

Autonics TEMPERATURE CONTROLLER TC4 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.
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.
Install on a device panel to use.
Do not connect, repair, or inspect the unit while connected to a power source.
Check 'Connections' before wiring.
Do not disassemble or modify the unit.

Caution

- When connecting the power input and relay output, use AWG 2.0(0.50mm²) cable or over and tighten the terminal screw with a tightening torque of 0.74-0.90N·m.
Use the unit within the rated specifications.
Use dry cloth to clean the unit, and do not use water or organic solvent.
Keep metal chip, dust, and wire residue from flowing into the unit.

Ordering Information

Table with columns for TC4S, 1, 4, R, Control output, Power supply, Sub output, Size, Digit, Setting type, Item.

*1: In case of the AC voltage model, SSR drive output method (standard ON/OFF control, cycle control, phase control) is available to select.
*2: It is unavailable for TC4SP, TC4Y.
*3: Sockets for TC4SP (PG-11, PS-11(N)) are sold separately.

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 and the technical descriptions (catalog, homepage).

Specifications

Table with columns for Series (TC4S, TC4SP, TC4Y, TC4M, TC4W, TC4H, TC4L) and various specifications like Power supply, Allowable voltage range, Display method, etc.

Weight: Approx. 141g (TC4S), 123g (TC4SP), 174g (TC4Y), 204g (TC4M), 194g (TC4W), 194g (TC4H), 254g (TC4L).
*1: Thermocouple L (IC) type, RTD Cu50Ω.
*2: The weight includes packaging.

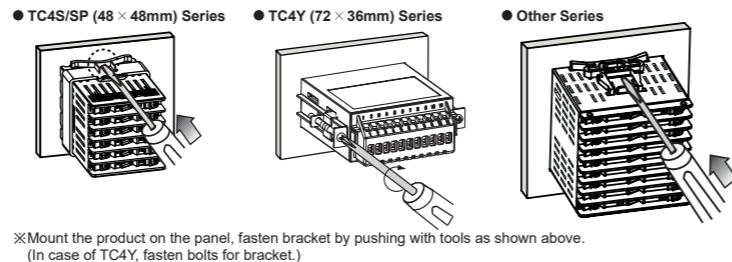
Unit Description

- Present temperature (PV) display: RUN mode, Parameter setting mode.
Deviation indicator, Auto-tuning indicator: Shows current temperature (PV) deviation based on set temperature (SV) by LED.
MODE key: Used when entering into parameter group, returning to RUN mode, moving parameter, and saving setting values.
Adjustment: Used when entering into set value change mode, digit moving and digit up/down.
FUNCTION key: Press [F] keys for 3 sec. to operate function (RUN/STOP, alarm output cancel, auto-tuning) set in inner parameter [J - L].

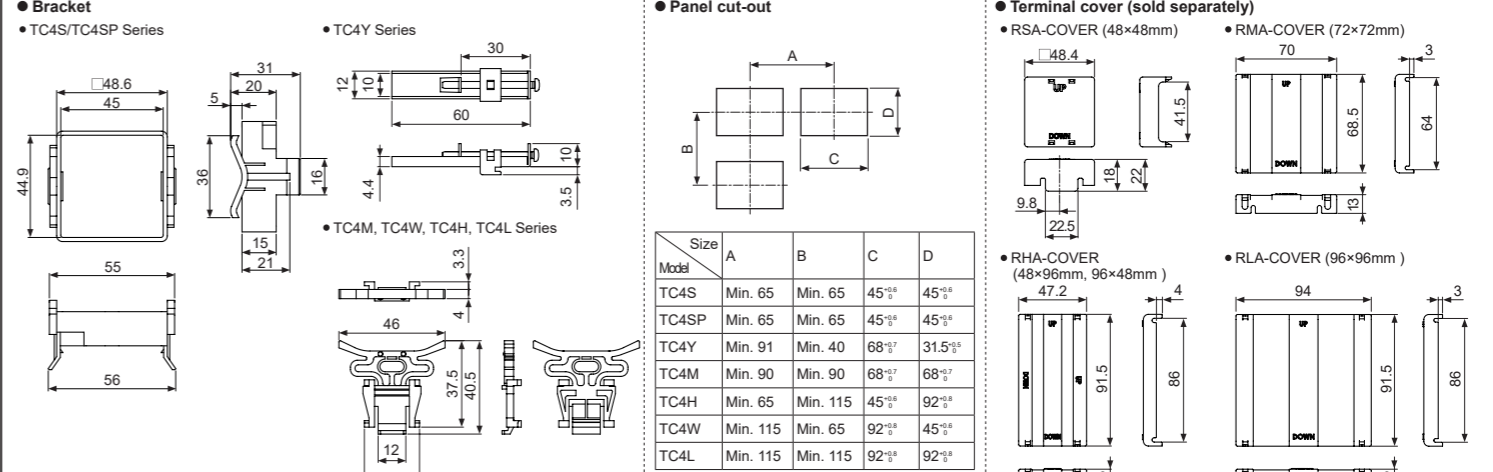
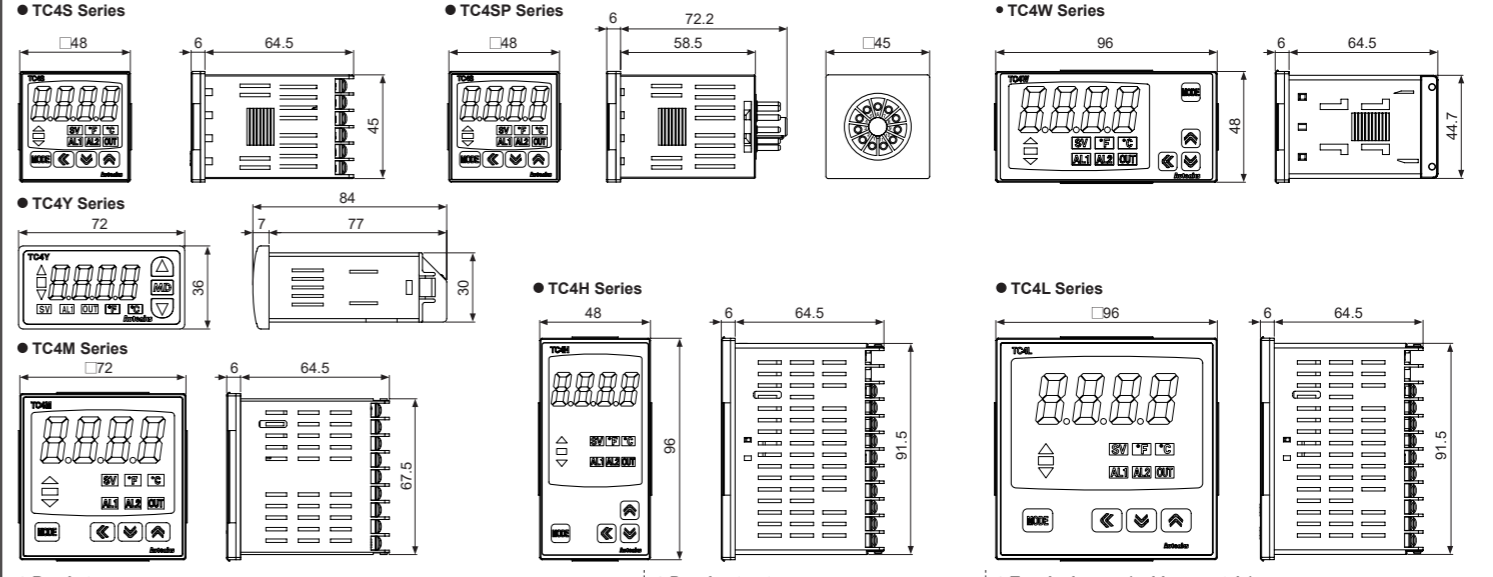
Input Sensor and Temperature Range [°C / °F]

Table mapping Input sensor (Thermocouple, RTD) to Display and Temperature range (°C and °F).

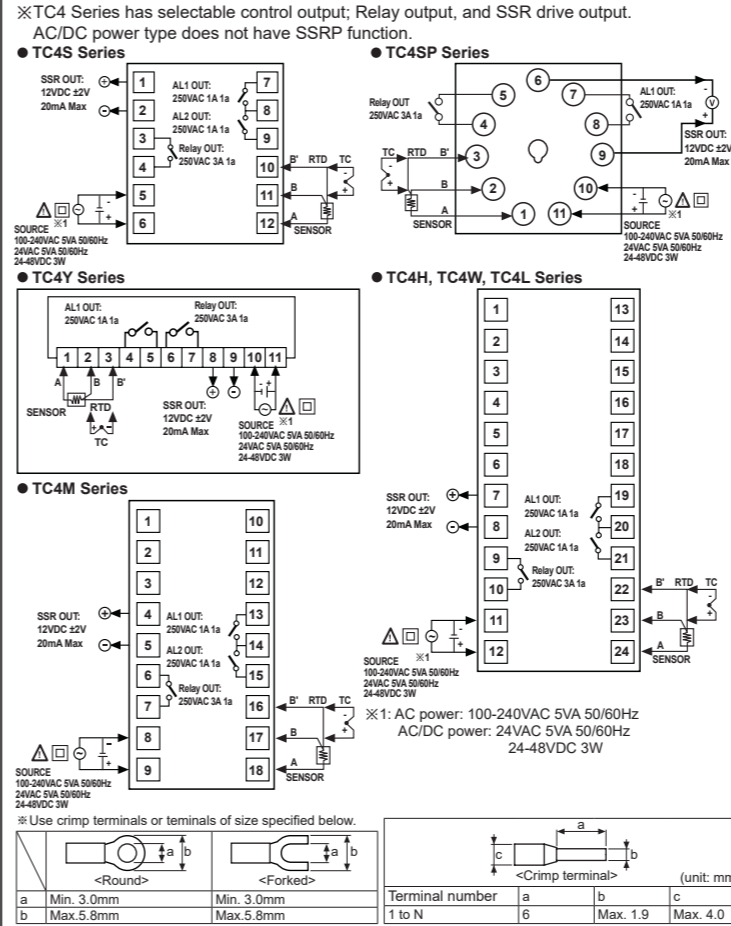
Installation



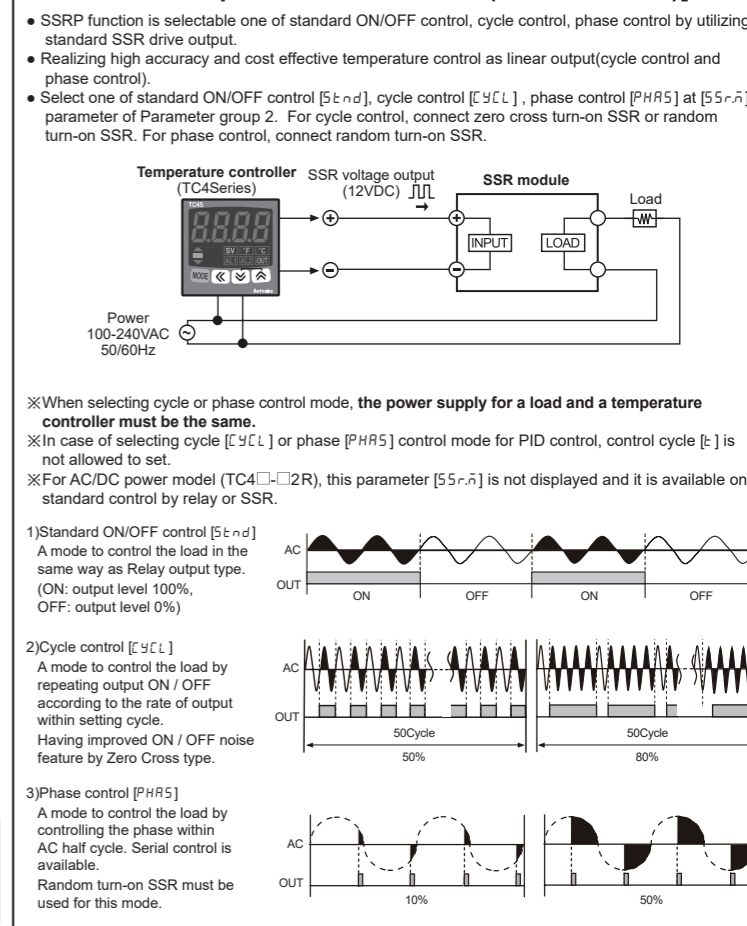
Dimensions



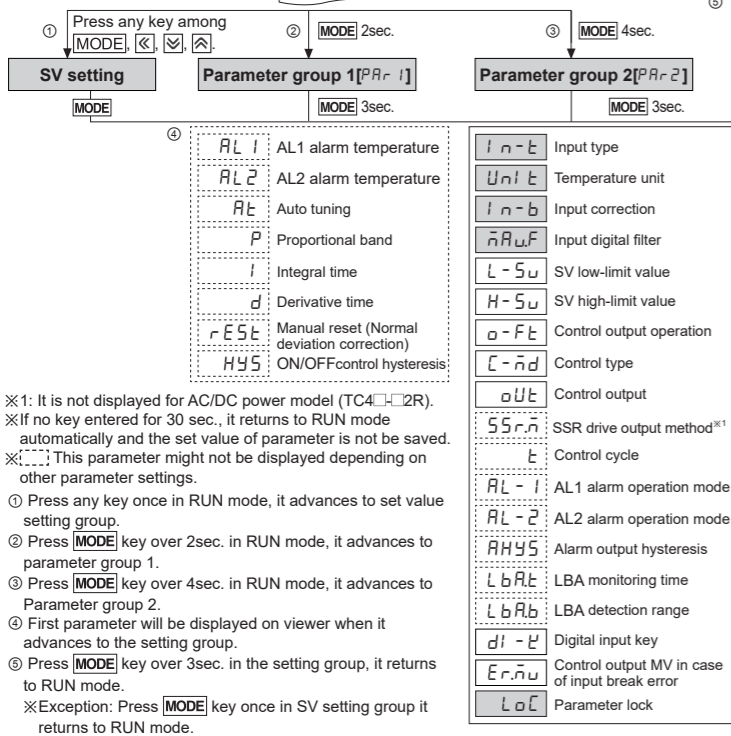
Connections



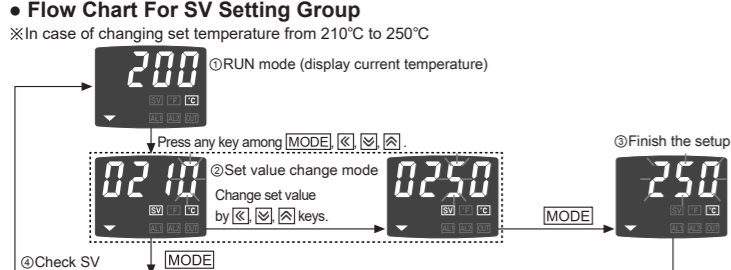
SSR Drive Output Selection Function (SSRP Function)



Parameter Groups



- ① Press any key once in RUN mode, it advances to set value setting group.
 - ② Press **MODE** key over 2sec. in RUN mode, it advances to parameter group 1.
 - ③ Press **MODE** key over 4sec. in RUN mode, it advances to parameter group 2.
 - ④ First parameter will be displayed on viewer when it advances to the setting group.
 - ⑤ Press **MODE** key over 3sec. in the setting group, it returns to RUN mode.
- ※Exception: Press **MODE** key once in SV setting group it returns to RUN mode.



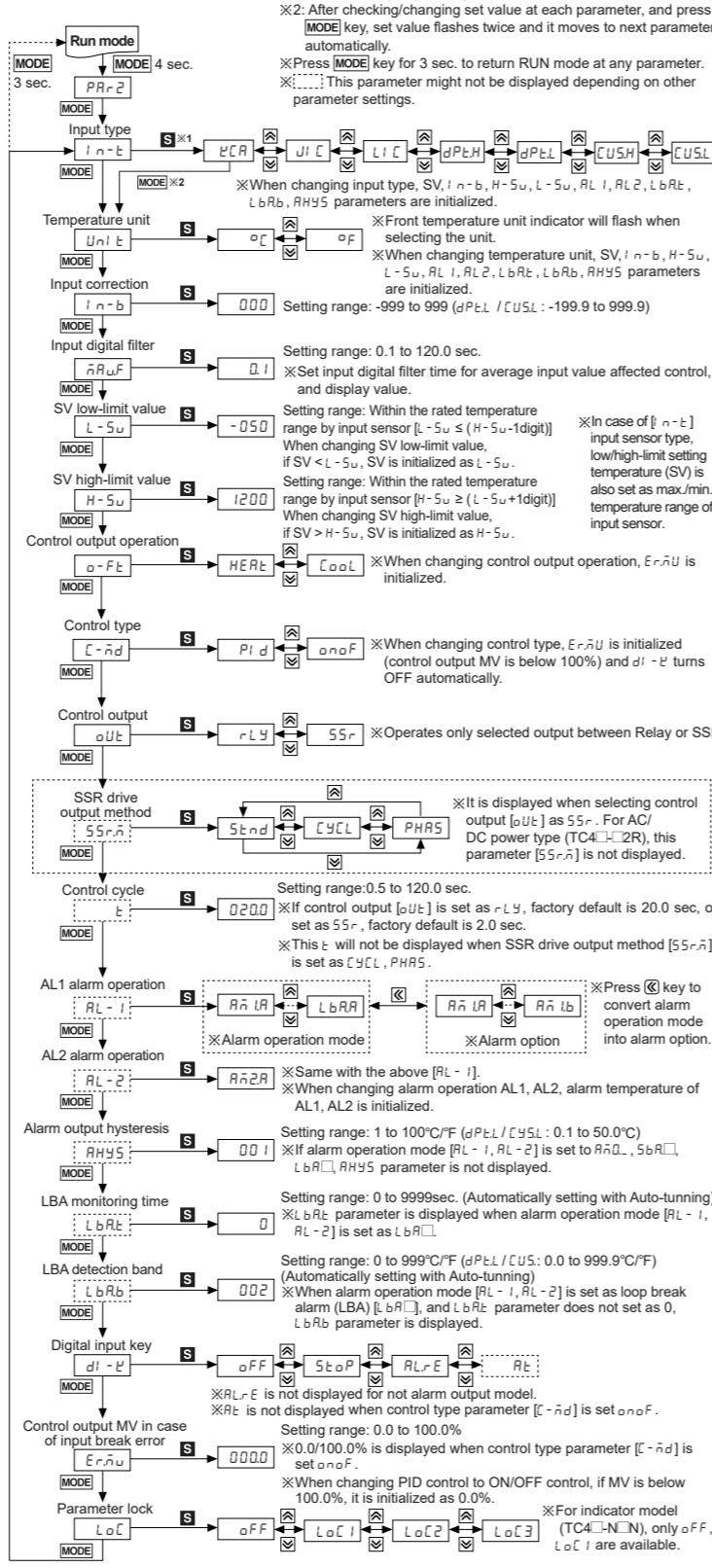
Parameter Reset

Reset all parameters as factory default. Hold the front [OK] + [MODE] keys for 5 sec., to enter parameter reset [rESt] parameter. Select 'YES' and all parameters are reset as factory default. Select 'no' and previous settings are maintained. If setting parameter lock [LoC] or processing auto-tuning, parameter reset is unavailable.

Parameter Group 1

- AL1 alarm temperature (AL1): Setting range: Deviation alarm [-F.S] to [F.S]. Absolute value alarm (temperature range)
- AL2 alarm temperature (AL2): Setting range: Deviation alarm [-F.S] to [F.S]. Absolute value alarm (temperature range)
- Auto-tuning (At): It starts to operate auto-tuning when it is ON and set as OFF automatically after finish the operation.
- Proportional band (P): Setting range: 0.1 to 999.9°C/F
- Integral time (I): Setting range: 0 to 9999 sec. Integral operation will be OFF when set value is "0".
- Derivation time (d): Setting range: 0 to 9999 sec. Derivative operation will be OFF when set value is "0".
- Manual reset (Normal deviation correction) (rESL): Setting range: 0.0 to 100.0%. It is displayed in P/PD control.
- ON/OFF control hysteresis (HY5): Setting range: 1 to 100°C/F (For dPFL / CUSL: 0.1 to 50.0°C/F) It is displayed when control type parameter [C-nD] of Parameter group 2 is set as onOFF.

Parameter Group 2



Factory Default

Parameter	Factory default
In-t	0
Unit	0
Un-b	0
nRUF	0.1
L-Su	-0.50
H-Su	1.200
o-Ft	0
C-nD	0
oUt	0
t	2.00
AL-1	0
AL-2	0
AHY5	0.01
LbRt	0
LbRb	0.02
dl-l	0
Er-nu	0
LoC	0

Parameter	Factory default
AL-1	0
AL-2	1250
At	oFF
P	0.100
I	0000
d	0000
rESL	0500
HY5	002

Parameter	Factory default	Parameter	Factory default
In-t	0	t	0200
Unit	0	AL-1	0
Un-b	0	AL-2	0
nRUF	0.001	AHY5	0.001
L-Su	-0.50	LbRt	0.000
H-Su	1.200	LbRb	0.002
o-Ft	HERt	dl-l	0
C-nD	PI d	Er-nu	0
oUt	rLY	LoC	oFF
5Sr-n	Stnd		

Alarm [AL-1/AL-2]

Set both alarm operation and alarm option by combining. Each alarm operates individually in two alarm output models. When the current temperature is out of alarm range, alarm clears automatically. If alarm option is alarm latch or alarm latch and standby sequence 1/2, press digital input key [dl-l] 3 sec., digital input key [dl-l] of Parameter group 2 set as AL-E, or turn OFF the power and turn ON to clear alarm.

Mode	Name	Alarm operation	Description
RA0	—	—	No alarm output
RA1	Deviation high-limit alarm	OFF → ON (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.
RA2	Deviation low-limit alarm	ON → OFF (Lower 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.
RA3	Deviation high/low-limit alarm	ON → OFF (High/Lower 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.
RA4	Deviation high/low-limit reserve alarm	OFF → ON (High/Lower 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 OFF.
RA5	Absolute value high limit alarm	OFF → ON (Absolute-value Alarm: Set as 90°C)	If PV is higher than the absolute value, the output will be ON.
RA6	Absolute value low limit alarm	ON → OFF (Absolute-value Alarm: Set as 110°C)	If PV is lower than the absolute value, the output will be ON.
SbR	Sensor break alarm	—	It will be ON when it detects sensor disconnection.
LbR	Loop break alarm	—	It will be ON when it detects loop break.

Alarm operation

1) Alarm operation

2) Alarm option

3) Sensor break alarm

4) Loop break alarm (LBA)

Factory Default

Input Correction [r-n-b]

Controller itself does not have errors but there may be error by external input temperature sensor. This function is for correcting this error.

E.g.) If actual temperature is 80°C but controller displays 78°C, set input correction value [r-n-b] as 0.02 and controller displays 80°C.

※As the result of input correction, if current temperature value (PV) is over each temperature range of input sensor, it displays 'HHHH' or 'LLLL'.

Input Digital Filter [nRUF]

If current temperature (PV) is fluctuating repeatedly by rapid change of input signal, it reflects to MV and stable control is impossible. Therefore, digital filter function stabilizes current temperature value.

For example, set input digital filter value as 0.4 sec, and it applies digital filter to input values during 0.4 sec and displays this values. Current temperature may be different by actual input value.

Hysteresis [HY5]

If Hysteresis is too narrow, hunting (oscillation, chattering) can occur due to external noise.

In case of ON / OFF control mode, even if PV reaches stable status, there still occurs hunting. It could be due to Hysteresis [HY5]. SV, load's response characteristics or sensor's location. In order to reduce hunting to a minimum, it is required to take into following factors consideration when designing temp. controlling: proper Hysteresis [HY5], heater's capacity, thermal characteristics, sensor's response and location.

Manual Reset [rESL]

When selecting P/PD control mode, certain temperature difference exists even after PV reaches stable status because heater's rising and falling time is inconsistent due to thermal characteristics of controlled objects, such as heat capacity, heater capacity. This temperature difference is called offset and manual reset [rESL] function is to set/correct offset.

When PV and SV are equal, reset value is 50.0%. After control is stable, PV is lower than SV, reset value is over 50.0% or PV is higher than SV, reset value is below 50.0%.

Digital Input Key ([dl-l] 3sec.) [dl-l]

Parameter	Operation
oFF	It does not use digital input key function.
oPF	Pauses control output. Auxiliary output (except loop break alarm, sensor break alarm) except Control output operates as setting. Hold the digital input keys for 3 sec. to restart. Digital input key (t over 3 sec.)
5tOP	Clears alarm output by force. (only when alarm option is alarm latch, or alarm latch and standby sequence 1/2.) This function is applied when present value is out of alarm operation range but alarm output is ON. Alarm operates normally right after clearing alarm.
AL-E	Starts/Stops auto-tuning. This function is same as auto-tuning [At] of parameter group 1. (You can start auto-tuning [At] of parameter group 1 and stop it by digital input key.)
At	Pauses control output. Auxiliary output (except loop break alarm, sensor break alarm) except Control output operates as setting. Hold the digital input keys for 3 sec. to restart. Digital input key (t over 3 sec.)

Control Output MV When Input Sensor Line Is Broken [Er-nu]

The function to set control output MV in case of open error. Users are able to set by ON/OFF setting or MV setting. It executes control output by set MV regardless of ON/OFF or PID control output.

Parameter Lock [LoC]

A function to prevent changing SV and parameters of each setting group. Parameter setting values are still possible to check when parameter lock is set.

※oFF, LoC are available only for indicator (TC4-IN□).

Display	Description
oFF	Unlock
LoC1	Lock parameter group 2
LoC2	Lock parameter group 1, 2
LoC3	Lock parameter group 1, 2, SV setting

Error

Display	Description	Troubleshooting
oPE	Flashes if input sensor is disconnected or sensor is not connected.	Check input sensor state.
HHHH	Flashes if measured sensor input is higher than temperature range.	When input is within the rated temperature range, this display disappears.
LLLL	Flashes if measured sensor input is lower than temperature range.	

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.
- When changing the input sensor, turn off the power first before changing. After changing the input sensor, modify the value of the corresponding parameter.
- 24VAC, 24-48VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- 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. 2,000m
 - Pollution degree 2
 - Installation category II