EMKO

PROCESS CONTROL UNITS
ESM-XX50



ESM-4450, ESM-7750, ESM-9950, ESM-4950, ESM-9450
Universal Input PID Process Controller with
Smart I/O Module System

- **4 digits process (PV) ve 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**
- **Auto-tune and Self-tune PID**
- **Manual/Automatic mode selection for control outputs**
- **Bumpless transfer**
- **Motorized valve control function**
- **Programmable heating, cooling and alarm functions for control outputs**
- **8 steps profile control (Ramp & Soak) function and start-holdstop by using logic input module**
- **Remote set point function by using analogue input modules**
- **Re-Transmission**
- **Detection of heater failure by using 0...5 A∿CT input module**
- **Smart I/O module system**
- **RS-232 (standard) or RS-485 (optional) serial communication with Modbus RTU protocol**

SPECIFICATIONS:

Process Inputs
Universal Input: Universal input, TC, RTD, ⎓Voltage/Current
Thermocouple (TC) : L(DIN 43710) ,J , K , R , S , T , B , E ve N (IEC584.1)(ITS90) ,C (ITS90)
Thermoresistance (RTD): PT-100 (IEC751)(ITS90)
⎓ Input : mV, V, mA
Measurement Range: Please refer to Table-1 for selection of input type and scala.
Accuracy: ± 0,25% of full scale for thermocouple, thermoresistance and voltage
Cold Junction Compensation: Automatically ± 0.1°C/1°C.
Line Compensation: Maximum 10 Ohm
Sensor Break Protection: Upscale
Sampling Cycle: 3 samples per second
Input Filter : 0.0 ile 900.0 seconds
CONTROL
Control Forms: Programmable ON / OFF, P, PI, PD or PID.

OUTPUT
Standard Relay Output : 5A@250V∿ (Programmable control or alarm output) (Electrical Life : 100.000 Operation (Full Load))
Output Modules
-Relay Output Module
-SSR Driver Output Module (Max.26mA , 22V⎓)
-Digital (Transistor) Output Module (Maks.40 mA@18V⎓)
-0/4...20 mA⎓ Current Output Module
Input Modules
-Digital Input Module
-0/4...20 mA⎓ Current Input Module
-0...5A∿ CT Input Module
-TC or 0...50mV⎓ Input Module
-PT-100 Input Module
-0...10V⎓ Input Module

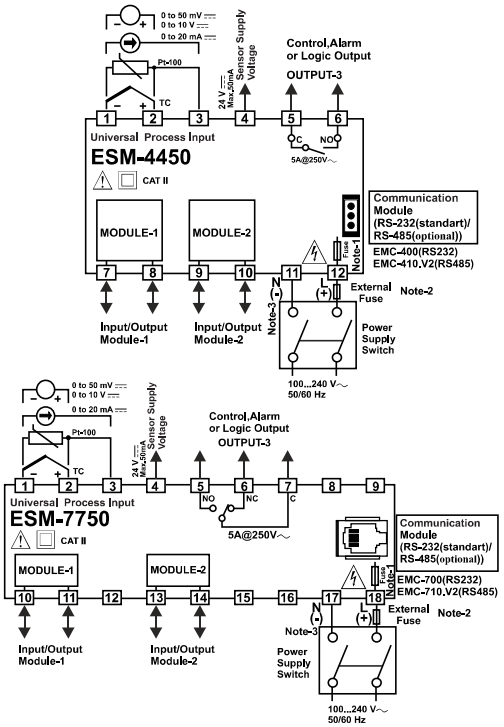
Supply Voltage
100-240V ∿ 50/60 Hz (-%15;+%10) -7VA
24V ∿ 50/60 Hz(-%15 ; +%10)-7VA or 24V ⎓ (-%15 ; +%10)-7W
(Supply Voltage must be determined in order.)

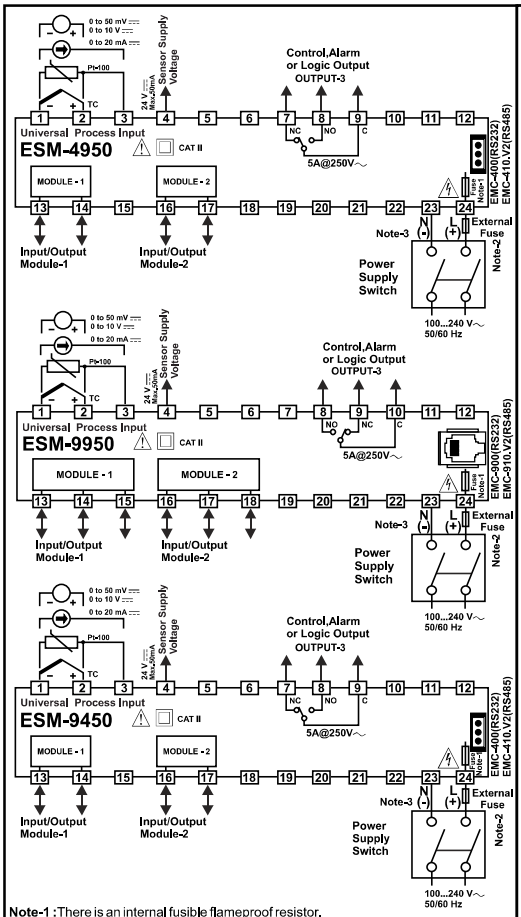
INDICATORS
Process Indicators :
ESM-4450 and ESM-9450 : 10.1 mm Red 4 digit LED Display
ESM-4950 and ESM-7750 : 13.2 mm Red 4 digit LED Display
ESM-9950 : 19 mm Red 4 digit LED Display

Setpoint Indicators :
ESM-4450, ESM-4950 and ESM-9450 : 8 mm Green 4 dijit LED Display
ESM-7750 : 9.1 mm Green 4 dijit LED Display
ESM-9950 : 10.8 mm Green 4 dijit LED Display
LED Indicators : AT(Auto Tuning), SV(Set Value), Man(Manuel Operation),Auto(Auto Operation), O1/2/3 (Output status Leds),°C,°F, V, Ramp and Remote LEDs

Environmental Ratings and Pyhsical Spesifications
Operating Temperature: 0...50°C
Max. Operating Humidity : 0-90%RH (non-condensing)
Protection Class : NEMA 4X (IP65 at front, IP20 at rear).
Mounting: Type-1 Enclosure Mounting
Installation: Fixed installation Category II
Over Voltage Category: II
Pollution Degree: II, office or workplace, none conductive pollution
Weight:
ESM-4450 : 210 gr. ; ESM-4950 : 260 gr.
ESM-7750 : 270 gr. ; ESM-9950 : 370 gr. ; ESM-9450 : 260 gr.
Dimensions / Panel Cut-Out:
ESM-4450 : (48 x 48mm, Derinlik:116 mm) / (46 x 46mm)
ESM-4950 : (96 x 48mm, Derinlik:86.5 mm) / (92 x 46mm)
ESM-7750 : (72 x 72mm, Derinlik:87.5 mm) / (69 x 69mm)
ESM-9950 : (96 x 96mm, Derinlik:87.5 mm) / (92 x 92mm)
ESM-9450 : (48 x 96mm, Derinlik:86.5 mm) / (46 x 92mm)
Minimum Distance Between Panel Cut-Out Centers:
ESM-4450 : X=65mm, Y=65mm
ESM-4950 : X=129mm, Y=65mm
ESM-7750 : X=97mm, Y=97mm
ESM-9950 : X=129mm, Y=129mm
ESM-9450 : X=65mm, Y=129mm

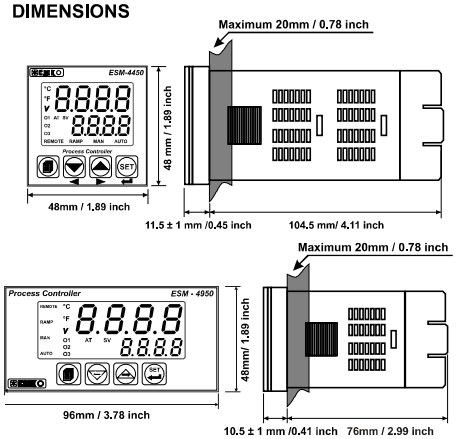
Electrical Connections

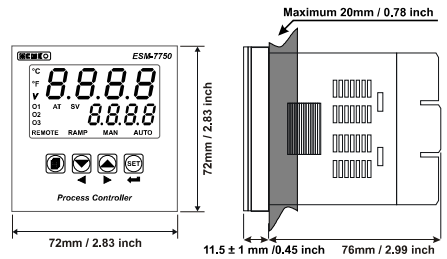


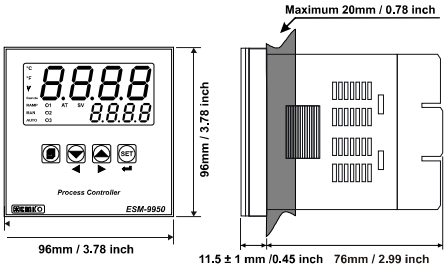


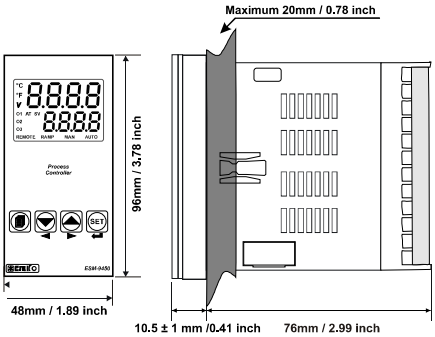
Note-1 : There is an internal fusible flameproof resistor.
Note-2 : External fuse is recommended.
1A~T for power supply 100...240 V~ or 24V~
1A⎓T for power supply 24V⎓
Note-3 : **"L"** is (+) , **"N"** is (-) for 24V⎓ supply voltage

DIMENSIONS

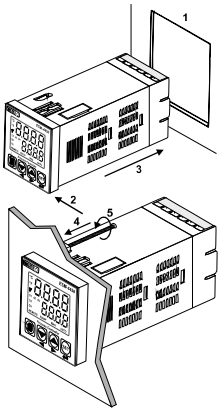








PANEL MOUNTING



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

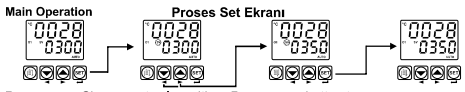
2-Check front panel gasket position

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

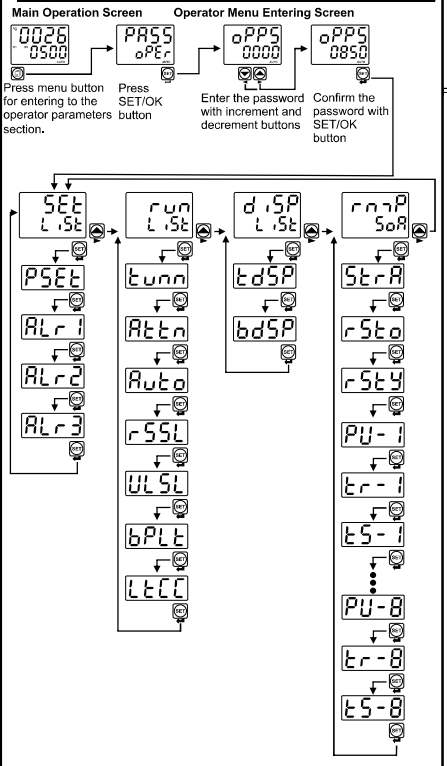
4-Insert the unit in the panel cut-out from the front side.

5-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

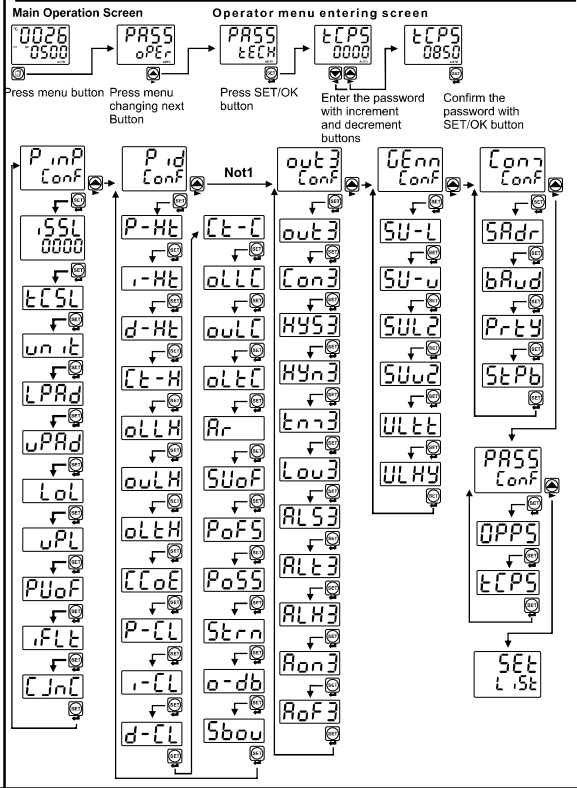
Adjustment of Process Set Value



Easy Access Diagram for Operator Parameters



Easy Access Diagram for Technician Parameters



Set LiSt: Set values

- PSEt **Proses Set (-1999,9999)Unit**
- ALr1 **Alarm-1 Set (-1999,9999)Unit**
- ALr2 **Alarm-2 Set (-1999,9999)Unit**
- ALr3 **Alarm-3 Set (-1999,9999)Unit**

Run LiSt: Selection of PID Tune and Operation Form

- tunn **TUNE SELECTION**By selecting one of the methods below, device can determine the PID parameters.
  - no Device operates according to the defined PID
  - Atun **Auto tune** (Limit Cycle Tuning) operation
  - Stun **Self tune** (Step Response Tuning) operation
  - ASEt **Auto-Self Tune** Self Tune operation is performed, if the conditions are realized when power on firstly. In normal operation, it controls the tune conditions in **Auto Tune** selection which explained below. If any of the conditions is realized, it performs the **Auto Tune** operation
- ATtn **AUTOMATIC TUNE SELECTION**
  - no Device does not do (Limit Cycle Tuning) operation
  - YES Device does (Limit Cycle Tuning) operation
- Auto **OPERATION FORM SELECTION**
  - Auto Automatic:The device automatically calculates the %output
  - MAn Manual: %cutput rate can be controlled manually by using direction buttons.
- rSSL **Ramp/Soak Control**
  - oFF Ramp/Soak function is deactivated
  - run Ramp/Soak function is active
  - Hold Ramp/Soak function is holding. Real time is stopped
- ULSL **MOTORIZED VALVE CONTROL**
  - no Motorized valve control is deactive
  - HEAt Motorized valve runs with heating PID function.
  - CooL Motorized valve runs with cooling PID function.
- bPLt **BUMPLESS TRANSFER**
  - no Process output value in manual control is not taken into consideration while passing from manual control to automatic control. New control output that is measured in automatic control is applied to process output. Last %output value is taken output value of manual control and manual control continues while passing from automatic control to manual control

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

ALARM LATCH CANCELING

no Alarm latch canceling is not performed.

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

dISP LiSt: Function Selection for Top and Bottom Display

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 analogue input modules is plugged in Module-1 or Module-2 socket, measured value from this module input is shown in top display.

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

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 analogue 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-420) is plugged in Module-1 or Module-2 socket, measured value from this module input is shown in bottom display.

rmP SoA: 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.

Ramp Soak Tolerance Parameter (%0;%50 Scale)
In Ramp/Soak operation,if process value is out of the tolerance that is defined with this parameter,then time is stopped.

Ramp/Soak program step selection parameter.

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 time for Ramp/Soak
Process value reaches to step set values at the end of the time that are defined in these parameters.

Soak time for Ramp/Soak Process value is constant in step set value for time that are defined in these parameters.

PInP ConF: Process Input Type and Relevant Parameters with Process Input

Defines the process input

0000 TC input type selection

0001 RTDinput type selection

0002 ⎓Voltage/Current input type selection.

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

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°C;1700°C) or (32°F;3092°F)
0007 R (0.0°C;999.9°C) or (32.0°F;999.9°F)
0008 S (0°C;1700°C) or (32°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)
0013 B (44.0°C;999.9°C) or (111.0°F ; 999.9°F)
0014 E (-150°C;700°C) or (-238°F;1292°F)
0015 E (-150.0°C;700.0°C) or (-199.9°F;999.9°F)
0016 N (-200°C;1300°C) or (-328°F;2372°F)
0017 N (-199.9°C;999.9°C) or (-199.9°F;999.9°F)
0018 C (0°C;2300°C) or (32°F;3261°F)
0019 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

0000 PT-100 (-200°C ; 650°C) or (-328°F ; 1202°F)
0001 PT-100 (-199.9°C ; 650.0°C) or (-199.9°F ;999.9°F)

⎓ Voltage / Current Input Selection
This parameter 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)

Display Point Position
This parameter is active if ⎓Voltage / Current is selected.

0000 No point
0001 Between first and second digits “0.0”
0002 Between second and third digits “0.00”
0003 Between third and fourth digits “0.000”

Display Value Adjustment Type

0000 Fixed dual point display adjustment. Display adjustment low point value is fixed to -1999, display adjustment high point value is fixed to 9999.

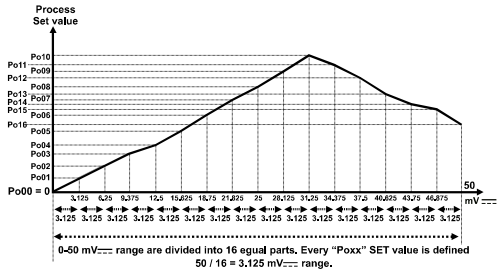
0001 User can do dual point display adjustment with tPoL and tPoH.

0002 User can do defined 16 display adjustment points.

Low Point Display adjustment (-1999, 9999)Unit
Active if ⎓Voltage / Current input is selected.

High Point Display adjustment (-1999, 9999)Unit
Active if ⎓Voltage / Current input is selected.

Display adjustment points (-1999, 9999)Unit
This parameter is active if ⎓Voltage / Current is selected.
In multi point display adjustment operation, defined scale is divided into 16 adjustment points.
For example : uASL is 0 (0-50 mV⎓) .



CoEF **Coefficient value (1.000, 9.999)**
Process value is multiplied with this value.
Active if ⎓Voltage / Current input is selected.

unit **Unit selection**

- °C Unit°C
- °F Unit °F
- U Unit is Voltage. Active if ⎓Voltage / Current input is selected
- - No unit. Active if ⎓Voltage / current input is selected

LPAd **Process Value Low Point Adjustment Parameter (For TC and RTD input scales)**
It can be adjusted -50% to 50% of scale.

uPAd **Process Value Up Point Adjustment Parameter (For TC and RTD input scales)**
It can be adjusted -50% to 50% of scale.

LoL **Operating Scale Minimum Value (Scale Low Point, Scale High Point)Unit**
Used for Proportional band calculation and display blink.

uPL **Operating Scale Maximum Value (Scale Low Point, Scale High Point)Unit**
Used for Proportional band calculation and display blink.

PUoF **Display offset for process value (Scale -10%, Scale +10%)Unit** This parameter value is added to the process value.

FiLt **Filter Time (0.0, 900.0)Second**
Defines filter time for display value.

CJnC **Cold Junction Compensation**
This parameter is active if process input is selected TC input.

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

Scale: The difference, between high point and low point of the process input type. Example: If tCSL = 2 (low point is -200, high point is 900), then scale is 1100. If input type is Voltage/Current, then the scale is difference between tPoH and tPoL parameters.

Pid ConF: PID Configuration Parameters

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

I-Ht **INTEGRAL TIME (0, 3600)Second**
Can be changed by the user. After complated the tunning correctly, integral time value changes automatically. If it is 0, integral control is deactivated.

d-Ht **DERIVATIVE TIME (0.0, 999.9)Second**
Can be changed by the user. After complated the tunning correctly, integral time value changes automatically. If it is 0, derivative control is deactivated.

Ct-H **CONTROL PERIOD TIME (1, 150)Second**
Process output period time

oLLH **MINIMUM CONTROL OUTPUT (0.0, oULH)%**
Even as a result of the PID calculation device calculates the %output value less than this parameter, heating or cooling output is active minimum for OLL parameter.

oULH **MAXIMUM CONTROL OUTPUT (oLLH , 100.0)%**
Even as a result of the PID calculation device calculates the % output value greater than this parameter, heating or cooling output is active maximum for OUL parameter.

oLtH **HEATING MINIMUM CONTROL OUTPUT TIME(0.0,Ct-H)sec**
Heating output can not be active less than this parameter. Even if this parameter is 0, this parameter is accepted 50 msecs for security.

CCoE **COOLING PROPORTIONAL BAND COEFFICIENT (0.0, 100.0)**
If heating and cooling PID is used in a system, tune operation is performed by heating output.Cooling proportional parameter is calculated with heating proportional band value and coefficient(P-CL = P-Ht * CCoE / 100.0)

P-CL **COOLING PROPORTIONAL BAND (000.0% , 999.9%)**
If uPL = 1000 °C, LoL = 0 °C and P-CL = 50.0 ise
Proportional Band = (uPL - LoL)* P-CL / 100.0
Proportional Band = (1000-0)*50.0/100.0 = 500 °C

I-CL **COOLINGINTEGRALTIME (0000 sec, 3600 secs)**
It can be changed by the user. When tune operation finishes, it can be changed by the device. If it is 0, integral control part does not perform.

d-CL **COOLINGDERIVATIVE TIME (000.0 sec, 999.9 secs)**
It can be changed by the user. When tune operation finishes, it can be changed by the device. If it is 0, derivative control part does not perform. When tune operation finishes if this parameter is 0, it can not be changed because derivative control part does not perform.

Ct-C **COOLING OUTPUT PERIOD TIME (1 sec, 150 secs)**
It is control period of cooling output.

oLLC **COOLING MINIMUM CONTROL OUTPUT(0.0oULC)%**
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 minimumor OLLC parameter.

oULC **COOLING MAXIMUM CONTROL OUTPUT (oLLC ,100.0)%**
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 forOULCparameter.

oLtC **COOLING MINIMUM CONTROL OUTPUT (0.0% ,Ct-C)**
Cooling output can not be active less than this parameter. Even if this parameter is 0, this parameter is accepted 50 msecs for security.

Ar **ANTI-RESET WINDUP (otAr,0-SCALE HIGH POINT)UNIT**
While PID operation is running if
PSEt - Ar <= process value <= PSEt + Ar
condition is true, integral value is calculated. If the condition is not true, integral value is not calculated and last calculated integral value is used. If Ar Parameter is selected otAr, 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.

SUoF **SETVALUEOFFSET**
((- SCALE HIGH POINT / 2) , (SCALE HIGH POINT / 2))Unit
PSEt +SUoF is used as set value in PID calculations. This parameter is used for shifting the proportional band.

PoFS **PID OUTPUT OFFSET**
(FOR HEATING PID 0.0, 100.0)%
(FOR COOLING PID -100.0, 0.0)%
(FOR HEATING&COOLIND PID : -100.0, 100.0)%
This parameter is added to "Output %" which is calculated at the end of the PID.

PoSS **OUTPUT OFFSET RELATED TO PID SET**
(FOR HEATING PID 0.0, 100.0)%
(FOR COOLING PID -100.0, 0.0)%
(FOR HEATING&COOLIND 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
PoSS * PSEt /(uPL- LoL)

Strn **PROCESS VALUE STABILIZATION (1, SCALE HIGH POINT)Unit**

It is used for controlling if process value oscillates or not when **tunn** Parameter is **AtUn** or **AtSt** If; **PSEt - Strn <= Process Value <= PSEt + Strn** condition is not true, then device start tunn operation

SCALE LOW POINT : Minimum process input value in Pt-100 and Tc inputs. -1999 for fixed dual point display adjustment used inputs, Scale low point is the lowest one from **tPoL** or **tPoH** for selectable dual point display adjustment used inputs Scale low point is the lowest one from **Po00** or **Po15** for multi point display adjustment used inputs

SCALE HIGH POINT : Maximum process input value in Pt-100 and Tc inputs. 9999 for fixed dual point display adjustment used inputs, Scale high point is the biggest one from **tPoL** or **tPoH** for selectable dual point display adjustment used inputs Scale high point is the biggest one from **Po00** or **Po15** for multi point display adjustment used inputs

o-db **PROPORTIONAL BAND SHIFTING ((-SCALE HIGH POINT / 2) , (SCALE HIGH POINT / 2))Unit**

If cooling function is performed ;
Cooling process set value is calculated by adding set value **PSEt** With parameter **o-db**
Control form can be ON/OFF or PID.

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

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

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

ioP1 ConF: MODULE-1 Configuration Parameters

ⓘ **These parameters are active if EMO-400 (Relay Output) , EMO-410 (SSR Driver) or EMO-420 (Digital Output) module is plugged in Module-1 socket.**

out 1 **Defines output function for Module-1**

- **HEAt** Heating
- **Cool** Cooling
- **Lout** Logic output

Fon 1 It is active if output function of Module-1 is heating or

- **onoF** ON/OFF
- **Pid** PID

HYS 1 **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 1 **It determines operation form of hysteresis.** (ON/OFF)

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

tm 1 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.

Lou 1 **Logic output function of output module in Module-1**
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 **uPL** And maximum value of operating scale **LoL**
- **0004** Output indicates that Ramp/Soak function has finished
- **0005** Sensor break alarm output for analogue input module in Module-2 socket. (It is visible if one of analogue input modules is plugged in Module-2 socket)
- **0006** If process value is less than minimum value of operating Scale for analogue input module in Module-2 socket or greater than maximum value of operating scale for analogue input module in Module-2 socket, process output becomes active.(This parameter is visible if one of the analogue input modules is plugged in Module-2 socket).

AL S 1 **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 analogue input modules is plugged in Module-2 socket

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

AL t 1 **MODULE-1 alarm**

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
- **0003** Deviation low alarm
- **0004** Deviation band alarm.
- **0005** Deviation range alarm
- **0006** Heater failure alarm. It is active if~ CT input module is plugged in Module-2 socket.

AL H 1 **MODULE-1 Alarm-1 hysteresis value.**

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

Aon 1 **Alarm on delay time (0, 9999)Seconds**
It is active if logic output function of Module-1 is an alarm output

AoF 1 **Alarm off delay time (0, 9998)Seconds**
Alarm off delay time. It can be adjusted from 0000 to 9998 seconds.When the value is greater than 9998 **LtCH** , is seen on the display. It means alarm latching output is selected.

ioP1 ConF: MODULE-1 Configuration Parameters

ⓘ **These parameters are active if EMO-x30 (0/4...20 mA ⎓ Akım Çıkış) mmodule is plugged in Module-1 socket.**

oAt 1 **Configuration of analogue output module in odule-1**

- **0000** 0...20mA⎓ output is selected
- **0001** 4...20mA⎓ output is selected

ouA 1 **Function selection of analogue output module in Module-1 socket.**

- **HEAt** Heating
- **Cool** Cooling.
- **rEtr** Re-transmission

rEt 1 **MODÜL-1 re-transmission function**
(It is active if *"re-transmission"* function is selected for analogue output module in Module-1 socket

- **rtPr** It retransmits Process value to analogue output.
- **rtEr** difference of the process value and the set value
- **rtPU** It retransmits Set value to analogue output.

ioP1 ConF: MODULE-1 Configuration Parameters

ⓘ These parameters are active if EMI-400 (Digital Input) plugged in Module-1 socket.

L in 1 **Configuration of digital input in Module-1 socket.**

- **0000** Manual /Automatic selection input
- **0001** **Auto Tune (Limit Cycle Tuning)** Start/Stop input.
- **0002** Ramp&Soak Start/Stop input.
- **0003** Ramp&Soak Start/Hold input.
- **0004** Alarm Latch Canceling.
- **0005** Process Output Control Enable/Disable Selection.

ⓘ Process Output Control Selection(5) only works if AUTO mode is active. If Manual mode is active, the output is turned off but it can be changed manually again.

ⓘ If Digital Input plugged in Module-1 and Module-2 socket, do not select same function for two modules.

oP1 ConF:MODULE-1 Configuration Parameters

These parameters are active if EMI-410 (0/4...20mA ⎓current Input) , EMI-430 (TC or 0...50mV⎓ Input), EMI-X40 (PT-100 Input) or EMI-450 (0...10V⎓ Input) module is plugged in Module-1

iSL1 Configuration of analogue input module in Module-1 socket.

- **0000** TC input type selection. This must be selected if analogue input module in Module-1 socket is EMI-430.
- **0001** PT-100 input type selection. This must be selected, if analogue input module in Module-1 socket is EMI-440.
- **0002** ⎓ Voltage / Current input type selection. This must be selected if analogue input module in Module-1 socket is EMI-410 , EMI-430 or EMI - 450.

tCSL **MODULE-1** TC input module in Module-1 sensor type selection It is active if input type of Module-1 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°C;1700°C) or (32°F;3092°F)
- **0007** R (0.0°C;999.9°C) or (32.0°F;999.9°F)
- **0008** S (0°C;1700°C) or (32°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)
- **0013** B (44.0°C;999.9°C) or (111.0°F ; 999.9°F)
- **0014** E (-150°C;700°C) or (-238°F;1292°F)
- **0015** E (-150.0°C;700.0°C) or (-199.9°F;999.9°F)
- **0016** N (-200°C;1300°C) or (-328°F;2372°F)
- **0017** N (-199.9°C;999.9°C) or (-199.9°F;999.9°F)
- **0018** C (0°C;2300°C) or (32°F;3261°F)
- **0019** C (0.0°C;999.9°C) or (32.0°F;999.9°F)

rtS1 **MODULE-1 PT-100** input module in Module-1 sensor type selection It is active if input type of Module-1 is selected PT-100

- **0000** PT-100 (-200°C ; 650°C) or (-328°F ; 1202°F)
- **0001** PT-100 (-199.9°C ; 650.0°C) or (-199.9°F ;999.9°F)

uAS1 **MODÜL-1 ⎓Voltage/Current Input Module Selection** It is active if input type of Module-1 is selected ⎓Voltage/Current

- **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)

dPn1 **point position for display** .It is active if input type of Module-1 is selected ⎓Voltage /Current.

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

iCA1 **Calibration type** .It is active if input type of Module-1 is selected ⎓Voltage /Current.

- **0000** Fixed dual point calibration is performed. Minimum value of calibration is -1999 and maximum value of calibration is 9999.
- **0001** Selectable dual point calibration is performed.

iCL1 Defines minimum value for selectable dual point calibration. .It is active if input type of Module-1 is selected ⎓Voltage /Current.

iCH1 Defines maximum value for selectable dual point calibration. .It is active if input type of Module-1 is selected ⎓Voltage /Current.

unt1 Unit selection

- **°C** Unit is °C
- **°F** Unit is °F
- **U** Unit is U.
- **-** No unit.

LoL1 Minimum value of operating scale (Low Limit). It can be changed according to analogue input type and scale.

uPL1 Maximum value of operating scale (High Limit). It can be changed according to analogue input type and scale

iPu1 Display offset for value in analogue input module. It can be adjusted from -10% to +10% of scale. This value is added to the process value.

iFL1 It is filter time for input signal. It can be adjusted from 0.0 to 900.0

CJn1 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.

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

rES1 It determines if the measured value from analogue 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 analogue input module.

- **YES** Measured value from analogue input module in Module-1 socket is used as process set value. User defined process set value is not considered
- **no** Measured value from analogue input module in Module-1 socket is not used as process set value. User defined process set value is considered

oP1 ConF: MODULE-1 Configuration Parameters

These parameters are active if EMI-420(∼ CT) Input Module is plugged in Module-1 socket.

Ctr1 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 Ctr1= 100/5 = 20

oP2 ConF: MODULE-2 Configuration Parameters

All the functions that apply for module-1, module-2 applies to.

out3 ConF: Output-3 Configuration Parameters

out3 **Defines output function for Output-3**

- **HEAt** Heating
- **CooL** Cooling
- **Lout** Logic output

Con3 **Defines control algorithm of Output-3.** It is active if output function of Output-3 is heating or cooling

- **onoF** ON/OFF control algorithm
- **Pid** PID control algorithm

HYS3 **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)

HYn3 **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

tn73 In ON/OFF operation, this time must be passed for the output to be energised again. (It is active if ON/OFF control is selected)

Lou3 **It determines logic output function of Output-3.**
It is active if output function of Output-3 is Lout(Logicoutput)

- 0000 Alarm output
- 0001 Manual /Automatic data output
- 0002 Sensor break alarm output
- 0003 POutput is active when the process value is out of the band which is defined with minimum value of operating scale LoL And maximum value of operating scale uPL
- 0004 Output indicates that Ramp/Soak function has finished
- 0005 Sensor break alarm output for analogue input module in Module-1or Module-2 socket. (It is visible if one of analogue input modules is plugged in Module-1 or Module-2 socket)
- 0006 If process value is less than minimum value of operating scale or for analogue input module in Module-1 or Module-2 socket or greater than maximum value of operating scale or for analogue input module in Module-1 or Module-2 socket, process output becomes active.(This parameter is visible if one of the analogue input modules is plugged in Module-1 or Module-2 socket)

AL53 **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 analogue input modules is plugged in Module-1 or Module-2 socket

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

ALt3 **It determines alarm**

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

- 0000 Process high alarm
- 0001 Process low alarm
- 0002 Deviation high alarm.
- 0003 Deviation low alarm.
- 0004 Deviation band alarm.
- 0005 Deviation range alarm
- 0006 Isıtıcı Arızası Alarmı. It is active if ⁓CT input module is plugged in Module-1 or Module-2 socket.

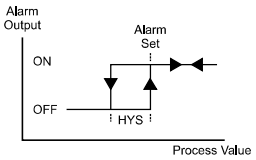
ALH3 **Alarm- 3 hysteresis value. (Scale 0% , scale 50%)Unit**
It is active if logic output function of Output-3

Aon3 **Alarm on delay time(0, 9999)Seconds**
It is active if logic output function of Module-1 is alarm output.

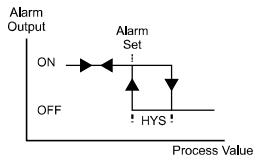
AoF3 **Alarm off delay time (0, 9998)Seconds**
When the value is than 9998, LtCH is seen on the display. It means alarm latching output is selected. It is active if logic output function of Output-3 is alarm output.

Alarm Types

Process high alarm

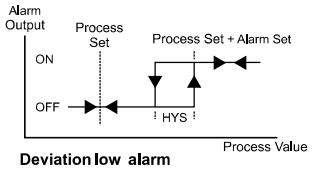


Process low alarm

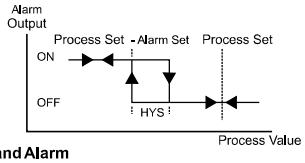


Alarm Types

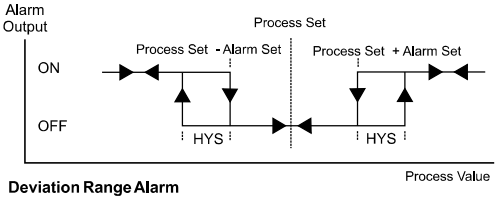
Deviation high alarm



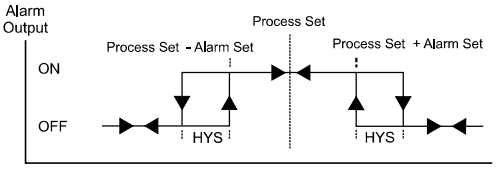
Deviation low alarm



Deviation Band Alarm



Deviation Range Alarm



Gen ConF: General Parameters

SU-L Minimum value for process set and alarm set values

SU-U Maximum value for process set and alarm set values

SUL2 **2. Sensor Set Point Low Limit** .sensor scale min. SUU2)
2. Sensor Unit
Module-1 or Module-2 socket Analog Input Modules.
(If you have any of these parameters is observed)

SUU2 **2. Sensor Set Point High Limit** .sensor scale min. SUL2)
2. Sensor Unit
Module-1 or Module-2 socket Analog Input Modules.
(If you have any of these parameters is observed)

ULtt **While the motor is completely off the valve fully open**
While the fully open or fully closed for the pass time required. Value between 5 and 600 seconds can be entered.
(If motorized valve control is selected this parameter is active)

ULHY **The minimum duration of the valve motor drive output (0,1, 5,0)%**
Ultt = 100 sec and ULHY = %1.0 and the motor driving the valve outlet. The minimum time to be active in 100 * 1.0%=1 sec.
(If motorized valve control is selected this parameter is active)

Com ConF: Parameters for Configuration of Serial Communication

SAdr **Communication Accessing Address (1,247)**
Communication accessing address of device. It can be adjusted from 1 to 247.

bAud **Communication Baud Rate**

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

PrtY Parity Selection for Communication

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

StPb Stop Bit Selection for Communication

0000 1 stop bit
0001 2 stop bit

PASS ConF: Operator and Technician Passwords

oPPS Operator Passwords (0, 9999)

It is used for accessing to the operator parameters.
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 0000 and 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

tCPS Technician Passwords(0, 9999)

It is used for accessing to the technician parameters.
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 tCPS password correctly :It turns to operation screen without accessing to parameters.:
When tCPS in top display 0000 and in bottom display are seen, if user presses SET button without entering tCPS Password (For observing the parameters):
Operator can see operator menus and parameters but operator can not change the parameters.

Failure Messages in ESM-XX50 Process Controllers



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



2- If parameter in "Disp List" menu is and analogue input module is plugged in Module-1 or Module-2 socket, this is sensor failure of analogue input module. Sensor connection is wrong or there is no sensor connection.



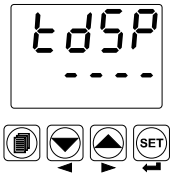
3-If parameter is and parameter is and analogue input module is plugged in Module-1 or Module-2 socket, this is sensor failure of analogue input module. Sensor connection is wrong or there is no sensor connection.



4- If top display blinks : If analogue input value is less than minimum value of operating scale LoL top display starts to blink.



5- If top display blinks : If analogue input value is greater than maximum value of operating scale uPL top display starts to blink.



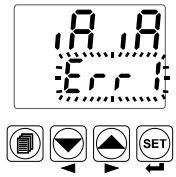
6- If operator or technician password is different from "0" and user accesses to the parameter by Set button without entering the operator or technician password and wants to change a parameter, the warning message is shown on the bottom display as shown on the left. Device does not allow to do any changes without entering the password correctly.



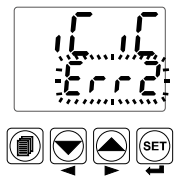
7- If tuning operation can not be completed in 8 hours, AT led starts to blink.Blinking can be canceled by pressing Enter button.



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



9- The device is powered up, the normal does not begin to run, and the bottom of the screen As the side flashing;
Module-1 and Module-2 slots, EMIX10 EMI-X30, X40-EMI, EMI-X50 Analog input modules installed at the same time the event occurs. The unit normal to return to work, the device energy cut-off and Analog Input one of the modules must be removed.



10- When power is on ; not starting the normal operation and blinking the bottom display as shown on the left; It appears when two analogue input modules (EMI-410, EMI-430,EMI-440, EMI-450) 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 analogue input modules.

Installation

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

In package ,
- One piece unit
- Twopiece mounting clamp
- One piece instruction manual

A visual inspection of this product for possible damage occured during shipment is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product.
If there is danger of serious accident resulting from a failure or defect in this unit, power off the system and seperate the electrical connection of the device from the system.
The unit is normally supplied without a power switch or a fuse. Use power switch and fuse as required.
Be sure to use the rated power supply voltage to protect the unit against damage and to prevent failure.
Keep the power off until all of the wiring is completed so that electric shock and trouble with the unit can be prevented.
Never attempt to disassemble, modify or repair this unit. Tampering with the unit may results in malfunction, electric shock or fire.
Do not use the unit in combustible or explosive gaseous atmospheres.
During the equipment is putted in hole on the metal panel while mechanical installation some metal burrs can cause injury on hands, you must be careful.
Montage of the product on a system must be done with it's 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.
It is your responsibility if this equipment is used in a manner not specified in this instruction manual.

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.

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.

Other Informations

Manufacturer Information:
Emko Elektronik Sanayi ve Ticaret A.Ş.
Bursa Organize Sanayi Bölgesi, (Fethiye OSB Mah.)
Turkuaz Cd. No:15 16215 BURSA/TÜRKİYE
Phone : +90 224 261 1900
Fax : +90 224 261 1912

Repair and maintenance service information:
Emko Elektronik Sanayi ve Ticaret A.Ş.
Bursa Organize Sanayi Bölgesi, (Fethiye OSB Mah.)
Turkuaz Cd. No:15 16215 BURSA/TÜRKİYE
Phone : +90 224 261 1900
Fax : +90 224 261 1912

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

Ordering Information

ESM-4450 (48x48 DIN 1/16)
ESM-4950 (96x48 DIN 1/8)
ESM-7750 (72x72 DIN Sizes)
ESM-9950 (96x96 DIN 1/4)
ESM-9450 (48x96 DIN 1/8)

A	BC	D	E	/	FG	HI	/	U	V	W	Z
			1	/			/				

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

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

D	Serial Communication	Product Code
0	None	-
1	RS-232	EMC-X00
2	RS-485	EMC-X10

E	Output-3 (Alarm)
1	Relay Output (5A@250V~at Resistive Load)

FG	Module-1	Product Code
00	None	-
01	Relay Output Module	EMO-X00
02	SSR Driver Output Module	EMO-X10
03	Digital (Transistor) Output Module	EMO-X20
04	Current Output Module (0/4 ...20 mA ⎓)	EMO-X30
07	Digital Input Module	EMI-X00
08	0/4...20 mA ⎓ Current Input Module	EMI-X10
09	0...5A ~ CT Input Module	EMI-X20
10	TC veya 0...50mV ⎓ Input Module	EMI-X30
11	PT-100 Input Module	EMI-X40
12	0...10 V ⎓ Input Module	EMI-X50

HI	Module-2	Product Code
00	None	-
01	Relay Output Module	EMO-X00
02	SSR Driver Output Module	EMO-X10
03	Digital (Transistor) Output Module	EMO-X20
04	Current Output Module (0/4 ...20 mA ⎓)	EMO-X30
07	Digital Input Module	EMI-X00
08	0/4...20 mA ⎓ Current Input Module	EMI-X10
09	0...5A ~ CT Input Module	EMI-X20
10	TC veya 0...50mV ⎓ Input Module	EMI-X30
11	PT-100 Input Module	EMI-X40
12	0...10 V ⎓ Input Module	EMI-X50

Table-1

BC	Input Type(TC)	Scale(°C)	Scale(°F)
21	L ,Fe Const DIN43710	-100°C,850°C	-148°F ,1562°F
22	L ,Fe Const DIN43710	-100.0°C,850.0°C	-148.0°F,999.9°F
23	J ,Fe CuNi IEC584.1(ITS90)	-200°C,900°C	-328°F,1652°F
24	J ,Fe CuNi IEC584.1(ITS90)	-199.9°C,900.0°C	-199.9°F,999.9°F
25	K ,NiCr Ni IEC584.1(ITS90)	-200°C,1300°C	-328°F,2372°F
26	K ,NiCr Ni IEC584.1(ITS90)	-199.9°C,999.9°C	-199.9°F,999.9°F
27	R ,Pt13%Rh Pt IEC584.1(ITS90)	0°C,1700°C	32°F,3092°F
28	S ,Pt10%Rh Pt IEC584.1(ITS90)	0°C,1700°C	32°F,3092°F
29	T ,Cu CuNi IEC584.1(ITS90)	-200°C,400°C	-328°F,752°F
30	T ,Cu CuNi IEC584.1(ITS90)	-199.9°C,400.0°C	-199.9°F,752.0°F
31	B ,Pt30%Rh Pt6%Rh IEC584.1(ITS90)	44°C,1800°C	111°F,3272°F
32	B ,Pt30%Rh Pt6%Rh IEC584.1(ITS90)	44.0°C,999.9°C	111.0°F,999.9°F
33	E ,NiCr CuNi IEC584.1(ITS90)	-150°C,700°C	-238°F,1292°F
34	E ,NiCr CuNi IEC584.1(ITS90)	-150.0°C,700.0°C	-199.9°F,999.9°F
35	N ,Nicrosil Nisil IEC584.1(ITS90)	-200°C,1300°C	-328°F,2372°F
36	N ,Nicrosil Nisil IEC584.1(ITS90)	-199.9°C,999.9°C	-199.9°F,999.9°F
37	C , (ITS90)	0°C,2300°C	32°F,3261°F
38	C , (ITS90)	0,0°C,999,9°C	32,0°F,999,9°F

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

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

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