TM Series

Multi-Channel (4 Channel / 2 Channel) Modular Type PID Control

▣ Features

- Multi-channel (4 channel/ 2 channel) simultaneous controlling possible
- High-speed sampling cycle (4 channel: 100ms, 2 channel: 50ms)
- **No communication and power supply for expansion modules required by using side connectors: Max. 31 units (124 channels / 62 channels)**
- Input channel isolated design (Dielectric strength 1,000 VAC)
- Heating/Cooling simultaneous controlling
- Allows parameter setting by USB port of PC
  : Free download the comprehensive device management program (DAQMaster)
  ※Communication converter, sold separately
  : SCM-US (USB to Serial converter), SCM-38I (RS-232C to RS485 converter),
  SCM-US48I (USB to RS485 converter)
- Parameter setting by SCM-US without power/wiring
- Easy maintenance via connector type connection
  : Sensor input connector, control output connector, power/communication connector
- Multi input / Multi range
- Heater disconnection function (CT input) ※ CT, sold separately: CSTC-E80LN, CSTC-E200LN

⚠ Please read "Caution for your safety" in operation manual before using.

CE c(UL)us KC

▣ Manual

- Visit our website (www.autonics.com) to download user manual and communication manual.
- User manual describes for specifications and function, and communication manual describes for RS485 communication (Modbus RTU protocol) and parameter address map data.

▣ Comprehensive Device Management Program (DAQMaster)

- DAQMaster is comprehensive device management program for convenient management of parameters and multiple device data 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
Operations	Microsoft 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	RS-232 serial port (9-pin), USB port

< DAQMaster screen >

▣ Ordering Information

TM 4 – N 2 R B

Module type	B	Basic module	
	E	Expansion module ※1	

Control output	2CH	R	Relay output
		C	Current or SSR drive output selectable
	4CH	R	Relay output
		S	SSR drive output

| Power supply | 2 | 24VDC | |

Option I/O	2CH	2	CT input, Digital input (DI-1, DI-2), Alarm output 1+2, RS485 comm. output
		4	CT input, Digital input (DI-1, DI-2), Alarm output 1+2+3+4, RS485 comm. output
	4CH	N	RS485 comm. output

| Channels | 2 | 2 channels | |
| | 4 | 4 channels | |

| Item | TM | Multi-channel modular temperature controller | |

※The expansion module does not supply power/comm. terminal. Order it with the basic module.

Autonics

Multi-channel Modular Type PID Control

■ Specifications

(A) Photoelectric Sensors

(B) Fiber Optic Sensors

(C) Door/Area Sensors

(D) Proximity Sensors

(E) Pressure Sensors

(F) Rotary Encoders

(G) Connectors/ Sockets

(H) Temperature Controllers

(I) SSRs / Power Controllers

(J) Counters

(K) Timers

(L) Panel Meters

(M) Tacho / Speed / Pulse Meters

(N) Display Units

(O) Sensor Controllers

(P) Switching Mode Power Supplies

(Q) Stepper Motors & Drivers & Controllers

(R) Graphic/ Logic Panels

(S) Field Network Devices

(T) Software

Series		TM2	TM4
No. of channels		2 channels (insulated each channel-dielectric strength 1,000VAC)	4 channels (insulated each channel-dielectric strength 1,000VAC)
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	JPt100Ω, DPt100Ω (permissible line resistance max. 5Ω)	
Sampling cycle		50ms (2CH synchronous sampling)	100ms (4CH synchronous sampling)
Measured accuracy	Thermocouple[※1]	(PV ±0.5% or ±1℃, select the highter one) ±1digit max.	
	RTD		
	CT input	±5% F.S. ±1digit max.	―
	Current output	±1.5% F.S. ±1digit max.	―
Influence of temp.[※2]	Thermocouple	(PV ±0.5% or ±2℃, select the highter one) ±1digit max. (TC input max. -100℃ is within ±5℃)	
	RTD	• TC B, R, S, C, G, L, U: (PV ±0.5% or ±5℃, select the highter one) ±1digit max.	
Control output	Relay	250VAC 3A 1a	
	SSR	Max. 12VDC ±3V 30mA	Max. 22VDC ±3V 30mA
	Current	Selectable DC 4-20mA or DC 0-20mA (load resistance max. 500Ω)	―
Control method	Heating, Cooling	ON/OFF control, P, PI, PD, PID control	
	Heating&Cooling		
Option output	Alarm	250VAC 3A 1a	―
	Communication	RS485 communication output (Modbus RTU method)	
Option input	CT input	0.0-50.0A (primary current measurement range) ※CT ratio=1/1000	―
	Digital input	• Contact input: ON max. 1kΩ, OFF min. 100kΩ • Solid-state input: ON residual voltage max. 1.5V, OFF leakage current max. 0.1mA • Outflow current: Approx. 0.5mA per input	―
Hysteresis		1 to 100℃/℉ (0.1 to 100℃/℉) variable	
Proportional band (P)		0.1 to 999.9℃/℉	
Integral time (I)		0 to 9999 sec.	
Derivative time (D)		0 to 9999 sec.	
Control period (T)		0.1 to 120.0 sec. (only for relay output, SSR drive output)	
Manual reset		0.0 to 100.0%	
Relay life cycle	Mechanical	Min. 10,000,000 operations	
	Electrical	Min. 100,000 operations (250VAC 3A resistance load)	
Insulation resistance		100MΩ (at 500VDC megger)	
Insulation type		Double insulation or reinforced insulation (mark: 回, 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 resistance		±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	
Accessories		Expansion connector: 1, Power/Comm. connector: 1 (only for basic module)	
Approval		CE c**N**us 〔C〕	
Weight[※3]	Basic module	Approx. 217g (Approx. 152g)	Approx. 239g (Approx. 174g)
	Expansion module	Approx. 208g (Approx. 143g)	Approx. 231g (Approx. 166g)

※1: In case of thermocouple K, J, E, T, N, it is below -100℃ and L, U, Platinel II, it is below ±2℃ ±1digit.
    In case of thermocouple B, display accuracy cannot be ensured under 400℃.
    In case of thermocouple R, S, it is below 200℃ and C, G, it is max. 3℃ ±1digit.
※2: Applied when it is for out of room temperature (23±5℃) range.
※3: The weight includes packaging. The weight in parentheses is for unit only.
※Environment resistance is rated at no freezing or condensation.
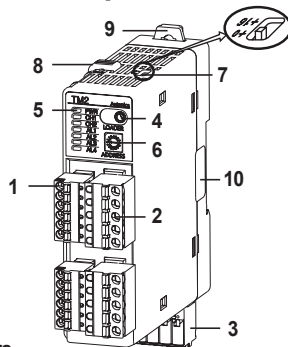
TM Series

◼ Dimensions

(unit: mm)
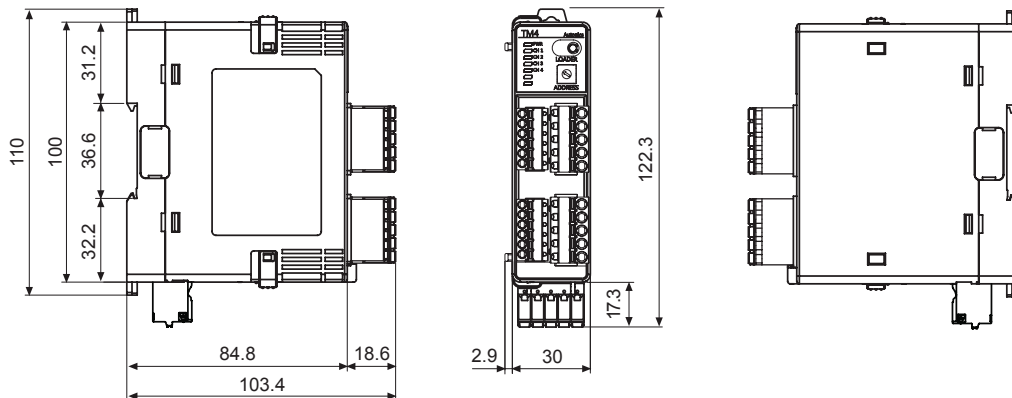
◼ Unit Description

1. Sensor input connector
2. Control output connector
3. Power/Comm. terminal
 [only for basic module (TM□-□2□B)]
 Suppling power to basic/expansion modules and communicating with over 1 module (s).
**4. PC loader port**
 It is the PC loader port for serial communication between one module and PC to set parameter and monitoring by DAQMaster. Use this for connecting SCM-US (USB to serial converter, sold separately).
 ※When using PC loader port (connecting SCM-US), communication via power/comm. terminal is blocked and monitoring is not available.

5. Indicators
●**TM2 Series**

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

※1: When power is supplied initially, the set communication speed LED flashes for 5 sec.
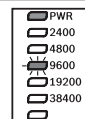
●**TM4 Series**

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

※2: The auto-tuning CH LED flashes for 1 sec in turn.
※3: The PWR LED flashes during communication for 1 sec in turn.
※4: Turns ON when CH1 control method is heating & cooling control and cooling output occurs.
  (disable AL1 setting)
※5: Turns ON when CH2 control method is heating & cooling control and cooling output occurs.
  (disable AL2 setting)

6. Communication address setting switch (SW1): Set the communication address.
7. Communication address group switch (SW2): When setting the communication address over 16, select +16.
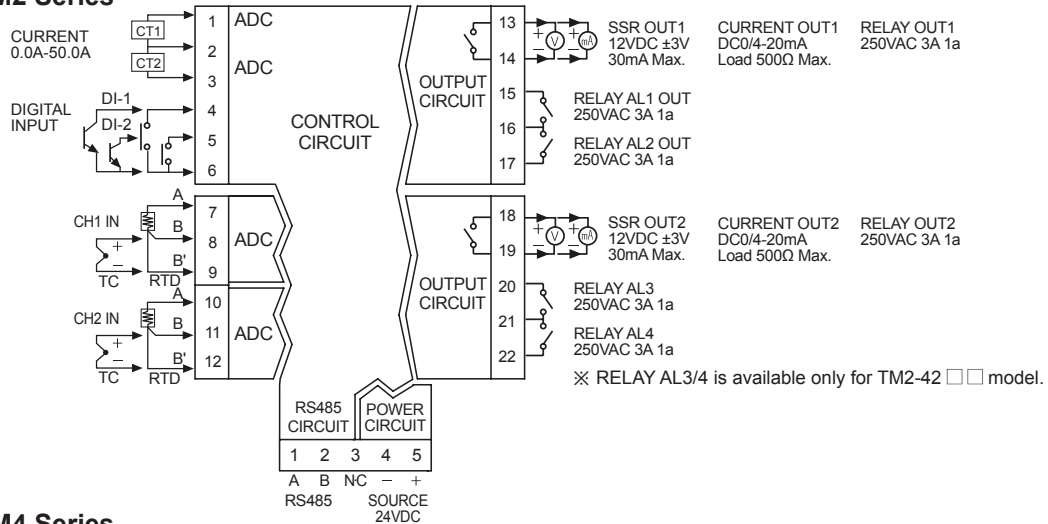**8. Lock switch:** Used for fixing modules at top and bottom.
9. Rail Lock: Used for installing at DIN rail or using bolts.
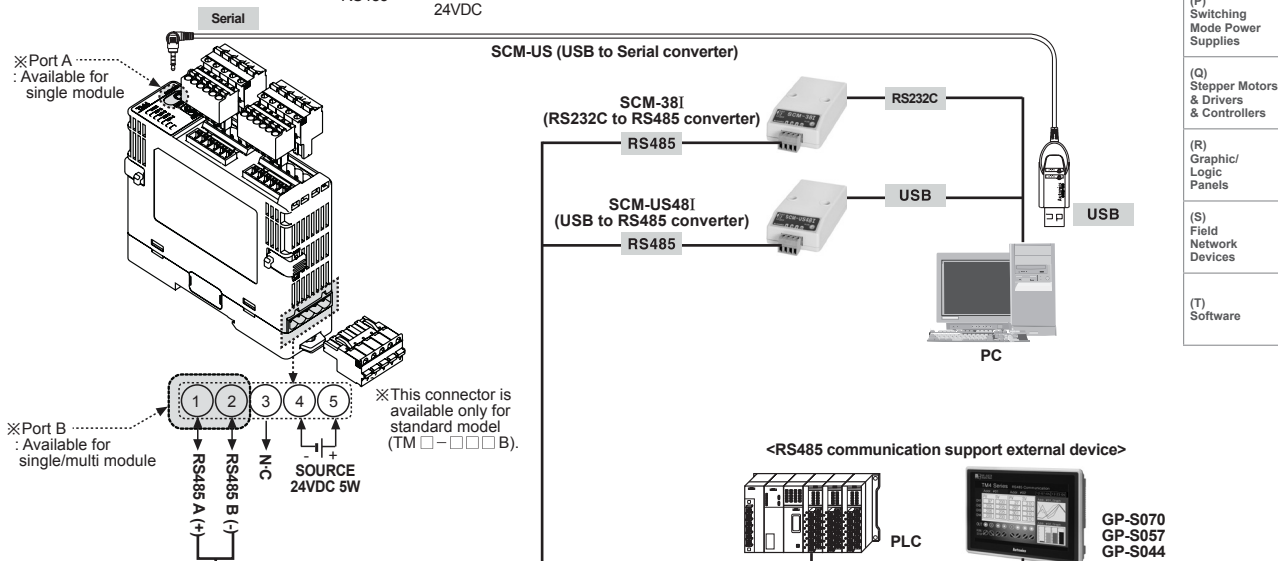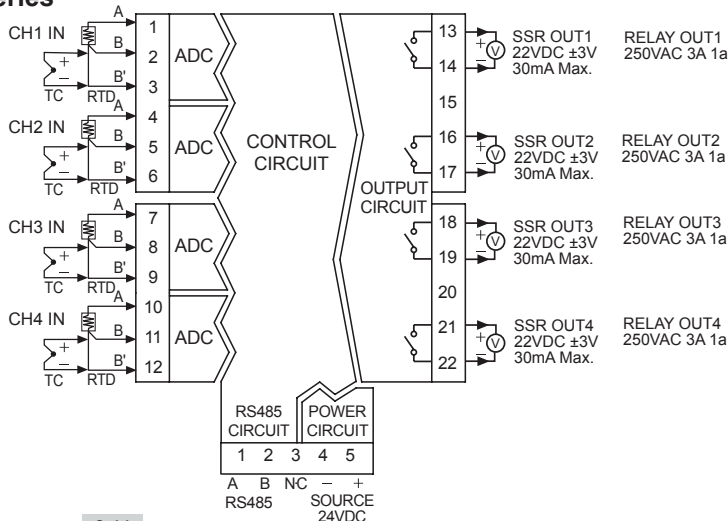**10. END cover**: Remove it when connecting each module to connect an expansion connector.

Autonics

Multi-channel Modular Type PID Control

■ Connections And Block Diagram

● TM2 Series

CURRENT 0.0A-50.0A

CT1
CT2

DIGITAL INPUT

DI-1
DI-2

1 ADC
2
3 ADC
4
5
6

CONTROL CIRCUIT

OUTPUT CIRCUIT

13
14   SSR OUT1   CURRENT OUT1   RELAY OUT1
      12VDC ±3V   DC0/4-20mA   250VAC 3A 1a
      30mA Max.   Load 500Ω Max.

15   RELAY AL1 OUT
16   250VAC 3A 1a

      RELAY AL2 OUT
17   250VAC 3A 1a

CH1 IN
A
B
B'
TC   RTD

7 ADC
8
9
A
10 ADC
11
12

CH2 IN
B
B'
TC   RTD

OUTPUT CIRCUIT

18
19   SSR OUT2   CURRENT OUT2   RELAY OUT2
      12VDC ±3V   DC0/4-20mA   250VAC 3A 1a
      30mA Max.   Load 500Ω Max.

20   RELAY AL3
21   250VAC 3A 1a

      RELAY AL4
22   250VAC 3A 1a

※ RELAY AL3/4 is available only for TM2-42 ☐☐ model.

RS485 CIRCUIT | POWER CIRCUIT

1 2 3 4 5
A B NC − +
RS485   SOURCE
           24VDC

● TM4 Series

CH1 IN
A
B
B'
TC   RTD

1 ADC
2
3
A
4 ADC
5
6

CH2 IN
B
B'
TC   RTD

CONTROL CIRCUIT

OUTPUT CIRCUIT

13
14   SSR OUT1   RELAY OUT1
      22VDC ±3V   250VAC 3A 1a
      30mA Max.

15

16   SSR OUT2   RELAY OUT2
17   22VDC ±3V   250VAC 3A 1a
      30mA Max.

CH3 IN
A
B
B'
TC   RTD

7 ADC
8
9
A
10 ADC
11
12

CH4 IN
B
B'
TC   RTD

OUTPUT CIRCUIT

18   SSR OUT3   RELAY OUT3
19   22VDC ±3V   250VAC 3A 1a
      30mA Max.

20

21   SSR OUT4   RELAY OUT4
22   22VDC ±3V   250VAC 3A 1a
      30mA Max.

RS485 CIRCUIT | POWER CIRCUIT

1 2 3 4 5
A B NC − +
RS485   SOURCE
           24VDC

Serial

※Port A : Available for single module

SCM-US (USB to Serial converter)

SCM-38I
(RS232C to RS485 converter)
RS485

RS232C

SCM-US48I
(USB to RS485 converter)
RS485

USB

USB

PC

※Port B : Available for single/multi module

1 2 3 4 5

RS485 A (+)
RS485 B (-)
N.C
SOURCE 24VDC 5W

※This connector is available only for standard model (TM☐−☐☐☐B).

<RS485 communication support external device>

PLC

GP-S070
GP-S057
GP-S044

TM Series

▣ Installation

● Connector connection

Sensor input connector

Control output connector

Power / Comm. connector
(only for basic module:
TM□-□2□B
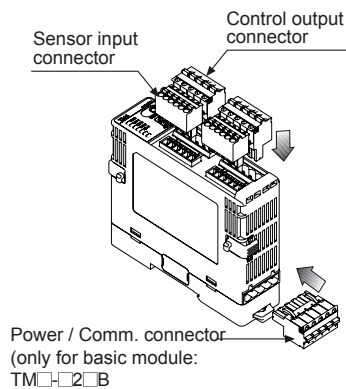
● Multi module connection

TM□-□2□B
**(basic module)**

TM□-□2□E
**(expansion module)**

TM□-□2□E
(expansion module)
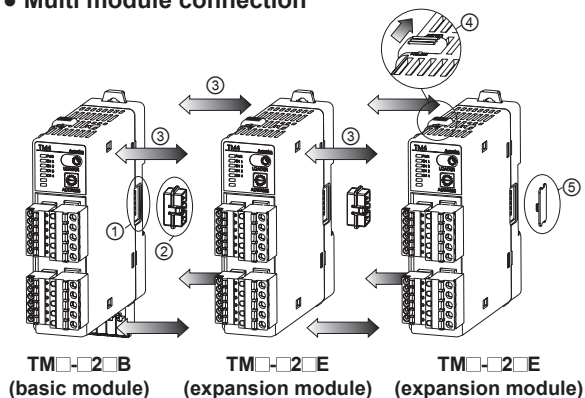
①Remove each module's END covers.
　(do not remove at the ends of END covers)
②Connect expansion connectors between modules.
③Push each modules. (max. 30 units)
④Push the lock switch to lock direction.
※Supply adequate power for power input specifications and overall capacity.
　(Max. power when connecting 31 modules:
　 31 units×5W=155W)

● Bolt Inserting

M4 Bolt

110

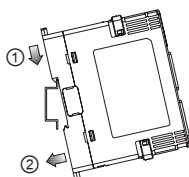M4 Bolt
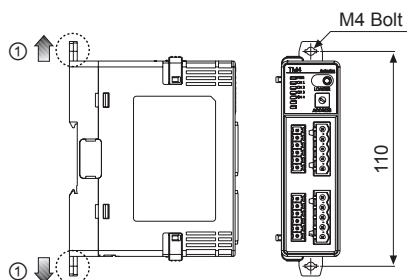
① Pull each Rail Lock switch up and down.
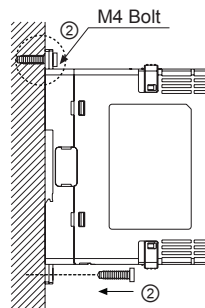
② Insert the bolts to fix.
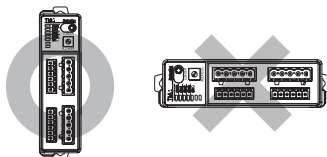　(Tightening torque is 0.5N·m to 0.9N·m.)

● DIN Rail Installation

[Installation method]
① Put the top edge of the rail Lock on the top edge or the DIN rail.
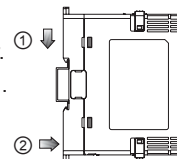② Push the module body in while pressing down.

[Removal method]
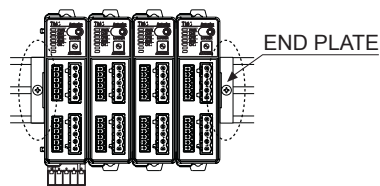① Press down the module body.
② Pull the module body forward.

※**Install the units vertically.**

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

END PLATE

Autonics

Multi-channel Modular Type PID Control

■ Input Sensor Type And Temperature Range

Input sensor		No.	Dot	Display	Input range (℃)	Input range (℉)
Thermocouple	K(CA)	0	1	K(CA).H	-200 to 1350	-328 to 2462
		1	0.1	K(CA).L	-200.0 to 1350.0	-328.0 to 2462.0
	J(IC)	2	1	J(IC).H	-200 to 800	-328 to 1472
		3	0.1	J(IC).L	-200.0 to 800.0	-328.0 to 1472.0
	E(CR)	4	1	E(CR).H	-200 to 800	-328 to 1472
		5	0.1	E(CR).L	-200.0 to 800.0	-328.0 to 1472.0
	T(CC)	6	1	T(CC).H	-200 to 400	-328 to 752
		7	0.1	T(CC).L	-200.0 to 400.0	-328.0 to 752.0
	B(PR)	8	1	B(PR)	0 to 1800	32 to 3272
	R(PR)	9	1	R(PR)	0 to 1750	32 to 3182
	S(PR)	10	1	S(PR)	0 to 1750	32 to 3182
	N(NN)	11	1	N(NN)	-200 to 1300	-328 to 2372
	C(TT)[1]	12	1	C(TT)	0 to 2300	32 to 4172
	G(TT)[2]	13	1	G(TT)	0 to 2300	32 to 4172
	L(IC)	14	1	L(IC).H	-200 to 900	-328 to 1652
		15	0.1	L(IC).L	-200.0 to 900.0	-328.0 to 1652.0
	U(CC)	16	1	U(CC).H	-200 to 400	-328 to 752
		17	0.1	U(CC).L	-200.0 to 400.0	-328.0 to 752.0
	Platinel II	18	1	PLII	0 to 1400	32 to 2552
RTD	JPt 100Ω	19	1	JPt100.H	-200 to 600	-328 to 1112
		20	0.1	JPt100.L	-200.0 to 600.0	-328.0 to 1112.0
	DPt 100Ω	21	1	DPt100.H	-200 to 600	-328 to 1112
		22	0.1	DPt100.L	-200.0 to 600.0	-328.0 to 1112.0

※1: C(TT): Same as existing W5(TT).
※2: G(TT): Same as existing W(TT).
※Default: K(CA).H

■ Error Display

Status / Indicators	Disconnected input sensors	Out of temperature range
PWR (red)	ON	
CH□ (red)[1]	Flash (for 0.5 sec. in turn)	
Comm. output (decimal)	Outputs '31000'	Outputs '30000 (high-limit)', '-30000 (low-limit)'
DAQMaster	Displays 'OPEN'	Displays 'HHHH (high-limit)', 'LLLL (low-limit)'

※1: The applied CH LED indicator flashes.

(A)
Photoelectric
Sensors

(B)
Fiber
Optic
Sensors

(C)
Door/Area
Sensors

(D)
Proximity
Sensors

(E)
Pressure
Sensors

(F)
Rotary
Encoders

(G)
Connectors/
Sockets

(H)
Temperature
Controllers

(I)
SSRs / Power
Controllers

(J)
Counters

(K)
Timers

(L)
Panel
Meters

(M)
Tacho /
Speed / Pulse
Meters

(N)
Display
Units

(O)
Sensor
Controllers

(P)
Switching
Mode Power
Supplies

(Q)
Stepper Motors
& Drivers
& Controllers

(R)
Graphic/
Logic
Panels

(S)
Field
Network
Devices

(T)
Software

TM Series

▣ Communication Setting

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

• Interface

Comm. protocol	Modbus RTU	Comm. distance	Max. 800m
Connection type	RS485	Comm. speed	2400, 4800, 9600 (default), 19200, 38400 bps
Application standard	Compliance with EIA RS485	Start bit	1-bit (fixed)
Max. connection	31 units (address: 01 to 31)	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)

※It is not allowed to set overlapping communication address at the same communication line.
  Use twisted pair wire for RS485 communication.

• Application of system organization
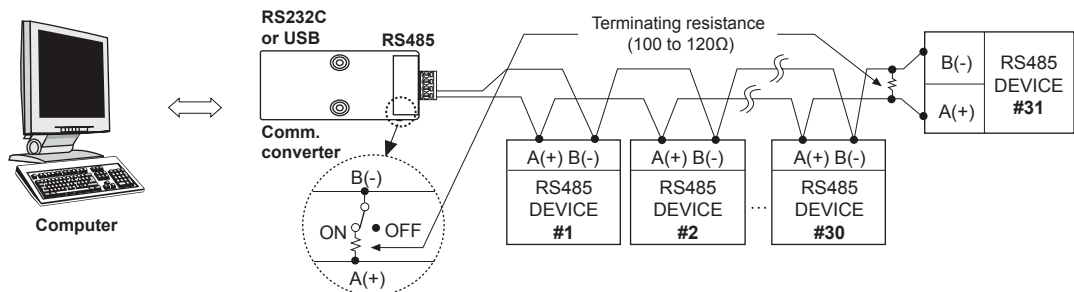
※It is recommended to use Autonics communication converter; SCM-US48I (USB to RS485 converter, sold separately),
  SCM-38I (RS232C to RS485 converter, sold separately), SCM-US (USB to Serial converter, sold separately).
  Please use twisted pair wire for RS485 communication.

• Communication Address Setting

Set the communication address by the communication address setting switch (SW1) and Communication address group switch (SW2).
When setting as 0, it does not operate communication.
(setting range: 01 to 31, factory default: [SW1] 1, [SW2] +0)

SW2 \ SW1	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
+0 / +16	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
+0 / +16	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

• Caution for Communication Address Setting

When changing communication address via the Power/Comm. terminal, resupply the power.

Autonics

■ Sold Separately

◎ Communication converter

- **SCM-38I**
  (RS232C to RS485 converter)
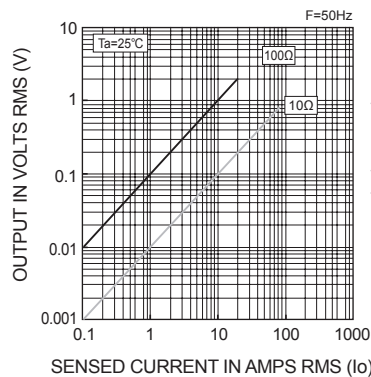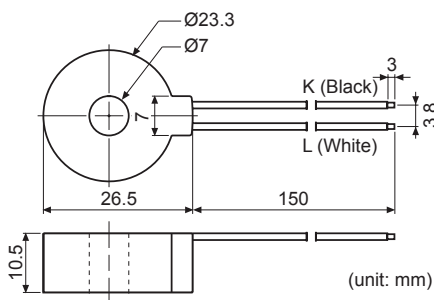
  C€ ℝ

- **SCM-US48I**
  (USB to RS485 converter)
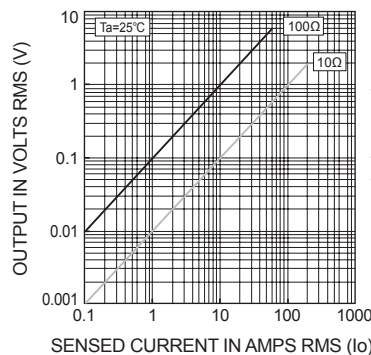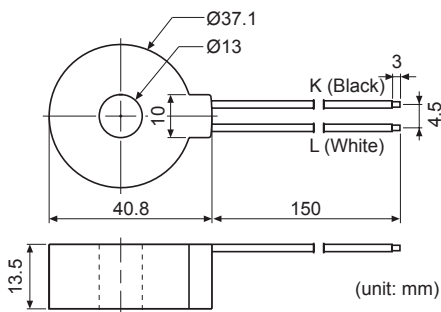
  C€ ℝ

- **SCM-US**
  (USB to Serial converter)

  C€ ℝ

◎ Current transformer (CT)

- **CSTC-E80LN**

Ø23.3
Ø7
3
K (Black)
3.8
L (White)
26.5   150
10.5
(unit: mm)

F=50Hz
Ta=25℃
100Ω
10Ω
OUTPUT IN VOLTS RMS (V)
10 / 1 / 0.1 / 0.01 / 0.001
SENSED CURRENT IN AMPS RMS (Io)
0.1 1 10 100 1000

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

- **CSTC-E200LN**

Ø37.1
Ø13
3
K (Black)
4.5
L (White)
40.8   150
13.5
(unit: mm)

Ta=25℃
100Ω
10Ω
OUTPUT IN VOLTS RMS (V)
10 / 1 / 0.1 / 0.01 / 0.001
SENSED CURRENT IN AMPS RMS (Io)
0.1 1 10 100 1000

- Max. load current: 200A (50/60Hz)
  ※Max. load current for TM Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance: 20Ω±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 two CTs is 50A same but inner hole sizes are different. Please use this your environment.

◎ Display units (DS/DA-T Series)

- **DS/DA-T Series** C€
  (RS485 communication input type display unit)

DS16-□T   **DS22/DA22-□T**   **DS40/DA40-□T**   **DS60/DA60-□T**

※Connect RS485 communication input type display unit (DS/DA-T Series) and TM Series, the display unit displays present value of the device without PC/PLC.

TM Series

▣ Proper Usage

◎ Simple failure diagnosis

- **LED indicators flash (for 0.5 sec. in turn), or external device displays OPEN.**
  - Check input sensor setting.
  - Disconnect the power and check the input connection.
  - If input is connected, disconnect the input wiring from the temperature controller and short the + and - terminals. Power the temperature controller and check if the external device displays the room temperature. If it does not display the room temperature and continues to display HHHH or LLLL, the controller is broken. Please contact our technical support. (input type is thermocouple)
- **Output does not operate normally.**
  - Check that CH indicators for control output operates normally.
  - If CH indicators for control output does not operates, check the parameter settings.
  - If CH indicators for control output operates, remove the control output connector and check the output.
- **External device receives no-response or abnormal data.**
  - Check the communication converter (SCM-38I or SCM-US, sold separately).
  - Do not install communication converter line and AC power supply lines.
  - Use different communication converter power and temperature controller power.
  - Indicates damage to internal chip by strong noise. Please contact our technical support. Locate the source of the noise device countermeasures.
- **Communication does not work between TM and external device**
  - Check the communication converter power and connections.
  - Check the communication settings.
  - Check the temperature controller and external device connections.

◎ Caution during use

- Use DC power only.
- Must use DC power.
- After connecting input sensors and supplying the power, use the controller 20 minutes later.
- If measurement accuracy is low, check the Input Bias parameter setting.
- Install a power switch or circuit breaker to control the power supply.
- The power switch or circuit breaker should be installed where it is easily accessible by the user.
- The unit is for temperature controller. Do not use the unit as volt-meter or ampere-meter.
- When line extension between thermocouple and temperature controller is required, use the specified compensation line. If using the general line, temperature difference at the joint part between thermocouple and extension lines.
- When using RTD temperature sensor, must wire it as 3-wire type. If cable is extended, use 3 wires which are same thickness as the line. It might cause the deviation of temperature when line resistance is different.
- Please separate the unit wiring from high voltage lines or power lines to prevent inductive noise.
- If power line and input signal line are close each other, install line filter for noise protection at power line and use shielded input signal line.
- Keep away from the high frequency instruments (High frequency welding machine & sewing machine, large capacity SCR controller) or the devices (radio, television, wireless machines) which causes high frequency interference.
- Before changing the input sensor, turn OFF the power. Connect the input sensor and re-supply the power, change parameter settings via communication.
- 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.
- Use twisted pair wire for RS485 communication. Connect ferrite bead at each end of line to reduce the effect of external noise.
- Do not overlapping communication line and AC power line.
- Install the unit at well ventilation place. If not, take the ventilation countermeasures.
- This unit may be used in the following environments.
  - Indoor
  - Altitude: Under 2,000m
  - Pollution degree 2
  - Installation category II