Two-Degree-of-Freedom PID Temperature Controllers

TN 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

- 2-DOF PID algorithm optimized for various control environments
- 50 ms high-speed sampling and ±0.2% display accuracy
- Program control and fixed control models available
  - Up to 10 patterns X 20 steps program setting (program control model)
  - Timer function for preset operation (fixed control model)
- Simultaneous heating/cooling and automatic/manual control function
- Control functions: Group PID, Zone PID, Anti Reset Windup (ARW)
- Control status monitoring of up to 10 events
- RS485 communication output model available
  - Communication protocols: Modbus RTU/ASCII, PLC ladderless, Sync-Master
  - Communication speed: up to 115,200bps
- Heater burnout alarm function (CT input)
- Parameter setting via PC
  - Comprehensive Device Management Software (DAQMaster) provided
  - Communication converter connection with front loader port (TNH, TNL only)
- Shortcut key setting with front user key button [U]
- Easy maintenance with detachable terminal blocks

Ordering Information

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

T N ❶ - ❷ 4 ❸ ❹ ❺ - ❻ S - ❼

❶ Size
S: DIN W 48 × H 48 mm
H: DIN W 48 × H 96 mm
L: DIN W 96 × H 96 mm

❷ Control method
No mark: Fixed control
P: Program control

❸ Alarm outputs
2: Alarm 1 / 2
4: Alarm 1 / 2 / 3 / 4
6: Alarm 1 / 2 / 3 / 4 / 5 / 6

❹ Control output 1
R: Relay
S: SSR drive
C: Current or SSR drive

❺ Control output 2
R: Relay
S: SSR drive
C: Current or SSR drive

❻ Communication
N: None
R: RS485

❼ Option input/output

No.	Digital input	CT input	Transmission output
006	0	1	0
008	2	1	0
009	3	1	0
014	3	2	0
026	0	1	1
031	0	2	1
035	6	2	1

Product Components

- Product
- Bracket
- Instruction manual

Specifications

Power supply		100 - 240 VAC~, 50/60 Hz ±10%
Power consumption		≤ 8 VA
Display type		11 segment, LCD type (operating value display part: 7 segment)
Sampling period		50 / 100 / 250 ms (parameter)
Input specification		Refer to 'Input Type and Using Range'
Option input	CT	• 0.0-50.0 A (primary current measurement range) • CT ratio: 1/1,000 • Measurement accuracy: ±5% F.S. ±1digit
	Digital	• Contact - ON: ≤ 2 kΩ, OFF: ≥ 90 kΩ • Non contact - residual voltage ≤ 1.0 V, leakage current ≤ 0.1 mA • Outflow current: ≈ 0.5 mA per input
Control output	Relay	250 VAC~ 3A 1a
	SSR	12 VDC⎓ ±2 V, ≤ 20 mA
	Current	DC 0 - 20 mA or DC 4 - 20 mA (parameter), Load resistance: ≤ 500 Ω
Option output	Alarm	250 VAC~ 3 A 1a
	Transmission	DC 4 - 20 mA (load resistance: ≤ 500 Ω, output accuracy: ±0.3% F.S.)
	Communication	RS485
Control type	Type	ON/OFF, P, PI, PD, PID
	Multi SV	≤ 4 SV
	Group PID	≤ 8 group
	Zone PID	4 zones
	ARW (Anti Reset Windup)	50 to 200 %
Program control	Program	≤ 10 patterns
	Step	≤ 200 steps (1 pattern: ≤ 20 steps)
	Setting type	Time setting
Hysteresis		• Thermocouple, RTD: 1 to 100 (0.1 to 100.0) °C/°F • Analog: 1 to 100 digit
Proportional band (P)		0.1 to 999.9 °C (0.1 to 999.9%)
Integral time (I)		0 to 9,999 sec
Derivative time (D)		0 to 9,999 sec
Control cycle (T)		• Relay / SSRP output: 0.1 to 120.0 sec • Selectable current or SSR drive output: 1.0 to 120.0 sec
Manual reset		0.0 to 100.0%
Dielectric strength		Between the charging part and the case: 3,000 VAC~ 50/60 Hz for 1 min
Vibration		0.75 mm amplitude at frequency of 5 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Relay life cycle	Mechanical	• OUT1/2: ≥ 5,000,000 operations • AL1/2/3/4/5/6: ≥ 20,000,000 operations
	Electrical	• OUT1/2: ≥ 200,000 operations • AL1/2/3/4/5/6: ≥ 100,000 operations
Insulation resistance		≥ 100 MΩ (500 VDC⎓ megger)
Insulation type		Double insulation or reinforced insulation (mark: ⊡, dielectric strength between the measuring input part and the power part: 3 kV)
Noise immunity		±2 kV square shaped noise by noise simulator (pulse width: 1 μs) R-phase, S-phase
Memory retention		≈ 10 years (non-volatile semiconductor memory type)
Ambient temperature		-10 to 50 °C, storage: -20 to 60 °C (no freezing or condensation)
Ambient humidity		35 to 85%RH
Protection structure		IP65 (Front panel, IEC standards)
Loader port		• TNS: top side • TNH, TNL: front side
Accessory		Bracket
Unit weight (packaged)		• TNS: ≈ 128 g (≈ 156 g) • TNH: ≈ 184 g (≈ 286 g) • TNL: ≈ 301 g (≈ 443 g)
Approval		CE c UL us KC

Communication Interface

■ RS485

Comm. protocol	Modbus RTU/ASCII, Sync-Master, PLC ladderless
Connection type	RS-485, RS-422A
Application standard	EIA RS485 compliance with
Maximum connection	32 units (address: 01 to 99)
Synchronous method	Asynchronous
Comm. Method	Two-wire half duplex
Comm. effective range	≤ 800 m
Comm. speed	≤ 115,200 bps
Response time	5 to 99 ms (default: 20 ms)
Start bit	1 bit (fixed)
Data bit	8 bit (fixed)
Parity bit	None (default), Odd, Even
Stop bit	1 bit, 2 bit (default)
EEPROM life cycle	≈ 1,000,000 operations (Erase / Write)

• 1 character of ModBus RTU is fixed at 11 bit.

Input Type and Using Range

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

Input type		Decimal point	Display	Using range (°C)	Using range (°F)
Thermo-couple	K (CA)	1	K CA.H	-200 to 1,350	-328 to 2,463
		0.1	K CA.L	-199.9 to 999.9	-199.9 to 999.9
	J (IC)	1	J IC.H	-200 to 800	-328 to 1,472
		0.1	J IC.L	-199.9 to 800.0	-199.9 to 999.9
	E (CR)	1	E CR.H	-200 to 800	-328 to 1,472
		0.1	E CR.L	-199.9 to 800.0	-199.9 to 999.9
	T (CC)	1	t CC.H	-200 to 400	-328 to 752
		0.1	t CC.L	-199.9 to 400.0	-199.9 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) 01)	1	C tt	0 to 2,300	32 to 4,172
	G (TT) 02)	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	-199.9 to 900.0	-199.9 to 999.9
	L (RUS)	1	L R.H	-200 to 800	-328 to 1,472
		0.1	L R.L	-199.9 to 800.0	-199.9 to 999.9
	U (CC)	1	U CC.H	-200 to 400	-328 to 752
		0.1	U CC.L	-199.9 to 400.0	-199.9 to 752.0
	Platinel II	1	PLII	0 to 1,390	32 to 2,534
RTD	Cu50 Ω	0.1	Cu 5	-199.9 to 200.0	-199.9 to 392.0
	Cu100 Ω	0.1	Cu 10	-199.9 to 200.0	-199.9 to 392.0
	JPt100 Ω	1	JPt.H	-200 to 650	-328 to 1,202
		0.1	JPt.L	-199.9 to 650.0	-199.9 to 999.9
	DPt50 Ω	0.1	dPt5	-199.9 to 600.0	-199.9 to 999.9
	DPt100 Ω	1	dPt.H	-200 to 650	-328 to 1,202
		0.1	dPt.L	-199.9 to 650.0	-199.9 to 999.9
	Nickel120 Ω	1	NI 12	-80 to 200	-112 to 392
Analog	0 to 10 V	-	Av 1	0 to 10 V	
	0 to 5 V	-	Av2	0 to 5 V	
	1 to 5 V	-	Av3	1 to 5 V	
	0 to 100 mV	-	AMV 1	0 to 100 mV	
	0 to 20 mA	-	AMA 1	0 to 20 mA	
	4 to 20 mA	-	AMA2	4 to 20 mA	

• Permissible line resistance per line: ≤ 5 Ω

01) C (TT): Same as existing W5 (TT) type sensor

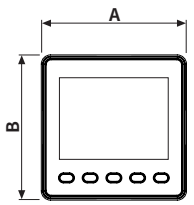
02) G (TT): Same as existing W (TT) type sensor

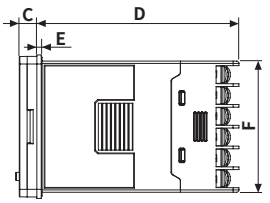
■ Display accuracy

Input type	Using temperature	Display accuracy
Thermo-couple RTD	At room temperature (23°C ±5 °C)	(PV ±0.2% 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
	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°C ±5 °C)	±0.2% F.S. ±1-digit
	Out of room temperature range	±0.5% F.S. ±1-digit

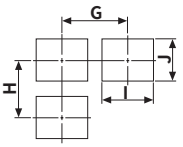
Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics website.
- Below is based on TNS Series.





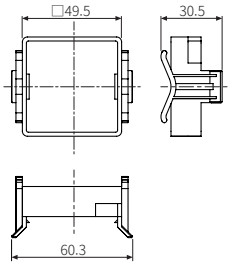
■ Panel cut-out



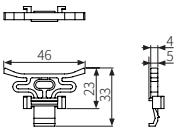
	Body						Panel cut-out			
	A	B	C	D	E	F	G	H	I	J
TNS	49	49	6	69	1.5	44.8	≥ 65	≥ 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
TNH	49	97	6	69	1.5	91.5	≥ 65	≥ 115	$45^{+0.6}_{0}$	$92^{+0.8}_{0}$
TNL	97	97	6	69	1.5	91.5	≥ 115	≥ 115	$92^{+0.8}_{0}$	$92^{+0.8}_{0}$

■ Bracket

TNS

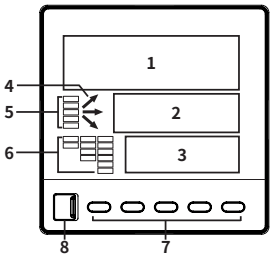


Other series



Unit Descriptions

- Below is based on TNL Series.
- The shape and function of each part may be different depending on the series, and it is possible to check the additional information in the user manual.



1. PV display part (White)
- RUN mode: Displays PV (Present value) and unit.
- Setting mode: Displays parameter name

2. SV display part (Green)
- RUN mode: Displays SV (Setting value) and unit.
- Setting mode: Displays parameter setting value.

3. Operating value display part (Yellow)
- RUN mode: Displays selected value among MV (Manipulated output value), CT, TIME with unit.

4. Temperature control indicator
- Fixed control: Relative PV value status display based on SV
  PV > SV (↗), PV = SV (→), PV < SV (↘)
- Program control: Displays temperature control status of up (↗), hold (→), down (↘).

5. Operation status indicator

Display	Name	Description
LOCK	Lock	Turns ON during key lock status.
PROG	Program	Turns ON during program control.
WAIT	Wait	Turns ON during waiting status.
HBA1/2	Heater break alarm	Turns ON when the heater break alarm output is ON.

6. Output status indicator

Display	Name	Description
OUT1/2	Control output	Turns ON when the control output is ON
AT	Auto tuning	Flashes during auto tuning every 1 sec
MAN	Manual control	Turns ON during manual control mode
STOP	Control output stop	Turns ON during control output stop mode
HOLD	Program control hold	Turns ON when program control is hold status
AL1 to 6	Alarm output	Turns ON when the alarm output is ON

7. Input key

Display	Name
[U]	User key
[M]	Mode key
[◀], [▼], [▲]	Setting value control key

8. PC loader port

For connecting communication converter (SCM-USP).

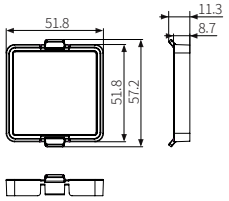
Sold Separately

- Communication converter: SCM Series
- Current transformer (CT)
- Terminal protection cover
- Front cover

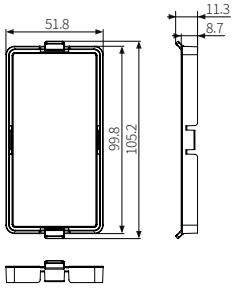
Sold Separately: Front cover

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

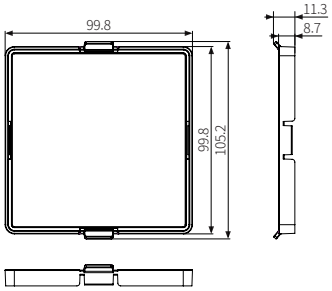
■ TNS: FSA-COVER



■ TNH: FHA-COVER



■ TNL: FLA-COVER



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