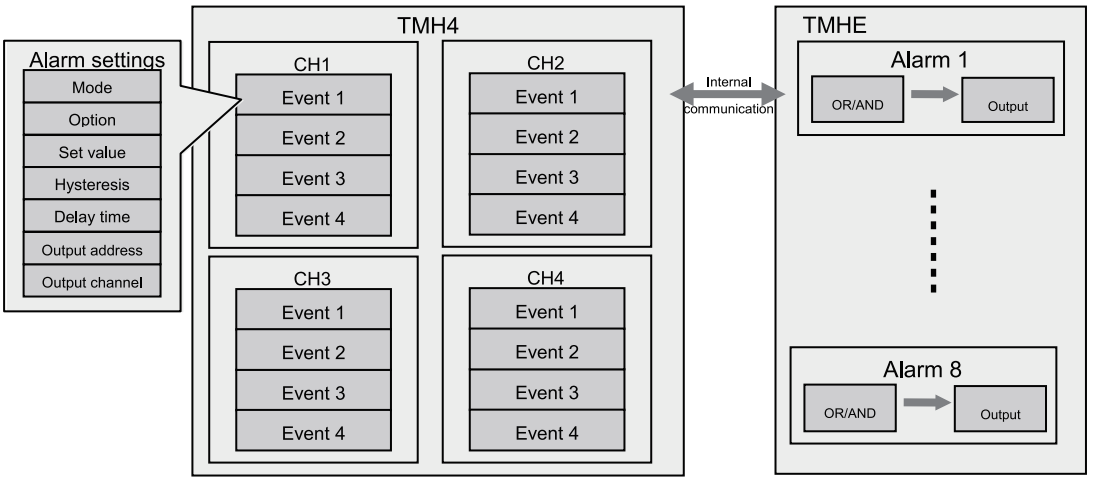
E.g.) RSV function is available when PV of TMHA (address 33, channel 1) is used for SV of TMH2(address 1, channel 3). Set RSV Master setting of TMH2. RSV Master address: 33, RSV Master channel: 1, RSV Master channel target: PV



3. Alarm TMH2/4 TMHE

Alarm output (Alarm) is output terminal and alarm (Event) is for alarm setting by each channel.
One channel is available to set total 4 alarms (Event 1 to 4).
One alarm consists of alarm mode, option, set value, hysteresis, delay time, output address, and channel settings, etc.

● Using TMHE Option module alarm output
TMH2/4 is connectable to TMHE option module. (according to address setting)
TMH4 does not have built-in alarm and TMHE option module outputs alarm when alarm condition occurs by internal communication.
Several alarm (Event 1 to 4) is selectable as one alarm output and AND/OR operation is selectable at TMHE.



4. CT input value indicators channel TMHCT

The indicator of TMHCT turns ON by the input value of CT.

Indicator \ Status			CT input
LED 1 LED 2 PWR	LED 1	PWR (green)	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)	—
		(yellow)	ON (40.1 to 50.0A)
		(yellow)	ON (30.1 to 40.0A)
		(yellow)	ON (20.1 to 30.0A)
		(yellow)	ON (10.1 to 20.0A)

Set at LED 1: CT Input Value Indication Lamp1 / LED 2: CT Input Value Indication Lamp2 of TMHC.

5. User parameter group TMH2/4 TMHA TMHE TMHCT TMHC

At DAQMaster, user parameter group of each module, TMH2/4/A/E/CT/C, is available to set.
This function is able to set the frequently used parameters to the user parameter group, so you can quickly and easily set the parameter settings.
In addition, the parameters set to the user group are configured sequentially and consecutively in TMHC, so it can improve efficiency of communication to the master device via batch read/write process.
For more information, refer to the user manual for communication.
Visit our website (www.autonics.com) to download the DAQMaster program and the manuals.

▣ Communication Setting

It is for parameter setting and monitoring via external devices (PC, PLC, etc.).
In case of TMHC, set COM1/2 both.

◎ Interface

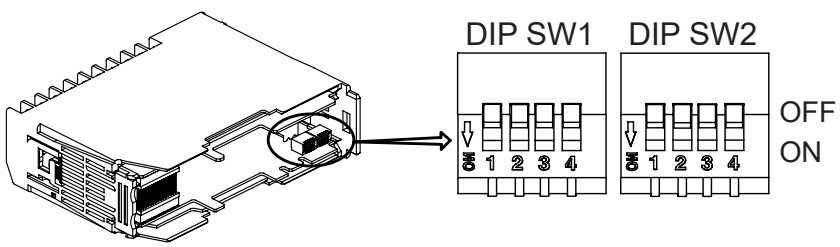
Protocol	TMH2/4/TMHA/TMHE/TMHCT/		Modbus RTU
	TMHC	-22LE	Modbus RTU, PLC ladderless comm.
		-22EE	10BaseT (Modbus/TCP)
Connection method	TMH2/4/TMHA/TMHE/TMHCT/		RS485
	TMHC	-22LE	RS422, 485
		-22EE	10BaseT (Modbus/TCP)
Maximum connection	TMH2/4		32unit (address: 01 to 32) (in case connecting TMHC module: 16 units (address: 01 to 16))
	TMHA/TMHE/TMHCT		Each module 16 units
	TMHC		16 control modules and 16 option modules per 1 TMHC module
Synchronization type			Asynchronous
Communication method			Two-wire half duplex
Communication effective range			Max. 800m
Communication speed			4800, 9600 (default), 19200, 38400, 115200 bps
Response time			5 to 99ms (default: 20ms)
Start bit			1-bit (fixed)
Data bit			8-bit (fixed)
Parity bit			None (default), Odd, Even
Stop bit			1bit, 2bit (default)

◎ Mac address [Ethernet comm. module: TMHC-22EE]

After connecting Ethernet module (TMHC-22EE), can check Mac address in 'Property - Mac address' item.
For more details as like method of module connection, refer to the user manual for TMH.
※Mac address is the network address for Ethernet communication.

◎ DIP switch configuration [PLC ladderless comm. module: TMHC-22LE]

After separating base terminal block, set communication speed, stop bit, PLC connection and protocol by using a internal DIP switch. (Default: All switches OFF(configure via PC))
※When connecting PLC, apply setting value to COM1 only.



- SW1

1	2	**Comm. speed**
OFF	OFF	Comm. parameter setting
OFF	ON	19200bps
ON	OFF	38400bps
ON	ON	115200bps

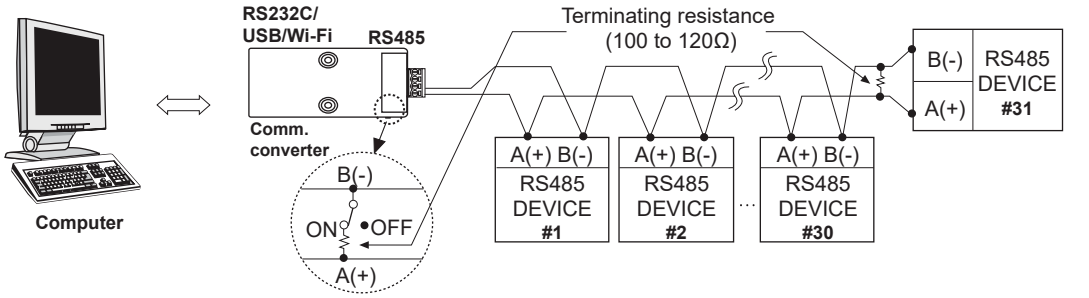
3	4	**Stop bit**
OFF	OFF	Comm. parameter setting
OFF	ON	Stop bit: 1bit
ON	OFF	Stop bit: 2bit
ON	ON	–

- SW2

1	2	3	4	**PLC connection and Protocol**
OFF	OFF	OFF	OFF	Comm. parameter setting
OFF	OFF	OFF	ON	MODBUS(RTU) protocol
OFF	OFF	ON	OFF	LS MASTER-K Series special protocol
OFF	OFF	ON	ON	LS GLOFA-GM Series special protocol
OFF	ON	OFF	OFF	LS XGT/XGB Series special protocol
OFF	ON	OFF	ON	MITSUBISHI MELSEC Series special protocol Q/QnACPU common command (1401/0401)
OFF	ON	ON	OFF	MITSUBISHI MELSEC Series special protocol ACPU common Command (WW/WR)
OFF	ON	ON	ON	OMRON SYSMAC Series special protocol

▣ Communication Setting

◎ Application of system organization



※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).
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). (default: [SW1] 1)

Module \ SW		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
TMH4/2	+0	16	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
	+16	32	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
TMHC		16	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
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

※When using TMHC, in case connecting only TMHC to Master (PC, PLC, etc.), communication address of TMHC and TMH2/4 Series control module can be duplicated. However, in case connecting both TMHC and TMH2/4 Series control module to Master, communication address must not be duplicated. (If the TMHC and TMH modules communicate to Master at the same time, a communication error may occur.)

◎ Caution for communication interface setting

When changing the setting value related to communication interface, reboot the device for normal operation.

▣ Proper Usage

◎ 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 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.
- 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.
- 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.
- 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