



**ESM-3710 77 x 35 DIN Size  
Digital, ON / OFF Temperature Controller**

- 3 Digits Display
- NTC Input or,  
PTC Input or,  
J type thermocouple Input or,  
K type thermocouple Input or,  
2-Wire PT 100 Input or,  
2-Wire PT 1000 Input (It must be determined in order)
- ON/OFF temperature control
- Selectable heating or cooling function
- Selection of operation with hysteresis
- Adjustable temperature offset
- Set value low limit and set value high limit boundaries
- Relay or SSR driver output
- Operation selection of compressor operates continuously, stops or operates periodically in case of probe defect
- Compressor protection delays
- Password protection for programming mode

Instruction manual of ESM-3710 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 Company Name** : Emko Elektronik A.S.

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

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

**Product Name** : Temperature Controller

**Model Number** : ESM-3710

**Type Number** : ESM-3710

**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-3710 series temperature controllers are designed for measuring and controlling temperature. They can be used in many applications with their On / Off control form, heating and cooling control form and easy-use properties.

Some application fields which they are used are below:

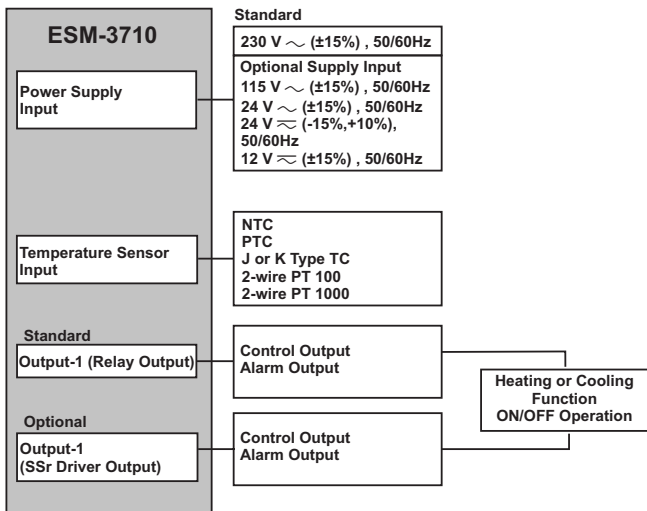
### Application Fields

Glass  
Plastic  
Petro-Chemistry  
Textile  
Automotive  
Machine production industries

### Applications

Heating  
Baking Ovens  
Incubators  
Storages  
Air Conditioning

## 1.1 General Specifications



## 1.2 Ordering Information

ESM-3710 <small>(7x35 DIN Size)</small>	A	BC	D	E	/	FG	HI	/	U	V	W	Z
			0		/	00	00	/	Z		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
6	12V $\approx$ ( $\pm$ 15%) 50/60Hz
9	Customer

BC	Input Type	Scale(°C)	
05	J, Fe CuNi IEC584.1(ITS90)	0°C	800°C
10	K, NiCr Ni IEC584.1(ITS90)	0°C	999°C
11	PT 100, IEC751(ITS90)	-50°C	400°C
09	PT 100, IEC751(ITS90)	-19.9°C	99.9°C
12	PTC (Note-1)	-50°C	150°C
15	PTC (Note-1)	-19.9°C	99.9°C
14	PT 1000, IEC751(ITS90)	-50°C	400°C
13	PT 1000, IEC751(ITS90)	-19.9°C	99.9°C
18	NTC (Note-1)	-50°C	100°C
19	NTC (Note-1)	-19.9°C	99.9°C

Note-1: If input type is selected PTC or NTC (BC = 12, 15, 18, 19), Temperature sensor is given with the device. For this reason, If input type is selected as PTC, sensor type (V = 0, 1 or 2) or If input type is selected as NTC, sensor type (V = 0, 3 or 4) must be declared in ordering information.

E	Output-1
1	Relay Output ( resistive load 10 A@250 V $\sim$ , 1 NO + 1NC )
2	SSR Driver Output (Maximum 15 mA@ 5 V $\approx$ )

V	Temp. Sensor which is given with ESM 3710
0	None
1	PTC-M6L40.K1.5 (PTC Air Probe with 1.5 m silicon cable)
2	PTCS-M6L30.K1.5.1/8" (PTC Liquid Probe with 1.5 m silicon cable)
3	NTC-M5L20.K1.5 (NTC Probe, thermoplastic moulded with 1.5 m cable for cooling application)
4	NTC-M6L50.K1.5 (NTC Probe, stainless steel housing with 1.5 m cable for cooling application)
9	Customer

## 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.

All order information of ESM-3710 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.



$\sim$  Symbol means Vac,  
 $\approx$  Symbol means Vdc,  
 $\approx$  Symbol means Vac/dc

## 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 clamps
- 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 supply 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.

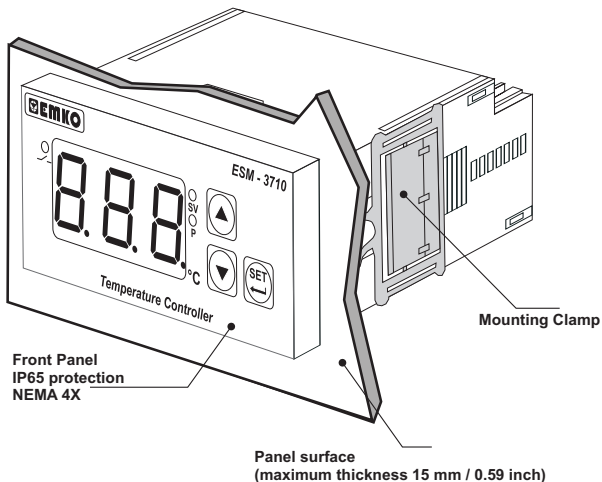
Do not use the unit in combustible or explosive gaseous atmospheres.

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.

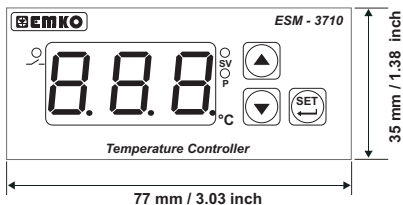
Montage of the product on a system must be done with it's fixing clamps. Do not do the montage of the device with inappropriate fixing clamp. Be sure that device will not fall while doing the montage.

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

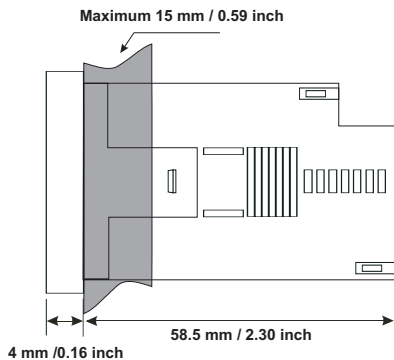
## 2.1 General Description



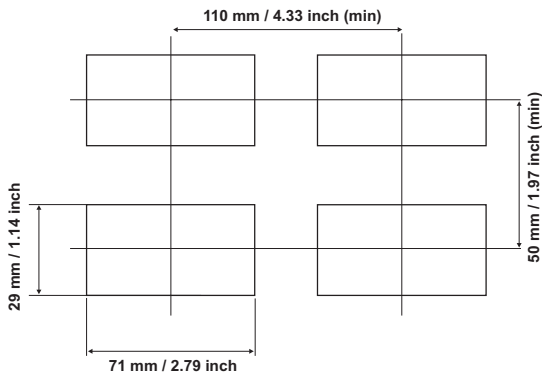
## 2.2 Front View and Dimensions of ESM-3710 Temperature Controller







### 2.3 Panel Cut-Out



## 2.4 Environmental Ratings

### Operating Conditions



Operating Temperature : 0 to 50 °C



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

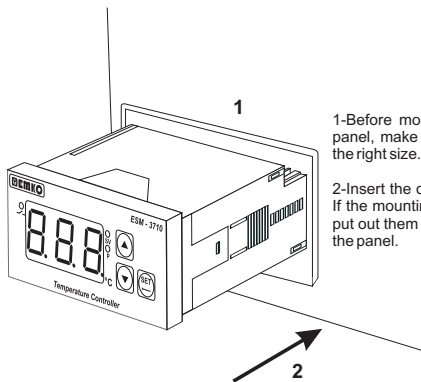


Altitude : Up to 2000 m.



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

## 2.5 Panel Mounting



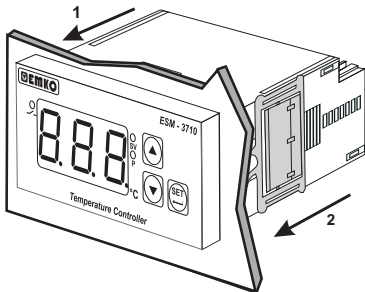
1-Before mounting the device in your panel, make sure that the cut-out is of the right size.

2-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 left and right sides of the device and make the unit completely immobile within the panel

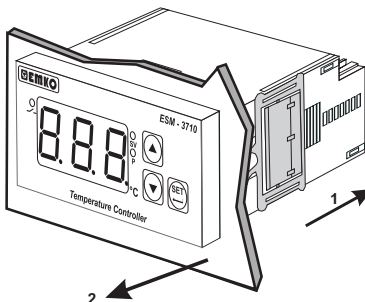


Montage of the unit to a system must be done with it's own fixing clamps. Do not do the montage of the device with inappropriate fixing clamps. Be sure that device will not fall while doing the montage.

## 2.7 Removing from the Panel



Before starting to remove the unit from panel, power off the unit and the related system.



Loosen the screws

1-Pull mounting clamps from left and right fixing sockets.

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

### 3. Electrical Wiring



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.

Device parameters 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.

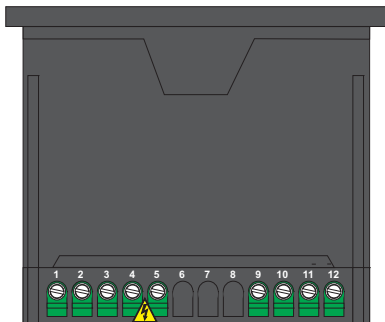


Be sure to use the rated power supply voltage to protect the unit against damage and to prevent failure.



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



Screw driver  
0,8 x 3 mm



Torque  
0,5 Nm

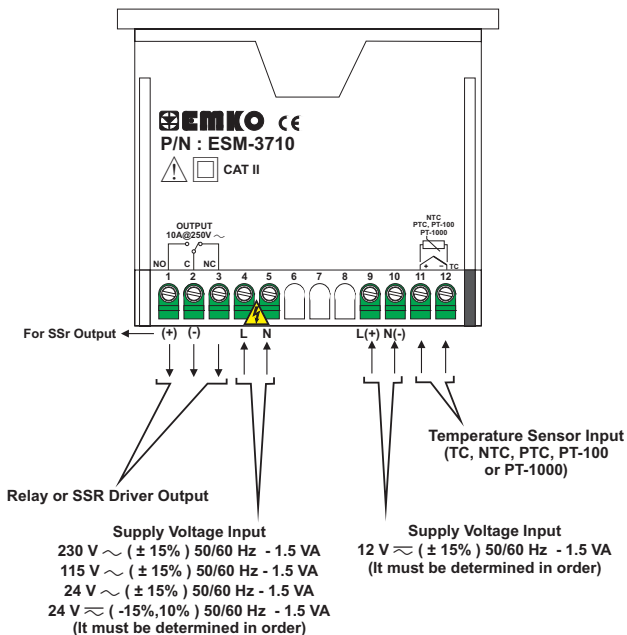


Max. 2.5 mm / 0.098 inch  
Wire Size:  
14AWG/1 mm<sup>2</sup>  
Solid /Stranded

### 3.2 Electrical Wiring Diagram



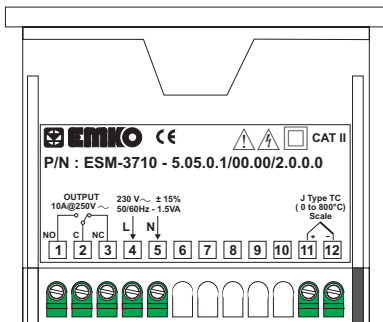
Electrical wiring of the device must be the same as 'Electrical Wiring Diagram' below to prevent damage to the process being controlled and personnel injury.



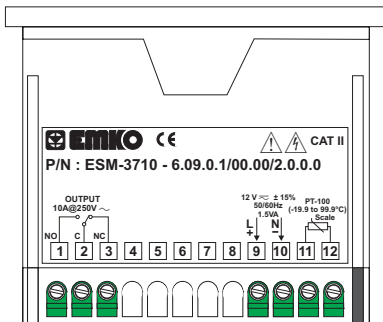
Temperature Sensor Input is in CAT II class.

### 3.3 View of the Device Label

Device Label for J Type ( 0 ; 800 ) scaled, Thermocouple input, 230V  $\sim$  Supply Voltage Input and Relay Output

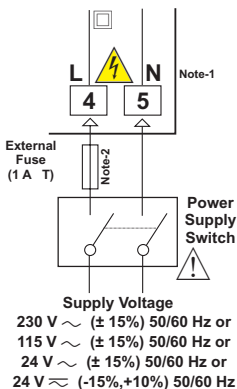


Device Label for PT-100 Type ( -19.9 ; 99.9 ) scaled, Thermoresistance input , 12V  $\sim$  Supply Voltage Input and Relay Output

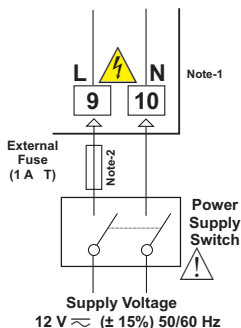


### 3.4 Supply Voltage Input Connection of the Device

Connection of Supply Voltage Input



Connection of Supply Voltage Input



Note-1: "L" is (+), "N" is (-) for 12V  $\text{---}$  and 24V  $\text{---}$  Supply Voltage

Note-2: External Fuse is recommended



Make sure that the power supply voltage is same indicated on the instrument. Switch on the power supply only after that all the electrical connection have been completed.

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 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 a power supply switch and a fuse must be added to the supply voltage input. Power supply switch and fuse must be put to a place where user can reach easily.

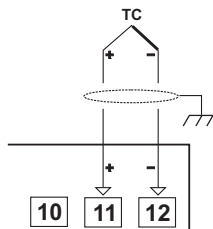
Power supply switch must be two poled for separating phase and neutral. On/Off condition of power supply switch is very important in electrical connection. On/Off condition of power supply switch must be signed for preventing the wrong connection.

External fuse must be on phase connection in  $\sim$  supply input.

External fuse must be on (+) line connection in  $\text{---}$  supply input.

### 3.5 Temperature Sensor Input Connection

#### 3.5.1 TC (Thermocouple) Connection



Connect the wires with the polarity as shown in the figure left.

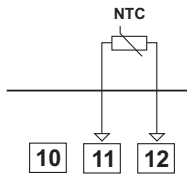
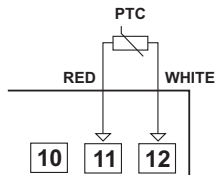


Always use compensation wire corresponding to the thermocouple used. If present, the shield must be connected to a proper ground.



Input resistance is greater than  $10M\Omega$ .

#### 3.5.2 PTC and NTC Connection



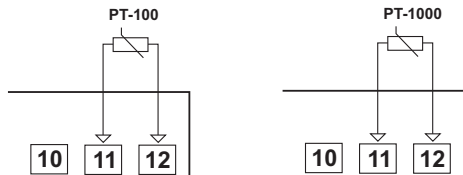
Input resistance is greater than  $10M\Omega$ .



Pay attention the cable colours of PTC probe while doing the PTC probe connection.

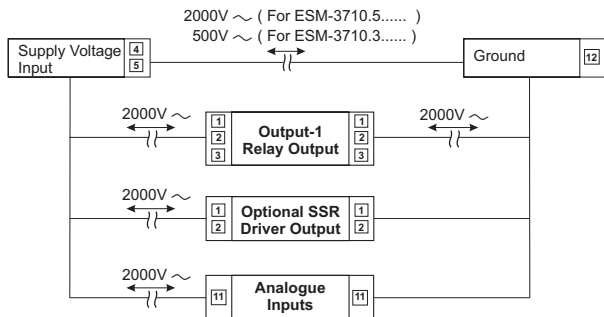


### 3.5.3 PT-100 and PT-1000 Connection

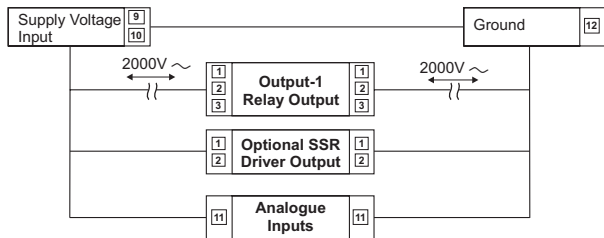


Input resistance is greater than 10MΩ.

### 3.6 Galvanic Isolation Test Values of ESM-3710 Temperature Controller

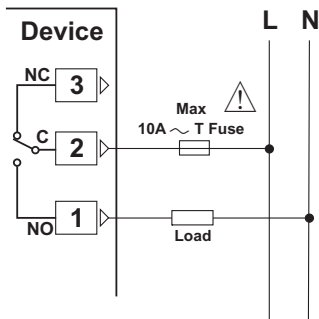


### Galvanic Isolation Test Values For 12V AC Power Supply



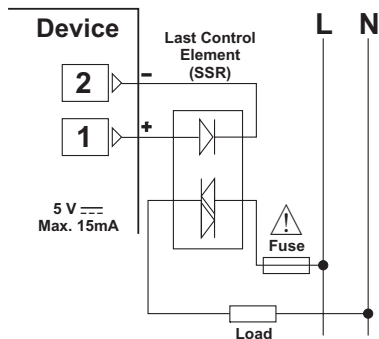
### 3.7 Output Connections

#### 3.7.1 Relay Output Connection



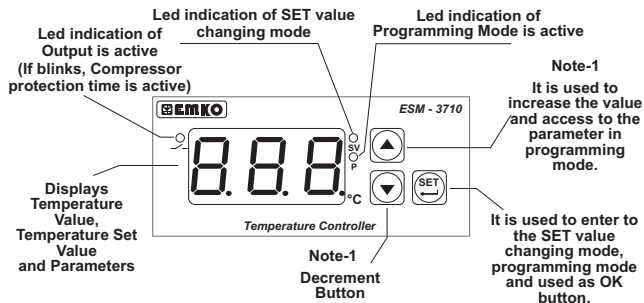
Fuses must be selected according to the application.

#### 3.7.2 SSR Driver Output Connection



Fuses must be selected according to the application.

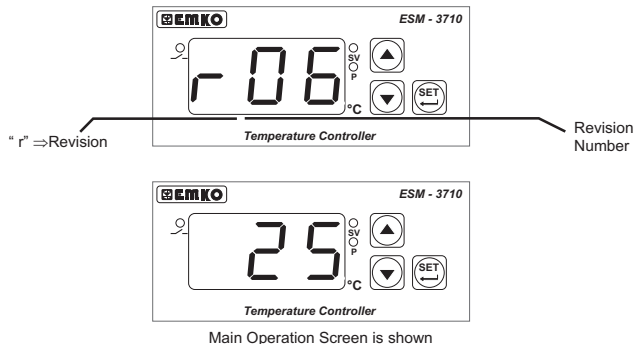
#### 4. Front Panel Definition and Accessing to the Menus



**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.

#### 4.1 Observation of Software Revision on the Displays

When power is first applied to the temperature controller, software revision number is shown on the displays.



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

## 4.2 Changing and Saving Set Value

### Main Operation Screen



When SET button is pressed, SV LED lights on and SET value is shown on the displays.

### SET Value Screen



Change the SET value with increment and decrement buttons.

### SET Value Screen



Press SET button for saving the SET value

### Main Operation Screen



SV LED lights off and main operation screen is shown.

SET value is can be adjusted from minimum set value parameter  $\overline{5UL}$  to maximum set value parameter  $\overline{5UH}$ , Which can be accessed from programming parameters.



If no operation is performed in Set value mode for 20 seconds, device turns to main operation screen automatically.

### 4.3 Program Parameters

**HSt**

#### Hysteresis Parameter for Output (Default = 0)

0 to 100 °C for TC Type Devices,  
0 to 100 °C for PT-100 (-50°C, 400°C) and PT-1000 (-50°C, 400°C),  
0.0 to 10.0 °C for PT-100 (-19.9°C, 99.9°C) and PT-1000 (-19.9°C, 99.9°C),  
0 to 20 °C for PTC (-50°C, 150°C) and NTC (-50°C, 100°C),  
0.0 to 10.0 °C for PTC (-19.9°C, 99.9°C) and NTC (-19.9°C, 99.9°C)

**SuL**

#### Minimum Set Value Parameter (Default = Minimum value of device scale)

Set value can not be lower than this value. This parameter value can be adjusted from minimum value of device scale to maximum set value parameter **SuH**

**SuH**

#### Maximum Set Value Parameter (Default = Maximum value of device scale)

Set value can not be greater than this value. This parameter value can be adjusted from minimum set value **SuL** to maximum value of the device scale

**oFt**

#### Process Offset Parameter (Default = 0)

-100 to 100 °C for TC Type Devices,  
-100 to 100 °C for PT-100 (-50°C, 400°C) and PT-1000 (-50°C, 400°C),  
-10.0 to 10.0 °C for PT-100 (-19.9°C, 99.9°C) and PT-1000 (-19.9°C, 99.9°C),  
-20 to 20 °C for PTC (-50°C, 150°C) and NTC (-50°C, 100°C),  
-10.0 to 10.0 °C for PTC (-19.9°C, 99.9°C) and NTC (-19.9°C, 99.9°C)

**HCS**

#### Operating Type Parameter (Default = 1)

- 0 Heating  
 1 Cooling

**Pos**

#### Switch On Delay After Power On Parameter (Default = 0)

When power is first applied to the device, this time delay must be expired for activation of the compressor. It can be adjusted from 0 to 20 minutes

**SPd**

#### Compressor Stop/Start Time Delay Parameter (Default=0)

When compressor is inactive, this time delay must be expired for activation of the compressor. It can be adjusted from 0 to 20 minutes.

**Std**

#### Compressor Start/Start Time Delay Parameter (Default=0)

This time delay must be expired between two activation of the compressor. It can be adjusted from 0 to 20 minutes.

**PdF**

#### Probe Defect Parameter (Default = 0)

- 0 Compressor is OFF in case of probe defect  
 1 Compressor is ON in case of probe defect  
 2 Compressor operates periodically according to **Pon** and **Pof** time periods in case of probe defect.

**Pon**

#### Compressor is active during this time period in case of probe defect

(Default = 0) If Probe Defect Parameter **PdF** is  2, then this parameter can be observed. It can be adjusted from 0 to 99.

**Pof**

#### Compressor is inactive during this time period in case of probe defect

(Default = 0) If Probe Defect Parameter **PdF** is  2, then this parameter can be observed. It can be adjusted from 0 to 99.

**PAS**

#### Programming Mode Accessing Password (Default=0)

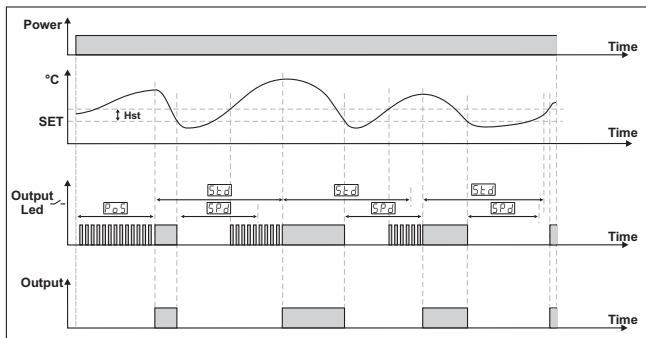
It is used for accessing to the programming mode. It can be adjusted from 0 to 999. If it is selected 0, password is not entered for accessing to the parameters.



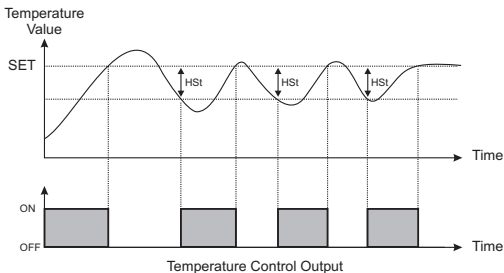
**Pos**, **SPd**, **Std**, **PdF**, **Pon** and **Pof** parameters are observed if Operating type is selected "Cooling". If operating type is selected "Heating" beginning of the parameters list is shown.

#### 4.4 Working Graphics of ESM-3710 Temperature Controller

- 1-If Operating Type Parameter Value  $[HCS] = 1$  (Cooling),  
 Switch On Delay After Power On Parameter Value  $[POSD] \geq 1$ ,  
 Compressor Stop/Start Time Delay Parameter Value  $[SPD] \geq 1$  and  
 Compressor Start/Start Time Delay Parameter Value  $[STD] \geq 1$ ;

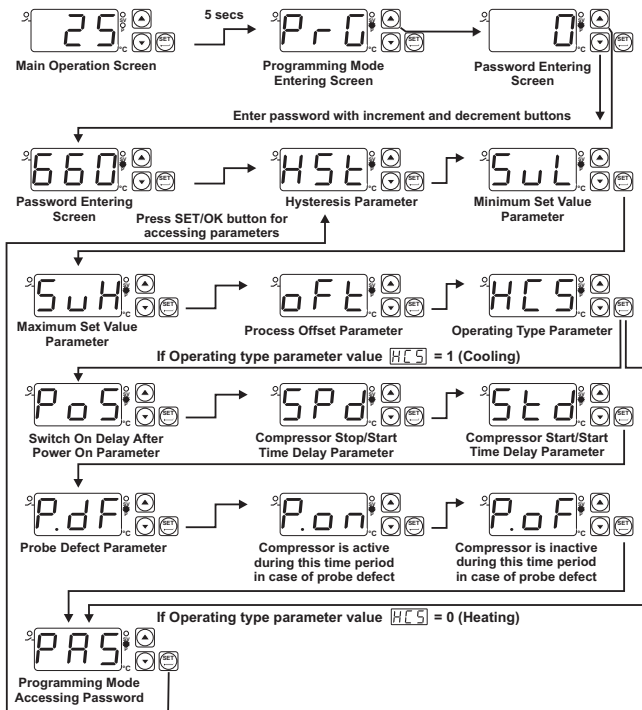


- 2-If Operating Type Parameter Value  $[HCS] = 0$  (Heating),



In ON/OFF control algorithm, temperature value is tried to keep equal to set value by opening or closing the last control element. ON/OFF controlled system, temperature value oscillates continuously. Temperature value's oscillation period or amplitude around set value changes according to controlled system. For reducing oscillation period of temperature value, a threshold zone is formed below or around set value and this zone is named hysteresis. Action of control output is described with figures above.

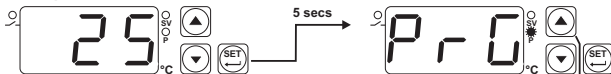
## 4.5 Easy Access Diagram Of Programming Mode Parameters



If no operation is performed in Programming mode for 20 seconds, device turns to main operation screen automatically

## 4.6 Entering To The Programming Mode, Changing and Saving Parameter

### Main Operation Screen



When SET button is pressed for 5 seconds, "P" led starts to blink. If programming mode entering password is different from 0, programming mode entering screen [P r 0] will be observed.

**Note-1:** If programming mode accessing password is 0, hysteresis screen [H 5 L] is observed instead of programming screen accessing password [P r 0]

### Programming Mode Entering Screen

Press increment button for accessing to the password



### Password Entering

Enter programming mode accessing password with increment and decrement

### Password Entering

Press SET/OK button for accessing to the parameters

**Note-2:** Parameters can be observed by pressing SET/OK button in password entering screen without entering the programming mode entering password. But parameters can not be changed.

### Programming Screen

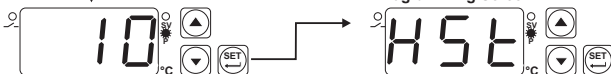


### Hysteresis Parameter

Parameter is accessed by pressing increment button. If set button is pressed, next parameter is shown.

### Hysteresis Parameter Value

Change the parameter with increment and decrement buttons



### Hysteresis Parameter Value

Press Set button for saving the parameter value

### Programming Screen

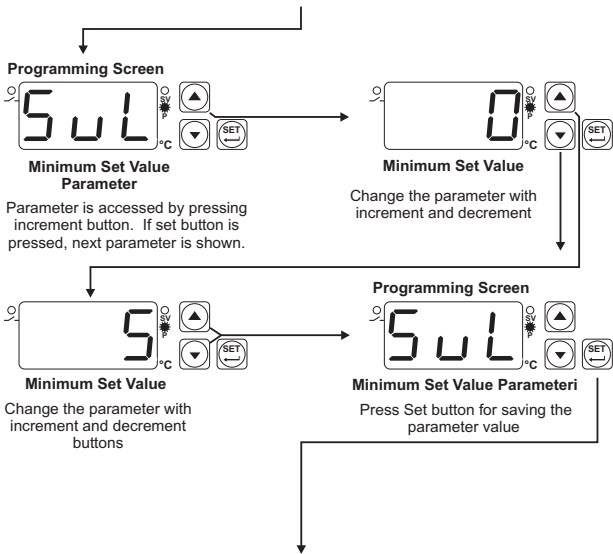
### Hysteresis Parameter

Press Set button for accessing to the next parameter



If no operation is performed in Programming mode for 20 seconds, device turns to main operation screen automatically



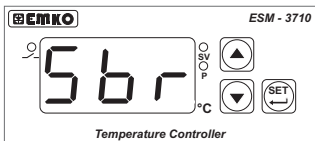


Other Programming mode parameters can be accessed with the same method explained above, observed and changed.



If no operation is performed in Programming mode for 20 seconds, device turns to main operation screen automatically

## 5. Failure Messages in ESM-3710 Temperature Controller



Probe defect in analogue inputs. Sensor connection is wrong or there is no sensor connection.

## 6. Specifications

<b>Device Type</b>	: Temperature Controller
<b>Housing&amp;Mounting</b>	: 77 mm x 35 mm x 62.5 mm plastic housing for panel Mounting. Panel cut-out is 71 x 29 mm.
<b>Protection Class</b>	: NEMA 4X (IP65 at front , IP20 at rear).
<b>Weight</b>	: Approximately 0.20 Kg.
<b>Environmental Ratings</b>	: Standard, indoor at an altitude of less than 2000 meters with none condensing humidity.
<b>Storage / Operating Temperature:</b>	: -40 °C to +85 °C / 0 °C to +50 °C
<b>Storage / Operating Humidity</b>	: 90 % max. (None condensing)
<b>Installation</b>	: Fixed installation
<b>Overvoltage Category</b>	: II.
<b>Pollution Degree</b>	: II, office or workplace, none conductive pollution
<b>Operating Conditions</b>	: Continuous
<b>Supply Voltage and Power</b>	: 230 V ~ (± 15%) 50/60 Hz. 1.5 VA 115 V ~ (± 15%) 50/60 Hz. 1.5 VA 24 V ~ (± 15%) 50/60 Hz. 1.5 VA 24 V ≈ (-%15, +%10) 50/60 Hz. 1.5 VA 12 V ≈ (± 15%) 50/60 Hz. 1.5 VA
<b>Temperature Sensor Inputs</b>	: NTC, PTC, TC, RTD
<b>NTC Input Type</b>	: NTC (10 kΩ @.25 °C )
<b>PTC Input Type</b>	: PTC (1000 Ω @.25 °C )
<b>Thermocouple Input Types</b>	: J, K (IEC584.1)(ITS90)
<b>Thermoresistance Input Type</b>	: PT-100, PT-1000 (IEC751)(ITS90)
<b>Accuracy</b>	: ±1% of full scale for thermocouple and thermoresistance
<b>Cold Junction Compensation</b>	: Automatically ± 0.1°C/1°C.
<b>Sensor Break Protection</b>	: Upscale
<b>Sampling Cycle</b>	: 3 samples per second
<b>Control Form</b>	: ON / OFF
<b>Relay Output</b>	: Resistive Load 10 A@250 V ~ (Electrical Life : 100.000 operation (Full Load))
<b>Optional SSR Output</b>	: Maximum 15 mA@5 V ---
<b>Display</b>	: 14 mm Red 3 digits LED Display
<b>Leds</b>	: SV (Green) , OUT (Red) , P(Red) 3 mm
<b>Approvals</b>	: GOST-R, CE