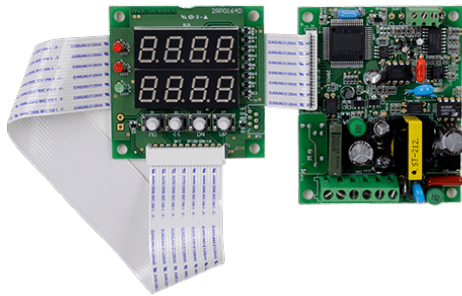


Board Type PID Temperature Controllers



TB42 Series PRODUCT MANUAL

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

- High performance temperature control at low cost
- Flexible installation in various applications
- Dual-speed PID control
- Timer operation function

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

- 01. 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.
- 02. 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.
- 03. Install on a device panel to use.**
Failure to follow this instruction may result in fire or electric shock.
- 04. 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.
- 05. Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.
- 06. 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

- 01. 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.
- 02. Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
- 03. 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.
- 04. 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
	SSR
	Current
	PV Transmission
Option output	Event 1
	Event 2
Display type	7 Segment (Green, Red), LED type
Control type	ON/OFF Control, P, PI, PD, PIDF, PIDS 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
	Electrical
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 MΩ (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)	1	ℰ℄℄	-100 to 1,300	-148 to 2,372
	J (IC)	1	℄℄℄	0 to 800	32 to 1,472
RTD ⁰²⁾	DPT100 Ω	1	℄℄℄	0 to 500	32 to 932
		0.1	℄℄℄	-199.9 to 199.9	-199.9 to 392.0
	JPT100 Ω	1	℄℄℄	0 to 500	32 to 932
		0.1	℄℄℄	-199.9 to 199.9	-199.9 to 392.0

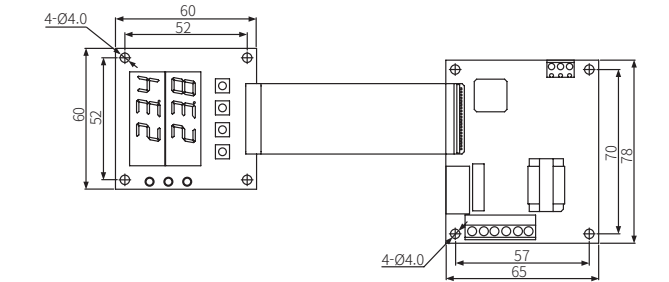
- 01) Tolerance outer resistance: ≤ 100 Ω
- 02) Allowable line resistance per a wire: ≤ 5Ω

■ Display accuracy

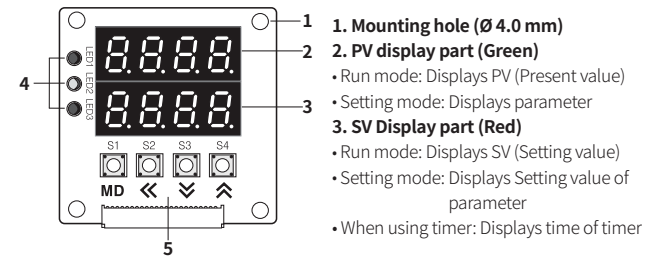
Input type	Using temperature	Display accuracy
Thermocouple	At room temperature (23°C ± 5 °C)	F.S. ± 0.3% or 3°C higher one
RTD	Out of room temperature range	F.S. ± 0.3% or 3°C higher one

Dimensions

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



Unit Descriptions



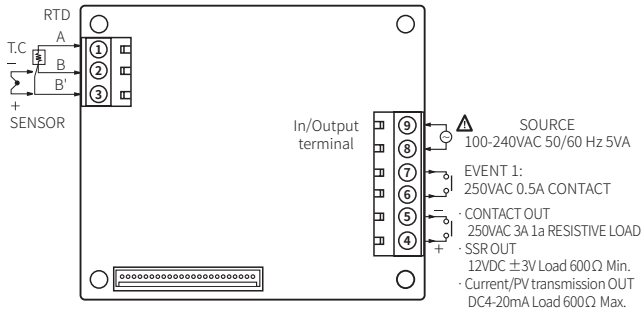
4. Indicator

Display	Name	Description	PCB
LED1	Main output	Turns ON when control output is ON • It is not operated when current/PV transmission output is ON	LED 1
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

5. Input key

Display	Name	PCB
[MD]	Mode key	S1
◀	Setting value control key	S2
▼		S3
▲		S4

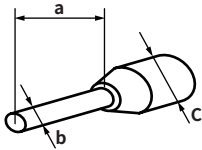
Connections



Crimp Terminal Specifications

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

Wire ferrule

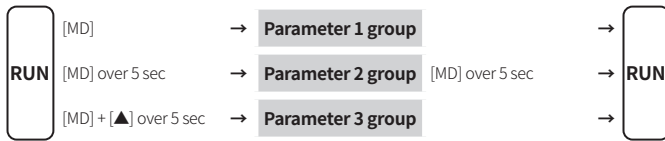


Terminal number	a	b	c
1 to 3	4 to 5	≤ 1.3	≤ 3.3
4 to 9	6	≤ 2.1	≤ 4.2

Errors

Display	Description	Troubleshooting
PE n	Flashes when input sensor is disconnected or sensor is not connected.	Check input sensor status.
HHHH	Flashes when PV is higher than input range.	When input is within the rated input range, this display disappears.
LLLL	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	C - 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	E u - 1	10	Within '3-1 Input specification Input range'	3-7 Event 1: AL-1 to 6
1-3 Event 2 alarm temperature	E u - 2	10		3-9 Event 2: AL-3/4
1-4 Timer usage time	t - 5 u	0.1	0.1 to 999.9 hour	1-5 Timer setting: 1, 2
1-5 Timer setting	5 t 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.

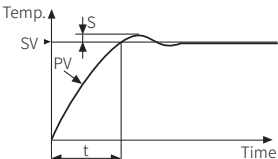
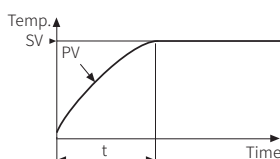
Parameter	Display	Default	Setting range	Condition
2-1 Auto tuning	R t	OFF	OFF: Stop, ON: Execution	2-2 Proportional band: > 0.0
2-2 Proportional band	P	3.0	0.0 (ON/OFF control) to 100.0%	-
2-3 Integral time	I	0	0 (OFF) to 3,600 sec	2-2 Proportional band: > 0.0
2-4 Derivative time	d	0	0 (OFF) to 3,600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

Parameter 3 group

Parameter	Display	Default	Setting range	Condition
3-1 Input specification	I n - t	0.0		Refer to 'Input Type and Using Range'.
3-2 High limit Scale	H - 5 C	400		
3-3 Low limit Scale	L - 5 C	0		
3-4 Temperature unit	U n I t	°C	°C, °F	-
3-5 Input correction	I n - b	0	-50 to 50 (-50.0 to 50.0) °C	-
3-6 PID type	P I d t	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 1, 2: Heating 3, 4: Cooling	2-2 Proportional band: > 0.0 2-2 Proportional band: 0.0
3-7 Event 1	E u - 1	AL - 1	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	-
3-8 Alarm option	AL - t	AL - R	AL-A: Standard alarm AL-B: Alarm latch AL-C: Standby sequence AL-D: Alarm latch and standby sequence	-
3-9 Event 2	E u - 2	AL - 4	AL-0: Off AL-3: Deviation high, low limit alarm AL-4: Deviation high, low limit reverse alarm	-
3-10 Lock	L o C	OFF	LOC1: Parameter 2/3 group lock LOC2: All parameter lock without 1-1 SV setting ALL: All parameter lock	-

PID Type

Select the mode depending on the characteristics of the control target by referring to the following description.

High speed response mode	Low speed response mode
 Used to minimize the time (t) required to reach the SV. Overshoot (S) occurs. Used in machinery that may require warming up. (injection molding machine, electric furnace, etc.)	 Used to minimize overshoot (S). Time (t) required to reach SV may be slower. Used for machinery or environments where overshoot may cause explosion or fire. (oil temperature control, metal plating machinery, etc.)

Segment Table

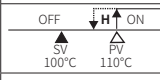
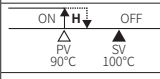
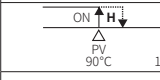
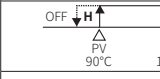
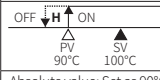
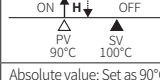
The segments displayed on the product indicate the following meanings. It may differ depending on the product.

7 Segment	11 Segment	12 Segment	16 Segment
0 0 I I	0 0 I I	0 0 I I	0 0 I I
1 1 J J	1 1 J J	1 1 J J	1 1 J J
2 2 K K	2 2 K K	2 2 K K	2 2 K K
3 3 L L	3 3 L L	3 3 L L	3 3 L L
4 4 M M	4 4 M M	4 4 M M	4 4 M M
5 5 N N	5 5 N N	5 5 N N	5 5 N N
6 6 O O	6 6 O O	6 6 O O	6 6 O O
7 7 P P	7 7 P P	7 7 P P	7 7 P P
8 8 Q Q	8 8 Q Q	8 8 Q Q	8 8 Q Q
9 9 R R	9 9 R R	9 9 R R	9 9 R R
A A S S	A A S S	A A S S	A A S S
b B T T	b B T T	b B T T	b B T T
c C U U	c C U U	c C U U	c C U U
d D V V	d D V V	d D V V	d D V V
E E W W	E E W W	E E W W	E E W W
F F X X	F F X X	F F X X	F F X X
G G Y Y	G G Y Y	G G Y Y	G G Y Y
H H Z Z	H H Z Z	H H Z Z	H H Z Z

Function: Alarm

Operation

• H: Alarm output hysteresis

Name	Alarm operation	Description
-	-	No alarm output
Deviation high limit	 High deviation: Set as 10°C	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
Deviation low limit	 Low deviation: Set as 10°C	If deviation between PV and SV as low limit is higher than set value of deviation temperature, the alarm output will be ON.
Deviation high, low limit	 High, Low deviation: Set as 10°C	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
Deviation high, low limit reverse	 High, Low deviation: Set as 10°C	If deviation between PV and SV as high/low-limit is lower than set value of deviation temperature, the alarm output will be OFF.
Absolute value high limit	 Absolute value: Set as 90°C	If PV is higher than the absolute value, the output will be ON.
Absolute value low limit	 Absolute value: Set as 90°C	If PV is lower than the absolute value, the output will be ON.

Option

Name	Description	Condition of re-apply
Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.	-
Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status.	-
Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.	Power ON
Alarm latch and standby sequence 1	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.	