

Thank you for choosing our Autonics product.  
**Read and understand the instruction manual and manual thoroughly before using the product.**

**For your safety, read and follow the below safety considerations before using our safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.**

Keep this instruction manual in a place where you can find easily.  
 The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.  
 Follow Autonics website for the latest information.

**Safety Considerations**

- Observe all "Safety Considerations" for safe and proper operation to avoid hazards.
- △ symbol indicates caution due to special circumstances in which hazards may occur.

**Warning** Failure to follow instructions may result in serious injury or death

- Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**  
 Failure to follow this instruction may result in personal injury, economic loss or fire.
- Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact or salinity may be present.**  
 Failure to follow this instruction may result in explosion or fire.
- Install on a device panel to use.**  
 Failure to follow this instruction may result in electric shock.
- Do not connect, repair, or inspect the unit while connected to a power source.**  
 Failure to follow this instruction may result in fire or electric shock.
- Check connectors' before wiring.**  
 Failure to follow this instruction may result in fire or electric shock.
- Do not disassemble or modify the unit.**  
 Failure to follow this instruction may result in fire or electric shock.

**Caution** Failure to follow instructions may result in injury or product damage

- When connecting the power input and relay output, use AWG 20 (0.50 mm<sup>2</sup>) cable or over, and tighten the terminal screw with a tightening torque of 0.74 to 0.90 Nm.**  
 When connecting the sensor input and communication cable without dedicated cable, use AWG 28 to 16 cable and tighten the terminal screw with a tightening torque of 0.74 to 0.90 N.m.  
 Failure to follow this instruction may result in fire or malfunction due to contact failure.
- Use the unit within the rated specifications.**  
 Failure to follow this instruction may result in fire or product damage.
- Use a dry cloth to clean the unit, and do not use water or organic solvent.**  
 Failure to follow this instruction may result in fire or electric shock.
- Keep the product away from metal chip, dust, and wire residue which flow into the unit.**  
 Failure to follow this instruction may result in fire or product damage.

**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 (TC) 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.

**Specifications**

<b>Power supply</b>	100 ~ 240 VAC~, 50/60 Hz, ±10%
<b>Display consumption</b>	≤ 1.8 W
<b>Display type</b>	11 segment, LCD type (operating value display part, 7 segment)
<b>Sampling period</b>	50 / 100 / 250 ms (parameter)
<b>Input specification</b>	Refer to Input Type and Using Range* • IO-500mA (primary current measurement range) • Measurement accuracy: ±0.5% F.S. ±1digit • Measurement resolution: 0.1mA • Offset: ON/≤ 9 mA, OFF/≥ 100 mA • Maximum residual voltage: ≤ 1.0V, leakage current: ≤ 0.1 mA • Outflow current: ≈ 0.5 mA per input
<b>Option input</b>	Digital Contact: ON/≤ 9 mA, OFF/≥ 100 mA • Measurement accuracy: ±0.5% F.S. ±1digit • Measurement resolution: 0.1mA • Outflow current: ≈ 0.5 mA per input
<b>Control output</b>	Relay SSR DC 0 ~ 20 mA or DC 4 ~ 20 mA (parameter), Load resistance ≤ 500 Ω 12VDC~ ±2 V, ≤ 20 mA
<b>Option output</b>	Alarm Transmission DC 4 ~ 20 mA (load resistance: ≤ 500 Ω, output accuracy: ±0.3%, F.S.)
<b>Control type</b>	Communication: RS485 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: ≤ 10 patterns Step: ≤ 200 steps (1 pattern: ≤ 20 steps) Setting type: Time setting
<b>Hysteresis</b>	Thermocouple, RTD: 1 to 100 (0.1 to 100.0) °C/°F Analog: 1 to 10 (0.1 to 999.9%)
<b>Proportional band (P)</b>	0.1 to 999.9 °C (0.1 to 999.9%)
<b>Integral time (I)</b>	0 to 999.9 sec
<b>Derivative time (D)</b>	• Relay / SSR output: 0.1 to 120.0 sec • Selectable current or SSR drive output: 1.0 to 120.0 sec
<b>Control cycle (T)</b>	0.0 to 100.0%
<b>Manual reset</b>	Between the charging part and the case: 0.75 mm amplitude at frequency of 5 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours • OUT1/F: ≥ 5,000,000 operations • AL1/D2/4/6/6: ≥ 20,000,000 operations • OUT1/F: ≥ 200,000 operations • AL1/D2/4/6/6: ≥ 100,000 operations
<b>Dielectric strength</b>	≥ 100 kV (50 VDC= megger)
<b>Vibration</b>	Double insulation or reinforced insulation (mark □, dielectric strength between the measuring input part and the power part: 3 kV) R-phase, S-phase ≈ 27kV square shaped noise by noise simulator (pulse width: 1μs)
<b>Relay life cycle</b>	Mechanical Electrical • TNS: top side • TNH, TNL: front side
<b>Insulation resistance</b>	Bracket • TNS: ≈ 128 (≈ 156 g) • TNH: ≈ 301 (≈ 445 g)
<b>Insulation type</b>	Double insulation or reinforced insulation (mark □, dielectric strength between the measuring input part and the power part: 3 kV) R-phase, S-phase ≈ 27kV square shaped noise by noise simulator (pulse width: 1μs)
<b>Noise immunity</b>	IP65 Front panel, IEC standards
<b>Memory retention</b>	• TNS: ≈ 128 (≈ 156 g) • TNH: ≈ 301 (≈ 445 g)
<b>Ambient temperature</b>	• TNS: ≈ 128 (≈ 156 g) • TNH: ≈ 301 (≈ 445 g)
<b>Ambient humidity</b>	• TNS: ≈ 128 (≈ 156 g) • TNH: ≈ 301 (≈ 445 g)
<b>Protection structure</b>	• TNS: top side • TNH, TNL: front side
<b>Loader port</b>	Bracket • TNS: ≈ 128 (≈ 156 g) • TNH: ≈ 301 (≈ 445 g)
<b>Accessory</b>	• TNS: ≈ 128 (≈ 156 g) • TNH: ≈ 301 (≈ 445 g)
<b>Unit weight (packaged)</b>	• TNS: ≈ 128 (≈ 156 g) • TNH: ≈ 301 (≈ 445 g)
<b>Approval</b>	CE, RoHS, REACH

**Communication Interface**

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

\* 1 character of Modbus RTU is fixed at 11 bit.

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

**Input Type and Using Range**

Input type	Decimal point	Display	Using range (°C)	Using range (°F)
Thermo-couple	K (CA)	LCRH	-200 to 1,350	-328 to 2,463
		LCRL	-199.9 to 999.9	-199.9 to 999.9
		JCRH	-200 to 800	-328 to 1,472
		JCRL	-199.9 to 800.0	-199.9 to 999.9
		EGRH	-200 to 800	-328 to 1,472
		EGR	-199.9 to 800.0	-199.9 to 999.9
	T (CC)	LCRH	-200 to 400	-328 to 752
		LCRL	-199.9 to 400.0	-199.9 to 752.0
		PCRH	0 to 1,800	32 to 3,272
		PCR	0 to 1,800	32 to 3,272
		PCRH	0 to 1,750	32 to 3,182
		PCR	0 to 1,750	32 to 3,182
RTD	Pt100 Ω	LCRH	-20 to 4,300	-32 to 7,732
		LCRL	0 to 2,300	32 to 4,172
		PCRH	0 to 2,300	32 to 4,172
	Pt100 Ω	LCRH	-200 to 900	-328 to 1,652
		LCRL	-199.9 to 900.0	-199.9 to 999.9
		PCRH	-200 to 400	-328 to 752
Analog	Pt100 Ω	LCRH	-200 to 400	-328 to 752
		LCRL	-199.9 to 400.0	-199.9 to 752.0
		PCRH	-200 to 400	-328 to 752
	Pt100 Ω	LCRH	-200 to 400	-328 to 752
		LCRL	-199.9 to 400.0	-199.9 to 752.0
		PCRH	-200 to 400	-328 to 752

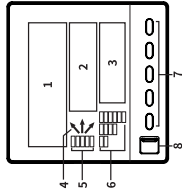
\* Permissible line resistance per line: ≤ 5 Ω  
 01 (CTT): Same as existing 45 (TT) type sensor  
 02 (CTT): Same as existing 41 (TT) type sensor

**Display accuracy**

Input type	Using temperature	Display accuracy			
Thermo-couple	At room temperature (23°C ±5°C)	IPV ±0.2% or ±1 °C (higher one) ±1-digit • Thermocouple K, J, T, N, E Below -100 °C and L, U, PLU, RTD Cu50 Ω, DP50 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 standard			
		Out of room temperature range	• RTD Cu50 Ω, DP50 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 (S-100 °C) ±0.2% F.S. ±1-digit		
			At room temperature (23°C ±5°C)	±0.5% F.S. ±1-digit	
				Out of room temperature range	±0.5% F.S. ±1-digit

## 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.



- PV display part (White)**
  - RUN mode: Displays PV (Present value) and unit.
  - Setting mode: Displays parameter name
- SV display part (Green)**
  - RUN mode: Displays SV (Setting value) and unit.
  - Setting mode: Displays parameter setting value.
- Operating value display part (Yellow)**
  - RUN mode: Displays selected value among MV (Manipulated output value), CT, TIME with unit.
- 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 (▼).

### 7. Input key

Display	Name
LOCK	Lock
PROG	Program
WAIT	Wait
HBA1/2	Heater break alarm

### 8. PC loader port

For connecting communication converter (SCM-LSP).

### 6. Output status indicator

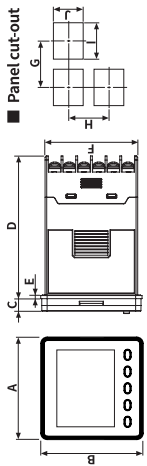
Display	Name	Description
OUT1/2	Control output	Turns ON when the control output is ON
AT	Auto tuning	Flashes during auto tuning every 1 sec
MAN	Manual control	Turns ON during manual control mode
STOP	Control output stop	Turns ON during control output stop mode
HOLD	Program control hold	Turns ON when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

### Errors

Display Input	Description	Output	Troubleshooting
oPEn	Flashes at 0.5 sec interval when the sensor is not connected or sensor is not connected.	Sensor error, MV parameter setting value	Check input sensor status.
	Flashes at 0.5 sec interval when inputs is over F.S. ±10%.	Sensor error, MV parameter setting value	Check analog input status.
	Flashes at 0.5 sec interval if the input value is above the input range.	Heating: 0% Cooling: 100%	
HHHH	Flashes at 0.5 sec interval if the input value is over 5 to 10% of high limit or low limit value.	Normal output	When inputs within the rated input range, the high/low input value disappears.
LLLL	Flashes at 0.5 sec interval if the input value is over 5 to 10% of low limit or high limit value.	Heating: 100% Cooling: 0%	
	Flashes at 0.5 sec interval if there is error for setting and it returns to the error before screen.	Normal output	Check setting method.
E P P			

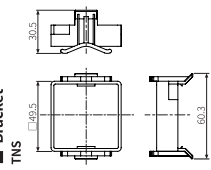
## Dimensions

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

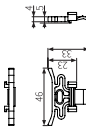


Body	A	B	C	D	E	F	G	H	I	J
TNS	49	49	6	69	1.5	44.8	≥ 65	≥ 65	45.6 <sup>±0.15</sup>	45.5 <sup>±0.15</sup>
TNH	49	97	6	69	1.5	91.5	≥ 65	≥ 115	45.6 <sup>±0.15</sup>	92.2 <sup>±0.15</sup>
TNL	97	97	6	69	1.5	91.5	≥ 65	≥ 115	92.2 <sup>±0.15</sup>	92.2 <sup>±0.15</sup>

### Bracket



### Other series



## Installation Method

### TNS



Insert the unit into a panel, fasten the bracket by pushing with tools with a flathead screwdriver.

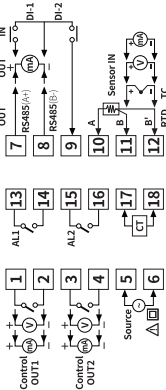
### Other series



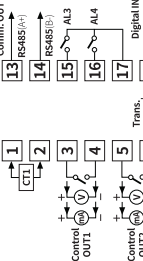
## Connections

- Digital input is not electrically insulated from internal circuits, so it should be insulated when connecting other circuits.

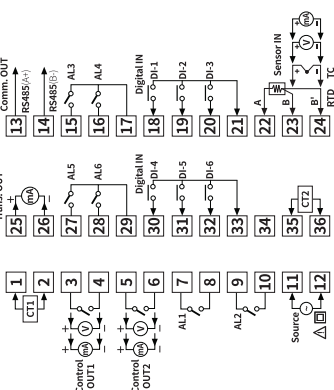
### TNS



### TNH



### TNL



## Crimp Terminal Specifications

- Unit: mm. Use the crimp terminal of follow shape.



Fork crimp terminal



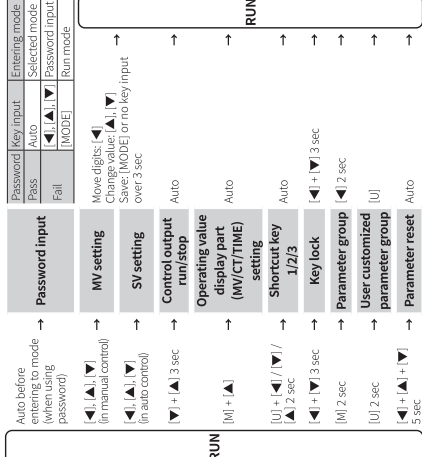
Round crimp terminal

## Initial Display When Power is ON

- When power is supplied, after all display will flash for 1 sec, model name is displayed sequentially. After input sensor type will flash twice, enter into RUN mode.

Display part	1. Model	2. Model	3. Input specification	4. RUN mode
PV	E-25P	P5	E-PFE	oPEn
SV	H-2PP	005	H-CRH	0

## Mode Setting



- TNS series does not support 'MV setting', 'Operation value display part setting' mode. For the details, refer to the user manual.