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TemcoLine®

T30 SERIES PID Controller
User's Manual

HYBRID
PID controller + Timer



T30 series

T32 | T33 | T34 | T37 | T39

Thank you for purchasing the T30 series from Temcoline.
The T30 series is a precision industrial controller that uses an advanced 2 degree-of-freedom (DOF) algorithm.
The T30 series consists of 5 models, which are T32, T33, T34, T37, and T39.
This manual explains the installation, the functions, the operation, and the handling of the products. Please read the manual thoroughly before using the products. If any difficulties arise while using our products, please call our customer service at +82-1588-5439.

Pay attention to the followings!

- Use the products under the conditions specified in this manual.
- Please heed the cautions and warnings listed in this manual.
- The contents of the manual may be changed without notice.
- The product is designed to be used installed on a control panel.
- This manual is copyrighted, and may not be copied in part or in whole without permission.
- The manufacturer takes no responsibility for direct or indirect damages caused by careless operation or operation under unpredictable or risky environments.

Safety requirements!

Safety requirements are intended to prevent accidents and dangers through the proper use of the products, so please heed them at all times.
The safety requirements are divided into "cautions" and "warnings", which indicate the following.

WARNING

Serious injury or death may be caused if instructions are not observed.

CAUTION

Failure to observe these instructions may cause damage to the instrument or some injury to the user.



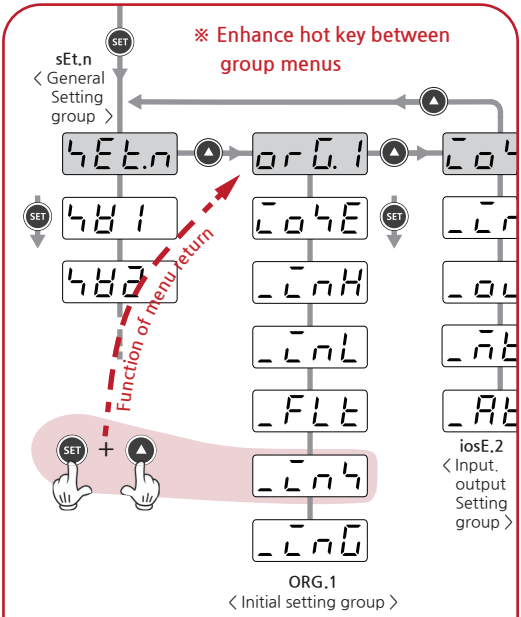
WARNING

1. Use a separate safety device when this product is used to control a device that could harm lives or expensive property in the event of a malfunction or a breakdown. (This may cause fires, deaths, or damage to property.)
2. Do not use this controller at place where there are flammable or explosive gas. (It may cause a fire or explosion.)
3. Before turning the power on, please check that wiring is correct to the number of terminal. (It may cause a fire.)
4. Turn off the power during wiring and maintenance to avoid an electric shock.
5. Do not touch the terminals when it is power on. (It may give an electric shock.)
6. This controller must be mounted on the panel to avoid an electric shock.
7. Do not attempt to disassemble, modify and repair.

CAUTION

1. Please conduct an inspection when water has entered the product. (It may cause short circuits, fires, and malfunction.)
2. This controller should be used indoors.(It may shorten the controller's life or give an electric shock.)
3. Observe the rated voltage and specification.(It may cause a fire or shorten the controller's life.)
4. Be careful that any of foreign materials do not inflow into the controller. (It may cause a fire or malfunction of the controller.)
5. Do not give direct vibration or shock to the controller. (It may cause of malfunction of the controller.)
6. Do not use chemical detergent or solvent, but use a dry towel in cleaning the controller. (It may cause an electric shock or a fire.)
7. Please check the polarity of power before wiring and connecting the sensor.(It may cause an electric shock or explosion.)
8. Power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
9. Altitude max. 2,000m
10. Pollution degree 2
11. Installation overvoltage category II
12. Relay output wires are at least 75 °C of heat resistance and, use Copper wires from 18 AWG to 24 AWG.
13. Tighten the screw of the terminal is torque from 0.74 to 0.90 N·m

Useful Features !



If you press the up key while pressing the set key in any setting menu, you can move to the corresponding upper menu and move to the desired menu immediately.

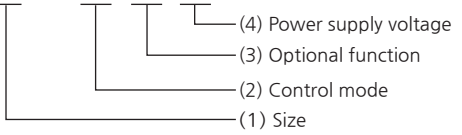
※ Use the menu return function to speed up the setting up to 10 times faster.

Contents

1. Ordering Information ····· 7
2. Input ranges & Output configuration ····· 9
3. Dimensions & Panel cutouts ····· 11
4. Terminal Arrangements & Wirings ····· 15
5. Ratings & Specifications ····· 17
6. Features & Function ····· 18
7. Check points before using ····· 19
8. Initial installation & Min. operation procedures ····· 20
9. Entering into "set menu" & Setting method ····· 21
10. Flow chart (Parameter structure) ····· 24
11. Setting mode ····· 25
12. Alarm(ALARM1, 2, 3) setting ····· 28
13. Details explanation of primary function ····· 30
1) Auto tuning(AT) function ····· 30
2) Manipulated variable(Mvn) check mode ····· 30
3) Alarm(ALARM1, 2) function ····· 31
4) Retransmission output ····· 32
5) Input function ····· 33
6) Selection function for Hysteresis ····· 34
7) SV1, 2 set up control by external contact signal ····· 35
8) Set value "LOCK" function ····· 35
9) Error indication during operation ····· 35
14. SOAK alam and Timer output ····· 35
1) SOAK alam and Timer output ····· 35
2) Timer Normal, T1~5 Output operation timing chart ····· 36

1. Ordering Information

1) T 3□ - □ □ □



(1) Size

Code	Model	Size	Remarks
2	T32-SERIES	48(W) x 96(H) x 77(D)	No option (Basic function)
3	T33-SERIES	96(W) x 48(H) x 77(D)	No option (Basic function)
4	T34-SERIES	48(W) x 48(H) x 77(D)	Option : 0, 1, 3
7	T37-SERIES	72(W) x 72(H) x 77(D)	Option : 0, 3
9	T39-SERIES	96(W) x 96(H) x 77(D)	No option (Basic function)

(2) Control mode

Code	Description	Remarks
S	SINGLE : Standard	Heating or Cooling control

(3) Optional function

Model	Code	Description	Remarks
T32, T33 SERIES	0	RELAY output 1, Alarm output 2, SCR(4~20mA), SSR(Voltage pulse) 1, RET(4~20mA Retransmission output) D.I(SV1, 2) External input	No function (Basic function S0x)
T34 SERIES	0	RELAY output 1 (ALARM or MAIN), SCR(4~20mA), SSR(Voltage pulse) 1	Basic function + Option code (0 : No option)
	1	RET(4~20mA Retransmission), Alarm 2	Ex.) T34-S10
	3	D.I(SV1, 2) External input, Alarm output 2	Ex.) T34-S30
T37 SERIES	0	RELAY output 1, Alarm output 2, SCR(4~20mA), SSR(Voltage pulse) 1	Basic function + Option code (0 : No option)
	3	D.I(SV1, 2), RET(4~20mA Retransmission)	Ex.) T37-S30
T39 SERIES	0	RELAY output 1, Alarm output 2, SCR(4~20mA), SSR(Voltage pulse) 1, RET(4~20mA Retransmission output) D.I(SV1, 2) External input	No function (Basic function S0x)

(4) Power supply voltage

Code	Description	Remarks
0	100 ~ 240 V AC	General-purpose usage
1	24V AC or DC	Alternating or Direct current usage

2) Example of model building

Ex.) T34-S00

(1) Size : 48(W) x 48(H) x 77(D) ➡ "4"
(2) Control mode : SINGLE ➡ "S"
(3) Optional function : Basic function ➡ "0"
(4) Supply voltage : 100~240V AC ➡ "0"

➡ T34-S00

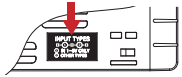
Ex.) T37-S30

(1) Size : 72(W) x 72(H) x 77(D) ➡ "7"
(2) Control mode : SINGLE ➡ "S"
(3) Optional function : DI(SV1,2), RET ➡ "3"
(4) Supply voltage : 100~240V AC ➡ "0"

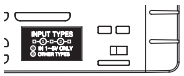
➡ T37-S30

2. Input ranges and Output configuration

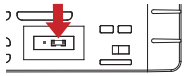
1) Input ranges ※ The T30 series has multiple inputs, which may be set and changed by the user.

Input type	Input	Set.Code	Temperature range	Accuracy	Remarks
Thermocouple (T.C)	K	1	-200 ~ 1370	±0.3 % of FS + 1 Digit	* F.S is max. value to min. value of each range. * Digit is minimum of display.
		2	-199.9 ~ 999.9		
	J	15	-200 ~ 1000		
		3	-199.9 ~ 999.9		
	E	16	-200 ~ 1000		
		4	-199.9 ~ 999.9		
	T	5	-199.9 ~ 400.0		
	R	6	0 ~ 1700		
	B	7	400 ~ 1800		
	S	8	0 ~ 1700		
	L	17	-200 ~ 900		
		9	-199.9 ~ 900.0		
	N	10	-200 ~ 1300		
		14	-199.9 ~ 999.9		
	U	11	-199.9 ~ 400.0		
	C (W5)	12	0 ~ 2300		
	D (W3)	13	0 ~ 2400		
	Platinel II	18	-90 ~ 1370		
		19	-90.0 ~ 999.9		
RTD	JPt100Ω (JIS, KS)	20	-199.9 ~ 500.0		
		22	-200 ~ 500		
	Pt100Ω (DIN, IEC)	21	-199.9 ~ 640.0		
		23	-200 ~ 640		
Voltage (V DC/mV DC)	0~100mV DC	33	0 ~ 100mV DC	※ When using 1~5V input (30), the interior jumper switch must be relocated. 	
	-10~20mV DC	32	-10 ~ 20mV DC		
	1~5V DC	30	1~5V DC		
Current	4~20mA DC	30	When using current input, use the resistor 250Ω on input terminal.		

※ How to change the interior switch when using 1~5V input



① Remove plate or take out the main cover.

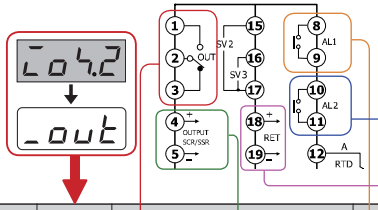


② Move and insert the jumper that pulled by tweezers.



③ Relocated jumper as above and attach plate or mounted cover.

2) Output configuration



√ The T30 series has multiple outputs.

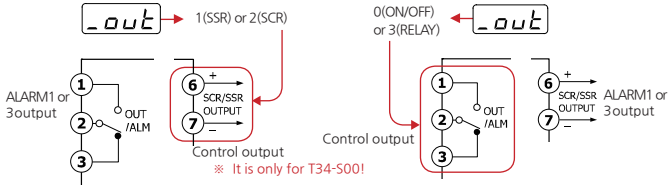
※ The figure on the left uses the terminal socket of T37-S30 as an example to illustrate the output response relationship.

General type	Setting number	OUTPUT-1			OUTPUT-1 (ALARM 1,2)		
		Relay output	SSR/SCR OUTPUT		AL1 output	AL2 output	SCR output
			SSR output	SCR output			
T30-SXX	0	OUT(ON/OFF)	ALM3(ALM1)	-	ALARM1	ALARM2	RET
	1	ALM3(ALM1)	OUT(PID)	-			RET
	2	ALM3(ALM1)	-	OUT(PID)			RET
	3	OUT(PID)	ALM3(ALM1)	-			RET

(1) Summary and explanation of output settings

- Relay output of ON/OFF control [Output setting number : 0]
  This is a simple on/off control, mainly used to control cooling devices.
- SSR output of PID control (Voltage pulse) [Output setting number : 1]
  This is the most widely used setting, and the default value at the point of manufacture.
- SCR output of PID control (4~20mA current output) [Output setting number : 2]
  This setting is used mainly with thyristor power regulator (TPR) modules, and is capable of precision control.
- Relay output of PID control [Output setting number : 3]
  This is the most cost-efficient method of implementing PID control and is used mainly with magnetic switches (electric switches). However, it may wear the contact point, and is difficult to use in places that require fast response.

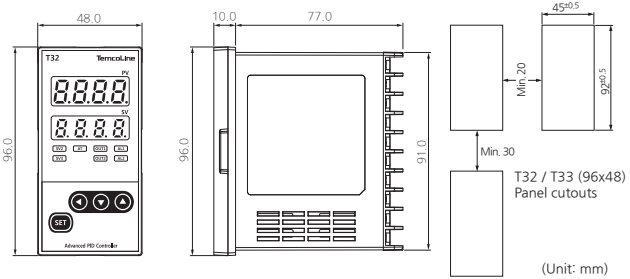
(2) Main relay control output and alarm output



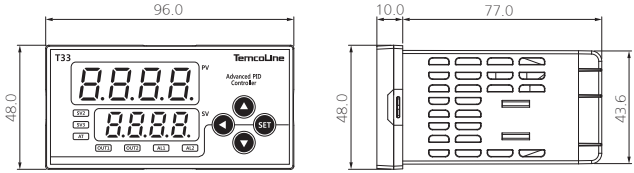
The T30 series can use up to three alarms independently when using the control output as SSR (1) or SCR (2). That is, the basic model (no option) can be used as alarm 1, and the optional model (alarm output) can be used as alarm 3.

3. Dimensions and Panel cutouts

1) T32 (48x96 mm) Dimensions

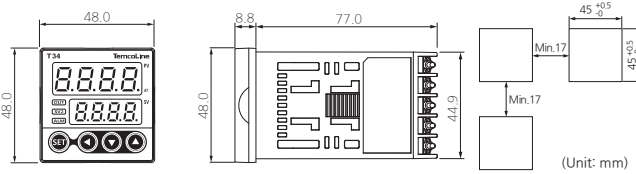


2) T33 (96x48 mm) Dimensions

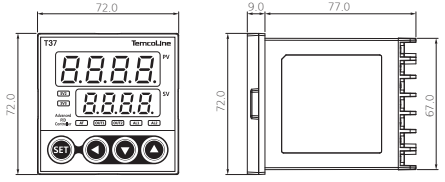


3) T34 (48x48 mm) Dimensions

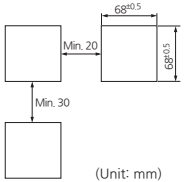
T34 (48x48) Panel cutouts



4) T37 (72x72 mm) Dimensions

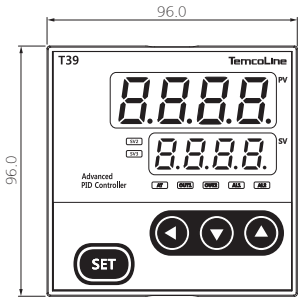


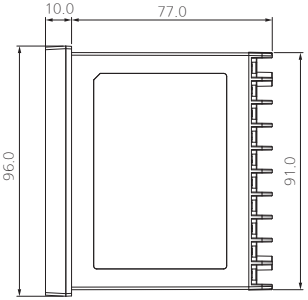
T37 (72x72) Panel cutouts



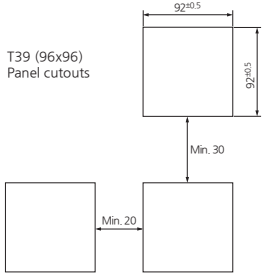
(Unit: mm)

5) T39 (96x96 mm) Dimensions





T39 (96x96)
Panel cutouts



(Unit: mm)

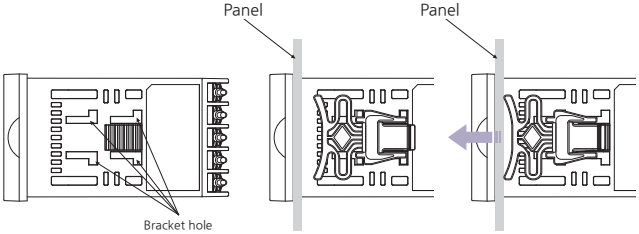
6) Installation

(1) T34-SERIES

① Bore a hole in the panel, referring to the panel cutouts on the previous page.

② Insert this device into the front of the panel.

③ After inserting two brackets into the holes on the left and right respectively of the device, Slide it forward until it fits tightly to the panel and secure.



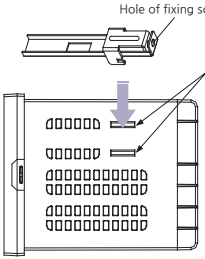
(2) T32 / T33 / T37 / T39-SERIES

① Bore a hole in the panel, referring to the panel cutouts on the previous page.

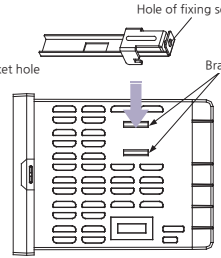
② Insert this device into the front of the panel.

③ Insert 2 brackets, one each on the B/K holes on the top and the bottom of the device.

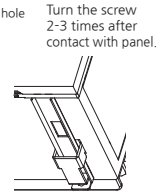
④ Secure using screws on the two locations at top and bottom.



[figure 1] Top side



[figure 2] Bottom side

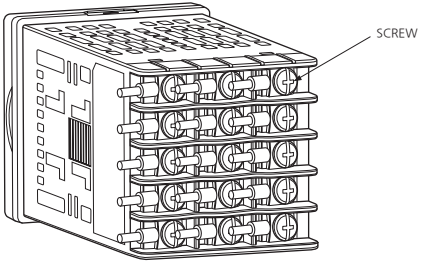


[figure 3] Fixing completion

7) Terminal wiring method

(1) SCREW

① When wiring the terminal, tighten the screw with a tightening torque of 0.74 to 0.90 N.m.



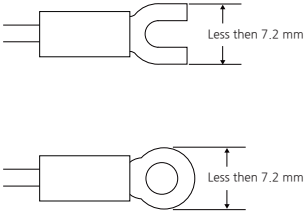
(2) Cautions for terminal wiring

① Signal lines and power lines should be separately wired to avoid the effects of noise

② Use a crimp terminal to wire the terminals.

③ Tighten the terminal screws with a tightening torque of 0.74 to 0.90 N.m.

④ Please use the following form of crimp terminal M3.5.

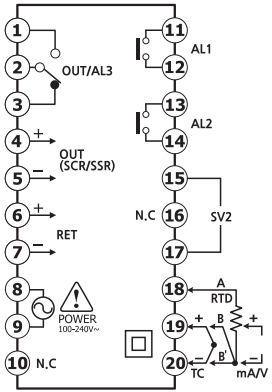


Crimp terminal

4. Terminal arrangements and Wirings

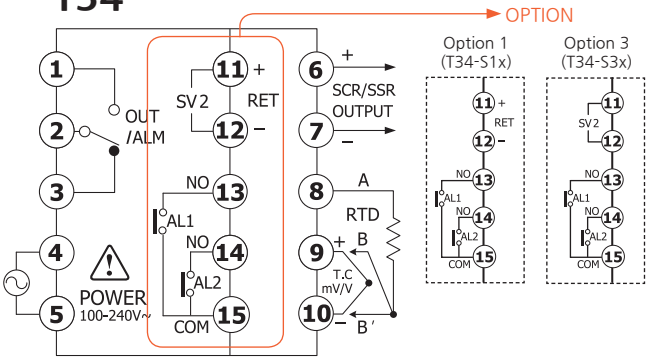
1) T32 (48x96 mm), T33 (96x48 mm)

T32, T33

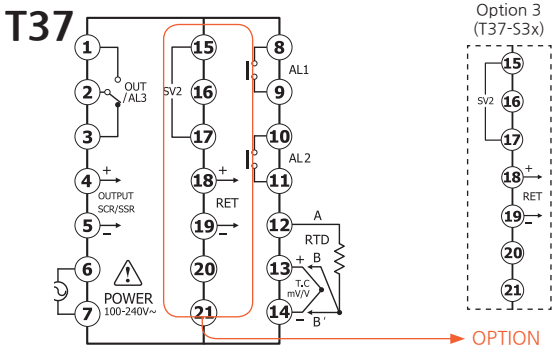


2) T34 (48x48 mm)

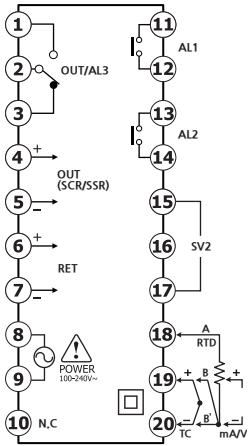
T34



3) T37 (72x72 mm)



4) T39 (96x96 mm)



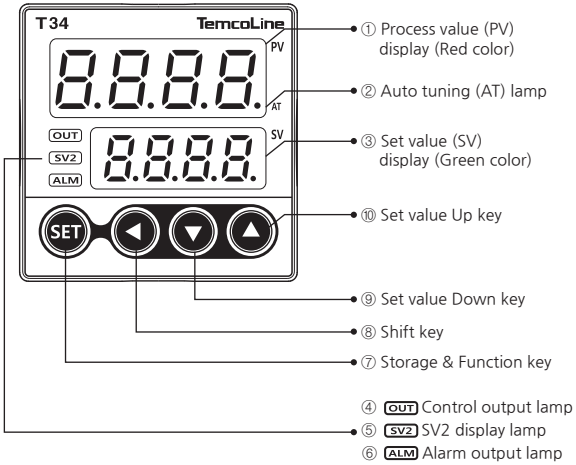
※ Terminal explanation (T39-S00)

- Terminal ① ② ③: OUT1 only for output selection no. 0, 3 (Relay output) mode.
- Terminal ④ ⑤: OUT1 only for output, selection no. 1, 2 (SSR, SCR output) mode.
- Terminal ⑥ ⑦: RET(Retransmission 4~20mA) or for power of sensor SPS. (DC 15V)
- Terminal ⑧ ⑨: Power supply terminal.
- Terminal ⑪ ⑫: Alarm1 output terminal.
- Terminal ⑬ ⑭: Alarm2 output terminal.
- Terminal ⑮ ⑰: The external D.I input terminal may be used when (DIS=ON), and the target value may be controlled. (SV1, SV2)
- Terminal ⑱ ⑲ ⑳: Input terminals.

5. Ratings and Specifications

Model		T30-SERIES
Power supply		Rating 100~240V AC 50~60Hz (voltage operating range: 85~265V AC) ※Option: Rating 24V AC or DC (voltage operating range: 20~28V DC)
Power consumption		8VA(MAX) at AC100~240V 4W at DC 24V
Input Type		TC: K, J, T, E, R, B, S, L, N, U, C(W5), D(W3) Platinum RTD: KPt100(KS), JPt100(JIS), Pt100(DIN) Current input(A): 4~20mA DC Voltage input(V): 1~5V DC, -10~20mV DC, 0~100mV DC
Display Accuracy		±0.3% of FS +1 Digit
Input Impedance		Current input (250Ω), Voltage input (TC included) ≥ 1MΩ (RTD line resistance : ≤10Ω, when 3-line resistance are the same)
Input sampling period		50~250ms (variable according to SG-PID algorithm)
Control Output	Relay	1c 250V AC, 3A(resistance load) electric lifespan ≥ 100,000 (time proportional PID output or ON/OFF output)
	Voltage (S.S.R)	DC15V 25mA (built-in short protection circuit) Voltage pulse (time proportional PID output)
	Current (S.C.R)	4~20mA DC, load impedance ≤ 600Ω (continuous PID output)
Control Method		Super 2 degree-of-freedom PID (SG-PID algorithm), Auto-Tuning
Multi SV Input (D.I)		ON : ≤ 1KΩ , OFF : ≥ 100KΩ (external control SV1,2)
Retransmission Output		4~20mA DC, load impedance ≤ 600Ω resolution 1/4,600 PV(process value), SV(set value), MV(manipulated variable[%]), SPS(sensor module power supply)
Alarm output (Alarm 1,2,3)	ALARM 1 ALARM 2 ALARM 3	1a 250V AC 3A (resistance load) 20 type of independent event output & Control loop break alarm Convenient timer output 6 types (SOAK ALARM external timer mode T1 to T5) Inverter operation (RUN) / stop (STOP) control
Ambient temperature and Humidity		-10~50℃ / relative humidity 25~85% RH (but with neither condensation nor freezing)
Certification Standards	Approved	c UL us T32-S00, T33-S00, T39-S00 T34-S01, T34-S11, T34-S31
	Conformed	CE
Weight (Bracket, Accessories included)		•T32, T33, T37 : 310g •T34 : 200g •T39 : 420g ※+ 30g, if options are added

6. Features and Function (ex. T34 SERIES)



※ Description

Name	Function
① Process value	Display the process value. (red color)
② Auto tuning lamp	Flash every 0.5 second during auto tuning.
③ Set value display	Display the set value, codes, and modes.
④ Control output lamp	Lights when the control output is ON.
⑤ SV2 display lamp	Lights when the SV2 is displayed.
⑥ Alarm output lamp	Lights during the alarm is ON.
⑦ SET Function key	Use to move the menus, to store, and to operate.
⑧ ◀ Shift key	Use to shift the digits.
⑨ ▼ Set value down key	Use to decrease set value and to move the menu.
⑩ ▲ Set value up key	Use to increase set value and to move the menu.

7. Check Points before Using

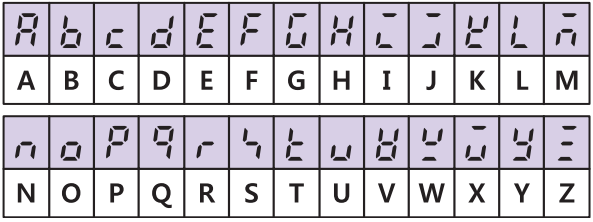
1) Default values at the point of manufacture

The default input and output values of the product at the point of manufacture are as follows.

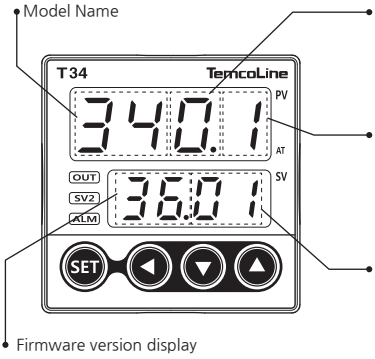
Input : K-Type (Code No. 1) Output : SSR (Code No. 1)

※ When selecting SSR (1), SCR (2) output mode only for model T34-S00 (no option), alarm 1 is output as MAIN RELAY. For models with other alarm options, alarm 3 is output as MAIN RELAY. (Refer to the page 8 for details)

2) 7 Segment display indications



3) Initial display on power supply (T34 SERIES basis)



- Model Name
- Option indication
  0 : Basic type (No option)
  1 : RET, ALARM1, 2
  3 : DI(SV1, 2), ALARM1, 2
- Output type indication
  0 : RELAY ON/OFF control
  1 : SSR (VOLT-PULSE) PID control
  2 : SCR (4~20mA) PID control
  3 : RELAY PID control
- Input type indication
  01 : K-Type (-200~1370 ℃)
  02 : K-type (-199.9~999.9 ℃)
  ⋮
  33 : mV DC (0~100 mV)
- Firmware version display

8. Initial installation and Minimum operation procedures

The following are the instructions for initial installation and minimum operation procedures. Please read the contents of this manual, including the general functions outlined here, as thoroughly as possible before operating the device.

1) Check the external wiring diagram and specifications.
(power supply and terminal arrangement)

2) Check input and output specifications!
The default setting for the T30 series at the point of manufacturer are as follows.

Input : K-Type (setting code 1 : -200 ~1370℃)
Output : SSR mode (setting code 1)

If you wish to change the input or the output type, please select the option you desire on the input group and the output group menus.

※ The input type settings must be configured first before changes to other set values are made.

When the input type is changed, all other parameters (set values) are reverted to their factory default.

3) Select the desired set value (SV).

4) Please set auto-tuning or P, I, D values to suit the operating environment.
Auto-tuning is recommended except under special circumstances.

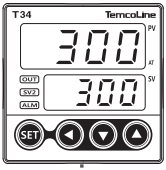
※ Direct menu navigation and entry key (hot key) support

T30 supports hot keys for user convenience.

1. SET : To enter general setting mode
2. SET + ◀ 3 seconds or more : To enter input/output setting mode when AT is not running.
3. SET + ▼ 3 seconds or more : To enter initial setting mode
4. SET + ▲ One click : Function of menu return, At any setting menu position, if you press the UP key while holding the SET key, it moves to the first position corresponding to the current menu.
5. SET + ▲ 0.5 seconds or more : Auto tuning

9. Entering into "set menu" and Setting method

1) Input & Output type setting



☑ Temcoline products are universalized input and output. Please set up input and output type firstly and use when install our unit.

The method for input and output setting menu before auto-tuning.

☞ **Caution !** When auto tuning is completed normally, the input/ output menu is locked for safety. Refer to the next page (P.20) for how to How to Disable.

① Press SET + ◀ key more than 3 seconds, Entering into input & output setting menu.



② Input type setting : Select the desired input sensor type.
(setting code 1~33 / refer to P7, Input ranges)



INPUT(T.C)	CODE	TEMP.RANGE
K	1	-200 ~ 1370
	2	-199.9 ~ 999.9
J	15	-200 ~ 1000
	3	-199.9 ~ 999.9
E	16	-200 ~ 1000
	4	-199.9 ~ 999.9
T	5	-199.9 ~ 400.0
R	6	0 ~ 1700
B	7	400 ~ 1800
S	8	0 ~ 1700
L	17	-200 ~ 900
	9	-199.9 ~ 900.0
N	10	-200 ~ 1300
	14	-199.9 ~ 999.9
U	11	-199.9 ~ 400.0
C (W5)	12	0 ~ 2300
D (W3)	13	0 ~ 2400
Platinel II	18	-90 ~ 1370
	19	-90.0 ~ 999.9

INPUT(RTD)	CODE	TEMP. RANGE
JPt100Ω (JIS, KS)	20	-199.9 ~ 500.0
	22	-200 ~ 500
Pt100Ω (DIN, IEC)	21	-199.9 ~ 640.0
	23	-200 ~ 640

INPUT(V DC/mV DC)	CODE
0~100 mV DC	33
-10~20 mV DC	32
1~5 V DC	30
4~20mA DC (Use 250Ω resistor)	

SET

③ Output type setting : Select the desired output type.
(setting code 0~3 / refer to P8, Output Configuration)



SETTING CODE	CONTROL OUTPUT
0	RELAY ON/OFF CONTROL
1	SSR P.I.D CONTROL
2	SCR (4~20mA) P.I.D CONTROL
3	RELAY P.I.D CONTROL

SET

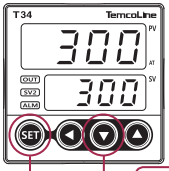
※ Even if PID control output (1, 2, 3) is selected, ON / OFF control mode can also be used when P value is OFF.



④ Manipulated Variable Display setting [%]
It works when display the manipulated variable (0~100%) at operating menu.

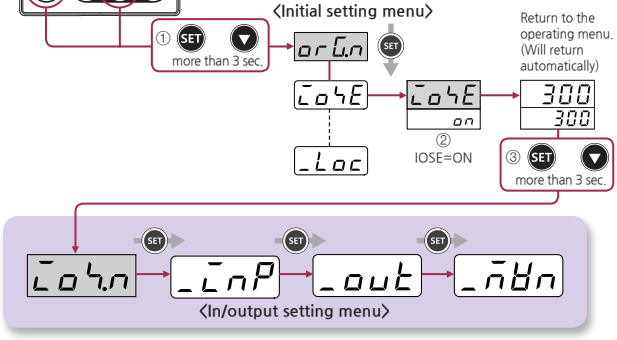
2) The processing for input/output setting menu after auto-tuning

After auto-tuning has done of T30 series models, to avoid any user's mistake, input/output setting menu is restricted automatically. But you can change input/output by following ways. However, unit will be returned to factory default when changed input type.



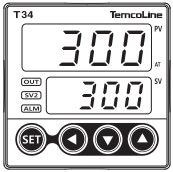
While normal using our products, the method for input/output setting menu after auto-tuning.

※ Describe how to enter by using hot keys.



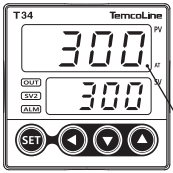
※Press SET + ◀ more than 3 seconds at the inital set. (before running auto-tuning)

3) Set value(SV) setting [in condition of Mvn = OFF (basic)]



① Enter to setting mode by (SET) key
② Set a desired value by ◀ ▼ ▲ key
③ Store a value by (SET) key

4) Auto tuning

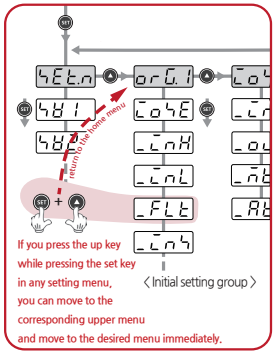


AT operation start : (SET) + (▲) 0.5 second
AT stop by perforce : (SET) + (▲) 0.5 second

AT command lamp (flash every 0.5 sec.)

Auto-tuning is required before operating for the first time. Set the target value(SV) in the range mainly used and run auto-tuning. When auto-tuning begins, the "auto-tuning command lamp" will flash every 0.5 second and will turn off upon completion of the auto-tuning process. Please refrain from operating the keys while auto-tuning is in progress.

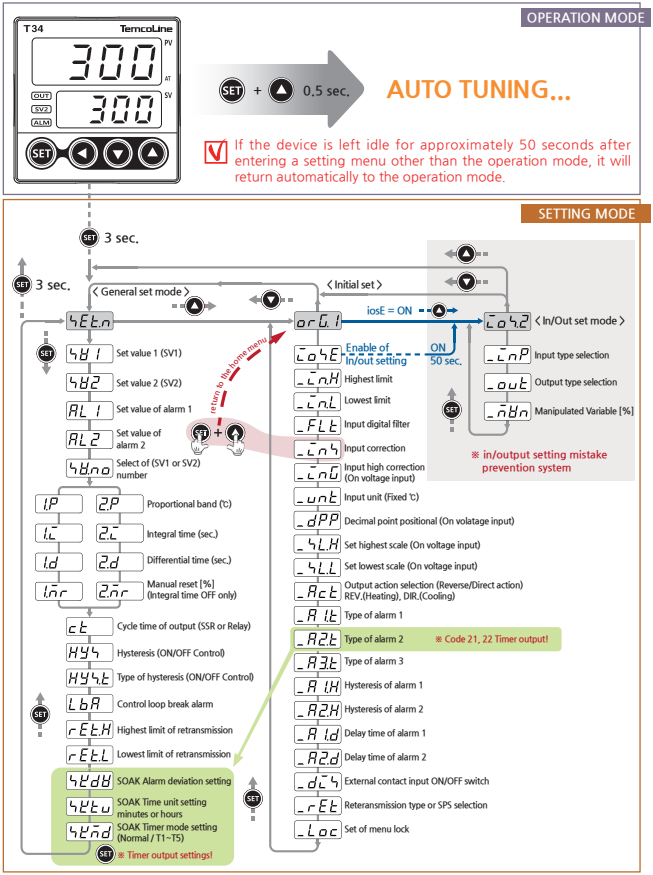
※ Function of menu return



※ Useful Features

Use the menu return function to speed up the setting up to 10 times faster.

10. Flow Chart (Parameter structure)

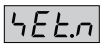
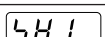
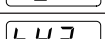
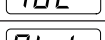
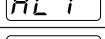
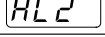
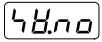
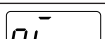
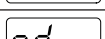
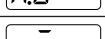
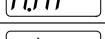
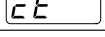
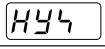
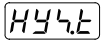
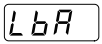


※ To enter 'Input/Output settings' by 'IOSE' on is valid for only time. If you want to enter 'Input/Output settings' again you must turn on 'IOSE' first. If there is no Key action the 'IOSE' will be OFF automatically in 50 seconds.

11. Setting mode

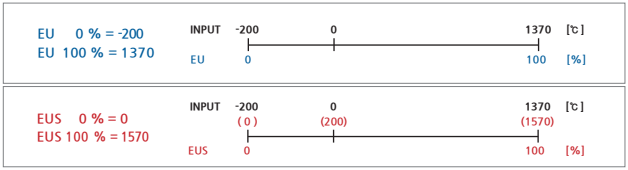
1) General setting mode

The general setting mode is for changing environment parameters on ad hoc basis and also for tuning performance enhancement and configuring other functionalities.

Display	Description	Setting range	Condition	Initial value
	Display general setting mode	-	-	-
	Set value 1 (SV1) setting	EU (0 ~ 100 %)	D.I Option in use	EU (0 %)
	Set value 2 (SV2) setting	EU (0 ~ 100 %)	D.I Option in use	EU (0 %)
	Set value of alarm 1 (AL1)	EU (0 ~ 100 %)	Use Alarm 1	EU (100 %)
	Set value of alarm 2 (AL2)	EU (0 ~ 100 %)	Use Alarm 2	EU (100 %)
	Selection of (SV1, 2) number	1 / 2	Always	1
	SV1, 2 proportional band (P)	OFF/ 0.1 ~ 999.9 ℃ (ON/OFF control)	PID control	20.0 ℃
	SV1, 2 Integral time (I)	OFF / 1 ~ 6000 sec.	PID control	240 sec.
	SV1, 2 Differential time (D)	OFF / 1 ~ 6000 sec.	PID control	60 sec.
	SV1, 2 Manual reset (MR)	-5.0 ~ 105.0 %	Integral time OFF	50.0 %
	Cycle Time (P.I.D Control Only)	1 ~ 1000 sec.	PID control (SSR or RELAY)	2 sec.
	Hysteresis (ON/OFF control)	EUS (0 ~ 100 %)	ON/OFF control	2 ℃
	Select the operational method of Hysteresis	HALF / NORMAL	ON/OFF control	NORMAL
	Control loop break alarm (LBA)	OFF / 1 ~ 9999 sec.	ALARM1 No. 21 selection	480 sec.
	Highest limit of retransmission (RET.H)	TC/RTD : _IN.H~_IN.L DCV IN : _SL.H~_SL.L (But, RET.H 〉 RET.L)	Use retransmission and select PV or SV	EU (100 %)
	lowest limit of retransmission (RET.L)			EU (0 %)

※ EU : An engineering unit in compliance with the input range

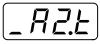
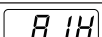
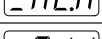
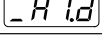
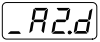
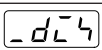
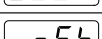
Ex.) Input selection no. : 01 (K-TYPE)



2) Initial setting mode

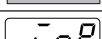
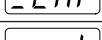
The initial setting mode is for setting up initial parameters and configuration for overall control and functionalities activation that are rarely changed after the initial setup.

Display	Description	Setting range	Condition	Initial value
orG.1	Initial set mode (ORG.1)	-	-	-
Lo5E	I/O setting entry switch (IOSE)	ON / OFF	Always	OFF
_In.H	Set highest input range (_IN.H)	Within input range (See input type and range) But, _IN.H > _IN.L	Always	1370
_In.L	Set lowest input range (_IN.L)			-200
_FLt	Set input digital filter value (_FLT)	OFF / 1~120 sec.	Always	OFF
_Ins	Input value correction (_INS)	EUS (-100.0~100.0 %)	Always	EUS (0.0 %)
_InG	Correcting upper limit(Gain) of input (_ING)	EUS (-100.0~100.0 %)	On voltage input	EUS (0.0 %)
_unt	Input temperature unit selection (Fixed Celsius)	℃ / ℉	Always	℃
_dPP	Select the decimal point position in Voltage input mode (_DPP)	0 ~ 3	Voltage or 4~20mA input mode only	1
_SL.H	Free scale upper limit set (voltage input mode)	-1999 ~ 9999 But , SL-H > SL-L Decimal point positioning by _DPP		100.0
_SL.L	Free scale lower limit set (voltage input mode)			0.0
_Act	Output action selection	REV (Heating), DIR (Cooling)	Always	REV (Heating)
_A1t	Select alarm 1 output type	OFF / 1 ~ 21(LBA) (See alarm type)	Always	3

Display	Description	Setting range	Condition	Initial value
	Select alarm 2 output type	OFF / 1 ~ 20 (See alarm type)	Using alarm 1, 2 option	4
	Select alarm 3 output type	OFF / 1 ~ 20 (See alarm type)	Using alarm 1, 2 option	OFF
	Hysteresis of alarm 1 output	EUS (0.0 ~ 100.0 %)	Using alarm1 (1~20)	1 ℃
	Hysteresis of alarm 2 output	EUS (0.0 ~ 100.0 %)	Using alarm2	1 ℃
	Delay time of alarm 1	OFF / 1~240 sec.	Using alarm1	OFF
	Delay time of alarm 2 and Timer output, T4, T5 Time setting	OFF / 1 ~ 5999 sec. Timer T4 and T5	Using alarm2 and Timer	OFF
	External contact input (SV1, 2) ON/OFF switch	OFF / ON	Using DI option	OFF
	Retransmission type or SPS selection	PV/ SV/ MV/ SPS	Using RET option	PV
	Set data protection	OFF/ ON/ ALL	Always	OFF

3) In/Output setting mode

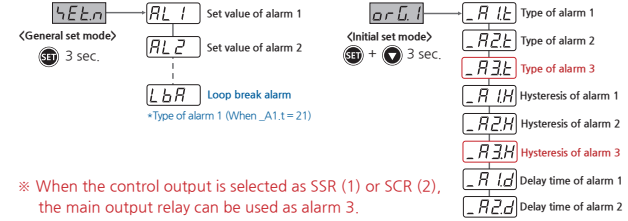
The input/output setting mode is a parameter for the first time use. It's ahardware configuration so requires special user caution. That is, the configuration is determined by the type of equipment and it must be configured first. (※ all parameters are initialized according to the entered input type.)

Display	Description	Setting range	Condition	Initial value
	In/output setting mode	-	-	-
	Input type selection (_InP)	1 ~ 33 (refer to P7, 2. 1)	Always	1
	Output type selection (_out)	0 ~ 3 (refer to P8, 2. 2)	Always	1
	Manipulated variable (_Mvn) Display setting	OFF / ON	Always	OFF

When the input type is changed, all parameters are reverted to their factory default. This means that before using the T30, the input type needs to be set first, after which other parameters can be configured. If the input settings are changed while in use, auto-tuning and other parameters need to be reconfigured.

12. Alarm(ALARM1, 2, 3) Setting

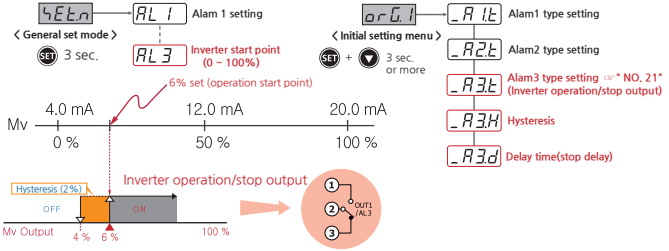
The T30 series has up to three independent alarm outputs, and you can set up to 21 alarm types, hysteresis, and delay time.

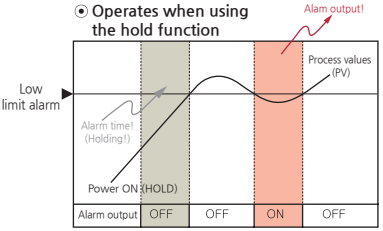


※ When the control output is selected as SSR (1) or SCR (2), the main output relay can be used as alarm 3.

1) Inverter operation start / stop function

The T30 series supports operation start / stop function during inverter control (4 ~ 20mA) to enable more stable control and solve the problems of lifetime and power saving of peripheral devices



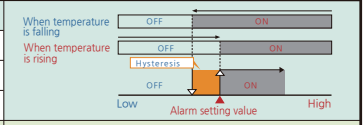
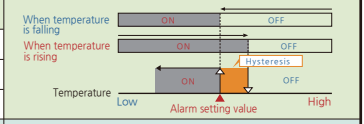
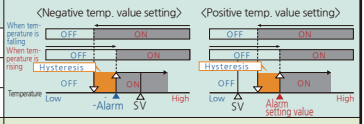
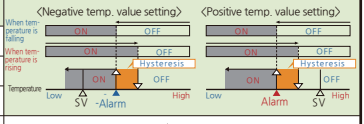
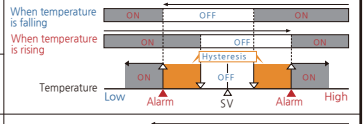
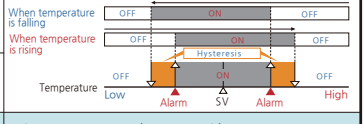


2) Hold function

When the low limit alarm is used, if the temperature before the power supply is lower than the set value, unnecessary low limit alarm occurs until the normal control temperature is reached.

At this time, when the hold function is used, it is possible to ignore the occurrence of the alarm up to the normal control temperature when the initial power is turned on when the temperature is within the alarm range.

2) Alarm output type and Selection code

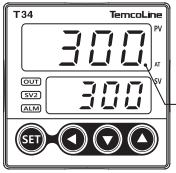
CODE NO.		ALARM TYPE	ALARM OUTPUT OPERATION
01		Absolute value upper-limit	
09		Process low	
11		Process high with hold	
19		Process low with hold	
02		Absolute value lower-limit	
10		Process low	
12		Process high with hold	
20		Process low with hold	
03		Upper-limit deviation	
05		Process low	
13		Process high with hold	
15		Process low with hold	
04		Lower-limit deviation	
06		Process low	
14		Process high with hold	
16		Process low with hold	
07		Upper & Lower-limit deviation	
17		Upper & Lower-limit deviation with hold	
08		Upper & Lower-limit deviation in range	
18		Upper & Lower-limit deviation in range with hold	
21	ALARM 1	Loop break alarm (LBA)	Refer to page 31 LBA ! **(ALARM1 only)**
	ALARM 3	Inverter operation / stop output alarm	Page 25, 1) Refer to inverter operation stop control! **(ALARM 3 only)**
	ALARM 2		[Alarm No. 2 code 21] Supports five kinds of SOAK alarm and timer output **(Process high)** (Setting mode T1 to T5)
22			[Alarm No. 2 code 22] SOAK Alarm and Timer Output **(Process low)** refer to * Page 33, 34 "14. SOAK alarm and timer output mode ".

When alarm type reverse-correspondence is selected for alarm type and code, please be aware that when the alarm lamp turns on, the contact output will be off.

13. Details explanation of primary function

1) Auto tuning (AT) function

Before the PID temperature controller can be used for the first time, the P, I, D values must be tuned. The auto-tuning function finds the optimal value by tuning automatically according to the load factor and other conditions.
Please make sure that the controller is tuned before using it for the first time, by defining the set values in the most frequently used range and running auto-tuning.
When auto-tuning begins, the "auto-tuning command lamp" will flash every 0.5 second and will turn off upon completion of the tuning process.
Please refrain from operating the keys while auto-tuning is in progress.



AT operation start : SET + ▲ 0.5 second
AT stop by perforce : SET + ▲ 0.5 second

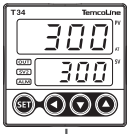
AT command lamp (flash every 0.5 sec.)

※ Do not use auto tuning under below Process.
- Rapid control Process such as Flow, input control.
- Process which should not ON/OFF output even a temporary.
- Process which should not over load at control.

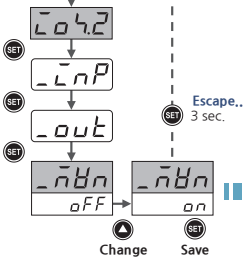
2) Manipulated Variable [%] (Mvn) check mode

"Mvn [%] check function" displays the control output [%], which can be viewed by pressing the " SET " key while operating in default operation mode and is shown as a percentage of the control output (0~100[%]) in the SV display. In this mode, pressing the " SET " key alternates between showing the SV and the Mvn values, and changes to the SV value can be made by " ▼ " or " ▲ ". If required, set in the order of ◀ save SET .

〈 Setting method 〉



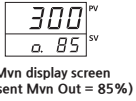
Refer to P19~20, I/O Set Mode



〈 In condition of Mvn = ON 〉



Operation mode



Mvn display screen
(Present Mvn Out = 85%)

3) Alarm (ALARM1,2) function

The T30 series alarm outputs have three independent alarm outputs and are designed to be used with a variety of auxiliary outputs as well as simple alarm functions. In the setting group, 21 types of alarms, hysteresis of alarm output and delay time can be set. (refer to th Page 25 ~ 26 Alarm Settings)

(1) Delay time of alarm



Alarm 1 delay time setting



Alarm 2 delay time setting

The alarm delay function is a function that waits for the set time when the alarm output is generated and then outputs the alarm output.
Actual applications can be used for various auxiliary output functions rather than alarm delay.

If you set the alarm delay time, alarm (1 or 2) output waits for the delay time after receiving the alarm. However, it is not applicable when the alarm is turns off. During the delay time the alarm (ALM) output lamp blink 0.5 second intervals to displays the current alarm is waiting to alert.

(2) LBA (Control Loop Break Alarm)

LBA is functionality where it triggers an alarm when there is no change in input while the difference is in consistent state (it assumes there is certain problem in the control loop). Therefore if the control loop is not in a normal working mode, it can be utilized for detection. E.g. output is generated if there are problems with control unit and other problems or can be used for heater disconnection.

① How to set up

Please set value of LBA two times of the normal integral time setting.
In addition, LBA can be set to automatically by the auto turning function.
In this case value will be set up automatically two times of integral times.

② Description of operation

Control loop break alarm consists to alert you Control loop break by detect. Variation during setting time when P.I.D calculations (On time/ period of output) is 0% or 100%.

ⅰ. When P.I.D calculations stays 100% more than LBA setting time, Break alarm will be turned on if calculations is not increase more than 2℃.(In positive action will turned on if calculations does not fall more than 2 ℃.)

ⅱ. When P.I.D calculations stays 0% more than LBA setting time, Break alarm will be turned on if calculations is not fall more than 2℃.
(In positive action it will turned on if calculations does not increase more than 2 ℃.)

③ Cause of activation

LBA will activate below condition.

i . Abnormalities of the control target : Heater break, No supply voltage, Wrong wiring, etc.

ii . Abnormalities of the sensor : Disconnection / short circuit of sensor

iii . Abnormalities of the handling tools : Splice relay, wrong wiring, etc.

iv . Abnormalities of Output circuit : Spliced relay inside of unit, break ON/OFF

v . Abnormalities of input circuit : No calculations change even input is change.

④ Notice of LBA

i . LBA will work when PID calculations is 0% or 100%. Thus the time from occurring of abnormalities to alarm time will be the time of PID value 0% or 100% plus.

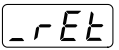
ii . LBA set-up times LBA will not working during auto tuning.

iii . The LBA function is influenced by disturbances (heat sources, etc) and as a result may be activated even if there is no trouble in the controlled system.

iv . When LBA setting time is too short or wrong control target, sometimes LBA will be on/off abnormally of not turned on. In this case please set LBA time little longer.

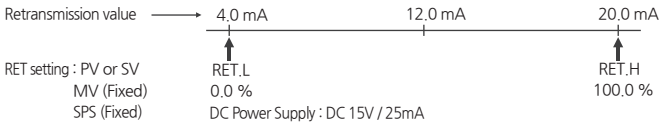
4) Retransmission output

The re-transmission output of the T30 series has all three transmission functions and the ability to supply power when using an external sensor.



Retransmission type or SPS selcetion

PV (Current Progress Value)
SV (Set Value)
MV (Manipulated Variable)
SPS (Power supply for external sensor)



5) Input function

(1) Digital input filter (_FLT)

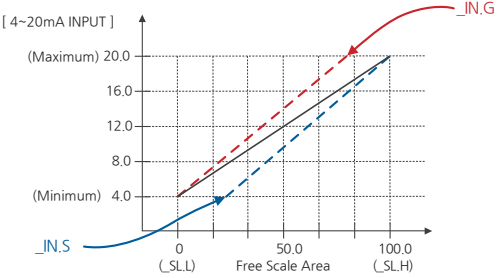
This function is useful when suboptimal environments cause noises or severe fluctuations, enabling a digital software filter. The filter's sensitivity may be set from off to 1~120 seconds. Please be careful when using this function, as it may affect the control-related algorithms.

(2) Input value correction (_INS)

This function allows the input values to be compensated. This function is useful, for example, when sensors cannot be placed at desired locations, or when several different thermometers are used in conjunction. The values may be compensated to extent desired by the user.

(3) Correcting upper limit of input vlaue(_ING)

Use only in voltage input(current 4-20mA) mode. This can accurately correct the deviation occurred by output error of sensor module and an error of conversion resistance (250Ω).



Ex.) When using DC 4~20mA input, the lower value, 4mA can be corrected at "_INS" mode and higher value, 20mA corrected at "_ING" mode.
To have more accurate correction, firstly set the lower value at "_INS" mode and then set the higher value at "_ING" mode. T30 series offers the powerful correction function with 4-20mA conversion resistance (250Ω) at ompetitive prices.

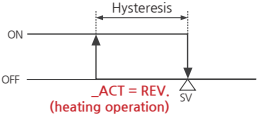
(4) Setting decimal point position (_DPP), and free scale high and low limits (SL-H, SL-L)

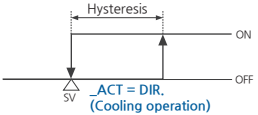
This applies only when using voltage inputs (DC V, mV) or currents between 4 to 20mA (1~5V). The user may set ranges, units and decimal point position as desired. This can be used not only for temperatures but also for a number of other measurements, including humidity, pressure, and weight.

6) Selection function for Hysteresis (ON/OFF control mode _out=0)

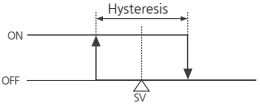
T30-series can select Hysteresis operation method in ON/OFF control mode.

(1) HYS.T = "NORM" selection





(2) HYS.T = "HALF" selection



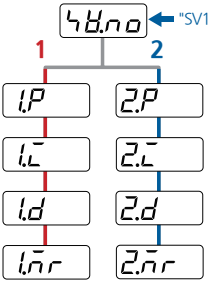
※ While Hysteresis operation in "HALF" mode, the operation of Heating and cooling is same, and "NORM" is factory default.

7) SV1, 2 set up control by External contact signal

_dI5	Use SV1,2 by external contact (_dis=ON)	
	SV Action	External terminal status
ON	SV1 Select	OPEN
	SV2 Select	SHORT
OFF	Block external contact signal (Can select under inside menu only.)	

Digital input switch (_dis) : This function selects whether to use digital input switch. This function the ability to change SV1, 2 to Each pre-set value by an external contact signal.

Please use a non-voltage contact (relays, switches) for direct input.
If a non-contact device such as a semiconductor are used, please operate within the ranges, ON=1KΩ, OFF=100KΩ.



T30 controls when the external or internal SV1 or SV2 select control by independent P, I, D, MR value.
As a result, it will have best control performance depending on the temperature value.
Typically, when use Auto-tuning, it will work if either SV1 or SV2 tuned and set same P, I, D value with the other.

8) Set value "LOCK" function

Lock function will protect change set value and activate function such as auto tuning from accidental key operation. Please use after setting prevents.



Lock has 3 setting mode (OFF/ ON/ ALL)

- OFF : LOCK function off
- ON : Can operate SV setting and AT only.
- ALL : Impossible all setting and operation, only LOCK OFF is available.

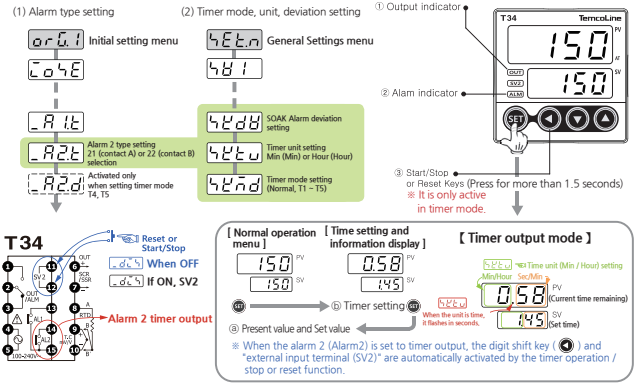
9) Error indication during operation

B.OUT : INPUT SENSOR error or burn out etc.
+OVR : Out of maximum input range (refer to input group setting) or overheating
-OVR : Out of minimum input range (refer to input group setting) or overcooling
SYS.E : SYSTEM setting error or Memory damage (request for repair)
RJC.E : RJC Sensor damage or PCB burn (request for repair)
EEP.E : EEPROM damage (request for repair)
COM.E : Communication ERROR (request for repair)
AT.E : Auto Tuning Error, Checking heater break or controller

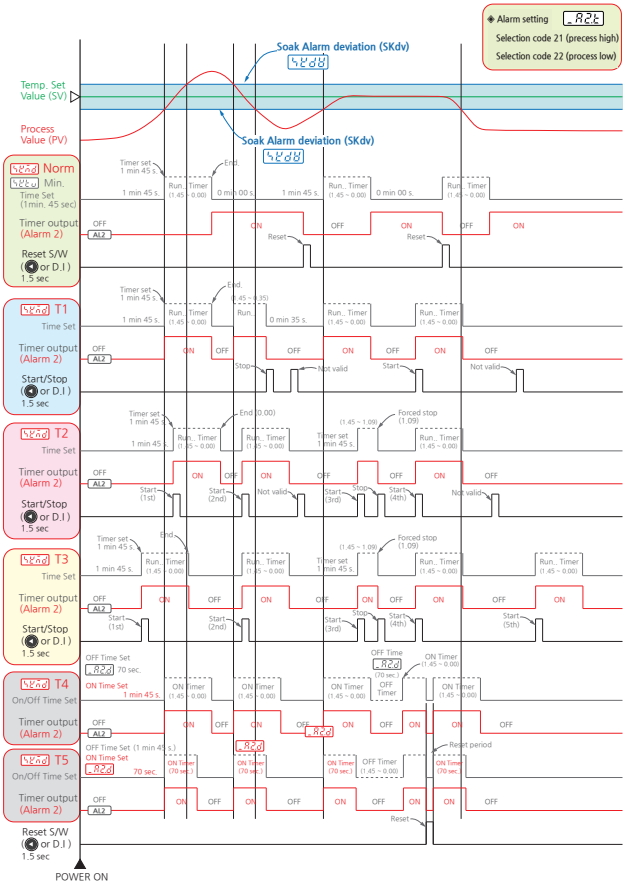
14. SOAK alarm and timer output

ALARM 2 of the T30 series supports powerful digital timer function. There are 5 types of timer output mode besides the basic SOAK ALARM function.

1) SOAK alarm and timer output



2) Timer normal , T1~5 Output Operation Timing Chart



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