Autonics

Modular 2/4-Channel PID Temperature Controllers with Screw Connector

TMH Series
CATALOG

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.
The specifications, dimensions, etc are subject to change without notice for product improvement Some models may be discontinued without notice.

Features

[Common]
- Easy maintenance with detachable body and base terminal
- Power supply and communication with expansion connectors (up to 32 units)

[TMH2/4 Series (Control Module)]
- Multi-channel (2-channel/4-channel) input and output control: Expandable up to 32 units (64-channels/128-channels)
- 50 ms high-speed sampling rate and ±0.3% measurement accuracy
- Simultaneous heating and cooling control function and auto/manual control mode (patent: Korea Patent Registration 10-1624105)

[TMHA (Analog Input / Output Option Module)]
- 4 channels, various input types/temperature ranges/transmission outputs
- 50 ms high-speed sampling rate and ±0.3% measurement accuracy

[TMHE (Digital Input / Alarm Output Option Module)]
- 8 digital inputs / 8 alarm outputs

[TMHCT (CT Input Option Module)]
- 8 CT inputs

[TMHC (Communication Modules)]
- Allows connection of control modules and option modules to master devices
- Connect up to 32 control/option modules per communication model

Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

■ Control module

T	M	H	❶	-	❷	2	❸	❹

❶ Channel
2: 2 channels
4: 4 channels

❷ Alarm output
2: Alarm output 1/2 (2 channels)
4: Alarm output 1/2/3/4 (2 channels)
N: None (4 channels)

❸ Control output
R: Relay output
S: SSR drive output
C: Selectable current or SSR drive output

❹ Module type
B: Basic module
E: Expansion module
- Since the expansion module is not supplied with power/comm. terminal. Use it with the basic module.

■ Option module

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

■ Communication module

Model	Connection type	Protocol
TMHC-22LE	RS422, RS485	Modbus RTU, PLC Ladderless communication
TMHC-22EE	Ethernet (10BaseT)	Modbus TCP

DAQMaster

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

Specifications

■ Control module

Model	TMH2	TMH4
No. of channels	2 channels	4 channels
Sampling period	50 ms (2 channels or 4 channels synchronous sampling)	
Input specification	Thermocouple, RTD, Analog (refer to 'Input Specification')	
CT input	• 0.0 - 50.0A (primary current measurement range) • CT ratio: 1/1,000, • Measurement accuracy: ±5% F.S. ±1 digit	
Digital input	• Connect input ON: ≤ 1 kΩ, OFF: ≥ 100 kΩ • Solid state input Residual voltage: ≤ 0.9 V, Leakage current: ≤ 0.5 mA • Outflow current: ≈ 0.3 mA per input	-
Control type	Heating, cooling, heating & cooling: ON/OFF, P, PI, PD, PID control	
Control output	• Relay: 250 VAC~ 3 A 1a mechanical life cycle: ≥ 10,000,000 operations, electrical life cycle: ≥ 100,000 operations • SSR: 12 VDC⎓ ±3 V, ≤ 20 mA • Current[01]: DC 4 - 20 mA or DC 0 - 20 mA (Load: ≤ 500 Ω)	
Alarm output	250 VAC~ 3 A 1a Mechanical life cycle: ≥ 10,000,000 operations Electrical life cycle: ≥ 100,000 operations	-
Communication	Modbus RTU	
Hysteresis	• Thermocouple / RTD: 1 to 100 (0.1 to 100) °C/°F • Analog: 1 to 100 digit	
Proportional band (P)	• Thermocouple / RTD: 1 to 999 (0.1 to 999.9) °C/°F • Analog: 0.1 to 999.9 digit	
Integral time (I)	0 to 9,999 sec	
Derivative time (D)	0 to 9,999 sec	
Control period (T)	• Relay output, SSR drive output: 0.1 to 120.0 sec • Selectable current or SSR drive output: 1.0 to 120.0 sec	
Manual reset	0 to 100 (0.0 to 100.0) %	
Insulation type	Double insulation or reinforced insulation (mark: ⊡, dielectric strength between the measuring input part and the power part: 1 kV)	
Unit weight (packaged)	• Basic module: ≈ 178 g (≈ 251 g) • Expansion module: ≈ 173 g (≈ 246 g)	

01) When the control output is set to the current output, the heater current value monitoring function through the CT input terminals is not available.

■ Option module

Model	TMHA-42AE
No. of channels	4 channels
Sampling period	50 ms (4 channels synchronous sampling)
Input specification	Thermocouple, RTD, analog (refer to 'Input Specification')
Transmission output	DC 4 - 20 mA or DC 0 - 20 mA (Load: ≤ 500 Ω)
Communication	Modbus RTU
Insulation type	Double insulation or reinforced insulation (mark: ⊡, dielectric strength between the measuring input part and the power part: 1 kV)
Unit weight (packaged)	≈ 161 g (≈ 234 g)

Model	TMHE-82RE	TMHCT-82NE
No. of channels	8 points	8 points
Input specification	- Digital input • Connect input ON: ≤ 1 kΩ, OFF: ≥ 100 kΩ • Solid state input Residual voltage: ≤ 0.9 V, Leakage current: ≤ 0.5 mA • Outflow current: ≈ 0.3 mA per input	- CT input • 0.0-50.0 A (primary current measurement range) • CT ratio: 1/1,000 • Measurement accuracy: ±5% F.S. ±1 digit
Alarm output	250 VAC~ 3 A 1a, • Mechanical life cycle: ≤ 10,000,000 operations • Electrical life cycle: ≤ 100,000 operations	-
Communication	• Comm. terminal: RS485, • PC loader: TTL • Protocol: Modbus RTU,	
Insulation type	Double insulation or reinforced insulation (mark: ⊡, dielectric strength between the measuring input part and the power part: 1 kV)	-
Unit weight (packaged)	≈ 166 g (≈ 239 g)	≈ 148 g (≈ 221 g)

■ Communication module

Model		TMHC-22LE	TMHC-22EE
Communi-cation	COM1	• Connection type: RS422 / RS485 • Protocol: Modbus RTU, PLC Ladderless communication	• Connection type: Ethernet (10BaseT) • Protocol: Modbus TCP
	COM2		
	PC loader	TTL (Protocol: Modbus RTU)	
Insulation type		Double insulation or reinforced insulation (mark: ⊡, dielectric strength between the measuring input part and the power part: 1 kV)	
Unit weight (packaged)		≈ 147 g (≈ 219 g)	≈ 129 g (≈ 200 g)

■ Common

Power supply[01]	24 VDC⎓
Allowable voltage range	90 to 110% of rated voltage
Power Consumption	≤ 5 W (for max. load)
Display type	None- parameter setting and monitoring is available at external devices
Memory retention	≈ 10 years (non-volatile semiconductor memory type)
Insulation resistance	100 MΩ (500 VDC⎓ megger)
Dielectric strength	1,000 VAC~ 50/60 Hz 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	Square shaped noise by noise simulator (pulse width 1 μs) ±0.5 kV
Ambient temperature	-10 to 50 °C, storage: -20 to 60 °C (no freezing or condensation)
Ambient humidity	35 to 85%RH, Storage: 35 to 85%RH (no freezing or condensation)
Accessory	Expansion connector: 1, module lock connector: 2
Protection structure	IP20 (IEC standard)
Approval	CE cULus KC EAC

01) The control extension/option/communication module uses the power voltage from the control basic module.

Input Specifications

■ Input type and range

The setting range of some parameters is limited when using the decimal point display.

Input type		Decimal point	Display Method	Input range (°C)	Input range (°F)
Thermo-couple	K (CA)	1	K (CA) .H	-200 to 1,350	-328 to 2,463
		0.1	K (CA) .L	-200.0 to 1,350.0	-328.0 to 2463.0
	J (IC)	1	J (IC) .H	-200 to 800	-328 to 1,472
		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 1,472
		0.1	E (CR) .L	-200.0 to 800.0	-328.0 to 1,472.0
	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 1,800	32 to 3,272
	R (PR)	1	R (PR)	0 to 1,750	32 to 3,182
	S (PR)	1	S (PR)	0 to 1,750	32 to 3,182
	N (NN)	1	N (NN)	-200 to 1,300	-328 to 2,372
	C (TT)	1	C (TT)	0 to 2,300	32 to 4,172
	G (TT)	1	G (TT)	0 to 2,300	32 to 4,172
	L (IC)	1	L (IC) .H	-200 to 900	-328 to 1,652
		0.1	L (IC) .L	-200.0 to 900.0	-328.0 to 1,652.0
	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 1,390	32 to 2,534
RTD	Cu50 Ω	0.1	CU 50	-200.0 to 200.0	-200.0 to 392.0
	Cu100 Ω	0.1	CU 100	-200.0 to 200.0	-200.0 to 392.0
	JPt100 Ω	1	JPt100.H	-200 to 650	-328 to 1,202
	JPt100 Ω	0.1	JPt100.L	-200.0 to 650.0	-328.0 to 1,202.0
	DPt50 Ω	0.1	DPt50.L	-200.0 to 600.0	-328.0 to 1,202.0
	DPt100 Ω	1	DPt100.H	-200 to 650	-328 to 1,202
	DPt100 Ω	0.1	DPt100.L	-200.0 to 650.0	-328.0 to 1,202.0
	Nickel120 Ω	1	NI12	-80 to 260	-112 to 500
Analog	0 to 10 V	-	AV1	0 to 1,000	
	0 to 5 V	-	AV2	0 to 5,000	
	1 to 5 V	-	AV3	1,000 to 5,000	
	0 to 100 mV	-	AMV1	0 to 1,000	
	0 to 20 mA	-	AMA1	0 to 2,000	
	4 to 20 mA	-	AMA2	400 to 2,000	

• Permissible line resistance per line: ≤ 5 Ω

■ Measurement accuracy

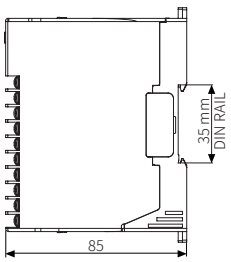
Input type	Using temperature	Measurement accuracy
Thermo-couple	At room temperature (23 ±5 °C)	(PV ±0.3% or ±1 °C higher one) ±1-digit • Thermocouple K, J, T, N, E below -100 °C and L, U, PLII, RTD Cu50 Ω, DPt50 Ω: (PV ±0.3% or ±2 °C higher one) ±1-digit • Thermocouple C, G and R, S below 200 °C: (PV ±0.3% or ±3 °C higher one) ±1-digit • Thermocouple B below 400°C: there is no accuracy standards
RTD	Out of room temperature range	(PV ±0.5% or ±2 °C higher one) ±1-digit • RTD Cu50 Ω, DPt50 Ω: (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 • Other sensors: ≤ ±5 °C (≤-100 °C)
Analog	At room temperature (23 ±5 °C)	±0.3% F.S. ±1-digit
	Out of room temperature range	±0.5% F.S. ±1-digit

• Connecting 1 or more expansion module can vary measurement accuracy about ±1°C, regardless of the number of connected expansion module.

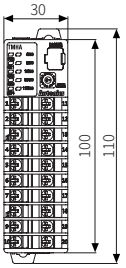
Dimensions

• Unit: mm, For the detailed drawings, follow the Autonics website.

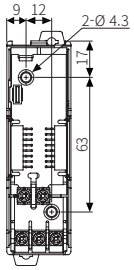
■ Side



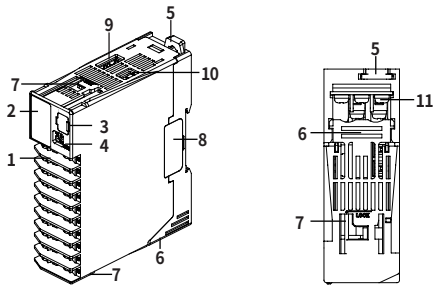
■ Front



■ Inside



Unit Descriptions



[Front / Side / Top] [Bottom]

1. Input / Output Terminal

Refer to 'Connection' for the details about terminal description.

2. Indicator

- Control module: TMH2

Indicator	Status	Initial power ON [01]	Control output	Auto tuning [02]	Alarm output N.O. OFF	Alarm output N.O. ON	Alarm output N.C OFF	Alarm output N.C ON
PWR	PWR (green) [03]	-	ON	ON	-			
CH 1 AL 1	CH1 (red)		ON	Flash				
	CH2 (red)		ON	Flash				
	(red)		ON [04]	OFF				
	(red)		ON [05]	OFF				
CH 2 AL 2	(yellow)	Flash (4,800 bps)	Module communication status [06]					
AL 3	AL1 (yellow)	Flash (9,600 bps)	-	-	OFF	ON	OFF	ON
	AL2 (yellow)	Flash (19,200 bps)	-	-	OFF	ON	OFF	ON
AL 4	AL3 (yellow)	Flash (38,400 bps)	-	-	OFF	ON	OFF	ON
	AL4 (yellow)	Flash (115,200 bps)	-	-	OFF	ON	OFF	ON

- Control module: TMH4

Indicator	Status	Initial power ON [01]	Control output	Auto tunning [02]
PWR	PWR (green) [03]	-	ON	ON
CH 1	CH1 (red)		ON	Flash
	CH2 (red)		ON	Flash
CH 2	CH3 (red)		ON	Flash
	CH4 (red)		ON	Flash
CH 3	(yellow)	Flash (4,800 bps)	Module communication status [06]	
	(yellow)	Flash (9,600 bps)	-	-
CH 4	(yellow)	Flash (19,200 bps)	-	-
	(yellow)	Flash (38,400 bps)	-	-
	(yellow)	Flash (115,200 bps)	-	-

- Option module: TMHA [Analog input / output]

Indicator	Status	Initial power ON [01]	Internal comm.	Transmission output
PWR	PWR (green) [07]	-	ON	ON
CH 1	CH1 (red)		-	ON
	CH2 (red)		-	ON
CH 2	CH3 (red)		-	ON
	CH4 (red)		-	ON
CH 3	(yellow)	Flash (4,800 bps)	Module communication status [06]	
	(yellow)	Flash (9,600 bps)	ON (CH1)	-
CH 4	(yellow)	Flash (19,200 bps)	ON (CH2)	-
	(yellow)	Flash (38,400 bps)	ON (CH3)	-
	(yellow)	Flash (115,200 bps)	ON (CH4)	-

- Option module: TMHE [Digital input, Alarm output]

Indicator	Status	Initial power ON [01]	Internal comm.	Alarm output N.O. Open	Alarm output N.O. Closed	Alarm output N.C. Open	Alarm output N.C. Closed
PWR	PWR (green) [07]	-	ON	ON			
AL 1 AL 5	AL1 (red)		-	OFF	ON	OFF	ON
	AL2 (red)		-	OFF	ON	OFF	ON
AL 2 AL 6	AL3 (red)		-	OFF	ON	OFF	ON
	AL4 (red)		-	OFF	ON	OFF	ON
AL 3 AL 7	(yellow)	Flash (4,800 bps)	Module communication status [06]				
	AL5 (yellow)	Flash (9,600 bps)	-	OFF	ON	OFF	ON
AL 4 AL 8	AL6 (yellow)	Flash (19,200 bps)	-	OFF	ON	OFF	ON
	AL7 (yellow)	Flash (38,400 bps)	-	OFF	ON	OFF	ON
	AL8 (yellow)	Flash (115,200 bps)	-	OFF	ON	OFF	ON

- Option module: TMHCT [CT input]

Indicator	Status	Initial power ON [01]	CT input [08]	Internal comm.
PWR	PWR (green) [07]	-	ON	ON
	(red)		ON (40.1 to 50.0 A)	-
	(red)		ON (30.1 to 40.0 A)	-
	(red)		ON (20.1 to 30.0 A)	-
	(red)		ON (10.1 to 20.0 A)	-
	(yellow)	Flash (4,800 bps)	Module communication status [06]	
	(yellow)	Flash (9,600 bps)	ON (40.1 to 50.0 A)	-
	(yellow)	Flash (19,200 bps)	ON (30.1 to 40.0 A)	-
	(yellow)	Flash (38,400 bps)	ON (20.1 to 30.0 A)	-
	(yellow)	Flash (115,200 bps)	ON (10.1 to 20.0 A)	-

- Communication module: TMHC-22LE [Ladderless communication]

Indicator	Status	Initial power ON [09]	Internal comm.	Connection	Ladderless communication
PWR	PWR	Flash (4,800 bps)	Flash (green)	-	Flash (red, read operation)
	(red)	Flash (9,600 bps)	Flash (TMH2/4)		-
	(red)	Flash (19,200 bps)	Flash (TMHA)		-
	(red)	Flash (38,400 bps)	Flash (TMHE)		-
	(red)	Flash (115,200 bps)	Flash (TMHCT)		-
	(yellow)	Flash (4,800 bps)	-	ON	Flash (send operation)
	(yellow)	Flash (9,600 bps)		ON (TMH2/4)	-
	(yellow)	Flash (19,200 bps)		ON (TMHA)	-
	(yellow)	Flash (38,400 bps)		ON (TMHE)	-
	(yellow)	Flash (115,200 bps)		ON (TMHCT)	-

- Communication module: TMHC-22EE [Ethernet communication]

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

01) At the moment when power is on, the indicator of set communication speed flashes for 5 sec.

02) Indicator of the channel, which is in the process of auto-tuning, flashes at 1 sec interval.

03) When communicating with external device, PWR indicator flashes.

04) Turns on, when CH1 outputs cooling control in the heating&cooling control method.

05) Turns on, when CH2 outputs cooling control in the heating&cooling control method.

06) • ON: Internal comm. (normal) • Flash: Internal comm. (abnormal) • OFF: not communicating

07) • 1 sec interval flash: external comm. (normal) • ON: Internal comm. (normal) • Flash: Internal comm. (abnormal) • OFF: not Internal communicating

08) The indicator corresponding to the certain setting value of CT input flashes according to the parameter.
• LED 1: CT Input Value Indication Lamp1 • LED 2: CT Input Value Indication Lamp2

09) At the moment when power is ON, the indicator of communication speed flashes for 5 sec at 1 sec interval.
• LED 1: HOST 1 • LED 2: HOST 2

3. PC loader port

PC loader port supports serial communication between single module and PC. It needs communication converter 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. Refer to 'Installation Method' for the details.

6. Lock lever

Lock lever holds module body and base tightly.

7. Module lock connector hole

When connecting modules, insert module lock connector in the hole in order to enhance coherence between them.

8. END Cover

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

9. CT input Terminal [Control module]

Refer to 'Connection' for the details.

9. Communication mode switch (SW2) [Ladderless communication module]

Select communication mode between RS485 and RS422.

10. Communication address group switch (SW2) [Control module]

When setting the communication address over 16, select +16.

11. Power / Communication terminal [Control basic module]

Supplies power to both basic control/expansion module and communicates with one or more module.

Sold Separately

- Communication converter: SCM-series
- CT connector cable: CICT4-□
- Current transformer (CT)

18, Bansong-ro 513Beon-gil, Haeundae-gu, Busan, Republic of Korea, 48002
www.autonics.com | +82-2-2048-1577 | sales@autonics.com