



ESM-4420 48 x 48 DIN 1/16 Temperature Controller with Universal Input

- ***4 digits process(PV) and 4 digits process set value(SV) display***
- ***Universal process input (TC, RTD)***
- ***Configurable ON/OFF, P, PI, PD and PID control forms***
- ***Adaptation of PID Coefficients to the system with Self-Tune operation (Step Response Tuning)***
- ***Programmable Heating or Cooling Functions for Control Output***
- ***Alarm Functions for Alarm Output***

ABOUT INSTRUCTION MANUAL

Instruction manual of ESM-4420 Temperature 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:

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

Operation and Parameters:

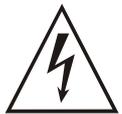
In this section user interface of the device, accessing to the parameters, description of the parameters are explained.

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.

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EU DECLARATION OF CONFORMITY

Manufacturer's Name : EMKO ELEKTRONIK A.S.
Manufacturer's Address : DOSAB, Karanfil Sk., No:6,
16369 Bursa, TURKEY

The manufacturer hereby declares that the product:

Product Name : Temperature Controller Unit
Type Number : ESM-4420
Product Category : Electrical equipment for measurement, control and laboratory use

Conforms to the following directives :

2006 / 95 / EC The Low Voltage Directive

2004 / 108 / EC The Electromagnetic Compatibility Directive

has been designed and manufactured to the following specifications :

EN 61000-6-4:2007 EMC Generic Emission Standard for Industrial Environments

EN 61000-6-2:2005 EMC Generic Immunity Standard for Industrial Environments

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

When and Where Issued

16th October 2009

Bursa-TURKEY

Authorized Signature

Name : Serpil YAKIN

Position : Quality Manager

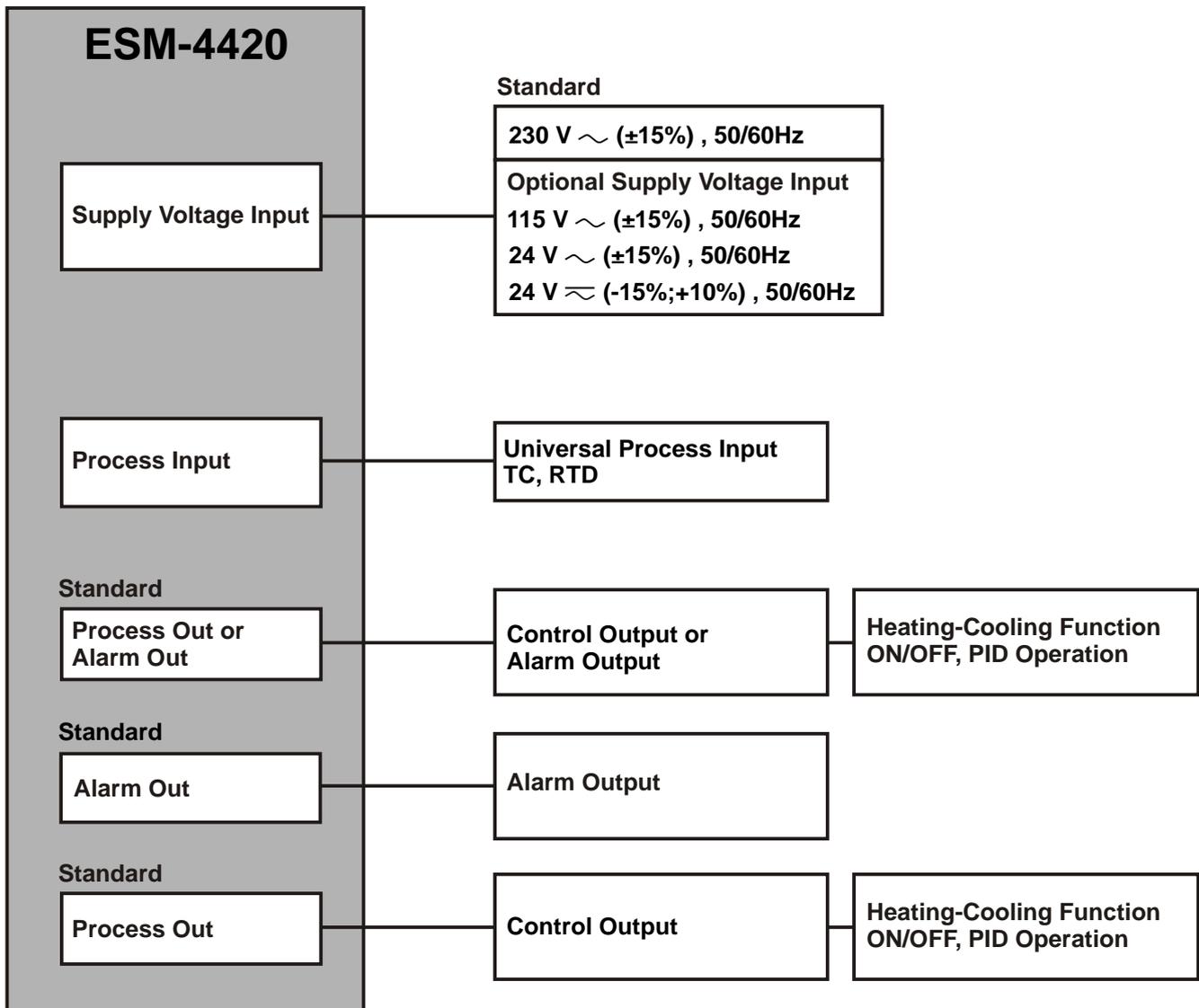
1.Preface

ESM-4420 series temperature controllers are designed for measuring and controlling a process value. They can be used in many applications with their universal process input, control outputs and selectable alarm functions.

Some application fields which they are used are below:

<u>Application Fields</u>	<u>Application</u>
Glass	PID Process Control
Plastic	
Petro-Chemistry	
Textile	
Automotive	
Machine production industries	

1.1 General Specifications



1.2 Ordering Information

ESM-4420 (48x48 DIN 1/16)	A	BC	D	E	/	FG	HI	/	U	V	W	Z
			0		/	01	02	/	0	0	0	0

A	Supply Voltage
2	24V \approx (-15%;+10%) 50/60Hz
3	24V \sim (\pm %15) 50/60Hz
4	115V \sim (\pm %15) 50/60Hz
5	230V \sim (\pm %15) 50/60Hz
9	Customer

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

D	Serial Communication
0	None

E	Output-1 (Process or Alarm Output)
1	Relay Output (resistive load 5A@250V \sim , 1 NO + 1NC)
2	SSR Driver Output (maximum 12V \equiv , max. 24mA)

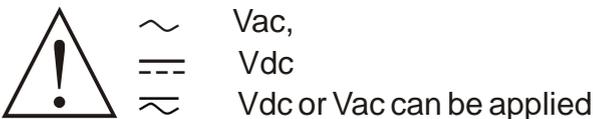
FG	Output-2 (Alarm Output)
01	Relay Output (resistive load 5A@250V \sim , 1 NO)

HI	Output-3 (Process Output)
02	SSR Driver Output (maximum 12V \equiv , max. 24mA)

Table-1

BC	Input Type(TC)	Scale($^{\circ}$ C)	Scale($^{\circ}$ F)
23	J ,Fe CuNi IEC584.1(ITS90)	-200 $^{\circ}$ C,900 $^{\circ}$ C	-328 $^{\circ}$ F,1652 $^{\circ}$ F
25	K ,NiCr Ni IEC584.1(ITS90)	-200 $^{\circ}$ C,1300 $^{\circ}$ C	-328 $^{\circ}$ F,2372 $^{\circ}$ F
27	R ,Pt13%Rh Pt IEC584.1(ITS90)	0 $^{\circ}$ C,1700 $^{\circ}$ C	32 $^{\circ}$ F,3092 $^{\circ}$ F
28	S ,Pt10%Rh Pt IEC584.1(ITS90)	0 $^{\circ}$ C,1700 $^{\circ}$ C	32 $^{\circ}$ F,3092 $^{\circ}$ F
29	T ,Cu CuNi IEC584.1(ITS90)	-200 $^{\circ}$ C,400 $^{\circ}$ C	-328 $^{\circ}$ F,752 $^{\circ}$ F

BC	Input Type(RTD)	Scale($^{\circ}$ C)	Scale($^{\circ}$ F)
39	PT 100 , IEC751(ITS90)	-200 $^{\circ}$ C,650 $^{\circ}$ C	-328 $^{\circ}$ F,1202 $^{\circ}$ F
40	PT 100 , IEC751(ITS90)	-199.9 $^{\circ}$ C,650.0 $^{\circ}$ C	-199,9 $^{\circ}$ F,999.9 $^{\circ}$ F



All order information of ESM-4420 Temperature Controller 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.

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.

2. Installation



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

In package ,

- One piece unit
- Two pieces mounting clamp
- One piece instruction manual

A visual inspection of this product for possible damage occurred 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.

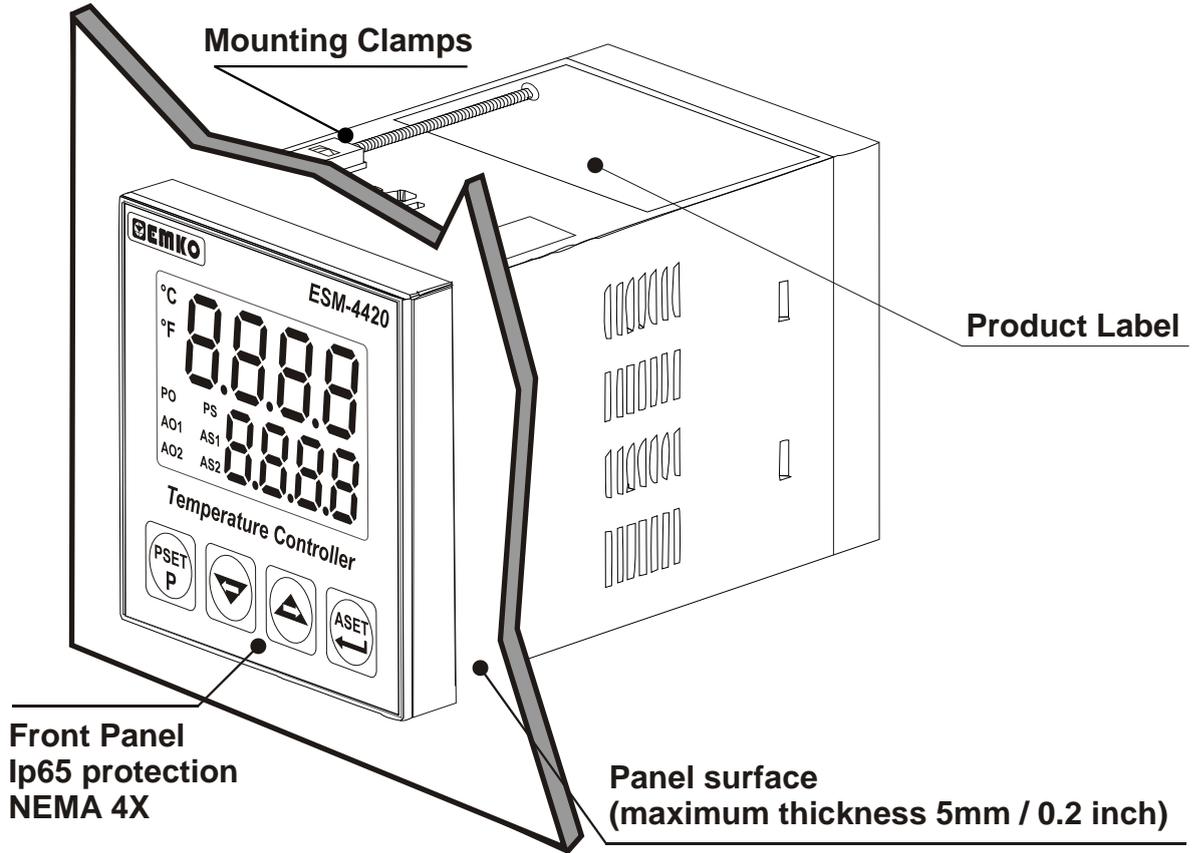
Do not use the unit in combustible or explosive gaseous atmospheres.

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.

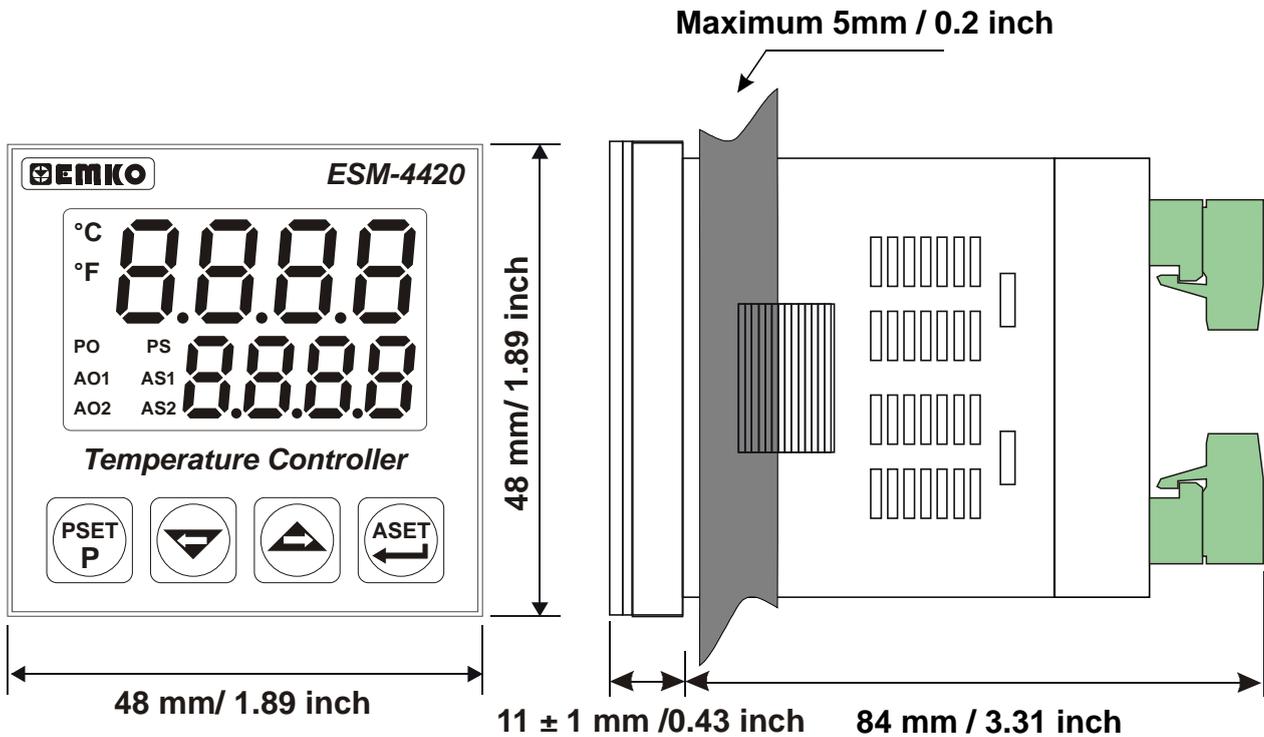
Montage of the product on a system must be done with it's mounting clamp. Do not do the montage of the device with inappropriate mounting clamp. Be sure that device will not fall while doing the montage.

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

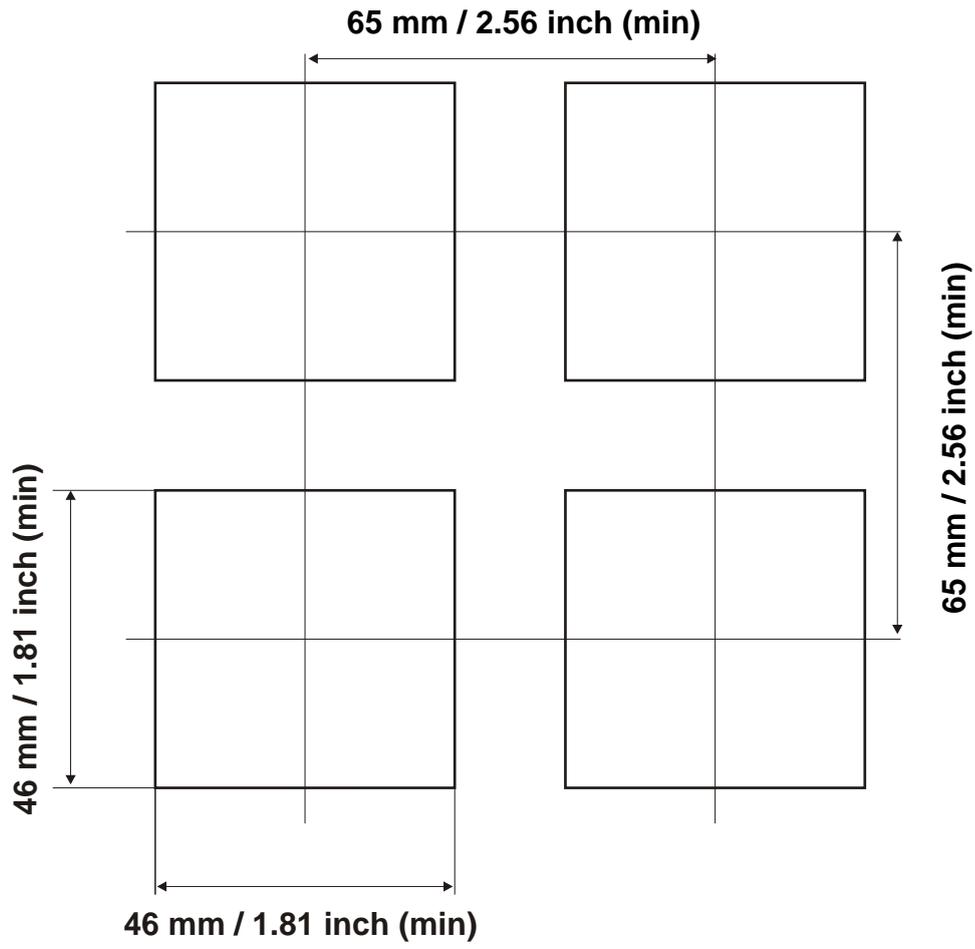
2.1 General Description



2.2 Dimensions



2.3 Panel Cut-Out



2.4 Environmental Ratings

Operating Conditions



Operating Temperature : 0 to 50 °C



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



Altitude : Up to 2000m.



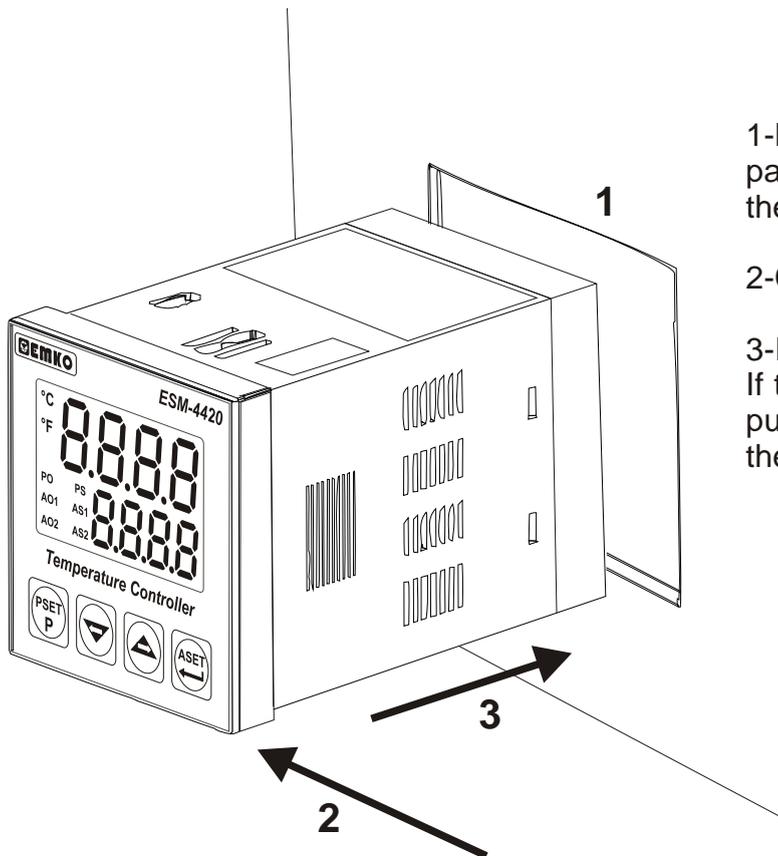
Forbidden Conditions:

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.

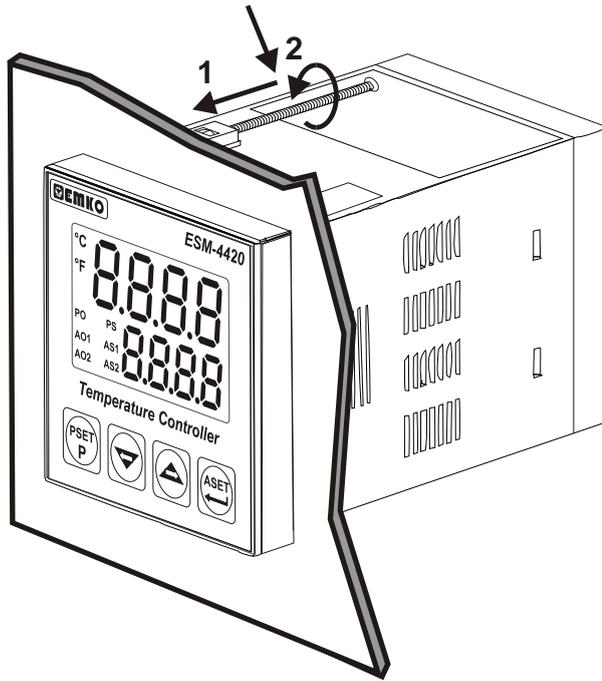
2-Check front panel gasket position

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 Fixing 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

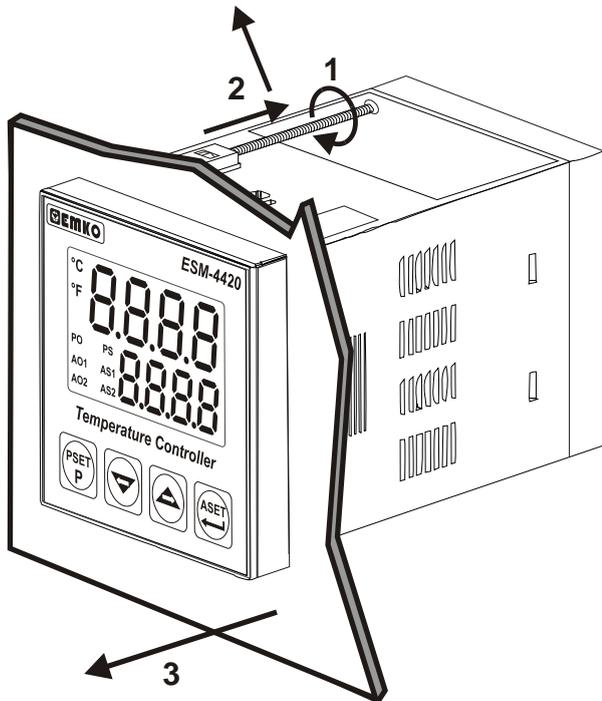


Montage of the unit to a system must be done with it's own fixing clamps. Do not do the montage of the device with inappropriate fixing clamps. Be sure that device will not fall while doing the montage.

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.

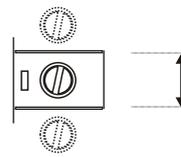
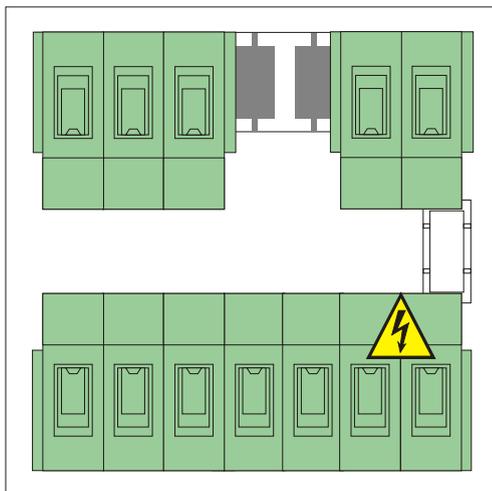


Be sure to use the rated power supply voltage to protect the unit against damage and to prevent failure.



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



Max. 2.5mm / inch
Wire Size:
14AWG/1mm²
Solid /Stranded



Torque 0.5 Nm

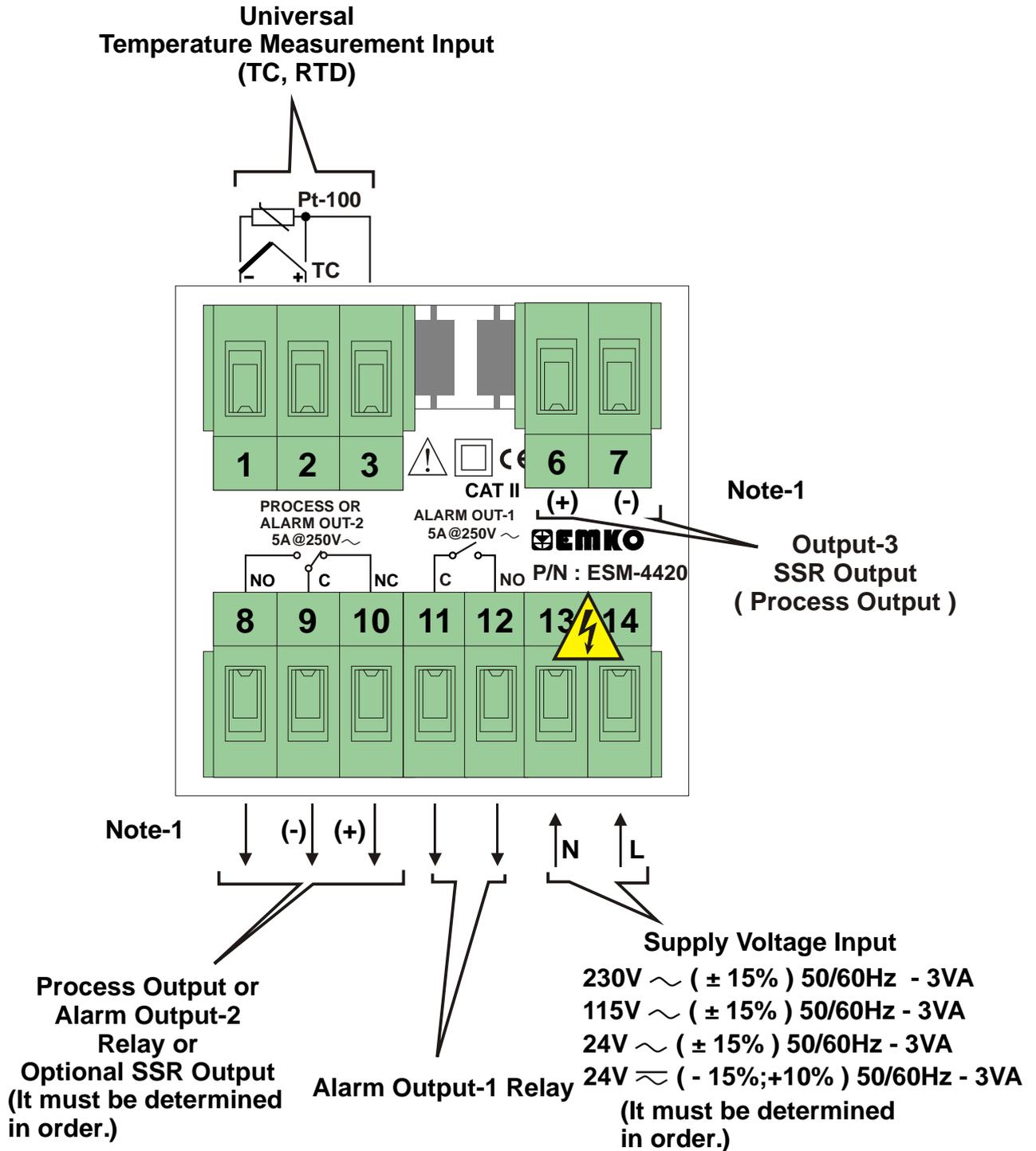


Screw driver 0.8x3mm

3.2 Electrical Wiring Diagram



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.

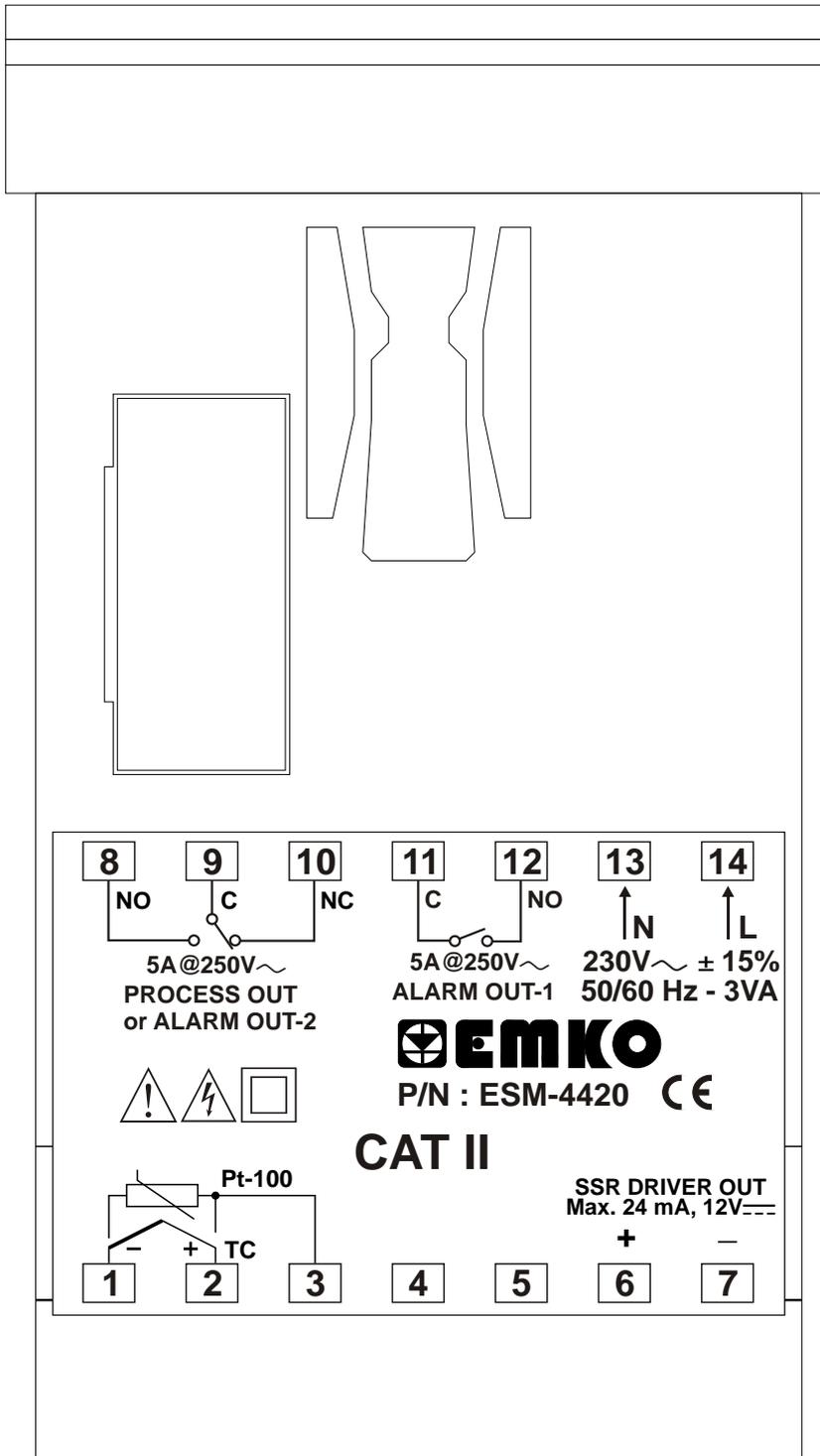


Note-1: Max. 12V $\overline{\text{---}}$, Max. 24mA for SSR Driver Output



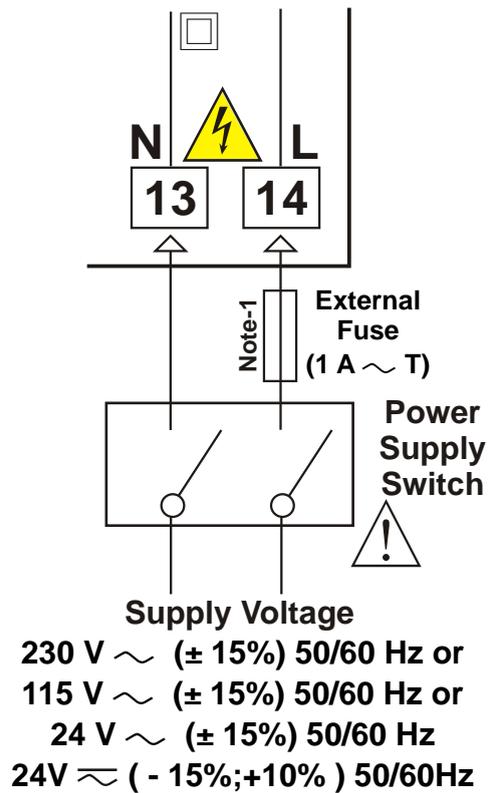
Temperature measurement input is in CAT II class.

3.3 View of the Device Label



3.4 Supply Voltage Input Connection of the Device

Connection of Supply Voltage Input



Note-1: External fuse is recommended.



Make sure that the power supply voltage is the same indicated on the instrument.

Switch on the power supply only after that all the electrical connections have been completed.



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



There is no power supply switch or fuse on the device. So the user must put power supply switch and a fuse to the supply voltage input. In accordance with the safety regulations, the power supply switch shall bring the identification of the relevant instrument. Power supply switch and fuse must be put to a place where user can reach easily.



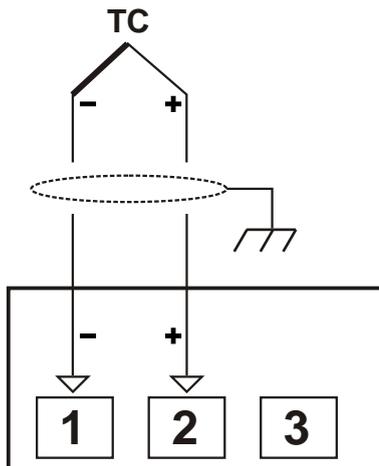
Power supply switch must be two poled for seperating phase and neutral. On/Off condition of power supply switch is very important in electrical connection. On/Off condition of power supply switch must be signed for preventing the wrong connection.



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.

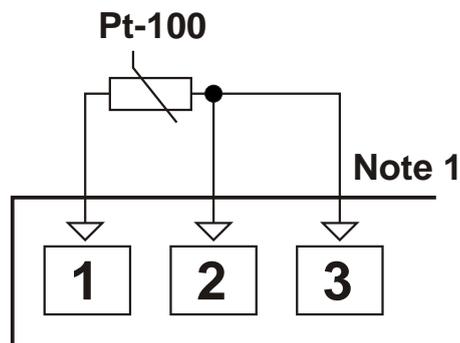


Always use compensation wire corresponding to the thermocouple used. If present, the shield must be connected to a proper ground.

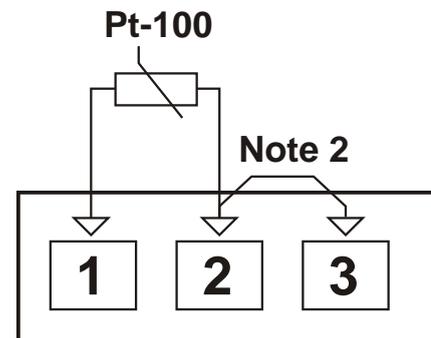


Input resistance is greater than 10M

3.5.2 RTD Connection



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



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.

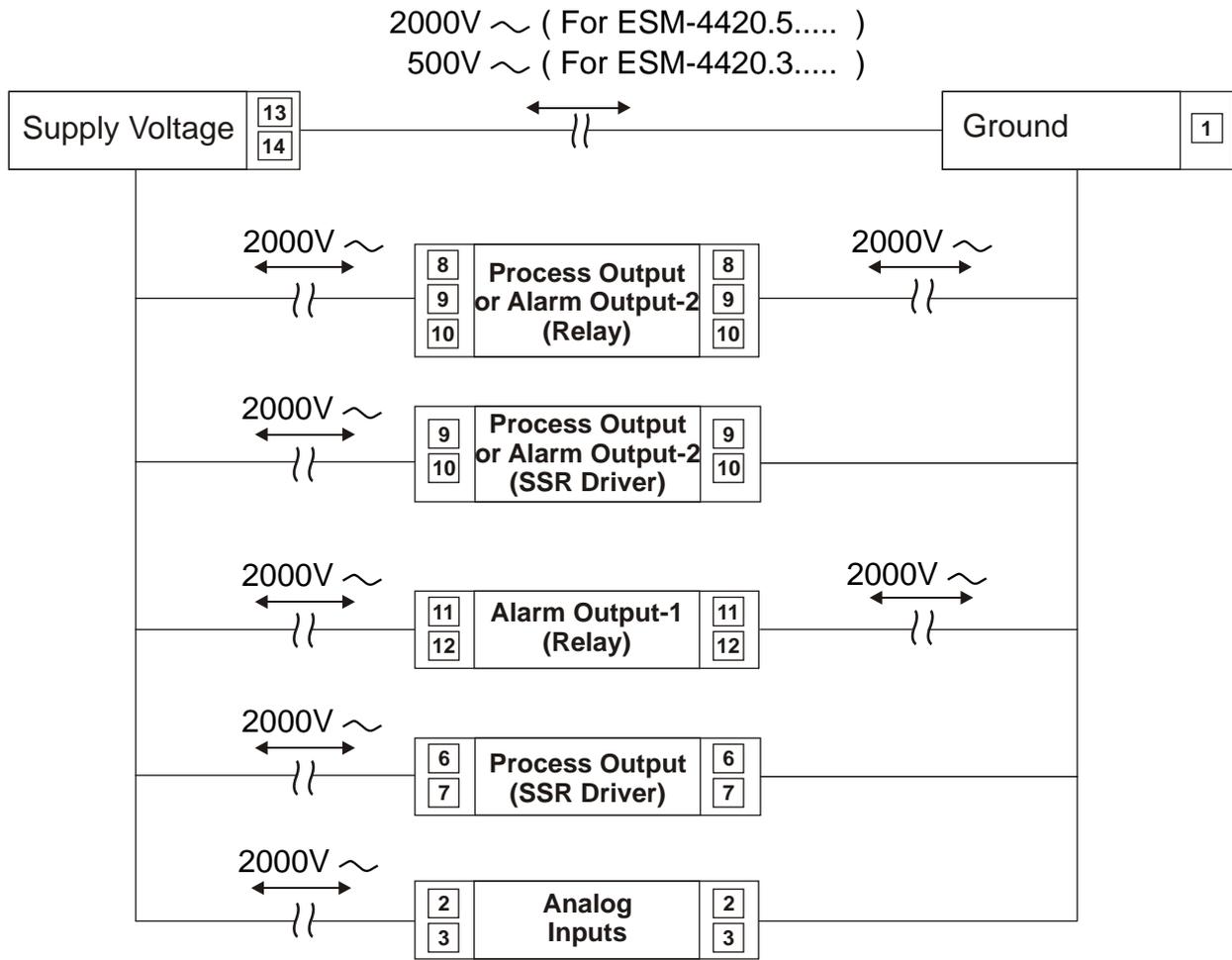
Note 2 : Install a jumper between terminals 2 and 3 when using a 2-wire RTD.

Note 3 : If the distance is longer than 10 meters, use 3-wire system



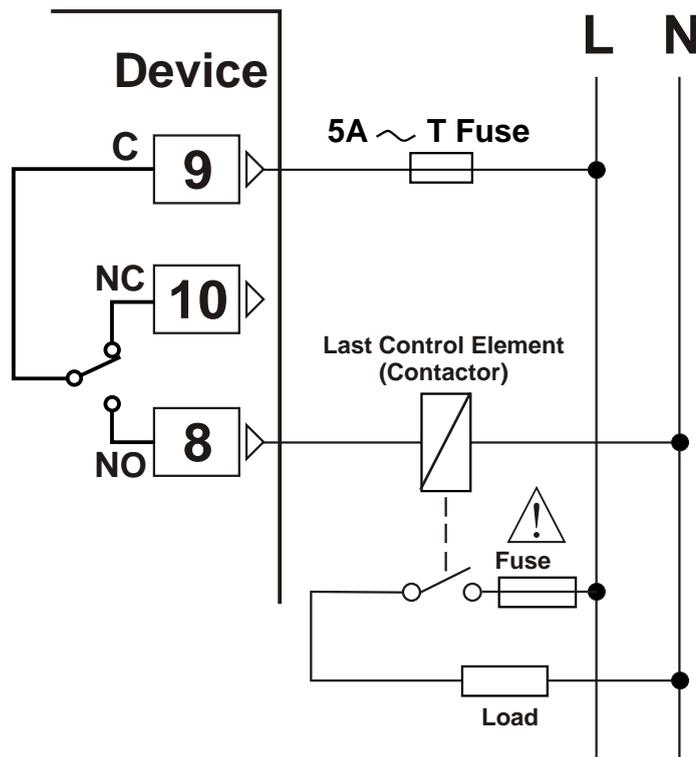
Input resistance is greater than 10M

3.6 Galvanic Isolation Test Values of ESM-4420 Temperature Controller



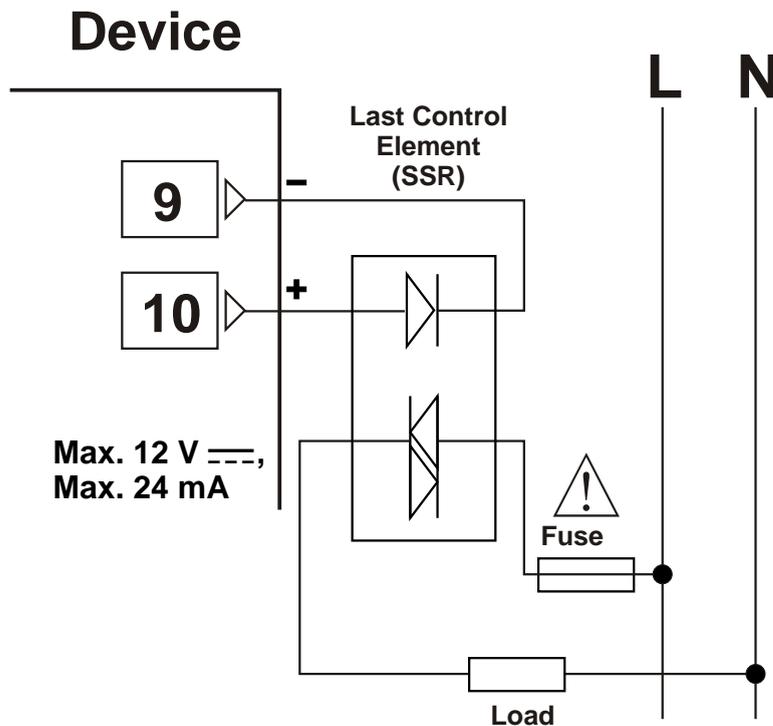
4. Output Connection Forms in ESM-4420 Temperature Controller

4.1 Process Output or Alarm Output-2 (Relay) Connection



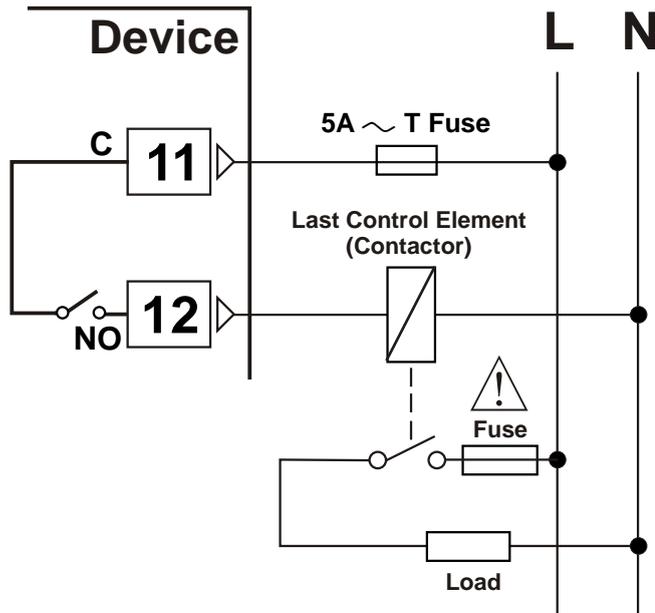
Fuses must be selected according to the application.

4.2 Process Output or Alarm Output-2 (SSR Driver) Connection



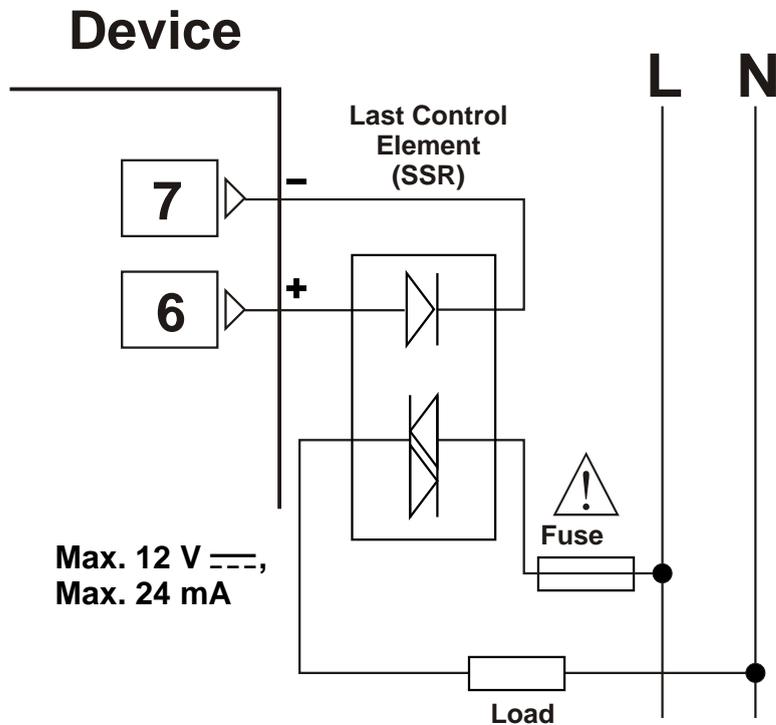
Fuses must be selected according to the application.

4.3 Alarm Output-1 (Relay) Connection



Fuses must be selected according to the application.

4.4 Process Output (SSR Driver) Connection



Fuses must be selected according to the application.

5. Front Panel Definition and Accessing to the Menus

5.1 Front Panel Definition

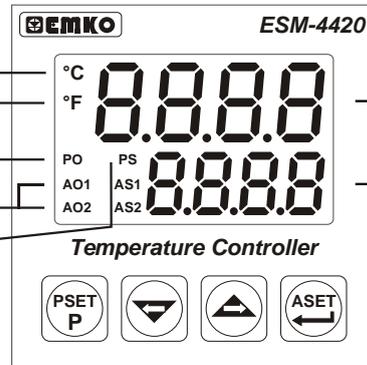
LED indication of °C:Centigrade Unit

LED indication of °F
Fahrenheit Unit

Process Output Status Led

Alarm Output Status Leds

PS , Process Set
Value LED
AS1 , Alarm-1 Set
Value LED
AS2 , Alarm-2 Set
Value LED



Displays
Process Value (PV)
and Parameter

Displays Set Value,
Parameter

Please refer to Section 6.1
for detailed information;
Section 6.1 (Process and
Alarm Set Parameters)

This button is used to access
to the process set value. If it
is pressed for 5 seconds
continuously programming
section is entered.

This button is used to
access to the alarm set
value and use as OK
button.

Note-1

This button is used to
decrease the parameter
values, access to the
program menus

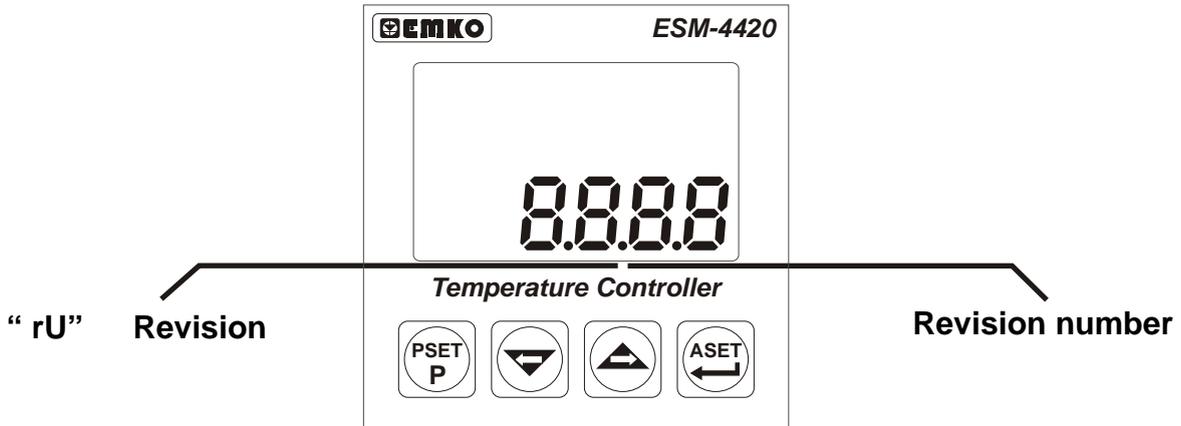
Note-1

This button is used to
increase the parameter
values and access to
the program menus

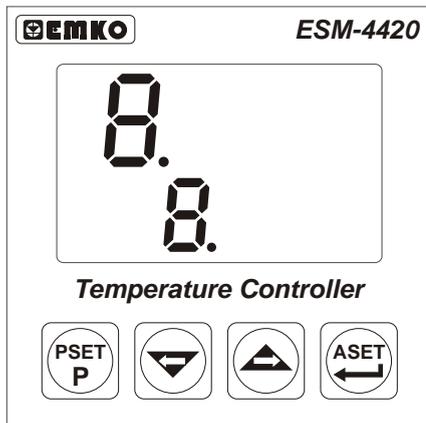
Note-1: If increment or decrement button is pressed for 5 seconds continuously, increment and decrement number become 10, if increment or decrement button is pressed for 10 seconds continuously, increment and decrement number become 100.

5.2 Run the Device and Observation of Software Version on the Displays

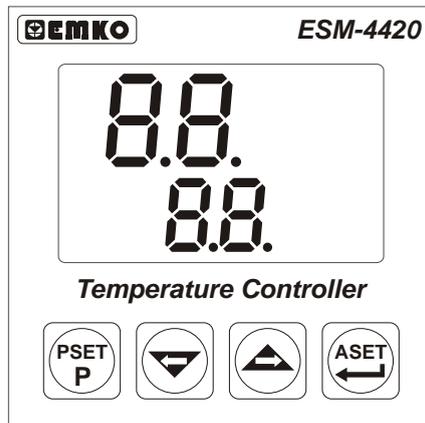
When the power is applied to the device all led indicators and display segments are momentarily illuminated for testing. Software revision number of the controller on the bottom display is momentarily illuminated.



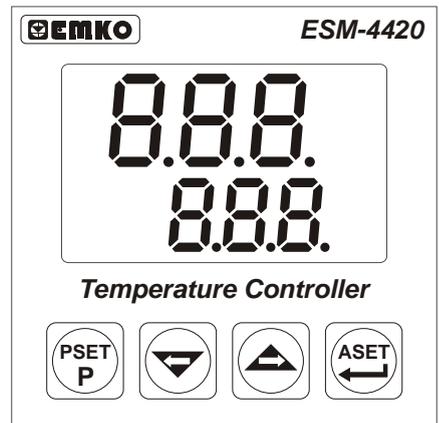
When power on, display of the indicator is like below:



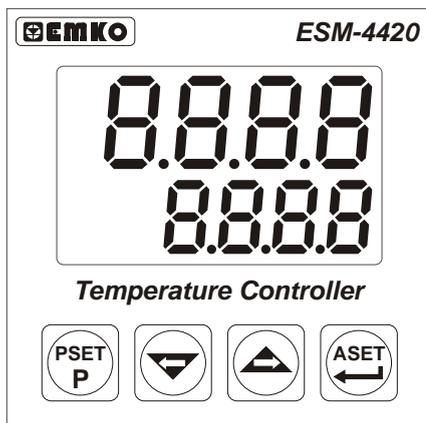
First segments of top and bottom displays are tested



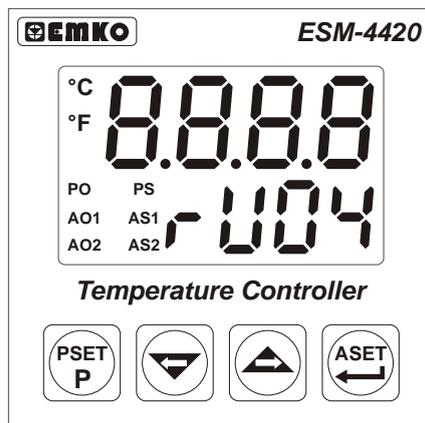
Second segments of top and bottom displays are tested.



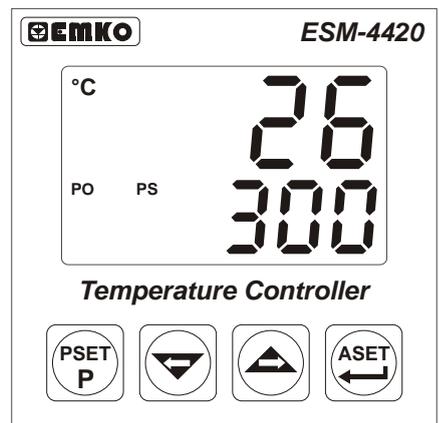
Third segments of top and bottom displays are tested.



Fourth segments of top and bottom displays are tested.



Revision number is shown. All leds are energised.

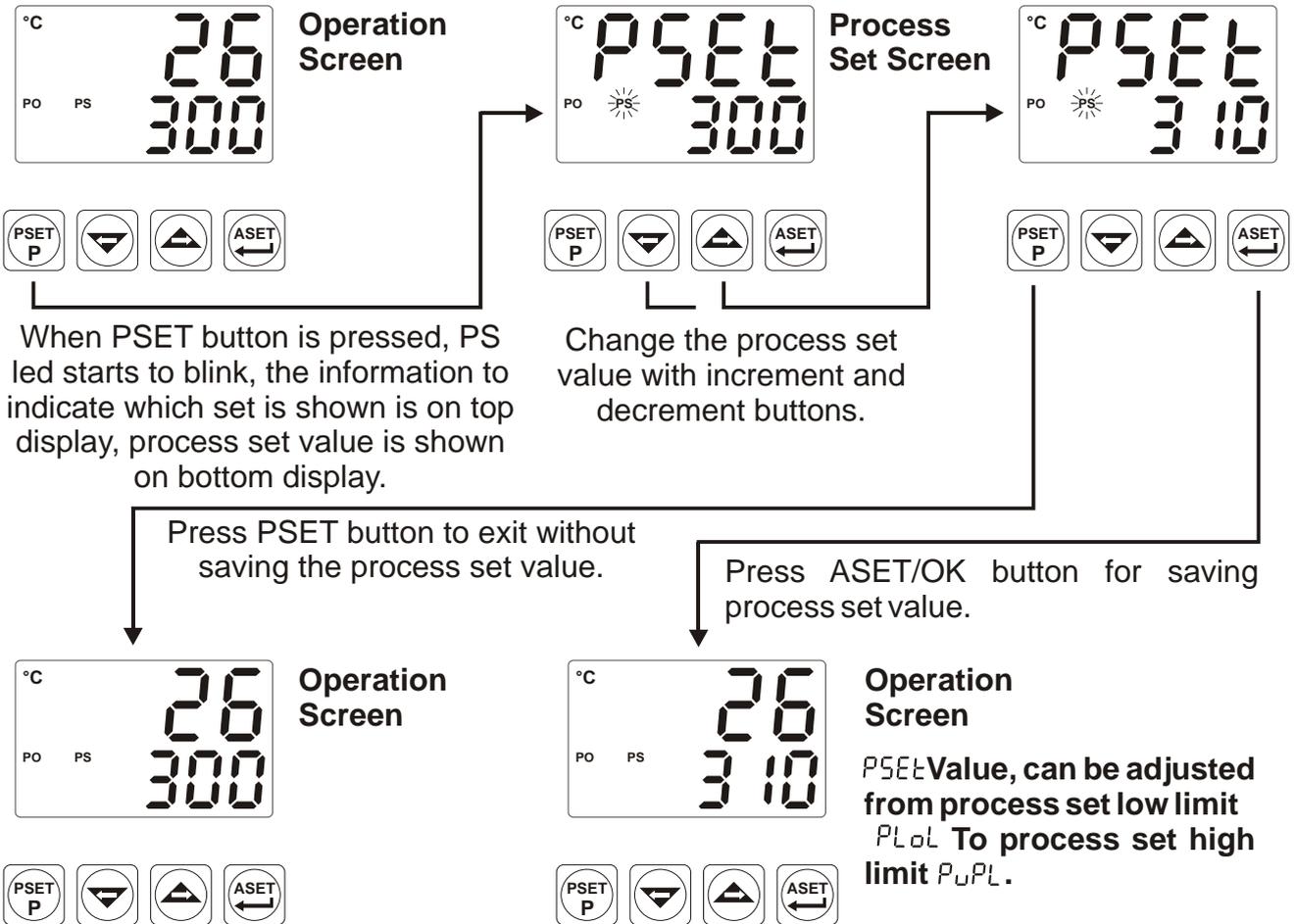


Main operation screen is shown

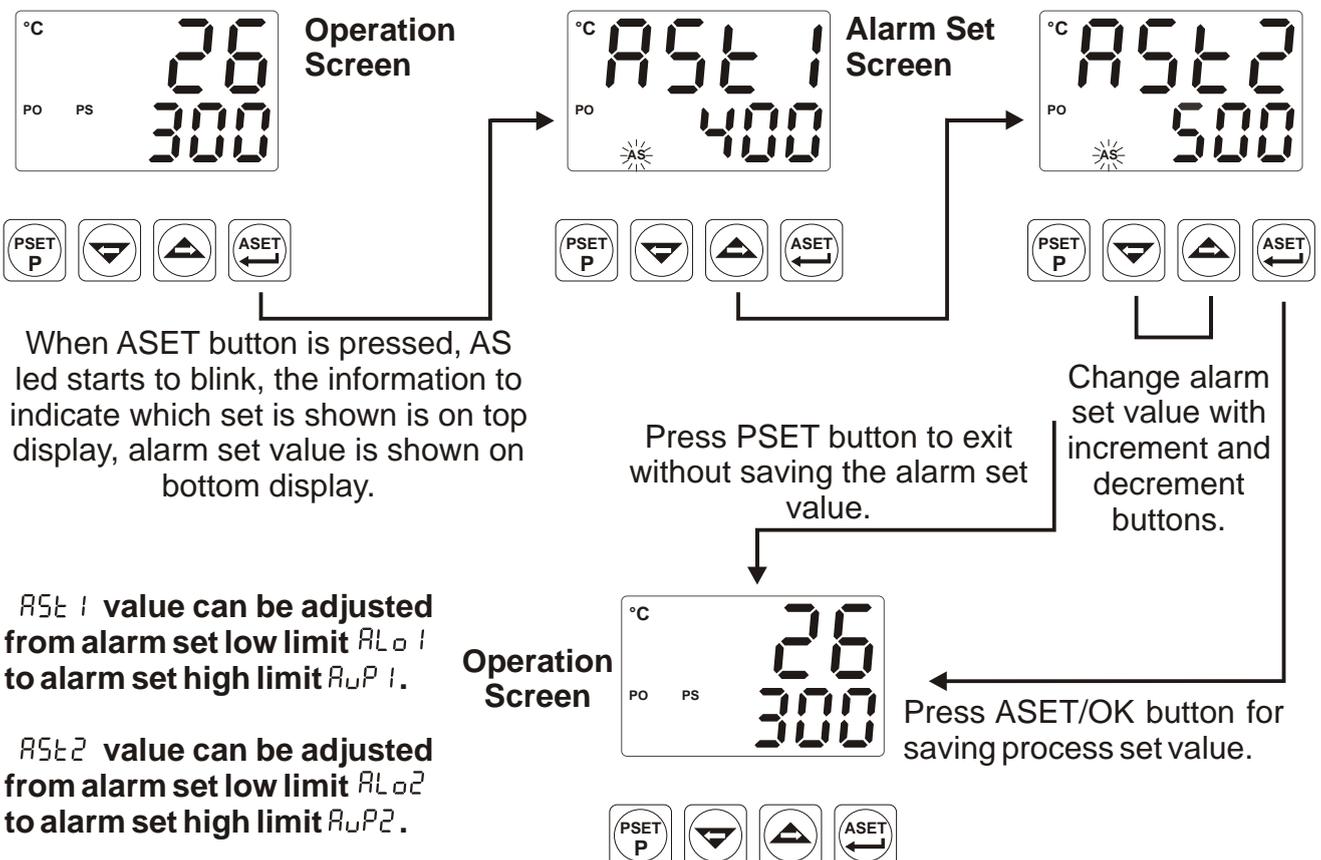


If there is an unexpected situation while opening the device, power off the device and inform a qualified personnel.

5.3 Adjustment of Process SET Value



5.4 Adjustment of Alarm SET Value



6. Parameters

6.1 Parameter List

PrGS

Process menu title

PInS

Process input type selection (**Default Value = J Type (FE.C.n)**)

FE.C.n

J type (Fe,Cu,Ni) Thermocouple, -200°C,900°C or -328°F,1652°F

n.C.n

K type (Ni,Cr,Ni) Thermocouple, -200°C,1300°C or -328°F,2372°F

P13.r

R type (Pt13%RhPt) Thermocouple, 0°C,1700°C or 32°F,3092°F

P10.r

S type (Pt10%RhPt) Thermocouple, 0°C,1700°C or 32°F,3092°F

Cu.C.n

T type (Cu,Cu,Ni) Thermocouple, -200°C,400°C or -328°F,752°F

rtd0

Pt- 100, -200°C,650°C or -328°F,1202°F

rtd1

Pt- 100, -199.9°C,650.0°C or -199.9°F,999.9°F

unit

Unit Selection (**Default Value = °C**)

oC

Unit is °C

oF

Unit is °F

PLoL

Operation scale Low Limit. Minimum Operation scale is defined with this parameter. It changes according to process input type and scale. (**Default Value = -200**)

PuPL

Operation scale High Limit. Maximum Operation scale is defined with this parameter. It changes according to process input type and scale. (**Default Value = 900**)

SU-L

Process Set Low Limit. Minimum process set value is defined with this parameter. It changes according to process input type and scale. (**Default Value = -200**)

SU-u

Process Set High Limit. Maximum process set value is defined with this parameter. It changes according to process input type and scale. (**Default Value = 900**)

PUoF

Display offset for process value.
It can be adjusted from -10% of scale (PuPL- PLoL) to 10% of scale(PuPL- PLoL). It is added to the process display value. (**Default Value = 0**)

Cont

Control menu title

PrTS

Process Type selection (**Default Value = Heat**)

HEAT

Process type is heating

Cool

Process type is cooling

CntS

Process Control Type selection (**Default Value = on.oF**)

on.oF

Process Control form is ON/OFF

Pid

Process Control form is PID

tunE

Tune parameter (**Default Value = no**)

This parameter can be observed if **CntS** parameter is **Pýd**

Prbn

Proportional Band . It can be adjusted from 1.0% to 100.0%.(**Default Value = 10.0**)

If process control type selection **CntS = Pýd**, then this parameter can be observed.

tint

Integral Time. It can be adjusted from 0 to 3600 secs.

If process control type selection **CntS = Pýd**, then this parameter can be observed
(**Default Value = 100**)

tdEr

Derivative Time. It can be adjusted from 0.0 to 999.9 secs.

If process control type selection **CntS = Pýd**, then this parameter can be observed
(**Default Value = 25.0**)

tCon

Output Control period. It can be adjusted from 1 to 150 seconds.

If process control type selection **CntS = Pýd**, then this parameter can be observed
(**Default Value = 10**)

HYSL

Hysteresis value.

If Process Control Type selection **CntS = on.oF**, then this parameter can be observed. It can be adjusted from 0% of defined scale (PuPL- PLoL) to 50% of defined scale (PuPL- PLoL).(**Default Value = 0**)

Sbou

Sensor Break output value. It can be adjusted from %0.0 to %100.0

(**Default value = 0.0**) When sensor breaks, controlling of the process can continue by this %output value.

Cout

Process Output Selection parameter. This parameter determines, which output will be Proces Control Output. If rLY is chosen, process ouput is relay output(Output-1). If Ssr is chosen, process output is ssr output(Output-3) and Output-1 will be alarm-2 output. (**Default = rLY**)

SSEt

Soft Start Set value. It can be adjusted from 0 to 9999. This parameter determines to end point set value of the soft start operation. (**Default value = 0**)

SSCo

Soft Start Control output. It can be adjusted from %10.0 to %90.0

(**Default value = 10.0**) This value determines Soft Start control output percentage.

SSCL

Soft Start Control period. It can be adjusted from 0 to 100 sec. This value determines Soft Start control period. (**Default value = 0**)

ALr

Alarm menu title

AH51

Alarm-1 Hysteresis value. It can be adjusted from 0% of defined scale (AuP1- ALo1) to 50% of defined scale (AuP1- ALo1). (**Default Value = 0**)

AL51

Alarm-1 Type selection (**Default Value = PHýA (Process High Alarm)**)

ALo1

Alarm-1 Set Value Low Limit. Minimum value of the alarm set value is defined in this parameter.

It can be adjusted from operation scale low limit parameter to alarm set high limit parameter. It changes according to process input type and scale(**Default Value = 0**)

AuP1

Alarm-1 Set High Limit. Maximum value of the alarm set value is defined in this parameter.

It can be adjusted from alarm set low limit parameter to operation scale high limit parameter. It changes according to process input type and scale(**Default Value = 500**)

Aon1

Alarm-1 on delay time.

It can be adjusted from 0 to 9999 seconds. (**Default Value = 0**)

AoF1

Alarm-1 off delay time. It can be adjusted from 0 to 9998 seconds. When it is higher than 9998, "LtCH" is shown and alarm latching output is selected. To make the alarm latching output passive, decrement button must be pressed in main operation screen. (**Default Value = 0**)

AH52 Alarm-2 Hysteresis value. It can be adjusted from 0% of defined scale (AuP2 - ALo2) to 50% of defined scale (AuP2- ALo2). **(Default Value = 0)**

AL52 Alarm-2 Type selection **(Default Value = PH^YA (Process High Alarm))**

ALo2 Alarm-2 Set Value Low Limit. Minimum value of the alarm set value is defined in this parameter.

It can be adjusted from operation scale low limit parameter to alarm set high limit parameter. It changes according to process input type and scale **(Default Value = 0)**

AuP2 Alarm-2 Set High Limit. Maximum value of the alarm set value is defined in this parameter.

It can be adjusted from alarm set low limit parameter to operation scale high limit parameter. It changes according to process input type and scale **(Default Value = 500)**

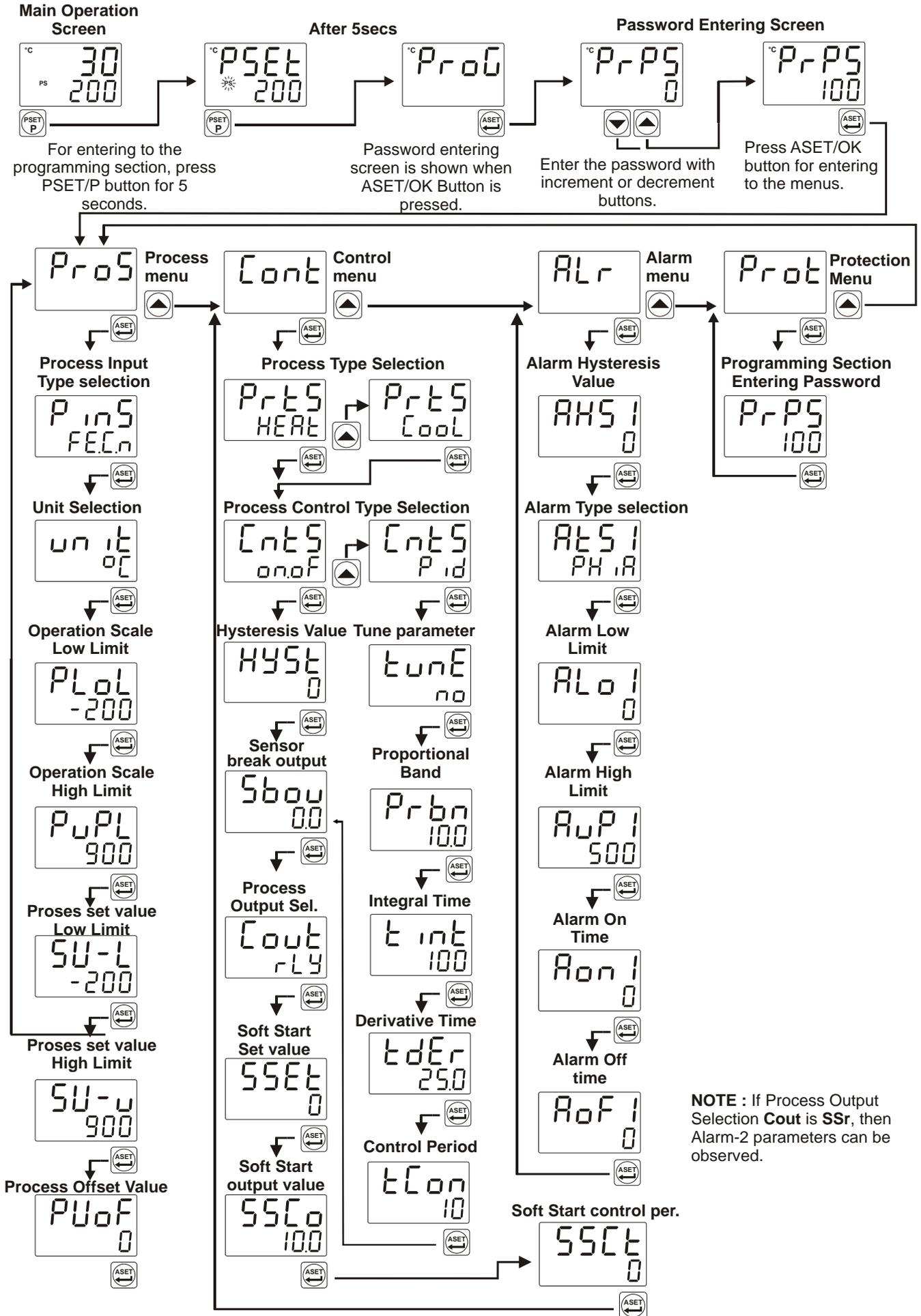
Aon2 Alarm-2 on delay time.
It can be adjusted from 0 to 9999 seconds. **(Default Value = 0)**

Aof2 Alarm-2 off delay time. It can be adjusted from 0 to 9998 seconds. When it is higher than 9998, "LtCH" is shown and alarm latching output is selected. To make the alarm latching output passive, decrement button must be pressed in main operation screen. **(Default Value = 0)**

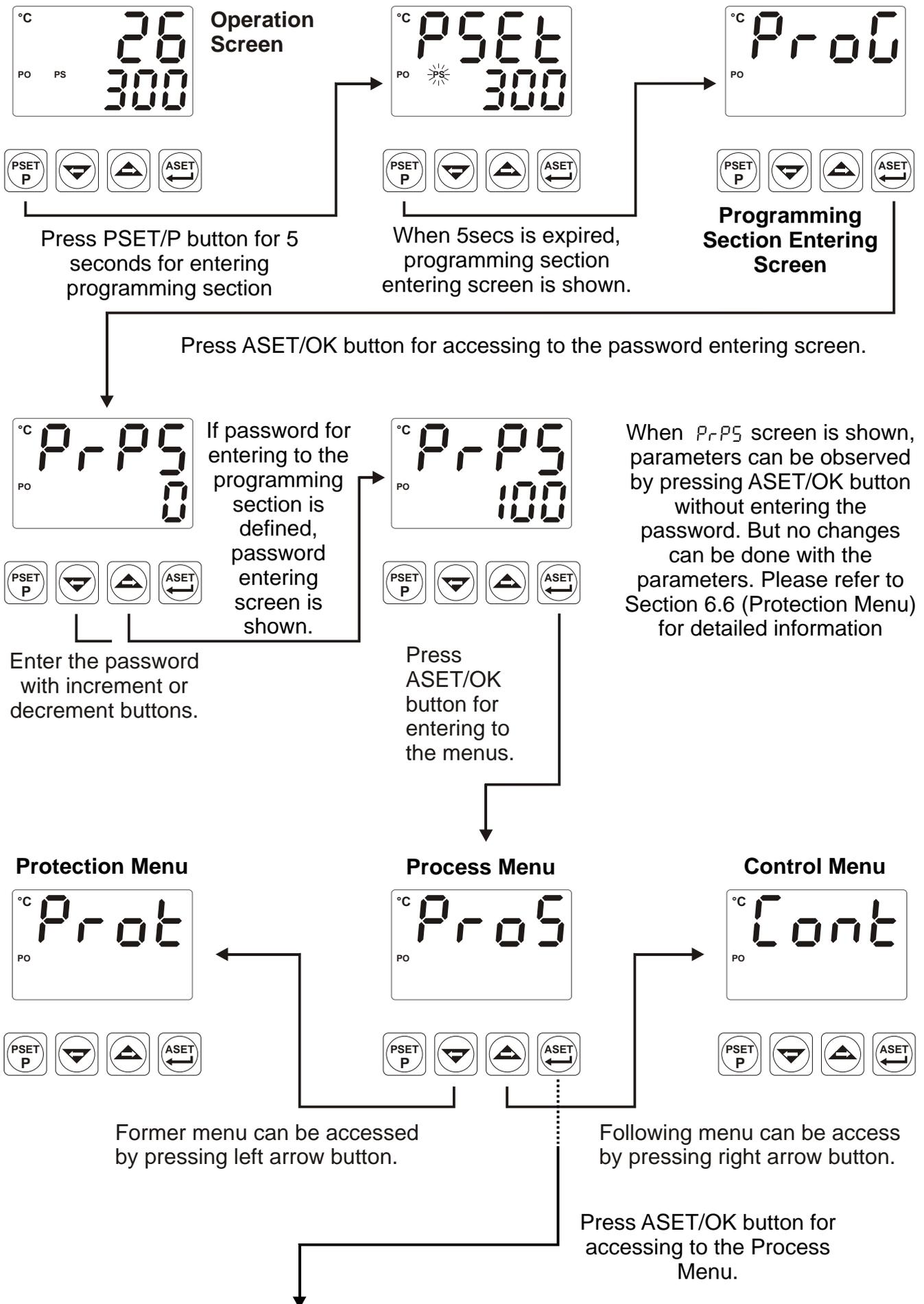
Prot **Protection menu title**

PrPS Password for accessing to the programming section. It can be adjusted from 0 to 9999. **(Default Value = 0)**

6.2 Easy Access Diagram of Parameters



6.3 Entering to the Programming Section and Process Menu





Process Input Type Selection

Process Input Type can be changed into any of the type which are listed below with increment and decrement buttons.

- FEEn*: J type (Fe,Cu,Ni) Thermocouple, -200°C,900°C or -328°F,1652°F
- nEnn*: K type (Ni,Cr,Ni) Thermocouple, -200°C,1300°C or -328°F,2372°F
- P13r*: R type (Pt13%RhPt) Thermocouple, 0°C,1700°C or 32°F,3092°F
- P10r*: S type (Pt10%RhPt) Thermocouple, 0°C,1700°C or 32°F,3092°F
- EuEn*: T type (Cu,Cu,Ni) Thermocouple, -200°C,400°C or -328°F,752°F
- rtd0*: Pt - 100, -200°C,650°C or -328°F,1202°F
- rtd1*: Pt - 100, -199.9°C,650.0°C or -199.9°F,999.9°F



Press ASET/OK button for saving the changes and accessing to the following parameter.



Unit selection

Unit can be selected °C or °F by increment and decrement buttons.



Press ASET/OK button for saving the changes and accessing to the following parameter.



Operation Scale Low Limit

Minimum value of the operation scale value can be adjusted with this parameter. It can be adjusted from process input type minimum value to operation scale high limit parameter *PuPL* value. It changes according to the process input type and scale.



Press ASET/OK button for saving the changes and accessing to the following parameter.



Operation Scale High Limit

Maximum value of the operation scale value can be adjusted with this parameter. It can be adjusted from operation scale low limit parameter *PLoL* to process input type maximum value. It changes according to the process input type and scale.

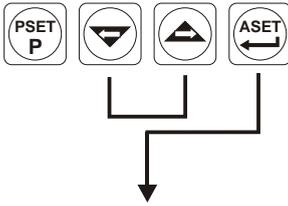


Press ASET/OK button for saving the changes and accessing to the following parameter.



Process Set value Low Limit

Minimum value of the process set value can be adjusted with this parameter. It can be adjusted from operation scale low limit value to process high limit parameter 5U-U value. It changes according to the process input type and scale.

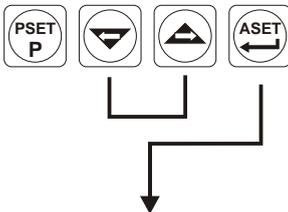


Press ASET/OK button for saving the changes and accessing to the following parameter.

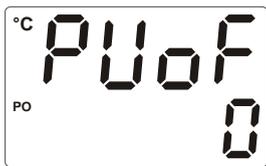


Process Set value High Limit

Maximum value of the process set value can be adjusted with this parameter. It can be adjusted from process low limit parameter 5U-L to operation scale high limit value. It changes according to the process input type and scale.

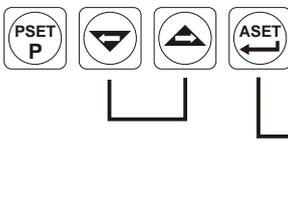


Press ASET/OK button for saving the changes and accessing to the following parameter.



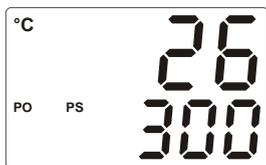
Process Value Display Offset

It can be adjusted -10% of scale(PuPL- PLoL) to 10% of scale(PuPL- PLoL). Defined value is added to the process display value.



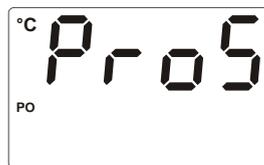
Press ASET/OK button for saving the changes and accessing to the following parameter.

Operation Screen



Press PSET/P for exiting menu list and turn to operation screen.

Process Menu

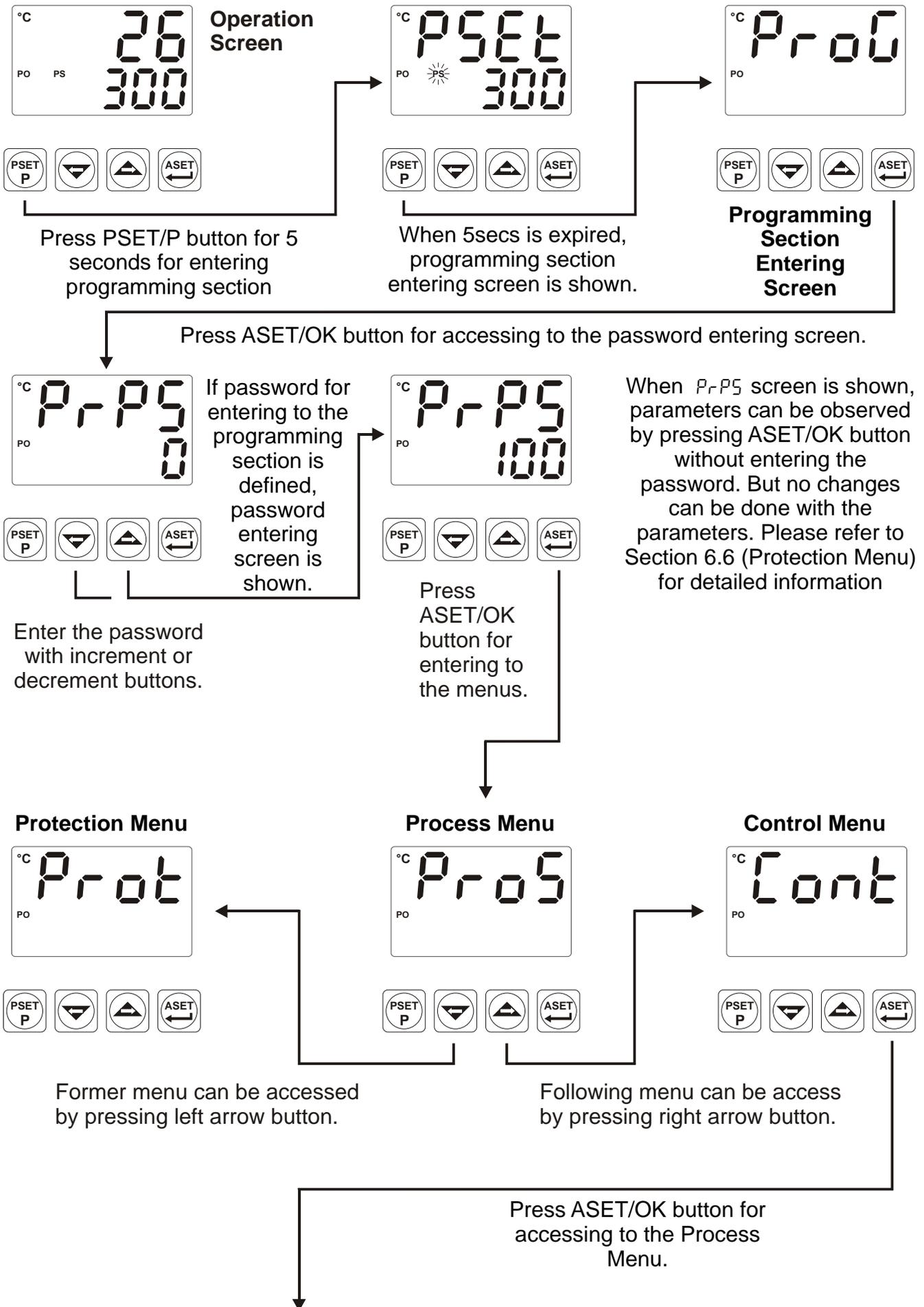


Following menu can be accessed by pressing right arrow button.

Control Menu



6.4 Control Menu





Process Type Selection

Process Type Selection can be selected *HEAT* or *COOL* with increment and decrement buttons.

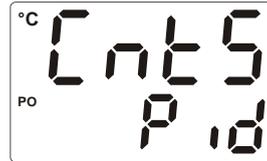


Press ASET/OK button for saving the parameter and accessing to the next parameter.



Process Control Type Selection

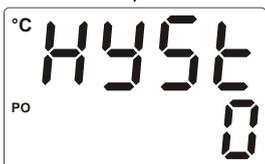
Process Control Type can be selected *onof* or *Pid* with increment and decrement buttons.



Press ASET/OK button for saving the parameter and accessing to the next parameter.

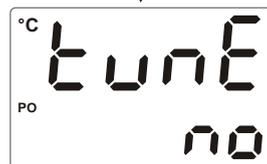


Press ASET/OK button for saving the parameter and accessing to the next parameter.



Hysteresis Value

Process Control Type selection. If *Cnts = onof*, then this parameter can be observed. It can be adjusted from 0% of full scale (PuPL-PLoL) to 50% of full scale (PuPL-PLoL) with increment and decrement buttons.



Tune Parameter

Tune operation can be started and stopped with increment and decrement buttons. If Process Control Type *Cnts* is *Pid* Then this parameter can be observed.



Press ASET/OK button for saving the parameter and accessing to the next parameter.



Proportional Band

Press ASET/OK button for saving the parameter and accessing to the next parameter.

Proportional band can be adjusted from 1.0% to 100.0% with increment and decrement buttons. If Process Control Type selection

Cnts = Pid, then this parameter can be observed.

For example ;

If $P_{uPL} = 1000^{\circ}\text{C}$, $P_{LoL} = 0^{\circ}\text{C}$ and $P_{rbn} = 50.0$

Proportional Band = $(P_{uPL} - P_{LoL}) * P_{rbn} / 100.0$

Proportional Band = $(1000 - 0) * 50.0 / 100.0 = 500^{\circ}\text{C}$





Integral Time

It can be adjusted from 0 to 3600 seconds with increment and decrement buttons. If Process Control Type selection $\text{Ctrl} = P_{id}$, then this parameter can be observed.



Press ASET/OK button to save the value and access to the next parameter.



Derivative Time

It can be adjusted from 0.0 to 999.9 seconds. If Process Control Type selection $\text{Ctrl} = P_{id}$, then this parameter can be observed.

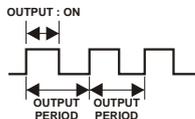


Press ASET/OK button to save the value and access to the next parameter.



Output Control Period

It can be adjusted from 1 to 150 with increment and decrement buttons. If Process Control Type selection $\text{Ctrl} = P_{id}$, then this parameter can be observed.



Press ASET/OK button for saving the parameter and accessing to the next parameter.

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 module as last control



Sensor Break Output

It can be adjusted from %0 to %100 with increment and decrement buttons.



Process Output Selection

Process Output Selection Type can be selected rLY or SSR with increment and decrement buttons.



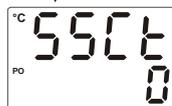
Soft Start Set value

It can be adjusted from 0 to 9999 with increment and decrement buttons. When the device power on, if the Soft start set value different from "0", and temperature value is lower than soft start value on heating processes, device starts soft start operation, until temperature reaches soft start set value. On soft start device output period is SSCt parameter value and device control output is SSCo parameter value.



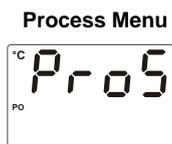
Soft Start Control Output

It can be adjusted from %10 to %90 with increment and decrement buttons.



Soft Start Control Period

It can be adjusted from 0 to 100 sec with increment and decrement buttons.



Process Menu



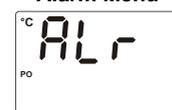
Former menu can be accessed by pressing left-arrow button.

Control Menu



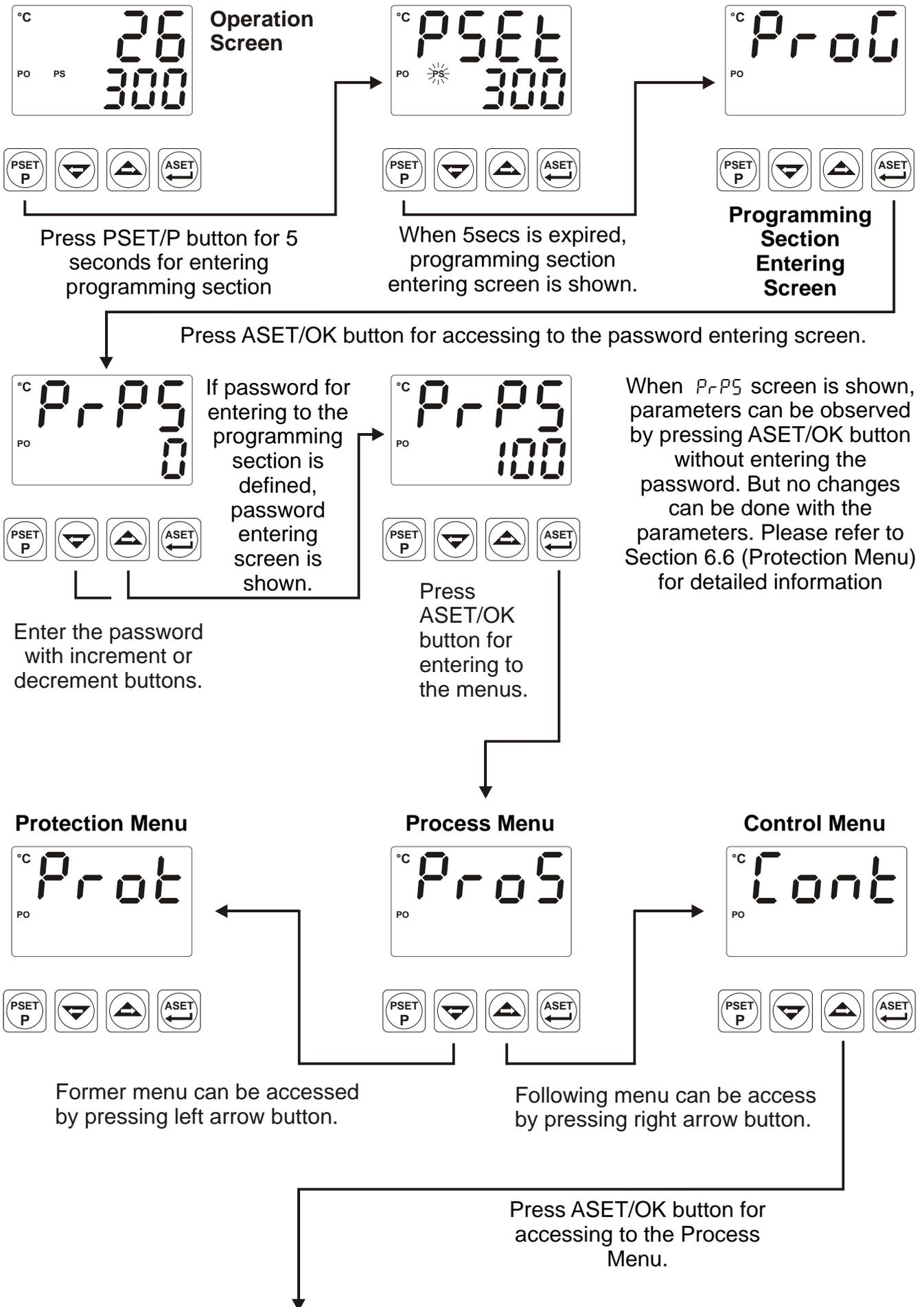
Next menu can be accessed by pressing right-arrow button.

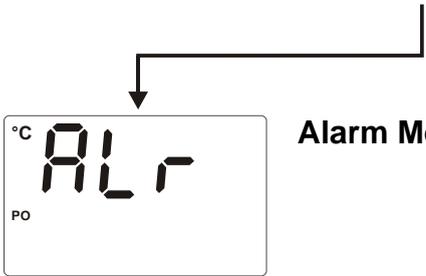
Alarm Menu



Press PSET/P button to exit from menu list and turn to the operation screen.

6.5 Alarm Menu

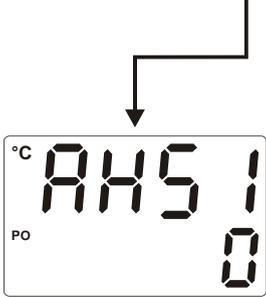




Alarm Menu



Press ASET/OK button for accessing to the alarm menu.

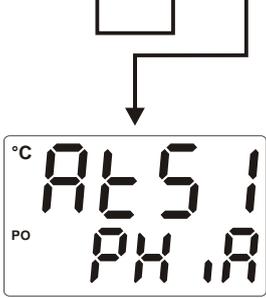


Alarm-1 Hysteresis value

It can be adjusted from 0% of (AuP1-ALo1) to 50% of (AuP1-ALo1).



Press ASET/OK button for saving the changes and accessing to the following parameter.



Alarm-1 Type Selection

It can be adjusted to the values listed below:

- PH.A* : Process High Alarm
- PLoA* : Process Low Alarm
- dH.A* : Deviation High Alarm
- dLoA* : Deviation Low Alarm
- dbnA* : Deviation Band Alarm
- drnA* : Deviation Range Alarm
- drHA* : Deviation Range High Alarm

Please refer to Section 7.2 Alarm Types for detailed information



Press ASET/OK button for saving the changes and accessing to the following parameter.

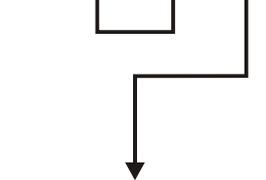


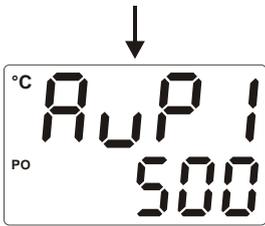
Alarm-1 Set Low Limit Value

Minimum value of the alarm set is defined with this parameter. It changes according to the process type and scale. It can be adjusted from operation scale low limit parameter *PLoL* to alarm set high limit parameter *AuPL* value.



Press ASET/OK button for saving the changes and accessing to the following parameter.





Alarm-1 Set High Limit Value

Maximum value of alarm set is defined with this parameter. It can be adjusted from alarm set low limit parameter $ALo1$ to operation scale high limit parameter $PuPL$. It changes according to process input type and scale.

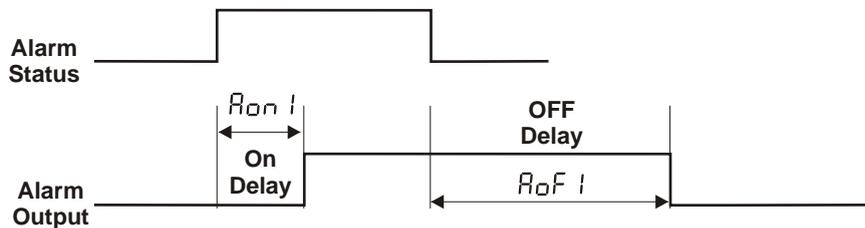


Press ASET/OK button for saving the changes and accessing to the following parameter.



Alarm-1 On Delay Time

It can be adjusted from 0 to 9999 seconds with increment and decrement buttons.



Press ASET/OK button for saving the changes and accessing to the following parameter.



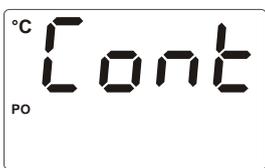
Alarm-1 OFF Delay Time

It can be adjusted from 0 to 9998 seconds. When it is higher than 9998, $LECH$ is shown and alarm latching output is selected. To make the alarm latching output passive, decrement button must be pressed in main operation screen.



Press ASET/OK button for saving the changes and accessing to the following parameter.

Control Menu



Former menu can be accessed by pressing left arrow button.

Alarm Menu



Following menu can be access by pressing right arrow button.

Protection Menu

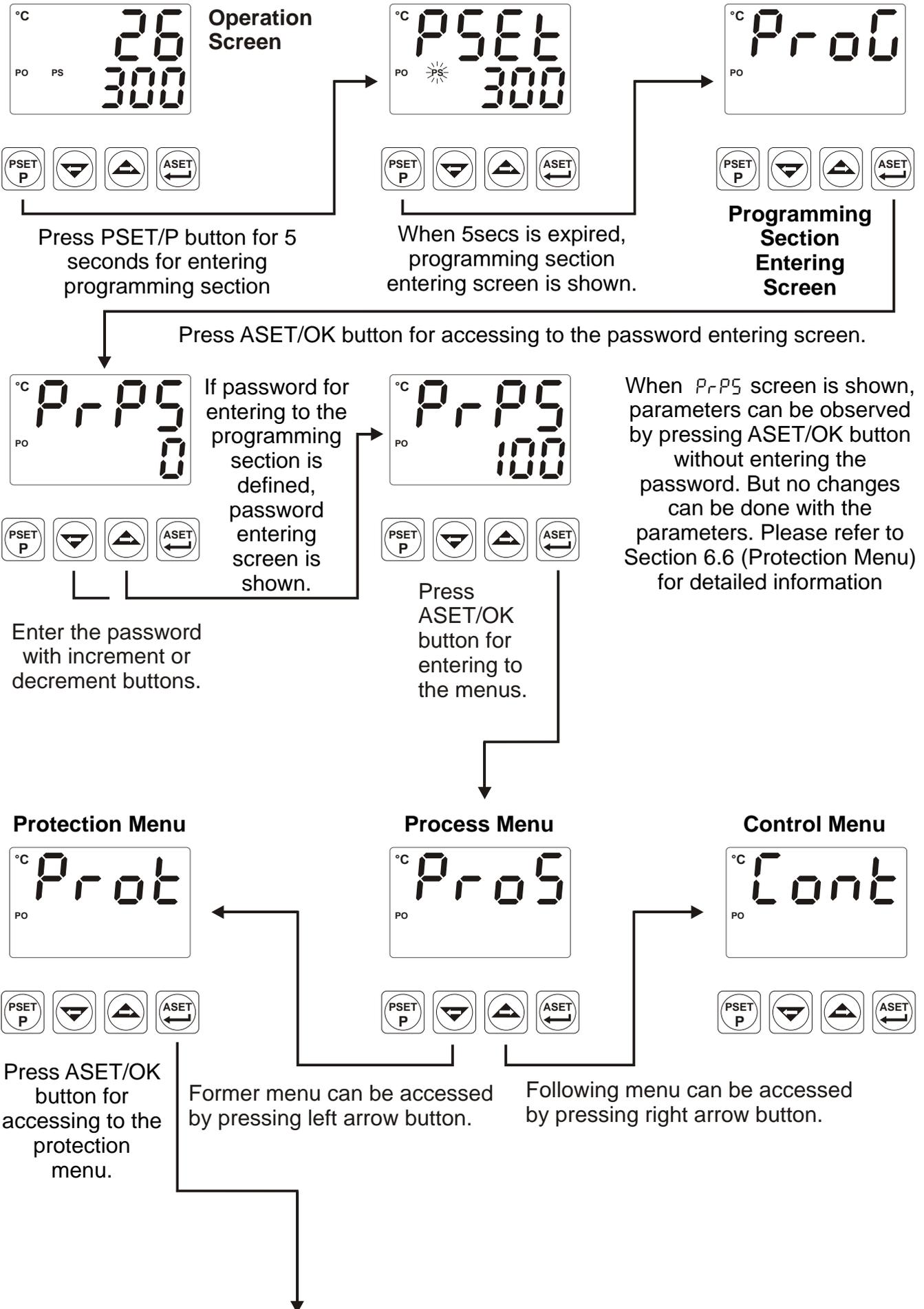


Press PSET/P for exiting menu list and turn to operation screen.

Press ASET/OK button for accessing to the Process Menu.

NOTE : If Process Output Selection **Cout** is **SSr**, after Alarm-1 parameters, Alarm-2 parameters can be observed.

6.6 Protection Menu





Programming Section Entering Password

It is used for accessing to the programming section. It can be adjusted from 0 to 9999.

If it is 0, programming section is accessed without entering the password.



If it is different from 0, in programming section entering password;

1- If user enters the password incorrect:

Device turns to main operation screen without being able to see the parameters

2- If user press the ASET/OK button without entering the password *PrPS* for entering to the programming section (observation of the parameters):

All menus and parameters except protection menu (*Prot*) can be observed but they can not be changed.

(Please refer to Section 8. Failure Messages in ESM-4420 Temperature Controller(4))

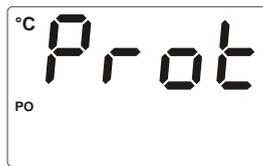
Press ASET/OK button for saving the parameter and exiting from protection menu parameters.

Alarm Menu



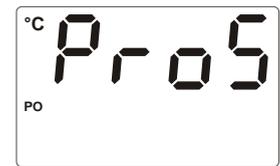
Former menu can be accessed by pressing left arrow button.

Protection Menu



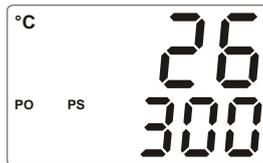
Following menu can be access by pressing right arrow button.

Process Menu



Press PSET/P for exiting menu list and turn to operation screen.

Operation Screen



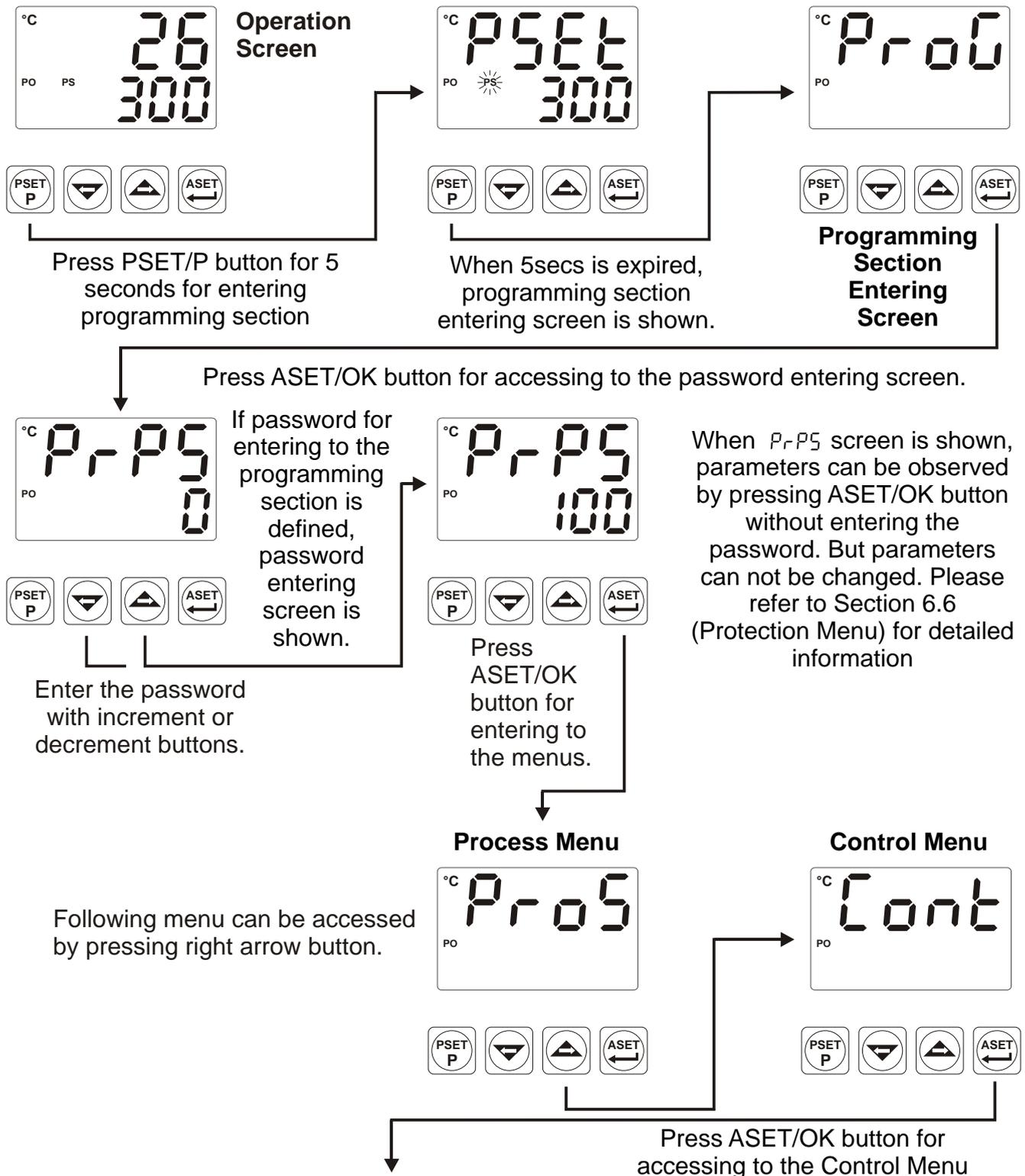
7. General Information

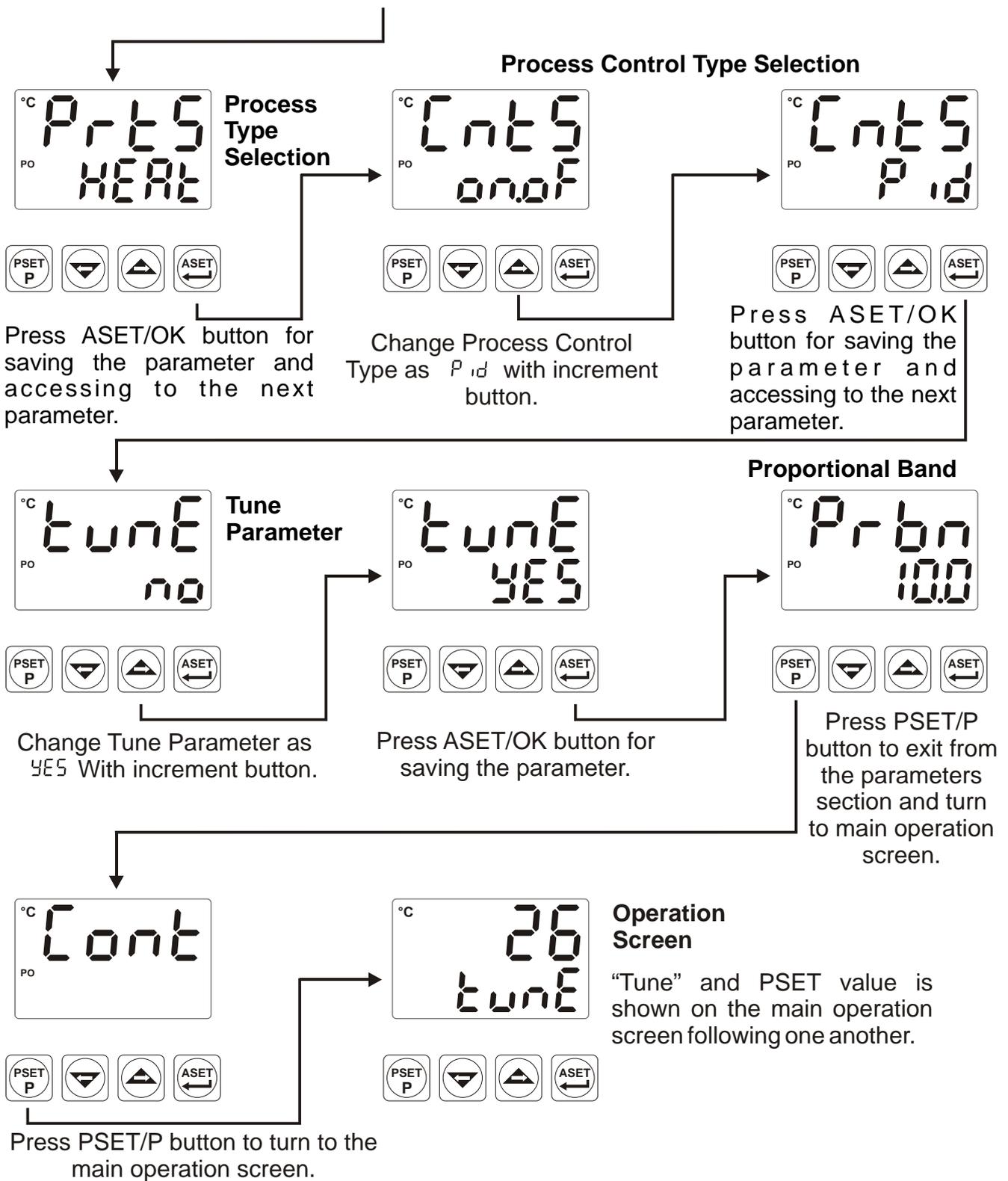
7.1 Tune Operation

Esm-XX20 devices use **Self Tune** (Step Response Tuning) method to automatically determine PID parameters.

Starting the Tune operation by the user

- Enter to the programming section
- Select the *tune* parameter in *Cont* menu, *YES* and turn to main operation screen.
- Observe that *tune* is blinking in set display





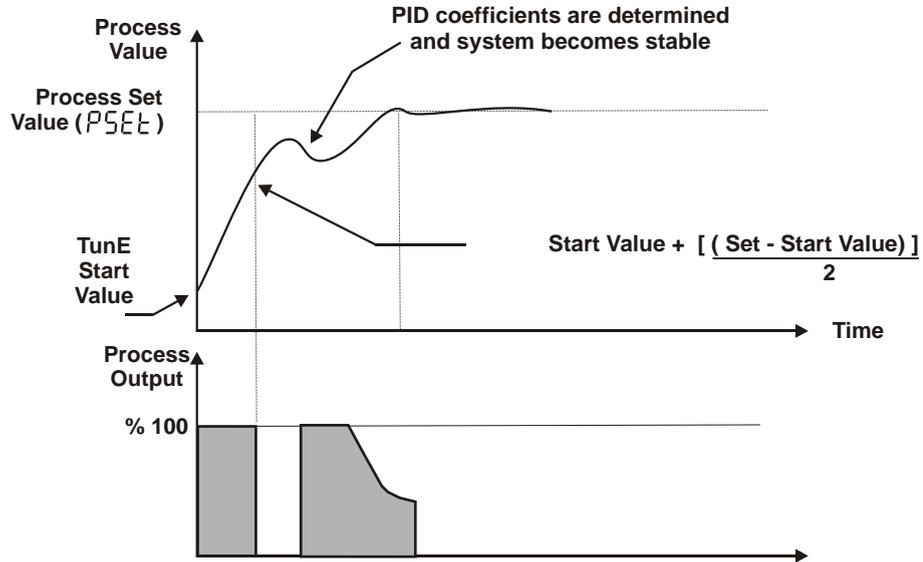
If **Self Tune** operation is finished without any problem, device saves new PID parameters to memory and runs. It changes *tune* parameter to *no*

Canceling **Self Tune** operation :

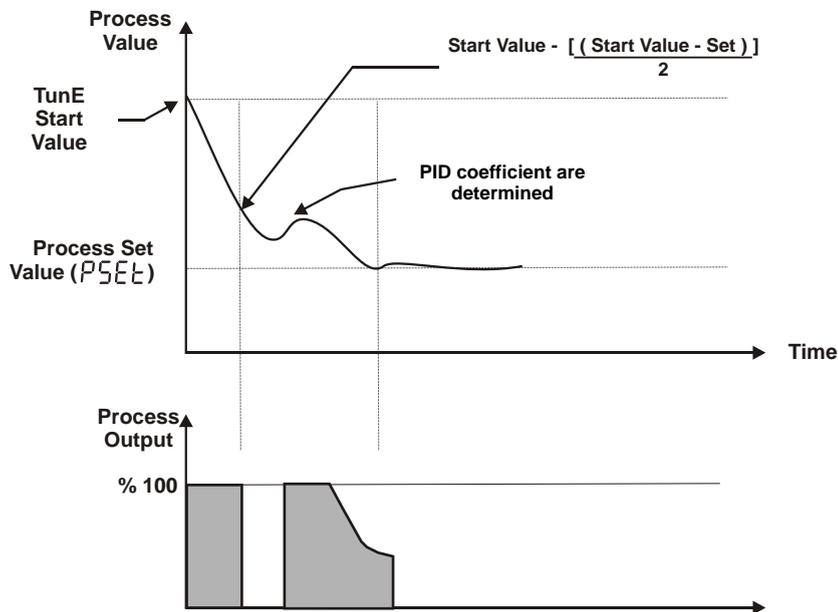
- 1- If sensor breaks ;
 - 2- If **Self Tune** operation can not be completed in 8 hours ;
 - 3- While **Self Tune** operation is running, if user changes process set value;
- Self Tune** operation is canceled. Then device continues to run with former PID parameters without changing PID parameters.

If power is off while **Self Tune** operation continues, PID parameters and t_{unE} parameter are not changed. When power is off and then on, device starts to complete the **Self Tune** operation.

If heating 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.



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 starts to calculate PID coefficients.



For starting Tune (Step Response Tuning) operation :

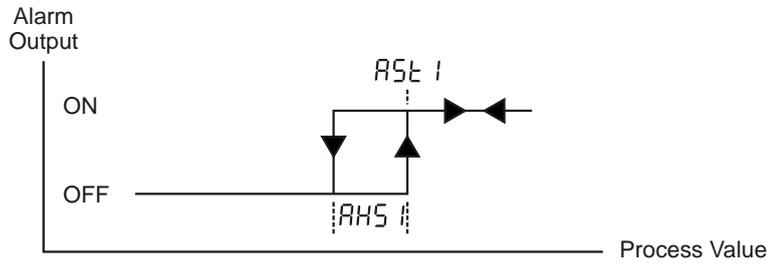
- 1- Control form must be P,PI,PD or PID.
- 2- For heating tune, Process Value must be 5% of full scale lower than process set value
 For cooling tune, process value must be 5% of full scale higher than process set value.
- 3- If Process Set Value is changed while Tune operation continues, tune operation is canceled.

7.2 Alarm Types

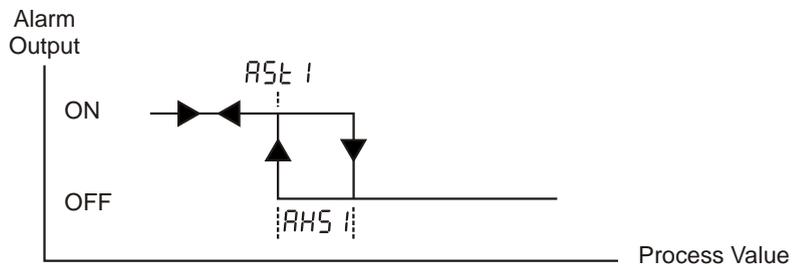
Alarm types which are explained in Section 6.5 Alarm Types Selection parameter *AL51* are explained below:



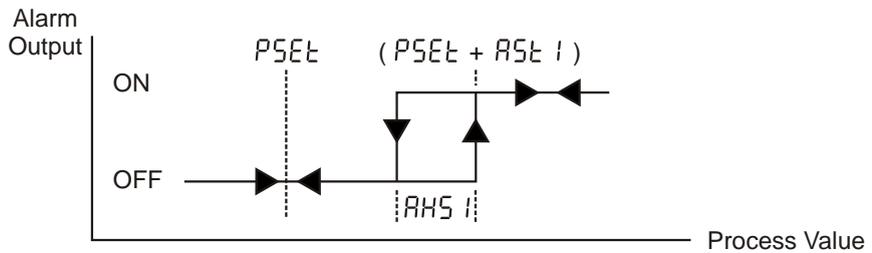
Process High Alarm



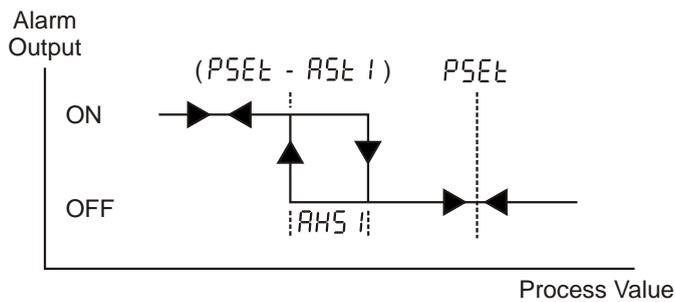
Process Low Alarm



Deviation High Alarm

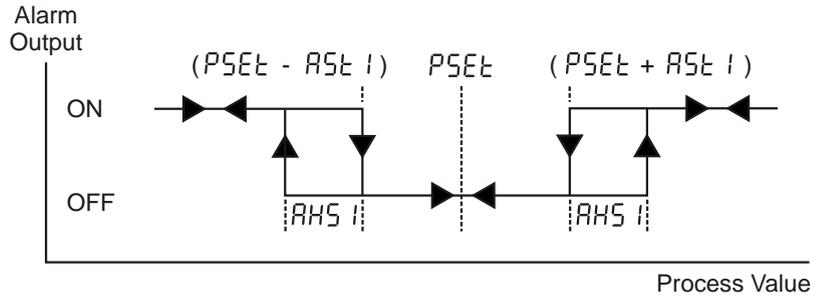


Deviation Low Alarm

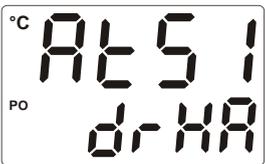
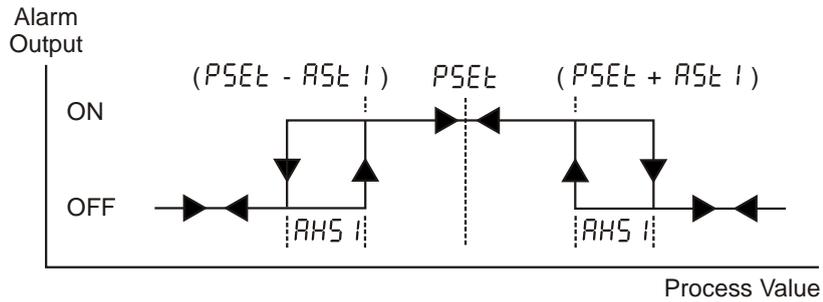




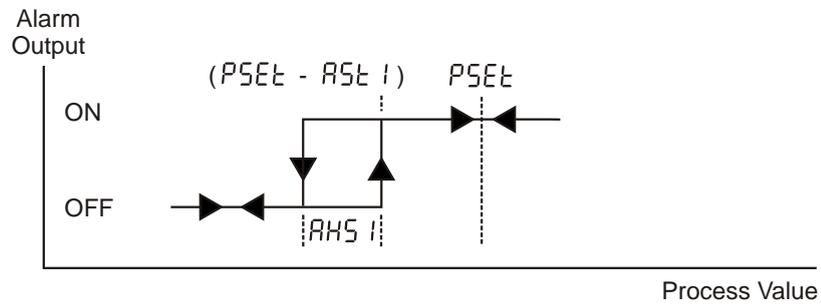
Deviation Band Alarm



Deviation Range Alarm



Deviation Range High Alarm



Note : If the one of $dH 1R$, $dLoR$, $dbnA$, $drnA$ and $drHA$ these alarm types are selected, alarm set value can be decreased to zero with the decrement button even though alarm set low limit is negative value.

8. Failure Messages in ESM-4420 Temperature Controller



1- Sensor failure in analog inputs. Sensor connection is wrong or there is no sensor connection.



2- If value that is read from the analog input is lower than process set low limit parameter P_{LoL} , value on the top display starts to blink like on the picture.



For this example in *ProS* menu
 $P_{inS} = FEEn$; unit = °C; $P_{LoL} = -150$ and
 $P_{uPL} = 250$



Please refer to Section 6.3 for detailed information about the parameter



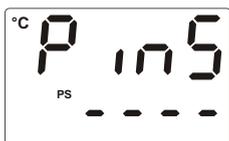
3- If value that is read from the analog input is higher than process set high limit parameter value P_{uPL} , value on the top display starts to blink like on the picture.



For this example in *ProS* menu
 $P_{inS} = FEEn$; unit = °C; $P_{LoL} = -150$ and
 $P_{uPL} = 250$



Please refer to Section 6.3 for detailed information about the parameter



4- If programming section entering password is different from "0" and user accesses to the parameter by ASET/OK button without entering the password and wants to change a parameter, the warning message is shown on the bottom display as shown on the left. Device does not allow to do any changes without entering the password correctly.



5- If user does not do anything for 120 seconds while device is on programming section, device turns to operation screen.



6- In programming section, when Tune operation is selected *YES*, if warning which is shown on the left blinks in operation screen for 10 seconds, it means that start conditions is not okay for Tune operation.



9. Specifications

Device Type	: Temperature Controller
Housing&Mounting	: 48mm x 48mm x 95mm 1/16 DIN 43700 plastic housing for panel mounting. Panel cut-out is 46x46mm.
Protection Class	: NEMA 4X (IP65 at front, IP20 at rear).
Weight	: Approximately 0.22 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
Overvoltage Category	: II
Pollution Degree	: II, office or workplace, none conductive pollution
Operating Conditions	: Continuous
Supply Voltage and Power	: 230 V ~ (±15%) 50/60 Hz. 3VA 115 V ~ (±15%) 50/60 Hz. 3VA 24 V ~ (±15%) 50/60 Hz. 3VA 24 V ≈ (-15%;+10%) 50/60 Hz. 3VA
Process Inputs	: Universal input TC, RTD
Thermocouple input types	: Selectable by parameters J ,K ,R ,S ,T (IEC584.1)(ITS90)
Thermoresistance input type	: PT 100 (IEC751) (ITS90)
Accuracy	: ± 0,25% of full scale for Thermocouple and Thermoresistance
Cold Junction Compensation	: Automatically ± 0.1°C/1°C.
Line Compensation	: Maximum 10 .
Sensor Break Protection	: Upscale
Sampling Cycle	: 3 samples per second
Input Filter	: 1.0 second
Control Forms	: Programmable ON / OFF, P, PI, PD or PID.
Relay Outputs	: 2 pieces. Resistive load 5A@250V ~ (Programmable control or alarm output) (Electrical Life : 100.000 Operation (Full Load))
SSR Driver Output	: Max. 12V==, Max. 24mA
Optional SSR Driver Output	: Max. 12V==, Max. 24mA
Process Display	: 10.1 mm Red 4 digits LED display
Set Display	: 8 mm Green 4 dijit LED display
LED Indicators	: PS (Process Set Value), AS1 (Alarm-1 Set Value), AS2 (Alarm-2 Set Value), PO (Process Output) , AO1 (Alarm-1 Output) , AO2 (Alarm-2 Output), °C ve °F unit leds
Approvals	: GOST-R, C €

