

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. **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

- 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.
- 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 electric shock or fire.
- 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 electric shock or fire.

Caution

- 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 0.74~0.90Nm. When connecting the sensor input and communication cable without dedicated cable, use AWG 28~26 cable or over and tighten the terminal screw with a tightening torque of 0.74~0.90Nm. 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 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.
- 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.
- 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 ²⁾	Standard	N	None	※Select in case of standard control (heating or cooling)			
OUT1 control output ²⁾	Heating & Cooling	R	Relay output				
Power supply	S	C	Current output or SSR drive output selectable				
	2	5	24VAC 50/60Hz, 24-48VDC				
	4		100-240VAC 50/60Hz				
	1	Standard	Alarm output 1+CT input ³⁾				
	2	Standard	Alarm output 1+Alarm output 2				
	Standard	D	Alarm output 1+Digital input (DI-1, DI-2)				
	Standard	N	Heating&Cooling Digital input (DI-1, DI-2)				
	Standard	R	Alarm output 1+Transmission output				
	Standard	T	Transmission output				
	Standard	R	Alarm output 1+RS485 communication output				
	Standard	T	RS485 communication output				
	SP	1	Alarm output 1				
	1	S	Alarm output 1				
	2	R	Alarm output 1+Alarm output 2				
	Standard	M	Alarm output 1+Transmission output				
	Standard	W	Alarm output 1+RS485 communication output				
	Standard	L	Alarm output 1+Alarm output 2+Transmission output				
	Standard	H	Alarm output 1+Alarm output 2+RS485 communication output				
	Standard	D	Alarm output 1+Alarm output 2+Digital input (DI-1, DI-2) ³⁾				
	N		DIN W48×H24mm				
	SP		DIN W48×H48mm (11pin plug type) ³⁾				
	S		DIN W48×H48mm (terminal block type)				
	M		DIN W72×H72mm				
	W		DIN W96×H48mm				
	H		DIN W48×H96mm				
	L		DIN W96×H96mm				
	4		9999 (4-digit)				
Item	TK		Temperature / Process Controller				

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

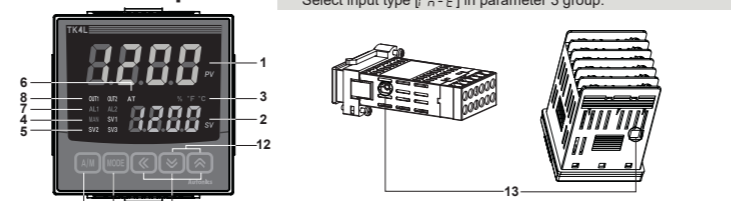
※Shaded descriptions are upgraded or added functions from the before TK Series. ※The above specifications are subject to change and some models may be discontinued without notice. ※Be sure to follow cautions written in the instruction manual, user manual and the technical descriptions (catalog, homepage).

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	—	—	—	—
AC/DC voltage	—	—	Max. 8VA (24VAC 50/60Hz), max. 5W (24-48VDC)	—	—	—	—
Display method	7-segment (PV: red, SV: green, other display part: green, yellow, red) LED method						
Character size	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
SV (W×H)	—	—	—	—	—	—	—
Input type	RTD	JPT 100Ω, DPT 100Ω, DPT 50Ω, Cu 100Ω, Cu 50Ω, NiKEI 120Ω (6 types)					
Thermocouple	K, J, E, T, L, N, U, R, S, B, C, G, PLII (13 types)						
Analog	Voltage: 0-100mVDC=, 0-5VDC=, 1-5VDC=, 0-10VDC= (4 types)						
Current: 0-20mA, 4-20mA (2 types)							
Display accuracy	RTD	AI room temperature (23°C ±5°C); (PV ±0.3% or ±1°C, select the higher one) ±1-digit ¹⁾					
Thermocouple	Out of room temperature ranges: (PV ±0.5% or ±2°C, select the higher one) ±1-digit						
Analog	AI room temperature (23°C ±5°C); (PV ±0.3% F.S. ±1-digit)						
Out of room temperature ranges: ±0.5% F.S. ±1-digit							
CT input	±5% F.S. ±1-digit						
Control output	Relay	OUT1, OUT2: 250VAC~3A, 30VDC=3A, 1a					
SSR	Max. 11VDC=±2V 20mA						
Current	DC/4-20mA or DC/0-20mA selectable (resistance load: max. 500Ω)						
Alarm output ¹⁾	Relay	AL1, AL2: 250VAC~3A 1a ※TK4N AL2: 250VAC~0.5A, 1a (max. 125VA), TK4SP has only AL1					
Transmission	DC/4-20mA (resistance load: max. 500Ω, output accuracy: ±0.3% F.S.)						
Communication	RS485 communication output (Modbus RTU)						
Option input	CT	0.0-50.0A (primary heater current reading range) ※CT ratio is 1/1000 (except TK4SP)					
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							
※TK4SM: 1 (TK4S-□□□□), 2 (TK4SP: none), TK4NH/W/L: 2 (except TK4SP)							
Control method	Heating, Cooling	ON/OFF, P, PI, PD, PID control mode					
Heating&Cooling							
Hysteresis	RTD/Thermocouples: 1 to 100°C/°F (0.1 to 100.0°C/°F) variable						
Analog: 1 to 100-digit							
Proportional band (P)	0.1 to 999.9°C/°F (0.1 to 999.9%)						
Integral time (I)	0 to 9999 sec						
Derivative time (D)	0 to 9999 sec						
Control period (T)	Relay output, SSR drive output: 0.1 to 120.0 sec						
Current output+SSR drive output: 1.0 to 120.0 sec							
Manual reset value	0.0 to 100.0%						
Sampling period	50ms						
Dielectric strength	2,000VAC 50/60Hz for 1 min (between power source terminal and input terminal)						
Vibration	0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours						
Relay life cycle	Mechanical	OUT1/OUT2: min. 5,000,000 operations, AL1/AL2: min. 20,000,000 operations (TK4H/W/L: min. 5,000,000 operations)					
Electrical	OUT1/OUT2, AL1/AL2: min. 100,000 operations						
Insulation resistance	Over 100MΩ (at 500VDC megger)						
Noise immunity	Square shaped noise by noise simulator (pulse width 1μs) ±2kV R-phase, S-phase						
Memory retention	Approx. 10 years (non-volatile semiconductor memory type)						
Environment	Ambient temp.	-10 to 50°C, storage: -20 to 60°C					
-ment	Ambient humi.	35 to 85%RH, storage: 35 to 85%RH					
Protection	IP65 (front panel)	※TK4SP: IP50 (front panel)					
Double insulation or reinforced insulation (mark: □)	dielectric strength between the measuring input part and the power part : 2kV)						
Insulation type	Approval	CE, VDE					
Weight ¹⁾	Approx. 140g	Approx. 130g	Approx. 150g	Approx. 210g	Approx. 211g	Approx. 294g	Approx. 198g
(approx. 85g)	(approx. 85g)	(approx. 105g)	(approx. 140g)	(approx. 141g)	(approx. 198g)	(approx. 198g)	(approx. 198g)

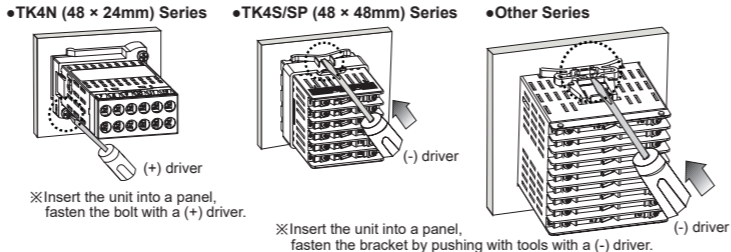
- ※1: ○At room temperature range (23°C±5°C):
- Thermocouple K, J, T, N, E type, below -100°C / Thermocouple L, U, PLII, Cu50Ω, DPT 50Ω: (PV ±0.3% or ±2°C, select the higher one) ±1-digit
 - Thermocouple C, G, R, S type, below 200°C: (PV ±0.3% or ±3°C, select the higher one) ±1-digit
 - Thermocouple B 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



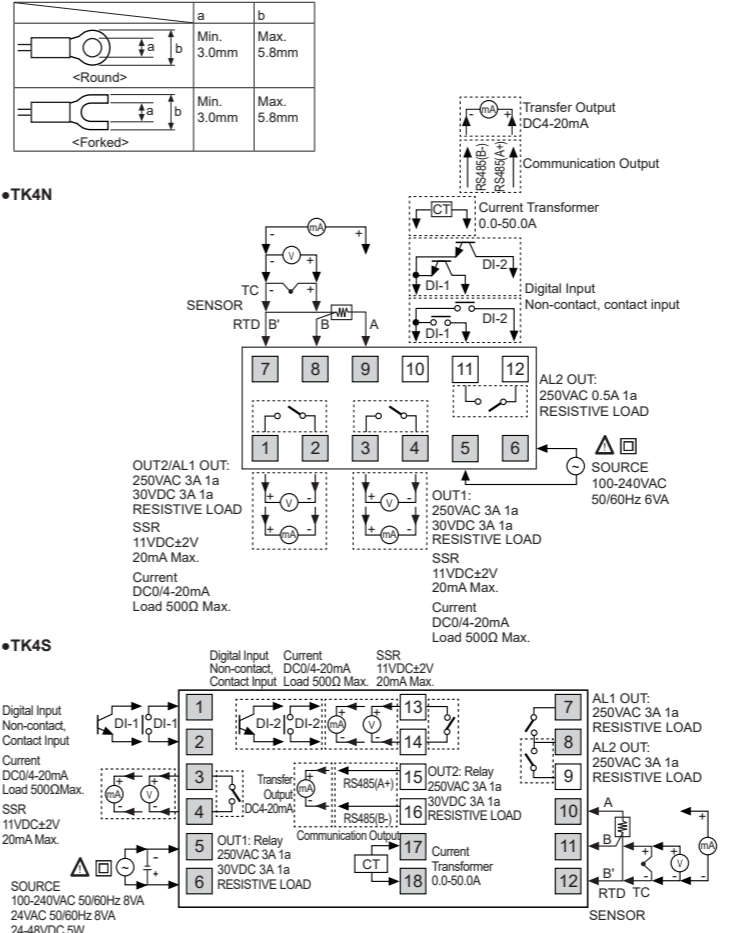
- Measured value (PV) display part: RUN mode: It displays currently measured value (PV). Setting mode: It displays the parameter.
- Set value (SV) display part: RUN mode: It displays the set value (SV). Setting mode: It displays the set value of the parameter.
- Unit (%C/F%) indicator: It displays the unit set at display unit [unit] in parameter 3 group. (In case of TK4N, % is not supported).
- Manual control indicator: It turns ON during manual controlling.
- Multi SV indicator: One of SV1 to 3 lamps will be ON in case of selecting multi SV function.
- Auto tuning indicator: It flashes by 1 sec. when executing auto tuning.
- Alarm output (AL1, AL2) indicator: It turns ON when the alarm output is ON.
- Control output (OUT1, OUT2) indicator: It turns ON when the control output is ON. ※During cycle/phase controlling in SSRP function model (TK4□-□4S□), 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.
- Key: It is used when switching auto control to manual control.
- TK4N/S/SP do not have the key. The key operates switching simultaneously.
- key: It is used when entering parameter groups, returning to RUN mode, moving parameter, saving the set value.
- keys: It is used when entering the set value changing mode and moving or changing up/down digit.
- 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 - v] in parameter 5 group.
- 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

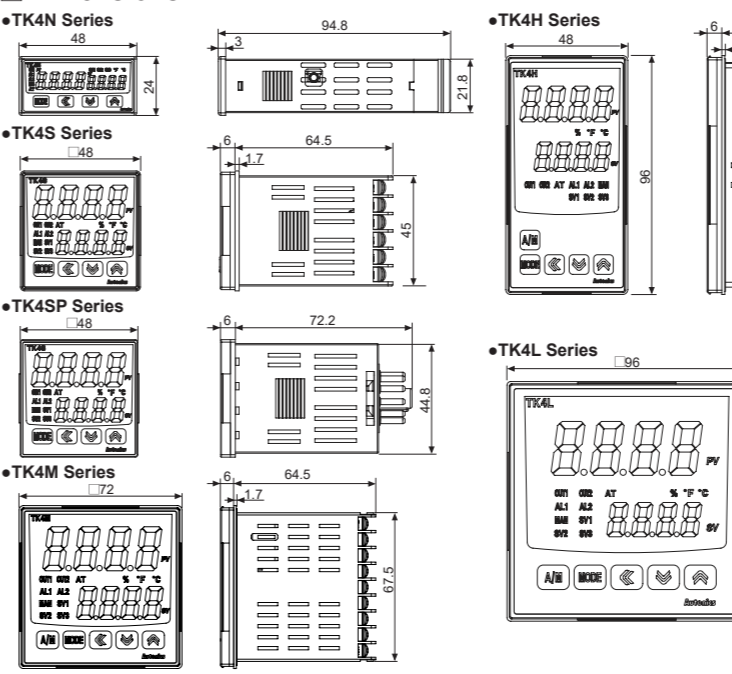


Connections

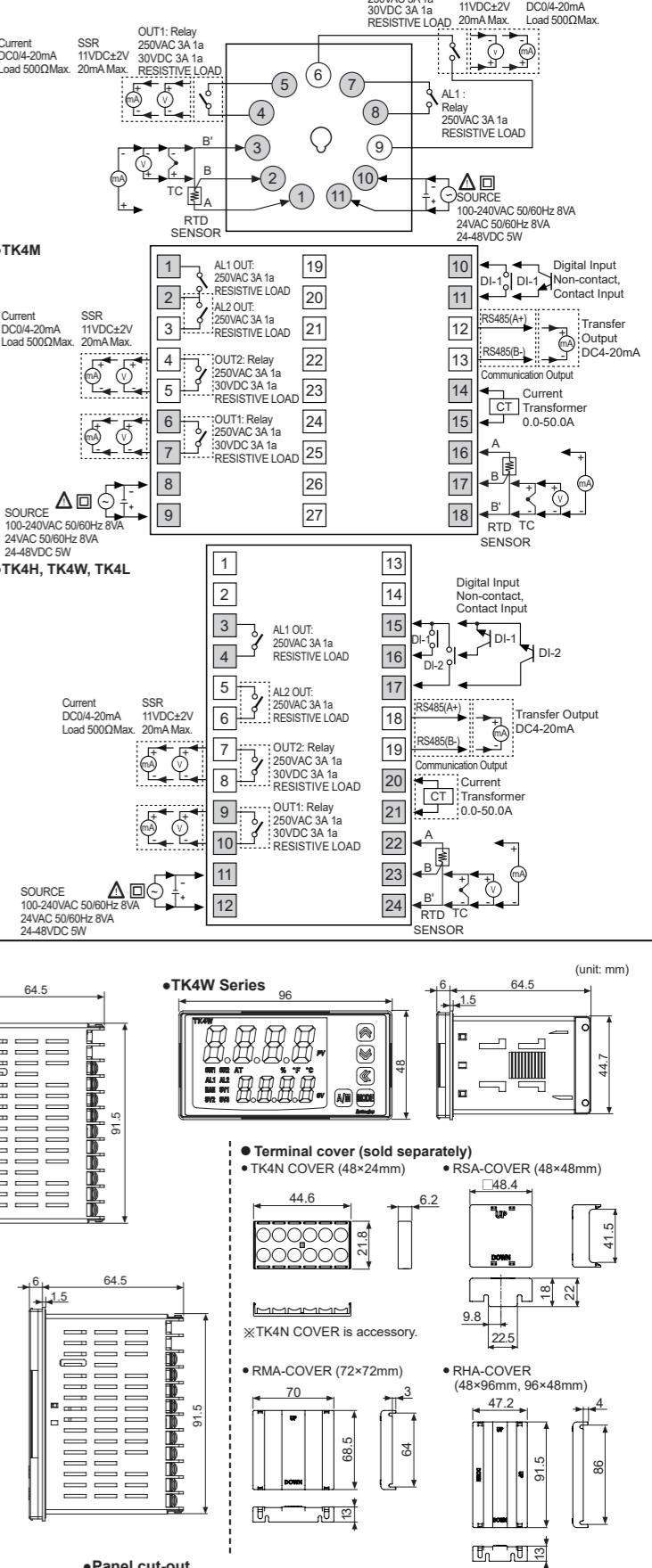
※Standard model has shaded terminals only.
 ※When the operation mode of heating&cooling OUT2 relay output model is heating or cooling control, the OUT2 is usable as alarm output 3 (except TK4N Series).
 ※When the operation mode of heating&cooling OUT2 current output model is heating or cooling control,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



Dimensions



Terminal cover



Panel cut-out

Model	Size	A	B	C	D
TK4N	55	37	45 ^{+0.2}	22 ^{+0.3}	91.5
TK4S	65	65	45 ^{+0.2}	45 ^{+0.2}	91.5
TK4S (P)	65	65	45 ^{+0.2}	45 ^{+0.2}	91.5
TK4M	90	90	68 ^{+0.2}	68 ^{+0.2}	91.5
TK4H	65	115	45 ^{+0.2}	92 ^{+0.2}	91.5
TK4W	115	65	92 ^{+0.2}	45 ^{+0.2}	91.5
TK4L	115	115	92 ^{+0.2}	92 ^{+0.2}	91.5

