

Autonics

TEMPERATURE CONTROLLER

TK4 SERIES

M A N U A L



Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

Caution for your safety

- Please keep these instructions and review them before using this unit.
- Please observe the cautions that follow:
 - Warning** Serious injury may result if instructions are not followed.
 - Caution** Product may be damaged, or injury may result if instructions are not followed.
- The following is an explanation of the symbols used in the operation manual.
 - Warning**: Injury or danger may occur under special conditions.

Warning

- In case of using this unit with machineries (Nuclear power control, medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc), it is required to install fail-safe device, or contact us. It may cause fire, human injury or property loss.
- Install the unit on a panel. It may cause an electric shock.
- Do not connect, inspect or repair when power is on. It may cause an electric shock.
- Wire properly after check terminal number. It may cause a fire.
- Do not disassemble the case. Please contact us if it is required. It may cause an electric shock or a fire.

Caution

- This unit shall not be used outdoors. It might shorten the life cycle of the product or give an electric shock.
- When connect wire, no.20AWG(0.50mm) should be used and screw bolt on terminal block with 0.74N·m to 0.90N·m strength. It may cause a malfunction or fire due to contact failure.
- For crimped terminal, select following shaped terminal.
- Please observe the rated specifications. It might shorten the life cycle of the product and cause a fire.
- Do not use beyond of the rated switching capacity of relay contact. It may cause insulation failure, contact melt, contact failure, relay broken and fire etc.
- In cleaning unit, do not use water or an oil-based detergent and use dry towels. It may cause an electric shock or a fire.
- Do not use this unit in place where there are flammable or explosive gas, humidity, direct ray of the light, radiant heat, vibration and impact etc. It may cause a fire or an explosion.
- Do not inflow dust or wire dregs into the unit. It may cause a fire or a malfunction.
- Please wire properly after check the terminal polarity when connect temperature sensor. It may cause a fire or an explosion.
- In order to install the units with reinforced insulation, use the power supply unit which basic insulation level is ensured.

Ordering information

TK	4	S	-	1	4	R	R
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OUT2 Control output (#3)
OUT1 Control output (#2)
Power supply
Option output (#1)
Size
Digit
Item

Standard	N	None	*Select in case of standard control(Heating or Cooling)
Heating	R	Relay output	
Cooling	C	Current output+SSR drive output	
	R	Relay output	
	S	SSRP output	
	C	Current output+SSR drive output	
Power supply	4	100-240VAC 50/60Hz	
SP	1	ALARM1 output	
	1	ALARM1 output	
	2	ALARM1+ALARM2 output	
R		ALARM1+PV transmission output	
T		ALARM1+RS485 Communication output	
A		ALARM1+ALARM2+PV transmission output	
B		ALARM1+ALARM2+RS485 Communication output	
SP		DIN W48×H48mm(plug type)(#4)	
S		DIN W48×H48mm(Terminal block type)	
M		DIN W72×H72mm	
W		DIN W96×H48mm	
H		DIN W48×H96mm	
L		DIN W96×H96mm	
Digit	4	9999(4 Digit Type)	
Item	TK	Temperature / Process Controller	

- * 1: In case of SP series, option control output selection and digital input will be limited due to number of terminals.
- * 2: "S" represents SSRP drive voltage output support model which SSR standard/cycle/phase control are available. "C" represents both current and SSR(standard) output support model.
- * 3: Select "R" or "C" type in case of using heating&cooling control. Select "N" type in case of using standard control.
- * 4: 11 Pin Socket(PG-11,PS-11): Sold separately

*The above specifications are subject to change without notice.

Specifications

Series	TK4S	TK4SP	TK4M	TK4W	TK4H	TK4L
Power supply	100-240VAC 50/60Hz					
Allowable voltage range	90 ~ 110% of rated voltage					
Power consumption	Max. 8VA					
Display method	7 Segment(Red), Other display part(Green, Yellow, Red) LED					
Character size	PV(W×H) 7.0mm×14.0mm	9.5mm×20.0mm	8.5mm×17.0mm	7.0mm×14.0mm	11.0mm×22.0mm	11.0mm×22.0mm
Size	SV(W×H) 5.0mm×10.0mm	7.5mm×15.0mm	6.0mm×12.0mm	6.0mm×12.0mm	7.0mm×14.0mm	7.0mm×14.0mm
Input type	RTD JPT 100Ω, DPT 100Ω, CU 100Ω, CU 50Ω, Nickel 120Ω(6types)					
Thermocouples	K, J, E, T, L, N, U, R, S, B, C, G, PLII(13types)					
	Voltage: 0-100mV, 0-5V, 1-5V, 0-10V(4types) / Current: 0-20mA, 4-20mA(2types)					
RTD	(*1) At room temperature(23±5°C): (PV ±0.3% or ±1°C, select the bigger one) ±1Digit Out of range of room temperature: (PV ±0.5% or ±2°C, select the bigger one) ±1Digit In case of TK4SP series, ±1°C will be added.					
Analog	At room temperature(23±5°C): ±0.3% F·S ±1Digit, Out of range of room temperature: ±0.5% F·S ±1Digit					
	CT input: ±5% F·S ±1Digit					
Relay	250VAC 3A 1a					
SSR	11VDC±2V 20mA Max.					
Current	DC4-20mA or DC0-20mA (Load 500Ω Max.)					
Alarm output	Relay AL1, AL2 Relay: 250VAC 3A 1a (TK4SP: AL1 only)					
Transmission	DC4-20mA (Load 500Ω Max., Accuracy: ±0.3% F·S)					
Communication	RS485 communication output (Modbus RTU)					
CT	0.0-50.0A(Primary heater current value measuring range) *CT ratio = 1000:1(except TK4SP)					
Digital input	ON/Max. 2kΩ, OFF=Min. 90kΩ * Non-contact input: ON-Residual voltage max. 1.0V, OFF-leakage current max. 0.1mA * TK4S/M-1EA(due to limited terminals, TK4H/W/L-2EA(except TK4SP))					
heating/cooling	ON/OFF, P, PI, PD, PID control mode					
Thermocouples / RTD	1 ~ 100°C/°F (0.1 ~ 100.0°C/°F) variable • Analog: 1 ~ 100Digit					
Proportional band(P)	0.1 ~ 999.9% (0.1 ~ 999.9%)					
Integral time(I)	0 ~ 9999 sec.					
Derivative time(D)	0 ~ 9999 sec.					
Control period(T)	0.1 ~ 120.0 sec(*Relay output and SSR drive output only)					
Manual reset value	0.0 ~ 100.0%					
Sampling period	50ms					
Dielectric strength	2000VAC 50/60Hz for 1min. (between power source terminal and input terminal)					
Vibration resistance	0.75mm amplitude at frequency of 5 ~ 55Hz (for 1min.) in each X, Y, Z direction for 2 hours					
Relay	Mechanical OUT1/2: Over 5,000,000 times, AL1/2: Over 20,000,000 times(TK4H/W/L: Over 5,000,000 times) Electrical OUT1/2: Over 200,000 times, AL1/2: Over 100,000 times(TK4H/W/L: Over 200,000 times)					
Insulation resistance	Over 100MΩ (500VDC megger)					
Noise resistance	Square shaped noise by noise simulator (pulse width 1μs) ±2kV R-phase, S-phase					
Memory retention	Approx. 10years(When using non-volatile semiconductor memory type)					
Ambient temperature	-10 ~ 50°C (at non-freezing status)					
Storage temperature	-20 ~ 60°C (at non-freezing status)					
Ambient humidity	35 ~ 85%RH(at non-dew status)					
Protection	IP65(Front panel) *TK4SP: IP50(Front panel)					
Insulation type(*2)	□					
Unit weight	Approx. 105g	Approx. 85g	Approx. 140g	Approx. 141g	Approx. 141g	Approx. 198g

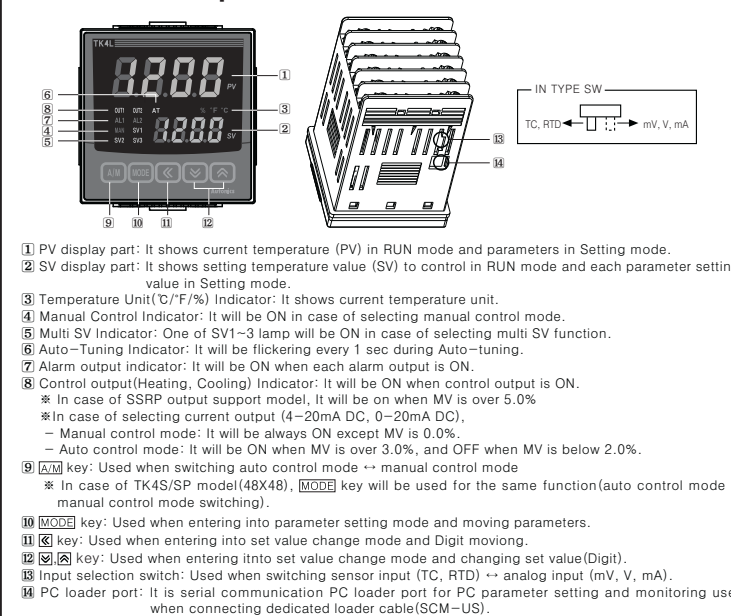
- * 1: ○ At room temperature(23±5°C)
 - TC K, J, T, N, E type, below -100°C / TC L, U, PLII type: (PV ±0.3% or ±2°C, select the bigger one) ±1Digit
 - TC C, G type/TC R, S type, below 200°C: (PV ±0.3% or ±3°C, select the bigger one) ±1Digit
 - TC B type, below 400°C: There is no accuracy standards.
 - Out of range of room temperature
 - TC R, S, B, C, G: (PV ±0.5% or ±5°C, select the bigger one) ±1Digit
 - Others: Below -100°C: Within ±5°C
 - In case of TK4SP series, ±1°C will be added.
- * 2: "□" represents that this unit is double or reinforced insulated.

Input Sensor Type and Temperature Range

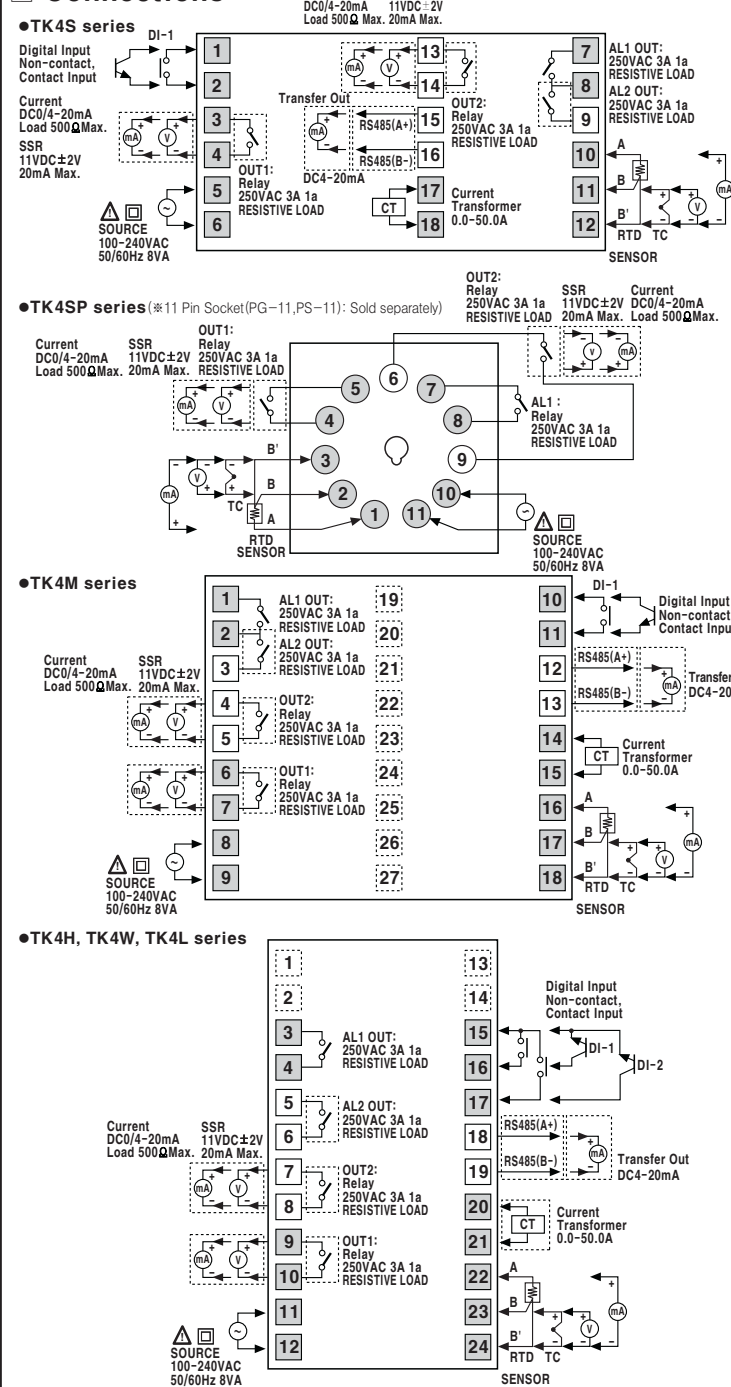
Input type	Dot	Display	Input range(°C)	Input range(°F)	
K(CA)	1	℄CAH	-200 ~ 1350	-328 ~ 2463	
	0.1	℄CAL	-199.9 ~ 999.9	-199.9 ~ 999.9	
	1	℄CH	-200 ~ 800	-328 ~ 1472	
	0.1	℄CL	-199.9 ~ 800.0	-199.9 ~ 999.9	
	1	℄CH	-200 ~ 800	-328 ~ 1472	
	0.1	℄CL	-199.9 ~ 800.0	-199.9 ~ 999.9	
E(CR)	1	℄CH	-200 ~ 800	-328 ~ 1472	
	0.1	℄CL	-199.9 ~ 800.0	-199.9 ~ 999.9	
	1	℄CH	-200 ~ 400	-328 ~ 752	
	0.1	℄CL	-199.9 ~ 400.0	-199.9 ~ 752.0	
	1	℄CH	-200 ~ 1800	32 ~ 3272	
	1	℄CH	-200 ~ 1750	32 ~ 3182	
T(CC)	1	℄CH	-200 ~ 400	-328 ~ 752	
	0.1	℄CL	-199.9 ~ 400.0	-199.9 ~ 752.0	
	1	℄CH	0 ~ 1750	32 ~ 3182	
	1	℄CH	0 ~ 1750	32 ~ 3182	
	1	℄CH	-200 ~ 1300	-328 ~ 2372	
	1	℄CH	0 ~ 2300	32 ~ 4172	
G(TT)(*2)	1	℄CH	0 ~ 2300	32 ~ 4172	
	1	℄CH	-200 ~ 900	-328 ~ 1652	
	0.1	℄CL	-199.9 ~ 900.0	-199.9 ~ 999.9	
	1	℄CH	-200 ~ 400	-328 ~ 752	
	0.1	℄CL	-199.9 ~ 400.0	-199.9 ~ 752.0	
	1	℄CH	-200 ~ 400	-328 ~ 752	
U(CC)	0.1	℄CL	-199.9 ~ 400.0	-199.9 ~ 752.0	
	1	℄CH	0 ~ 1390	32 ~ 2534	
	0.1	℄CL	-199.9 ~ 200.0	-199.9 ~ 392.0	
	0.1	℄CL	-199.9 ~ 200.0	-199.9 ~ 392.0	
	1	℄CH	-200 ~ 650	-328 ~ 1202	
	0.1	℄CL	-199.9 ~ 650.0	-199.9 ~ 999.9	
DIN Standards	DPT 50Ω	0.1	dPt5	-199.9 ~ 600.0	-199.9 ~ 999.9
	DPT 100Ω	1	dPt5	-200 ~ 650	-328 ~ 1202
	DPT 100Ω	0.1	dPtL	-199.9 ~ 650.0	-199.9 ~ 999.9
	Nickel 120Ω	1	nI2	-80 ~ 200	-112 ~ 392
	0 ~ 10V		Rv1		
	0 ~ 5V		Rv2		
Voltage	1 ~ 5V		Rv3		
	0 ~ 100mV		Rv4		
	0 ~ 20mA		RvA1		
	4 ~ 20mA		RvA2		
				-1999 ~ 9999	
				(Display point will be changed according to decimal point position.)	

(*1) Same as existing W5 (TT) type sensor (*2) Same as existing W(TT) type sensor

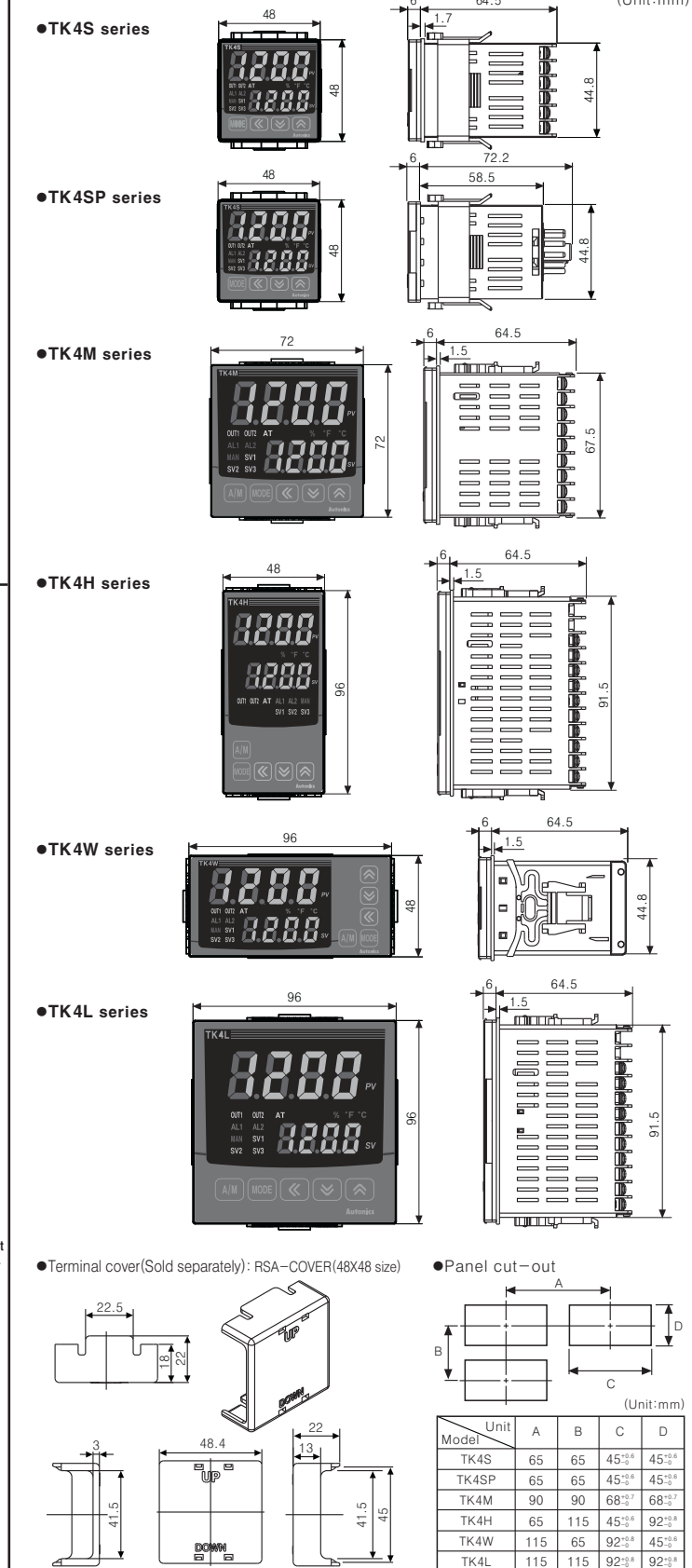
Parts description



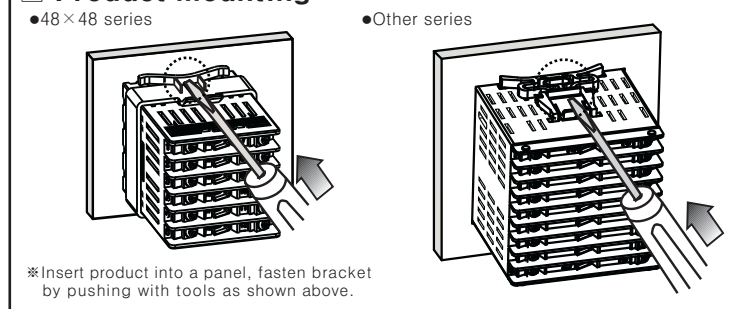
Connections



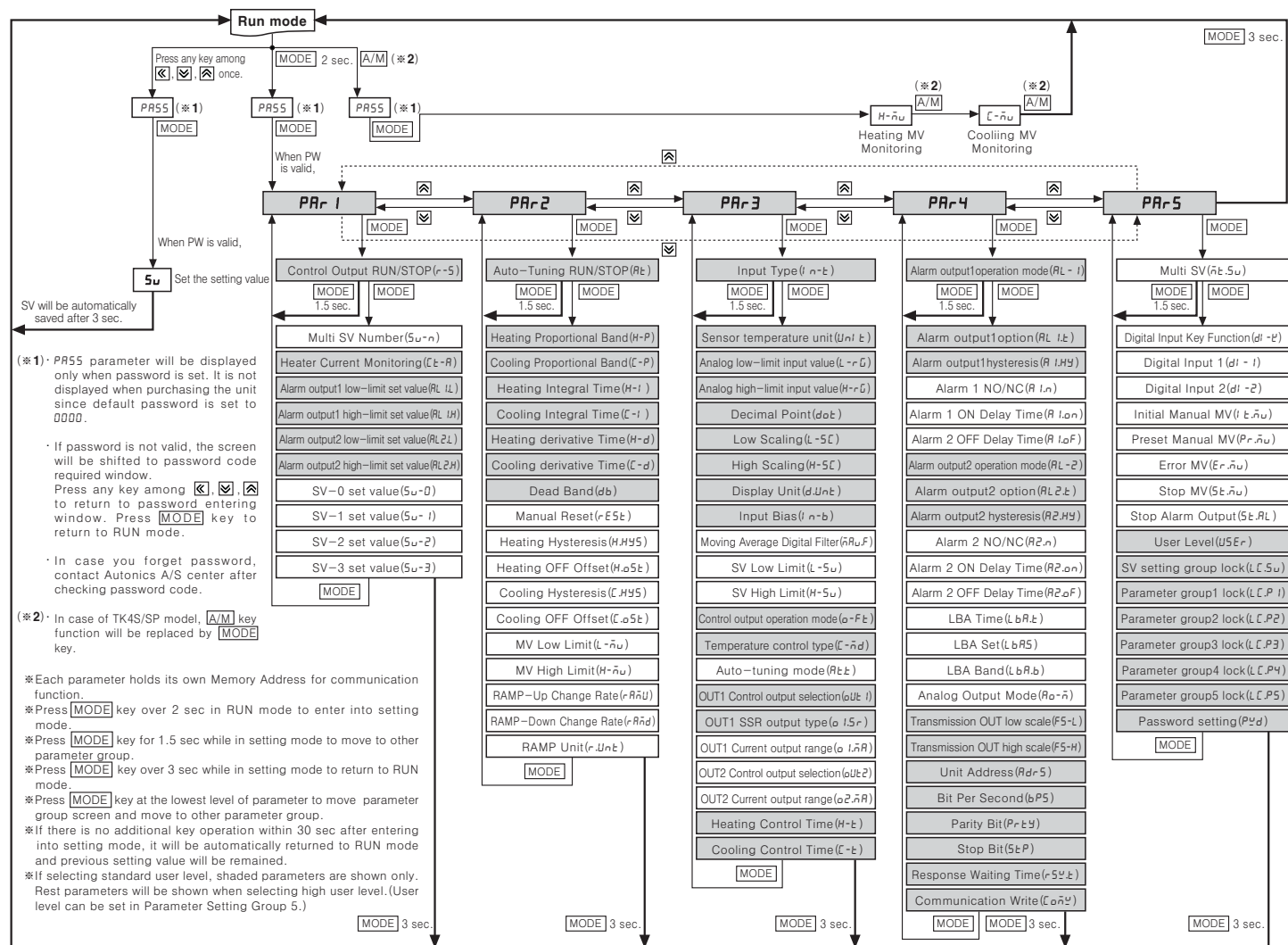
Dimensions



Product mounting



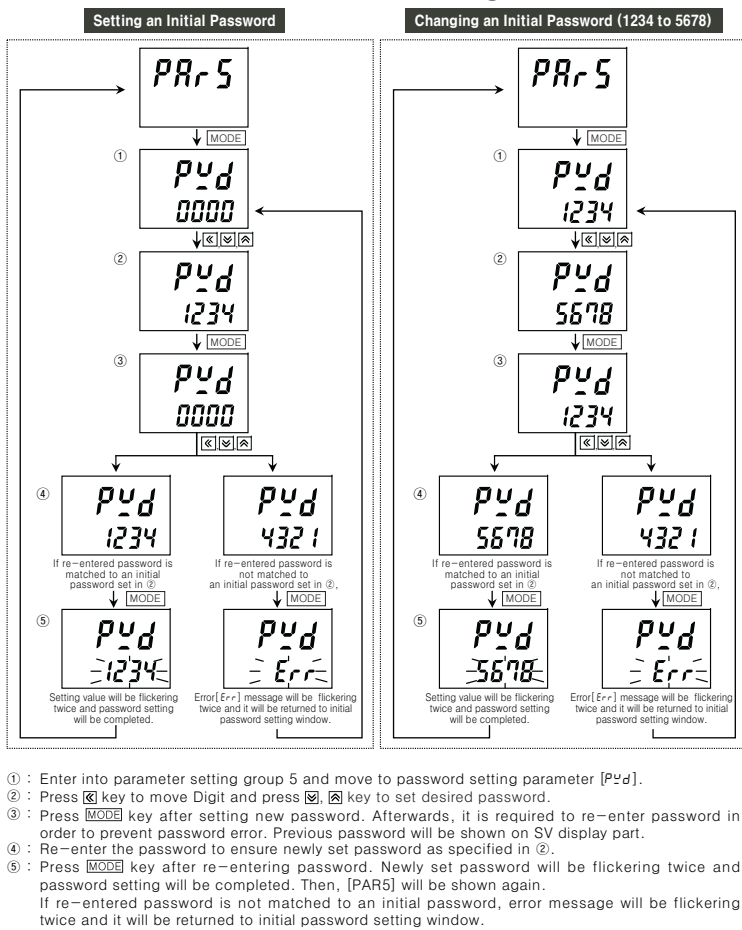
Flow chart for setting group



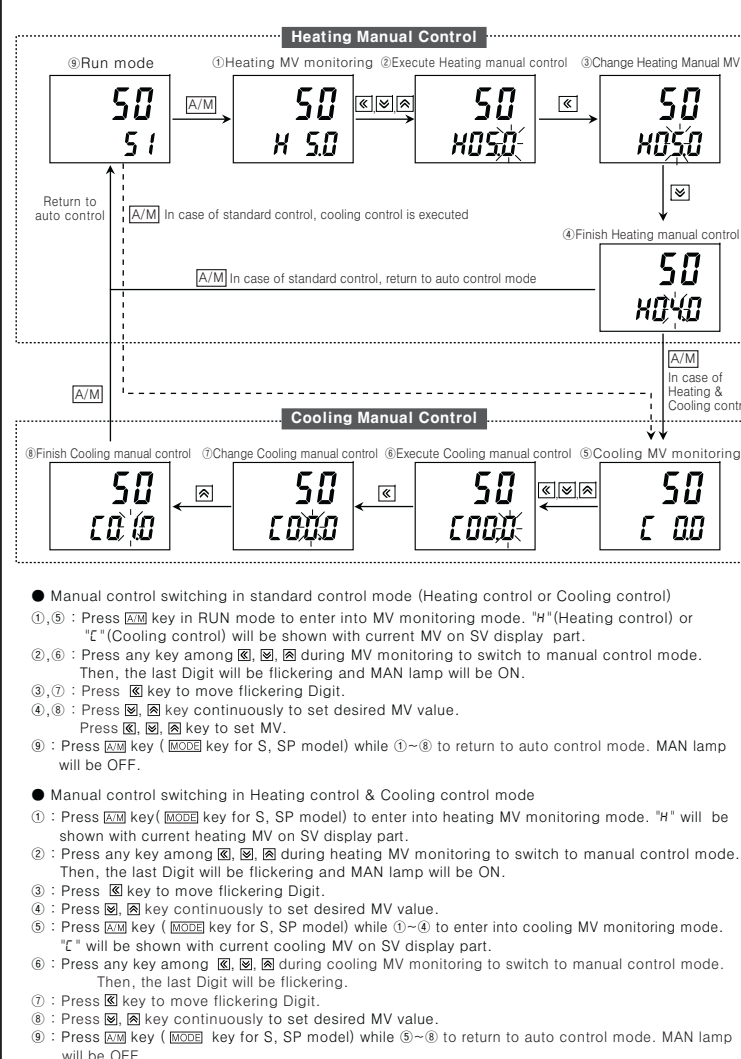
Alarm output operation mode

Mode	Alarm output operation	Description(Default Deviation)
oFF	OFF ON	No alarm output
dUCC	OFF ON (SV 100°C, PV 110°C) / OFF ON (SV 90°C, PV 100°C)	Deviation high-limit alarm (Temperature, analog: +F · S). If PV/SV deviation is occurring higher than set value of deviation temperature, alarm output will be ON. Deviation temperature is set in RL 1H / RL 2H.
JJdU	ON OFF (PV 90°C, SV 100°C) / ON OFF (SV 100°C, PV 110°C)	Deviation low-limit alarm (Temperature, analog: +F · S). If PV/SV deviation is occurring lower than set value of deviation temperature, alarm output will be ON. Deviation temperature is set in RL 1L / RL 2L.
JduC	ON OFF (PV 90°C, SV 100°C) / OFF ON (SV 100°C, PV 120°C)	Deviation high / low-limit alarm (Temperature, analog: +F · S). If PV/SV deviation is occurring higher or lower than set value of deviation temperature, alarm output will be ON. High-limit deviation temperature is set in RL 1H / RL 2H. Low-limit deviation temperature is set in RL 1L / RL 2L.
CduJ	OFF ON (PV 90°C, SV 100°C) / OFF ON (SV 100°C, PV 120°C)	Deviation high / low-limit reverse alarm (Temperature: 0, analog: 0). If PV/SV deviation is occurring higher or lower than set value of deviation temperature, alarm output will be ON. High-limit deviation temperature is set in RL 1H / RL 2H. Low-limit deviation temperature is set in RL 1L / RL 2L.
PuCC	OFF ON (PV 90°C, SV 100°C) / OFF ON (SV 100°C, PV 110°C)	Absolute value high-limit alarm (Temperature: High-limit value, analog: H-5C or L-5C, Select the higher one.). If PV is higher than absolute value of alarm temperature, alarm output will be ON. Absolute alarm value is set in RL 1H / RL 2H.
JJPu	ON OFF (PV 90°C, SV 100°C) / ON OFF (SV 100°C, PV 110°C)	Absolute value low-limit alarm (Temperature: Low-limit value, Analog: H-5C or L-5C, Select the lower one.). If PV is lower than absolute value of alarm temperature, alarm output will be ON. Absolute alarm value is set in RL 1L / RL 2L.
LbAr	ON OFF	Loop Break Alarm
SbAr	ON OFF	Sensor Break Alarm
HbAr	ON OFF	Heater Break Alarm

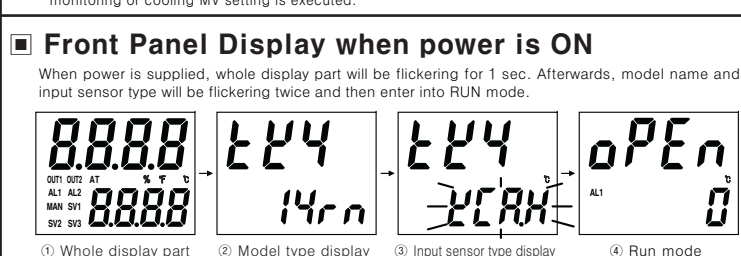
Flow chart for Password setting



MV Monitoring and Manual Control



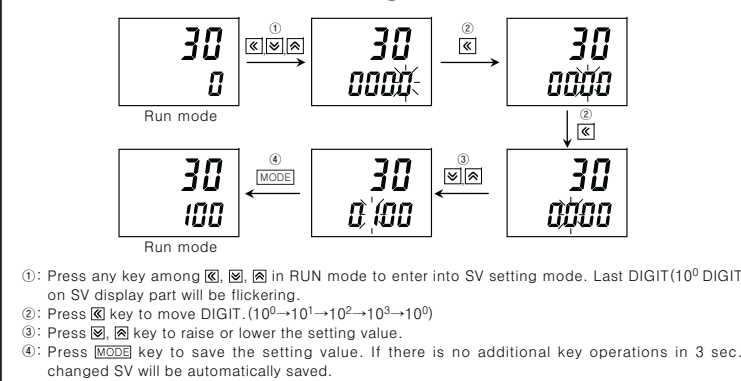
Front Panel Display when power is ON



Auto tuning ON/OFF

- Set [Rt] parameter to "on" in parameter setting group 2. Set [Rt] parameter to "oFF" to stop auto-tuning. (* Previously set P, I, D value will be remained.)
- When [oPEn] error occurs while auto-tuning, auto-tuning will be automatically stopped and previous PID time constant will be remained.
- When [HHH], [LLL] error occurs while auto-tuning, auto-tuning keeps operating.
- It is not available to change set values while auto-tuning. (Parameter check is available only.)
- Setting range: oFF, on
- Default: oFF (Unit: -)

Flow chart for SV setting



Factory Default

Mode	Factory Default	Mode	Factory Default	Mode	Factory Default	Mode	Factory Default
SV	0	PR55	0000	PR5	0000	PR5	0000
r-5	rUn	RL 1L	150.0	RL 2H	150.0	SV-2	0000
SV-n	SV-0	RL 1H	150.0	SV-0	0000	SV-3	0000
Ct-A	RL 2L	150.0	SV-1	0000			

Parameter 1 setting group [PR-1]

Mode	Factory Default	Mode	Factory Default	Mode	Factory Default	Mode	Factory Default
Rt	oFF	H-d	0000	H.o5t	000	rARU	000
H-P	0 10.0	C-d	0000	C.HY5	002	rARd	000
C-P	0 10.0	db	0000	C.o5t	000	rUnL	ni n
H-i	0000	rE5t	050.0	L-nu	-100.0		
C-i	0000	H.HY5	002	H-nu	100.0		

Parameter 2 setting group [PR-2]

Mode	Factory Default	Mode	Factory Default	Mode	Factory Default	Mode	Factory Default
LnL	LCRH	H-5C	100.0	o-Ft	HErE (Standard type)	o 15R	5tnd
UnL t	oC	dJnL	P.Po	H-C (Heating, Cooling type)	o 15R	4-20	
L-rG	0000	i n-b	0000	C-nD	Pi d (Standard type)	oUt 2	CUr r
H-rG	10.00	rARF	000.1		P.P (Heating, Cooling type)	o2AR	4-20
dot	0.0	L-5u	-200.0	Rt t	tUn 1	H-t	020.0 (RELAY)
L-5C	000.0	H-5u	1350	oUt 1	CUr r	C-t	002.0 (SSR drive)

Parameter 3 setting group [PR-3]

Mode	Factory Default	Mode	Factory Default	Mode	Factory Default	Mode	Factory Default
LnL	LCRH	H-5C	100.0	o-Ft	HErE (Standard type)	o 15R	5tnd
UnL t	oC	dJnL	P.Po	H-C (Heating, Cooling type)	o 15R	4-20	
L-rG	0000	i n-b	0000	C-nD	Pi d (Standard type)	oUt 2	CUr r
H-rG	10.00	rARF	000.1		P.P (Heating, Cooling type)	o2AR	4-20
dot	0.0	L-5u	-200.0	Rt t	tUn 1	H-t	020.0 (RELAY)
L-5C	000.0	H-5u	1350	oUt 1	CUr r	C-t	002.0 (SSR drive)

Parameter 4 setting group [PR-4]

Mode	Factory Default	Mode	Factory Default	Mode	Factory Default	Mode	Factory Default
RL-1	dUCC	RL-2	JJdU	LbAr t	0000	Rd-5	0 1
RL 1L	RL-A	RL 2H	RL-A	LbAr 5	008	bP5	96
RL 1H	00 1	R2H	00 1	LbAr b	003	Pr tY	nanE
RL 1n	no	R2n	no	Rd-n	Pu	StP	2
RL 1on	0000	R2on	0000	F5-L	-200	r5Yt	20
RL 1oF	0000	R2oF	0000	F5-H	1350	C.o5t	EnR

Parameter 5 setting group [PR-5]

Mode	Factory Default	Mode	Factory Default	Mode	Factory Default	Mode	Factory Default
nt 5u	1	Pr-nu	000.0	L.C 5u	oFF	L.CP5	oFF
dI-t	5t oP	Er-nu	000.0	L.C P 1	oFF	P.Yd	0000
dI-1	5t oP	5t-nu	000.0	L.C P 2	oFF		
dI-2	RL-rE	5t-RL	C.o5t	L.C P 3	oFF		
1 t-nu	Rt t o	USEr	5tnd	L.C P 4	oFF		

User Manual

- Refer to User Manual for more detailed product descriptions and usage.
- Visit our web site (www.autonics.com) to download user manual and PC loader program.

Software[PC loader program(DAQMaster)]

- PC loader program : DAQMaster is used for parameter setting and monitoring.

Item	Recommended Requirement
System	IBM PC compatible PC, Intel Pentium III above
Memory	256MB
Hard Disk	100M of Hard Disk Space or more
Resolution	1024X768
Operating system	Windows 98/NT/XP/Vista/Window 7 (In case of Windows 98, only English supported)
Communication Port	RS-232 Serial Port (9Pin), USB Port

User Level Setting

- A function to set user levels(Standard Level/High Level) to place limitations on parameter display.
- User level can be set in Parameter Setting Group 5. When selecting Standard Level, shaded parameters specified in "Flow chart for Setting Group" will be displayed only.
- Setting Range : 5tnd, Ht GH
- Default : 5tnd (Unit : -)

Parameter Initialization

- Press [] + [] to initialize all parameters in memory to default value.
- Set [] parameter to "yE5" to initialize all parameters.
- In case password function is on, it is required to enter valid password to initialize parameters. (Password is also initialized.)
- Setting range : yE5, no
- Default : no (Unit : -)

Caution for using

- Installation environment
 - It shall be used indoor.
 - Altitude Max. 2000m.
 - Pollution Degree 2.
 - Installation Category II.
- Please use separated line from high voltage line or power line in order to avoid inductive noise.
- Please install power switch or circuit-breaker in order to cut power supply off.
- The switch or circuit-breaker should be installed near by users.
- This unit is designed for temperature controlling only. Do not apply this unit as a voltage meter or a current meter.
- In case of using RTD sensor, 3wire type must be used. If you need to extend the line, 3wires must be used with the same thickness as the line. It might cause temperature difference if the resistance of line is different.
- In case of making power line and input signal line close, line filter for noise protection should be installed at power line and input signal line should be shielded.
- Keep away from the high frequency instruments. (High frequency welding machine & sewing machine, big capacitive SCR controller)

*It may cause malfunction if above instructions are not followed.

Major products

- Proximity sensors
- Area sensors
- Door/Door side sensors
- Counters
- Rotary encoders
- Power controllers
- Panel meters
- Temperature controllers
- Temperature/Humidity transducers
- Stepping motors/drivers/motion controllers
- Laser marking system (CO₂, Nd:YAG)
- Laser welding/soldering system
- Photoelectric sensors
- Fiber optic sensors
- Pressure sensors
- Timers
- Display units
- Sensor controllers
- Graphic/Logic panels
- Tachometer/Pulse(Rate) meters

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Satisfiable Partner For Factory Automation

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