

Autonics

High Accuracy PID Temperature Controller

TK4 SERIES

INSTRUCTION MANUAL



Thank you for choosing our Autonics product.
Please read the following safety considerations before use.

■ Safety Considerations

- ※Please observe all safety considerations for safe and proper product operation to avoid hazards.
※⚠ symbol represents caution due to special circumstances in which hazards may occur.

- ⚠ Warning** Failure to follow these instructions may result in serious injury or death.
⚠ Caution Failure to follow these instructions may result in personal injury or product damage.

⚠ Warning

1. **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 fire, personal injury, or economic loss.
2. **Install on a device panel to use.** Failure to follow this instruction may result in electric shock.
3. **Do not connect, repair, or inspect the unit while connected to a power source.** Failure to follow this instruction may result in electric shock or fire.
4. **Check 'Connections' before wiring.** Failure to follow this instruction may result in fire.
5. **Do not disassemble or modify the unit.** Failure to follow this instruction may result in electric shock or fire.

⚠ Caution

1. **When connecting the power input and relay output, use AWG 20 (0.50mm²) cable or over and tighten the terminal screw with a tightening torque of 0.74~0.90N·m.**
When connecting the sensor input and communication cable without dedicated cable, use AWG 28~16 cable or over and tighten the terminal screw with a tightening torque of 0.74~0.90N·m.
Failure to follow this instruction may result in fire or malfunction due to contact failure.
2. **Use the unit within the rated specifications.** Failure to follow this instruction may result in fire or product damage.
3. **Use dry cloth to clean the unit, and do not use water or organic solvent.** Failure to follow this instruction may result in electric shock or fire.
4. **Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.** Failure to follow this instruction may result in fire or explosion.
5. **Keep metal chip, dust, and wire residue from flowing into the unit.** Failure to follow this instruction may result in fire or product damage.

■ Ordering Information

TK	4	N	-	1	4	R	N
							OUT2 control output ¹⁾
							OUT1 control output ²⁾
							Power supply
							Input/Output option ¹⁾
							Size
							Digit
							Item
							Item

- ※1. In case of TK4N/SP Series, option control selection and digital input will be limited due to number of terminals.
※2. "S" represents SSR drive output support models which SSRP function (standard ON/OFF, cycle, phase) control are available. "C" represents selectable current and SSR drive output support models.
※3. Select "R" or "C" type in case of using heating&cooling control and "N" type in case of using standard control.
※4. Does not support in AC/DC voltage type model.
※5. Does not support in TK4N.
※6. The CT input model of TK4N is selectable only for standard model which has alarm output 1.
※7. The heating&cooling model of TK4N-1□□□ only has alarm output 2.
※8. Only for TK4S-□□□□, OUT2 output terminal is used as DI-2 input terminal.
※9. 11Pin socket (PG-11, PS-11(N)) for TK4SP: sold separately.

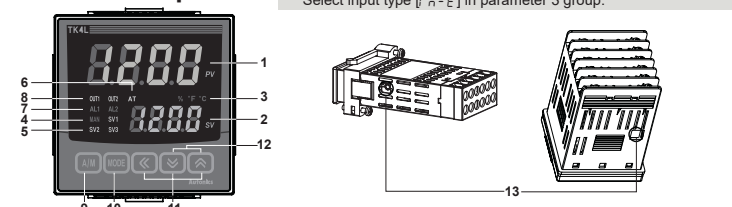
- ※Shaded descriptions are upgraded or added functions from the before TK Series.
※The above specifications are subject to change and some models may be discontinued without notice.
※Be sure to follow cautions written in the instruction manual, user manual and the technical descriptions (catalog, homepage).

■ Specifications

Series	TK4N	TK4SP	TK4S	TK4M	TK4W	TK4H	TK4L
Power supply	AC voltage	100-240VAC~ 50/60Hz	—	—	—	—	—
Allowable voltage range	AC/DC voltage	24VAC~50/60Hz, 24-48VDC=	—	—	—	—	—
Power consumption	AC voltage	Max. 6VA	Max. 8VA	Max. 8VA	Max. 8VA	Max. 8VA	Max. 8VA
Display method	AC/DC voltage	—	Max. 8VA (24VAC 50/60Hz), max. 5W (24-48VDC)	—	—	—	—
Character size	7-segment (PV: red, SV: green, other display part (green, yellow, red) LED method	—	—	—	—	—	—
Input type	PV (W×H)	4.5×7.2mm	7.0×14.0mm	9.5×20.0mm	8.5×17.0mm	7.0×14.6mm	11.0×22.0mm
Display accuracy	SV (W×H)	3.5×5.8mm	5.0×10.0mm	7.5×15.0mm	6.0×12.0mm	6.0×12.0mm	7.0×14.0mm
Control output	RTD	JPT 100Ω, DPT 100Ω, DPT 50Ω, Cu 100Ω, Cu 50Ω, Nickel 120Ω (6 types)	—	—	—	—	—
Alarm output	Thermocouple	K, J, E, T, L, N, U, R, S, B, C, G, PLII (13 types)	—	—	—	—	—
Option output	Analog	-Voltage: 0-100mVDC=, 0-5VDC=, 1-5VDC=, 0-10VDC= (4 types) -Current: 0-20mA, 4-20mA (2 types)	—	—	—	—	—
Option input	Relay	OUT1, OUT2: 250VAC~ 3A, 30VDC= 3A, 1A	—	—	—	—	—
Control method	SSR	Max. 11VDC= ±2V 20mA	—	—	—	—	—
Hysteresis	Current	DC4-20mA or DC0-20mA selectable (resistance load: max. 500Ω)	—	—	—	—	—
Proportional band (P)	Relay	AL1, AL2: 250VAC~ 3A 1a ※TK4N AL2: 250VAC~ 0.5A, 1a (max. 125VA), TK4SP has only AL1	—	—	—	—	—
Integral time (I)	Transmission	DC4-20mA (resistance load: max. 500Ω, output accuracy: ±0.3% F.S.)	—	—	—	—	—
Derivative time (D)	Communication	RS485 communication output (Modbus RTU)	—	—	—	—	—
Control period (T)	CT	0.0-50.0A (primary heater current reading range) ※CT ratio is 1/1000 (except TK4SP)	—	—	—	—	—
Manual reset value	Digital input	-Contact input: ON - max. 2kΩ, OFF - min. 90kΩ -Non-contact input: ON - residual voltage max. 1.0VDC=, OFF - leakage current max. 0.1mA -Outflow current: approx. 0.5mA per input ※TK4SUM: 1 (TK4S-□□□□ 2, TK4SP: none), TK4NH/W/L: 2 (except TK4SP)	—	—	—	—	—
Sampling period	Heating, Cooling	ON/OFF, P, PI, PD, PID control mode	—	—	—	—	—
Dielectric strength	Heating&Cooling	—	—	—	—	—	—
Vibration	RTD/Thermocouples: 1 to 100°C/°F (0.1 to 100.0°C/°F) variable -Analog: 1 to 100-digit	—	—	—	—	—	—
Relay life cycle	Mechanical	-RTD/Thermocouples: 1 to 100°C/°F (0.1 to 100.0°C/°F) variable -Analog: 1 to 100-digit	—	—	—	—	—
Insulation resistance	Electrical	0.1 to 999.9°C/°F (0.1 to 999.9%)	—	—	—	—	—
Noise immunity	Electrical	0 to 9999 sec	—	—	—	—	—
Memory retention	Electrical	0 to 9999 sec	—	—	—	—	—
Environ -ment	Ambient temp.	-10 to 50°C, storage: -20 to 60°C	—	—	—	—	—
Protection	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH	—	—	—	—	—
Insulation type	IP65 (front panel) ※TK4SP: IP50 (front panel)	—	—	—	—	—	—
Approval	CE, RoHS	—	—	—	—	—	—
Weight ¹⁾	Approx. 140g (approx. 70g)	Approx. 130g (approx. 85g)	Approx. 150g (approx. 105g)	Approx. 210g (approx. 140g)	Approx. 211g (approx. 141g)	Approx. 294g (approx. 198g)	Approx. 294g (approx. 198g)

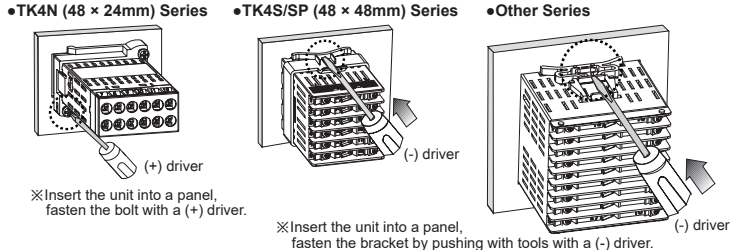
- ※1: ○At room temperature range (23°C±5°C)
• Thermocouple K, J, T, N, E type, below -100°C / Thermocouple L, U, PLII, Cu50Ω, DPT 50Ω: (PV ±0.3% or ±2°C, select the higher one) ±1-digit
• Thermocouple C, G, R, S type, below 200°C: (PV ±0.3% or ±3°C, select the higher one) ±1-digit
• Thermocouple B type, below 400°C: there is no accuracy standards.
○Out of room temperature range
• RTD Cu50Ω, DPT50Ω: (PV ±0.5% or ±3°C, select the higher one) ±1-digit
• Thermocouple R, S, B, C, G type: (PV ±0.5% or ±5°C, select the higher one) ±1-digit
• Others, below -100°C: within ±5°C
In case of TK4SP Series, ±1°C will be added to the degree standard.
※2: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

■ Unit Description



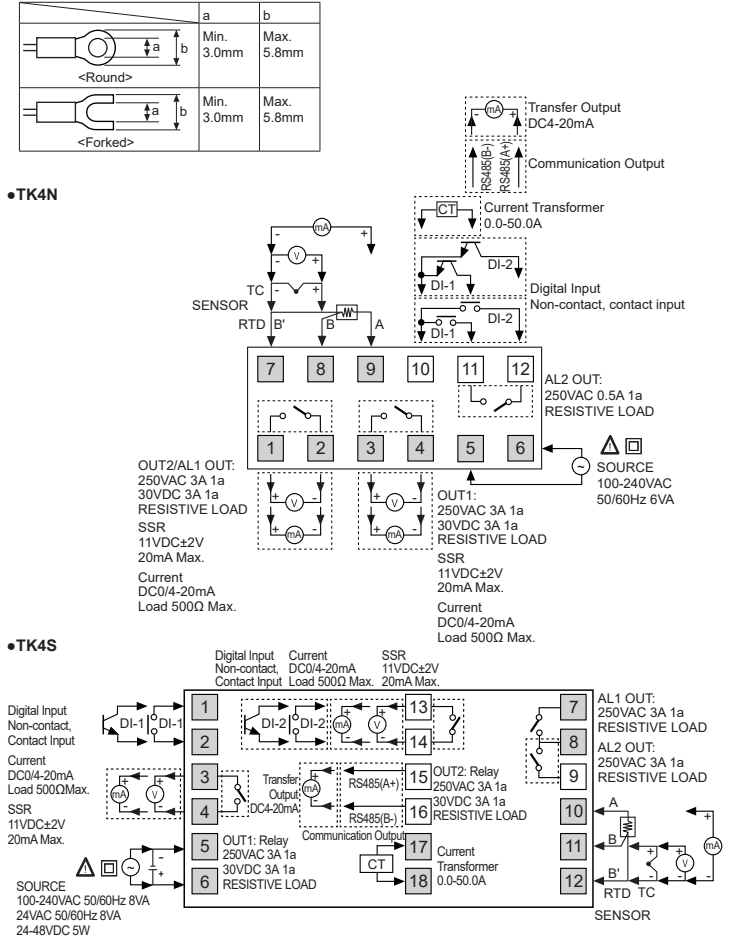
1. **Measured value (PV) display part:** RUN mode: It displays currently measured value (PV). Setting mode: It displays the parameter.
2. **Set value (SV) display part:** RUN mode: It displays the set value (SV). Setting mode: It displays the set value of the parameter.
3. **Unit (°C/°F%) indicator:** It displays the unit set at display unit [unit] in parameter 3 group. (In case of TK4N, % is not supported).
4. **Manual control indicator:** It turns ON during manual controlling.
5. **Multi SV indicator:** One of SV1 to 3 lamps will be ON in case of selecting multi SV function.
6. **Auto tuning indicator:** It flashes by 1 sec. when executing auto tuning.
7. **Alarm output (AL1, AL2) indicator:** It turns ON when the alarm output is ON.
8. **Control output (OUT1, OUT2) indicator:** It turns ON when the control output is ON.
※During cycle/phase controlling in SSRP function model (TK4-□□□□□□), when MV is over 5.0%, it turns ON.
※To use current output, when MV is 0.0% in manual control, it turns OFF. Otherwise, it always turns ON.
When MV is over 3.0% in auto control, it turns ON and when MV is below 2.0%, it turns OFF.
9. **key:** It is used when switching auto control to manual control.
※TK4N/SP do not have the key. The key operates switching simultaneously.
10. **key:** It is used when entering parameter groups, returning to RUN mode, moving parameter, saving the set value.
11. **key:** It is used when entering the set value changing mode and moving or changing up/down digit.
12. **Digital input key:** When pressing + keys for 3 sec. at the same time, it operates the function (RUN/STOP, alarm clear, auto tuning) set at digital input key [di - p] in parameter 5 group.
13. **PC loader port:** It is the PC loader port for serial communication to set parameter with DAQMaster installed in PC. Use this for connecting SCM-US (USB/Serial converter, sold separately).

■ Installation

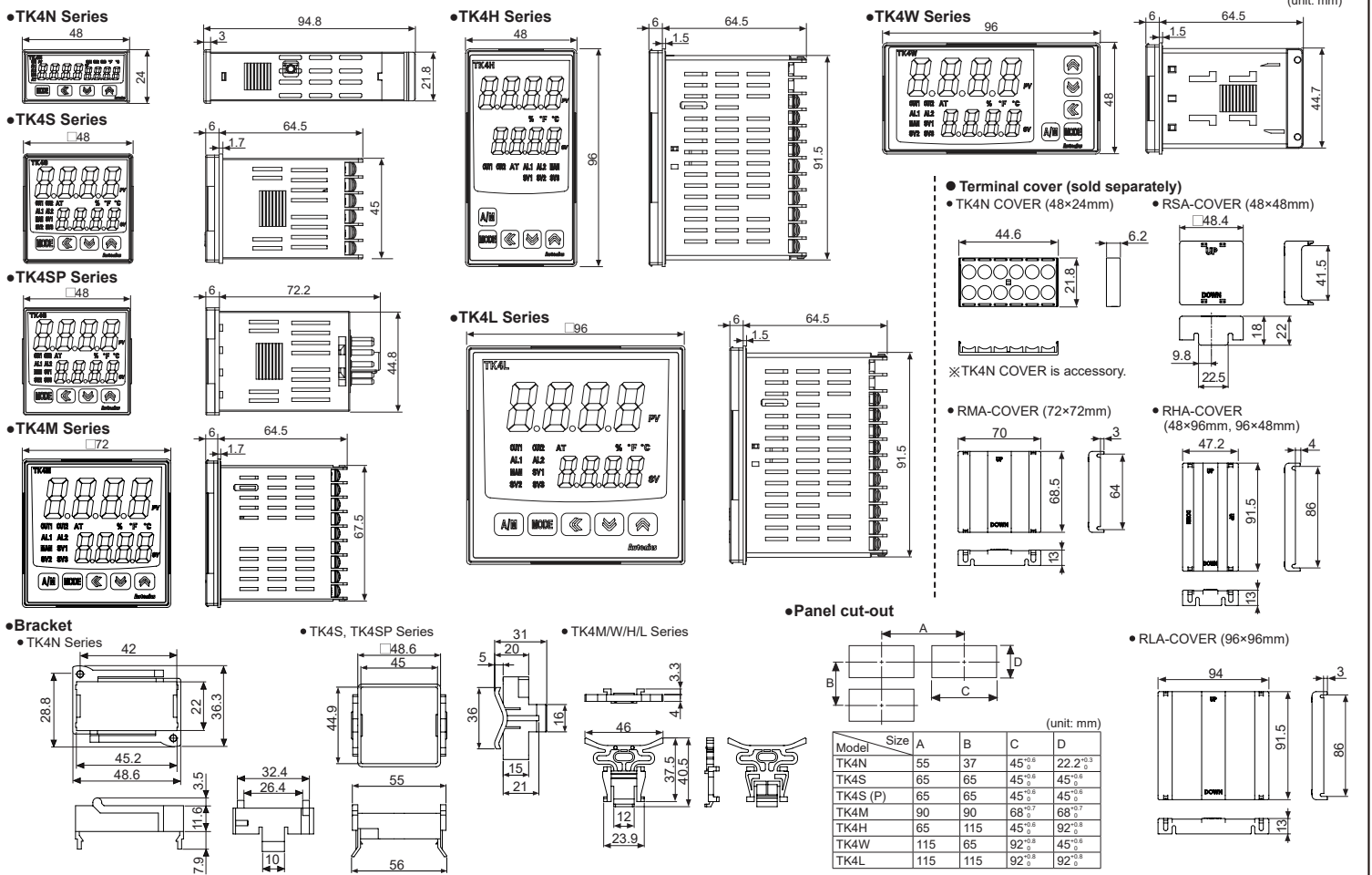


■ Connections

- ※Standard model has shaded terminals only.
※When the operation mode of heating&cooling OUT2 relay output model is heating or cooling control, the OUT2 is usable as alarm output 3 (except TK4N Series).
※When the operation mode of heating&cooling OUT2 current output model is heating or cooling control, the OUT2 is usable as transmission output 2.
※Use terminals of size specified below.



■ Dimensions



[illegible]

Input type		Decimal point	Display	Input range (°C)	Input range (°F)
Thermocouple	K (CA)	1	$\overline{E}CRH$	-200 to 1350	-328 to 2463
		0.1	$\overline{E}CRL$	-199.9 to 999.9	-199.9 to 999.9
	J (IC)	1	$\overline{J}IC.H$	-200 to 800	-328 to 1472
		0.1	$\overline{J}I.C.L$	-199.9 to 800.0	-199.9 to 999.9
	E (CR)	1	$\overline{E}C.r.H$	-200 to 800	-328 to 1472
		0.1	$\overline{E}C.r.L$	-199.9 to 800.0	-199.9 to 999.9
	T (CC)	1	$\overline{E}CC.H$	-200 to 400	-328 to 752
		0.1	$\overline{E}CC.L$	-199.9 to 400.0	-199.9 to 752.0
	B (PR)	1	$\overline{b}Pr$	0 to 1800	32 to 3272
	R (PR)	1	$\overline{r}Pr$	0 to 1750	32 to 3182
	S (PR)	1	$\overline{s}Pr$	0 to 1750	32 to 3182
	N (NN)	1	$\overline{n}n.n$	-200 to 1300	-328 to 2372
	C (TT) ^{*1}	1	$\overline{C}t.t$	0 to 2300	32 to 4172
	G (TT) ^{*2}	1	$\overline{G}t.t$	0 to 2300	32 to 4172
L (IC)	1	$\overline{L}I.C.H$	-200 to 900	-328 to 1652	
	0.1	$\overline{L}I.C.L$	-199.9 to 900.0	-199.9 to 999.9	
U (CC)	1	$\overline{U}CC.H$	-200 to 400	-328 to 752	
	0.1	$\overline{U}CC.L$	-199.9 to 400.0	-199.9 to 752.0	
Platinel II	1	$\overline{P}L.t.t$	0 to 1390	32 to 2534	
RTD	Cu 50Ω	0.1	$\overline{C}U.5$	-199.9 to 200.0	-199.9 to 392.0
	Cu 100Ω	0.1	$\overline{C}U.10$	-199.9 to 200.0	-199.9 to 392.0
	JPT 100Ω	1	$\overline{j}P.t.H$	-200 to 650	-328 to 1202
		0.1	$\overline{j}P.t.L$	-199.9 to 650.0	-199.9 to 999.9
	DPT 50Ω	0.1	$\overline{d}P.t.5$	-199.9 to 600.0	-199.9 to 999.9
	DPT 100Ω	1	$\overline{d}P.t.H$	-200 to 650	-328 to 1202
		0.1	$\overline{d}P.t.L$	-199.9 to 650.0	-199.9 to 999.9
	Nickel 120Ω	1	$\overline{n}l.12$	-80 to 200	-112 to 392
Analog	Voltage	0-10V	$\overline{R}u.1$	-1999 to 9999 (Display point will be changed according to decimal point position.)	
		0-5V	$\overline{R}u.2$		
		1-5V	$\overline{R}u.3$		
		0-100mV	$\overline{R}\overline{n}.u.1$		
	Current	0-20mA	$\overline{R}\overline{n}\overline{n}.1$		
		4-20mA	$\overline{R}\overline{n}\overline{n}.2$		

When power is supplied, whole display parts flash for 1 sec. Afterwards, model name and input sensor type will be flash twice and then in enters into RUN mode.

① Whole display part

② Model type display

③ Input type display twice

④ Run mode

■ Set Value (SV) Setting

You can set the temperature to control with , , keys.

Set range is within SV low-limit value [$\downarrow - 5\mu$] to SV high-limit value [$\uparrow - 5\mu$].

Ex) In case of changing set temperature from 210°C to 250°C

①

Press any key among , , in RUN mode to enter into SV setting mode.

Last digit (10⁰ digit) on SV display part flashes.

②

Press key to move digit ($10^0 \rightarrow 10^1 \rightarrow 10^2 \rightarrow 10^3 \rightarrow 10^0$)

③

Press , key to raise or lower the set value.

④

Press key to save the set value.

If there is no additional key operations in 3 sec., the changed SV is automatically saved.

■ Parameter Reset

Press + + to reset all parameters in memory to default value.

Set [$\downarrow$ n t $\uparrow$] parameter to '955' to reset all parameters.

In case password function is on, it is required to enter valid password to reset parameters. Password is also reset.

※Condition of re-applied standby sequence for standby sequence 1, alarm latch and standby sequence 1: Power ON
Condition of re-applied standby sequence for standby sequence 2, alarm latch and standby sequence 2: Power ON,
changing set temperature, alarm temperature [A_L - 1, A_L - 2] or alarm operation [A_L - 1, A_L - 2], switching STOP mode to RUN mode.

- Photoelectric Sensors
- Fiber Optic Sensors
- Door Sensors
- Door Side Sensors
- Area Sensors
- Proximity Sensors
- Pressure Sensors
- Rotary Encoders
- Connector/Socket
- Switching Mode Power Supplies
- Control Switches/Lamp Drivers
- I/O Terminal Blocks & Cables
- Stepper Motors/Drivers/Motion Controllers
- Graphic/Logic Panels
- Field Network Devices
- Laser Marking System (Fiber, CO₂, Nd: YAG)
- Laser Welding/Cutting System
- Temperature Controllers
- Temperature/Humidity Transducers
- SSRs/Power Controllers
- Counters
- Timers
- Panel Meters
- Tachometer/Pulse (Rate) Meters
- Display Units
- Sensor Controllers