TC 10 - L

LIMIT CONTROL TYPE

Engineering Manual

Code: IM 05C01E81-12EN

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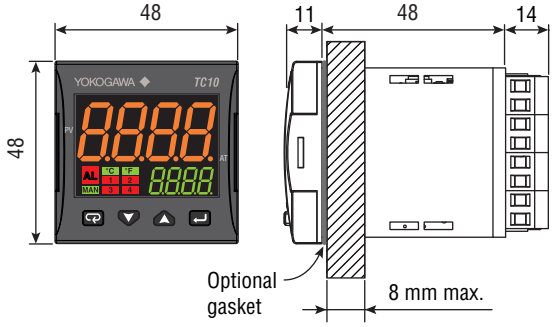
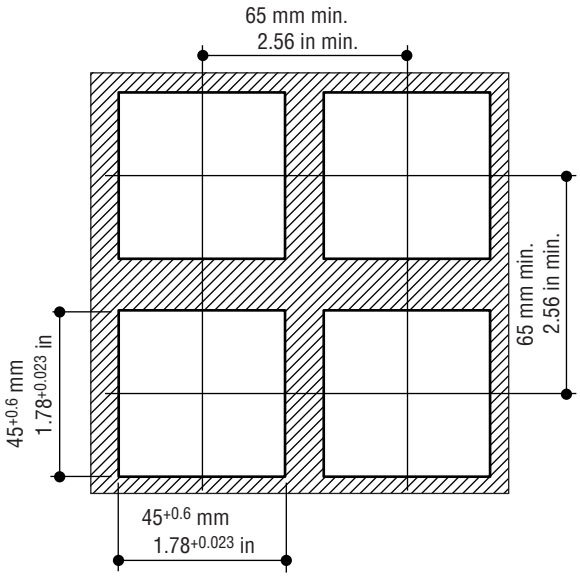
1. OUTLINE DIMENSIONS (mm)

1.1 INSTRUMENT DIMENSIONS



1.2 PANEL CUT-OUT



1.3 MOUNTING REQUIREMENTS

This instrument is intended for permanent installation, for indoor use only, in an electrical panel which encloses the rear housing, exposed terminals and wiring on the back.

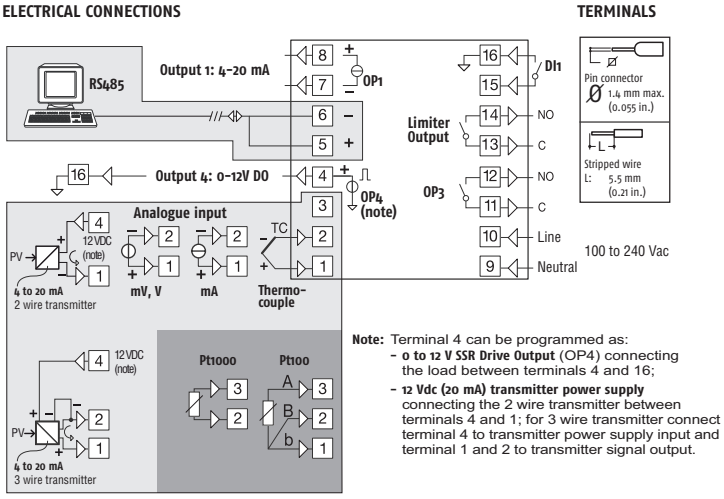
Select a mounting location having the following characteristics:

1. It should be easily accessible;
2. There is minimum vibrations and no impact;
3. There are no corrosive gases;
4. There are no water or other fluids (i.e. condensation);
5. The ambient temperature is in accordance with the operative temperature (0 to 50°C);
6. The relative humidity is in accordance with the instrument specifications (20 to 90%);

The instrument can be mounted on panel with a maximum thickness of 8 mm.

When the maximum front protection (IP65) is desired, the optional gasket must be mounted. This is mandatory for FM approval.

2. CONNECTION DIAGRAM

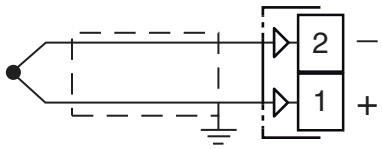


2.1 GENERAL NOTES ABOUT WIRING

1. Do not run input wires together with power cables.
2. External components (like zener barriers, etc.) connected between sensor and input terminals may cause errors in measurement due to excessive and/or not balanced line resistance or possible leakage currents.
3. When a shielded cable is used, it should be connected at one point only.
4. Pay attention to the line resistance; a high line resistance may cause measurement errors.

2.2 INPUTS

2.2.1 Termocouple Input



External resistance: 100Ω max., maximum error 25 µV.

Continuity detection current: 250 nA.

Cold junction: automatic compensation between 0 to 55°C.

Cold junction accuracy: 0.04°C/°C after a warm-up of 20 minutes.

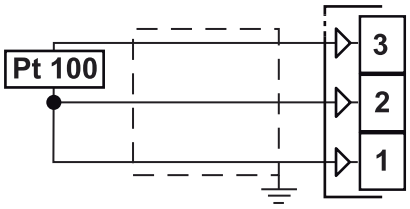
Input impedance: > 1 MΩ.

Burn out: full scale

Calibration: According to EN 60584-1.

Note: For TC wiring use proper compensating cable preferable shielded.

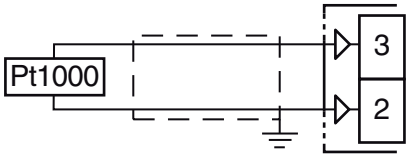
2.2.2 RTD Pt 100 Input



Input circuit: Current injection (135 µA).
Line resistance: Automatic compensation up to 20Ω/wire with maximum error ±0.1% of the input span.
Calibration: According to EN 60751/A2.

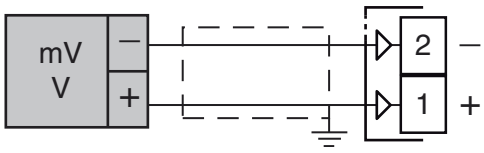
Note: The resistance of the 3 wires must be the same.

2.2.3 RTD Pt 1000 Input



Line resistance: Not compensated.
Pt 1000 input circuit: Current injection (15,5 µA).
Pt 1000 calibration: According to EN 60751/A2.

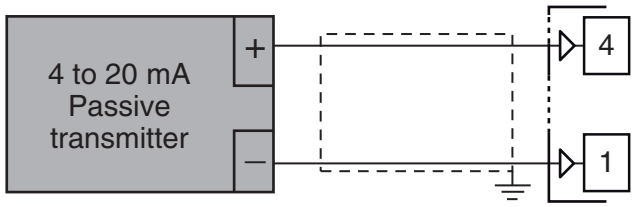
2.2.4 V and mV Input



Input impedance: > 1 MΩ for mV Input
500 kΩ for Volt Input.

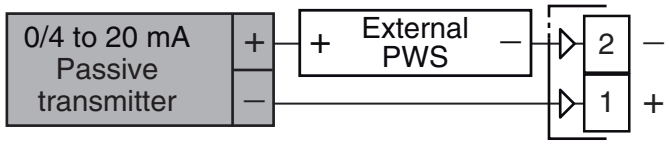
2.2.5 mA Input

0/4 to 20 mA input wiring for passive transmitter using the auxiliary pws

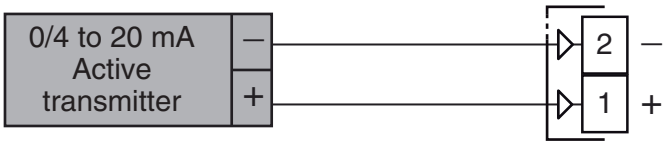


Input impedance: < 53Ω.
Internal auxiliary PWS: 12 VDC (±10%), 20 mA max..

0/4 to 20 mA input wiring for passive transmitter using an external pws



0/4 to 20 mA input wiring for active transmitter

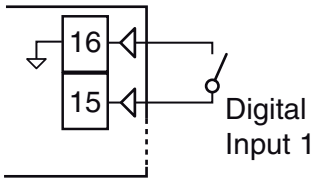


2.2.6 Logic Input

Safety notes:

– Do not run logic input wiring together with power cables;
– The instrument needs 150 ms to recognize a contact status variation;
– Logic inputs are **NOT** isolated by the measuring input. A double or reinforced isolation between logic inputs and power line must be assured by the external elements.

Logic inputs driven by dry contact



Maximum contact resistance: 100Ω.
Contact rating: DI1 = 10 V, 6 mA;

2.3 OUTPUTS

Safety notes:

– To avoid electrical shocks, connect power line at last.
– For supply connections use No. 16 AWG or larger wires rated for at last 75°C.
– Use copper conductors only.
– SSR outputs are not isolated. A reinforced isolation must be assured by the external solid state relays.
– For SSR, mA and V outputs if the line length is longer than 30 m use a shielded wire.
– Do not short-circuit the terminals of the SSR output.

WARNING! Before connecting the output actuators, we recommend to configure the parameters to

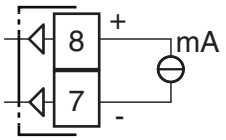
suit your application (e.g.: input type, Control strategy, alarms, etc.).

2.3.1 Output 1 (OP1)

Function: retransmission

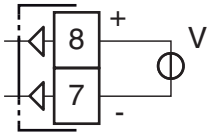
Output type: isolated output

Current Analog Output



mA output: 0/4... 20 mA, galvanically isolated, RL max. 600Ω.

Voltage Analog Output

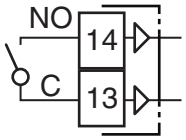


V output: 0/2... 10 V, galvanically isolated, RL min.: 500Ω.

2.3.2 Output 2 (OP2)

Function: limiter output

Relay Output

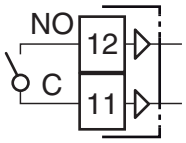


Contact rating: • 2 A /250 V cosφ = 1;
• 1 A /250 V cosφ = 0.4.

Operation: 1 x 10^5.

2.3.3 Output 3 (OP3)

Relay Output

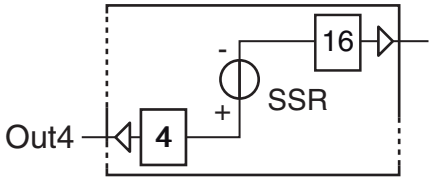


Contact rating: • 2 A /250 V cosφ = 1;
• 1 A /250 V cosφ = 0.4.

Operation: 1 x 10^5.

2.3.4 Output 4 (OP4)

SSR Output

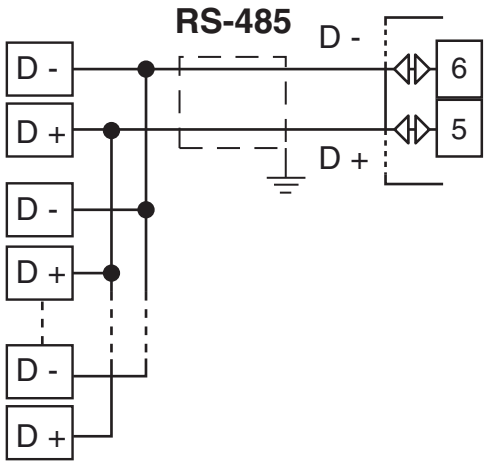


Logic level 0: Vout < 0.5 VDC;

Logic level 1: 12 V ±20%, 20 mA max..

Note: Overload protected.

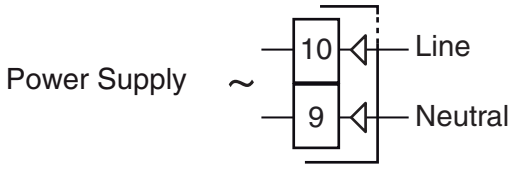
2.4 SERIAL INTERFACE



Interface type: Isolated (50 V) RS-485;
Voltage levels: According to EIA standard;
Protocol type: Modbus RTU;
Byte format: 8 bit with no parity;
Stop bit: 1 (one);
Baud rate: Programmable between 1200 to 38400 baud;
Address: Programmable between 1 to 254.

Notes: **1.** RS-485 interface allows to connect up to 30 devices with one remote master unit.
2. The cable length must not exceed 1.5 km at 9600 baud.

2.5 POWER SUPPLY



Supply Voltage: 100 to 240 VAC (-15 to +10%).

Notes: **1.** Before connecting the instrument to the power line, make sure that line voltage is equal to the voltage shown on the identification label;
2. The polarity of the power supply has no importance;
3. The power supply input is NOT fuse protected. Please, provide a T type 1A, 250 V fuse externally.

3. TECHNICAL CHARACTERISTICS

3.1 TECHNICAL SPECIFICATION

Case: Plastic, self-extinguishing degree: V-0 according to UL 94;

Front protection: IP 65 (when the optional panel gasket is mounted) for indoor locations according to EN 60070-1;

Terminals protection: IP 20 according to EN 60070-1;

Installation: Panel mounting;

Terminal block: 16 screw terminals for cables of 0.25 to 2.5 mm^2 (AWG22 to AWG14) with connection diagram, tightening torque 0.5 Nm;

Dimensions: 48 x 48, depth 73 mm, (1.89 x 1.89 x 2.87 in.)

Panel cutout: 45[-0, +0.6] x 45[-0, +0.6] mm
(1.78[- 0.000, +0.023] x 1.78[- 0.000, +0.023] in.)

Weight: 180 g max..

Power supply: 100 to 240 VAC (-15 to +10% of the nominal value);

Power consumption: 6.0 VA max. (100 to 240 VAC);

Insulation voltage: 2300 V rms according to EN 61010-1;

Display updating time: 500 ms;

Sampling time: 130 ms;

Resolution: 30000 counts;

Total Accuracy: ±0.5% F.S.V. ±1 digit @ 25°C of room temperature;

Electromagnetic compatibility and safety requirements

Compliance: directive EMC 2004/108/CE (EN 61326-1), directive LV 2006/95/CE (EN 61010-1), UL 61010-1 CSA 61010-1;

Note: During the test, the instrument continues to operate at the measurement accuracy within specification.

Installation category: II;

Pollution category: 2;

Temperature drift: It is part of the global accuracy;

Operating temperature: 0 to 50°C (32 to 122°F);

Storage temperature: -20 to +70°C (-4 to +158°F);

Humidity: 20 to 95% RH, not condensing.

4. MODEL AND SUFFIX CODES

Model Code	Suffix codes										Description
TC10	-L	□	C	□	□	□	D	□	F		Temperature Controller
Fixed code	-L										Always "-L"
Power supply		H									100 to 240 VAC
Fixed code			C								Always "C"
Retransmission				N							None
				A							PV retrans. output 4 to 20 mA
Limit control output					R						limit control relay output
Alarm output 1 - 2						N					None
						R					Alarm output:2 Points (OT3 relay + OT4 SSR drive)
Fixed code							D				Always "D"
Serial communication								S			RS485 Modbus
								N			None
Fixed code									F		Always “F”
Option Code										/GK	Panel gasket for IP65

5. CONFIGURATION PROCEDURE

5.1 INTRODUCTION

When the instrument is powered, it starts immediately to work according to the parameters values loaded in its memory.

The instrument behaviour and its performance are governed by the value of the stored parameters.

At the first start up the instrument will use a “default” parameter set (factory parameter set); this set is a generic one (e.g. a TC J input is programmed).

WARNING! Before connecting the output actuators, we recommend to configure the parameters to suit your application (e.g.: input type, Control strategy, alarms, etc.).

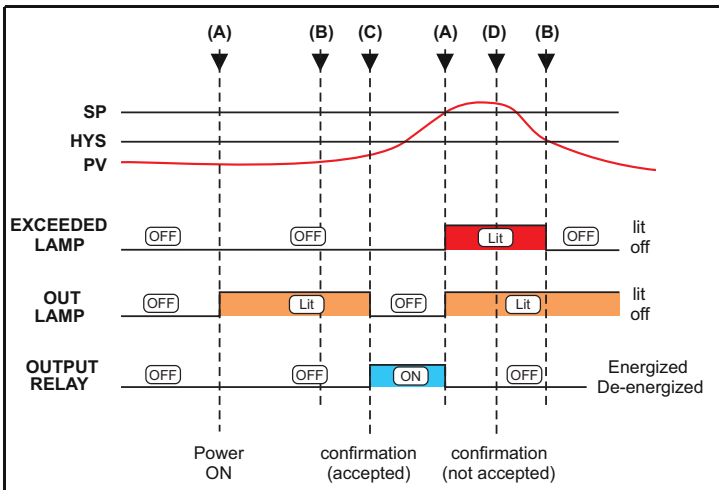
To change these parameters you need to enter the “Configuration mode”.

5.2 INSTRUMENT BEHAVIOUR AT POWER ON

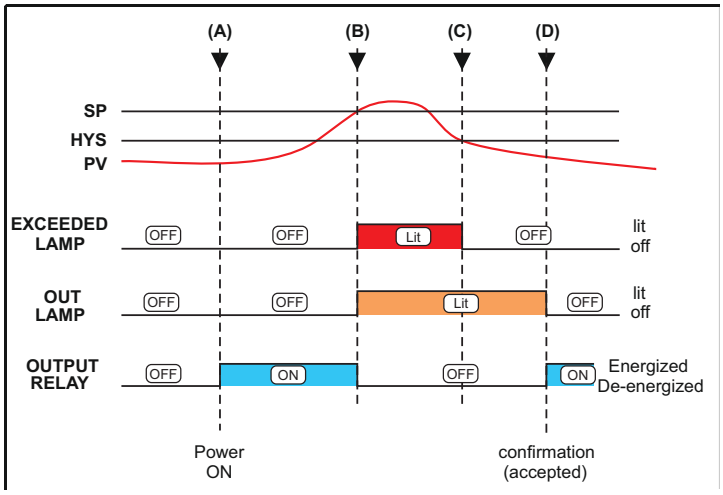
At power ON the instrument can operate in two different mode according to the value assigned to [34] r.md parameter [34] r.md equal to 0

(Limit output is de-energized at power on in any cases.)

The output relay is always de-energized (opened) at power-on,even if PV does not exceed SP(A). The output (OUT) display lamp is lit. If thePV does not exceed SP, after the confirming operation, output relay will be energized (closed) and the output (OUT) display lamp turns off .



[34] r.md equal to 1(Limit output is de-energized at power on in any cases.)The state of output relay is energized (closed) and the output (OUT) display lamp turns off if the PV does not exceed SP at power-on.



5.3 HOW TO ENTER THE “CONFIGURATION MODES”

The configuration procedure allows to take advantage of all instrument features.

The instrument have one complete parameter set.

We call this set “configuration parameter set” (or “configuration parameters”).

The access to the configuration parameters is protected by a password.

5.3.1 Complete configuration procedure

The configuration parameters are collected in various groups. Every group defines all parameters related with a specific function (e.g.: control, alarms, output functions).

1. Push the ↵ button for more than 3 seconds. The upper display will show PASS while the lower display will show 0.
2. Using ▲ and ▼ buttons set the programmed password.

Notes: 1. The factory default password for configuration parameters is equal to 30.

3. Push the ↵ button
   If the password is correct the display will show the acronym of the first parameter group preceded by the symbol: ⊐.
   In other words the upper display will show: ⊐ inP (group of the **Input parameters**).

The instrument is in configuration mode.

5.4 HOW TO EXIT THE “CONFIGURATION MODE”

Push ⟲ button for more than 3 seconds, the instrument will come back to the “standard display”.

5.5 KEYBOARD FUNCTIONS DURING PARAMETER CHANGING

⟲ A short press allows to exit from the current parameter group and select a new parameter group.
A long press allows you to close the configuration parameter procedure (the instrument will come back to the “standard display”).

↵ When the upper display is showing a group and the lower display is blank, this key allows to enter in the selected group.
When the upper display is showing a parameter and

the lower display is showing its value, this key allows to store the selected value for the current parameter and access the next parameter within the same group.

Allows to increase the value of the selected parameter.

Allows to decrease the value of the selected parameter.

+ These two keys allow to return to the previous group. Proceed as follows:
Push the button and maintaining the pressure, then push the button; release both the buttons.

Note: The group selection is cyclic as well as the selection of the parameters in a group.

5.6 FACTORY RESET - DEFAULT PARAMETERS LOADING PROCEDURE

Sometime, e.g. when you re-configure an instrument previously used for other works or from other people or when you have made too many errors during configuration and you decided to re-configure the instrument, it is possible to restore the factory configuration.

This action allows to put the instrument in a defined condition (the same it was at the first power ON).

The default data are those typical values loaded in the instrument prior to ship it from factory.

To load the factory default parameter set, proceed as follows:

1. Press the button for more than 5 seconds. The upper display will show PASS while the lower display shows 0;
2. Using and buttons set the value -481;
3. Push button;
4. The instrument will turn OFF all LEDs for a few seconds, then the upper display will show dFLt (default) and then all LEDs are turned ON for 2 seconds. At this point the instrument restarts as for a new power ON.

The procedure is complete.

Note: The complete list of the default parameters is available in Appendix A.

5.7 CONFIGURING ALL THE PARAMETERS

In the following pages we will describe all the parameters of the instrument. However, the instrument will only show the parameters applicable to its hardware options in accordance with the specific instrument configuration (i.e. setting AL 1t [Alarm 1 type] to nonE [not used], all parameters related to alarm 1 will be skipped).

inP Group - Main and auxiliary input configuration

[1] SEnS - Input type

Available: Always.

Range: • When the code of the input type is equal to c (see paragraph "How to order").

J	TC J	(-50... +1000°C/-58... +1832°F);
crAL	TC K	(-50... +1370°C/-58... +2498°F);
S	TC S	(-50... 1760°C/-58... +3200°F);
r	TC R	(-50... +1760°C/-58... +3200°F);
t	TC T	(-70... +400°C/-94... +752°F);
n	TC N	(-50...1300°C/-58...2372°F);
Pt1	RTD Pt 100	(-200... 850°C/-328... 1562°F);
Pt10	RTD Pt 1000	(-200... 850°C/-328... 1562°F);
0.60	0... 60 mV linear;	
12.60	12... 60 mV linear;	
0.20	0... 20 mA linear;	
4.20	4... 20 mA linear;	
0.5	0... 5 V linear;	
1.5	1... 5 V linear;	
0.10	0... 10 V linear;	
2.10	2... 10 V linear.	

Notes: **1.** When a TC input is selected and a decimal figure is programmed (see the next parameter) the max. displayed value becomes 999.9°C or 999.9°F.

2. Every change of the SEnS parameter will produces a change of the related parameter and in particular:
- [7] bS (PV bias) will be forced to zero
- [11] Ao1L and [12] Ao1H (when the analog retransmission is present) will be forced to the Ex.Range limits.
- [13] AL1 and [30] AL2 will be forced to :
  – for an absolute maximum alarm, them will be forced to the maximum input span
  – for an absolute minimum alarm, them will be forced to the minimum input span
  – for all other alarm, them will be forced to zero
- [14] HAL1 and [31] HAL2 will be forced equal to the 0.5% of the input span
- [28] AL2L extended limit low
- [29] AL2H extended limit high
- [35] HYS will be forced equal to 0.05 % of the input span
- [37] SPLL and [38] SPHL
- [39] SP
- the CAL group will be reset [51]A.L.P, [52] A.L.O, [53] A.H.P, [54] A.H.O

[2] dP - Decimal point position

Available: Always.

Range: 0 to 3 when [1] SenS = Linear input;
0 or 1 when [1] SenS different from linear input.

Note: Every change of the dP parameter setting will produce a change of the parameters related with it (e.g.: set points, proportional band, etc.).

[3] SSc - Initial scale read-out for linear inputs

Available: When a linear input is selected by [1] SenS.

Range: -1999 to 9999.

Notes: **1.** SSc allows the scaling of the analog input to set the minimum displayed/measured value.
The instrument will show a measured value up to 5% less than SSc value and then it will show an underrange error.

2. It is possible to set a initial scale read-out higher than the full scale read-out in order to obtain a reverse read-out scaling.
E.g.:
0 mA = 0 mBar and 20 mA = -1000 mBar (vacuum).

[4] FSc - Full scale read-out for linear input

Available: When a linear input is selected by [1] SenS.

Range: -1999 to 9999.

Notes: **1.** Fsc allows the scaling of the analog input to set the maximum displayed/measured value.
The instrument will show a measured value up to 5% higher than [4] FSc value and then it will show

an overrange error.

2. It is possible to set a full scale read-out lower than the initial scale read-out in order to obtain a reverse read-out scaling.
   E.g.:
   0 mA = 0 mBar and 20 mA = -1000 mBar (vacuum).

[5] unit - Engineering unit

Available: When a temperature sensor is selected by [1] SenS parameter.
Range: °C = Celsius;
°F = Fahrenheit.

[6] FiL - Digital filter on the measured value

Available: Always.
Range: oFF (No filter);
0.1 to 20.0 s.
Note: This is a first order digital filter applied on the measured value. For this reason it will affect the measured value but also the control action and the alarms behaviour.

[7] bS - PV input bias

Available: Always.
Range: In Engineering unit, it is programmable from -100 to 100 % of the input span

[8] di.A - Digital Input Action

Available: Always.
Range: 0 = DI1 Direct action,
1 = DI1 Reverse action,

out Group - Output parameters

[9] o1.t - Out 1 type

Available: When the out 1 is a linear output.
Range: 0.20 0 to 20 mA;
4.20 4 to 20 mA;
0.10 0 to 10 V;
2.10 2 to 10 V.

[10] o1F - Out 1 function

Available: Always.
Range: • When the out 1 is a linear output:
nonE = Output not used. With this setting the status of this output can be driven directly from serial link;
r.inP = Measured value Analog retransmission.
r.Err = Analog retransmission of the measured error (PV-SP);
r.SP = Analog retransmission of the operative set point;
r.SEr = Analog retransmission of a value coming from serial link;

[11] Ao1L - Initial scale value of the analog retransmission

Available: When Out 1 is a present
Range: -1999 to [12] Ao1H.

[12] Ao1H - Full scale value of the analog retransmission

Available: When Out 1 is present
Range: [11] Ao1L to 9999.

[13] o3F - Out 3 function

Available: When the instrument has out 3 option.
Range: nonE = Output not used. With this setting the status of the this output can be driven directly from serial link;
AL = Alarm output;
or.bo = Out-of-range or burn out indicator;
P.FAL = Power failure indicator;
bo.PF = Out-of-range, burn out and Power failure indicator;

[14] o3AL - Alarms linked up with Out 3

Available: When [13] o3F = AL.
Range: 0 to 15 with the following rule:
+1 = Alarm 1;
+2 = Alarm 2;
+4 = Sensor break (burn out);
+8 = Overload on Out 4 (short circuit on out 4);

[15] o3Ac - Out 3 action

Available: when [13] o3F is different from “nonE”.
Range: dir = Direct action;
rEU = Reverse action;
Notes: 1. Direct action: the output repeats the status of the driven element. Example: the output is an alarm output with direct action. When the alarm is ON, the relay will be energized (logic output 1).
2. Reverse action: the output status is the opposite of the status of the driven element. Example: the output is an alarm output with reverse action. When the alarm is OFF, the relay will be energized (logic output 1). This setting is usually named “fail-safe” and it is generally used in dangerous process in order to generate an alarm when the instrument power supply goes OFF or the internal watchdog starts.

[16] o4F - Out 4 function

Available: Always
Range: nonE = Output not used. With this setting the status of the this output can be driven directly from serial link.
AL = Alarm output;
or.bo = Out-of-range or burn out indicator;
P.FAL = Power failure indicator;
bo.PF = Out-of-range, burn out and Power failure indicator;
On = Output ever ON (it is used as auxiliary power supply for TX).

[17] o4AL - Alarms linked up with Out 4

Available: When [16] o4F = AL.
Range: 0 to 7 with the following rule.
+1 = Alarm 1;
+2 = Alarm 2;
+4 = Sensor break (burn out);

[18] o4Ac - Out 4 action

Available: When [16] o4F is different from “nonE”.
Range: dir = Direct action;
rEU = Reverse action;.

For more details see [15] o3.Ac parameter.

AL1 Group - Alarm 1 parameters

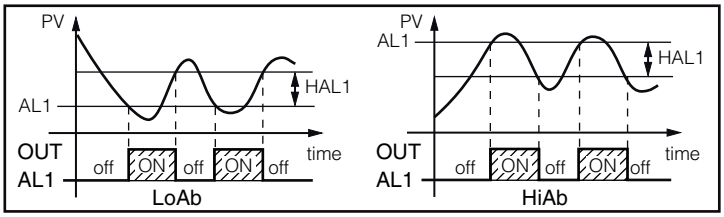
[19] AL1t - Alarm 1 type

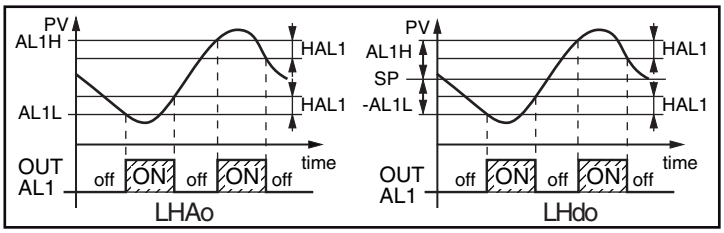
Available: Always.

Range:

nonE = Alarm not used;
LoAb = Absolute low alarm;
HiAb = Absolute high alarm;
LHAo = Absolute band alarm with alarm indication out of the band;
LHAi = Absolute band alarm with alarm indication inside the band;
SE.br = Sensor break;
LodE = Deviation low alarm (relative);
HidE = Deviation high alarm (relative);
LHdo = Relative band alarm with alarm indication out of the band;
LHdi = Relative band alarm with alarm indication inside the band.

Notes: **1.** The relative and deviation alarms are “relative” to the operative set point value.





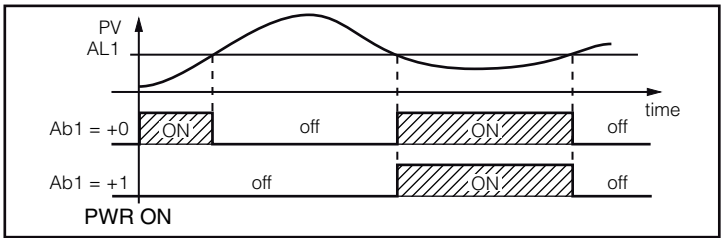
2. The (SE.br) sensor break alarm will be ON when the display shows - - - - indication.

[20] Ab1 - Alarm 1 function

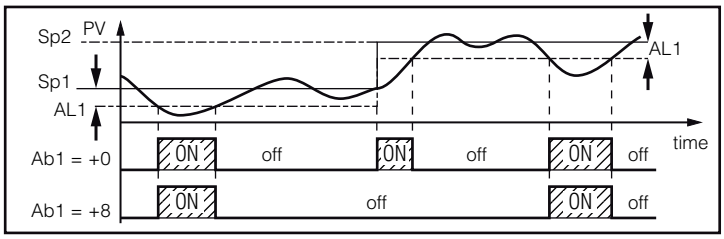
Available: When [28] AL1t is different from “nonE”.

Range: 0 to 3 with the following rule:
+1 = Not active at power up;
+2 = Relative alarm not active at set point change.

Notes: **1.** The “not active at power up” selection allows to inhibit the alarm function at instrument power up The alarm will be automatically enabled when the measured value reaches, for the first time, the alarm threshold ±hysteresis (in other words, when the initial alarm condition disappears).



2. A relative alarm not active at set point change” is an alarm that masks the alarm condition after a set point change until process variable reaches the alarm threshold ±hysteresis.



3. The instrument does not store in EEPROM the alarm status. For this reason, the alarm status will be lost if a power down occurs.

[21] AL1L - For High and low alarms it is the low limit of the AL1 threshold - For band alarm it is low alarm threshold

Available: When [19] AL1t is different from “nonE”.

Range: From -1999 to [22] AL1H engineering units.

[22] AL1H - For High and low alarms, it is the high limit of the AL1 threshold - For band alarm, it is the high alarm threshold

Available: When [19] AL1t is different from “nonE”.

Range: From [21] AL1L to 9999 engineering units.

[23] AL1- Alarm 1 threshold

Available: When:
[19] AL1t = LoAb - Absolute low alarm;
[19] AL1t = HiAb - Absolute high alarm;
[19] AL1t = LodE - Deviation low alarm (relative);
[19] AL1t = HidE - Deviation high alarm (relative).

Range: From [21] AL1L to [22] AL1H engineering units.

[24] HAL1 - Alarm 1 hysteresis

Available: When [19] AL1t is different from “nonE”.

Range: 1 to 9999 engineering units.

Notes: **1.** The hysteresis value is the difference between the Alarm threshold value and the point the Alarm automatically resets.

2. When the alarm threshold plus or minus the hysteresis is out of input range, the instrument will not be able to reset the alarm.

Example: Input range 0 to 1000 (mBar).

– Set point equal to 900 (mBar);
– Deviation low alarm equal to 50 (mBar);
– Hysteresis equal to 160 (mBar) the theoretical reset point is 900 - 50 + 160 = 1010 (mBar) but this value is out of range. The reset can be made only by turning the instrument OFF, removing the condition that generate the alarm and then turn the instrument ON again;
– All band alarms use the same hysteresis value for both thresholds;
– When the hysteresis of a band alarm is bigger than the programmed band, the instrument will not be able to reset the alarm.

Example: Input range 0 to 500 (°C).

– Set point equal to 250 (°C);
– Relative band alarm;
– Low threshold equal to 10 (°C);
– High threshold equal to 10 (°C);
– Hysteresis equal to 25 (°C).

[25] AL1d - Alarm 1 delay

Available: When [19] AL1t is different from “nonE”.
Range: From oFF (0) to 9999 seconds.
Note: The alarm goes ON only when the alarm condition persists for a time longer than [25] AL1d time but the reset is immediate.

AL2 Group - Alarm 2 parameters

[26] AL2t - Alarm 2 type

Available: Aways.
Range:

- nonE = Alarm not used;
- LoAb = Absolute low alarm;
- HiAb = Absolute high alarm;
- LHAo = Absolute band alarm with alarm indication out of the band;
- LHAi = Absolute band alarm with alarm indication inside the band;
- SE.br = Sensor break;
- LodE = Deviation low alarm (relative);
- HidE = Deviation high alarm (relative);
- LHdo = Relative band alarm with alarm indication out of the band;
- LHdi = Relative band alarm with alarm indication inside the band.

Note: The relative alarm are “relative” to the current set point.

[27] Ab2 - Alarm 2 function

Available: When [26] AL2t is different from “nonE”.
Range: 0 to 3 with the following rule:

- +1 = Not active at power up;
- +2 = Relative alarm not active at set point change.

[28] AL2L - For High and low alarms it is the low limit of the AL2 threshold - For band alarm it is low alarm threshold

Available: When [26] AL2t is different from “nonE”.
Range: -1999 to [29] AL2H engineering units.

[29] AL2H - For High and low alarms it is the high limit of the AL2 threshold - For band alarm it is high alarm threshold

Available: When [26] AL2t is different from “nonE”.
Range: From [28] AL2L to 9999 engineering units.

[30] AL2 - Alarm 2 threshold

Available: When:
[26] AL2t = LoAb Absolute low alarm;
[26] AL2t = HiAb Absolute high alarm;
[26] AL2t = LodE Deviation low alarm (relative);
[26] AL2t = HidE Deviation high alarm (relative).
Range: From [28] AL2L to [29] AL2H engineering units.

[31] HAL2 - Alarm 2 hysteresis

Available: When [26] AL2t is different to “nonE” or [26] AL2t is different from “SE.br”.
Range: 1 to 9999 engineering units.
Note: For other details see [24] HAL1 parameter.

[32] AL2d - Alarm 2 delay

Available: When [26] AL2t type is different form “nonE”.
Range: From oFF (0) to 9999 seconds.
Note: The alarm goes ON only when the alarm condition persist for a time longer than [32] AL2d time but the reset is immediate.

rEG group - Control parameters

[33] Hi.Lo - Control type:

Available: Always.
Range:

- Hi = Hi limit;
- Lo = Low limit.

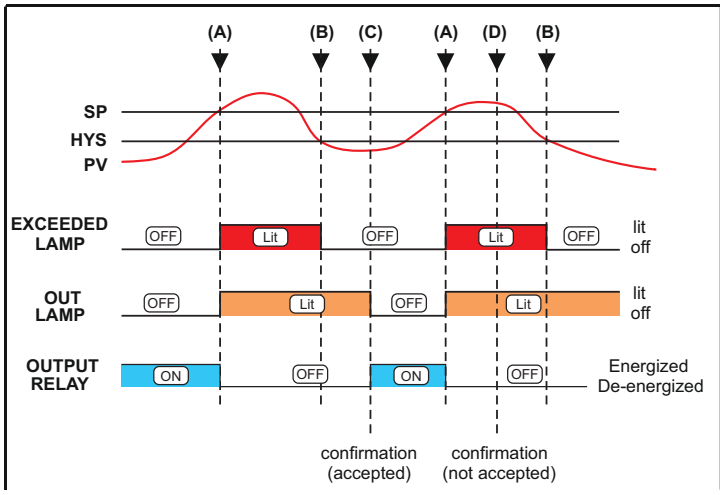
High limit control

When a measured value (PV) exceeds a set point (SP),“EXCEEDED” [EX]lamp lights, “OUT” lamp turns ON and the limit output relay (Out 2) is de-energized.

“EXCEEDED” [EX] lamp turns off when PV goes into normal condition, while the output [OUT] display lamp stays on as it is (b). The output [OUT] display lamp turns off when a confirming operation (rearm) is done by an operator.

The way to confirm are: pressing key or by DI1 (according to the <<diS>> parameter setting).

The confirming operation is not accepted during PV exceeds SP (D) (during EXCEEDED lamp lights*). State of output relay is de-energized whenever “OUT” lamp is on.



When the EXCEED lamp is ON but PV is lower than SP, the upper display will be in green value and it shows that the PV is in the hysteresis area.

Low limit control

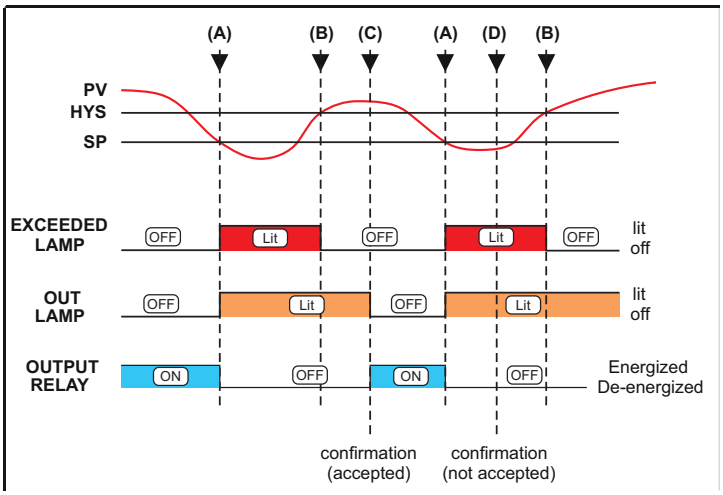
When a measured value (PV) exceeds a setpoint (SP), “EXCEEDED” lamp (c) lights, and “OUT” lamp (b) turns ON . The limit output relay is de-energizedthen.

“EXCEEDED” lamp turns off when PV goes into normal condition, while the output (OUT) display lamp stays on as it is. The output (OUT) display lamp turns off when a confirming operation is done by an operator.

The way to confirm are:

- pressing key or
- by DI1 (according to the <<diS>> parameter setting).

The confirming operation is not accepted during PV exceeds SP (D) (during EXCEEDED lamp lights*). State of output relay is de-energized whenever “OUT” lamp is on.



When the EXCEED lamp is ON but PV is Higher than SP, the upper display will be in green value and it shows that the PV is in the hysteresis area.

[34] r.md – Limit output status at power ON (Re-start mode)

Available: Available: always
Range: 0 = limit output is ON in any cas
1 = Limit output is OFF at power on when PV doesn't exceed SP.

[35] HyS – Hysteresis of the control output

Available: Available: always
Range: In engineering unit from 0.0 to 100 % of the input span

[36] oP.SL – Operating display selection.

Available: Available: always

Range:

Range: PU.SP = (0) PV (upper display) and SP (lower display)
PU = (1) SP only (lower display)
Note: When you change the [37] SPLL value, the nstrument checks the local set points (SP parameters). If SP is out of this range, the instrument forces it to the maximum acceptable value

[37] SPLL – Minimum set point value

Available: Available: always
Range: from -1999 to [38] SPHL
Note: When you change the [37] SPLL value, the instrument checks the local set points (SP parameters). If SP is out of this range, the instrument forces it to the minimum acceptable value.

[38] SPHL – Maximum set point value

Available: Available: always
Range: from [37] SPLL to 9999.

[39] SP - Set point.

Available: Available: always
Range: from [37] SPLL to [38] SPHL

[40] diS– the way of confirming operation

Available: Available: always
Range: but = by keyboard
di = by digital input

[41] tim – time duration of the last exceeded period.

Available: Available: always but it is a read only parameter.
Range: from 00.00 to 99.59 (HH.mm).

[42] Hi- maximum measured value

Available: Available: when [33] Hi.Lo = Hi (high limit) but it is a read only parameter.
Range: Engineering unit within the input range

[43] Lo – minimum measured value

Available: Available: when [33] Hi.Lo = Lo (low limit) but it is a read only parameter.
Range: Engineering unit within the input range.

PAn group - Operator HMI

[44] PAS2 - Level 2 password:

Available: Always.
Range: oFF = Level 2 not protected by password (as level 1 = Operator level) 1 to 200.

[45] PAS3 - Level 3 password: Complete configuration level

Available: Always.
Range: 3 to 200.
Note: Setting [44] PAS2 equal to [45] PAS3, the level 2 will be masked.

[46] di.CL - Display color

Available: Always.
Range: 0 = the display color is used to show the Exceed condition.
When no exceed condition is present, the upper display will be green.
when [33] Hi.Lo = Hi (high limit) and PV > SP the upper display will be red.
when [33] Hi.Lo = Lo (low limit) and PV < SP the upper display will be red.
1 = Display red (fix);
2 = Display green (fix);
3 = Display orange (fix).

[47] diS.t - Display time out

Available: Always.
Range: oFF = The display is ever ON;
0 (OFF) to 99.59 minutes and seconds.
Note: This function allows to turn OFF the display when no alarm is present and no action is made on the instrument. When diS.t is different from OFF and no button is pressed for more than the programmed time out, the display goes OFF and only 4 segments of the less significant digit are turned ON in sequence in order to show that the instrument is working correctly.
If an alarm occurs or a button is pressed, the display will come back to the normal operation.

Ser group - Serial link parameter

[48] Add - Instrument address

Available: Always.
Range: oFF = Serial interface not used;
1 to 254.

[49] bAud - Baud rate

Available: When [48] Add different from oFF.
Range: 1200 = 1200 baud;
2400 = 2400 baud;

9600 = 9600 baud;
19.2 = 19200 baud;
38.4 = 38400 baud.

CAL group - User calibration group

This function allows to calibrate the complete measuring chain and to compensate the errors due to:
– Sensor location;
– Sensor class (sensor errors);
– Instrument accuracy.

[50] A.L.P - Adjust Low Point

Available: Always.
Range: -1999 to (A.H.P - 10) engineering units.
Note: The minimum difference between A.L.P and A.H.P is equal to 10 Engineering Units.

[51] A.L.o - Adjust Low Offset

Available: Always.
Range: -300 to +300 engineering units.

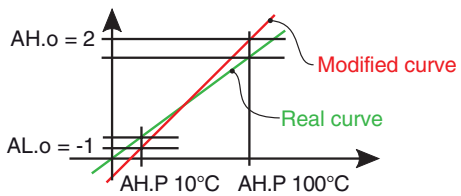
[52] A.H.P - Adjust High Point

Available: Always.
Range: From (A.L.P + 10) to 9999 engineering units.
Note: The minimum difference between A.L.P and A.H.P is equal to 10 Engineering Units.

[53] A.H.o - Adjust High Offset

Available: Always.
Range: -300 to +300 Engineering Units.
Example: Environmental chamber with an operative range: 10 to 100°C.

1. Insert in the chamber a reference sensor connected with a reference instrument (usually a calibrator).
2. Start the control of the instrument, and set a set point equal to the minimum value of the operative range (e.g.: 10°C). When the temperature in the chamber is steady, take note of the temperature measured by the reference system (e.g.: 9°C).
3. Set [50] A.L.P = 10 (low working point) and [140] A.L.o = -1 (it is the difference between the reading of the instrument and the reading of the reference system). Note that after this set the measured value of the instrument is equal to the measured value of the reference system.
4. Set a set point equal to the maximum value of the operative range (e.g. 100°C). When the temperature in the chamber is steady, take note of the temperature measured by the reference system (e.g. 98°C).
5. Set [52] A.H.P = 100 (low working point) and [142] A.H.o = +2 (it is the difference between the reading of the instrument and the reading of the reference system). Note that after this set the measured value of the instrument is equal to the measured value of the reference system.



The most important step of the configuration procedure is completed.

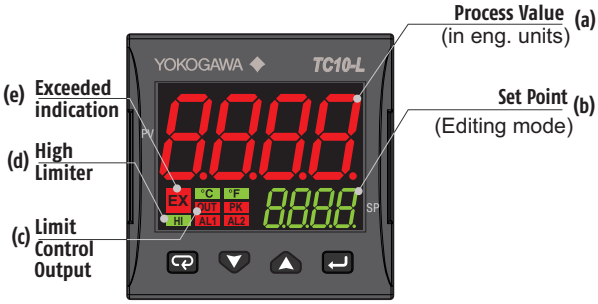
In order to exit from configuration parameter procedure, proceed as follows:

- Push button.
- Push button for more than 3 s. The instrument will come back to the “standard display”.

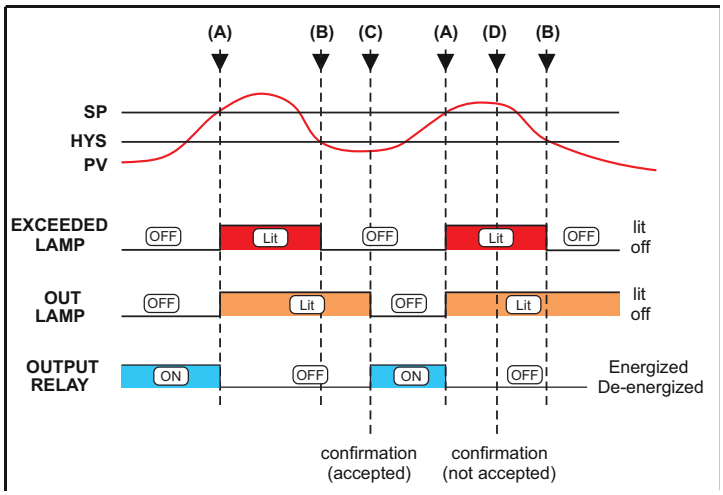
6. OPERATIVE MODES

The TC10-L is an FM (both FM3545 and FM3810) approved limit controller that can be configured either as a high limit or as a low limit controller by a user.
The relay of the output 2 operates in fail-safe mode (relay de-energized during shutdown condition) and latching mode.
OUT 2 turns OFF (in this document this condition will be named shutdown) when:
The instrument is configured as a high limiter (Hi.Lo = Hi) and the measured value is greater than limiter threshold ["SP" parameter] or.
The instrument is configured as a low limiter (Hi.Lo = Lo) and the measured value is lower than limiter threshold.
Out 2 remains OFF until the condition which generated the shutdown, no longer exists and the Confirming action (re-arm) has been performed.
During a shutdown (Out 2 is OFF) the upper display will be red.
Confirming action (rearm) can be performed in two different way:
- by pressing the key [when "diS" parameter is set to "but"] but it will be accepted only when the condition which generated the shutdown, no longer exists (EX lamp is OFF) and the set point is shown on the lower display (see "normal display" in "Navigation access")
- by momentarily closing the digital input (by an external dry contact) [when diS parameter is set to "di"] but it will be accepted only when the condition which generated the shutdown, no longer exists.
We define also that the time duration of the shutdown condition, stored by the instrument, will be the time from Out 2 goes OFF (shutdown start) and the condition that generate the shutdown no longer exists.
The confirmation action is not part of this time count.
The time duration of the shutdown condition and max/min measured values are stored in memory and available for viewing (see "navigation access") until the next shutdown condition occurs.
These informations are lost at power down.

6.1 HIGH LIMIT CONTROL



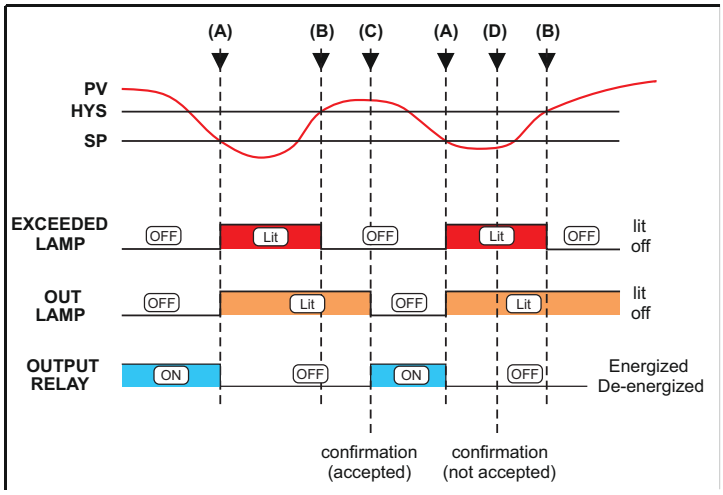
The HI lamp (d) is ON
When a measured value (a) is higher then the set point (b),"EX" lamp (e) lights, "OUT" lamp (b) turns ON and the limit output relay (Out 2) is de-energized.
EX lamp (e) turns off when PV goes into normal condition, while the "OUT" lamp (c) stays on as it is.
The out (c) lamp turns off only when the EX lamp (e) is off and a confirming operation (rearm) has been done by an operator.
The way to confirm are (according to the "diS" parameter):
- pressing key for more than 3 seconds or
- by DI1.
Output relay is de-energized whenever "OUT" lamp is on.
Check the "HYS" parameter value if the EX lamp (e) is not turn off when PV (a) is lower than SP (b).



When the EX lamp (e) is ON but PV (a) is lower than SP (b), the upper display will be in green color and it shows that the PV is in the hysteresis area

6.2 LOW LIMIT CONTROL

The HI lamp (d) is OFF
When a measured value (a) is lower than the set point (b), "EX" lamp (e) lights, and "OUT" lamp (c) turns ON and the limit output relay is de-energized.
"EX" (e) lamp turns off when PV goes into normal condition, while the "OUT" lamp (c) lamp stays on as it is.
The out (c) lamp turns off only when the EX lamp (e) is off and a confirming operation (rearm) has been done by an operator.
The way to confirm are (according to the "dis" parameter):
- pressing key for more than 3 seconds or
- by DI1.
The confirming operation is not accepted during PV exceeds SP (D) (during EXCEEDED lamp lights*). State of output relay is de-energized whenever "OUT" lamp is on.
Output relay is de-energized whenever "OUT" lamp is on.
Check the "HYS" parameter value if the EX lamp (e) is not turn off when PV (a) is lower than SP (b).



When the EX lamp (e) is ON but PV (a) is higher than SP (b), the upper display will be in green color and it shows that the PV is in the hysteresis area

6.3 ACCESS LEVELS AND SPECIFIC PARAMETERS

The instrument is showing the “standard display”
This instrument is equipped with 3 different access levels:Level 1 – Operator Mode.(not protected by password)
Level 2 – Operator modify parameter (protected by a programmable password [default 20])
Level 3 – Configuration parameters mode (protected by programmable password [default 30])

- The operator area (Level 1) allows: confirmation action, to see and to reset the << tim >> parameter (time duration of the last shutdown condition detected) and to see and to reset the << Min/max >> (minimum or maximum measured value during last shutdown condition detected).

Note: when a new shutdown condition is detected, the instrument automatically reset << tim>> and << min/max >> parameters and start to memorize the values related with the new shutdown condition only. At the end of the shut down condition, <<tim>> and <<min/max>> can be read and reset.

- The Level 2 area encompasses the following parameters:

Param.	Description	Dec. Point
SP	Set point (shutdown set point)	dP
AL1L	For high or low alarm, it is the low limit of AL1 threshold	dP
	For band alarm, it is low alarm threshold	
AL1H	For high or low alarm, it is the high limit of AL1 threshold	dP
	For band alarm, it is high alarm threshold	
AL1	Alarm 1 threshold	dP
AL2L	For high or low alarm, it is the low limit of AL2 threshold	dP
	For band alarm, it is low alarm threshold	
AL2H	For high or low alarm, it is the high limit of AL2 threshold	dP
	For band alarm, it is high alarm threshold	
AL2	Alarm 2 threshold	dP
HyS	Hysteresis of the shutdown control (relay hysteresis for control output)	dP
Fil	Digital filter on the measured value	1
bS	PV input bias	

6.4 ENTER THE “OPERATOR MODIFY PARAMETER”

The instrument is showing the “standard display”.

1. Press the ↵ button for more than 3 seconds;
2. The upper display will show PASS while the lower display will show 0;
3. By ▲ and ▼ buttons set the value assigned to [44] PAS2 (Level 2 password).

Notes: 1. The factory default password for configuration parameters is equal to 20.

2. All parameter modification are protected by a time out. If no button is pressed for more than 30 second the instrument comes automatically back to the Standard display, the new value of the last selected parameter is lost and the parameter modification procedure is closed.When you desire to remove the time out (e.g. for the first configuration of an instrument) you can use a password equal to 1000 plus the programmed password (e.g. 1000 + 20 [default] = 1020).It is always possible to manually End the parameter configuration procedure (see below).

4. Push ↵ button.
5. The instrument will show on the upper display the acronym of the first parameter promoted to this level and on the lower display its value.
6. By ▲ and ▼ buttons assign to this parameter the desired value.
7. Press the ↵ button in order to memorize the new value and go to the next parameter.
8. When you want to come back to the “standard display” push the ↩ button for more than 3 s.

6.5 HOW TO SEE BUT NOT MODIFY THE “OPERATOR MODIFY PARAMETERS ACCESS PARAMETERS”

Sometime it is necessary to let the possibility to see the value assigned to the Operator Modify Parameter but it is important that changes are made by authorized personnel only.In this cases, proceed as follows:

1. Press the ↵ button for more than 3 seconds;
2. The upper display will show PASS while the lower display will show 0;
3. By ▲ and ▼ button set the value -181;
4. Push ↵ button;
5. The upper display will show the acronym of the first parameter promoted to the level 2 and lower display will show its value;
6. Using ↵ button it is possible to see the value assigned to all parameter present in level 2 but it will not be possible to modify it;
7. It is possible to come back to the “standard display” by pushing the ↩ button for more than 3 seconds or by pushing no pushbutton for more than 30 seconds.

6.6 LIST OF POSSIBLE ERRORS

ErAt Fast Auto-tune cannot start. The measure value is too close to the set point.
Push the ↵ button in order to delete the error message.

ouLd Overload on the out 4
The messages shows that a short circuit is present on the Out 4 when it is used as output or as a transmitter power suply.
When the short circuit disappears the output restart to operate.

noAt Auto-tune not finished within 12 hours.

ErEP Possible problem of the instrument memory.
The messages disappears automatically.
When the error continues, send the instrument to your supplier.

ronE Possible problem of the firmware memory.
When this error is detected, send the instrument to your supplier.

Err.t Possible problem of the calibration memory.
When this error is detected, send the instrument to your supplier.

7. HARDWARE SPECIFICATIONS

7.6.1 Measuring input

Thermocouples

Type: J,K,S,R,T,N programmable.
Continuity detection current: 250 nA
Engineering Unit: °C or °F programmable.
CJ: automatic compensation from 0 to +55 °C.
CJ temperature drift : 0,04 °C/°C @ 25 °C after a warm-up (instrument ON) equal to 20 minutes.
Burn-out: full scale.
Calibration: EN584-1, DIN 43710 - 1977

TC Type	Ranges			
J	-50 to 1000 °C	-50.0 to 999.9 °C	-58 to 1832 °F	-58.0 to 999.9°F
K	-50 to 1370 °C	-50.0 to 999.9 °C	-58 to 2498 °F	-58.0 to 999.9 °F
S	-50 to 1760 °C	-50.0 to 999.9 °C	-58 to 3200 °F	-58 to 999.9 °F
R	-50 to 1760 °C	-50.0 to 999.9 °C	-58 to 3200 °F	-58.0 to 999.9 °F
T	-70 to 400 °C	-70.0 to 400.0 °C	-94 to 752 °F	-94.0 to 752.0 °F
N	-50 to1300°C	-50.0 to 999.9°C	-58 to 2372°F	-58.0 to 999.9 °F

RTD (Resistive Temperature Detector)

Type: Pt 100 - 3 wires
Pt 1000 - 2 wires.
Current injection: 135 µA.
Line resistance: Automatic compensation (PT100 only) up to 20 Ohm/wire with maximum error <+0.1% input span.
Engineering unit: °C or °F programmable.
Burn-out: full scale.
Calibration: DIN 43760, EN 60751/A2

RTD type	Ranges	
Pt 100 3 wires	-200 to 850 °C	-328 to 1562 °F
	- 200.0 to 850.0 °C	-328.0 to 999.9 °F
PT 1000	-200 to 850 °C	-328 to 1562 °F
	- 200.0 to 850.0 °C	-328.0 to 999.9 °F

Linear inputs

Type: 0/12-60 mV, 0/4-20 mA, 0/1-5V, 0/2-10V.
Readout: programmable from -1999 to 9999
Decimal point: programmable

Input type	Input impedance
0/12 to 60 mV	> 1 MOhm
0/4 to 20 mA	53 Ohm
0/1 to 5 V or 0/2 to 10 V	> 500 kOhm

Digital input

Type: contact free of voltage
Max. contact resistance: 100 Ohm.
Contact rating: 10 V, 6 mA.
Outputs
Out 1
Available: Optionally
Output action: direct/reverse programmable
Function: retransmission
Output type: 0-20 mA, 4-20 mA, 0-10 V or 2-10V programmable
Isolation: isolated output
Maximum load: 500 Ohm

Out 2

Function: Limiter output
Available: Ever
Output action: Reverse
Output type: relay
Contatto: SPST (NO contact)
Contact rating: - 2A / 250 V c.a. on resistive load.
1 A / 250 V with cosf = 0.4

Out 3

Function: Alarm output
Available: optionally
type : relay o SSR
a) Relay output
Contact type: SPST (No contact)
Contact rating: - 2A / 250 V c.a. on resistive load.
-1 A / 250 V with cosf = 0.4

b) Logic voltage for SSR drive.
Isolation: Output NOT isolated.
Protection: Output protected from short circuit.
1 logic status: 12 V ±20% @ 15 mA.
0 logic status: <0.5 V

Out 4 (when programmed)

Function: alarm output
Available: ever
Type : SSR drive
Isolation: Not isolated
Protection : Output protected from short circuit.
Stato logico 1: 12 V ±20% @ 23 mA.
Stato logico 0: <0.5 V

Auxiliary power supply for TX

NOTE: this output is obtained by forcing the out 4 to ON.
Isolation: Not isolated
Protection : Output protected from short circuit.
Voltage: 12 VDC
Current: 23 mA Max.

Serial interfaces

Type: TTL
Available: ever
Isolation: Not isolated
Protocol: Modbus RTU
Baud rate: from 1200 to 38400 baud
Multiple reading: max 16 word.
Multiple writing: max 16 word.
Parity: none
Data format: 8 bit
Start Bit : 1
Stop Bit: 1

Type: RS 485 optionally
Available: on request
Isolation: Isolated (50 V)
Protocol: Modbus RTU
Baud rate: from 1200 to 38400 baud
Multiple reading: max 16 word.
Multiple writing: max 16 word.
Parity: none
Data format: 8 bit
Start Bit : 1
Stop Bit: 1

8. GENERAL NOTES

8.1 PROPER USE

Every possible use not described in this manual must be consider as a improper use.

This instrument is in compliance with EN 61010-1 “Safety requirements for electrical equipment for measurement, control and laboratory use”; for this reason it could not be used as a safety equipment.

Whenever a failure or a malfunction of the control device may cause dangerous situations for persons, thing or animals, please remember that the plant has to be equipped with additional safety devices.

Yokogawa Electric Corporation and its legal representatives do not assume any responsibility for any damage to people, things or animals deriving from violation, wrong or improper use or in any case not in compliance with the instrument’s features.

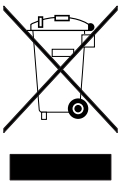
8.2 WARRANTY

This product is under warranty against manufacturing defects or faulty materials that are found within 18 months from manufacturing date. The warranty is limited to the replacement of the instrument.

The tampering of the instrument or an improper use of the product will bring about the immediate withdrawal of the warranty’s effects.

In the event of a faulty instrument, either within the period of warranty, or further to its expiry, please contact our sales department to obtain authorisation for sending the instrument to our company.

8.3 DISPOSAL



Waste Electrical and Electric Equipment (WEEE) Directive (This directive is valid in the EU member states).

This product complies with the WEEE Directive marking requirements.

The following marking indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category

With reference to the equipment types in the WEEE directive, this product is classified as a “Monitoring and control instruments”.

Do not dispose of this product in domestic household waste.

When disposing of product in the EU, contact your Yokogawa Europe B.V. office.

Appendix A

InP Group

N	Param.	Description	Range value or selection list elements	Dec. point
1	SEnS	Measuring input	J = TC J crAL = TC K, S = TC S, r = TC R t = TC T, n = TC N Pt1 = PT 100, Pt10 = PT 1000, 0.60 = 0 to 60 mV, 12.60 = 12 to 60 mV, 0.20 = 0 to 20 mA, 4.20 = 4 to 20 mA, 0.5 = 0 to 5 V, 1.5 = 1 to 5 V, 0.10= 0 to 10 V 2.10 = 2 to 10 V,	dP
2	dP	Decimal point figure Note: For TC and RTD inputs the decimal figure must be 0 or 1 only.	0 to 3	dP
3	SSc	Initial scale readout NOTE: This parameter will be shown only when a linear input has been selected (mV, V or mA).	-1999 to 9999	dP
4	FSc	Full scale readout NOTE: This parameter will be shown only when a linear input has been selected (mV, V or mA).	-1999 to 9999 (E.U.)	dP
5	unit	Engineering unit NOTE: This parameter will be shown only when a TC or RTD input has been selected.	°C or °F	
6	FiL	Digital filter on the measured value. Note: This filter will affect the measured value but also the control action the analogue retransmission and the alarms behaviour.	0(oFF) to 20.0 (s)	1
7	bS	PV input bias	-100 to 100 % of the input span	dP
8	di.A	Digital Input action	0 = DI1 direct 1 = DI1 reverse	

OUT group

N	Param.	Description	Range value or selection list elements	Decimal point
9	O1.t	Out 1 type NOTE: this parameter will be shown only when Out 1 is present	0.20 = 0 to 20 mA 4.20 = 4 to 20 mA 0.10 = 0 to 10 Volt 2.10 = 2 to 10 Volt	0
10	o1F	Out 1 function	nonE = Out not used r.inP = Measure retransmission r.Err = Error retransmission r.SP = SP retransmission r.SEr = Retransmission of a value coming from serial link	
11	Ao1L	Retransmission – initial scale value	-1999 to Ao1H	dP
12	Ao1H	Retransmission – full scale value	Ao1L to 9999	dP
13	o3F	Out 3 function Available: when Out 3 is present.	nonE = Out not used AL = Alarm output or.bo = Over-range and burn-out P.FAL = Power failure bo.PF = Over-range, Burn-out and power Fail	
14	o3AL	Alarms linked up with Out 3	from 0 to 15 +1 = Alarm 1 +2 = Alarm 2 +4 = Burn-out +8 = Overload of the Out 4	0
15	o3Ac	Out 3 action	dir = Direct action rEU = Reverse action	
16	o4F	Out 4 function	nonE = Out not used AL = Alarm output or.bo = Over-range and burn-out P.FAL = Power failure bo.PF = Over-range, Burn-out and power Fail On = Output ever ON (usable as auxiliary PWS for a transmitter).	

N	Param.	Description	Range value or selection list elements	Decimal point
17	o4AL	Alarms linked up with Out 4	from 0 to 7 +1 = Alarm 1 +2 = Alarm 2 +4 = Burn-out	0
18	o4Ac	Out 4 action	dir = Direct action rEU = Reverse action	

AL1 Group

N	Param.	Description	Range value or selection list elements	Decimal figure
19	AL1t	Alarm 1 type	nonE = Alarm not used; LoAb = Absolute low alarm; HiAb = Absolute high alarm; LHAo = Absolute band alarm with alarm indication out of the band; LHAi = Absolute band alarm with alarm indication inside the band; SE.br = Sensor break; LodE = Deviation low alarm; HidE = Deviation high alarm; LHdo = Relative band alarm with alarm indication out of the band; LHdi = Relative band alarm with alarm indication inside the band.	
20	Ab1	Alarm 1 function	from 0 to 3 0 = no function +1 = not active at power up +2 = Relative alarm not active at set point change.	0
21	AL1L	- For High and low alarms, it is the low limit of the AL1 threshold - For band alarm, it is low alarm threshold	-1999 to AL1H (E.U.)	dP
22	AL1H	- For High and low alarms, it is the high limit of the AL1 threshold - For band alarm, it is the high alarm threshold	AL1L to 9999 (E.U.)	dP
23	AL1	Alarm 1 threshold	AL1L to AL1H (E.U.)	dP
24	HAL1	Alarm 1 hysteresis	1 to.9999 (E.U.)	dP
25	AL1d	Alarm 1 delay	0 (oFF) to 9999 (s)	0

AL2 Group

N	Param.	Description	Range value or selection list elements	Decimal figure
26	AL2t	Alarm 2 type	nonE = Alarm not used; LoAb = Absolute low alarm; HiAb = Absolute high alarm; LHAo = Absolute band alarm with alarm indication out of the band; LHAi = Absolute band alarm with alarm indication inside the band; SE.br = Sensor break; LodE = Deviation low alarm; HidE = Deviation high alarm; LHdo = Relative band alarm with alarm indication out of the band; LHdi = Relative band alarm with alarm indication inside the band.	
27	Ab2	Alarm 2 function	From 0 to 3 0 = no function +1 = not active at power up +2 = Relative alarm not active at set point change.	0
28	AL2L	- For High and low alarms, it is the low limit of the AL2 threshold - For band alarm, it is low alarm threshold	-1999 to AL2H (E.U.)	dP
29	AL2H	- For High and low alarms, it is the high limit of the AL2 threshold - For band alarm, it is the high alarm threshold	AL2L to 9999 (E.U.)	dP
30	AL2	Alarm 2 threshold	AL2L to AL2H (E.U.)	dP
31	HAL2	Alarm 2 hysteresis	1 to 9999 (E.U.)	dP
32	AL2d	Alarm 2 delay	0 (oFF) to 9999 (s)	0

rEG group

N	Param.	Description	Range value or selection list elements	Decimal figure
33	Hi.Lo	Limit control type	Hi = High limit. Lo = Low limit.	
34	r.md	Restart mode	0 = On > limit output is ON in any case (the instrument start in shutdown condition) 1 = oFF > limit output is OFF when, at power on, PV doesn't exceed SP.	
35	HyS	Hysteresis of the control output	From 0.0 to 100% of the input span	dP
36	oP.SL	Operative display selection	0 = PU.SP > PV and SP / SP only (lower display) 1 = SP > SP only (lower display)	

N	Param.	Description	Range value or selection list elements	Decimal figure
37	SPLL	Minimum set point value	-1999 to SPHL (E.U.)	dP
38	SP.HL	Maximum set point value	SPLL to 9999 (E.U.)	dP
39	SP	Set point	SPLL to SPHL	dP
40	dis	The way to confirming operation	but = by keyboard (button) di = by digital input	
41	tim	Duration time when in exceeded (in shoutdown)	00.00 to 99.59 (HH.mm)	0
42	Hi	Maximum measured value	In Engineering Units	dP
43	Lo	Minimum measured value	In Engineering Units	dP

PAn Group

N	Param.	Description	Range value or selection list elements	Decimal figure
44	PAS2	Password level 2	0 (oFF) to 200	0
45	PAS3	Password level 3	3 to 200	0
46	di.CL	Display color	0 = The display color is used to show the Exceeded condition. 1 = fixed red display 2 = fixed green display 3 = fixed amber display	0
47	diS.t	Display time-out	0 (OFF) to 99.59 (mm.ss)	2

SEr group

N	Param.	Description	Range value or selection list elements	Decimal figure
48	Add	Address	0 (oFF) to 254	0
49	bAud	Baud rate	1200 2400 9600 19.2 38.4	

CAL group

N	Param.	Description	Range value or selection list elements	Decimal figure
50	A.L.P	Adjust low Point	-1999 to A.H.P-10 (E.U.)	dP
51	A.L.o	Adjust low Offset	-300 to 300 (E.U.)	dP
52	A.H.P	Adjust High Point	A.L.P +10 to 9999 (E.U.)	dP
53	A.H.o	Adjust High Offset	-300 to 300 (E.U.)	dP