ESM-9950 96 x 96 1/4 DIN
Universal Input PID Process Controller with Smart I/O Module System

- 4 digits process (PV) and 4 digits process set (SV) display
- Universal process input (TC, RTD, mV, V, mA)
- Optional secondary sensor input
- Dual or multi point calibration for Voltage / Current input
- Configurable ON/OFF, P, PI, PD and 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
- Smart I/O module system
- Programmable heating, cooling and alarm functions for control outputs
- Motorized valve control function
- 8 steps profile control (Ramp & Soak) function and start-hold-stop by using logic input module
- Remote set point function by using analog input modules
- Retransmission of process value or process control by using 0/4...20 mA Current Output Module
- Detection of heater failure by using 0...5 A CT input module
- Hardware configuration by using input/output modules
- RS-232 (standard) or RS-485 (optional) serial communication with Modbus RTU protocol
Instruction manual of ESM-9950 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:**

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

**Operation and Parameters:**

In this section, user interface of the device, how to access 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.

In parameters section, for making relevant parameters to be active, determined module must be installed to Module-1 or Module-2 socket.
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9. FAILURE MESSAGES IN ESM-9950 PROCESS CONTROLLERS

10. SPECIFICATIONS
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-9950
Type Number : ESM-9950
Product Category laboratory use : Electrical equipment for measurement, control and

Conforms to the following directives :

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
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, multifunction control outputs, selectable alarm functions, serial communication unit and input/output modules.

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

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<tr>
<th>Application Fields</th>
<th>Applications</th>
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<td>Motorized valve control</td>
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<td>Plastic</td>
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<tr>
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### 1.1 General Specifications

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<td>Low Voltage (optional) Supply Input 24V<del>50/60Hz , 24V</del></td>
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<td></td>
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<td>Control Output Alarm Output Re-Transmission Output</td>
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<tr>
<td></td>
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<td>Optional RS-485</td>
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<td>Input/Output Module-1</td>
<td>Start and Stop function for RAMP/SOAK</td>
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<td>Input/Output Module-2</td>
<td>Selection of Manual / Automatic operation for process control output</td>
<td></td>
</tr>
</tbody>
</table>
1.2 Ordering Information

All order information of ESM-9950 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 input/output modules and 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.

![Warning]

Vac → Vdc
Vdc or Vac can be applied.
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 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 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 result 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 its 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

- Mounting Clamp
- Product Label
- Terminal protection cover
- Front Panel
  - IP65 protection
  - NEMA 4X
- Panel surface
  - (maximum thickness 15mm / 0.59 inch)

2.2 Dimensions

- Process Controller
  - ESM-9950
- Maximum 15mm / 0.59 inch
- 96mm / 3.78 inch
- 96mm / 3.78 inch
- 11.5 ± 1 mm / 0.45 inch
- 76mm / 2.99 inch
2.3 Panel Cut-Out

129 mm / 5.08 inch (min)

92 mm / 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 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

Montage of the unit to a system must be done with its 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.

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.

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. Device parameters have 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

[Diagram showing terminal layout and connection instructions]
**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.

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

Sensor or Transmitter Supply Voltage

Output-3
Standard Relay Output

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)

Optional Input/Output Module Terminals
Relay, SSR Driver, Digital or Current Output Module
Digital, Analog and CT Input Modules

Process input, Analog Module Inputs (EMI-910, EMI-930, EMI-940, EMI-950) and CT Module Input (EMI-920) are in CAT II class.
3.3 Supply Voltage Input Connection of the Device

Connection of Universal Supply Voltage Input

Connection of Low Voltage 24 V~ Supply Voltage Input

Note-1: There is an internal 33R Ω fusible flameproof resistor in 100-240 V~ 50/60Hz supply voltage input.
There is an internal 4R7 Ω fusible flameproof resistor in 24V~ 50/60Hz, 24V~ for 24V~ supply voltage.

Note-2: “L” is (+), “N” is (-) for 24V~ supply voltage.

Note-3: 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. 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 on the device. So a power supply switch must be added 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 shall be easily accessible by the user. Power switch must be two poled for separating 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.

If an external fuse is used, it must be on phase connection in ~ supply input.
If an external fuse is used, it must be on (+) line connection in ~ supply input.

The instrument is protected with an internal fuse (Please refer to Note1 for information). In case of failure it is suggested to return the instrument to the manufacturer for repair.
3.4 Process Input Connection

3.4.1 TC (Thermocouple) Connection

Connect the wires with the polarity as shown in the figure at 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 Ω.

3.4.2 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 10M Ω.
### 3.4.3 Process Input Connection of Serial Transmitters with Current Output (Loop Powered)

Transmitter connection by using supply voltage on the device.

- **1**
- **3**
- **4**

12 V ***Max. 50mA***

Transmitter connection by using external supply voltage source.

- **1**
- **3**
- **4**

12 V ***Max. 50mA***

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

**Input Resistance is 2Ω.**

### 3.4.4 Process Input Connection of 3-Wire Transmitters with Current Output

Transmitter connection by using supply voltage on the device.

- **1**
- **3**
- **4**

12 V ***Max. 50mA***

Transmitter connection by using external supply voltage source.

- **1**
- **3**
- **4**

12 V ***Max. 50mA***

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

**Input Resistance is 2Ω.**
3.4.5 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 $10\,\text{M\,\Omega}$ for $0\ldots50\text{mV}$

Input resistance is $43\,\text{K\,\Omega}$ for $0\ldots10\text{V}$

3.5 Relay Output Connection

Fuses must be selected according to the application.
3.6 Galvanic Isolation Test Values of ESM-9950 Process Controller and Input/Output Modules

2000V ~ (For ESM-9950.1......)
500V ~ (For ESM-9950.2......)

Supply Input 1

Ground 2

12V ~ Voltage Output 4

EMC-910 RS-485 Serial Communication Module

EMC-900 RS-232 Serial Communication Module

Analog Inputs 2

12V ~ Voltage Output 4

EMC-910 RS-485 Serial Communication Module

EMC-900 RS-232 Serial Communication Module

2000V ~ (For ESM-9950.1......)
500V ~ (For ESM-9950.2......)
4. Definitions and Specifications of Modules

ESM-9950 process controller is a modular product which is designed to operate with additional analog and digital input/output units which user may need.

Two input/output modules can be plugged in the device by the user. User may configure the product for different applications according to the system requirements with the input/output modules which are described in this section.

Dimensions of Input/Output Modules

4.1 Input Modules

4.1.1 EMI-900 Digital Input Module

EMI-900 Digital input module can be installed to Module-1 or Module-2 socket for using the digital input functions.

Specifications of EMI-900 Digital Input Module

Input Type: Normally Open Contact, NPN, PNP, Voltage Input (2 Volt and below 2 Volt is Logic “0”, 4 Volt and above 4 Volt is Logic “1”. Maximum 30V can be applied)
Dimensions: 18x75.2x41.4mm
Input Resistance: 2K2Ω

Applications of EMI-900 Digital Input Module

It is used to run, stop and pause ramp-soak functions in RAMP/SOAK applications. It can be used to operate the process control output as AUTOMATIC/MANUAL, start the PID tune operation and latch canceling.

Detailed information about functions of Digital Input Module functions are given in parameters section. For using these functions EMI-900 Digital Input Module must be installed to Module-1 or Module-2 socket.
4.1.2 EMI-910 0/4…20mA Current Input Module

EMI-910 0/4…20mA current input module can be plugged in Module-1 or Module-2 socket to use as 2nd sensor input, for measuring process value or for using alarm functions which are related to measured value. Also, "remote set" function can be used by installing the module. Please refer to Section 8.2.3 or 8.2.4 for detailed information (R5, R52 parameters).

Specifications of EMI-910 0/4…20mA Current Input Module
- Input Type: 0/4…20 mA Current Input
- Accuracy: 0.3%
- Dimensions: 18x75.2x41.4mm
- Input Resistance: 2R7Ω

Applications of EMI-910 0/4…20mA Current Input Module
It can be used to measure any process value and use it with an alarm function in applications that 2nd sensor input is necessary. The current value (0/4…20mA) on the module input can be used as process set value when "remote set" function is activated and system can be controlled with analog signal (0/4…20 mA) which is applied from remote point.

Detailed information about functions of EMI-910 0/4…20mA Current Input Module functions are given in parameters section. For using these functions EMI-910 0/4…20mA Current Input Module must be installed to Module-1 or Module-2 socket.

For using EMI-910 0/4…20mA current input module as 0…20mA, R5 or R52 must be 7000Ω.

4.1.3 EMI-920 0…5A CT Input Module

EMI-920 0…5A CT Input Module can be plugged in Module-1 or Module-2 socket for detecting heater failures in any applications. Only one EMI-920 CT input module can be plugged in Module-1 or Module-2 socket.

Specifications of EMI-920 0…5A CT Input Module
- Input Type: 0…5A
- Accuracy: 2% FS
- Dimensions: 18x75.2x41.4mm
- Input Resistance: 23mΩ

Applications of EMI-920 0…5A CT Input Module
It can be used for observing heater current with current transformer and detecting heating failure.

Detailed information about functions of EMI-920 0…5A CT Input Module functions are given in parameters section. For using these functions EMI-920 0…5A CT Input Module must be installed to Module-1 or Module-2 socket.
4.1.4 EMI-930 TC (Thermocouple) or 0...50mV--- Input Module

EMI-930 TC or 0...50mV--- input module can be plugged in Module-1 or Module-2 socket to use as 2nd sensor input, for measuring process value or for using alarm functions which are related to measured value. Also “remote set” function can be used by plugging this module. Please refer to Section 8.2.3 or 8.2.4 for detailed information. ( $\text{REF1}$, $\text{REF2}$ parameters)

- EMI-910, EMI-930, EMI-940 or EMI-950 analog input modules can not be plugged-in Module-1 and Module-2 socket at the same time.

Specifications of EMI-930 TC or 0...50mV--- Input Module
Please refer to Section 8.2.3 or 8.2.4 for selection of input type and scale of TC input type (L, J, K, R, S, T, B, E, N,C)

- **Accuracy**: 0.3%
- **Dimensions**: 18x75.2x41.4mm
- **Input Resistance**: Greater than 10M $\Omega$

Applications of EMI-930 0...50mV--- Input Module
It can be used to measure any process value and use it with an alarm function in applications that 2nd sensor input is necessary.
The voltage value (0...50mV---)on the module input can be used as process set value when "remote set" function is activated and system can be controlled with analog signal(0..50mV--- ) which is applied from remote point.

Detailed information about functions of EMI-930 TC or 0...50mV--- Input Module are given in parameters section. For using these functions EMI-930 TC or 0...50mV--- Input Module must be installed to Module-1 or Module-2 socket.

For using EMI-930 TC or 0...50mV--- input module as 0...50mV---, $\text{REF1}$ or $\text{REF2}$ must be 0000.

4.1.5 EMI-940 Pt-100 Input Module

EMI-940 Pt-100 input module can be plugged in Module-1 or Module-2 socket to use as 2nd sensor input, for measuring process value or for using alarm functions which are related to measured value. Also “remote set” function can be used by plugging this module. Please refer to Section 8.2.3 or 8.2.4 for detailed information. ($\text{REF1}$, $\text{REF2}$ parameters)

- EMI-910, EMI-930, EMI-940 or EMI-950 analog input modules can not be plugged-in Module-1 and Module-2 socket at the same time.

Specifications of EMI-940 Pt-100 Input Module
Please refer to Section 8.2.3 or 8.2.4 for selection of input type and scale

- **Accuracy**: 0.5%
- **Dimensions**: 18x75.2x41.4mm
- **Input Resistance**: Greater than 10M$\Omega$
Applications of EMI-940 Pt-100 Input Module
It can be used to measure any process value and use it with an alarm function in applications that
2nd sensor input is necessary.
The Pt-100 value on the module input can be used as process set value when “remote set”
function is activated and system can be controlled with analog signal which is applied from remote point.

Detailed information about functions of EMI-940 Pt-100 input module are given in
PARAMETERS section. For using these functions EMI-940 Pt-100 input module
must be installed to Module-1 or Module-2 socket.

4.1.6 EMI-950 0...10V--- Input Module
EMI-950 0...10V--- input module can be plugged in Module-1 or Module-2 socket to use as 2nd
sensor input, for measuring process value or for using alarm functions which are related to
measured value.(In some sections it is defined as analog input module)
Also “remote set” function can be used by plugging this module. Please refer to Section 8.2.3 or 8.2.4 for detailed information.(F5E1, F5E2 parameters)

EMI-910, EMI-930, EMI-940 or EMI-950 analog input modules can not be plugged-
in Module-1 and Module-2 socket at the same time.

Specifications of EMI-950 0...10V--- Input Module
Accuracy : 0.3%
Dimensions : 18x75.2x41.4mm
Input Resistance : 43KΩ.

Applications of EMI-950 0...10V--- Input Module
It can be used to measure any process value and use it with an alarm function in applications that
2nd sensor input is necessary.
(0...10V--- ) value on module input can be used as process set value when “remote set” function
is activated and system can be controlled with analog signal(0...10V--- ) which is applied from remote point.

Detailed information about functions of EMI-950 0...10mV--- Input Module are
given in parameters section. For using these functions EMI-950 0...10mV---
Input Module must be installed to Module-1 or Module-2 socket.

For using EMI-950 0...10V--- input module as 0...10V---, JAS1 or JAS2 must be
GOOD.
4.2 Output Modules

4.2.1 EMO-900 Relay Output Module

EMO-900 Relay output module can be plugged in Module-1 or Module-2 socket to use functions which are defined for relay output.

Specifications of EMO-900 Relay Output Module

Output: 5A@250V at resistive load, Single Open / Close Contact
Dimensions: 18x75.2x41.4mm
Electrical Life: 100,000 Operation (Full Load)

Applications of EMO-900 Relay Output Module

It can be used with heating or cooling functions as process control output, as alarm output by programmable different alarm functions, as logic output to transfer some datas on the device to the system. These alternatives are explained in parameters section as logic output function.

Detailed information about functions of EMO-900 Relay Output Module are given in parameters section. For using these functions EMO-900 Relay Output Module must be installed to Module-1 or Module-2 socket.

4.2.2 EMO-910 SSR Driver Output Module

EMO-910 SSR Driver Output Module can be plugged in Module-1 or Module-2 socket to use functions which are defined for SSR driver output.

Specifications of EMO-910 SSR Driver Module

Output: Maximum 20 mA, 15-18V ±10%, isolated
Dimensions: 18x75.2x41.4mm

Applications of EMO-910 SSR Driver Output Module

It can be used with heating or cooling functions as process control output, as alarm output by programmable different alarm functions, as logic output to transfer some datas on the device to the system.

Note 1: If short output period is needed in a system, using SSR Driver output module is recommended. (Relay must not be used for short output periods because of limited life of their relay contact (open/close events))

Detailed information about functions of EMO-910 SSR Output Module are given in parameters section. For using these functions EMO-910 Output Module must be installed to Module-1 or Module-2 socket.
### 4.2.3 EMO-920 Digital (Transistor) Output Module

EMO-920 Digital (Transistor) Output Module can be plugged in Module-1 or Module-2 socket to use functions which are defined for digital output.

**Specifications of EMO-920 Digital (Transistor) Output Module**

**Output**: Maximum 40 mA, 15-18V\(\pm\) 10%, isolated

**Dimensions**: 18x75.2x41.4mm

**Applications of EMO-920 Digital (Transistor) Output Module**

It can be used with heating or cooling functions as process control output, as alarm output by programmable different alarm functions, as logic output to transfer some datas on the device to the system. These alternatives are explained in parameters section as logic output function.

Detailed information about functions of EMO-920 Digital (Transistor) Output Module are given in parameters section. For using these functions EMO-920 Digital (Transistor) Output Module must be installed to Module-1 or Module-2 socket.

### 4.2.4 EMO-9300/4 ...20mA Current Output Module

EMO-930 0/4...20mA\(\cdots\) Current Output Module can be plugged in Module-1 or Module-2 socket to use functions which are defined for current output.

**Specifications of EMO-9300 0/4...20mA\(\cdots\) Current Output Module**

**Output**: 0/4...20mA\(\cdots\) current output

**Accuracy**: 1%

**Note**: To get 0...10V\(\cdots\), 500Ω resistor with 0.05% tolerance must be connected in parallel as a shunt resistor to module output (Please refer to Section 5.2.5 for detailed information)

**Maximum load impedance**: 600 Ω

**Dimensions**: 18x75.2x41.4mm

**Applications of EMO-930 0/4...20mA\(\cdots\) Current Output Module**

It can be used in heating or cooling functions as process control output. Process value, error between process and set value or set value can be retransmitted to the system as 0...20mA\(\cdots\) or 4...20mA\(\cdots\) output. Retransmission is explained in parameters section.

Detailed information about functions of EMO-930 Current Output Module are given in parameters section. For using these functions EMO-9300 0/4...20mA\(\cdots\) current Output Module must be installed to Module-1 or Module-2 socket.
4.3 Installing and Pulling Out Input/Output Modules

First, detach all cable connections from the device and uninstall it from the panel.

Push to the lock pins where top and bottom of the device

Pull the cover case with your other hand from front panel to rear side.

Pull out the cover case from the device

Slide input/output modules into socket.
Pull out the module from it’s socket, instead of this module install the new one or other module user wants to use.

Replace the cover case by taking care of the terminal numbers should be at right position.

After adding or changing modules to the unit, these changes must be taken into consideration while mounting of the unit to the system. If mounting is incorrect, it can cause accidents to harm system, operator or person who does the mounting. Responsibility of these kind of harmful events belongs to the user.
4.4 To Stick Input/Output Modules’ Labels to the Device

Every module which is plugged in Module-1 or Module-2 socket has labels' for showing the relation between connection terminal and the device. These labels are attached to empty boxes which are separated for Module-1 and Module-2 on the device. Labels for all modules and attachment places are shown below.

Label which is plugged in Module-2 socket, describes module termination connection is attached to this area.

Label which is plugged in Module-1 socket, describes module termination connection is attached to this area.

LABELS FOR INPUT MODULES

- **Digital Input Module**: EMI-900
- **0 to 5A CT Input Module**: EMI-920
- **Pt-100 Input Module**: EMI-940
- **0/4 to 20 mA Current Input Module**: EMI-910
- **TC or 0 to 50mV Input Module**: EMI-930
- **0/4 to 20 mA Current Input Module**: EMI-950

LABELS FOR OUTPUT MODULES

- **Relay Output Module**: EMO-900
- **Digital Output Module**: EMO-920
- **SSR Driver Module**: EMO-910
- **0/4...20mA Current Output Module**: EMO-930
- **5A@250V Relay Output Module**: EMO-900
- **Max. 40mA@18V Digital Output Module**: EMO-920
- **Max. 20mA@18V SSR Driver Output Module**: EMO-910
- **0/4...20mA Current Output Module**: EMO-930
Example: If user installs EMO-900 Relay Output Module to Module-1 socket, EMO-930 0/4...20mA Current Output Module to Module-2 socket and attach the appropriate labels on the device view will be like below:
Module-1 / Module-2 Optional Input Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
<th>Connection Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMI-900</td>
<td>Digital Input Module</td>
<td>13 14</td>
</tr>
<tr>
<td>EMI-910</td>
<td>Current Input Module 0/4 to 20 mA</td>
<td>13 14</td>
</tr>
<tr>
<td>EMI-920</td>
<td>CT Input Module 0 to 5A</td>
<td>13 14</td>
</tr>
<tr>
<td>EMI-930</td>
<td>TC or 0 to 50mV Input Module</td>
<td>13 14</td>
</tr>
<tr>
<td>EMI-940</td>
<td>Pt-100 Input Module</td>
<td>13 14</td>
</tr>
<tr>
<td>EMI-950</td>
<td>0 to 10V Input Module</td>
<td>13 14</td>
</tr>
</tbody>
</table>

Module-1 / Module-2 Optional Output Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
<th>Connection Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMO-900</td>
<td>Relay Output Module 5A@250V</td>
<td>13 14 15</td>
</tr>
<tr>
<td>EMO-910</td>
<td>SSR Driver Output Module Max. 20mA@18V</td>
<td>13 14</td>
</tr>
<tr>
<td>EMO-920</td>
<td>Digital Output Module Max. 40mA@18V</td>
<td>13 14</td>
</tr>
<tr>
<td>EMO-930</td>
<td>Current Output Module 0/4 to 20mA</td>
<td>13 14</td>
</tr>
</tbody>
</table>

5.1 Connection Wirings for Input Modules

5.1.1 Connection of EMI-900 Digital Input Module

Module-1

14

13

Switch

Module-2

17

16

Switch
5.1.2 Connection of 3-Wire Transmitter to EMI-910 0/4…20 mA – Current Input Module

Transmitter connection by using supply voltage on the device

Transmitter connection by using external supply voltage source.

**Note 1**: There is internal 2R7 Ω shunt

**Note 2**: External power supply must be selected according to power supply voltage range and required current for transmitter.

---

**i** EMI-910, EMI-930, EMI-940 or EMI-950 analog input modules can not be plugged-in Module-1 and Module-2 socket at the same time.
5.1.3 Connection of Serial Transmitter (Loop Powered) to EMI-910 0/4...20 mA Current Input Module

Transmitter connection by using supply voltage on the device

Transmitter connection by using external supply voltage source.

**Module-1**

[Diagram showing connections for Module-1]

**Module-2**

[Diagram showing connections for Module-2]

**Note-1**: There is internal 2R7 Ω shunt

**Note 2**: External power supply must be selected according to power supply voltage range and required current for transmitter.

- EMI-910, EMI-930, EMI-940 or EMI-950 analog input modules can not be plugged-in Module-1 and Module-2 socket at the same time.
5.1.4 Current Transformer Connection to EMI-920 0...5 A CT Input Module

Two EMI-920 CT input modules can not be plugged in Module-1 and Module-2 socket at the same time.

5.1.5 Connection of EMI-930 TC (Thermocouple) or 0...50mV Input Module

Connect the wires with the polarity as shown above. Always use compensation wire corresponding to the thermocouple used. If present, the shield must be connected to a proper ground.

EMI-910, EMI-930, EMI-940 or EMI-950 analog input modules can not be plugged-in Module-1 and Module-2 socket at the same time.
5.1.6 Using EMI-930 TC or 0...50mV Input Module as 0...50mV Input

Module-1

```
13
14
```

 PV

0...50mV

Transmitter

Module-2

```
16
17
```

 PV

0...50mV

Transmitter

By selecting Module-1 or Module-2 analog input configuration parameter or is defined with dual point calibration property, EMI-930 TC or 0...50mV module can be used as 0...50mV input.

EMI-910, EMI-930, EMI-940 or EMI-950 analog input modules can not be plugged-in Module-1 and Module-2 socket at the same time.

5.1.7 Connection of EMI-940 PT-100 Input Module

Module-1

```
14
13
```

 Pt-100

Module-2

```
17
16
```

 Pt-100

There is no line compensation in PT-100 Input Module

EMI-910, EMI-930, EMI-940 or EMI-950 analog input modules can not be plugged-in Module-1 and Module-2 socket at the same time.

5.1.8 Connection of EMI-950 0...10V Input Module

Module-1

```
13
14
```

 PV

0...10V

Transmitter

Module-2

```
16
17
```

 PV

0...10V

Transmitter

EMI-910, EMI-930, EMI-940 or EMI-950 analog input modules can not be plugged-in Module-1 and Module-2 socket at the same time.
5.2 ConnectionWirings for Output Modules

5.2.1 EMO-900 Relay Output Module Connection

Fuses must be selected according to the applications.

5.2.2 EMO-910 SSR Driver Output Module Connection

Fuses must be selected according to the applications.
5.2.3 EMO-920 Digital (Transistor) Output Module Connection

Module-1

14

13

15-18 V
Maximum 40mA

Load

Module-2

17

16

15-18 V
Maximum 40mA

Load

5.2.4 EMO-930 0/4... 20 mA Current Output Module Connection

Module-1

14

13

Other Device

Shunt (Max. 600\(\Omega\))

Module-2

17

16

Other Device

Shunt (Max. 600\(\Omega\))

5.2.5 To Get 0...10V with EMO-930 0/4...20 mA Current Output Module

Module-1

14

13

0...10V Output

Shunt (500.0 \(\Omega\))

Module-2

17

16

0...10V Output

Shunt (500.0 \(\Omega\))

RS-232 Terminal Definitions

RS-485 Terminal Definitions
6.1 Cable Connection Between RS-232 Terminal of the Device and PC

PC (Personal Computer)
9 Pin DCON connection

Cable Lenght must be max. 12 meters for 9600 baud rate

PC (Personal Computer)
25 Pin DCON connection

Cable Lenght must be max. 12 meters for 9600 baud rate
6.2 Connection for RS-485 Serial Communication

PC (Personal Computer)

RS-232 → RS-485 Converter

MASTER Connection Cable

32 terminal can be connected in RS-485 line

Rt resistor = 120 Ω

For communication connection Twisted Pair cable must be used

Cable length can be maximum 1000 meters in 9600 baud rate.

When baud rate increases, cable length must be decreased.
6.3 Installing RS-232 / RS-485 Serial Communication Modules to the Device

Pull the cover case with your hand through rear side as explained in “Installing and Pulling Out Input/Output Modules” section. Pull the modules in Module-1 and Module-2 socket through rear side. Separate supply card which is at the bottom of the equipment by lifting the locking tabs located on front panel. Pay attention to cable connection between top and bottom cards. Damages in this cable makes the equipment not to work.

RS-232 or RS-485 module is plugged into socket signed as A and B. Hold the equipment to be it’s front panel is on your right, communication socket is on your left and module connection socket with 5 terminals on above. Plug in module connection socket with 5 terminals to the socket on Top Card. Do the same things for terminal socket in bottom card and connection socket with 3 terminals. Plug in bottom card to the place in front panel. Install the modules which are pulled out to Module-1 and Module-2 socket. Replace the cover case by taking care of the terminal numbers should be at right position.
7. Definition of Front Panel and Accessing to the Parameters

7.1 Definition of Front Panel

- LED indication of °C: Centigrade Unit
- LED indication of °F: Fahrenheit Unit
- LED indication of units other than °C and °F
- LED indication of Operation with Remote set value
- LED indication of Ramp & Soak operation is active
- LED indication of Manual operation (For process output)
- LED indication of Automatic operation (For process output)
- LED indication of Output-1, Output-2 and Output-3 Status
- Displays Process Value (PV) and Parameter
- Displays Process Set Value (SV) and Parameter

For detailed information; Please refer to Section 8.1.1 (Process and Alarm Set Parameters) and 8.1.3 (Function selection for Top and Bottom Display)

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.
7.2 Observation of Optional Modules and Software Revision on the Displays

There are two sockets for plugging optional modules to the device. These modules are recognized by the device automatically. 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 and module definition codes on the top display are momentarily illuminated. Module definition codes and how to observe these codes of optional modules in Module-1 and Module-2 socket are explained below:

Optional Input/Output module code for Module-1

- Relay Output Module (EMO-900)
- SSR Driver and Digital Output Module (EMO-910, EMO-920)
- 0/4...20mA Current Output Module (EMO-930)
- Digital Input Module (EMI-900)
- Analog Input Module (EMI-910, EMI-930, EMI-940 or EMI-950)
- 0...5 A CT Input Module (EMI-920)
- There is no module in Module-1 socket

Optional Input/Output module code for Module-2

- Relay Output Module (EMO-900)
- SSR Driver and Digital Output Module (EMO-910, EMO-920)
- 0/4...20mA Current Output Module (EMO-930)
- Digital Input Module (EMI-900)
- Analog Input Module (EMI-910, EMI-930, EMI-940 or EMI-950)
- 0...5 A CT Input Module (EMI-920)
- There is no module in Module-2 socket
When power 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.

On top display which modules are plugged in Module-1 and Module-2 socket and on bottom display revision number are shown. All leds are energised. Above, there is EMO-910 SSR Driver Output module in Module-1 socket and EMO-900 Relay Output Module in Module-2 socket. Revision number is “13”.

Main operation screen is shown

If there is an unexpected situation while opening the device, power off the device and inform a qualified personnel.
7.3 Adjustment of Process Set Value

When SET button is pressed SV LED flashes, set value is shown in bottom display.

Set value can be changed with increment and decrement buttons.

Press menu button to exit without saving Set value.

Press SET button for saving Set value.
7.4 Easy Access Diagram for Operator Parameters

Press menu button for entering to the operator parameters section
Press SET/OK button for entering to the password section
Enter the password with increment and decrement buttons
Confirm the password with SET/OK button

**Set menu**
- **PSet**: Process Set Value
- **Alm1**: Alarm1 Set Value
  - Note-1: It is observed when EMO-900, EMO-910 or EMO-920 module is plugged in Module-1 or Module-2 socket if out1 parameter is Lout in op1_conf menu and Lout1 parameter is 0000 or if out2 parameter is Lout in op2_conf menu and Lout2 parameter is 0000.
- **Alm2**: Alarm2 Set Value
  - Note-2: It is observed if out3 parameter is Lout in out3_conf menu and Lout3 parameter is 0000.
- **Alm3**: Alarm3 Set Value
  - Note-3: It is observed if EMO-900 Relay Module is plugged in Module-1 socket.

**Run List Menu**
- **Run**: Run List

**Display menu**
- **Disp**: Top Display
- **bDisp**: Bottom Display

**Ramp/Soak Menu**
- **Str**: Soft-Start
- **rSto**: Ramp/Soak Tolerance
- **rSty**: Ramp/Soak Program Step Selection
- **Pu-1**: Ramp/Soak Step Set Value
- **tr-1**: Ramp time for Ramp/Soak
- **ts-1**: Soak time for Ramp/Soak
- **Pu-0**: Ramp/Soak Step Set Value
- **tr-0**: Ramp time for Ramp/Soak
- **ts-0**: Soak time for Ramp/Soak

Legend:
- **SET**: Confirm the password with SET/OK button
7.5 Easy Access Diagram for Technician Parameters

Note-3: If EMO-900, 910, 920 modules were plugged in Module-1 or Module-2 socket;
- If I fi sa n d is in menu or
- If I fi sa n d is in menu or
- If I fi sa n d is in menu,
Then this parameter can be observed.

Note-4: If one of , , parameters are chosen as , then these
parameters can be observed.

Note-5: Parameters in or menus are changed according to the module
types, so please refer to the Section 7.6 and easy access diagram
### 7.5 Easy Access Diagram for Technician Parameters

**TCPS**

Entering Screen

Confirm the password with SET/OK button

---

**Out3 Menu**

- `out3 Conf`
- `out3`
- `Con3`
- `Hys3`
- `Hym3`
- `Lmt3`
- `Lou3`
- `als3`
- `Alt3`
- `Alh3`
- `Ron3`
- `RoF3`

**Genn Menu**

- `Genn Conf`
- `SU-L`
- `SU-U`
- `SUL2`
- `SUL2`
- `ULt2`
- `ULt2`
- `ULH2`
- `ULH2`

**Comm Menu**

- `Comm Conf`
- `SAd`
- `BAd`
- `Prty`
- `StPb`
- `StPb`
- `Mot`

**Pass Menu**

- `Pass Conf`
- `OOPs`
- `tCPS`
- `tCPS`
- `Run List Menu`
- `Disp Menu`
- `Ramp/Soak Menu`

**Operator menus are entered.**

---

**Note-6:** It can be observed if `out3` is **HEAT** or **COOL**

**Note-7:** It can be observed if `out3` is **HEAT** or **COOL** and control type is `MAN`

**Note-8:** It can be observed if `out3` is **Lout**

**Note-9:** It can be observed if `out3` is **Lout**, `Lou3` is **0000** and an analog input module is plugged in Module-1 or Module-2 socket.

**Note-10:** It can be observed if `out3` is **Lout** and `Lou3` is **0000**

**Note-11:** It can be observed if one of the analog input module is plugged in Module-1 or Module-2 socket.

**Note-12:** If `UL5L` parameter is **HEAT** or **COOL**, then these parameters can be observed.

**Note-13:** Please refer to the Section 7.4 Operator Parameters easy access diagram.
7.6 Easy Access Diagram for and Parameters

- **If EMO-900, 910 or 920 module is plugged in Module-1 socket**
  - Press menu button for entering to the technician parameters section

- **If EMO-930 Output Module is plugged in Module-1 socket**
  - Press menu button changing next button to access to technician menu entering screen

- **If EMI-900 Input Module is plugged in Module-1 socket**
  - Press SET/OK button to access to the password entering screen

- **If EMI-910, 930-940-950 Input Module is plugged in Module-1 socket**
  - Enter the password with increment and decrement buttons

- **If EMI-920 Input Module is plugged in Module-1 socket**

**Note-1:** It can be observed if `out1` is `HEAT` or `Cool`
**Note-2:** It can be observed if `out1` is `HEAT` or `Cool` and control type is `MAN`
**Note-3:** It can be observed if `out1` is `Lout`
**Note-4:** It can be observed if `out1` is `Lout`, `Lou` is `0000` and an analog input module is plugged in Module-2 socket
**Note-5:** It can be observed if `out1` is `Lout` and `Lou` is `0000`
**Note-6:** It can be observed if `out1` is `rEt`
**Note-7:** According to the parameter selection, another parameter can be observed instead of `TESL` parameter and `CJn` parameter can not be observed
Confirm the password with SET/OK button.

If EMO-900, 910 or 920 module is plugged in Module-2 socket:

- If EMO-930 Output Module is plugged in Module-2 socket:
  - Out2 Function selection
  - Configura-
tion selection
  - Logic Input
  - Configuration
  - Function Selection
  - Retransmission

- If EMI-900 Input Module is plugged in Module-2 socket:

- If EMI-910, 930-940-950 Input Module is plugged in Module-2 socket:

- If EMI-920 Input Module is plugged in Module-2 socket:

Note-8: It can be observed if out2 is Heat or Cool.
Note-9: It can be observed if out2 is Heat or Cool and control type is SVAT.
Note-10: It can be observed if out2 is Low.
Note-11: It can be observed if out2 is Low, Low2 is 0000, and an analog input module is plugged in Module-1 socket.
Note-12: It can be observed if out2 is Low and Low2 is 0000.

Note-13: It can be observed if out2 is RErr.

Note-14: According to the parameter selection, another parameter can be observed instead of tSL2 parameter and CJn2 parameter can not be observed.

It turns to the beginning of the menu list.
7.7 Accessing to the Operator 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.

When menu button is pressed, Operator Menu Entering screen is shown. Operating Screen

Operator or technician can access to the following menu by pressing menu changing next button

When $\text{OPPS}$ screen is shown, operator parameters can be seen by pressing SET button without entering operator password. But parameters can not be changed. Please refer to Section 8.2.8. (Operator and Technician Passwords)

Operator Menu Entering Screen

Operator Password Entering Screen is shown by pressing SET button.

Operator Password

If Operator password is not 0, operator password entering screen is shown

Press the Enter button to confirm password

Operator and technician can access to this menu.

SET LIST Menu

Process and alarm set values are in SET LiSt menu

Operator or technician can access to the following menu by pressing menu changing next button

RUN LIST Menu

Operating form selection parameters are in run LiSt menu.

Operator or technician can access to this menu.

Operator or technician can access to the former menu by pressing menu changing back button

Operator or technician can access to the following menu by pressing menu changing next button
DISPLAY LIST Menu
This menu determines which parameter is shown in top and bottom display.

RAMP&SOAK Menu
Configuration of Ramp/Soak function and step set value parameters are in this menu.

SET LIST Menu
SET LIST menu exists after RAMP/SOAK menu.

Press menu button to exit from MENU list and turn to operation screen.
Continue to press menu changing next and back buttons to change the menu.

By pressing ENTER button, user can access to the menu page and to all parameters in this menu page.
7.8 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.

Operator Menu Entering Screen

When menu button is pressed, Operator Menu Entering screen is shown.

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

Technician Password Entering screen is accessed by pressing SET button.

If technician password is not 0, technician password entering screen is shown.

When menu changing next button is pressed Technician Menu Entering screen is shown.

When menu button is pressed, Operator Menu Entering screen is shown.

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

Press the Enter button to confirm password.

PINP CONF Menu
Configuration parameters of process input.
Operator can not access to this menu.
Technician can access to the following menu by pressing menu changing next button.

PID CONF Menu
Parameters about PID algorithm.
Technician can access to the following menu by pressing menu changing next button.
Operator can not access to this menu.

This menu is not visible if there is no module in Module-1 socket.

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

Operator can not access to this menu.

This menu is not visible if there is no module in Module-2 socket.

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

Operator can not access to this menu.

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

Operator can not access to this menu.

This menu is not visible if there is no module in Module-3 socket.

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

Operator can not access to this menu.

This menu is not visible if there is no module in Module-4 socket.

Technician can access to the former menu by pressing menu changing next button.
Operator and technician can access to this menu.

This menu is not visible if Technician Parameters Section is entered by pressing SET button without entering Technician Password.

Operator and technician can access to the former menu by pressing menu changing back button.

Operator and technician can access to this menu.

Operator and technician can access to the following menu by pressing menu changing next button.

PASS CONF Menu
Operator and technician passwords are in this menu.

Operator and technician can access to the following menu by pressing menu changing back button.

SET LIST Menu
Process and alarm set values are in SET LIST menu.

Operator and technician can access to the following menu by pressing menu changing next button.

RUN LIST Menu
Operating form selection parameters are in RUN LIST menu.

Operator and 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 displays.

Operator and technician can access to the following menu by pressing menu changing next button.

Ramp&Soak Menu
Configuration of Ramp/Soak functions and step set value parameters are in this menu.

Operator and technician can access to the following menu by pressing menu changing next button.
Operator can not access to this menu.

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

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

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

By pressing ENTER button, user accesses to the menu and to all parameters in this menu.
7.9 Adjustment of Alarm Set Values

If standard output (Output-3), Module-1 or Module-2 is configured as an alarm output, alarm set values of these outputs are in "SET LiSt" menu. User can access to "SET LiSt" menu both from operator and technician menus.

When menu button is pressed, Operator Menu Entering screen is shown.

When operator parameters can be seen by pressing SET button without entering operator password. But operator can not change the parameters. Please refer to Section 8.2.8 (Operator and Technician Passwords).

Operator Password
If Operator password is not 0, operator password entering screen is shown.

Press Enter button to confirm password.

SET LIST Menu
Process and alarm set values are in SET LiSt menu.

Press Enter button for accessing SET LiSt menu.

Process Set Value
Operator and technician can change the parameter with increment and decrement buttons.

Press Enter button to confirm the changed value and access to the following parameter.
This parameter is not visible if there is no output module in Module-1 socket or output module is not configured as an alarm output.

Operator and technician can change the parameter with increment and decrement buttons.

This parameter is not visible if there is no output module in Module-2 socket or output module is not configured as an alarm output.

Operator and technician can change the parameter with increment and decrement buttons.

This parameter is not visible if Output-3 is not configured as alarm output.

Operator and technician can change the parameter with increment and decrement buttons.

Press menu button to turn to operation screen
7.10 Changing and Saving Parameter Values

Example-1: To change Process Input Type parameter SSL in “PinP Conf” menu, user must access to PinP Conf menu firstly.

Operator Menu Entering Screen

When menu button is pressed, Operator Menu Entering screen is shown.

Operation Screen

When menu changing next button is pressed, Technician Menu Entering screen is shown.

Technician Menu Entering Screen

Technician Password Entering screen is accessed by pressing SET button.

Technician Password

Press Enter button to confirm password

PINP CONF Menu

Operator can not access to this menu

Press Enter button to access to PinP ConF menu

Selection of Process Input Type

SSL is means, input type is RTD.

Parameter can be changed with increment and decrement buttons

Example-1: "To change Process Input Type parameter SSL in “PinP Conf” menu, user must access to PinP ConF menu firstly."
Press Enter button to confirm the changed value and access to the following parameter.

Selection of Process Input Type
TC input type is selected

Press Enter button to access to the following parameter.

Selection of TC Input Type

Technician can access to the following menu by pressing Enter button.

PINP CONF Menu
When Menu button is pressed, menu page can be accessed.

Operator can not access to this parameter.

Operator can not access to this parameter.

PINP CONF

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

Operation Screen
Example-2: To change heating proportional band parameter in “Pıd Conf” menu.

Parameter is on Pıd ConF menu. For accessing to this parameter, user must access to “Pıd ConF” menu firstly.

When menu button is pressed, Operator Menu Entering screen is shown.

When menu changing next button is pressed Technician Menu Entering screen is shown.

Technician Password Entering screen is accessed by pressing SET button.

If technician password is not 0, technician password entering screen is shown.

When technician password screen is shown, technician parameters can be seen by pressing SET button without entering password. But technician cannot change the parameters. Please refer to Section 8.2.8 (Operator and Technician Passwords)

Operator can not access to this menu.

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

Press Enter button to confirm password

Operator Menu Entering Screen

Technician Password

PINP CONF Menu

Operator can not access to this menu.

Technician can access to the following menu by entering Menu changing next button

Pıd CONF Menu

Technician can access to Pıd ConF menu by pressing Enter button.
Operator can not access to this parameter

Heating Proportional Band Selection

Parameter can be changed with increment and decrement buttons.

Press Enter button to confirm the changed value and access to the following parameter.

Operator can not access to this parameter

Heating Integral Time

Technician can access to the following menu by entering menu changing next button.

PID CONF Menu

Technician turns to Menu page by pressing Menu button.

If Menu button is pressed again, operation screen is shown.

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

Operation Screen
Example-3 : To change Voltage / Current Input Calibration Type Selection parameter in “PinP Conf” menu

Parameter is on “PinP ConF” menu. For accessing to this parameter, technician must access to “PinP ConF” menu firstly. In this example, changing input type of a device from thermocouple to Voltage/Current and dual point calibration selection is shown.

Operator Menu Entering Screen

![Operator Menu Entering Screen]

When menu button is pressed, Operator Menu Entering screen is shown.

When menu changing next button is pressed Technician Menu Entering screen is shown.

Technician Password Entering screen is accessed by pressing SET button.

Technician Password

![Technician Password]

Press Enter button to confirm password

If technician password is not 0, technician password entering screen is shown

When screen is shown, technician parameters can be seen by pressing SET button without entering password. But technician can not change the parameters. Please refer to Section 8.2.8 (Operator and Technician Passwords)

Operator can not access to this parameter

PINP CONF Menu

Operator can not access to this menu

Access to the parameters in PinP ConF menu by pressing Enter button

Selection of Process Input Type

For accessing to Parameter, Parameter must be If this parameter is not, change this parameter with increment button.

Press Enter button to confirm the changed value and access to the following parameter.
Operator can not access to this parameter

Technician can access to the following parameter by pressing Menu button

Operator can not access to this parameter

Decimal Point Position Selection

Operator can not access to this parameter

Technician can access to the following menu by pressing Enter button

Operator can not access to this parameter

Technician can change the parameter with increment and decrement buttons

Press Enter button to confirm the changed value and access to the following parameter.
Press Enter button to confirm the changed value and access to the following parameter.

Minimum value for selectable dual point calibration

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

Operation Screen

Operator can not access to this parameter

PINP CONF Menu
Technician turns to Menu page by pressing Menu button.

Maximum value for selectable dual point calibration

If Menu button pressed again, Operation Screen is shown.
8. Parameters

Parameters are divided into two groups. These can be accessed by operator and technician. Also, they are grouped into subgroups according to their functions. The subgroups are named as menu pages.

8.1 Operator Parameters

8.1.1 Process and Alarm SET Parameters

This is the device’s process set value. Controlling is done according to this value by process control outputs.

Process set value can be adjusted from minimum value of set scale \(SU-L\) to maximum value of set scale \(SU-U\).

If EMO-900 Relay, EMO-910 SSR Driver or EMO-920 Digital (Transistor) output module is plugged in Module-1 socket and output is configured as an alarm output, this parameter defines the set value of the alarm output.

Set value can be adjusted from minimum value of set scale \(SU-L\) to maximum value of set scale \(SU-U\).

If one of the analog input modules is plugged in Module-2 socket and measurement input selection parameter \(AL\) which is explained in Section 8.2.3 for Module-1 alarm output is \(0006\), \(AL\) can be defined alarm set value for analog input module in Module-2.

Parameter can be adjusted from minimum set value of 2nd sensor input \(SU-L\) to maximum set value of 2nd sensor input \(SU-U\).

Also point position of \(AL\) parameter and measured value from analog input module (2nd sensor input) is the same.

In this conditions, alarm output operates according to 2nd sensor input value and \(AL\) parameter.

Set value of Heating Failure Alarm

If CT input module (EMI-920) is plugged in Module-2 socket and Module-1 alarm type parameter \(AL\) which is explained in Section 8.2.3 is \(0006\), \(AL\) parameter can be adjusted from 0.0 to 100.0A.
If EMO-900 Relay, EMO-910 SSR Driver or EMO-920 Digital (Transistor) output module is plugged in Module-2 socket and output is configured as an alarm output, this parameter defines the set value of the alarm output.

Set value can be adjusted from minimum value of set scale to maximum value of set scale.

If OUT-3 relay output module is configured as alarm output, this parameter defines the set value of the alarm output.

Set value can be adjusted from minimum value of set scale to maximum value of set scale.

If one of the analog input modules is plugged in Module-1 socket and measurement input selection parameter which is explained in Section 8.2.3 for Module-1 alarm output is , parameter can be defined alarm set value for analog input module in Module-2.

Parameter can be adjusted from minimum set value of 2nd sensor input and maximum set value of 2nd sensor input. Also point position of parameter and measured value from analog input module (2nd sensor input) is the same. In this conditions, alarm output operates according to 2nd sensor input value and parameter.

Set value of Heating Failure Alarm

If CT input module (EMI-920) is plugged in Module-1 or Module-2 socket and Module-1 alarm type parameter which is explained in Section 8.2.5 is , parameter can be defined alarm set value for analog input module in Module-1 or Module-2 socket.

Parameter can be adjusted from minimum set value of 2nd sensor input and maximum set value of 2nd sensor input. Also point position of parameter and measured value from analog input module (2nd sensor input) is the same. In this conditions, alarm output operates according to 2nd sensor input value and parameter.

Set value of Heating Failure Alarm
8.1.2 Selection of PID Tune and Operation Form

**TUNE SELECTION**

By selecting one of the methods below, device can determine the PID parameters.

- **no**
  - Device operates according to the defined PID parameters.

- **Auto tune** (Limit Cycle Tuning) operation

- **Self tune** (Step Response Tuning) operation

- **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.

**AUTOMATIC TUNE SELECTION**

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

- **YES**
  - If **Tune parameter is Auto tune** or **Auto Self tune**, 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.

**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
3. If process value is out of **Set ± Process value stabilisation** value (Please refer to Section 8.2.2) and starts to oscillate, then device changes the parameter to **yes** and **Auto Tune** operation is started.

   If set value is changed to a value that is greater than:
   \[ \pm \text{Scale} \times \frac{\text{(Heating or Cooling Proportional Band)}}{1000} \]
   **Parameter is adjusted yes** by the device and **Auto Tune** operation is started.

For **Auto Tune** (Limit Cycle Tuning) operation:

1. Tune selection parameter **Tune parameter is in “run List” menu must be selected Auto tune or 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.
Example -1 : Starting Auto Tune operation by the user ;
- Enter operator or technician menu.
- Adjust tune selection parameter $E_{\text{run}}$ in "run List" menu, Auto Tune $\text{AT\, tun}$ or Auto-Self Tune $\text{RS\, tun}$
- Adjust automatic tune selection parameter $P_{\text{run}}$ in "run List" menu $\text{YES}$ 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. $\text{AT\, tun}$ Parameter is adjusted 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 $E_{\text{run}}$ parameter $\text{NO}$ or $S_{\text{run}}$
4- If user adjusts $P_{\text{run}}$ parameter $\text{NO}$
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 $\Rightarrow$ Cool, Cool $\Rightarrow$ 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 $\text{AT\, tun}$ Parameter, device continues to run with former PID parameters.

Auto Tune (Limit Cycle Tuning) operation ;
Process control output runs according to heating if heating or heating-cooling function and PID control form is selected,
Process control output runs according to cooling if cooling function and PID control form is selected.

For Auto Tune (Limit Cycle Tuning) operation :
1- Tune selection parameter $E_{\text{run}}$ in “run List” menu must be selected $\text{AT\, tun}$ or $\text{RS\, tun}$
2- For being started Tune operation (Auto Tune or Self Tune) control form must be P, PI, PD, PID.
3- If process set value is changed while Tune operation is being performed, Tune operation is canceled
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 the device off and then on. Also difference between process value and set value must be too much.

Example 2: Determination of PID parameters with Self Tune method

- Enter operator or technician menu
- Select tune selection parameter [Stun] in “run List” menu [Stun] or [Rest] and turn to operation screen.
- Power off the device.
- Wait system to be in first conditions.
  (For example: Decreasing 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 [Stun] in “run List” menu must be selected Self tune [Stun] or Auto-Self Tune [Rest]
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
If **Self Tune** operation is finished without any problem, device saves new PID parameters to memory and runs. It changes $E_c$ parameter.

If $E_c$ parameter is $Stun$ it is changed to $na$, if it is $rese$, it is changed to $Retun$.

If **Self Tune** operation is interrupted at half, PID parameters and $E_c$ 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 $E_c$ parameter $na$ or $Retun$
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 $E_c$ in “run List” menu must be selected **Self tune** $Stun$ or **Auto-Self Tune** $rese$
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
OPERATION FORM SELECTION

**Auto**

**Automatic Operation (Close-Loop Control)**
Device controls the process outputs by calculating the %output value automatically. (If there is a PID or ON/OFF output)

**Man**

**Manual Operation (Open-Loop Control)**
In PID control formed systems, user can adjust %output value with increment and decrement buttons.
In ON/OFF control formed systems, user can adjust %output value “OFF”, “HEAT” or “COOL” with decrement and decrement buttons.
If manual operation form is selected, %output value is shown on bottom display whatever parameter is selected.

RAMP / SOAK CONTROL

**off** Ramp / Soak function is not active.

**run** Ramp / Soak function is active

**Hold** Ramp / Soak function is paused.
Process set value becomes constant at last value and ramp or soak time does not take into consideration.

As explained in Section 8.1.4, when Soft-Start parameter is active, Ramp/Soak control parameter has no effect.

MOTORIZED VALVE CONTROL

It defines motorized valve control form. Module-1 output operates for opening the valve, Output-3 operates for closing the valve.
If Module-1 is relay output, motorized valve control parameter is shown even motorized valve control is not used. If motorized valve control is used, Module-2 output can not be used as PID.

**no** Motorized valve control is not active.

**HEAT** Motorized valve runs with heating PID

**Cool** Motorized valve runs with cooling PID

Motorized valve control parameter must not be changed, if there is an electrical wiring.
Motorized valve control can be performed with \textbf{U\text{L} S\text{L}} parameter. For doing this operation, EMO-900 Relay output module must be plugged in Module-1 socket. Module-1 and output-3 controls the position of the valve with motorized valve control.

**RELEVANT PARAMETERS:**

In PASS OPEr or PASS t\text{E}CH \Rightarrow (run LiSt) menu page:

\textbf{U\text{L} S\text{L}} \textbf{Parameter} : It defines how to perform the motorized valve control with the device.

If motorized valve control is activated by selecting the \textbf{U\text{L} S\text{L}} parameter \textbf{H\text{E}AT} or \textbf{C\text{OOL}}

In PASS t\text{E}CH \Rightarrow GEnn COnf menu page \textbf{U\text{L} T\text{H}} and \textbf{U\text{L} H\text{Y}} parameters are shown.

\textbf{U\text{L} T\text{H}} \textbf{parameter} : It can be adjusted from 5 to 600. The unit is “second”.

It defines after how many seconds valve is completely opened. For determining the parameter correctly, close the valve manually. Be sure that valve is closed completely, then open it manually without stopping and measure that how many seconds have passed for opening it completely. Parameter must be entered measured value+5% of measured value and as second.

\textbf{U\text{L} H\text{Y}} \textbf{parameter} : It can be adjusted from 0,1 to 5,0. Unit is %. It is % of Ultt parameter. Minimum movement steps of valve while opening or closing are determined as % ratio. If valve oscillates while controlling, INCREASE the parameter value!

**Note-1**:

- There is an internal 33R \( \Omega \) fusible flameproof resistor in 100-240 V \( \sim \) 50/60Hz
- There is an internal 4R7 \( \Omega \) fusible flameproof resistor in 24V \( \sim \) 50/60Hz, 24V-
BUMPLESS TRANSFER

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.

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.

ALARM LATCH CANCELING

Alarm latch canceling is not performed.

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 Automatically.
8.1.3 Function Selection for Top and Bottom Display

**edSP**

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

- **0000** Process value (PV) is shown in top display.
- **0001** Result of subtraction of process set value from process value (SV-PV) is shown in top display.
- **0002** If one of the analog input modules is plugged in Module-1 or Module-2 socket, measured value from this module input is shown in top display.

**bdSP**

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

- **0000** Process set value (SV) is shown in bottom display.
- **0001** %Output value that is applied to process control output is shown in bottom display.
- **0002** Status of the Ramp/Soak function is shown in bottom display.
- **0003** If one of the analog input modules is plugged in Module-1 or Module-2 socket, measured value from this module input is shown in top display.
- **0004** If CT input module (EMI-920) is plugged in Module-1 or Module-2 socket, measured value from this module input is shown in bottom display.

In ‘Run List’ menu Section 8.1.2, if operation form is [Auto], then **bdSP** parameter is considered. If operation form is [Ramp], %output value is shown in bottom display whatever **bdSP** parameter is.
**8.1.4 Configuration of RAMP/SOAK Function and Step SET Values**

**Soft-Start** parameter.
When the power is applied to the device, process value reaches to the set value at the end of this time. It can be adjusted from 0 to 99 hours 59 minutes.
When the power is applied to the device, if this parameter is 0, Ramp function is not active.

**Ramp / Soak Tolerance** parameter. It can be adjusted from 0% to 50% of scale. In Ramp/Soak operation, if process value is out of the tolerance that is defined with this parameter, then time is stopped. To continue to count the Ramp/Soak time, process value must be between tolerances which are determined with this parameter.
If parameter is 0, this function is not active.

**Ramp/Soak program step selection parameter.**
One program with 8 steps or two different programs with 4 steps can be defined.

- **0000** 1.program 1-4 steps
- **0001** 2.program 5-8 steps
- **0002** Steps between 1-8 is used as one program.

**Ramp/Soak step set value.**
For ramp operation; process value reaches to step set values that are defined with these parameters at the end of the time that are defined in ramp time parameters.
For soak operation; process value is constant in step set value that are defined in these parameters for time that are defined in soak time parameters.
Ramp/Soak step set values can be adjusted from minimum value of set scale to maximum value of set scale.

**Ramp/Soak step set value.**
Process value reaches to step set values at the end of the time that are defined in these parameters.
It can be adjusted 0 to 99 hours 59 minutes.

**Soak time for Ramp/Soak**
Process value is constant in step set value for time that are defined in these parameters.
It can be adjusted 0 to 99 hours 59 minutes.
RAMP ACTION DURING POWER ON (SOFT-START)

If the ramp parameter is different from 0 and selection of operation form parameter is AUTO, then Soft-Start operation is started. Ramp led blinks. By increasing the process output for ramp parameter, process output reaches to the %output value that is measured when power is first applied to the device. When Soft-Start operation finishes, if operation form of the device is AUTO, device continues to run from PSET value.

If selection of operation form parameter is adjusted as AUTO,
If ramp time is adjusted to a value that is less than the counted value or 0000,
If there is a sensor break failure
Then Soft-Start operation is canceled.

% Output

%Output value that is calculated when power is first applied to the device.

Time

RAMP/SOAK IN NORMAL OPERATION:

Whatever operation form parameter is, Normal Ramp/Soak operation is started by selecting FSSIL parameter RUN. Ramp led becomes active. Ramp/Soak operation can be paused by selecting FSSIL parameter HOLD. Ramp/Soak operation can be canceled by selecting FSSIL parameter OFF.

While Ramp/Soak operation continues, if parameter is 1-4 numbered, if it is 5-8 numbered, if it is 1-8 numbered steps run.

When Ramp/Soak operation finishes, device operates in operation form which operation form device has before Ramp/Soak operation. (FSSIL or AUTO)

If selection of operation form parameter before starting to Ramp/Soak operation is AUTO, then device continues to run from PSET set value.

If any Ramp time or Soak time is 0000, then relevant ramp or soak step is skipped.

Ramp/Soak operation is canceled
If there is a sensor break failure, while Ramp/Soak operation is running or if power off while Ramp/Soak operation is running.

While any Ramp/Soak function is running, changing relevant time set value can cause unexpected effects in set value and process output.

If Ramp / Soak tolerance parameter FSTA is 0000, then it has no function. When it is different from 0 (While Ramp/Soak is running);

If (Calculated SET - FSTA) < Process Value < (Calculated SET + FSTA) condition is not true (process value is out of the tolerance), time counting is stopped till the condition is true.
Example: If Ramp / Soak step set, ramp time and soak time parameters:

\[
\begin{align*}
PU-1 &= [0500, 0050, 0.140] \\
PU-2 &= [0700, 0000, 0.000] \\
PU-3 &= [0900, 0000, 0.000] \\
PU-4 &= [1000, 0.100, 0.100] \\
\end{align*}
\]

are adjusted as on the left.

Device operates as shown below:
8.2 Technician Parameters

8.2.1 Process Input Type and Relevant Parameters with Process Input

**Process Input**

Defines the process input type.

- **TC input type selection**
- **RTD input type selection**
- **Voltage/Current input type selection.**

**Scale**

Defines type and scale of the thermocouple for TC input. It is active if TC input type is selected.

- L (-100°C; 850°C) or (-148°F; 1562°F)
- L (-100.0°C; 850.0°C) or (-148.0°F; 999.9°F)
- J (-200°C; 900°C) or (-328°F; 1652°F)
- J (-199.9°C; 900.0°C) or (-199.9°F; 999.9°F)
- K (-200°C; 1300°C) or (-328°F; 2372°F)
- K (-199.9°C; 999.9°C) or (-199.9°F; 999.9°F)
- R (0°C; 1700°C) or (32°F; 3092°F)
- R (0.0°C; 999.9°C) or (32.0°F; 999.9°F)
- S (0°C; 1700°C) or (32°F; 3092°F)
- S (0.0°C; 999.9°C) or (32.0°F; 999.9°F)
- T (-200°C; 400°C) or (-328°F; 752°F)
- T (-199.9°C; 400.0°C) or (-199.9°F; 752.0°F)
- B (44°C; 1800°C) or (111°F; 3272°F)
- B (44.0°C; 999.9°C) or (111.0°F; 999.9°F)
- E (-150°C; 700°C) or (-238°F; 1292°F)
- E (-150.0°C; 700.0°C) or (-199.9°F; 999.9°F)
- N (-200°C; 1300°C) or (-328°F; 2372°F)
- N (-199.9°C; 999.9°C) or (-199.9°F; 999.9°F)
- C (0°C; 2300°C) or (32°F; 3261°F)
- C (0.0°C; 999.9°C) or (32.0°F; 999.9°F)
Defines type and scale of sensor for RTD input. It is active if RTD input is selected.

Sensor type: PT-100
- Scale: -200°C to 650°C (if unit is °C)
- Scale: -328°F to 1202°F (if unit is °F)

Defines input range and scale of Voltage/current input. It is active if Voltage / Current is selected.

- 0000 0...50mV: (-1999 ; 9999)
- 0001 0...5V: (-1999 ; 9999)
- 0002 0...10V: (-1999 ; 9999)
- 0003 0...20mA: (-1999 ; 9999)
- 0004 4...20mA: (-1999 ; 9999)

Defines point position for displays. It is active if Voltage/Current input is selected.

No point
- 0000
- 0001 000.0
- 0002 00.00
- 0003 0.000

It is active when Voltage/Current input is selected. It determines calibration type.

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.

- 0000
- 0001

It allows to do selectable dual point calibration.

It allows to define 16 calibration points.

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.

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.

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: \( \text{uASL} \) is \( \text{0000} \) (0-50 mV).

\( \text{0000} \) (0-50 mV)
Process Set Value

0-50 mV range are divided into 16 equal parts. Every “Poxx” SET value is defined.

\[
\frac{50}{16} = 3.125 \text{ mV range.}
\]

**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.

**Unit selection**

- **C** Unit is °C
- **F** Unit is °F

**Unit is U.** It is active if Voltage / Current input is selected

**Process Value Low Point Adjustment parameter** for TC and RTD input scales. It can be adjusted -50% to +50% of scale.

**Process Value Up Point Adjustment parameter** for TC and RTD input scales. It can be adjusted -50% to +50% of scale.

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

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

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

**Defines filter time for input signal.** It can be adjusted from 0.0 to 900.0.

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.
8.2.2 PID Configuration Parameters

If any output is configured as heating PID:


If any output is configured as cooling PID:


If no output is configured as PID:

Only b-db, Sbou parameters are visible in PID CONF menu.

**P-HT**

**HEATING PROPORTIONAL BAND (000.0%, 999.9%)**

Full Scale \((\frac{uPL - LoL}{LoL})\) %.

If \(\frac{uPL}{LoL} = 1000 \degree C\), \(LoL = 0 \degree C\) and \(P-HT = 50.0\) then

\[
\text{Proportional Band} = \left(\frac{uPL - LoL}{LoL}\right) * \frac{P-HT}{100.0}
\]

\[
\text{Proportional Band} = \left(1000-0\right)\frac{50.0}{100.0} = 500 \degree C
\]

**i-HT**

**HEATING INTEGRAL TIME (0000 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-HT**

**HEATING DERIVATIVE TIME (000.0 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.

**CT-H**

**CONTROL PERIOD FOR HEATING OUTPUT (1 sec, 150 secs)**

It is control period for heating. While motorized valve control runs, if \(U\) is heat or cool, this parameter is not visible.

**OUTPUT : ON**

**RELAY OUTPUT**

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 higher than this value.

**SSR OUTPUT**

SSR Output: If short output period is needed in a system (approximately 1-2 seconds) SSR driver output module as last control element is recommended.
HEATING MÍNIMUM CONTROL OUTPUT (0.0% , OLLH)

It is % of heating minimum output. If heating and cooling PID control functions operate together, this parameter is not considered. Even as a result of the heating PID calculation device calculates the % output value less than this parameter, heating output is active minimum for OLLH parameter.

HEATING MAXIMUM CONTROL OUTPUT (OLLH, 100.0%)

It is % of heating maximum output. Even as a result of the heating PID calculation device calculates the % output value greater than this parameter, heating output is active maximum for OULH parameter.

HEATING MINIMUM CONTROL OUTPUT TIME (0.0 sec , OLLH)

Heating output can not be active less than this parameter. Even if this parameter is 0, this parameter is accepted 50 msecs for security. While motorized valve control is running if [UL51] parameter is selected heating or cooling, this parameter is not accessible.
COOLING PROPORTIONAL BAND COEFFICIENT (0.0, 100.0)

If heating and cooling PID is used in a system, the tune operation is performed by heating output. Cooling proportional parameter \(P_{-CL}\) is calculated with heating proportional band value \(P_{-HC}\) and coefficient \(CoE\).

\[
P_{-CL} = \frac{P_{-HC} \times CoE}{100.0}
\]

**Example:** If heating and cooling PID is used in a system at the end of the tune operation, if \(P_{-HC} = 10.0\%\) and \(CoE = 50.0\) then

\[
P_{-CL} = \frac{P_{-HC} \times CoE}{100.0} = 10.0 \times 50.0 / 100.0 = 5.0\%\]

Note: It is recommended that cooling proportional band coefficient if cooling is done with water 40.0, with oil 80.0, with air 100.0 is accepted.

---

COOLING PROPORTIONAL BAND (000.0%, 999.9%)

Full Scale \(\left(\frac{u_{PL}}{LoL}\right)\) %

If \(u_{PL} = 1000\,^\circ C\), \(LoL = 0\,^\circ C\) and \(P_{-CL} = 50.0\) then

Proportional Band = \(\frac{(u_{PL} - LoL) \times P_{-CL}}{100.0}\)

Proportional Band = \(\frac{(1000-0) \times 50.0}{100.0} = 500\,^\circ C\)

---

COOLING INTEGRAL TIME (0000 sec, 3600 secs)

It can be changed by the user. When the tune operation finishes, it can be changed by the device. If it is 0, integral control part does not perform. When the tune operation finishes if this parameter is 0, it cannot be changed because integral control part does not perform.

---

COOLING DERIVATIVE TIME (000.0 sec, 999.9 secs)

It can be changed by the user. When the tune operation finishes, it can be changed by the device. If it is 0, derivative control part does not perform. When the tune operation finishes if this parameter is 0, it cannot be changed because derivative control part does not perform.

---

COOLING OUTPUT PERIOD TIME (1 sec, 150 secs)

It is the control period of cooling output. While motorized valve control is running, if \(S\) is selected heating or cooling, this parameter is not visible.

**OUTPUT**: ON

**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 higher 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 element is recommended.
COOLING MINIMUM CONTROL OUTPUT (0.0%, OLLC)
It is % of cooling minimum output. If heating and cooling PID control functions operate together, this parameter is not considered. Even as a result of the cooling PID calculation device calculates the output value less than this parameter, cooling output is active minimum for OLLC parameter.

COOLING MAXIMUM CONTROL OUTPUT (100.0%, OULC)
It is % of cooling maximum output. Even as a result of the cooling PID calculation device calculates the output value greater than this parameter, cooling output is active maximum for OULC parameter.

COOLING MINIMUM CONTROL OUTPUT TIME (0.0 sec, OLLC)
Cooling output can not be active less than this parameter. Even if this parameter is 0, this parameter is accepted 50 msecs for security. While motorized valve control is running if OULC parameter is selected heating or cooling, this parameter is not accessible.
ANTI-RESET WINDUP \( a(\bar{R}_r) \), 0-SCALE HIGH POINT

If Ar Parameter is entered from 0 to Scale High Point, this value is used for Anti-Reset Windup. If Ar Parameter is selected \( a(\bar{R}_r) \), heating proportional band is used for heating PID process instead of Ar Parameter and cooling proportional band is used for cooling PID process instead of Ar Parameter.

While PID operation is running if \( PSET - \bar{R}_r \leq \text{process value} \leq PSET + \bar{R}_r \) 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 \( tP_aL \) or \( tP_oH \) for selectable dual point calibration used inputs, Scale high point is the biggest one from \( P_000 \) or \( P_016 \) for multi point calibration used inputs.

Note: Point position changes according to process input type and scale, Unit changes according to the selection in this parameter.

SET VALUE OFFSET \( ((-\text{SCALE HIGH POINT}/2), (\text{SCALE HIGH POINT}/2)) \)

\( PSET + \bar{SUoF} \) is used as set value in PID calculations. It is used for shifting the proportional band.

Example: If \( PSET = 500^\circ C \), \( \bar{SUoF} = 5^\circ C \) or \( \bar{SUoF} = -5^\circ C \), 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 this parameter.
This parameter is added to “Output %” which is calculated at the end of the PID.

**Example:**

<table>
<thead>
<tr>
<th>°C</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>5%</td>
</tr>
</tbody>
</table>

Output Offset Related to PID Set

(For Heating PID 0.0%, 100.0%)
(For Cooling PID -100.0%, 0.0%)
(For Heating-Cooling PID -100.0%, 100.0%)

This parameter is added to the %process output that is calculated at the end of the PID according to process set value.

\[ PoFS \times \frac{PSET}{(UPL-LOL)} \]

**Example:** If \( PSET = 500°C, UP = 1000°C, LOL = 0 \), then \( PoFS = 5.0\% \) and \( PoFS \times \frac{PSET}{(UPL-LOL)} = 5.0 \times \frac{500}{1000-0} = 2.5\% \)

2.5% is added to calculated process value.
**PROCESS VALUE STABILIZATION (1, SCALE HIGH POINT)**

It is used to control if process value oscillates or not when parameter is selected.

If:

\[ \text{PSET} - \text{Strn} \leq \text{Process Value} \leq \text{PSET} + \text{Strn} \]

If this condition is not true and process value starts to oscillate (as shown in the diagram), then parameter is selected and the 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 \( E_{PoL} \) or \( E_{PoH} \) for selectable dual point calibration used inputs

Scale high point is the biggest one from \( P_{00} \) or \( P_{10} \) for multi point calibration used inputs

**Note**: Point position changes according to process input type and scale,

Unit changes according to the selection in this parameter.

---

**PROPORTIONAL BAND SHIFTING**

\((-\text{SCALE HIGH POINT} / 2), (\text{SCALE LOW POINT} / 2)\)

If heating-cooling or only cooling function is performed;

Cooling process set value is calculated by adding set value \( \text{PSET} \) with parameter \( \text{o-db} \)

Control form can be ON/OFF or PID.

If set value for heating = \( \text{PSET} + \text{SUOF} \);

Then set value for cooling = \( \text{PSET} + \text{SUOF} + \text{o-db} \)

**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 \( E_{PoL} \) or \( E_{PoH} \) for selectable dual point calibration used inputs

Scale high point is the biggest one from \( P_{00} \) or \( P_{10} \) for multi point calibration used inputs

**Note**: Point position changes according to process input type and scale,

Unit changes according to the selection in this parameter.
If $b - d > 0$ (Dead Band)

If $a - d < 0$ (Overlap Band)

SENSOR BREAK OUTPUT VALUE
(FOR HEATING PID 0.0%, 100.0%)
(FOR COOLING PID -100.0%, 0.0%)
(FOR HEATING-COOLING PID -100.0%, 100.0%)

When sensor breaks, controlling of the process can continue by entering %output value to $S_{bou}$ parameter.
If this parameter 0.0, process control output does not perform an output when sensor breaks.
8.2.3 MODULE-1 Configuration Parameters

Module-1 configuration parameters are arranged automatically by the device according to the module type in Module-1 socket. These parameters are not accessible if there is no module in Module-1 socket.

- **out 1**
  - Defines output function.

- **Con 1**
  - Defines control algorithm of output module.

- **HYS 1**
  - Hysteresis value of output module

- **Hyn 1**
  - Defines operation form of hysteresis

- **Em 1**
  - In ON/OFF operation, this time must be passed for the output to be energised again.

- **Lou 1**
  - Defines logic output function

- **AL5 1**
  - Selection of measurement input for alarm output. (There must be one of the analog input modules in Module-2 socket.)

- **ALT 1**
  - Defines alarm type

- **ALH 1**
  - Alarm hysteresis value

- **Ron 1**
  - Alarm on delay time

- **RoF 1**
  - Alarm off delay time

- **oAT 1**
  - Configuration of analog output module

- **ouA 1**
  - Function selection of analog output

- **rET 1**
  - It determines “re-transmission” function for analog output module

- **LIn 1**
  - Configuration of logic input

- **iSL 1**
  - Configuration of analog input module

- **ESL 1**
  - Selection of sensor type and scale for TC input module

- **rESL 1**
  - Selection of sensor type and scale for PT-100 input module

- **uASL 1**
  - It determines input type for voltage/Current input module

- **dPn 1**
  - It determines point position for display.

- **ICA 1**
  - It determines calibration type.

- **iCL 1**
  - It defines minimum value for selectable dual point calibration.
**Current transfer ratio parameter for CT input module**

- **iCH1**: It defines maximum value for selectable dual point calibration.
- **unit1**: Unit selection
- **LOL1**: Minimum value of operating scale
- **uPL1**: Maximum value of operating scale
- **iPU1**: Display offset for measured value from analog input module.
- **iFL1**: Filter time for input signal
- **Cjn1**: It determines if cold junction compensation is active or not. It is active if input module is TC.
- **RES1**: Remote Set function
- **Ctrl1**: Current transfer ratio parameter for ~CT input module
These parameters are active if EMO-900 (Relay Output), EMO-910 (SSR Driver) or EMO-920 (Digital Output) module is plugged in Module-1 socket.

![Diagram](image)

**out**

Defines output function for Module-1

- **Heat** Heating
- **Cool** Cooling
- **Logic** Logic output

**Con**

Defines control algorithm of output module in Module-1 socket. It is active if output function of Module-1 is heating or cooling.

- **On/OFF** ON/OFF control algorithm
- **PID** PID control algorithm

**Hys**

Hysteresis value for OUT-1. It can be adjusted from 0% to 50% of defined 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)

- **0000** SV + HYS/2 and SV - HYS/2
- **0001** SV and SV+HYS or SV and SV-HYS

**En**

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)
It determines logic output function of output module in Module-1 socket. It is active if output function of Module-1 is Lout (Logic Output).

- **0000** Alarm output
- **0001** Manual / Automatic data output
- **0002** Sensor break alarm output
- **0003** Output is active when the process value is out of the band which is defined with minimum value of operating scale \text{LoL} and maximum value of operating scale \text{uPL}.
- **0004** Output indicates that Ramp/Soak function has finished

Sensor break alarm output for analog input module in Module-2 socket. (It is visible if one of analog input modules is plugged in Module-2 socket)

- **0005** If process value is less than minimum value of operating scale \text{LoL} for analog input module in Module-2 socket or greater than maximum value of operating scale \text{uPL}, for analog input module in Module-2 socket, process output becomes active. (This parameter is visible if one of the analog input modules is plugged in Module-2 socket)

Measurement input selection for Module-1 alarm output. This parameter is visible if Logic output function of Module-1 is Alarm output and one of the analog input modules is plugged in Module-2 socket.

- **0000** Alarm output runs according to the process input.
- **0001** Alarm output runs according to the analog input module (2nd sensor input) in Module-2 socket.

It determines alarm type. It is active if logic output function of Module-1 is an alarm output.

- **0000** Process high alarm
- **0001** Process low alarm
- **0002** Deviation high alarm. It is active when alarm output runs according to the process input.
- **0003** Deviation low alarm. It is active when alarm output runs according to the process input.
- **0004** Deviation band alarm. It is active when alarm output runs according to the process input.
- **0005** Deviation range alarm. It is active when alarm output runs according to the process input.
Heater failure alarm. It is active if CT input module is plugged in Module-2 socket.

**Process high alarm**

**Process low alarm**

**Deviation High Alarm**

**Deviation Low Alarm**
**Deviation Band Alarm**

Alarm- 1 hysteresis value. It is active if logic output function of Module-1 is selected alarm output.

If [AL5] is 0000 or there is no analog input module (2nd sensor input) in Module-2 socket, then it can be adjusted from 0% to 50% of process input scale (UPL - LoL)

If [AL5] is 0001 and there is one of an analog input module (2nd sensor input) in Module-2 socket, then it can be adjusted from 0% to 50% of analog input module scale (UPL - LoL)

If there is CT input module (EMI-920) in Module-2 socket and alarm type parameter [AL5] is 0000, then it can be adjusted from 0.0 to 20.0A

**Deviation Range Alarm**

Alarm on delay time. It can be adjusted from 0000 to 9999 seconds. It is active if logic output function of Module-1 is alarm output.

Alarm off delay time. It can be adjusted from 0000 to 9998 seconds. When the value is greater than 9998, [ALCH] is seen on the display. It means alarm latching output is selected. It is active if logic output function of Module-1 is alarm output.
These parameters are active if EMO-930 (0/4...20 mA Current Output) module is plugged in Module-1 socket.

Configuration of analog output module in Module-1 socket.

- 0...20mA output or 0...10V according to Section 5.2.5 is selected.
- 4...20mA output or 2...10V according to Section 5.2.5 is selected.

Function selection of analog output module in Module-1 socket.

- **HEAT**: Analog output module in Module-1 socket is used for heating.
- **Cool**: Analog output module in Module-1 socket is used for cooling.
- **Retr**: Analog output module in Module-1 socket is used for retransmission.

Defines “Re-transmission” function. (It is active if “re-transmission” function is selected for analog output module in Module-1 socket.

- **rt.Pr**: It retransmits Process value to analog output.
- **rt.Er**: It retransmits difference between Process and Set value to analog output.
- **rt.PU**: It retransmits Set value to analog output.

![Graph showing re-transmission scale](image)
These parameters are active if EMI-900 (Digital Input) module is plugged in Module-1 socket.

Manual / Automatic selection input
When the logic input is triggered;
In PID Tune and selection of operation form menu (run List),
if selection of operation form parameter (Auto) is \textit{Auto},
then \textit{Auto} is selected, if Auto parameter is \textit{Auto},
then \textit{Auto} is selected.

Auto Tune (Limit Cycle Tuning) Start/Stop input.
When the logic input is triggered;
It is used to start or stop the Auto Tune operation.
If input is being active while \textit{Auto Tune} operation does not perform,
automatic tune selection parameter \textit{Auto Tune} is selected \textbf{YES} and then Auto Tune operation starts to run.
If input is being active while \textit{Auto Tune} operation performs,
Auto Tune operation is stopped.

Ramp&Soak, Start / Stop input.
When the logic input is triggered;
If Ramp / Soak control parameter \textbf{SOAK} is \textit{run} or \textit{Hold} then \textit{off} is selected
If it is \textit{off} then \textit{run} is selected.

Ramp&Soak, Start / Hold input.
When the logic input is triggered;
If Ramp / Soak control parameter \textbf{SOAK} is \textit{run} then \textit{Hold} is selected
\textit{Hold} then \textit{run} is selected

Alarm Latch Canceling.
When the logic input is triggered;
If there is a latching alarm output and alarm condition is not active,
latching is canceled.
These parameters are active if EMI-910 (0/4...20mA—Current Input), EMI-930 (TC or 0...50mV—Input), EMI-940 (PT-100 Input) or EMI-950 (0...10V—Input) module is plugged in Module-1 socket.

**Configuration of analog input module in Module-1 socket**

**TC input type selection.** This must be selected if analog input module in Module-1 socket is EMI-930.

**PT-100 input type selection.** This must be selected, if analog input module in Module-1 socket is EMI-940.

**Voltage / Current input type selection.** This must be selected if analog input module in Module-1 socket is EMI-910, EMI-930 or EMI-950.

**Selection of sensor type and scale for TC input module in Module-1 socket.** It is active if input type of Module-1 is selected TC.

- **L (-100°C;850°C) or (-148°F;1562°F)**
- **J (-200°C;900°C) or (-328°F;1652°F)**
- **K (-199.9°C;999.9°C) or (-199.9°F;999.9°F)**
- **R (0°C;1700°C) or (32°F;3092°F)**
- **S (0°C;1700°C) or (32°F;3092°F)**
- **T (-200°C;400°C) or (-328°F;752°F)**
- **B (44°C;1800°C) or (111°F;3272°F)**
Selection of sensor type and scale for Pt-100 input module in Module-1 socket. It is active if input type of Module-1 is selected Pt-100.

Sensor type: PT-100
Scale: -200°C to 650°C (If unit is °C)
Scale: -328°F to 1202°F (If unit is °F)

Selection of point position for display. It is active if input type of Module-1 is selected Voltage/Current.

It determines input type for Voltage/Current input module in Module-1 socket. (It is active if input type of Module-1 is selected Voltage/Current.)

If Module-1 is EMI-910; 0 ... 20mA input is selected.
If Module-1 is EMI-930; 0 ... 50mV input is selected.
If Module-1 is EMI-950; 0 ... 10V input is selected.

Fixed dual point calibration is performed. Maximum and minimum value of calibration can not be adjusted. Minimum value of calibration is -1999 and maximum value of calibration is 9999.

Selectable dual point calibration is performed.
Display offset for value in analog input module. It can be adjusted from -10% to +10% of scale. This value is added to the process value.

Filter time for input signal. It can be adjusted 0.0 to 900.0 seconds.

It decides if cold junction compensation is active or not for TC input module in Module-1 socket. It is active if process input of Module-1 is TC input.

It determines if the measured value from analog input module in Module-1 socket is used as Remote Set or not. This parameter is visible if point position and unit parameters are same for process input and analog input module.

Unit selection
- Unit is °C.
- Unit is °F.
- Unit is U. It is active if input type of Module-1 is selected Voltage / Current.
- No unit. It is active if input type of Module-1 is selected Voltage / Current.

Minimum value of operating scale (Low Limit). It can be changed according to analog input type and scale.

Maximum value of operating scale (High Limit). It can be changed according to analog input type and scale.

Defines minimum value for selectable dual point calibration. It is active if Voltage / Current is selected. It can be adjusted from -1999 to 9999.

Defines maximum value for selectable dual point calibration. It is active if Voltage / Current is selected. It can be adjusted from -1999 to 9999.

It is filter time for input signal. It can be adjusted 0.0 to 900.0 seconds.

It decides if cold junction compensation is active or not for TC input module in Module-1 socket. It is active if process input of Module-1 is TC input.

Cold junction compensation is active
- Yes
- No

Cold junction compensation is not active

It determines if the measured value from analog input module in Module-1 socket is used as Remote Set or not. This parameter is visible if point position and unit parameters are same for process input and analog input module.

Measured value from analog input module in Module-1 socket is used as process set value. User defined process set value is not considered.

Measured value from analog input module in Module-1 socket is not used as process set value. User defined process set value is considered.
These parameters are active if EMI-920 (CT) Input Module is plugged in Module-1 socket.

Current transfer ratio for Module-1. It can be adjusted from 0 to 100.

**Example**: For 100:5A type current transformer;

This parameter must be \[ \frac{100}{5} = 20 \]

Calculating set value for heating failure:

\[
\text{Set} = \frac{\text{(Current value without failure} + \text{Current value with heater failure})}{2}
\]

For example; If there is a system with one heater (200V and 1kW);

In normal conditions current in heater = \( \frac{1000}{200} = 5A \)

If there is a heater failure no current will be on the heater (0A).

Then Set value must be adjusted = \( \frac{5+0}{2} = 2.5A \)

For correct measurements with EMI-920 (CT) Input Module in Module-1 socket, heating output must be active minimum for 0.2 sec (200 msec).

If a system operates with PID control form, heating minimum output time must be minimum 0.2 sec.
For example; If there is a system with three heater (200V ~ and 1kW):
In normal conditions current in heater: \[ \frac{1000}{200} \times 3 = 5A \times 3 = 15A \]
If one of the heater is out of order, there is \(5 \times 2 = 10A\) current on two heaters. Current in heater failure is 10A. Then Set value must be adjusted \((15+10)/2 = 12.5A\)

![Diagram of heater control system](image)

For correct measurements with EMI-920 (CT) Input Module in Module-1 socket, heating output must be active minimum for 0.2 sec (200 msec).

If a system operates with PID control form, heating minimum control time must be minimum 0.2 second.
8.2.4 MODULE-2 Configuration Parameters

Module-2 configuration parameters are arranged automatically by the device according to the module type in Module-2 socket. These parameters are not accessible if there is no module in Module-2 socket.

- **out2**: Defines output function
- **Cond2**: Defines control algorithm of output module
- **HYS2**: Hysteresis value of output module
- **Hy2**: Defines operation form of hysteresis
- **En2**: In ON/OFF operation, this time must be passed for the output to be energised again.
- **Lou2**: Defines logic output function
- **ALS2**: Selection of measurement input for alarm output. (There must be one of analog input modules in Module-1 socket.)
- **ALT2**: Defines alarm type
- **ALH2**: Alarm hysteresis value
- **Ron2**: Alarm on delay time
- **RoF2**: Alarm off delay time
- **oAT2**: Configuration of analog output module
- **ouA2**: Function selection of analog output
- **reA2**: It determines “re-transmission” function for analog output module
- **lin2**: Configuration of logic input
- **iSL2**: Configuration of analog input module
- **esL2**: Selection of sensor type and scale for TC input module
- **rsL2**: Selection of sensor type and scale for PT-100 input module
- **uAS2**: It determines input type for Voltage/Current input module
- **DPn2**: It determines point position for display.
- **ICA2**: It determines calibration type.
- **iCL2**: It defines minimum value for selectable dual point calibration.
Maximum value of operating scale
Display offset for measured value from analog input module.
Filter time for input signal
Unit selection
Minimum value of operating scale
Maximum value of operating scale
It defines maximum value for selectable dual point calibration. It is active if Voltage/Current input is selected.
It determines if cold junction compensation is active or not. It is active if input module is TC.
Remote Set function
Current transfer ratio parameter for CT input module
Module-2 configuration parameters are defined according to which input / output modules are plugged in Module-2 socket.

**out2** Determines output function for Module-2

- **HEAT** Heating
- **Cool** Cooling
- **Out** Logic output

**Con2** It defines control algorithm of output module in Module-2 socket. It is active if output function of Module-1 is heating or cooling.

- **OnOF** ON/OFF control algorithm
- **PID** PID control algorithm

**HYS2** Hysteresis value for OUT-2. It can be adjusted from 0% to 50% of defined scale. (It is active if ON/OFF control is selected)

**HyN2** It determines operation form of hysteresis. (It is active if ON/OFF control is selected)

- **0000** SV + HYS/2 and SV - HYS/2
- **0001** SV and SV+HYS or SV and SV-HYS

**En12** 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. (It is active if ON/OFF control is selected)
It determines logic output function of output module in Module-2 socket. It is active if output function of Module-2 is Lout (Logic Output).

- **0000** Alarm output
- **0001** Manual/Automatic data output
- **0002** Sensor break alarm output
- **0003** Output is active when the process value is out of the band which is defined with minimum value of operating scale \( L_O L \) and maximum value of operating scale \( U_P L \)
- **0004** Output indicates that Ramp/Soak function has finished

Sensor break alarm output for analog input module in Module-1 socket. (It is visible if one of analog input modules is plugged in Module-1 socket)

- **0005** Sensor break alarm output for analog input module in Module-1 socket.

If process value is less than minimum value of operating scale \( L_O L \) for analog input module in Module-1 socket or greater than maximum value of operating scale \( U_P L \) for analog input module in Module-1 socket, process output becomes active. (This parameter is visible if one of the analog input modules is plugged in Module-1 socket)

Measurement input selection for Module-2 alarm output. This parameter is visible if Logic output function of Module-2 is Alarm output and one of the analog input modules is plugged in Module-1 socket.

- **0000** Alarm output runs according to the process input.
- **0001** Alarm output runs according to the analog input module (2nd sensor input) in Module-1 socket.

If there is no analog input module in Module-1 socket

- **0002** Deviation high alarm. It is active when alarm output runs according to the process input.
- **0003** Deviation low alarm. It is active when alarm output runs according to the process input.
- **0004** Deviation band alarm. It is active when alarm output runs according to the process input.
- **0005** Deviation range alarm. It is active when alarm output runs according to the process input.
Heater failure alarm. It is active if CT input module is plugged in Module-1 socket.

**Process High Alarm**

Alarm Output  
ON  |  OFF  
---|---
Alarm Set  
Process Value

**Process Low Alarm**

Alarm Output  
ON  |  OFF  
---|---
Alarm Set  
Process Value

**Deviation High Alarm**

Alarm Output  
ON  |  OFF  
---|---
Process Set  Process Set + Alarm Set  
Process Value

**Deviation Low Alarm**

Alarm Output  
ON  |  OFF  
---|---
Process Set - Alarm Set  Process Set  
Process Value
If there is CT input module (EMI-920) in Module-1 socket and alarm type parameter is , then it can be adjusted from 0.0 to 20.0A.

**Deviation Band Alarm**

- Alarm Output
- Process Set - Alarm Set
- Process Set
- Process Set + Alarm Set
- Process Value

**Deviation Range Alarm**

- Alarm Output
- Process Set - Alarm Set
- Process Set
- Process Set + Alarm Set
- Process Value

Alarm- 2 hysteresis value. It is active if logic output function of Module-2 is alarm output.

If [AL52] is [0000] or there is no analog input module (2nd sensor input) in Module-1 socket, then it can be adjusted from 0% to 50% of process input scale (\(-uPL\) - \(LoL\)).

If [AL52] is [0001] and there is one of the analog input module (2nd sensor input) in Module-1 socket, then it can be adjusted from 0% to 50% of analog input module scale (\(-uPL\) - \(LoL\)).

If there is CT input module (EMI-920) in Module-1 socket and alarm type parameter [AL62] is [0006], then it can be adjusted from 0.0 to 20.0A.

**Alarm on Delay Time**

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

**Alarm off Delay Time**

- Alarm off delay time. It can be adjusted from 0000 to 9998 seconds. When the value is greater than 9998, [LCH] is seen on the display. It means alarm latching output is selected. It is active if logic output function of Module-2 is alarm output.
These parameters are active if EMO-930 (0/4...20mA Current Output) module is plugged in Module-2 socket.

EMO-930 Configuration of analog output module in Module-2 socket.

0000 0...20mA output or 0...10V according to Section 5.2.5 is selected.
0001 4...20mA output or 2...10V according to Section 5.2.5 is selected.

Function selection of analog output module in Module-2 socket.

**HEAT** Analog output module in Module-2 socket is used for heating

**Cool** Analog output module in Module-2 socket is used for cooling

**rEtr** Analog output module in Module-2 socket is used for "re-transmission"

**Re-transmission** function. (It is active if "re-transmission" function is selected for analog output module in Module-2 socket)

rt.Pr It retransmits Process value to analog output.

rt.Er It retransmits difference between Process and Set value to analog output.

rt.PU It retransmits Set value to analog output.

Scale

<table>
<thead>
<tr>
<th>Scale</th>
<th>Re-transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPL</td>
<td></td>
</tr>
<tr>
<td>LOL</td>
<td></td>
</tr>
</tbody>
</table>

mA

0 20
These parameters are active if EMI-900 (Digital Input) is plugged in Module-2 socket.

Configuration of digital input in Module-2 socket.

**Manual / Automatic selection input**

When the logic input is triggered;

In PID Tune and selection of operation form menu (run List), if selection of operation form parameter (Auto) is \( \text{Auto} \), then \( \text{Auto} \) is selected, if Auto parameter is \( \text{Auto} \), then \( \text{Auto} \) is selected.

**Auto Tune (Limit Cycle Tuning) Start/Stop input**

When the logic input is triggered;

*It is used to start or stop the Auto Tune operation.*

If input is being active while \( \text{Auto} \) operation does not perform, automatic tune selection parameter \( \text{Auto} \) is selected \( \text{YES} \) and then Auto Tune operation starts to run.

If input is being active while Atun operation performs, Auto Tune operation is stopped.

**Ramp&Soak, Start / Stop input**

When the logic input is triggered;

If Ramp / Soak control parameter \( \text{Ramp} \) is \( \text{run} \) or \( \text{Hold} \) then \( \text{off} \) is selected.

If it is \( \text{off} \) then \( \text{run} \) is selected.

**Ramp&Soak, Start / Hold input**

When the logic input is triggered;

If Ramp / Soak control parameter \( \text{Ramp} \) is \( \text{run} \) then \( \text{Hold} \) is selected.

If \( \text{Hold} \) then \( \text{run} \) is selected.

**Alarm Latch Canceling.**

When the logic input is triggered;

If there is a latching alarm output and alarm condition is not active, latching is canceled.
These parameters are active if EMI-910 (0/4...20mA Current Input), EMI-930 (TC or 0...50mV Input), EMI-940 (PT-100 Input) or EMI-950 (0...10V Input) module is plugged in Module-2 socket.

**Configuration of analog input module in Module-2.**

TC input type selection. This must be selected if analog input module in Module-2 socket is EMI-930.

PT-100 input type selection. This must be selected, if analog input module in Module-2 socket is EMI-940.

Voltage / Current input type selection. This must be selected if analog input module in Module-2 socket is EMI-910, EMI-930 or EMI-950.

**Selection of sensor type and scale for TC input module in Module-2 socket. It is active if input type of Module-2 is selected TC.**

0000 L (-100°C;850°C) or (-148°F;1562°F)
0001 L (-100.0°C;850.0°C) or (-148.0°F;999.9°F)
0002 J (-200°C;900°C) or (-328°F;1652°F)
0003 J (-199.9°C;900.0°C) or (-199.9°F;999.9°F)
0004 K (-200°C;1300°C) or (-328°F;2372°F)
0005 K (-199.9°C;999.9°C) or (-199.9°F;999.9°F)
0006 R (0.0°C;1700°C) or (32.0°F;3092°F)
0007 R (0.0°C;999.9°C) or (32.0°F;999.9°F)
0008 S (0.0°C;1700°C) or (32.0°F;3092°F)
0009 S (0.0°C;999.9°C) or (32.0°F;999.9°F)
0010 T (-200°C;400°C) or (-328°F;752°F)
0011 T (-199.9°C;400.0°C) or (-199.9°F;752.0°F)
0012 B (44°C;1800°C) or (111°F;3272°F)
It is active if Voltage/Current input is selected for Module-2. It determines calibration type.

Selection of sensor type and scale for Pt-100 input module in Module-2 socket. It is active if input type of Module-2 is selected Pt-100.

It determines input type for Voltage/Current input module in Module-2 socket. (It is active if input type of Module-2 is selected Voltage/Current.)

It determines point position for display. It is active if input type of Module-2 is selected Voltage/Current.

It is active if Voltage/Current input is selected for Module-2. It determines calibration type.

Fixed dual point calibration is done. Maximum and minimum value of calibration can not be adjusted. Minimum value of calibration is -1999 and maximum value of calibration is 9999.

Selectable dual point calibration is done.
No unit. It is active if input type of Module-2 is selected voltage / Current.

Unit is U. It is active if input type of Module-2 is selected voltage / Current.

Unit selection

- °C Unit is °C.
- °F Unit is °F.

Unit is U. It is active if input type of Module-2 is selected voltage / Current.

- No unit. It is active if input type of Module-2 is selected voltage / Current.

LoL2 Minimum value of operating scale (Low Limit). It can be changed according to analog input type and scale.

uPL2 Maximum value of operating scale (High Limit). It can be changed according to analog input type and scale.

Display offset for value in analog input module. It can be adjusted from -10% to +10% of scale. This value is added to the process value.

It is filter time for input signal. It can be adjusted from 0.0 to 900.0 seconds.

It determines if cold junction compensation is active or not for TC input module in Module-2 socket. It is active if process input of Module-2 is TC input.

- YES Cold junction compensation is active
- no Cold junction compensation is not active

It determines if the measured value from analog input module in Module-2 socket is used as Remote Set or not. This parameter is visible if point position and unit parameters are same for process input and analog input module.

- YES Measured value from analog input module in Module-2 socket is used as process set value. User defined process set value is not considered.
- no Measured value from analog input module in Module-2 socket is not used as process set value. User defined process set value is considered.
These parameters are active if EMI-920 (CT) Input Module is plugged in Module-2 socket.

Example: For 100:5A type current transformer;

This parameter must be $\frac{100}{5} = 20$

Current Transformer Calculating set value for heating failure

$$\text{Set} = \frac{(\text{Current value without failure} + \text{Current value with heater failure})}{2}$$

For example; if there is a system with one heater (200V and 1kW);
In normal conditions current in heater = $\frac{1000}{200} = 5A$
If there is a heater failure no current will be on the heater (0A).
Then Set value must be adjusted = $(5+0)/2 = 2.5A$

For correct measurements with EMI-920 (CT) Input Module in Module-2 socket, heating output must be active minimum for 0.2 sec (200 msec).

If a system operates with PID control form, heating minimum output time must be minimum 0.2 sec.
For example, if there is a system with three heaters (200V~ and 1kW);
In normal conditions current in heater: \( \frac{1000}{200} \times 3 = 5A \times 3 = 15A \)
If one of the heaters is out of order, there is 5*2 = 10A current on two heaters. Current in heater failure is 10A. Then Set value must be adjusted \((15+10)/2 = 12.5A\)

For correct measurements with EMI-920 (CT) Input Module in Module-2 socket, heating output must be active minimum for 0.2 sec (200 msec).

If a system operates with PID control form, heating minimum control time must be minimum 0.2 second.
8.2.5 OUTPUT-3 Configuration Parameters

**out 3**

<table>
<thead>
<tr>
<th>Conf</th>
<th>Defines output function for Output-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat</td>
<td>Heating</td>
</tr>
<tr>
<td>Cool</td>
<td>Cooling</td>
</tr>
<tr>
<td>Lout</td>
<td>Logic output</td>
</tr>
</tbody>
</table>

**Con 3**

Defines control algorithm of Output-3. It is active if output function of Output-3 is heating or cooling.

- **Con 3**: ON/OFF control algorithm
- **Pid**: PID control algorithm

**Hys 3**

Hysteresis value for OUT-3. It can be adjusted from 0% to 50% of defined scale. (It is active if ON/OFF control is selected)

- **Hys 3**: SV + HYS/2 and SV - HYS/2
- **Hyn 3**: SV and SV+HYS or SV and SV-HYS

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)

**Lou 3**

It determines logic output function of Output-3. It is active if output function of Output-3 is Lout (Logic Output)

- **Lou 3**: Alarm output
- **Lou 3**: Manual/Automatic data output
- **Lou 3**: Sensor break alarm output
- **Lou 3**: Output is active when the process value is out of the band which is defined with minimum value of operating scale \( \text{Lol} \) and maximum value of operating scale \( \text{UpL} \)
- **Lou 3**: Output indicates that Ramp/Soak function has finished
Heater failure alarm. It is active if CT input module is plugged in Module-1 or Module-2 socket.

Sensor break alarm output for analog input module in Module-1 or Module-2 socket. (It is visible if one of the analog input modules is plugged in Module-1 or Module-2 socket)

If process value is less than minimum value of operating scale \( \text{LOL}_1 \) or \( \text{LOL}_2 \) for analog input module in Module-1 or Module-2 socket or greater than maximum value of operating scale \( \text{HPL}_1 \) or \( \text{HPL}_2 \) for analog input module in Module-1 or Module-2 socket, process output becomes active. (This parameter is visible if one of the analog input modules is plugged in Module-1 or Module-2 socket)

Measurement input selection for Output-3 alarm output. This parameter is visible if Logic output function of Output-3 is Alarm output and one of the analog input modules is plugged in Module-1 or Module-2 socket.

Alarm output runs according to the process input.

Alarm output runs according to the analog input module (2nd sensor input) in Module-1 or Module-2 socket.

It determines alarm type. It is active if logic output function of Output-3 is alarm output.

Process high alarm

Process low alarm

Deviation high alarm. It is active when alarm output runs according to the process input.

Deviation low alarm. It is active when alarm output runs according to the process input.

Deviation band alarm. It is active when alarm output runs according to the process input.

Deviation range alarm. It is active when alarm output runs according to the process input.

Heater failure alarm. It is active if \( \sim \) CT input module is plugged in Module-1 or Module-2 socket.
Deviation Range Alarm

Alarm-3 hysteresis value. It is active if logic output function of Output-3 is alarm output.

If \( AL3 \) is \( 0000 \) or there is no analog input module (2nd sensor input) in Module-1 or Module-2 socket, then it can be adjusted 0% to 50% of process input scale \(( UPL - LOL )\).

If \( AL3 \) is \( 0007 \) and there is one of the analog input module (2nd sensor input) in Module-1 or Module-2 socket, then it can be adjusted from 0% to 50% of analog input module scale \(( UPL2 - LOL2 )\) or \(( UPL3 - LOL3 )\).

If there is \( \sim CT \) input module (EMI-920) in Module-1 or Module-2 socket and alarm type parameter \( AL3 \) is \( 0006 \), then it can be adjusted from 0.0 to 20.0A \( \sim \).

Alarm on delay time. It can be adjusted from 0000 to 9999 seconds. It is active if logic output function of Module-1 is alarm output.

Alarm off delay time. It can be adjusted from 0000 to 9998 seconds. When the value is greater than 9998, \( LCH \) is seen on the display. It means alarm latching output is selected. It is active if logic output function of Output-3 is alarm output.
8.2.6 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 \( \text{SSL} \) parameter to \( \text{SU-w} \) parameter.
Please refer to Section 8.2.1 Process Input Type and Relevant Parameters with Process Input for \( \text{SSL} \) parameter.

**SU-w**
Maximum value for process set and alarm set values. It is named as high limit of set scale.
It can be adjusted from \( \text{SU-L} \) to high limit of input selected with \( \text{SSL} \) Parameter.
Please refer to Section 8.2.1 Process Input Type and Relevant Parameters with Process Input for \( \text{SSL} \) parameter.

**SL2**
Minimum value for set value of second sensor (analog input module) in Module-1 or Module-2 socket. It is named as low limit of set scale for second sensor.
It can be adjusted from low limit of analog input selected with \( \text{SL1} \) or \( \text{SL2} \) Parameter to \( \text{SL2} \) parameter.
Please refer to Section 8.2.3 (Module-1 Configuration Parameters) and Section 8.2.4 (Module-2 Configuration Parameter) for \( \text{SL1} \) and \( \text{SL2} \) Parameters.
(This parameter is visible if one of the analog input modules is plugged in Module-1 or Module-2 socket)

**SU2**
Maximum value for set value of second sensor (analog input module) in Module-1 or Module-2 socket. It is named as high limit of set scale for second sensor.
It can be adjusted from \( \text{SU2} \) to high limit of analog input selected with \( \text{SL1} \) Parameter to \( \text{SL2} \) parameter.
Please refer to Section 8.2.3 (Module-1 Configuration Parameters) and Section 8.2.4 (Module-2 Configuration Parameter) for \( \text{SL1} \) and \( \text{SL2} \) Parameters.
(This parameter is visible if one of the analog input modules is plugged in Module-1 or Module-2 socket)

**ULTE**
Motor travel time. It can be adjusted from **5** to **600** seconds.
(It is active if motorized valve control is selected)

**ULHY**
Minimum time of motorized valve output activation. It can be adjusted from **0.1%** to **5.0%**.
If \( \text{ULTE} = 100 \text{ sec} \) and \( \text{ULHY} = 1.0\% \) then minimum time of motorized valve output activation is \( 100 \times 1.0\% = 1 \text{ sec} \)
(It is active if motorized valve control is selected)
8.2.7 Parameters for Configuration of Serial Communication

**Communication Accessing Address**

Communication accessing address of device. It can be adjusted from 1 to 247.

**Communication Baud Rate**

- **0000** 1200 Baud Rate.
- **0001** 2400 Baud Rate.
- **0002** 4800 Baud Rate.
- **0003** 9600 Baud Rate.
- **0004** 19200 Baud Rate.

**Parity Selection for Communication**

- **0000** No parity.
- **0001** Odd parity.
- **0002** Even parity.

**Stop Bit Selection for Communication**

- **0000** 1 stop bit
- **0001** 2 stop bits
8.2.8 Operator and Technician Passwords

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

If it is 0000: no password protection while entering to the operator parameters.

If it is different from “0” and user wants to access to the operator parameters:
1- If user does not enter OPPS password correctly:
   It turns to operation screen without accessing to parameters.

2- When OPPS in top display and 0000 in bottom display are seen, if user presses SET button without entering OPPS password (For observing the parameters):
   Operator can see operator menus and parameters but operator can not change the parameters
   (Please refer to Section 9. Failure Messages in ESM-9950 Process Controllers)

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

If it is 0000: 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 user does not enter ECPS password correctly:
   It turns to operation screen without accessing to parameters.

2- When ECPS in top display and 0000 in bottom display are seen, if user presses SET button without entering ECPS password (For observing the parameters):
   Technician can see all menus and parameters except Operator and Technician Password menu (“Pass Conf”) but technician can not change the parameters
   (Please refer to Section 9. Failure Messages in ESM-9950 Process Controllers)
9. Failure Messages in ESM-9950 Process Controllers

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

2 - If \( E_dSP \) parameter in “Disp List” menu is \( 0002 \) and analog input module is plugged in Module-1 or Module-2 socket, this is sensor failure of analog input module. Sensor connection is wrong or there is no sensor connection.

3 - If analog input value is less than minimum value of operating scale \( \text{LoL} \) top display starts to blink.

4 - If top display blinks : If analog input value is less than minimum value of operating scale \( \text{LoL} \) top display starts to blink.

In “PinP Conf” Menu if;
- \( E_dSP \) = \( 0000 \);
- \( E_Sil \) = \( 0003 \);
- \( \text{LoL} \) = \( 4999 \);
- \( \text{LoH} \) = \( 0000 \) are defined.

Adjust \( \text{LoL} \rightarrow 4500 \)

If analog input value is less than minimum value of operating scale \( \text{LoL} \) top display starts to blink.

Please refer to Section 8.2.1 for detailed information about this parameter.
5 - If top display blinks: If analog input value is greater than maximum value of operating scale \( uPL \), top display starts to blink.

6 - If operator or technician password is different from “0” and user accesses to the parameter by Set button without entering the operator or technician 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.

7 - If tuning operation can not be completed in 8 hours, AT led starts to blink. Blinking can be canceled by pressing Enter button.

8 - If user does not do anything for 120 seconds while device is on Operator or Technician menus, device turns to operation screen.

9 - When Ramp / Soak operation finishes;

   If \( bdSP \) parameter is \( 0002 \), screen on the left is shown
   (Please refer to Section 8.1.3 for bdsp parameter)
10 - When power is on; not starting the normal operation and blinking the bottom display as shown on the left; It appears when two analog input modules (EMI-910, EMI-930, EMI-940, EMI-950) are plugged in Module-1 and Module-2 socket at the same time. For starting normal operation power off and pull out one of the analog input modules.

11 - When power is on; not starting the normal operation and blinking the bottom display as shown on the left; It appears when two EMI-920 CT input modules are plugged in Module-1 and Module-2 socket. For starting normal operation power off and pull out one of the EMI-920 CT input modules.
## 10. Specifications

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Process Controller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing &amp; Mounting</td>
<td>96mm x 96mm x 87.5mm 1/4 DIN 43700 plastic housing for Panel mounting. Panel cut-out is 92x92mm.</td>
</tr>
<tr>
<td>Protection Class</td>
<td>NEMA 4X (IP65 at front, IP20 at rear).</td>
</tr>
<tr>
<td>Weight</td>
<td>Approximately 0.34 Kg.</td>
</tr>
<tr>
<td>Environmental Ratings</td>
<td>Standard, indoor at an altitude of less than 2000 meters with none condensing humidity.</td>
</tr>
<tr>
<td>Storage/Operating Temperature</td>
<td>-40°C to +85°C / 0°C to +50°C</td>
</tr>
<tr>
<td>Storage/Operating Humidity</td>
<td>90 % max. (None condensing)</td>
</tr>
<tr>
<td>Installation</td>
<td>Fixed installation</td>
</tr>
<tr>
<td>Overvoltage Category</td>
<td>II</td>
</tr>
<tr>
<td>Pollution Degree</td>
<td>II, office or workplace, none conductive pollution</td>
</tr>
<tr>
<td>Operating Conditions</td>
<td>Continuous</td>
</tr>
<tr>
<td>Supply Voltage and Power</td>
<td>100 - 240 V~ (-15% / +10%) 50/60 Hz 6VA</td>
</tr>
<tr>
<td></td>
<td>24 V~ (-15% / +10%) 50/60 Hz 6VA</td>
</tr>
<tr>
<td></td>
<td>24 V~ (-15% / +10%) 6W</td>
</tr>
<tr>
<td>Process Inputs</td>
<td>Universal input TC, RTD, Voltage/Current</td>
</tr>
<tr>
<td>Thermocouple Input Types</td>
<td>Selectable by parameters</td>
</tr>
<tr>
<td></td>
<td>L (DIN43710), J, K, R, S, T, B, E, N (IEC584.1)(ITS90)</td>
</tr>
<tr>
<td>Thermoresistance Input Types</td>
<td>PT 100 (IEC751) (ITS90)</td>
</tr>
<tr>
<td>Voltage Input Types</td>
<td>Selectable by parameters 0...50mV, 0...5V, 0...10V</td>
</tr>
<tr>
<td>Current Input Types</td>
<td>Selectable by parameters 0...20mA, 4...20mA</td>
</tr>
<tr>
<td>Accuracy</td>
<td>± 0.25% of full scale for thermocouple, thermoresistance and voltage, ± 0.70% of full scale for current.</td>
</tr>
<tr>
<td>Cold Junction Compensation</td>
<td>Automatically ± 0.1°C/1°C.</td>
</tr>
<tr>
<td>Line Compensation</td>
<td>Maximum 10 Ω.</td>
</tr>
<tr>
<td>Sensor Break Protection</td>
<td>Upscale</td>
</tr>
<tr>
<td>Sampling Cycle</td>
<td>3 samples per second</td>
</tr>
<tr>
<td>Input Filter</td>
<td>0.0 to 900.0 seconds</td>
</tr>
<tr>
<td>Control Forms</td>
<td>Programmable ON / OFF, P, PI, PD or PID.</td>
</tr>
<tr>
<td>Standard Relay Output</td>
<td>5A@250V~ (Programmable control or alarm output) (Electrical Life: 100.000 Operation (Full Load))</td>
</tr>
<tr>
<td>Output Modules</td>
<td>-EMO-900 Relay Output Module (5A@250V~)</td>
</tr>
<tr>
<td></td>
<td>-EMO-910 SSR Driver Output Module (Max 20mA@18V)</td>
</tr>
<tr>
<td></td>
<td>-EMO-920 Digital (Transistor) Output Module (Max 40mA@18V)</td>
</tr>
<tr>
<td></td>
<td>-EMO-930 0/4...20mA Current Output Module</td>
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<tr>
<td>Input Modules</td>
<td>-EMI-900 Digital Input Module</td>
</tr>
<tr>
<td></td>
<td>-EMI-910 0/4...20mA Current Input Module</td>
</tr>
<tr>
<td></td>
<td>-EMI-920 0...5A ~ CT Input Module</td>
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<td></td>
<td>-EMI-930 TC or 0...50mV Input Module</td>
</tr>
<tr>
<td></td>
<td>-EMI-940 PT-100 Input Module</td>
</tr>
<tr>
<td></td>
<td>-EMI-950 0...10V Input Module</td>
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<tr>
<td>Standard Communication Module</td>
<td>EMC-900 RS-232 Communication Module</td>
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<tr>
<td>Optional Communication Module</td>
<td>EMC-910 RS-485 Communication Module</td>
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<tr>
<td>Communication Protocol</td>
<td>MODBUS-RTU</td>
</tr>
<tr>
<td>Process Display</td>
<td>19 mm Red 4 digit LED display</td>
</tr>
<tr>
<td>Set Display</td>
<td>10.8 mm Green 4 digit LED display</td>
</tr>
<tr>
<td>Led Indicators</td>
<td>AT (Auto Tune), SV (Set value), Man (Manual Mode), Auto (Automatic Mode), O1 / 2 / 3 (Outputs) Leds, °C / ºF / V unit, Ramp, Remote Leds</td>
</tr>
<tr>
<td>Approvals</td>
<td>UL Recognized Component (File No: E 254103), GOST-R, CZ, Δ</td>
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