ESM-9930 96 x 96 1/4 DIN
Universal Input PID Process Controller

- *4 digits process (PV) and 4 digits process set (SV) display*
- *Universal process input (TC, RTD, mV ===, V ===, mA ===)*
- *Dual or multi point calibration for === Voltage / Current input*
- *Configurable ON/OFF, P, PI, PD ve PID control forms*
- *Adaptation of PID coefficients to the system with Auto-tune and Self-tune*
- *Manual/Automatic mode selection for control outputs*
- *Bumpless transfer*
- *Programmable heating, cooling and alarm functions for control outputs*

Instruction manual of ESM-9930 Process Controller consists of two main sections. Explanation of these sections are below. Also, there are other sections which include order information and technical specifications of the device. All titles and page numbers in instruction manual are in "**CONTENTS**" section. User can reach to any title with section number.

Installation:

Physical dimensions, panel mounting, electrical wiring of the device, physical and electrical installation of the device to the system are explained in this section.

Operation and Parameters:

User interface of the device, how to access to the parameters, description of parameters are explained in this section.

Also in these sections, there are warnings to prevent serious injury while doing the physical and electrical mounting or using the device.

Explanation of the symbols which are used in these sections are given below.

This symbol is used for safety warnings. User must pay attention to these warnings.

This symbol is used to determine the dangerous situations as a result of an electric shock. User must pay attention to these warnings definitely.

This symbol is used to determine the important notes about functions and usage of the device.

CONTENTS

EU DECLARATION OF CONFORMITY

Manufacturer Company Name : Emko Elektronik A.S..

Manufacturer Company Address: DOSAB, Karanfil Sokak, No:6, 16369 Bursa, Turkiye

The manufacturer hereby declares that the product conforms to the following standards and conditions.

Product Name : Process Controller

Model Number : ESM-9930

Type Number : ESM-9930

Product Category : Electrical equipment for measurement, control and laboratory use

Conforms to the following directives :

73 / 23 / EEC The Low Voltage Directive as amended by 93 / 68 / EEC

89 / 336 / EEC The Electromagnetic Compatibility Directive

Has been designed and manufactured according to the following specifications

EN 61000-6-4:2001 EMC Generic Emission Standard for the Industrial Environment

EN 61000-6-2:2001 EMC Generic Immunity Standard for the Industrial Environment

EN 61010-1:2001 Safety Requirements for electrical equipment for measurement, control and laboratory use

1.Preface

ESM series process controllers are designed for measuring and controlling temperature and any process value.They can be used in many applications with their universal process input, control outputs, selectable alarm functions.

Some application fields and an application which they are used are below:

Application Fields	Application
Glass	PID Process Control
Plastic	
Petro-Chemistry	
Textile	
Automative	
Machine production industries	

1.1 General Specifications

ESM-9930

Power Supply Input

Standard

Universal Supply Input
100-240 V∿, 50/60Hz

Low Voltage (optional) Supply Input
24V∿50/60Hz ,24V⎓

Process Input

Universal Process Input
TC,RTD, ⎓Voltage/Current

Standard

Alarm Out-1 (Relay Output)

Control Output Alarm Output

Heating-Cooling Function ON/OFF, PID Operation Auto-Tune, Self-Tune Automatic/Manual Operation

Standard

Process Out or Alarm Out-2 (Relay Output)

Standard

Process Out (SSR Driver Output)

Control Output

1.2 Ordering Information

ESM-9930 (96x96 1/4 DIN)	A	BC	D	E	/	FG	HI	/	U	V	W	Z
			0	1	/	01	02	/				

A	Supply Voltage
1	100-240V∼ (-15%;+10%) 50/60Hz
2	24 V∼ (-15%;+10%) 50/60Hz 24V⎓ (-15%;+10%)
9	Customer (Maximum 240V∼ (-15%;+10%)) 50/60Hz

BC	Input Type	Scale
20	Configurable (Table-1)	Table-1

D	Serial Communication
0	None

E	Output-1
1	Relay Output (5A@250 V∼ at resistive load)

FG	Output-2
01	Relay Output (5A@250 V∼ at resistive load)

HI	Output-3
02	SSR Driver Output (Maximum 20mA@18V ⎓)

All order information of ESM-9930 are given on the table at left. User may form appropriate device configuration from information and codes that at the table and convert it to the ordering codes.

Firstly, supply voltage then other specifications must be determined. Please fill the order code blanks according to your needs.

Please contact us, if your needs are out of the standards.

Table-1

BC	Input Type(TC)	Scale(°C)	Scale(°F)
21	L ,Fe Const DIN43710	-100°C,850°C	-148°F ,1562°F
22	L ,Fe Const DIN43710	-100.0°C,850.0°C	-148.0°F,999.9°F
23	J ,Fe CuNi IEC584.1(ITS90)	-200°C,900°C	-328°F,1652°F
24	J ,Fe CuNi IEC584.1(ITS90)	-199.9°C,900.0°C	-199.9°F,999.9°F
25	K ,NiCr Ni IEC584.1(ITS90)	-200°C,1300°C	-328°F,2372°F
26	K ,NiCr Ni IEC584.1(ITS90)	-199.9°C,999.9°C	-199.9°F,999.9°F
27	R ,Pt13%Rh Pt IEC584.1(ITS90)	0°C,1700°C	32°F,3092°F
28	S ,Pt10%Rh Pt IEC584.1(ITS90)	0°C,1700°C	32°F,3092°F
29	T ,Cu CuNi IEC584.1(ITS90)	-200°C,400°C	-328°F,752°F
30	T ,Cu CuNi IEC584.1(ITS90)	-199.9°C,400.0°C	-199.9°F,752.0°F
31	B ,Pt30%Rh Pt6%Rh IEC584.1(ITS90)	44°C,1800°C	111°F,3272°F
32	B ,Pt30%Rh Pt6%Rh IEC584.1(ITS90)	44.0°C,999.9°C	111.0°F,999.9°F
33	E ,NiCr CuNi IEC584.1(ITS90)	-150°C,700°C	-238°F,1292°F
34	E ,NiCr CuNi IEC584.1(ITS90)	-150.0°C,700.0°C	-199.9°F,999.9°F
35	N ,Nicrosil Nisil IEC584.1(ITS90)	-200°C,1300°C	-328°F,2372°F
36	N ,Nicrosil Nisil IEC584.1(ITS90)	-199.9°C,999.9°C	-199.9°F,999.9°F
37	C , (ITS90)	0°C,2300°C	32°F,3261°F
38	C , (ITS90)	0.0°C,999.9°C	32.0°F,999.9°F

BC	Input Type(RTD)	Scale(°C)	Scale(°F)
39	PT 100 , IEC751(ITS90)	-200°C,650°C	-328°F,1202°F
40	PT 100 , IEC751(ITS90)	-199.9°C,650.0°C	-199.9°F,999.9°F

BC	Input Type (⎓ Voltage and Current)	Scale	
41	0...50 mV⎓	-1999	9999
42	0...5 V⎓	-1999	9999
43	0...10 V⎓	-1999	9999
44	0...20 mA⎓	-1999	9999
45	4...20 mA⎓	-1999	9999

⚠

∼ Symbol means Vac,
⎓ Symbol means Vdc
≂ Symbol means Vac and Vdc

1.3 Warranty

EMKO Elektronik warrants that the equipment delivered is free from defects in material and workmanship. This warranty is provided for a period of two years. The warranty period starts from the delivery date. This warranty is in force if duty and responsibilities which are determined in warranty document and instruction manual performs by the customer completely.

1.4 Maintenance

Repairs should only be performed by trained and specialized personnel. Cut power to the device before accessing internal parts.
Do not clean the case with hydrocarbon-based solvents (Petrol, Trichlorethylene etc.). Use of these solvents can reduce the mechanical reliability of the device. Use a cloth dampened in ethyl alcohol or water to clean the external plastic case.

⚠ **Before beginning installation of this product, please read the instruction manual and warnings below carefully.**

In package ,
- One piece unit
- Two pieces mounting clamps
- One piece instruction manual

A visual inspection of this product for possible damage occured during shipment is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product.

If there is danger of serious accident resulting from a failure or defect in this unit, power off the system and separate the electrical connection of the device from the system.

The unit is normally supplied without a power switch or a fuse. Use power switch and fuse as required.

Be sure to use the rated power supply voltage to protect the unit against damage and to prevent failure.

Keep the power off until all of the wiring is completed so that electric shock and trouble with the unit can be prevented.

Never attempt to disassemble, modify or repair this unit. Tampering with the unit may results in malfunction, electric shock or fire.

Do not use the unit in combustible or explosive gaseous atmospheres.

During the equipment is putted in hole on the metal panel while mechanical installation some metal burrs can cause injury on hands, you must be careful.

Montage of the product on a system must be done with it's fixing clamps. Do not do the montage of the device with inappropriate fixing clamp. Be sure that device will not fall while doing the montage.

It is your responsibility if this equipment is used in a manner not specified in this instruction manual.

2.1 General Description

Terminal protection cover

Product Label

Mounting Clamp

Front Panel
IP65 protection
NEMA 4X

Process Controller

ESM-9930

Panel surface
(maximum thickness 15mm / 0.59 inch)

2.2 Dimensions

Maximum 15mm / 0.59 inch

Process Controller

EMKO   ESM-9930

96mm / 3.78 inch

96mm / 3.78 inch

11.5 ± 1 mm /0.45 inch   76mm / 2.99 inch

129 mm / 5.08 inch (min)

129 mm / 5.08 inch (min)

92mm / 3.62 inch

92mm / 3.62 inch
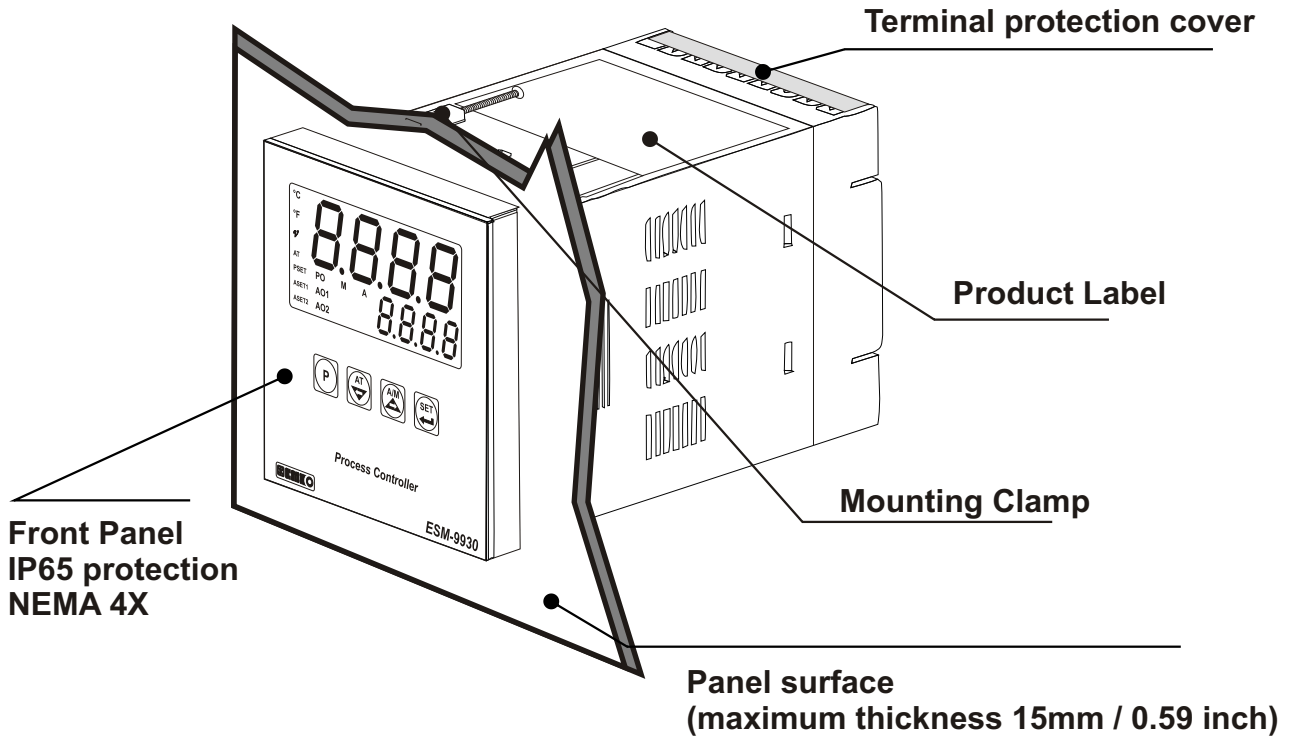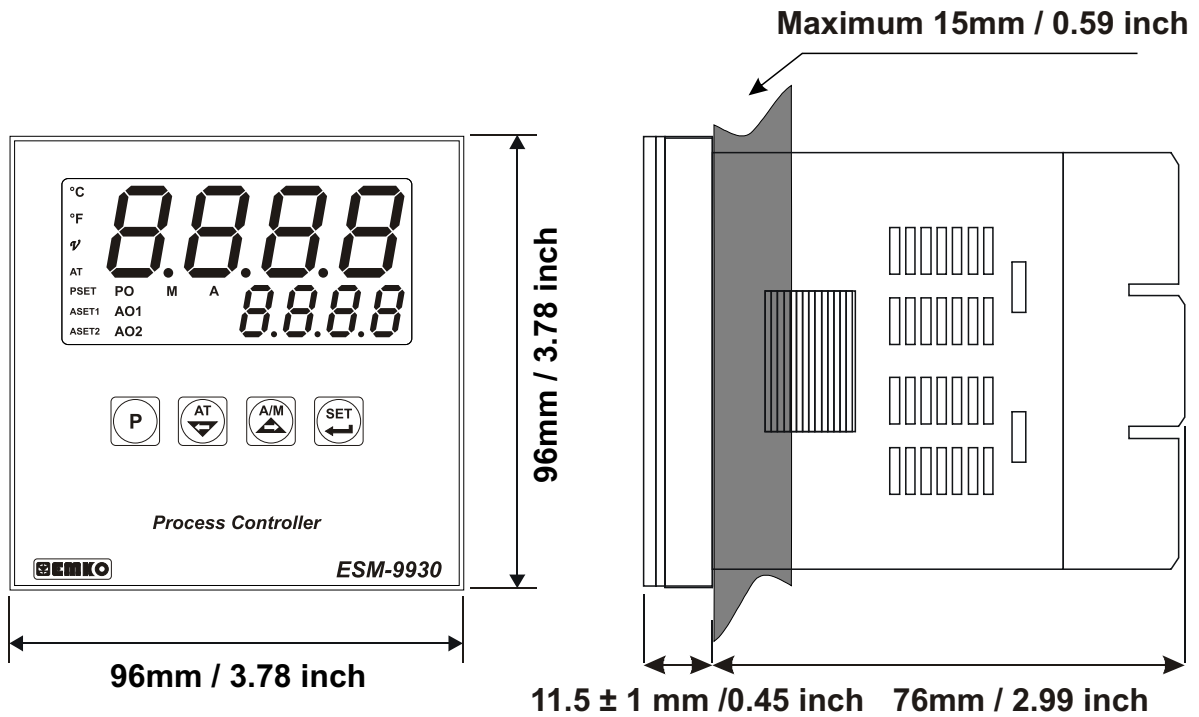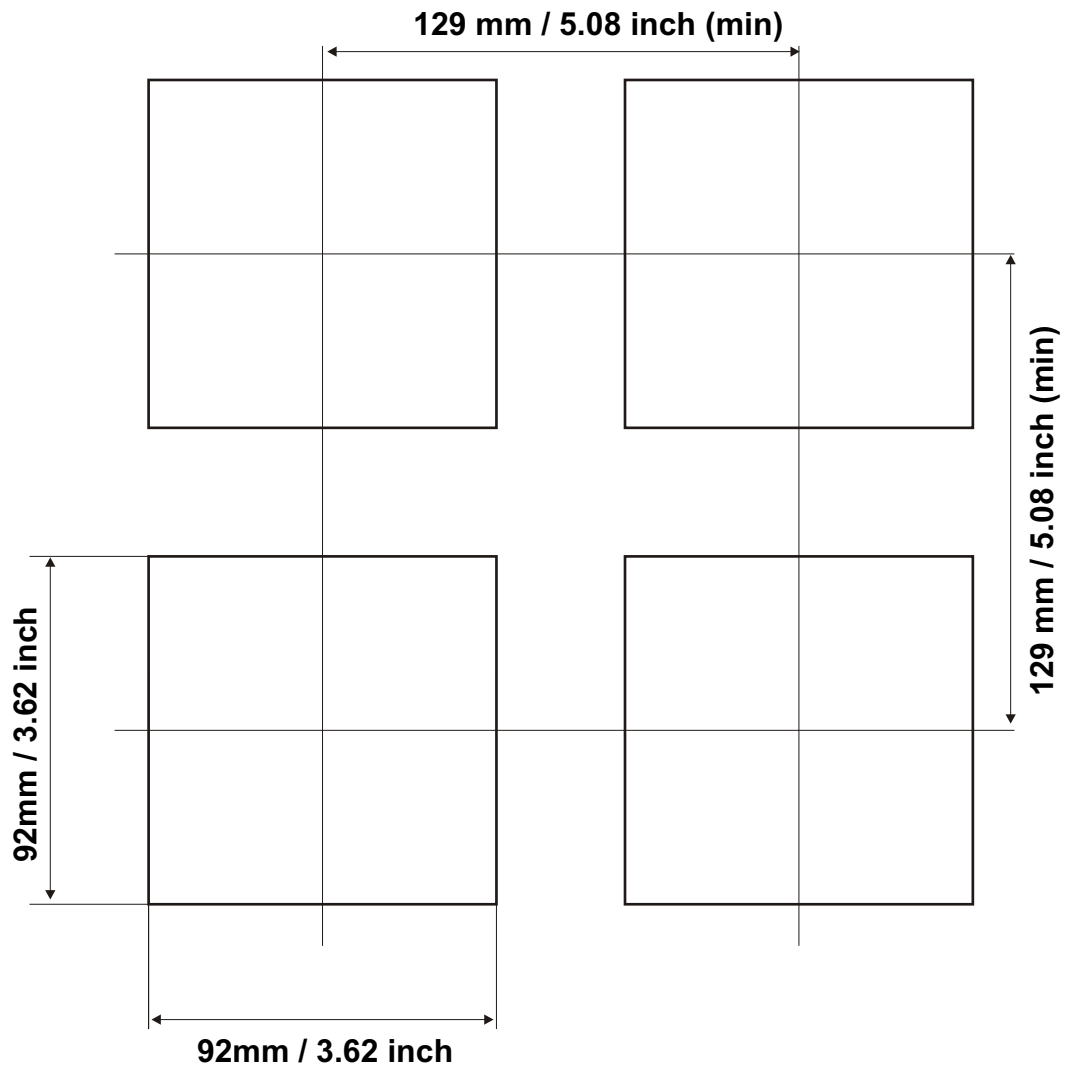
2.4 Environmental Ratings

Operating Conditions

Operating Temperature : 0 to 50 °C

Max. Operating Humidity : 90% Rh (non-condensing)

Altitude : Up to 2000m.

Forbidden Conditions:
Corrosive atmosphere
Explosive atmosphere
Home applications (The unit is only for industrial applications)

2.5 Panel Mounting
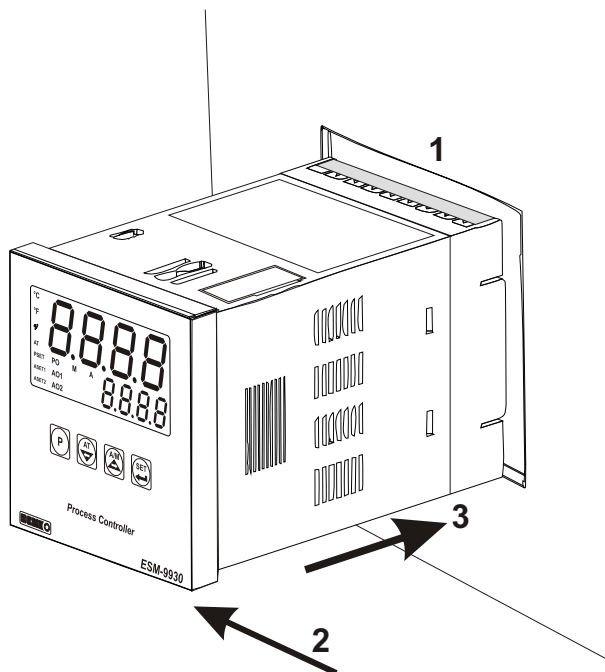
1-Before mounting the device in your panel, make sure that the cut-out is of the right size.

2-Check front panel gasket position

3-Insert the device through the cut-out. If the mounting clamps are on the unit, put out them before inserting the unit to the panel.

During installation into a metal panel, care should be taken to avoid injury from metal burrs which might be present. The equipment can loosen from vibration and become dislodged if installation parts are not properly tightened. These precautions for the safety of the person who does the panel mounting.

2.6 Installation Mounting Clamp
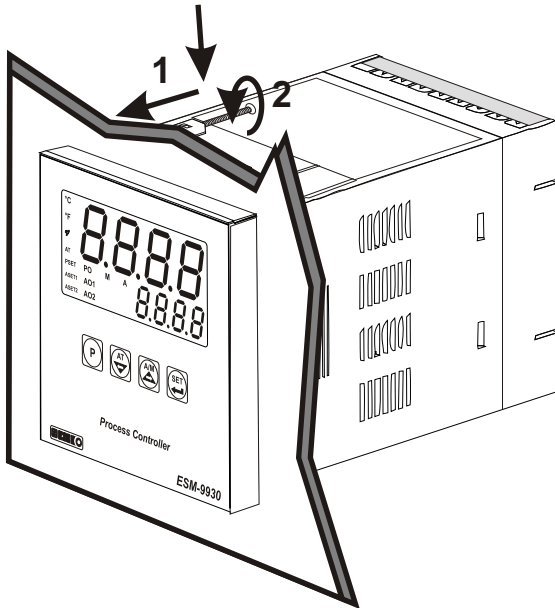
The unit is designed for panel mounting.

1-Insert the unit in the panel cut-out from the front side.

2- Insert the mounting clamps to the holes that located top and bottom sides of device and screw up the fixing screws until the unit completely immobile within the panel

⚠ **Montage of the unit to a system must be done with it's own fixing clamps. Do not do the montage of the device with inappropriate fixing clamps. Be sure that device will not fall while doing the montage.**

2.7 Removing from the Panel

⚠ **Before starting to remove the unit from panel, power off the unit and the related system.**
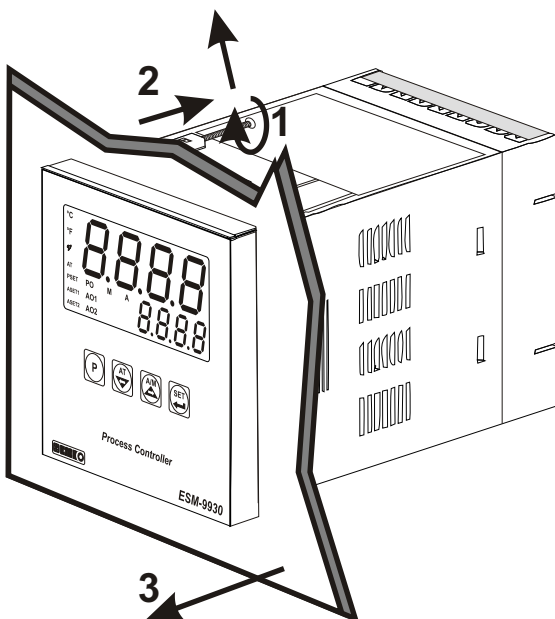
1-Loosen the screws.

2-Pull mounting clamps from top and bottom fixing sockets.

3-Pull the unit through the front side of the panel

3. Electrical Wirings

You must ensure that the device is correctly configured for your application. Incorrect configuration could result in damage to the process being controlled, and/or personal injury. It is your responsibility, as the installer, to ensure that the configuration is correct.
Parameters of the device has factory default values. These parameters must be set according to the system's needs.

Only qualified personnel and technicians should work on this equipment. This equipment contains internal circuits with voltage dangerous to human life. There is severe danger for human life in the case of unauthorized intervention.

Be sure to use the rated power supply voltage to protect the unit against damage and to prevent failure.

Keep the power off until all of the wiring is completed so that electric shock and trouble with the unit can be prevented.

3.1 Terminal Layout and Connection Instructions

6 mm / 0.236 inch
Wire Size:
18 AWG / 1 mm²
Solid /Stranded

24 screws
terminal M3

Empty terminals

Torque 0.5 Nm

Screw driver
0.8x3mm
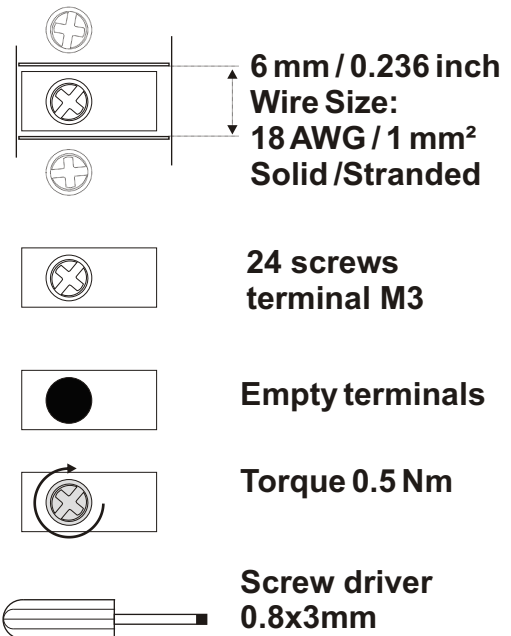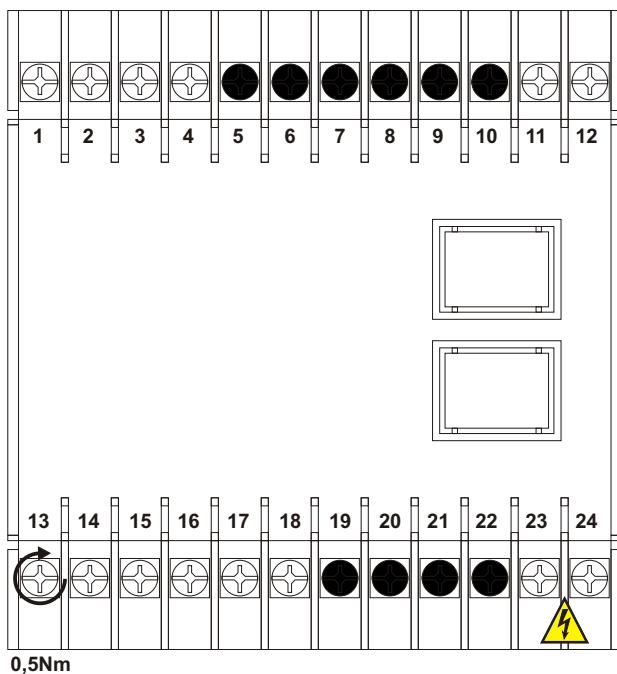
Electrical wiring of the device must be the same as 'Electrical Wiring Diagram' below to prevent damage to the process being controlled and personnel injury.

Universal Process Input
(TC, RTD, Voltage / Current)

Sensor or Transmitter Supply Voltage

Standard Process Output SSR Driver Output Max 20mA@18V

− **+** 0 to 50mV
0 to 10V
0 to 20mA
Pt-100
PTC NTC
− + TC

12 V Max 50mA

+ −

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

⊕**EMKO**

P/N : ESM-9930 CE

⚠ □ **CAT II**

PROCESS OUT (ALARM OUT-2) 5A@250V
NO NC C

ALARM OUT-1 5A@250V
NO NC C

⚡

| 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

Process Output or Alarm Output-2 Relay

Alarm Output-1 Relay

Supply Voltage Input
100-240V ∼ (-15%;+10%) 50/60Hz - 6VA
24 V ∼ (-15%;+10%) 50/60Hz - 6VA
24V ⎓ (-15%;+10%) - 6W
(It must be determined in order)

ⓘ **Process input is in CAT II class**

13	14	15	16	17	18	19	20	21	22	23	24
NO	NC	C	NO	NC	C					N	L

5A@250V∼
PROCESS OUT
(ALARM OUT-2)

5A@250V∼
ALARM OUT-1

EMKO
P/N : ESM-9930

CAT II

cⓊus   CE

100 to 240 V∼
50/60Hz - 6VA

PROCESS OUT
SSR DRIVER OUT.
Max.20mA@18V⎓
+   −

0 to 50mV⎓
0 to 10V⎓
0 to 20mA⎓

Pt-100
PTC, NTC
TC

12 V⎓
Max.50mA

1	2	3	4	5	6	7	8	9	10	11	12

**Universal Supply
Voltage Connection**

**Low Voltage 24 V∿
Supply Voltage Input**

Note-1

Note-1

Note-2

N ⚡ L
23 **24**

N ⚡ L
23 **24**

**External
Fuse
(1 A ∿ T)**

**External
Fuse
(24V ∿ : 1 A ∿ T)
(24V ⎓ : 1 A ⎓ T)**

**Power
Supply
Switch**

**Power
Supply
Switch**

**Supply Voltage
100 - 240 V∿
(-15%;+10%) 50/60Hz**

**Supply Voltage
24V∿ (-15%;+10%) 50/60Hz
or 24V⎓ (-15%;+10%)**

Note-1 : There is internal 33R Ω fusible flameproof resistor in 100-240 V∿ 50/60Hz
There is internal 4R7 Ω fusible flameproof resistor in 24V∿ 50/60Hz , 24V⎓
Note-2 : "L" is (+) ," **N"** is (-) for 24V ⎓ supply voltage

Supply voltage range must be determined in order. While installing the unit, supply voltage range must be controlled and appropriate supply voltage must be applied to the unit. Controlling the supply voltage range prevents damages in unit and system and possible accidents as a result of incorrect supply voltage.

There is no power switch or fuse on the device. So a power switch and a fuse must be added to the supply voltage input. Power switch and fuse must be put to a place where user can reach easily.

Power switch and fuse must be two poled for seperating phase and neutral. On/Off condition of power switch is very important in electrical connection. On/Off condition of power switch must be signed for preventing the wrong connection.
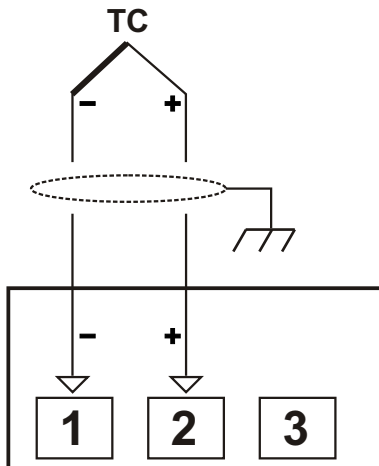
External fuse must be on phase connection in ∿ supply input.

External fuse must be on (+) line connection in ⎓ supply input.

3.5 Process Input Connection

3.5.1 TC (Thermocouple) Connection

Connect the wires with the polarity as shown in the figure left.
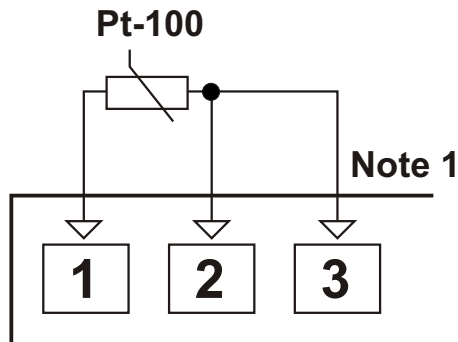
Always use compensation wire corresponding to the thermocouple used. If present, the shield must be connected to a proper ground.
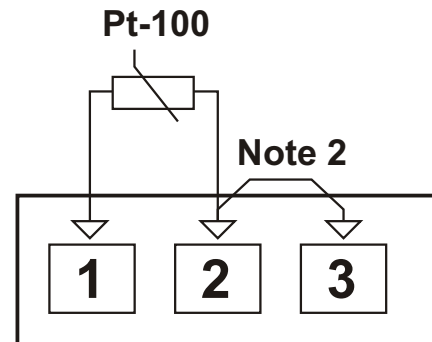
Input resistance is greater than 10MΩ

3.5.2 RTD Connection

3-wire Pt-100 connection
(with line compensation)
(Max. Line impedance is 10 Ω)

2-wire Pt-100 connection
(without line compensation)

Note 1 : In 3-wire system, use always cables of the same diameter (min 1mm²) Always use wires of the same gauge and type whether a 2-wire or 3-wire system.
Note 2 : Install a jumper between terminals 2 and 3 when using a 2-wire RTD.
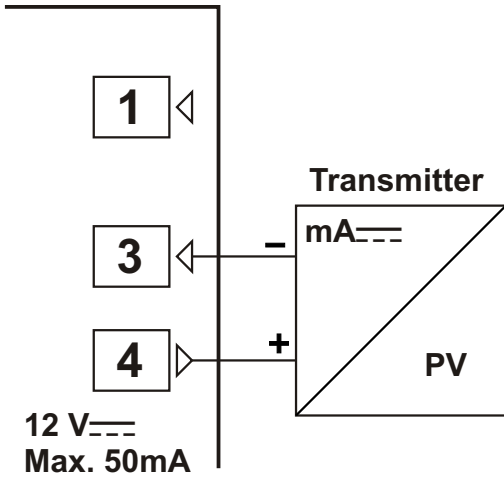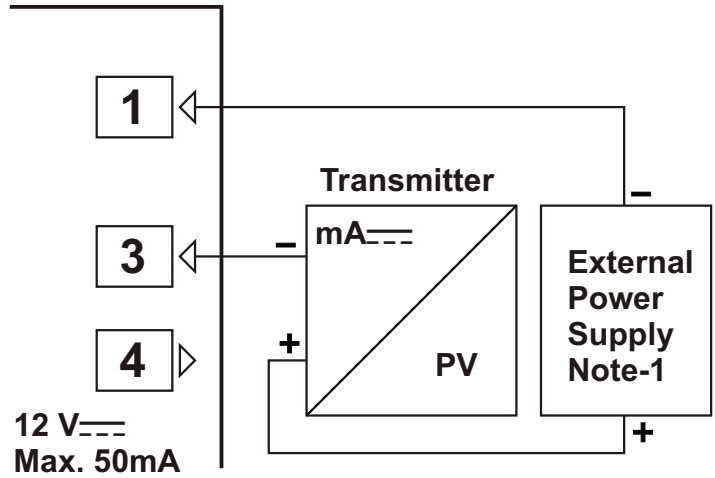**Note 3 :** If the distance is longer than 10 meters, use 3-wire system

Input resistance is greater than 10MΩ

3.5.3 Process Input Connection of Serial Transmitters with Current Output (Loop Powered)

Transmitter connection by using supply voltage on the device

Transmitter connection by using external supply voltage source.

Note 1 : External power supply must be selected according to supply voltage range and required current for transmitter.

ⓘ **Input resistance is 2R7 Ω.**

3.5.4 Process Input Connection of 3-wire Transmitters with Current Output

Transmitter connection by using supply voltage on the device

Transmitter connection by using external supply voltage source.

Note-1 : External power supply must be selected according to supply voltage range and required current for transmitter.

ⓘ **Input resistance is 2R7 Ω.**

3.5.5 Connection of Transmitters with Voltage Output to Process Input

Transmitter connection by using supply voltage on the device
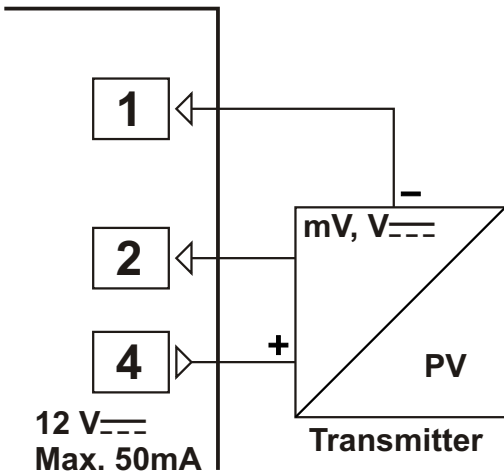
Transmitter connection by using external supply voltage source.
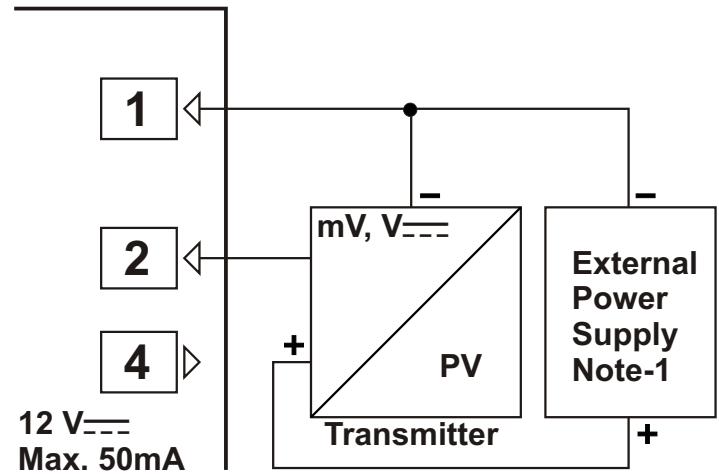
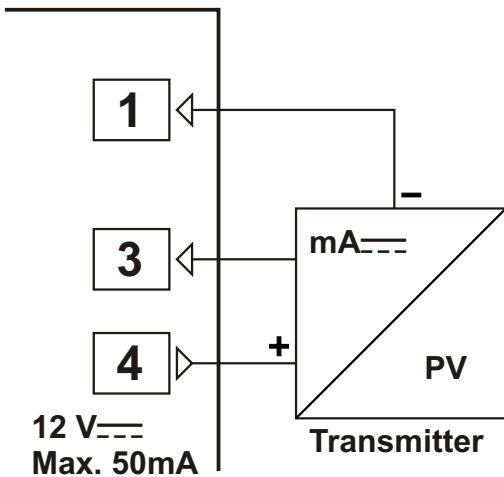

Note-1 : External power supply must be selected according to supply voltage range and required current for transmitter.
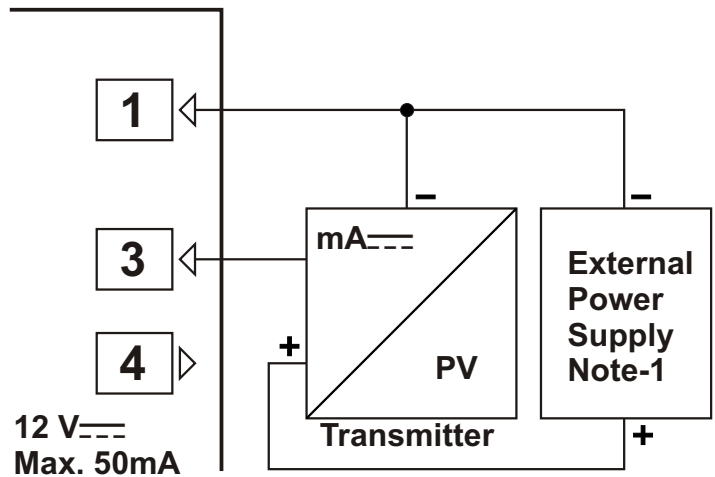
Input resistance is greater than 10M Ω for 0...50mV $\overline{}$
Input resistance is greater than 43K Ω for 0...10V $\overline{}$

3.6 Galvanic Isolation Test Values of ESM-9930 Process Controller

2000V∿ (For ESM-9930.1.....)
500V∿ (For ESM-9930.2.....)

| Supply Input | 23 24 | | Ground | 1 |

2000V∿

| 11 12 | Process Output (SSR Driver Output) | 11 12 |

2000V∿   2000V∿

| 13 14 15 | Process Output or Alarm Output-2 Relay | 13 14 15 |

2000V∿   2000V∿

| 16 17 18 | Alarm Output-1 Relay | 16 17 18 |

2000V∿

| 2 3 | Analog Inputs | 2 3 |

2000V∿

| 4 | 12V ⎓ Voltage Output | 4 |
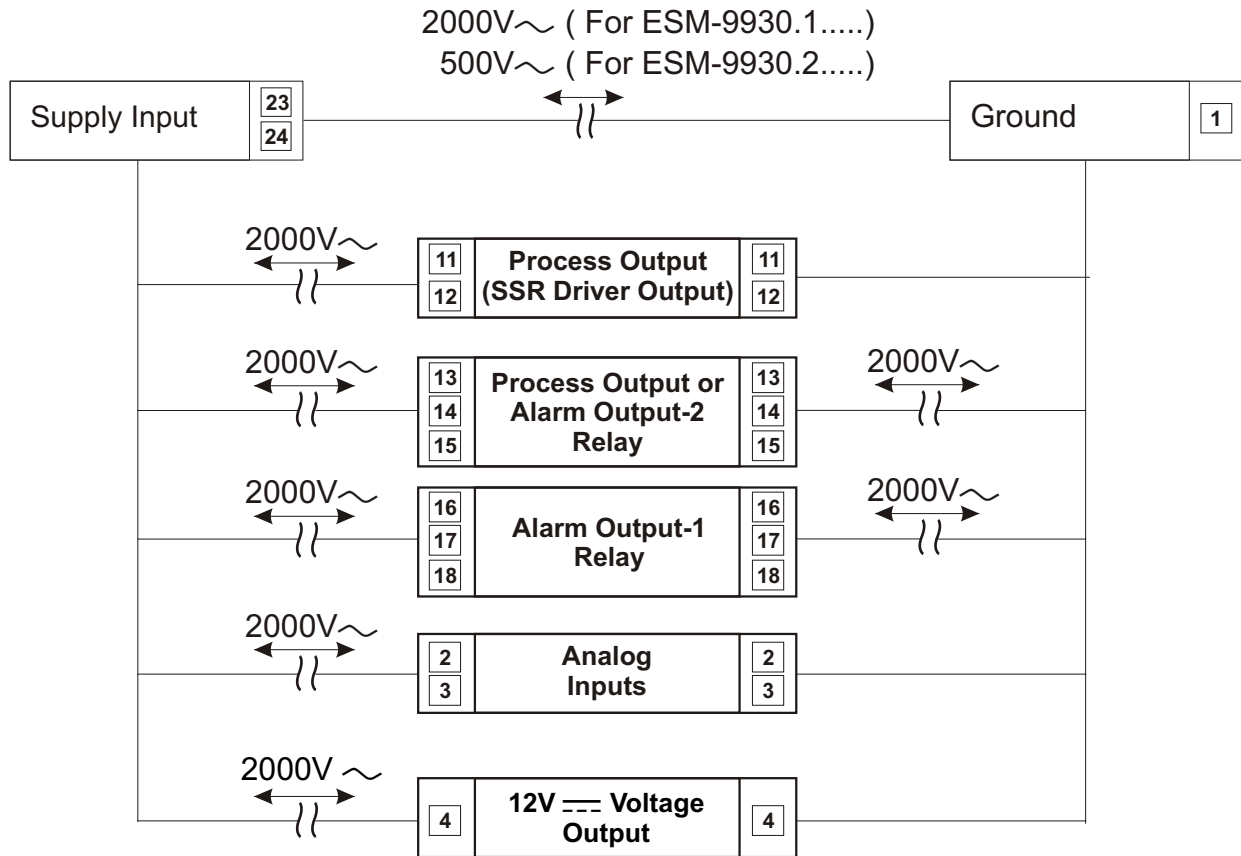
4. Connection Wirings for Outputs in ESM-9930 Process Controller

4.1 Process Output (SSR Driver Output) Connection

Device

12 –

11 +

Last Control Element (SSR)

15-18 V ⎓
Max. 20mA

L N

⚠ **Fuse**

Load
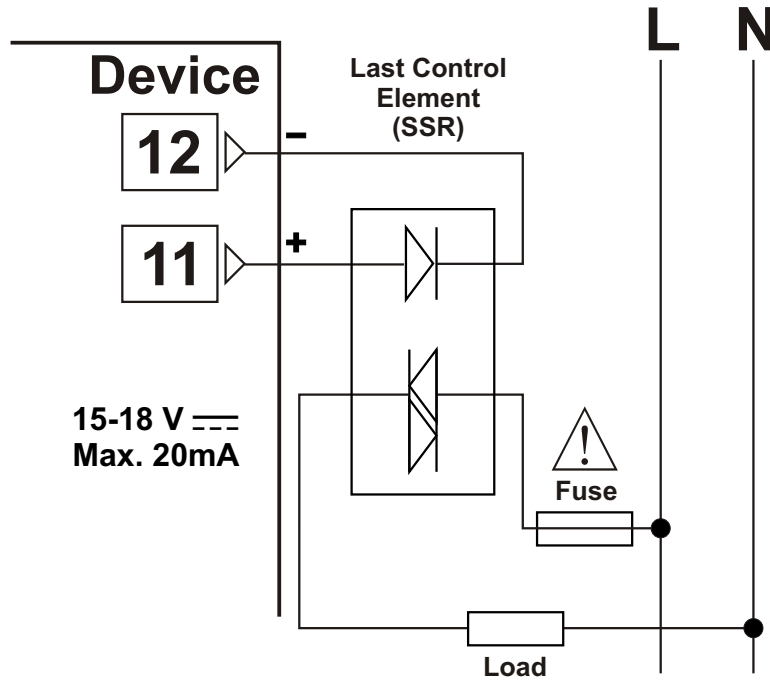
⚠ Fuses must be selected according to the applications.

4.2 Alarm Output-1 Relay Connection
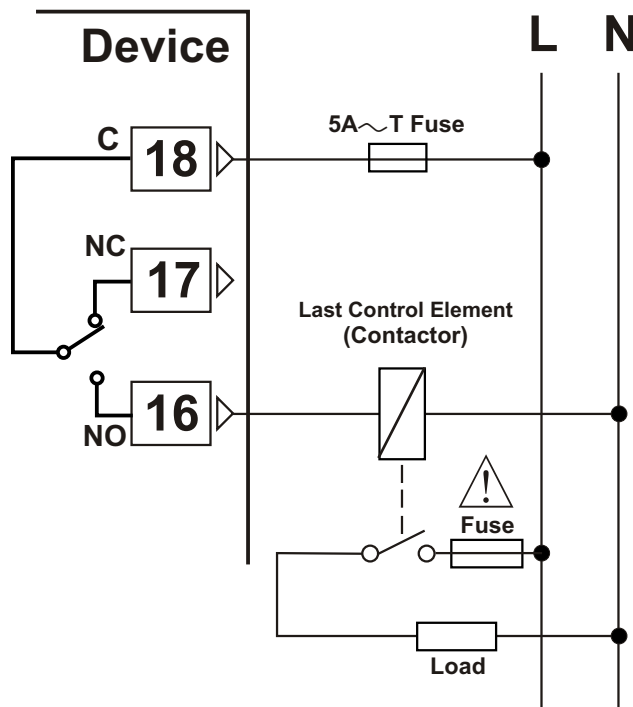
Device

L N

C **18** — 5A〜T Fuse

NC **17**

16 NO

Last Control Element (Contactor)

⚠ **Fuse**

Load

⚠ Fuses must be selected according to the applications.

Device   **L**   **N**

C   **15**

5A〜T Fuse

NC   **14**

Last Control Element
(Contactor)

13
NO

⚠ **Fuse**

Load
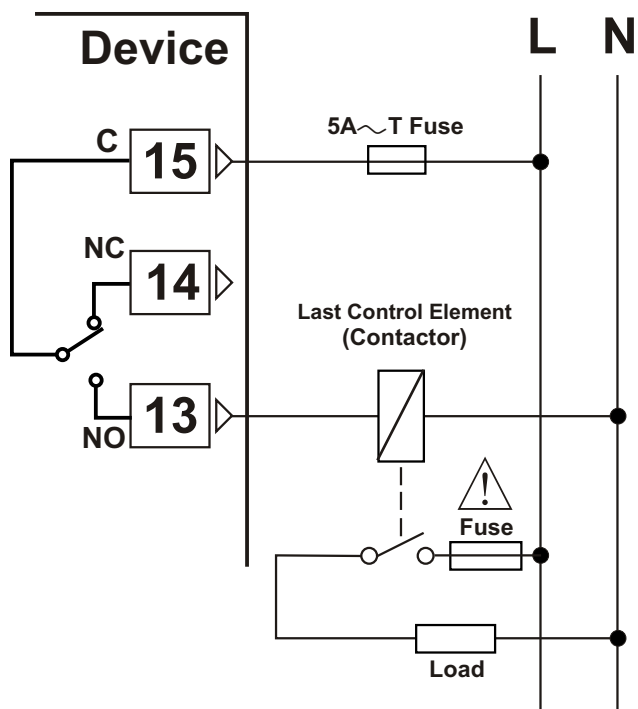
⚠ **Fuses must be selected according to the applications.**

5.1 Definition of Front Panel

Led indication of Automatic Operation (for Process Output) LED

Led indication of Manual Operation (for Process Output) LED

LED indication of °C:Centigrade Unit

LED indication of °F Fahrenheit Unit

LED indication of units other than °C and °F

LED indication of Process status

LED indication of Output-1 status

LED indication of Output-2 status

LED indication of AT , Autotune is active

LED indication of Process Set value

LED indication of Alarm-1 Set value

LED indication of Alarm-2 Set value

°C
°F
V
AT
PSET   PO   M   A
ASET1   AO1
ASET2   AO2

P   AT▼   A/M▲   SET←

Process Controller

EMKO   *ESM-9930*

Displays Process Value (PV) and Parameter

Displays Process Set Value(SV) and Parameter

For details, refer to Section 6.1 (Process and Alarm Set Parameters) and 6.2.2 (Function Selection for Top and Bottom Display)

Menu button
This button is used to access to the all menus and to move up to another menu in the menu list

This button is used to access to the process and alarm set values and it is used as OK button in program parameters

Note-1
This button is used to increase the value and access to the menu pages (menu changing back button). Also it is AT (Auto Tune Yes/No) button. For details on ⟦Attn⟧ parameter, refer to Section 6.2.1

Note-1
This button is used to increase the value and access to the menu pages (menu changing next button). Also it is Automatic or Manual Operation Form Selection button

Note-1: If increment or decrement button is pressed for 5 seconds continuously, increment and decrement number become 10, if increment or decrement button is pressed for 10 seconds continuously, increment and decrement number become 100.

5.2 Observation of Software Revision on the Bottom Display When Power Is On

When the power is applied to the device all led indicators and display segments are momentarily illuminated for testing. Software revision number of the controller is momentarily illuminated on the bottom display.

" rU" ☐ Revision   Revision number
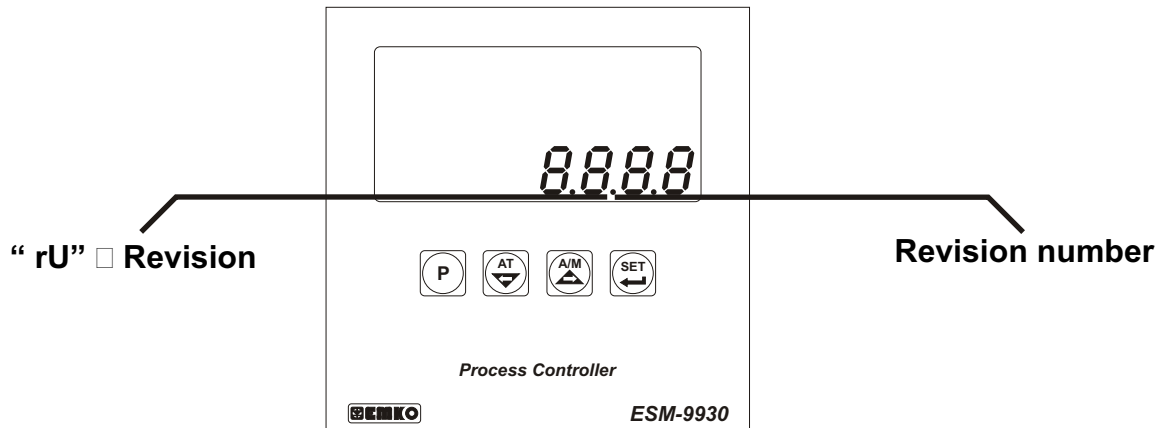
When power is on, display of the device is like below:
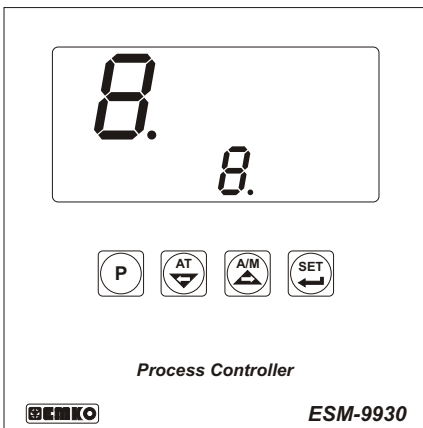
First segments of top and bottom displays are tested

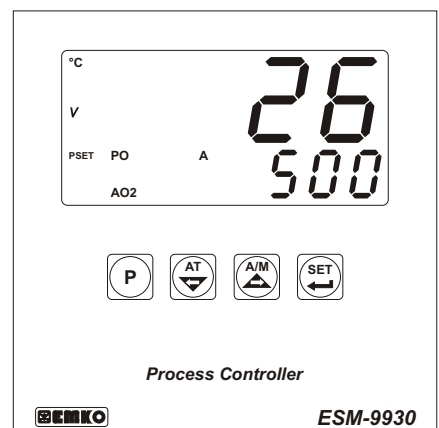Second segments of top and bottom displays are tested.

Third segments of top and bottom displays are tested.

Fourth segments of top and bottom displays are tested.

All leds are energised. On bottom display revision number is shown. Revision number is "06".
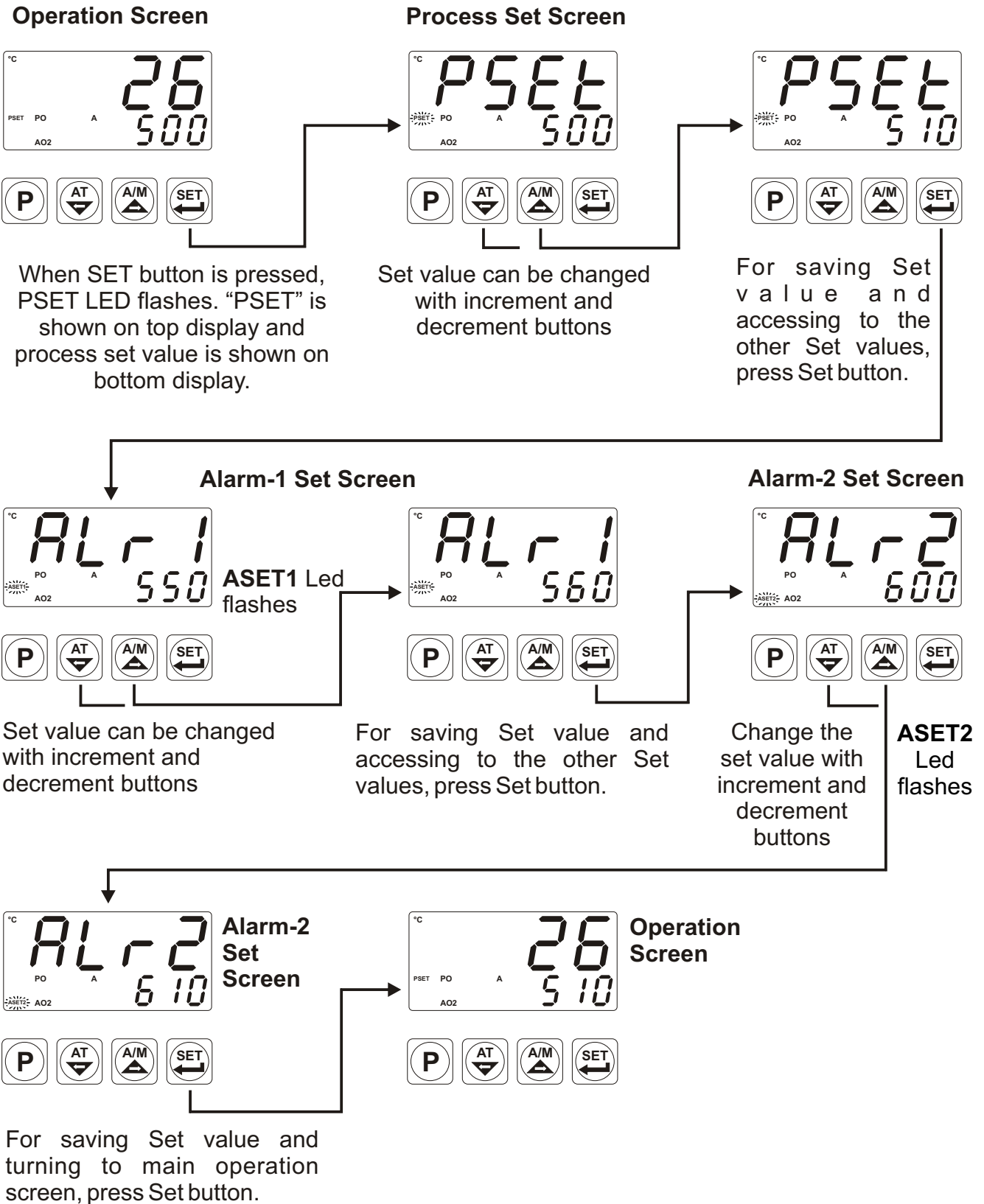
Main operation screen is shown

⚠ **If there is an unexpected situation while opening the device, power off the device and inform a qualified personnel.**
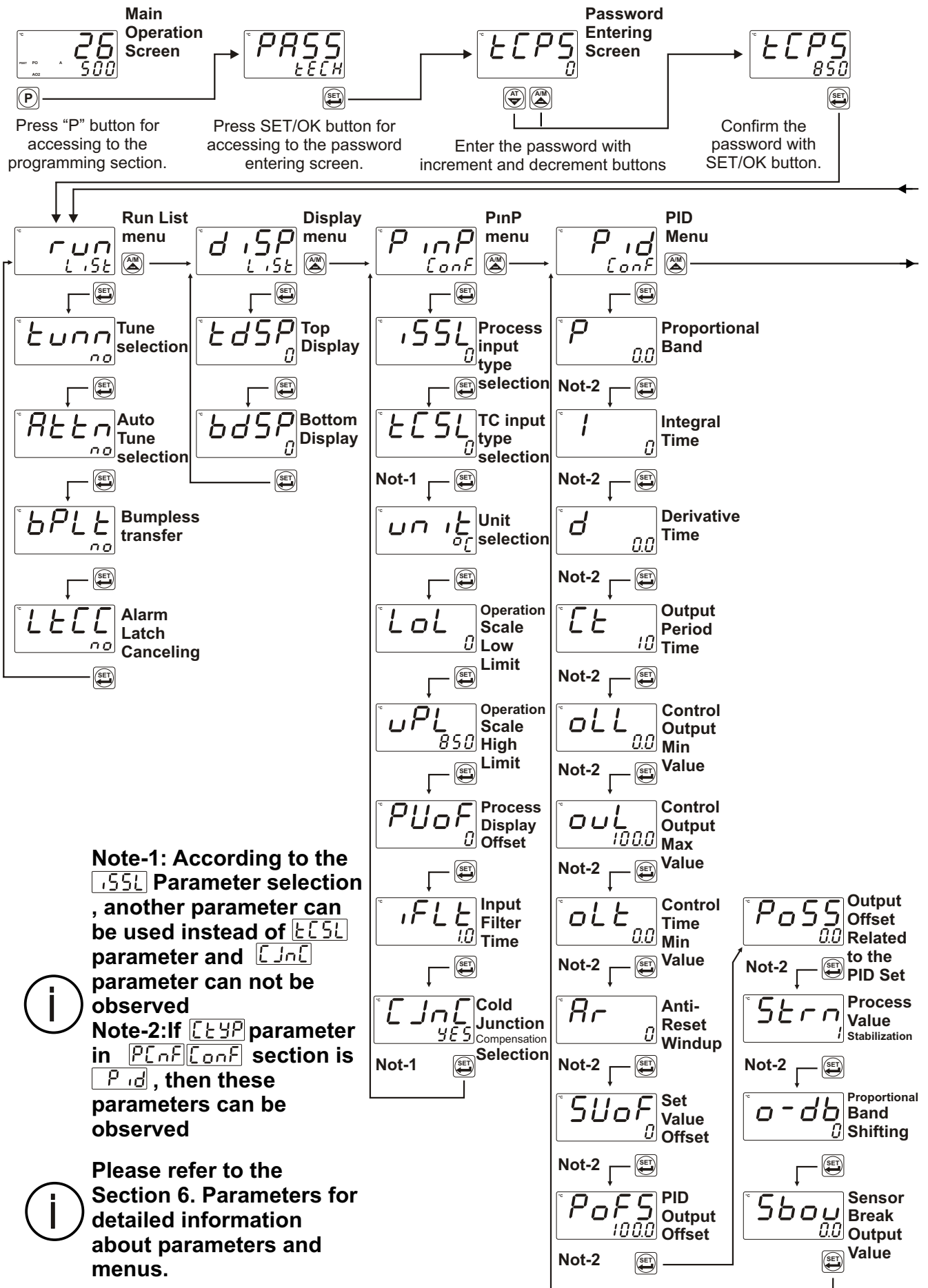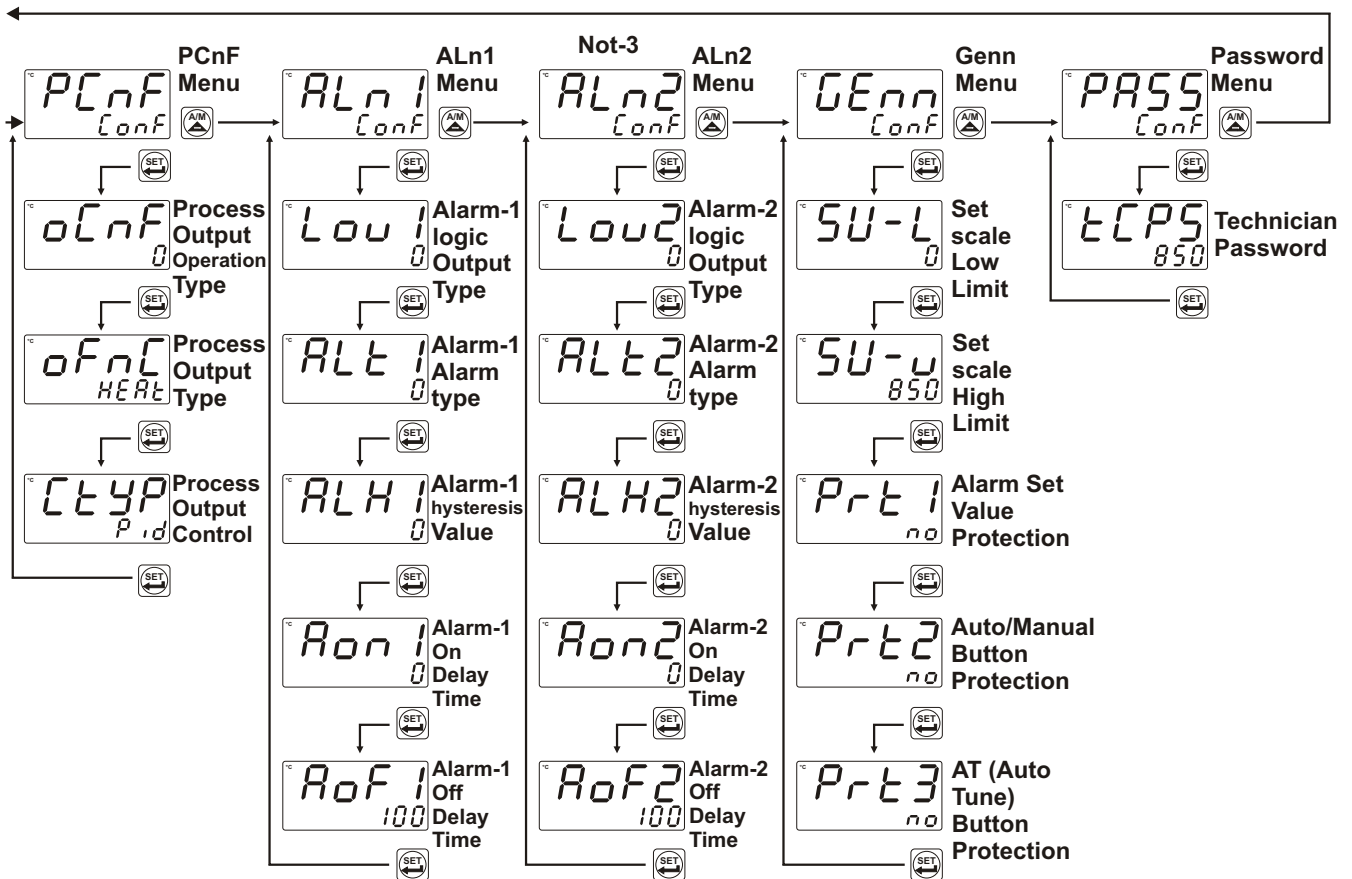
5.3 Adjustment of Process and Alarm Set Values

Operation Screen

Process Set Screen

When SET button is pressed, PSET LED flashes. "PSET" is shown on top display and process set value is shown on bottom display.

Set value can be changed with increment and decrement buttons

For saving Set value and accessing to the other Set values, press Set button.

Alarm-1 Set Screen

Alarm-2 Set Screen

ASET1 Led flashes

Set value can be changed with increment and decrement buttons

For saving Set value and accessing to the other Set values, press Set button.

Change the set value with increment and decrement buttons

ASET2 Led flashes

Alarm-2 Set Screen

Operation Screen

For saving Set value and turning to main operation screen, press Set button.

ⓘ If oCnF parameter in PCnF menu is ⬚0, ALr2 is accessible. If it is ⬚1, this parameter is not accessible and device turns to main operation screen.

ⓘ Press menu button "P" any time to exit without saving the Set value.

5.4 Easy Access Diagram For Program Parameters

Main Operation Screen

`26` / `500`

Press "P" button for accessing to the programming section.

`PASS` / `tECH`

Press SET/OK button for accessing to the password entering screen.

Password Entering Screen

`tCPS` / `0`

Enter the password with increment and decrement buttons

`tCPS` / `850`

Confirm the password with SET/OK button.

Run List menu — `run` / `LiSt`

- `tunn` / `no` — Tune selection
- `Attn` / `no` — Auto Tune selection
- `bPLt` / `no` — Bumpless transfer
- `LtCC` / `no` — Alarm Latch Canceling

Display menu — `diSP` / `LiSt`

- `tdSP` / `0` — Top Display
- `bdSP` / `0` — Bottom Display

PınP menu — `PinP` / `Conf`

- `iSSL` / `0` — Process input type selection
- `tCSL` / `0` — TC input type selection
- **Not-1**
- `unit` / `oC` — Unit selection
- `LoL` / `0` — Operation Scale Low Limit
- `uPL` / `850` — Operation Scale High Limit
- `PUoF` / `0` — Process Display Offset
- `iFLt` / `1.0` — Input Filter Time
- `CJnC` / `YES` — Cold Junction Compensation Selection
- **Not-1**

PID Menu — `Pid` / `Conf`

- `P` / `0.0` — Proportional Band
- **Not-2**
- `I` / `0` — Integral Time
- **Not-2**
- `d` / `0.0` — Derivative Time
- **Not-2**
- `Ct` / `10` — Output Period Time
- **Not-2**
- `oLL` / `0.0` — Control Output Min Value
- **Not-2**
- `ouL` / `100.0` — Control Output Max Value
- **Not-2**
- `oLt` / `0.0` — Control Time Min Value
- **Not-2**
- `Ar` / `0` — Anti-Reset Windup
- **Not-2**
- `SUoF` / `0` — Set Value Offset
- **Not-2**
- `PoFS` / `100.0` — PID Output Offset
- **Not-2**

- `PoSS` / `0.0` — Output Offset Related to the PID Set
- **Not-2**
- `Strn` / `1` — Process Value Stabilization
- **Not-2**
- `o-db` / `0` — Proportional Band Shifting
- `Sbou` / `0.0` — Sensor Break Output Value

Note-1: According to the `iSSL` Parameter selection, another parameter can be used instead of `tCSL` parameter and `CJnC` parameter can not be observed

Note-2: If `CtYP` parameter in `PCnF` `ConF` section is `Pid`, then these parameters can be observed

Please refer to the Section 6. Parameters for detailed information about parameters and menus.

5.4 Easy Access Diagram For Program Parameters

PCnF Menu	ALn1 Menu	Not-3 / ALn2 Menu	Genn Menu	Password Menu
PCnF ConF	**ALn1** ConF	**ALn2** ConF	**GEnn** ConF	**PASS** ConF
oCnF 0 — Process Output Operation Type	**Lou1** 0 — Alarm-1 logic Output Type	**Lou2** 0 — Alarm-2 logic Output Type	**SU-L** 0 — Set scale Low Limit	**tCPS** 850 — Technician Password
oFnC HEAt — Process Output Type	**ALt1** 0 — Alarm-1 Alarm type	**ALt2** 0 — Alarm-2 Alarm type	**SU-u** 850 — Set scale High Limit	
CtYP Pid — Process Output Control	**ALH1** 0 — Alarm-1 hysteresis Value	**ALH2** 0 — Alarm-2 hysteresis Value	**Prt1** no — Alarm Set Value Protection	
	Aon1 0 — Alarm-1 On Delay Time	**Aon2** 0 — Alarm-2 On Delay Time	**Prt2** no — Auto/Manual Button Protection	
	AoF1 100 — Alarm-1 Off Delay Time	**AoF2** 100 — Alarm-2 Off Delay Time	**Prt3** no — AT (Auto Tune) Button Protection	

ⓘ **Note-3:This menu can be observed if** oCnF **parameter in** PCnF ConF **section is selected** 0

ⓘ **Please refer to the Section 6.Parameters for detailed information about Parameters and menus.**

5.5 Accessing to the Technician Menu

The parameters have been divided into groups according to their functions. Every group has a title and firstly user must determine the title (menu) for accessing to the parameters. Refer to the parameters section for detailed information about parameters.

Operation Screen   **Technician Menu Entering Screen**
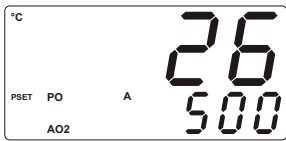
When "P" button is pressed, Technician Menu Entering screen is shown.

When Set button is pressed, Technician Password Entering Screen is shown

If password is not 0, Technician Password Entering Screen is shown.

Enter password with increment and decrement buttons

When `tCPS` screen is shown, technician parameters can be seen by pressing SET button without entering password. But parameters can not be changed. Please refer to Section 6.2.9. (Technician Password)
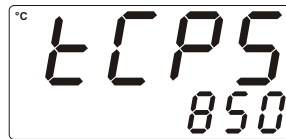
Technician Password
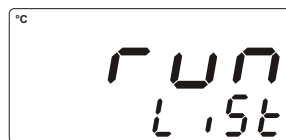
Press Set button to confirm password

Run List Menu
Selection of operation form

Technician can access to the following menu by pressing menu changing next button

DiSP List Menu
It defines which parameter will be shown on top and bottom display

Technician can access to the former menu by pressing menu changing back button.

Technician can access to the following menu by pressing menu changing next button
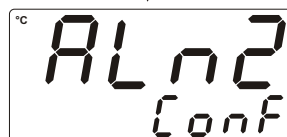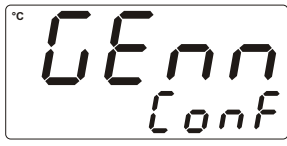
PINP CONF Menu
Configuration parameters of process input

Technician can access to the former menu by pressing menu changing back button.

Technician can access to the following menu by pressing menu changing next button

PID CONF Menu
PID algorithm parameters

Technician can access to the former menu by pressing menu changing back button.

Technician can access to the following menu by pressing menu changing next button

PCnF CONF Menu
Configuration parameters of Process outputs

Technician can access to the former menu by pressing menu changing back button.

Technician can access to the following menu by pressing menu changing next button
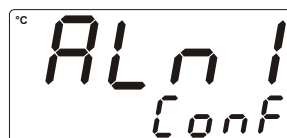
ALn1 CONF Menu
Configuration parameters of ALARM -1 output

Technician can access to the former menu by pressing menu changing back button.

Technician can access to the following menu by pressing menu changing next button

This parameter is accessible if oCnF parameter in PCnF menu is 0

ALn2 CONF Menu
Configuration parameters of ALARM -2 Output

Technician can access to the former menu by pressing menu changing back button.

Technician can access to the following menu by pressing menu changing next button

GENN CONF Menu
General parameters

Technician can access to the former menu by pressing menu changing back button.

Technician can access to the following menu by pressing menu changing next button

This menu is not accessible if Technician parameters are accessed by pressing SET button without entering technician password
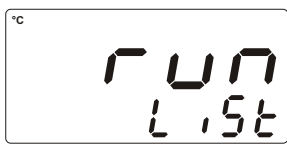
PASS CONF Menu
Technician password

Technician can access to the former menu by pressing menu changing back button.

Technician can access to the following menu by pressing menu changing next button

Run List Menu
After PASS CONF menu, beginning of the menu list is shown.

Technician can access to the former menu by pressing menu changing back button.

Press Menu button to exit from Menu list and turn back to operation screen

Continue to press menu changing next and back buttons to change the menu pages

By pressing SET button, technician can access to the menu page and to all parameters in this menu page.

5.6 Changing and Saving Parameters

Example-1 : To change Process Input Type parameter `ıSSL`

Process Input Type parameter `ıSSL` is in **"PınP Conf"** menu, so PınP ConF menu must be accessed firstly in order to reach `ıSSL` parameter.

°C **Sbr 500** — PSET A

Operation Screen

[P] [AT ▼] [A/M ▲] [SET ↵]

When "P" button is pressed, Technician Menu Entering screen is shown.

°C **PASS tECH**

Technician Menu Entering Screen

[P] [AT ▼] [A/M ▲] [SET ↵]

When Set button is pressed, Technician Password Entering Screen is shown

°C **tCPS 0**

[P] [AT ▼] [A/M ▲] [SET ↵]

If password is not 0, Technician Password Entering Screen is shown.

Enter password with increment and decrement buttons

°C **tCPS 850**

Technician Password

[P] [AT ▼] [A/M ▲] [SET ↵]

Press Set button to confirm password

When `tCPS` screen is shown, technician parameters can be seen by pressing SET button without entering password. But parameters can not be changed. Please refer to Section 6.2.9. (Technician Password)

°C **run LıSt**

Run List Menu
Selection of operation form

[P] [AT ▼] [A/M ▲] [SET ↵]

Technician can access to the following menu by pressing menu changing next button

°C **dıSP LıSt**

DiSP List Menu
It defines which parameter will be shown on top and bottom display

[P] [AT ▼] [A/M ▲] [SET ↵]

Technician can access to the following menu by pressing menu changing next button

Technician can access to the former menu by pressing menu changing back button.

°C **PınP ConF**

PINP CONF Menu
Configuration parameters of process input

Technician can access to the former menu by pressing menu changing back button.

[P] [AT ▼] [A/M ▲] [SET ↵]

Press Set button to access to PınP ConF menu

°C

ı55L
₁

Process Input Type Selection
`ı55L` is `1` means, input type is RTD.

[P] [AT ▼] [A/M ▲] [SET ↵]

Parameter can be changed with increment and decrement buttons

°C

ı55L
₀
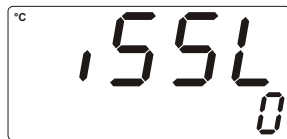
Process Input Type Selection
TC input type is selected

[P] [AT ▼] [A/M ▲] [SET ↵]

Press Set button to confirm the value and access to the next parameter.

°C

tC5L
₀
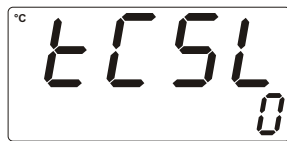
TC Input Type Selection

PINP CONF Menu
When Menu button is pressed, technician can access to the menu pages.

[P] [AT ▼] [A/M ▲] [SET ↵]

Press Set button to access to the next parameter

°C

PınP
ConF

°C

un ıt
°C

[P] [AT ▼] [A/M ▲] [SET ↵]

For accessing to the other menus, press menu changing next and back buttons.

[P] [AT ▼] [A/M ▲] [SET ↵]

Unit Selection

Press Menu button for turning to the operation screen

°C

26
500

PSET PO   A

AO2

[P] [AT ▼] [A/M ▲] [SET ↵]
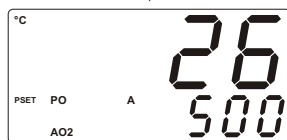
Operation Screen

Example-2 : Changing operation form from **"Auto"** to **"Manual"** and adjustment of % output.

If operation form is **Auto (Close-Loop Control)** and there is an output with PID or ON/OFF control form, device controls the process outputs by calculating the % output values automaticaly.

If operation form is **Manual (Open-Loop Control)** and there is an output with PID control form, then % output value can be adjusted with increment and decrement buttons.

If operation form is **Manual (Open-Loop Control),** and there is an output with ON/OFF control form, then %output value can be adjusted ⎡ oFF ⎤, ⎡HERE⎤ or ⎡CooL⎤ with decrement and increment buttons.

If operation form is Manual, % output value is shown on bottom display whatever ⎡bdSP⎤ parameter is.

ⓘ **Auto/Manual Operation Form can be adjusted Auto or Manual with A/M button from front panel. For using this button, Auto/Manual Operation Type Selection Parameter ⎡Prt2⎤ must be ⎡ no ⎤ .**
For details on this parameter, refer to Section 6.2.8 General Parameters.
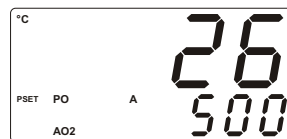
Operation Screen

While it operates in automatic mode, if auto/manual changing button is pressed, it starts to operate in manual mode
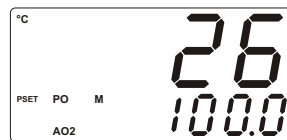
Operation Screen

It operates in Manual Mode

%Output value is shown on bottom display

Press SET button

If auto/manual changing button is pressed, it starts to operate in Auto Mode

Operation Screen
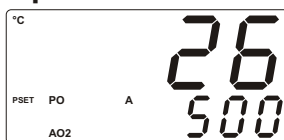
It operates in Auto Mode

Process Set Screen

PSET Led flashes

Press SET button

Alarm-1 Set Screen

ASET1 Led flashes

`°C` `ALr1` `PO` `M` `AO2` `55.0`

Press SET button

[P] [AT ▼] [A/M ▲] [SET ↵]

ASET2 Led flashes

`°C` `ALr2` `PO` `M` `AO2` `600`

Alarm-2 Set Screen

This parameter is accessible if `oCnF` parameter in PCnF menu is `0` . It is not accessible if `oCnF` parameter is `1` .

Press SET button

[P] [AT ▼] [A/M ▲] [SET ↵]

Manual Led flashes

`°C` `26` `PSET` `PO` `M` `AO2` `100.0`

Operation Screen

%Output value can be changed with increment and decrement buttons.

[P] [AT ▼] [A/M ▲] [SET ↵]

`°C` `26` `PSET` `PO` `M` `AO2` `80.0`

Operation Screen

Press Set button to confirm the value and turn to operation screen

[P] [AT ▼] [A/M ▲] [SET ↵]

`°C` `26` `PSET` `PO` `M` `AO2` `80.0`

Manual Led stops flashing

[P] [AT ▼] [A/M ▲] [SET ↵]

Operation Screen

Example-3 : To change proportional band parameter ꟼ▭

Proportional band parameter ꟼ▭ is in **"Pıd Conf"** menu, so "Pıd Conf" menu must be accessed firstly.

Operation Screen

Technician Menu Entering Screen

°C
26
PSET PO A
500
AO2

°C
PASS
tECH

°C
tCPS
0

When "P" button is pressed, Technician Menu Entering screen is shown.

When Set button is pressed, Technician Password Entering Screen is shown

If password is not 0, Technician Password Entering Screen is shown.

Enter password with increment and decrement buttons

When **tCPS** screen is shown, technician parameters can be seen by pressing SET button without entering password. But parameters can not be changed. Please refer to Section 6.2.9 (Technician Password)

°C
tCPS
850

Technician Password

Press Set button to confirm the password

°C
run
List

Run List Menu
Selection of operation form

Technician can access to the following menu by pressing menu changing next button

°C
dıSP
List

DiSP List Menu
It defines which parameter will be shown on top and bottom display

Technician can access to the former menu by pressing menu changing back button.

Technician can access to the following menu by pressing menu changing next button

**PINP CONF Menu**
Configuration parameters of process input

Technician can access to the former menu by pressing menu changing back button.

Technician can access to the following menu by pressing menu changing next button

PID CONF Menu
PID algorithm parameters

Technician can access to the former menu by pressing menu changing back button.

Enter Set button to access to Pıd ConF menu
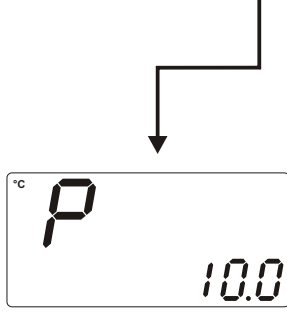
Proportional Band Selection

Parameter can be changed with increment and decrement buttons
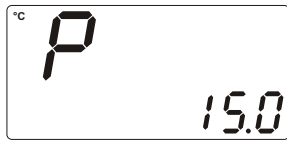
Proportional Band Selection

Press Set button to confirm the value and access to the next parameter

°C

I

100
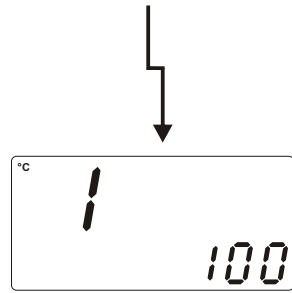
Integral Time

Pid CONF Menu
When Menu button is pressed, technician can access to the menu pages.

[P] [AT ▼] [A/M ▲] [SET ↵]

Press Set button to access to the next parameter

°C

Pid
ConF

[P] [AT ▼] [A/M ▲] [SET ↵]

For accessing to the other menus, press menu changing next and back buttons.

°C

d

25.0

[P] [AT ▼] [A/M ▲] [SET ↵]
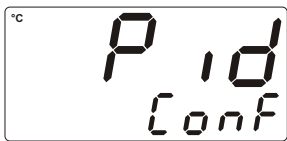
Derivative Time

Press Menu button to turn to the operation screen

°C

26
500

PSET   PO   A

AO2

[P] [AT ▼] [A/M ▲] [SET ↵]
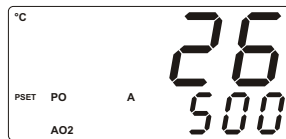
Operation Screen

Example-4 : To change ⎓Voltage / Current Input Calibration Type Selection parameter `uCAL` in **"PınP Conf"** menu

`uCAL` Parameter is in "PınP ConF" menu. For accessing to this parameter, technician must access to "PınP ConF" menu firstly. In this example, changing input type of a device from thermocouple to ⎓Voltage / Current and dual point calibration selection is shown.

Operation Screen

°C
26
PSET PO   A
500
AO2

[P] [AT ▼] [A/M ▲] [SET ↵]

When "P" button is pressed, Technician Menu Entering screen is shown.

Technician Menu Entering Screen

°C
PASS
tECH

[P] [AT ▼] [A/M ▲] [SET ↵]

When Set button is pressed, Technician Password Entering Screen is shown

°C
tCPS
0

[P] [AT ▼] [A/M ▲] [SET ↵]

If password is not 0, Technician Password Entering Screen is shown.

Enter password with increment and decrement buttons

When `tCPS` screen is shown, technician parameters can be seen by pressing SET button without entering password. But parameters can not be changed. Please refer to Section 6.2.9 (Technician Password)

°C
tCPS
850

Technician Password

[P] [AT ▼] [A/M ▲] [SET ↵]

Press Set button to confirm the password

°C
run
LıSt

Run List Menu
Selection of operation form

[P] [AT ▼] [A/M ▲] [SET ↵]

Technician can access to the following menu by pressing menu changing next button

°C
dıSP
LıSt

DiSP List Menu
It defines which parameter will be shown on top and bottom display

Technician can access to the former menu by pressing menu changing back button.

[P] [AT ▼] [A/M ▲] [SET ↵]

Technician can access to the following menu by pressing menu changing next button

PINP CONF Menu
Configuration parameters of
process input

Technician can access to the
former menu by pressing
menu changing back button.

Enter PınP ConF menu by
pressing Set button

Process Input Type Selection
For accessing to ⎕uCAL⎕ parameter,
⎕ıSSL⎕ parameter must be ⎕ 2⎕ .If
it is not ⎕ 2⎕ ,change the value as
⎕ 2⎕ With increment button.

Press Set button to confirm the
value and access to the next
parameter
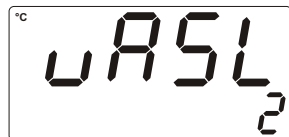
**‗‗Voltage / Current Input
Type Selection**

Press Set button to access
to the next parameter

Decimal Point Position

Press Set button to access
to the next parameter
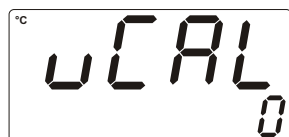
**‗‗Voltage / Current Input
Calibration Type Selection**

Parameter can be changed with
increment and decrement
buttons

°C

uCAL
₁

═══ **Voltage / Current Input Calibration Type Selection**

[P] [AT ▼] [A/M ▲] [SET ↵]

Press Set button to confirm the value and access to the next parameter

°C

tPoL
-199.9
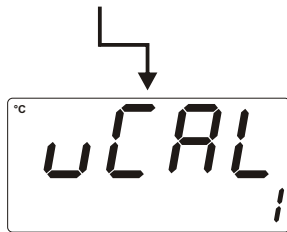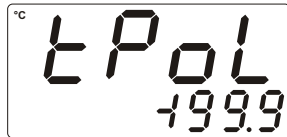
Minimum value for selectable dual point calibration

PINP CONF Menu
When Menu button is pressed, technician can access to the menu pages

[P] [AT ▼] [A/M ▲] [SET ↵]

Press Set button to access to the next parameter

°C

PinP
ConF

°C

tPoH
999.9

[P] [AT ▼] [A/M ▲] [SET ↵]

[P] [AT ▼] [A/M ▲] [SET ↵]

Maximum value for selectable dual point calibration

For accessing to the other menus, press menu changing next and back buttons.

Press Menu button to turn to the operation screen

°C

-199.9

PSET   PO   A

AO2   **50.0**

[P] [AT ▼] [A/M ▲] [SET ↵]
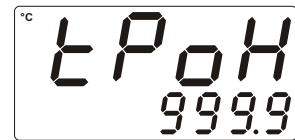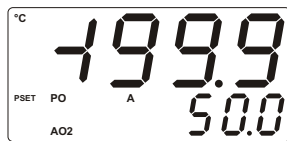
Operation Screen

6. Parameters

Parameters are divided into two groups. They are Process / Alarm Set parameters and Technician parameters. Technician parameters are grouped into subgroups according to their functions. The subgroups are named as menu pages.

6.1 Process / Alarm SET Parameters

`PSEt` Process set value

`PSEt` Process set value can be adjusted from minimum value of set scale `SU-L` to maximum value of set scale `SU-u`

`ALr1` Set value for alarm output-1

`ALr1` Process set value can be adjusted from minimum value of set scale `SU-L` to maximum value of set scale `SU-u`

`ALr2` Set value for alarm output-2. It is accessible if `oCnF` parameter is `0`

`ALr2` Process set value can be adjusted from minimum value of set scale `SU-L` to maximum value of set scale `SU-u`

(i) **For changing Alarm Output-1 and Alarm Output-2 Set values, Alarm Set Values protection parameter `Prt1` must be `no`**

`run`
`List`

`tunn` **TUNE SELECTION**
By selecting one of the methods below, device can determine the PID parameters.

`no` Device operates according to the defined PID parameters

`Atun` **Auto tune** (Limit Cycle Tuning) operation

`Stun` **Self tune** (Step Response Tuning) operation

`At.St` **Auto-Self Tune**
Self Tune operation is performed, if the conditions are realized when power on firstly. In normal operation, it controls the tune conditions in **Auto Tune** selection which explained below. If any of the conditions is realized, it performs the **Auto Tune** operation.

`Attn` **AUTOMATIC TUNE SELECTION**

`no` Device does not do `Atun` (Limit Cycle Tuning) operation or while `Atun` operation runs, this selection is adjusted `no` and **Auto Tune** operation is canceled.

`YES` If `tunn` parameter is `Atun` or `At.St`, when the conditions for Auto Tune parameter that are explained in Tune Methods section are realized, it starts to perform Auto Tune (Limit Cycle Tuning) operation.

(i) **By pressing AT button, Automatic Tune can be selected** `YES` **or** `no`
For being able to use AT button, AT (Auto Tune) Button protection parameter `Prt3` **must be** `no` **. (For details, refer to Section 6.2.8 General Parameters)**

TUNE METHODS

There are 2 different methods for determining PID parameters by the device. These are **Auto tune** (Limit Cycle Tuning) and **Self Tune** (Step Response Tuning) methods.

Determining of PID parameters with **Auto Tune** is started in these conditions :
1- By the user in any time,
2- By the device when system gets unstable and starts oscillation
If process value is out of **Set ± Process value stabilisation** $\boxed{5 t r n}$ value (Please refer to Section 6.2.4) and starts to oscillates, then device changes the $\boxed{Rt t n}$ Parameter to $\boxed{YE5}$ and Auto Tune operation is started.

3- After changing set value, if difference between newly defined set value and former set value is greater than proportional band, device will start it.
　　If set value is changed to a value that is greater than;
　　　± [Scale * (Heating or Cooling Proportional Band)] /1000 value,
　　　$\boxed{Rt t n}$ Parameter is adjusted $\boxed{YE5}$ by the device and **Auto Tune** operation is started.

Example -1 : Starting Auto Tune operation by the user ;
●　　　Enter technician menu.
●　　　Adjust tune selection parameter $\boxed{t u n n}$ in "run List" menu , **Auto Tune** $\boxed{Rt u n}$ Or **Auto-Self Tune** $\boxed{Rt.5t}$
●　　　Adjust automatic tune selection parameter $\boxed{Rt t n}$ in "run List" menu $\boxed{YE5}$ And return to main operation screen.
●　　　Observe that "AT" led is active.

If **Auto Tune** operation finishes without any problem, device saves the PID coefficients to memory and continue to run. $\boxed{Rt t n}$ Parameter is adjusted $\boxed{n o}$ automatically.

Canceling **Auto Tune** operation:

1- If sensor breaks ;
2- If **Auto Tune** operation can not be completed in 8 hours
3- If user adjusts $\boxed{t u n n}$ parameter $\boxed{n o}$ or $\boxed{5 t u n}$
4- If user adjusts $\boxed{Rt t n}$ parameter $\boxed{n o}$
5- If process set value is changed while Tune operation is being performed
6- While Tune operation is being performed, if operation type selection is changed as "Manual" when it is "Automatic" (If operation type selection is changed as "Automatic" when it is "Manual", then Tune operation is started again)
7- If output function is changed while Tune operation is being performed (Heat☐Cool, Cool☐Heat)
8- While Tune operation is being performed, if control form is changed as "ON/OFF" when it is "PID" (If control form is changed as "PID" when it is "ON/OFF", the Tune operation is started again)

Auto Tune is canceled. Then, without doing any changes in PID parameters and $\boxed{Rt t n}$ Parameter, device continues to run with former PID parameters.

For Auto Tune (Limit Cycle Tuning) operation :
1- Tune slection parameter $\boxed{t u n n}$ in "run List" menu must be selected $\boxed{Rt u n}$ **Auto tune** or $\boxed{Rt.5t}$ **Auto-Self tune** .
2 - For being started Tune operation (Auto Tune or Self Tune) control form must be P, PI, PD or PID.
3 - If process set value is changed while Tune operation is being performed, Tune operation is canceled.

Auto Tune (Limit Cycle Tuning) operation ;
if heating or heating-cooling function and PID control form is selected, process control output runs according to heating
if cooling function and PID control form is selected, process control output runs according to cooling .
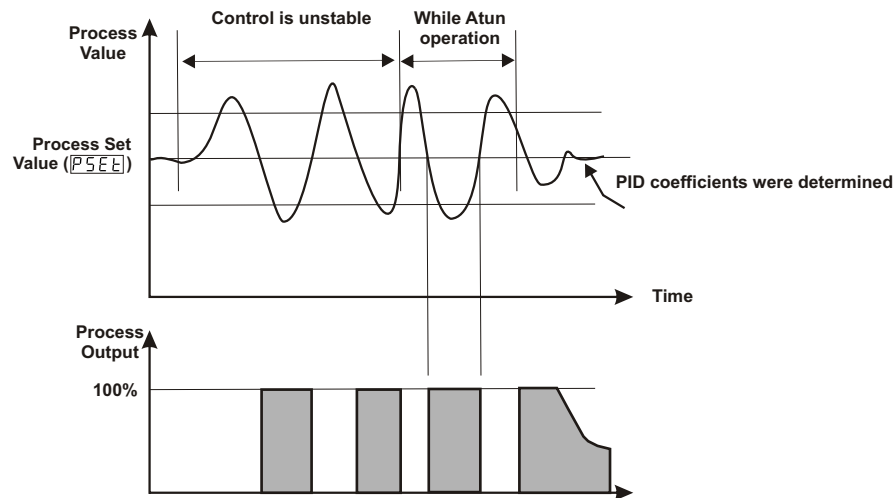
Self Tune (Step Response Tuning) :
When power is on, while process value starts to change for being equal to process set value, PID parameters are determined by the device with **Self Tune** method.

For starting **Self Tune (Step Response Tuning)** operation firstly power off and then apply power to the device. Also difference between process value and set value must be too much.

Example 2 : Determination of PID parameters with Self Tune method

- Enter technician menu
- Select tune selection parameter $\boxed{\text{tunn}}$ in "run List" menu $\boxed{\text{Stun}}$ or $\boxed{\text{At.St}}$ and turn to operation screen.
- Power off the device.
- Wait system to be in first conditions.
  (For example : Decrease of the temperature to ambient temperature while controlling the temperature)
- Apply power to the device
- See that "AT" led is active

If heating or heating-cooling function and PID control form is selected for the system;
If set value is greater than process value, process output becomes active till to the **Temperature+[(Set - Temperature) / 2]** value. When process value reaches to this value, process output reduces to 0% and it calculates the PID coefficients.

For Self Tune (Step Response Tuning) operation :
1 - Tune selection parameter $\boxed{\text{tunn}}$ in "run List" menu must be selected **Self tune** $\boxed{\text{Stun}}$ or **Auto-Self Tune** $\boxed{\text{At.St}}$
2 - For **Self Tune   (Step Response Tuning)** operation, firstly power off and then apply power to the device.
3 - For being started Tune operation (Auto Tune or Self Tune) control form must be P, PI, PD or PID.
4 - If process set value is changed while Tune operation is being performed, Tune operation is canceled

Process Value

Process Set Value ($\boxed{PSEt}$)

PID coefficients are determined and system becomes stable.

Start Value + $[\dfrac{(\text{ Set - Start Value})}{2}]$

Stun Start Value

Time

Process Output

100%
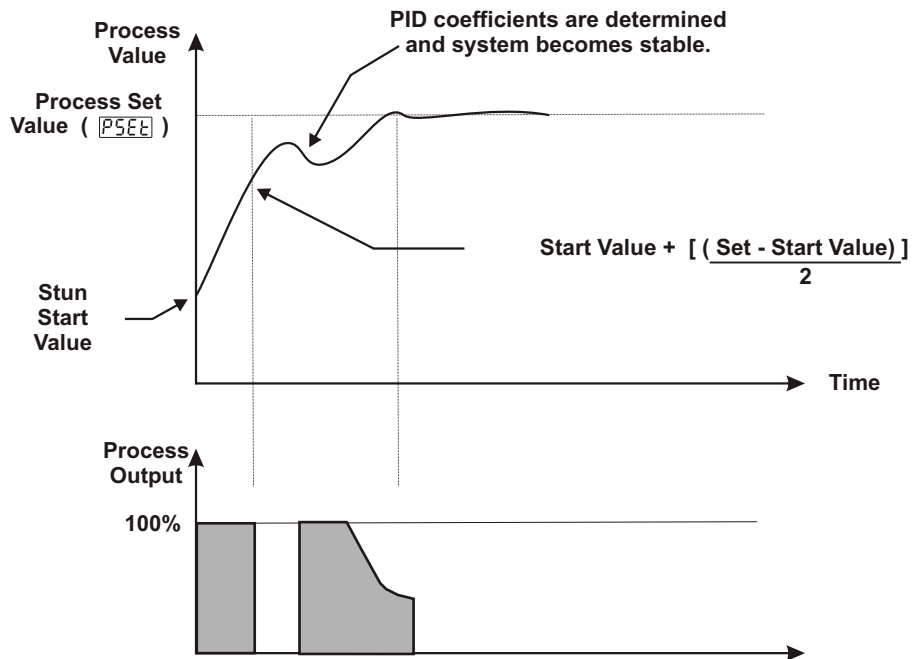
If cooling function and PID control form is selected for the system;

If set value is less than process value, process output becomes active till to the **Temperature - [(Temperature - Set) / 2]** value. When process value reaches to this value, process output is reduced to 0% and it calculates PID coefficients.
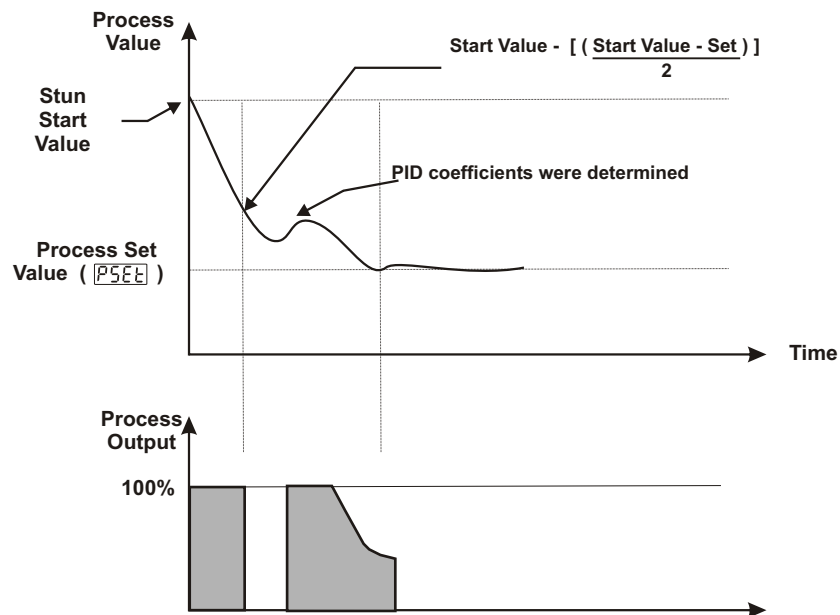
Process Value

Stun Start Value

Start Value - $[\dfrac{(\text{ Start Value - Set })}{2}]$

PID coefficients were determined

Process Set Value ($\boxed{PSEt}$)

Time

Process Output

100%

For Self Tune (Step Response Tuning) operation :

1 - Tune selection parameter $\boxed{tunn}$ in "run List" menu must be selected **Self tune** $\boxed{Stun}$ or **Auto-Self Tune** $\boxed{At.St}$

2 - For **Self Tune (Step Response Tuning)** operation, firstly power off and then apply power to the device.

3 - For being started Tune operation (Auto Tune or Self Tune) control form must be P, PI, PD or PID.

4 - If process set value is changed while Tune operation is being performed, Tune operation is canceled

If **Self Tune** operation is finished without any problem, device saves new PID parameters to memory and runs. It changes `tunn` parameter.
If `tunn` parameter is `Stun` it is changed to `no` , if it is `At.St` , it is changed to `Atun`

If **Self Tune** operation is interrupted at half, PID parameters and `tunn` parameter are not changed, device continues to run with former PID parameters. When power is off and then on, device starts to complete the **Self Tune** operation.

Canceling **Self Tune** operation :

1- If sensor breaks ;
2- If **Self Tune** operation can not be completed in 8 hours ;
3- While heating **Self Tune** operation is running, if process value becomes greater than Set value ;
4- While cooling **Self Tune** operation is running, if process value becomes less than Set value ;
5- If user selects `tunn` parameter `no` or `Atun`
6- If process set value is changed while Tune operation is being performed
7- While Tune operation is being performed, if operation type selection is changed as "Manual" when it is "Automatic"
8- If output function is changed while Tune operation is being performed (Heat☐Cool, Cool☐Heat)
9- While Tune operation is being performed, if control form is changed as "ON/OFF" when it is "PID" (If control form is changed as "PID" when it is "ON/OFF", the Tune operation is started again)

Self Tune operation is canceled. Then device continues to run with former PID parameters without changing PID parameters.

For Self Tune (Step Response Tuning) operation :
1 - Tune selection parameter `tunn` in "run List" menu must be selected **Self tune** `Stun` or **Auto-Self Tune** `At.St`
2 - For **Self Tune (Step Response Tuning)** operation, firstly power off and then apply power to the device.
3 - For being started Tune operation (Auto Tune or Self Tune) control form must be P, PI, PD or PID.
4 - If process set value is changed while Tune operation is being performed, Tune operation is canceled.

`bPLt` **BUMPLESS TRANSFER**

`no` Process output value in manual control is not taken into consideration while passing from manual control to automatic control. New control output that is measured in automatic control is applied to process output.
Last %output value is taken output value of manual control and manual control continues while passing from automatic control to manual control.

`YES` While passing from manual control to automatic control, last process output value in manual control is accepted as first process output value in automatic control and automatic control continues to run.
Last % process output value in automatic control is accepted as process output value of manual control and manual control continues to run.

`LtCC` **ALARM LATCH CANCELING**

`no` Alarm latch canceling is not performed.

`YES` If there is an alarm output with latching and there is no alarm status, latching operation will be finished by the device. When it is finished, this parameter becomes `no` Automatically.

`diSP`
`LiSt`

6.2.2 Function Selection for Top and Bottom Display

`tdSP` It defines the function of the top display. This parameter determines which value is shown in top display.

`0` Process value (PV) is shown in top display.

`1` Difference between process set value and process value (SV-PV) is shown in top display.

`bdSP` It defines the function of the bottom display. This parameter determines which value is shown in bottom display.

`0` Process set value (SV) is shown in bottom display.

`1` %Output value that is applied to process control output is shown in bottom display.

6.2.3 Process Input Type and Relevant Parameters with Process Input

| iSSL | Defines the process input type. |

0	TC input type selection
1	RTD input type selection
2	⎓Voltage / Current input type selection.

| iSSL 0 | → | tCSL | Defines type and scale of the thermocouple for TC input. It is active if TC input type is selected. |

0	L (-100°C;850°C) or (-148°F;1562°F)
1	L (-100.0°C;850.0°C) or (-148.0°F;999.9°F)
2	J (-200°C;900°C) or (-328°F;1652°F)
3	J (-199.9°C;900.0°C) or (-199.9°F;999.9°F)
4	K (-200°C;1300°C) or (-328°F;2372°F)
5	K (-199.9°C;999.9°C) or (-199.9°F;999.9°F)
6	R (0°C;1700°C) or (32°F;3092°F)
7	R (0.0°C;999.9°C) or (32.0°F;999.9°F)
8	S (0°C;1700°C) or (32°F;3092°F)
9	S (0.0°C;999.9°C) or (32.0°F;999.9°F)
10	T (-200°C;400°C) or (-328°F;752°F)
11	T (-199.9°C;400.0°C) or (-199.9°F;752.0°F)
12	B (44°C;1800°C) or (111°F;3272°F)
13	B (44.0°C;999.9°C) or (111.0°F ; 999.9°F)
14	E (-150°C;700°C) or (-238°F;1292°F)
15	E (-150.0°C;700.0°C) or (-199.9°F;999.9°F)
16	N (-200°C;1300°C) or (-328°F;2372°F)
17	N (-199.9°C;999.9°C) or (-199.9°F;999.9°F)
18	C (0°C;2300°C) or (32°F;3261°F)
19	C (0.0°C;999.9°C) or (32.0°F;999.9°F)
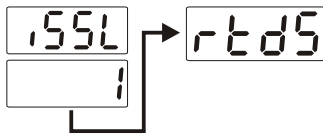
| `iSSL` `1` | → | `rtdS` | Defines type and scale of sensor for RTD input. It is active if RTD input is selected. |

| | `0` | Sensor type : PT-100
Scale: -200°C to 650°C (If unit is °C)
Scale: -328°F to 1202°F (If unit is °F) |
| | `1` | Sensor type : PT-100
Scale: -199.9°C to 650.0°C (If unit is °C)
Scale: -199.9°F ile 999.9°F (If unit is °F) |

| `iSSL` `2` | → | `uASL` | Defines input range and scale of ⎓ Voltage / Current input. It is active if ⎓ Voltage / Current is selected. |
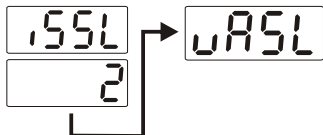
	`0`	0...50mV⎓ (-1999 ; 9999)
	`1`	0...5V⎓ (-1999 ; 9999)
	`2`	0...10V⎓ (-1999 ; 9999)
	`3`	0...20mA⎓ (-1999 ; 9999)
	`4`	4...20mA⎓ (-1999 ; 9999)

→ `dPnt` Defines point position for displays. It is active if ⎓ Voltage / Current input is selected.

	`0`	No point
	`1`	Between first and second digits "000.0"
	`2`	Between second and third digits "00.00"
	`3`	Between third and fourth digits "0.000"

→ `uCAL` It is active when ⎓ Voltage / Current input is selected. It determines calibration type.

	`0`	Fixed dual point calibration is done. It does not allow to adjust minimum and maximum value of calibration points. It can be adjusted from -1999 to 9999
	`1`	It allows to do selectable dual point calibration.
	`2`	It allows to define 16 calibration points.
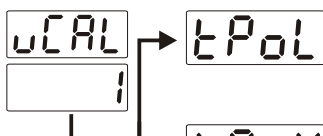
| `uCAL` `1` | → | `tPoL` | It defines minimum value for selectable dual point calibration. It is active if ⎓ Voltage / Current input is selected. It can be adjusted from -1999 to 9999. |
| | → | `tPoH` | It defines maximum value for selectable dual point calibration. It is active if ⎓ Voltage / Current is selected. It can be adjusted from -1999 to 9999. |

| `uCAL` `2` | → | `Po00`
⋮
`Po 16` | In multi point calibration, calibration points are defined with these parameters.
It is active if ⎓ Voltage / Current is selected. It can be adjusted from -1999 to 9999.
In multi point calibration operation, defined scale is divided into 16 calibration points. |
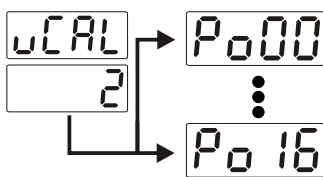
For example : `uASL` is `0` (0-50 mV⎓) .

Process Set value

Po10
Po11 Po09
Po12 Po08
Po13 Po07
Po14
Po15 Po06
Po16 Po05
Po04
Po03
Po02
Po01
Po00 = 0

3.125 6.25 9.375 12.5 15.625 18.75 21.825 25 28.125 34.375 37.5 40.625 43.75 46.875

50

mV⎓

3.125 3.125 3.125 3.125 3.125 3.125 3.125 3.125 3.125 3.125 3.125 3.125 3.125 3.125 3.125 3.125

0-50 mV⎓ range are divided into 16 egual parts. Every "Poxx" SET value is defined
50 / 16 = 3.125 mV⎓ range.
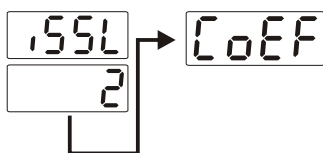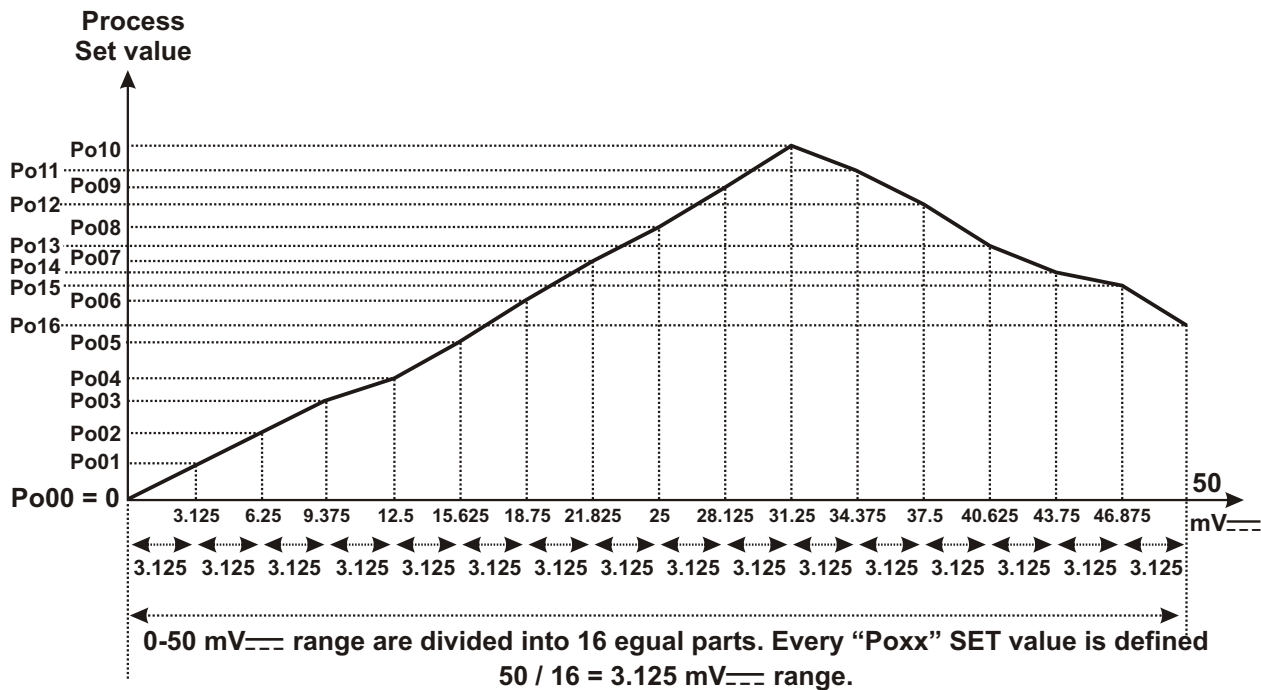
| ¡SSL 2 | → | CoEF | Coefficient value for ⎓Voltage / Current input. Process value is multiplied with this value. It is active if ⎓Voltage / Current input is selected. It can be adjusted from 1.000 to 9.999. |

| un ¡t | Unit selection |

| °C | Unit is °C |

| °F | Unit is °F |

| ¡SSL 2 | → | U | Unit is U. It is active if ⎓Voltage / Current input is selected |
| | → | – | No unit. It is active if ⎓Voltage / current input is selected |

| LoL | Minimum value of operating scale. It can be changed according to input type and scale of the process. |

| uPL | Maximum value of operating scale. It can be changed according to input type and scale of the process. |

| PUoF | Display offset for process value. It can be adjusted -10% to +10% of scale. The defined value is added to process value. |

| ¡FLt | Defines filter time for input signal. It can be adjusted from 0.0 to 900.0. |

| ¡SSL 0 | → | CJnC | It is active if process input is selected TC input. It decides if cold junction compensation is active or not. |

| YES | Cold junction compensation is active. |

| no | Cold junction compensation is not active. |
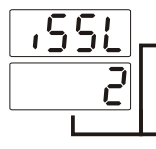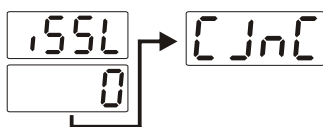
6.2.4 PID Configuration Parameters

If any output is configured as heating PID ;

| P | , | I | , | d | , | Ct | , | oLL | , | ouL | , | oLt | , | Ar | , | SUoF | , | PoFS | ,
| PoSS | , | Strn | , | o-db | , | Sbou | parameters are accessible

If no output is configured as PID ;
Only | o-db | , | Sbou | parameters are accessible in PID CONF menu.

| P | **PROPORTIONAL BAND (0.0% , 999.9%)**
Full Scale (| uPL | - | LoL |) %.
If | uPL | = 1000 °C, | LoL | = 0 °C and | P | = 50.0 then
Proportional Band = (| uPL | - | LoL |)* | P | / 100.0
Proportional Band = (1000-0)*50.0/100.0 = 500 °C

| I | **INTEGRAL TIME (0 sec, 3600 secs)**
It can be changed by the user. When Tune operation stops, it can be changed by the device. If it is 0, integral control part does not run. When tune operation stops if this parameter is 0, this parameter can not be changed because of integral control part does not run.

| d | **DERIVATIVE TIME (0.0 sec, 999.9 secs)**
It can be changed by the user. When Tune operation stops, it can be changed by the device. If it is 0, derivative control part does not run. When tune operation stops if this parameter is 0, this parameter can not be changed because of derivative control part does not run.

IF

| PCnF |
| ConF |
↓
| CtYP |
↓
| P id |
IS
SELECTED

| Ct | **CONTROL PERIOD TIME (1 sec, 150 secs)**
It is control period

OUTPUT : ON
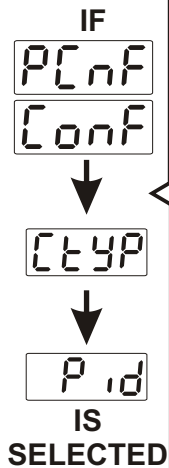
OUTPUT PERIOD   **OUTPUT PERIOD**
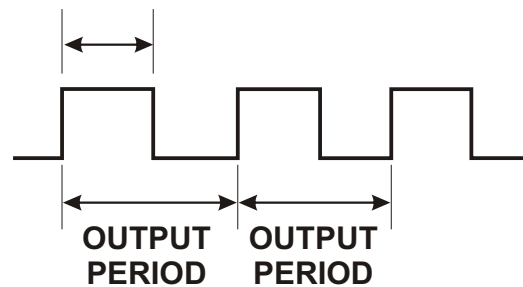
Relay Output : Output period must be short for stable process control. Relay must not be used in short output periods because of limited life of their relay contact (number of open/close events). Relay output must be used as control output in values near to 30 seconds or greater than this value.
SSR Output : If short output period is needed in a system (approximately 1-2 seconds) SSR driver output as last control element is recommended.

oLL MİNİMUM CONTROL OUTPUT (0.0% , [ouL])

It is % of minimum output.
Even as a result of the PID calculation device calculates the %output value less than this parameter, heating or cooling output is active minimum for OLL parameter.
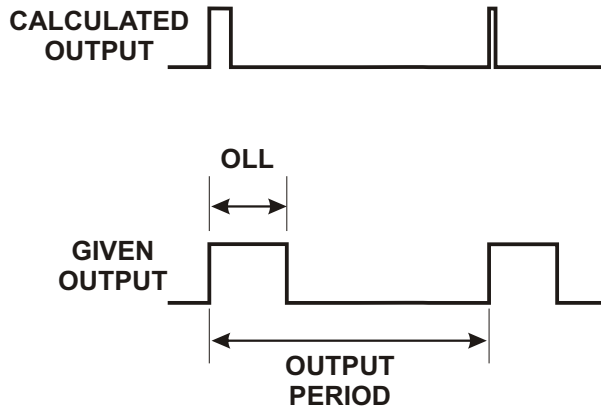
ouL MAXIMUM CONTROL OUTPUT ([oLL] , 100.0%)

It is % of maximum output.
Even as a result of the PID calculation device calculates the %output value greater than this parameter, heating or cooling output is active maximum for OULH parameter.
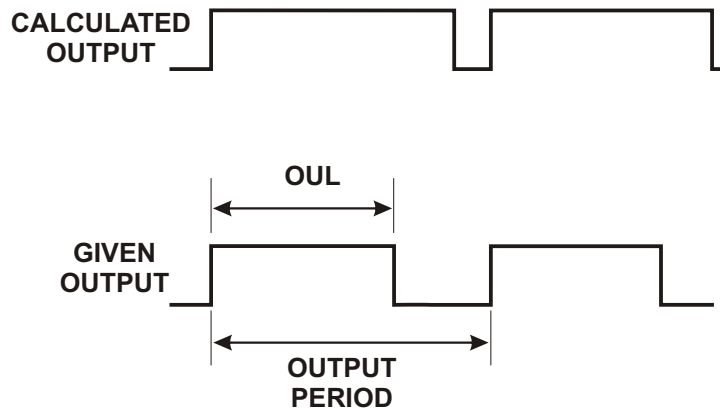
oLt MINIMUM CONTROL OUTPUT TIME (0.0 sec , [Ct])

Heating or cooling output can not be active less than this parameter. Even if this parameter is 0, this parameter is accepted 50 msecs for security.

IF
PCnF
ConF
↓
CtYP
↓
Pid
IS
SELECTED
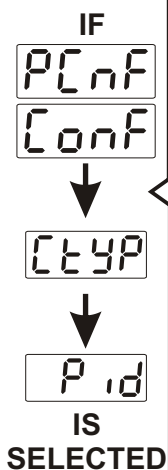
| Ar |

ANTI-RESET WINDUP (0, SCALE HIGH POINT)

While PID operation is running if

| PSEt | - | Ar | <= **process value** <= | PSEt | + | Ar | condition is true, integral value is calculated. If the condition is not true, integral value is not calculated and last calculated integral value is used.
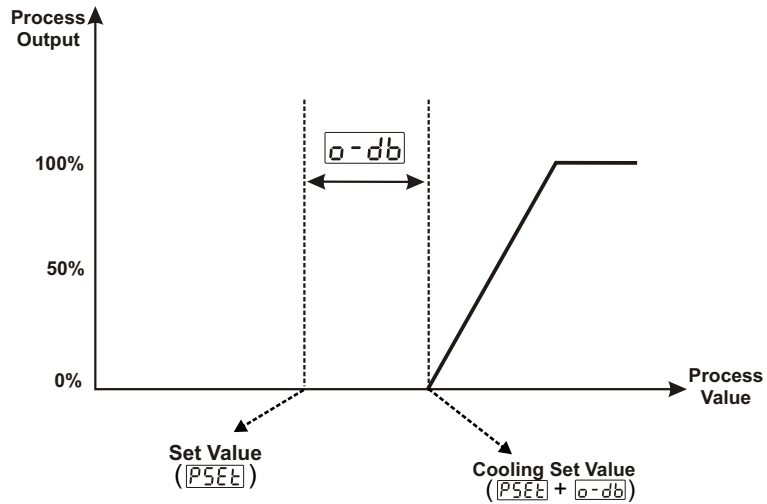
Scale High Point : Maximum process input value in Pt-100 and Tc inputs
9999 for fixed dual point calibration used inputs,
Scale high point is the biggest one from | tPoL | or | tPoH | for selectable dual point calibration used inputs
Scale high point is the biggest one from | Po00 | or | Po16 | for multi point calibration used inputs

Note: Point position changes according to process input type and scale, unit changes according to the selection in | unit | parameter.
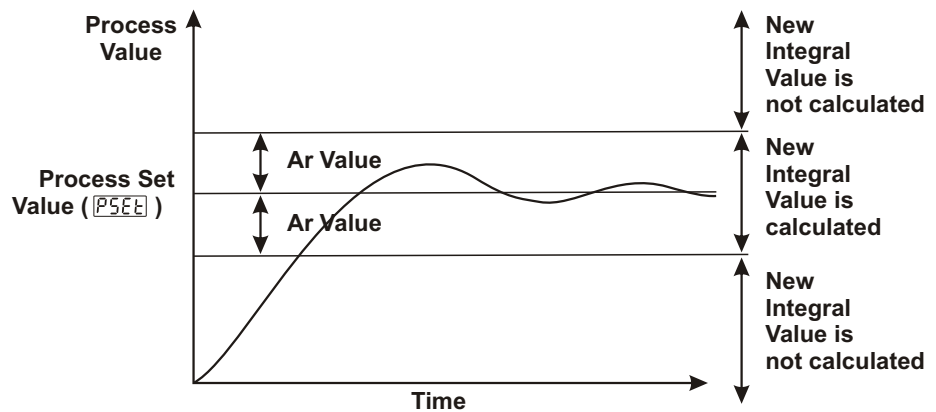
| SUoF |

SET VALUE OFFSET

((- SCALE HIGH POINT / 2) , (SCALE HIGH POINT / 2))

| PSEt | + | SUoF | is used as set value in PID calculations. It is used for shifting the proportional band.
Example: If | PSEt | = 500°C, | SUoF | = 5°C or | SUoF | = -5°C, shifting of the proportional band is shown below :

Note: Point position changes according to process input type and scale, unit changes according to the selection in | unit | parameter.
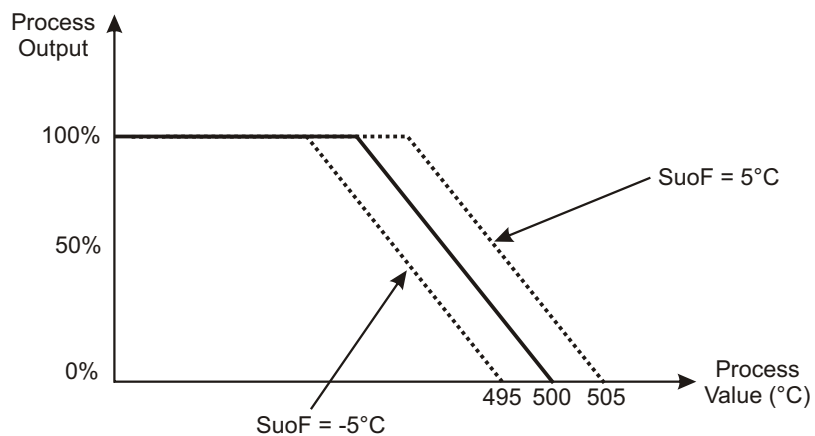
| $PoFS$ | **PID OUTPUT OFFSET** |

(FOR HEATING PID 0.0%, 100.0%)
(FOR COOLING PID -100.0%, 0.0%)

This parameter is added to "Output %" which is calculated at the end of the PID.
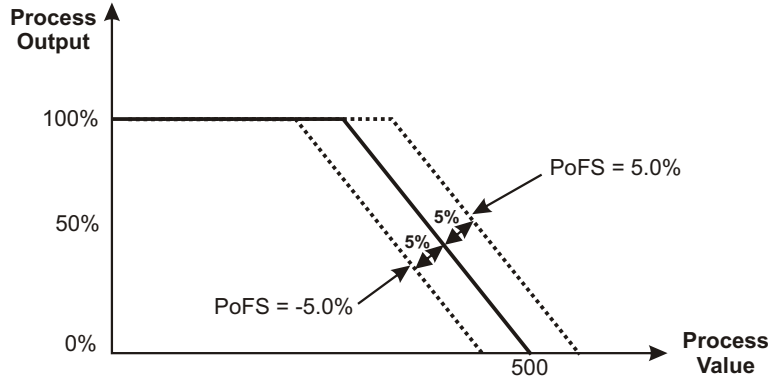
| $PoSS$ | **OUTPUT OFFSET RELATED TO PID SET** |

(FOR HEATING PID 0.0%, 100.0%)
(FOR COOLING PID -100.0%, 0.0%)

This parameter is added to the %process output that is calculated at the end of the PID according to process set value.
$PoSS$ * $PSEt$ / (uPL - LoL)

Example If $PSEt$ = 500°C , uPL = 1000°C , LoL = 0 , $PoSS$ = 5.0% then $PoSS$ * $PSEt$ / (uPL - LoL) = 5.0 * 500 /(1000-0) = 2.5% 2.5% is added to calculated process value.

IF
$PCnF$
$ConF$
↓
$CtYP$
↓
Pid
**IS
SELECTED**
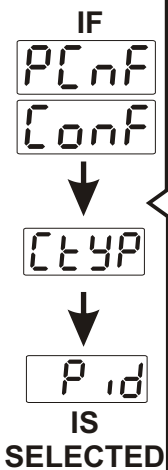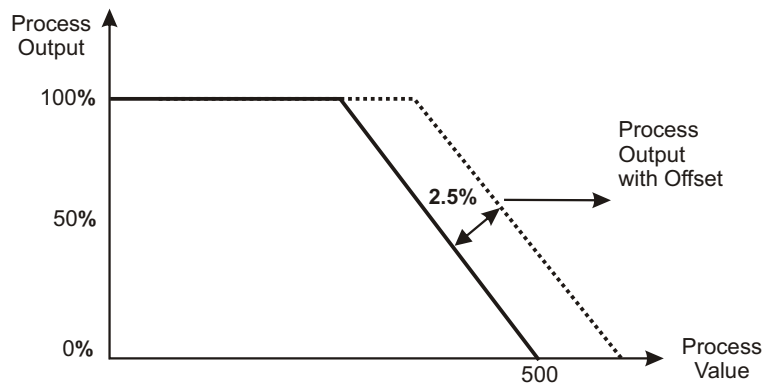
`Strn` PROCESS VALUE STABILIZATION (1, SCALE HIGH POINT)

It is used for controlling if process value oscillates or not when `tunn` Parameter is `Atun` or `At.St`
If;
`PSEt` - `Strn` **<= Process Value <=** `PSEt` + `Strn` condition is not true and process value starts to oscillate (as shown in the diagram). If `tunn` parameter is `Atun` or `At.St` ,then `Attn` parameter is selected `YES` And then Limit Cycle Tune operation starts for determining new PID parameters.

Scale High Point : Maximum process input value in Pt-100 and Tc inputs
9999 for fixed dual point calibration used inputs,
Scale high point is the biggest one from `tPoL` or `tPoH` for selectable dual point calibration used inputs
Scale high point is the biggest one from `Po00` or `Po 16` for multi point calibration used inputs

Note: Point position changes according to process input type and scale, unit changes according to the selection in `un it` parameter.

IF
`PCnF`
`ConF`
↓
`CtYP`
↓
`Pid`
IS SELECTED
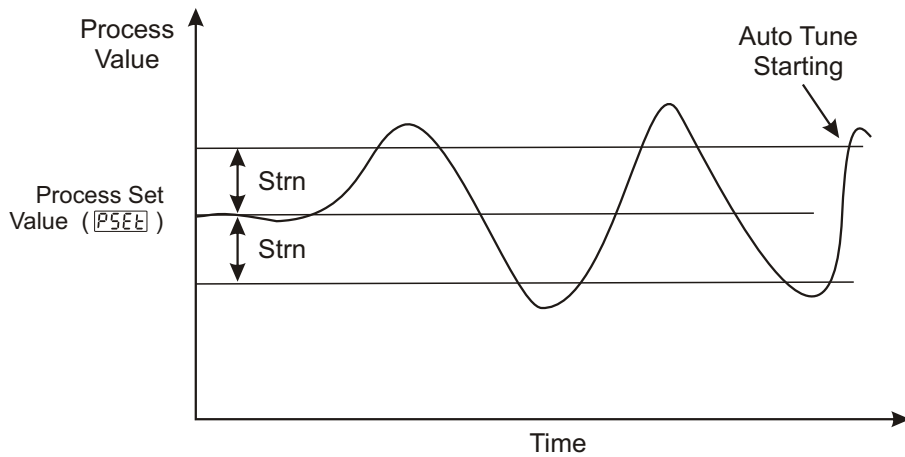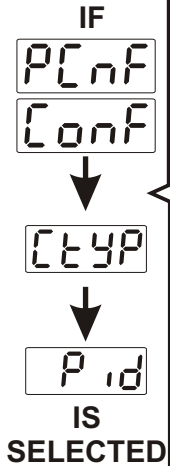
`o-db` PROPORTIONAL BAND SHIFTING ((- SCALE HIGH POINT / 2) , (SCALE LOW POINT / 2))

Cooling process set value is calculated by adding set value `PSEt` with parameter `o-db`
Control form can be ON/OFF or PID.

If set value for heating = `PSEt` + `SUoF` ;
Then set value for cooling = `PSEt` + `SUoF` + `o-db`

Scale High Point : Maximum process input value in Pt-100 and Tc inputs
9999 for fixed dual point calibration used inputs,
Scale high point is the biggest one from `tPoL` or `tPoH` for selectable dual point calibration used inputs
Scale high point is the biggest one from `Po00` or `Po 16` for multi point calibration used inputs

Note: Point position changes according to process input type and scale, unit changes according to the selection in `un it` parameter.

If $\boxed{o\text{-}db} > 0$

Process Output

100%

50%

0%

$\boxed{o\text{-}db}$

Process Value

Set Value
($\boxed{PSEt}$)

Cooling Set Value
($\boxed{PSEt}$ + $\boxed{o\text{-}db}$)

If $\boxed{o\text{-}db} < 0$

Process Output

100%

50%

0%

$\boxed{o\text{-}db}$

Process Value

Cooling Set Value
($\boxed{PSEt}$ + $\boxed{o\text{-}db}$)
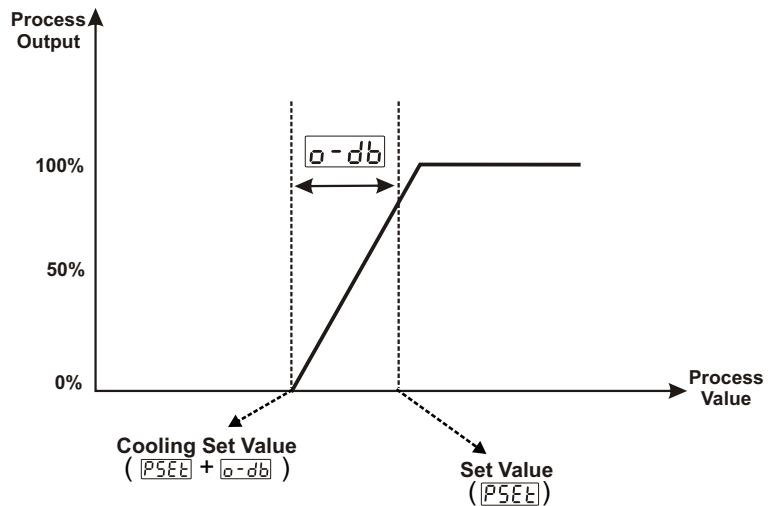
Set Value
($\boxed{PSEt}$)

$\boxed{Sbou}$ **SENSOR BREAK OUTPUT VALUE**
(FOR HEATING PID 0.0%, 100.0%)
(FOR COOLING PID -100.0%, 0.0%)

When sensor breaks, controlling of the process can continue by entering %output value to $\boxed{Sbou}$ parameter.
If this parameter 0.0, process control output does not perform an output when sensor breaks.

PCnF
ConF

6.2.5 Process Output Configuration Parameters

oCnF It determines if Process Output (SSR Driver Output) and Alarm Output-2 operates together or not.

0 Process Output (SSR Driver Output) and Alarm Output-2 operates separately.

1 Process Output (SSR Driver Output) and Alarm Output-2 operates together. Alarm functions of Alarm Output-2 can not be used

oFnC It determines output functions of Process Outputs

HEAt Heating

CooL Cooling

CtYP It determines control algorithms of Process Outputs

on.oF ON/OFF control algorithm

Pid PID control algorithm

CtYP
on.oF

→ **HYS** Hysteresis value of Process Outputs. It can be adjusted from 0% to 50% of full scale. (It is active if ON/OFF control is selected)

→ **HYn** It determines operation form of hysteresis (It is active if ON/OFF control is selected)

0 SV + HYS/2 and SV - HYS/2

1 SV and SV+HYS or SV and SV-HYS

→ **oFFt** In ON/OFF operation, this time must be passed for the output to be energised again. It can be adjusted from 0.0 to 100.0 seconds. (It is active if ON/OFF control is selected)

6.2.6 ALARM Output-1 Configuration Parameters

Lou1 It determines logic output function for Alarm Output-1
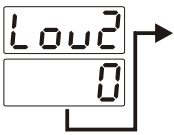
0	Alarm output
1	Manual / Automatic data output
2	Sensor break alarm output
3	Input is active when the process value is out of the band which is defined with minimum value of operating scale LoL and maximum value of operating scale uPL

| Lou1 |
| 0 |

→ **ALt1** It determines alarm type for Output-1. It is active if logic output function of Alarm Output-1 is alarm output.

0	Process high alarm
1	Process low alarm
2	Deviation high alarm
3	Deviation low alarm
4	Deviation band alarm
5	Deviation range alarm
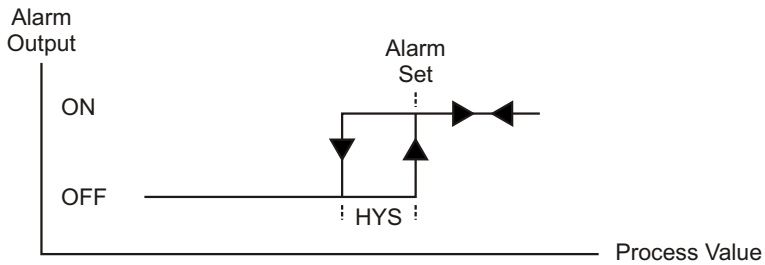
Process high alarm
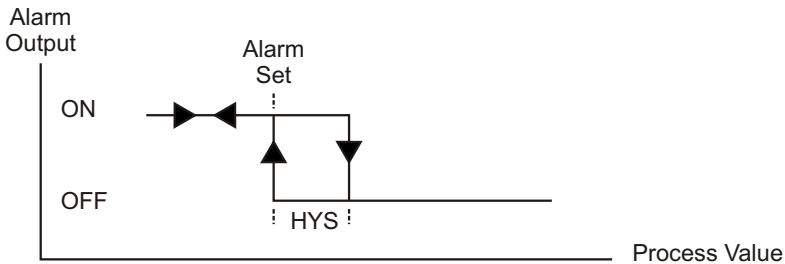
Process low alarm

Deviation high alarm
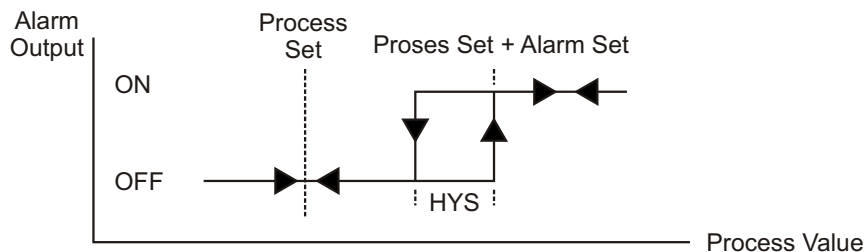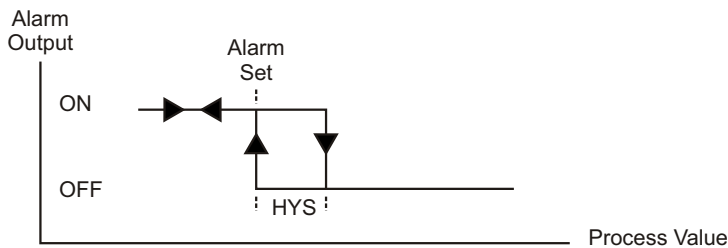
Deviation low alarm
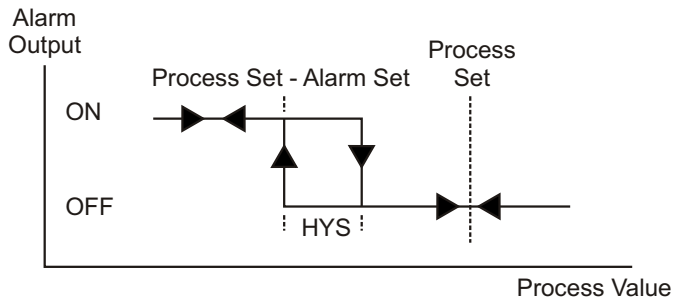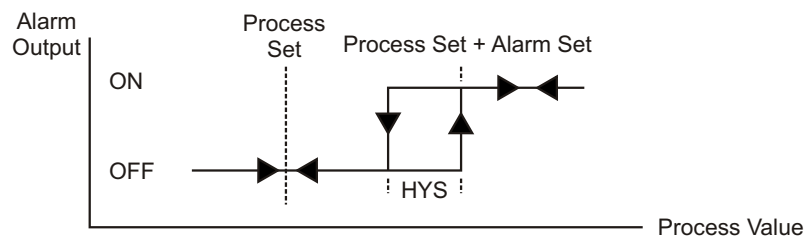

Deviation band alarm
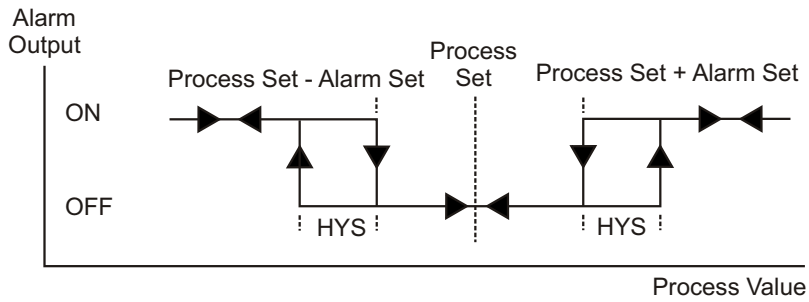
Deviation range alarm
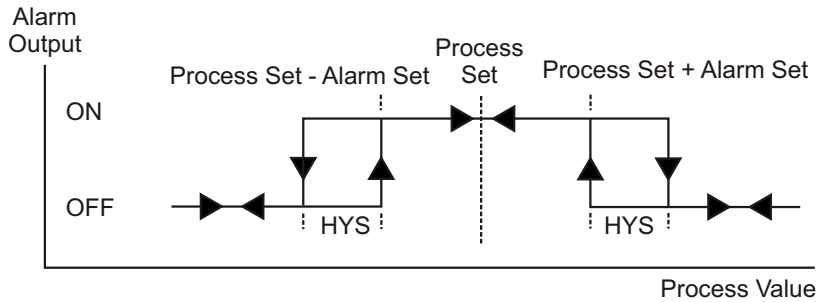
`Lou1` `0`	→	`ALH1`	Alarm- 1 hysteresis value. it can be adjusted from 0% to 50% of process input scale (`uPL` - `LoL`) It is active if logic output function of Alarm Output-1 is alarm output.
	→	`Aon1`	Alarm on delay time for Alarm Output-1. It can be adjusted from 0000 to 9999 seconds. It is active if logic output function of Alarm Output-1 is alarm output.
	→	`AoF1`	Alarm off delay time for Alarm Output-1. It can be adjusted from 0000 to 9998 seconds. When the value is greater than 9998, `LtCH` is seen on the screen. It means alarm latching output is selected. It is active if logic output function of Alarm Output-1 is alarm output.
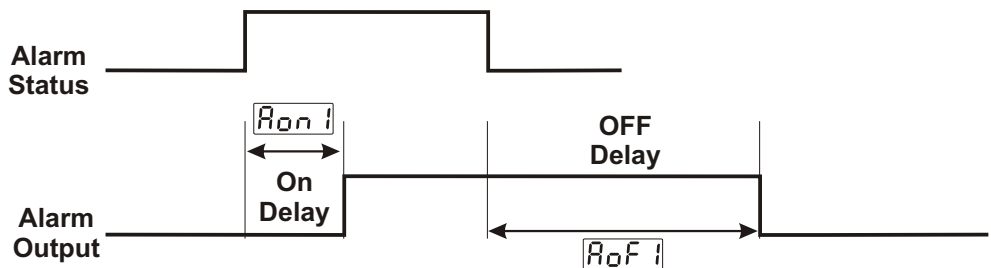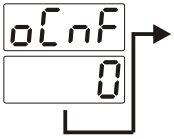
oⅭnF
0 → ALn2
ConF

(i) "Aln2 Conf" Menu is accessible if |oⅭnF| parameter in "PCnF ConF" is [0]

|Lou2| It determines logic output function for Alarm Output-2

0	Alarm output
1	Manual / Automatic data output
2	Sensor break alarm output
3	Input is active when the process value is out of the band which is defined with minimum value of operating scale |LoL| and maximum value of operating scale |uPL|

Lou2
0 → ALt2 It determines alarm type for Output-2. It is active if logic output function of Alarm Output-2 is alarm output.

0	Process high alarm
1	Process low alarm
2	Deviation high alarm
3	Deviation low alarm
4	Deviation band alarm
5	Deviation range alarm

Process high alarm

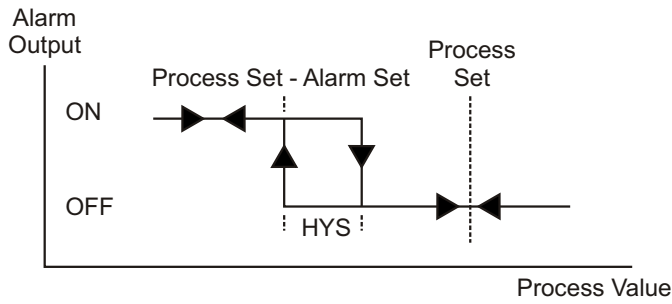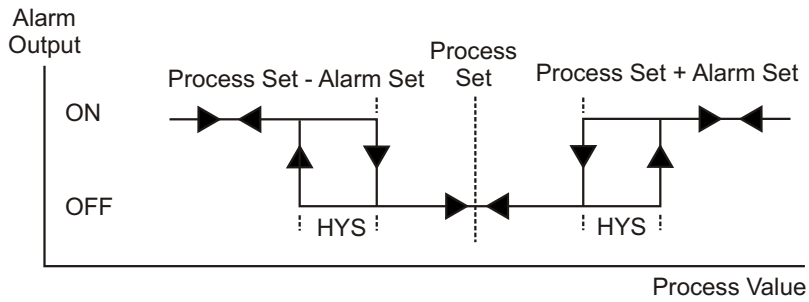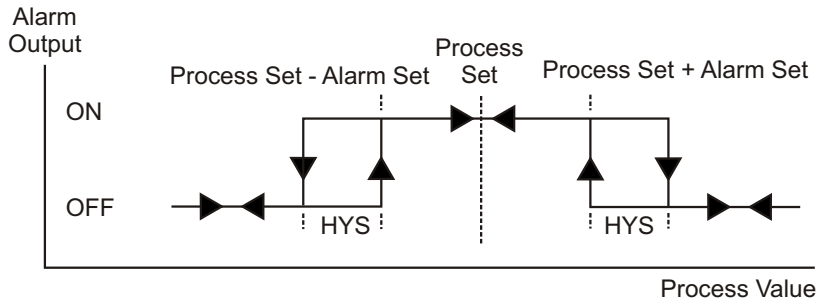
Process low alarm


Deviation high alarm

Deviation low alarm

Deviation band alarm

Deviation range alarm

Lou2
0
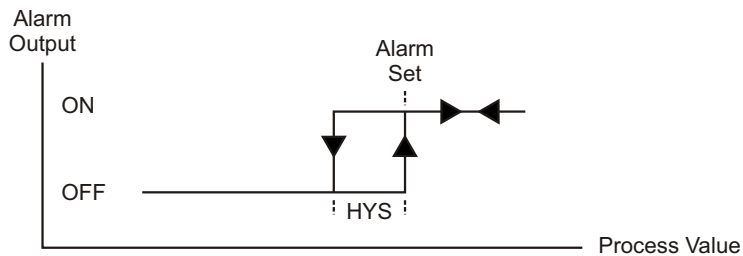
ALH2 Alarm-2 hysteresis value.

it can be adjusted from 0% to 50% of process input scale (uPL - LoL) It is active if logic output function of Alarm Output-2 is alarm output.

Aon2 Alarm on delay time for Alarm Output-2. It can be adjusted from 0000 to 9999 seconds. It is active if logic output function of Alarm Output-2 is alarm output.

AoF2 Alarm off delay time for Alarm Output-2. It can be adjusted from 0000 to 9998 seconds. When the value is greater than 9998, LtCH is seen on the screen. It means alarm latching output is selected. It is active if logic output function of Alarm Output-2 is alarm output.
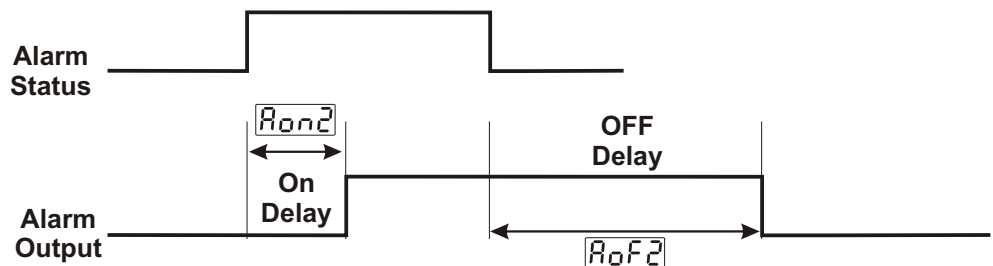
(i) "Aln2 Conf" Menu is accessible if oCnF parameter in "PCnF ConF" is 0

6.2.8 General Parameters

`SU-L` Minimum value for process set and alarm set values. It is named as low limit of set scale.
It can be adjusted from low limit of input selected with `iSSL` parameter to `SU-u` parameter.
Please refer to Section 6.2.3 Process Input Type and Relevant Parameters with Process Input for `iSSL` parameter

`SU-u` Maximum value for process set and alarm set values. It is named as high limit of set scale.
It can be adjusted from `SU-L` to high limit of input selected with `iSSL` Parameter.
Please refer to Section 6.2.3 Process Input Type and Relevant Parameters with Process Input for `iSSL` parameter

`Prt1` **Alarm Set Values Protection**

`no` Alarm Set values can be changed

`YES` Alarm Set values can not be changed. Alarm set values parameters, `ALr1` and `ALr2`, are not accessible

`Prt2` **AUTO / MANUAL Selection Button Protection**

`no` Auto or Manual selection is possible with A/M button in Main Operation screen

`YES` Auto or Manual selection is not possible with A/M button in Main Operation screen

`Prt3` **AT (AUTO TUNE) Button Protecttion**

`no` Limit Cycle Tuning operation can be active or inactive with AT (Auto Tune) Button in Main Operation screen

`YES` Limit Cycle Tuning operation can not be active or inactive with AT (Auto Tune) Button in Main Operation screen

`tCPS`

It is used for accessing to the technician parameters.
It can be adjusted from 0 to 9999.

If it is | *0* | ; there is no password protection while entering to the technician parameters.

If it is different from " 0" and user wants to access to the technician parameters;
1- If technician does not enter `tCPS` password correctly:
It turns to operation screen without entering to operator parameters.

2- When `tCPS` in top display and | *0* | in bottom display, if technician presses SET button without entering `tCPS` password (For observing parameter)
Technician can see all menus and parameters except Technician Password menu ("Pass Conf"), but parameters can not be changed.
(Please refer to Section 7. Failure Messages (4) in ESM-9930 Process Controllers)

1 - Sensor failure in analogue inputs. Sensor connection is wrong or there is no sensor connection.
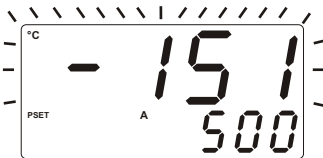
2 - If value on top display blinks : If analogue input value is less than minimum value of operating scale $\boxed{LoL}$ value on the top display starts to blink.

In "PınP Conf" Menu if;

$\boxed{ıSSL}$ = $\boxed{0}$; $\boxed{tCSL}$ = $\boxed{2}$; $\boxed{unıt}$ = $\boxed{°C}$;
$\boxed{LoL}$ = $\boxed{0}$; $\boxed{uPL}$ = $\boxed{600}$ are defined.
Adjust $\boxed{LoL}$ ☐ $\boxed{-150}$

If analogue input value is less than minimum value of operating scale $\boxed{LoL}$ Value on the top display starts to blink.

ⓘ Please refer to Section 6.2.3 for detailed information about this parameter.

3 - If value on top display blinks : If analogue input value is greater than maximum value of operating scale $\boxed{uPL}$ top display starts to blink.

In "PınP Conf" Menu if;

$\boxed{ıSSL}$ = $\boxed{0}$; $\boxed{tCSL}$ = $\boxed{2}$; $\boxed{unıt}$ = $\boxed{°C}$;
$\boxed{LoL}$ = $\boxed{0}$; $\boxed{uPL}$ = $\boxed{600}$ are defined
Adjust $\boxed{uPL}$ ☐ $\boxed{850}$

If analogue input value is greater than maximum value of operating scale $\boxed{uPL}$ value on the top display starts to blink.

ⓘ Please refer to Section 6.2.3 for detailed information about this parameter.

4 - If technician password is different from "0" and technician accesses to the parameters by Set button without entering the technician password and wants to change a parameter, device does not allow to do any changes in parameters. If increment or decrement button is pressed, a warning message will appear on the bottom display as shown on the left.
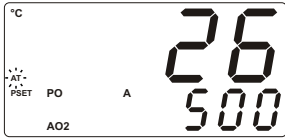
5 - If tuning operation can not be completed in 8 hours, AT led starts to blink.Blinking can be canceled by pressing Enter button.

 For details on parameters, refer to Section 6.2.1

6 - If user does not do anything for 120 seconds while device is on technician menus, device turns to operation screen.

8. Specifications

Device Type	: Process Controller
Housing&Mounting	: 96mm x 96mm x 87.5mm 1/4 DIN 43700 plastic housing for panel mounting. Panel cut-out is 92x92mm.
Protection Class	: NEMA 4X (IP65 at front, IP20 at rear).
Weight	: Approximately 0.28 Kg.
Environmental Ratings	: Standard, indoor at an altitude of less than 2000 meters with none condensing humidity.
Storage/Operating Temperature	: -40 °C to +85 °C / 0 °C to +50 °C
Storage/Operating Humidity	: 90 % max. (None condensing)
Installation	: Fixed installation
Over Voltage Category	: II
Pollution Degree	: II, office or workplace, none conductive pollution
Operating Conditions	: Continuous
Supply Voltage and Power	: 100 - 240 V$\sim$ (-15% / +10%) 50/60 Hz 6VA
	24 V$\sim$ (-15% / +10%) 50/60 Hz 6VA
	24 V$=$ (-15% / +10%) 6W
Process Inputs	: Universal input TC, RTD, $=$ Voltage/Current
Thermocouple Input Types	: Selectable by parameters L (DIN43710) , J ,K ,R ,S ,T ,B ,E ,N (IEC584.1)(ITS90) , C (ITS90)
Thermoresistance Input Types	: PT 100 (IEC751) (ITS90)
$=$ Voltage Input Types	: Selectable by parameters 0..50mV $=$, 0..5V $=$, 0..10V $=$
$=$ Current Input Types	: Selectable by parameters 0...20mA $=$, 4...20mA $=$
Accuracy	: ± 0,25% of full scale for thermocouple, thermoresistance and voltage, ± 0,70% of full scale for current.
Cold Junction Compensation	: Automatically ± 0.1°C/1°C.
Line Compensation	: Maximum 10 Ω .
Sensor Break Protection	: Upscale
Sampling Cycle	: 3 samples per second
Input Filter	: 0.0 to 900.0 seconds
Control Forms	: Programmable ON / OFF, P, PI, PD or PID.
Relay Outputs	: 2 pieces 5A@250V$\sim$(at resistive load) (Programmable control or alarm Input) (Electrical Life :100000 operation (Full Load))
Standard SSR Driver Output	: Max 20mA@18V$=$
Process Display	: 19 mm Red 4 digit LED display
Set Display	: 10.8 mm Green 4 digit LED display
Led Indicators	: AT (Auto Tune), M (Manual Mode), A (Automatic Mode), PSET (Process Set value), ASET1 (Alarm-1Set value), ASET2 (Alarm-2 Set value), PO (Process Output) , AO1 (Alarm Output-1) , AO2 (Alarm Output-2) °C / °F / V unit leds
Approvals	: UL Recognized Component (File No : E 254103), GOST-R, $C\epsilon$