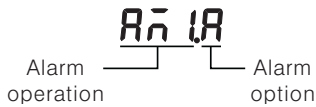


TC/TD Common Features

Alarm [AL - 1 / AL - 2]



There are two alarms which operate individually. You can set combined alarm operation and alarm option.

Use digital input key (set as AL E) or turn OFF power and re-start this unit to release alarm operation.

Alarm operation

Operation	Name	Alarm operation	Description
AL0	—	—	No alarm output
AL1	Deviation high-limit alarm	<p>Alarm temperature(Deviation): 10°C Alarm temperature(Deviation): -10°C</p>	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
AL2	Deviation low-limit alarm	<p>Alarm temperature(Deviation): 10°C Alarm temperature(Deviation): -10°C</p>	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AL3	Deviation high/low-limit alarm	<p>Alarm temperature(Deviation): 10°C</p>	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AL4	Deviation high/low-limit reverse alarm	<p>Alarm temperature(Deviation): 10°C</p>	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF.
AL5	Absolute value high limit alarm	<p>Alarm temperature(Absolute): 90°C Alarm temperature(Absolute): 110°C</p>	If PV is equal to or higher than the absolute value of alarm temperature, the output will be ON.
AL6	Absolute value low limit alarm	<p>Alarm temperature(Absolute): 90°C Alarm temperature(Absolute): 110°C</p>	If PV is equal to or lower than the absolute value of alarm temperature, the output will be ON.
SbA	Sensor break alarm	It will be ON when it detects sensor disconnection.	It will be ON when it detects sensor disconnection.
LbA	Loop break alarm	It will be ON when it detects loop break.	It will be ON when it detects loop break.

※H: Alarm output hysteresis [AHYS]

It displays alarm output ON and OFF interval and hysteresis is applied to both AL1 OUT and AL2 OUT.

Alarm option

Operation	Name	Description
AL0.A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AL0.b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status. (Alarm output HOLD)
AL0.C	Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates.
AL0.d	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.
AL0.E	Standby sequence 2	First alarm condition is ignored and from second alarm condition, standard alarm operates. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, standard alarm operates.
AL0.F	Alarm latch and standby sequence 2	Basic operation is same as alarm latch and standby sequence 1. It operates not only by power ON/OFF, but also alarm setting value, or alarm option changing. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates.

※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 [AL 1], [AL 2] or alarm operation [AL - 1], [AL - 2], switching STOP mode to RUN mode.

Sensor break alarm

The function that alarm output will be ON when sensor is not connected or when sensor's disconnection is detected during temperature controlling. You can check whether the sensor is connected with buzzer or other units using alarm output contact.

●It is selectable between standard alarm (SbAA) or alarm latch (SbAb).

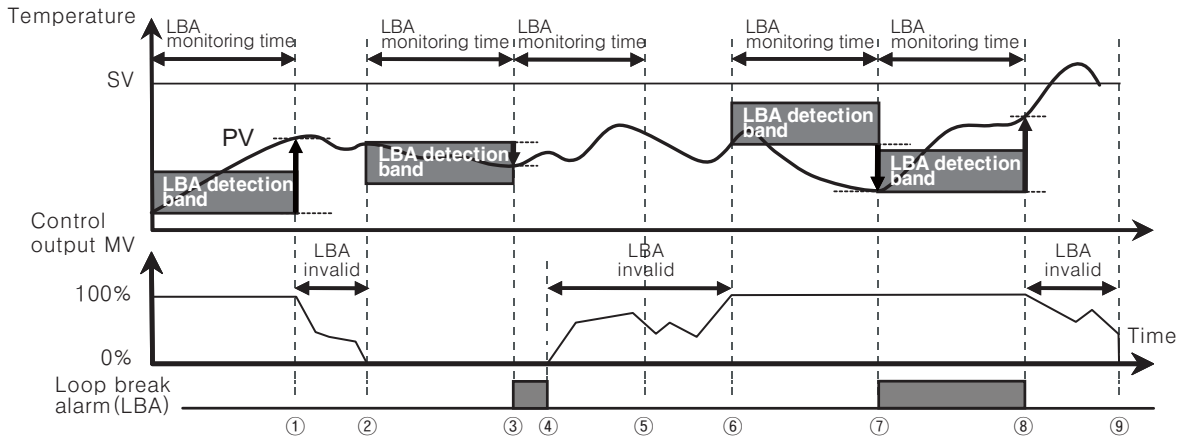
- (A) Photo electric sensor
- (B) Fiber optic sensor
- (C) Door/Area sensor
- (D) Proximity sensor
- (E) Pressure sensor
- (F) Rotary encoder
- (G) Connector/Socket
- (H) Temp. controller
- (I) SSR/Power controller
- (J) Counter
- (K) Timer
- (L) Panel meter
- (M) Tacho/Speed/Pulse meter
- (N) Display unit
- (O) Sensor controller
- (P) Switching power supply
- (Q) Stepping motor & Driver & Controller
- (R) Graphic/Logic panel
- (S) Field network device
- (T) Production stoppage models & replacement

TC/TD Common Features

Loop break alarm(LBA)

It checks control loop and outputs alarm by temperature change of the subject.

For heating control(cooling control), when control output MV is 100% (0% for cooling control) and PV is not increased over than LBA detection band [LbR.b] during LBA monitoring time [LbR.t], or when control output MV is 0% (100% for cooling control) and PV is not decreased below than LBA detection band [LbR.b] during LBA monitoring time [LbR.t], alarm output turns ON.



Start control to ①	When control output MV is 100%, PV is increased over than LBA detection band [LbR.b] during LBA monitoring time [LbR.t].
① to ②	The status of changing control output MV (LBA monitoring time is reset.)
② to ③	When control output MV is 0% and PV is not decreased below than LBA detection band [LbR.b] during LBA monitoring time [LbR.t], loop break alarm (LBA) turns ON after LBA monitoring time.
③ to ④	Control output MV is 0% and loop break alarm (LBA) turns and maintains ON.
④ to ⑥	The status of changing control output MV (LBA monitoring time is reset.)
⑥ to ⑦	When control output MV is 100% and PV is not increased over than LBA detection band [LbR.b] during LBA monitoring time [LbR.t], loop break alarm (LBA) turns ON after LBA monitoring time.
⑦ to ⑧	When control output MV is 100% and PV is increased over than LBA detection band [LbR.b] during LBA monitoring time [LbR.t], loop break alarm (LBA) turns OFF after LBA monitoring time.
⑧ to ⑨	The status of changing control output MV (LBA monitoring time is reset.)

*When executing auto-tuning, LBA detection band [LbR.b] and LBA monitoring time are automatically set based on auto tuning value.

When alarm operation mode [AL-1, AL-2] is set as loop break alarm (LBA) [LbR.□], LBA detection band [LbR.b] and LBA monitoring time [LbR.t] parameter is displayed.

Function

Auto tuning [At]

- When setting [At] parameter to [on], front temperature unit display (°C or °F) lamp will be flickering during Auto tuning. After completing auto tuning, temperature unit display lamp returns to normal operation and [At] parameter automatically becomes [off].
- Set as [off] to stop auto tuning.
 - *It keeps previous P, I, D set values.
- If SV is changed during auto tuning mode, auto tuning is stopped.
- PID time constants figured out through auto tuning function can be changed.
- If control method is set to [onoff], no parameters are displayed.

Finish auto tuning when [open] error or [Er.5u] error (for TD series) occurs during the operation.

*In case of [open] error or [Er.5u] error (for TD series), auto tuning operation is not applicable.

Input bias [In-b]

Input correction is to correct deviation occurred from temperature sensor such as thermocouples, RTD etc.

- If you check the deviation of every temperature sensor precisely, it can measure temperature accurately.
- Use this mode after measuring deviation occurred from temperature sensor exactly.
 - Because if measured deviation value is not corrected, displayed temperature may be too high or too low.
- When you set the Input revise value, you may need to record it, because it will be useful when performing maintenance.

Input digital filter [nRF]

A function to filter input signals for more stable PV display in order to provide stable control output. If noise occurs on input signals or PV value keeps changing, it gets difficult to perform high accuracy control since PV has a direct effect on output level.

TC/TD Common Features

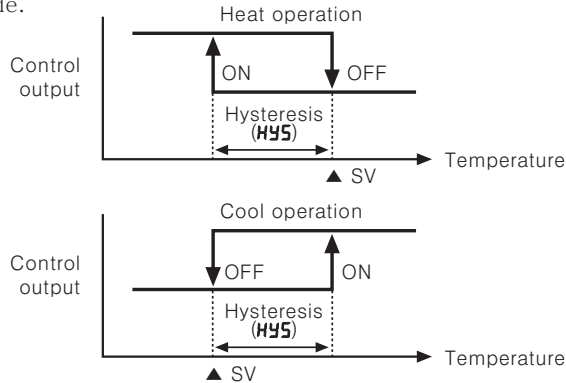
◎Control method selection [C - n d]

It is selectable PID, ON/OFF control.

- In case of ON / OFF (o n o f f) mode, Hysteresis (H Y 5) parameter is displayed.
- In case of PID (P i d) mode, Proportional band (P), Reset time (t) and Rate time (t) parameters are displayed.

◎Hysteresis [H Y 5]

Set control output ON / OFF interval in ON / OFF control mode.



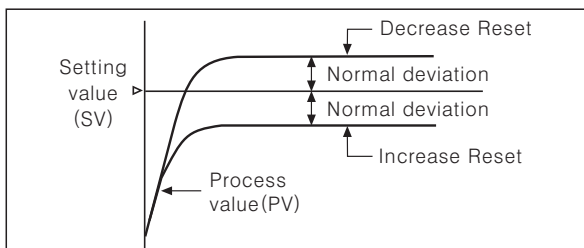
- If Hysteresis is too narrow, hunting (Oscillation, Chattering) could occur due to external noise.
- In case of ON / OFF control mode, even if PV reaches stable status, there still occurs hunting. It could be due to Hysteresis (H Y 5) SV, load's response characteristics or sensor's location. In order to reduce hunting to a minimum, it is required to take into following factors consideration when designing temp. controlling; proper Hysteresis (H Y 5), heater's capacity, thermal characteristics, sensor's response and location.

◎Manual reset function [r E 5 t]

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

- How to set
 - When PV and SV are equal, reset value is 50.0%.
 - When PV ≤ SV, reset value > 50.0%
 - When PV ≥ SV, reset value < 50.0%

- Reset (r E 5 t) setting depending on control results



※ Manual reset function is applicable only to P / PD control mode.

◎Temperature Unit Selection Function [U n i t]

- A function to select display temperature unit
- Unit display lamp will be ON when converting temperature unit

◎Cool / Heat function [o - F t]

There are two temperature controlling applications, one is heating and the other is cooling.

- Heating: When PV is lower than SV, control output will be ON to supply power to the load (heater) and vice versa.
- Cooling: When PV is higher than SV, control output will be ON to supply power to the load (cooler) and vice versa.
- In case of ON / OFF control, or P control mode, Control output for Cooling / Heating is opposite to each other.
- In case of PID mode, PID time constants for Cooling / Heating are different from each other since PID time constants are determined depending on each control object.

- Cool-function (C o o l) and heat-function (H E A t) must be set correctly according to the application, if set as opposite function, it may cause a fire.

(If set cool-function (C o o l) at heater, even if temperature is getting high, it will be maintained ON and it may cause a fire.)

- Avoid changing heat-function to cool-function or cool-function to heat-function on the unit is operating.
- It is impossible to operate both function at once in this unit. Therefore, only one function should be selected only.

◎FUNCTION key operation [d i - t]

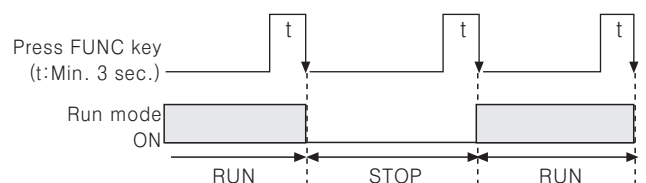
Press front keys ∇ + \blacktriangle at the same time for 3 sec. to have previously set operation in parameter performed. You can choose between control output stop and alarm output off.

It enables to stop control output without power off in RUN mode. [5 t o p]

◎Control output RUN / STOP

It is allowed for users to select RUN / STOP in RUN mode.

- When it is required to stop control output temporarily (e.g., during maintenance work), use "STOP" command to stop control output. (Auxiliary output is normally provided as setting values.)
- In case of STOP mode, [5 t o p] parameter and PV value is flashing in turn on display part.
- When power is off in "STOP" mode, "STOP" mode will be kept after Power is supplied again. (In order to return to normal control operation, make "STOP" mode OFF using front keys.)



◎Alarm Reset

A function to reset or initialize alarm output by force while alarm output is ON. Applicable only to Alarm latch (R n □ . b) and Alarm latch and standby sequence (R n □ . d) mode.

- If PV value is within alarm output range, this function is not available.

(A)	Photo electric sensor
(B)	Fiber optic sensor
(C)	Door/Area sensor
(D)	Proximity sensor
(E)	Pressure sensor
(F)	Rotary encoder
(G)	Connector/Socket
(H)	Temp. controller
(I)	SSR/Power controller
(J)	Counter
(K)	Timer
(L)	Panel meter
(M)	Tacho/Speed/Pulse meter
(N)	Display unit
(O)	Sensor controller
(P)	Switching power supply
(Q)	Stepping motor & Driver & Controller
(R)	Graphic/Logic panel
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(T)	Production stoppage models & replacement

TC/TD Common Features

◎SV High/Low limit[L-5u / H-5u]

- It sets SV high/low limit Limit range of using temperature within temperature range for each sensor, user can set/change set temperature(SV) within SV high limit [H-5u] ~SV low limit [L-5u]. (* L-5u > H-5u cannot be set.)
- When changing input type (I n-t), SV high limit (H-5u) and SV low limit (L-5u) of using temperature will be initialized as max./min. value of sensor temperature range automatically.

◎Input error MV(OPEn) [Er.nu]

- It sets control output when sensor input disconnection error is occurred enabling to set as ON/OFF and operation set by user.
- It executes control output by set operations regardless of ON/OFF and PID control operations.

■Proper usage

◎Simple "Error" diagnosis

- In case, the load (Heater etc) is not operated, please check operation of the out lamp located in front panel of the unit. If lamp does not operate, please check the parameter of all programmed mode. If lamp is operating, please check the output (Relay, Driving voltage of SSR) after separating output line from the unit.
- When it displays "OPEn" during operation.
This is a warning that external sensor is cut off. Please turn off power and check the state of sensor. If sensor is not cut off, disconnect sensor line from terminal block and +, - together. When you turn on power it can check room temperature. If this unit cannot indicate room temperature, this unit itself is faulty. Please remove this unit from equipment and service or replace.
(When the input mode is thermocouple, it is available to indicate room temperature.)
- In case of indicating "Error" in display
This Error message is indicated in case of damaging inner chip program data by outer strong noise. In this case, please send the unit to our after service center after removing the unit from system. Noise protection is designed in this unit, but it does not stand up strong noise continuously. If bigger noise than specified (Max. 2kV) flows in the unit, it can be damaged.

◎Caution for using

- Please use the terminal (M3, Max. 5.8mm) when connecting the AC power source.
- "△" mark indicated on the diagram of this unit means caution—refer to accompanying documents.
- In case of cleaning the unit, please keep as following Cautions;
 - ①Clean dust with a dry tissue.
 - ②Be sure to use alcohol to clean the unit, do not use acid, chromic acid, solvent, etc.
 - ③Be sure to clean the unit after turning off the power and then turn on the power after passing 30minute after cleaning.
- If this unit is used in a manner not to be specified by the manufacture, it can be injury to a person or damage to property.
- Be sure that metal dust and wire-dregs do not flow in the unit, because of malfunction damage of the unit or the cause of a fire.
- Service life for the relay of the unit is indicated in this manual, life cycle is different according to the load capacity and switching times, therefore please use the unit after checking the load capacity and switching times.
- Connect wires correctly after checking polarity of terminals.
- Do not use this unit as following place.
 - ①A place where dust, corrosive gas, oil, moisture are occurred.
 - ②A place where there are high humidity or freezing place.
 - ③A place where sunshine, radiant heat is occurred.
 - ④A place where vibration, shock is occurred.
- If the equipment is used in a manner not specified by the manufacture the protection provided by the equipment may be impaired.
- Please install power switch or circuit-breaker in order to cut power supply off.
- A switch or circuit-breaker meeting the relevant requirements of IEC947-1 and IEC947-3 shall be included in equipment when the temperature controller.
- The switch or circuit-breaker should be installed near by users.
- Installation environment
 - ①It shall be used indoor
 - ②Altitude Max. 2000m
 - ③Pollution Degree 2
 - ④Installation Category II.
- This SSRP of this controller are insulate from internal power.
- Do not connect power line to sensor connecting part. The inner circuit may be damaged.