

Board Type PID Temperature Controllers

TB42 Series
INSTRUCTION MANUAL

TCD210157AA

Autonics

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.

For your 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 fire or 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 'Connections' before wiring.**
Failure to follow this instruction may result in fire.
- 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 mm²) cable or over and tighten the terminal screw with a tightening torque of 0.74 to 0.90 N·m.**
When connecting the sensor input 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 (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.
- 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.
- 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.
- This unit may be used in the following environments.
 - Indoors (in the environment condition rated in 'Specifications')
 - Altitude Max. 2,000 m
 - Pollution degree 2
 - Installation category II

Caution For When Mounting on Panel

- This unit does not have an additional external case but has only a PCB. When mounting this unit on panel, maintain insulation between iron plates. If dust, oil, or water is enter to inside of panel, inner may be short.
- Be sure that interval between terminals is narrow to wire cables. The cable (20P) connected control PCB and front PCB is sensitive signal line.
- Be careful when wiring this cable not to enter noise or affect to high voltage line.

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 B 4 2 - 1 4 ①

① Control output

R: Relay
S: SSR drive
C: Current
N: PV Transmission

Product Components

- Product
- Instruction manual
- 20P cable (300 mm)

Sold Separately

- 20P cable (100 mm)

Specifications

Series	TB42 Series	
Power supply	100 ~ 240 VAC ~ 50/60 Hz	
Allowable voltage range	90 to 110% of rated voltage	
Power consumption	≤ 5 VA	
Sampling period	500 ms	
Input specification	Refer to 'Input Type and Using Range'.	
Control output	Relay	250 VAC ~ 3a, 30 VDC ≒ 3 A, 1a
	SSR	12 VDC ≒ ± 3 V, ≤ 30 mA
	Current	DC 4-20 mA, Load resistance: ≤ 600 Ω
	PV Transmission	DC 4-20 mA, Load resistance: ≤ 600 Ω, Resolution: 16,000
Option output	Event 1	Relay: 250 VAC ~ 0.5 A 1a (hysteresis: fixed 2 °C) • The PV transmission output model does not support Event 1 output.
	Event 2	OK monitoring display of LED type (hysteresis: fixed 2 °C)
Display type	7 Segment (Green, Red), LED type	
Control type	ON/OFF Control, P, PI, PD, PIDF, PID5 Control	
Hysteresis	1 to 100 (0.1 to 100.0) °C/°F	
Proportional band (P)	0.0 to 100%	
Integral time (I)	0 to 3,600 sec	
Derivative time (D)	0 to 3,600 sec	
Control cycle (T)	1 to 120.0 sec	
Manual reset	0.0 to 100.0%	
Relay life cycle	Mechanical	• Main output: ≥ 10,000,000 operations (Load resistance: 250 VAC ~ 3 A) • Option output: ≥ 2,000,000 operations (Load resistance: 250 VAC ~ 0.5 A)
	Electrical	• Main output: ≥ 100,000 operations (Load resistance: 250 VAC ~ 3 A) • Option output: ≥ 200,000 operations (Load resistance: 250 VAC ~ 0.5 A)
Dielectric strength	Between input terminal and power terminal: 2,000 VAC ~ 50/60 Hz for 1 min	
Vibration	0.75 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Insulation resistance	≥ 100 M Ω (500 VDC ≒ megger)	
Noise immunity	± 2 kV square shaped noise by (pulse width 1 μs) noise simulator	
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, storage: 35 to 85%RH (no freezing or condensation)	
Approval	CE, RoHS, ENEC	
Body weight	≈ 113.5 g	

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 ⁰¹⁾	K (CA)	℄℃℘	-100 to 1,300	-148 to 2,372
	J (IC)	℄℄℃	0 to 800	32 to 1,472
RTD ⁰²⁾	1	℘℄.℘	0 to 500	32 to 932
	0.1	℘℄.℄	-199.9 to 199.9	-199.9 to 392.0
	1	℘℘℄.℘	0 to 500	32 to 932
	0.1	℘℘℄.℄	-199.9 to 199.9	-199.9 to 392.0

01) Tolerance outer resistance: ≤ 100 Ω

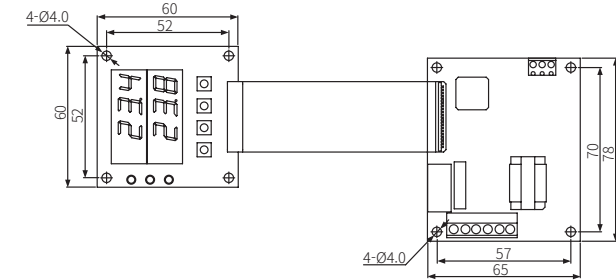
02) Allowable line resistance per a wire: ≤ 5Ω

■ Display accuracy

Input type	Using temperature	Display accuracy
Thermocouple	At room temperature (23°C ± 5 °C)	F.S. ± 0.3% or 3°C higher one
RTD	Out of room temperature range	F.S. ± 0.3% or 3°C higher one

Dimensions

- Unit: mm, For the detailed drawings, follow the Autonics website.
- The size of board is based on user's application. (customizable)



Unit Descriptions

1. Mounting hole (Ø 4.0 mm)

2. PV display part (Green)

3. SV Display part (Red)
1. Run mode: Displays PV (Present value)

2. Setting mode: Displays parameter

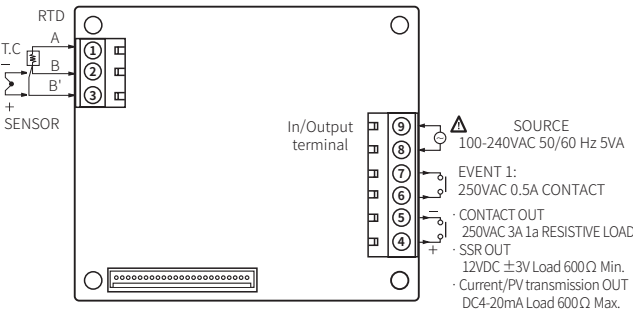
3. Run mode: Displays SV (Setting value)

4. Setting mode: Displays Setting value of parameter

5. When using timer: Displays time of timer

4. Indicator			5. Input key		
Display	Name	Description	PCB	Display	Name
LED1	Main output	Turns ON when control output is ON • It is not operated when current/PV transmission output is ON	LED 1	[MD]	Mode key
				◀	Setting value
				▼	control key
LED2	Event 1 output	Turns ON when event 1 alarm output is ON	LED 2	▲	
LED3	OK monitor operation	Turns OFF when event 2 alarm output is ON • Flashes during auto tuning	LED 3		

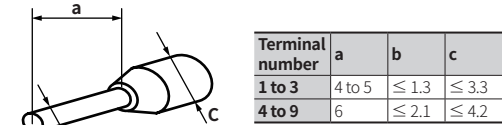
Connections



Crimp Terminal Specifications

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

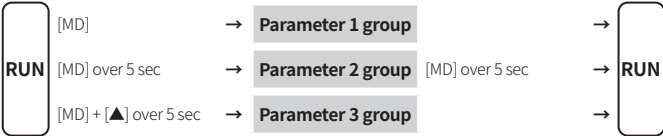
■ Wire ferrule



Errors

Display	Description	Troubleshooting
o P E n	Flashes when input sensor is disconnected or sensor is not connected.	Check input sensor status.
H H H H	Flashes when PV is higher than input range.	When input is within the rated input range, this display disappears.
L L L L	Flashes when PV is lower than input range.	

Mode Setting



Parameter Setting

- Some parameters are activated/deactivated depending on the model or setting of other parameters. Refer to the descriptions of each item.
- [MD] key: Move to next item after saving / Return to RUN mode after saving (≥ 5 sec) ◀ key: Select parameter / Move digits / Return to the upper level without saving (≥ 2 sec) / Return to RUN mode without saving (≥ 3 sec) ▲, ▼ key: Select parameter / Change setting value
- Return to RUN mode when there is no key input over 90 sec.
- The range in parentheses '()' is the setting range when the set value of the 'input specification' parameter is used with one decimal point.

■ Parameter 1 group

- Entering parameter 1 group is not available in PV transmission output type.

Parameter	Display	Default	Setting range	Condition
1-1 SV setting	℄ - 5 u	0	Refer to 'Input Type and Using Range'. • The setting value is initialized when changing '3-1 Input specification'.	-
1-2 Event 1 alarm temperature	℄ u - ℄	℄ 0	Within '3-1 Input specification Input range'.	3-7 Event 1: AL-1 to 6
1-3 Event 2 alarm temperature	℄ u - 2	℄ 0		3-9 Event 2: AL-3/4
1-4 Timer usage time	℄ - 5 u	0. ℄	0.1 to 999.9 hour	1-5 Timer setting: 1, 2
1-5 Timer setting	5 ℄ 5 P	0	0: Off 1: Output is cut off after temperature control is performed during '1-4 timer usage time'. 2: Temperature control output operation after waiting for 1-4 timer usage time. (reservation)	-

■ Parameter 2 group

- Entering parameter 2 group is not available in transmission output type.

Parameter	Display	Default	Setting range	Condition
2-1 Auto tuning	℘ ℄	o F F	OFF: Stop, ON: Execution	2-2 Proportional band: > 0.0
2-2 Proportional band	P	3.0	0.0 (ON/OFF control) to 100.0%	-
2-3 Integral time	i	0	0 (OFF) to 3,600 sec	2-2 Proportional band: > 0.0
2-4 Derivative time	d	0	0 (OFF) to 3,600 sec	
2-5 Control cycle	℄	2.0	1 to 120 sec ([SSR drive output model] Default: 2)	
2-6 Manual reset	r ℄ 5 ℄	0.0	0.0 to 100%	2-2 Proportional band: 0.0
2-7 Hysteresis	H ℄ 5	2	1 to 100 (0.1 to 100.0) °C	

■ Parameter 3 group

Parameter	Display	Default	Setting range	Condition
3-1 Input specification	℄ n - ℄	℄℃℘		Refer to 'Input Type and Using Range'.
3-2 High limit Scale	H - 5 ℄	4.0 0		
3-3 Low limit Scale	L - 5 ℄	0		
3-4 Temperature unit	U n ℄ ℄	o ℄	°C, °F	-
3-5 Input correction	℄ n - b	0	-50 to 50 (-50.0 to 50.0) °C	-
3-6 PID type	P ℄ d ℄	2	1: Heating high speed response PID 2: Heating low speed response PID 3: Cooling high speed response PID 4: Cooling low speed response PID	2-2 Proportional band: > 0.0
3-7 Event 1	℄ u - ℄	℘ ℄ - ℄	AL-0: Off AL-1: Deviation high limit alarm AL-2: Deviation low limit alarm AL-3: Deviation high, low limit alarm AL-4: Deviation high, low reverse alarm AL-5: Absolute value high limit alarm AL-6: Absolute value low limit alarm	2-2 Proportional band: 0.0
3-8 Alarm option	℘ ℄ - ℄	℘ ℄ - ℘	AL-A: Standard alarm AL-C: Standby sequence AL-B: Alarm latch AL-D: Alarm latch and standby sequence	-
3-9 Event 2	℄ u - 2	℘ ℄ - 4	AL-3: Deviation high, low limit alarm AL-4: Deviation high, low limit reverse alarm	-
3-10 Lock	L o ℄	o F F	LOC1: Parameter 2/3 group lock LOC2: All parameter lock without 1-1 SV setting ALL: All parameter lock	-