



BURNER CONTROL UNITS



MOTORIZED VALVE CONTROL

- Universal Input PID Burner Controller with
- 4 digits process (PV) ve 4 digits process set (SV) display
- Universal process input (TC, RTD, mV, V, mA)
- Configurable P, PI, PD and PID control forms
- Auto-tune
- Motorized valve control function
- 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 and E Thermoresistance (RTD): PT-100 (IEC751)(ITS90)

Input: mV, V, mA

Measurement Range: Please refer to Table-1 for selection of input type and scale.

Accuracy: $\pm 0.25\%$ of full scale for thermocouple, thermoresistance and voltage

Cold Junction Compensation: Automatically $\pm 0.1^\circ\text{C}/1^\circ\text{C}$.

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 P, PI, PD or PID.

OUTPUT

Standard Relay Output : 5A@250V~ (Motorized Valve Closing Side Out) (Electrical Life : 100.000 Operation (Full Load))

Output Modules

-Module 1: Motorized Valve Opening Side Out (Relay Output) (Relay Output)

EMO400 = 3A@250V~ (at Resistive Load)

EMO700 and EMO900 = 5A@250V~ (at Resistive Load)

Supply Voltage

100-240V ~ 50/60 Hz (-%15;+%10) -6VA

24V ~ 50/60 Hz(-%15; +%10)-6VA or 24V = (-%15; +%10)-6W (Supply Voltage must be determined in order.)

INDICATORS

Process Indicators :

ESM-4453 and ESM-9453 : 10.1 mm Red 4 digit LED Display

ESM-4953 and ESM-7753 : 13.2 mm Red 4 digit LED Display

ESM-9953 : 19 mm Red 4 digit LED Display

Setpoint Indicators :

ESM-4453, ESM-4953 and ESM-9453 : 8 mm Green 4 digit LED Display

ESM-7753 : 9.1 mm Green 4 digit LED Display

ESM-9953 : 10.8 mm Green 4 digit LED Display

LED Indicators : AT(Auto Tuning), SV(Set Value), Man(Manual Operation),Auto(Auto Operation), \blacktriangle (Motorized Valve Opening Led), \bullet (Burner Led), \blacktriangledown (Motorized Valve Closing Led), $^\circ\text{C}$, $^\circ\text{F}$, V

Environmental Ratings and Physical Specifications

Operating Temperature: 0...50°C

Max. Operating Humidity : 0-90%RH (non-condensing)

Protection Class : NEMA 4X (IP65 at front, IP20 at rear).

Weight:

ESM-4453 : 210 gr.

ESM-4953 : 260 gr.

ESM-7753 : 270 gr.

ESM-9453 : 260 gr.

ESM-9953 : 370 gr.

Dimensions:

ESM-4453 : (48 x 48mm, Depth :116 mm)

ESM-4953 : (96 x 48mm, Depth :86.5 mm)

ESM-7753 : (72 x 72mm, Depth :87.5 mm)

ESM-9953 : (96 x 96mm, Depth :87.5 mm)

ESM-9453 : (48 x 96mm, Depth :86.5 mm)

Panel Cut-Out

ESM-4453 : (46 x 46mm)

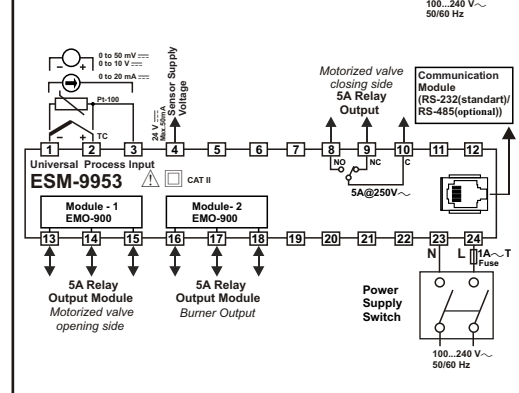
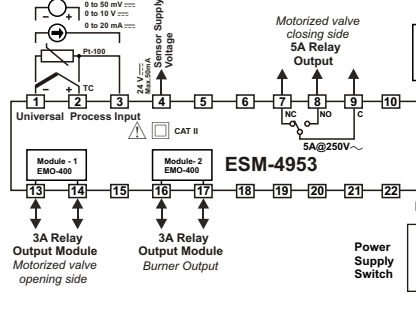
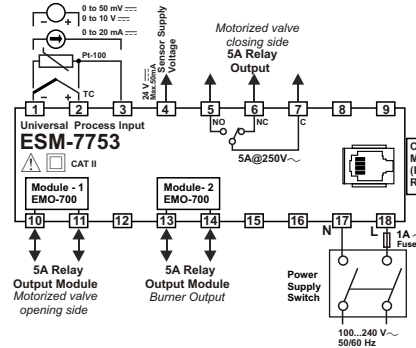
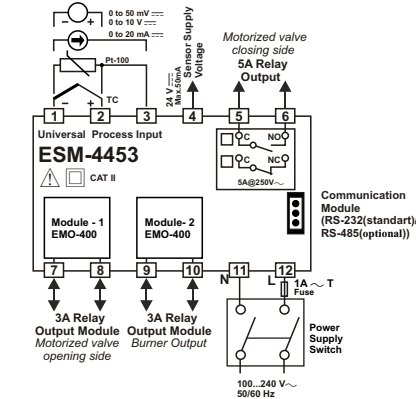
ESM-4953 : (92 x 46mm)

ESM-7753 : (69 x 69mm)

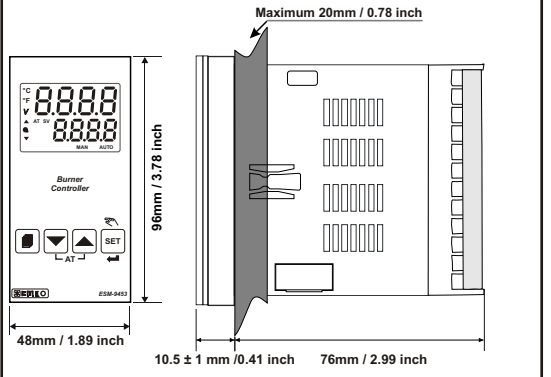
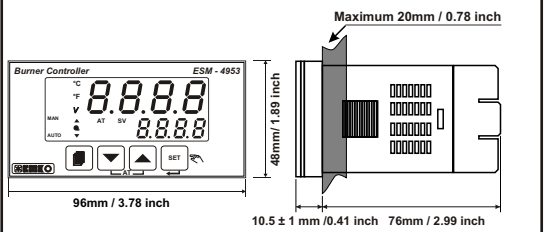
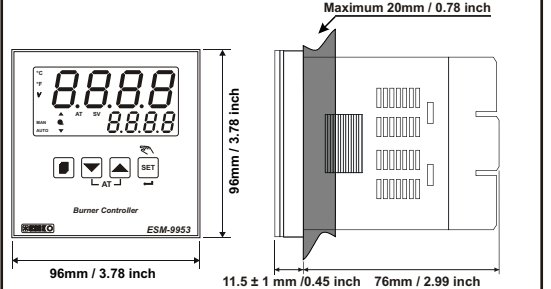
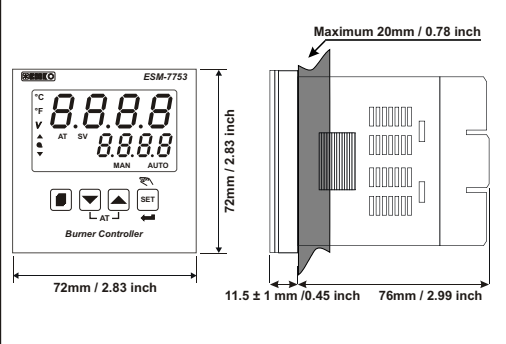
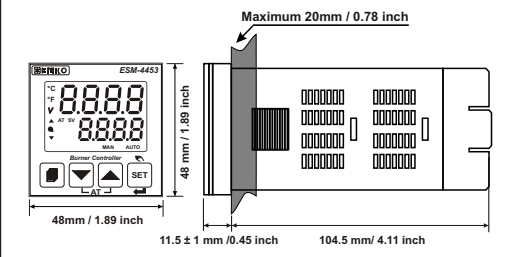
ESM-9953 : (92 x 92mm)

ESM-9453 : (46 x 92mm)

ELECTRICAL CONNECTIONS



DIMENSIONS

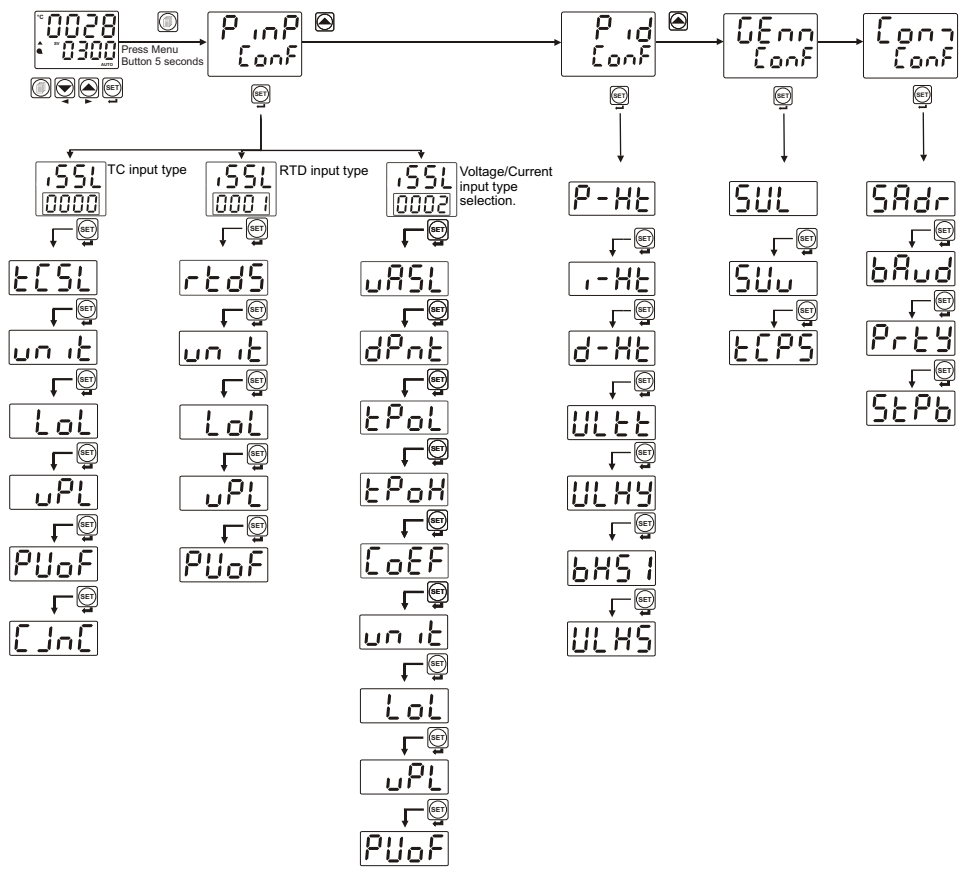


PANEL MOUNTING

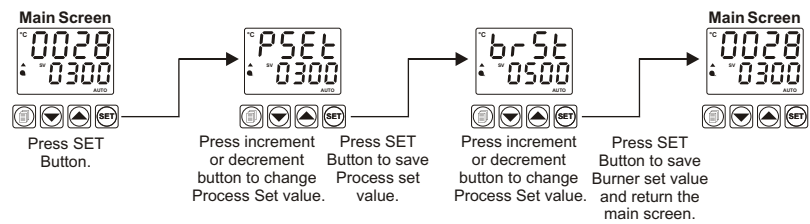
- 1-Before mounting the device in your panel, make sure that the cut-out is of the right size.
- 2-Check front panel gasket position
- 3-Insert the device through the cut-out. If the mounting clamps are on the unit, put out them before inserting the unit to the panel.
- 4-Insert the unit in the panel 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.

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.

ACCESS PARAMETER MENU



ACCESS AND CHANGE SET VALUES



Pset value is constant working set value. brSt is Burner set value. The way of work can depends on bHS1 parameters values which are under PID CONF menu.
Modbus Address=40001 : Process Set Value
Modbus Address=40002 : Burner Set Value

- tCSL** Defines the process input type (Modbus Address=40003)
 - 0000 TC input type selection
 - 0001 RTD input type selection
 - 0002 ---Voltage/Current input type selection.
- tCSL** Defines type and scale of the thermocouple for TC input. It is active if TC input type is selected. (Modbus Address=40004)
 - 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)
- rtdS** Defines type and scale of sensor for RTD input. It is active if RTD input. (Modbus Address=40005)
 - 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)
- wASL** ---Voltage / Current Input Selection (Modbus Address=40006)
 - This parameter is active if ---Voltage / Current is selected.
 - 0...50mV --- (-1999 ; 9999)
 - 0001 0...5V --- (-1999 ; 9999)
 - 0002 0...10V --- (-1999 ; 9999)
 - 0003 0...20mA --- (-1999 ; 9999)
 - 0004 4...20mA --- (-1999 ; 9999)
- dPnt** Display Point Position (Modbus Address=40007)
 - 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"
- tPoL** Low Point Display adjustment (-1999, 9999)Unit (Modbus Address=40008)
 - Active if ---Voltage / Current input is selected.
- tPoH** High Point Display adjustment (-1999, 9999)Unit (Modbus Address=40009)
 - Active if ---Voltage / Current input is selected.
- CoEF** Coefficient value (1,000, 9.999) (Modbus Address=40010)
 - Process value is multiplied with this value.
 - Active if ---Voltage / Current input is selected.
- un it** Unit selection (Modbus Address=40011)
 - 0°C Unit °C
 - 0°F Unit °F
 - U Unit is Voltage. Active if ---Voltage / Current input is selected
 - No unit. Active if ---Voltage / current input is selected

- LoL** Operating Scale Minimum Value (Scale Low Point, Scale High Point)Unit (Modbus Address=40012)
 - Used for Proportional band calculation and display blink.
- uPL** Operating Scale Maximum Value (Scale Low Point, Scale High Point)Unit (Modbus Address=40013)
 - Used for Proportional band calculation and display blink.
- PUoF** Display offset for process value (Scale -10%, Scale +10%)Unit (Modbus Address=40014)
 - This parameter value is added to the process value.
- tJnC** Cold Junction Compensation (Modbus Address=40015)
 - This parameter is active if process input is selected TC input.
 - no Cold junction compensation is not active.
 - YES Cold junction compensation is active.
- P-Ht** Proportional Band (0.0,999.9)% (Modbus Address=40016)
 - If $uPL = 1000^\circ C$ and $LoL = 0^\circ C$ and $P-Ht = 50.0$ then Proportional Band = $(\frac{uPL}{1000} - \frac{LoL}{1000}) * P-Ht / 100.0$
 - Proportional Band = $(1000-0)*50.0/100.0 = 500^\circ C$
- I-Ht** Integral Time (0, 3600) Second (Modbus Address=40017)
 - Can be changed by the user. After completed the tuning correctly, integral time value changes automatically. If it is 0, integral control is deactivated.
- D-Ht** Derivative Time (0.0,999.9) Second (Modbus Address=40018)
 - Can be changed by the user. After completed the tuning correctly, integral time value changes automatically. If it is 0, derivative control is deactivated.
- ULtt** While the motor is completely off the valve fully open (Modbus Address=40019)
 - While the fully open or fully closed for the pass time required. Value between 5 and 600 seconds can be entered.
- ULHY** The minimum duration of the valve motor drive output (0.1, 5.0)% (Modbus Address=40020)
 - 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.
- bRt** Burner Operation Type Selection (Modbus Adresi=40021)
 - It determines burner operation type (See-Burner Operation Type).It can be adjusted from 0 to 4.
- bHS** Burner Set Hysteresis Value (Modbus Address=40022)
 - Hysteresis value is subtracted from Burner Set value and the difference becomes the value which switch on threshold burner. It can be adjusted from 0 to 200°C.
- ULHS** Dead Band Value (0, 9999) (Modbus Address=40023)
 - Device is not resume heating process in specified range.
- SUL** Minimum value for process set and burner set values. It can be changed according to input type selection. (Modbus Address=40024)
- SUW** Maximum value for process set and burner set values. It can be changed according to input type selection. (Modbus Address=40025)
- tCPS** Technician Passwords (0, 9999) (Modbus Address=40026)
 - 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.

SRdr Communication Accessing Address (1,247)
(Modbus Address=40027)
Communication accessing address of device. It can be adjusted from 1 to 247.

BRwd Communication Baud Rate (Modbus Address=40028)

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

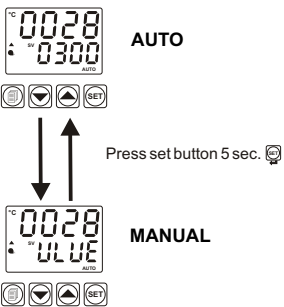
Prty Parity Selection for Communication (Modbus Address=40029)

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

StPB Stop Bit Selection for Communication (Modbus Address=40030)

0000 1 stop bit
0001 2 stop bit

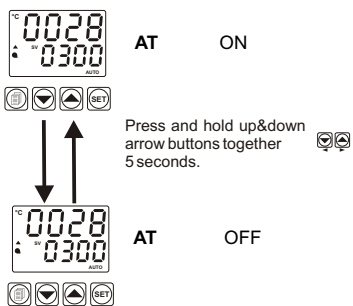
MANUAL CONTROL



While device is on manual situation display view ULUE parameter. Motorized valve can be open with using up arrow, can be close with using down arrow.

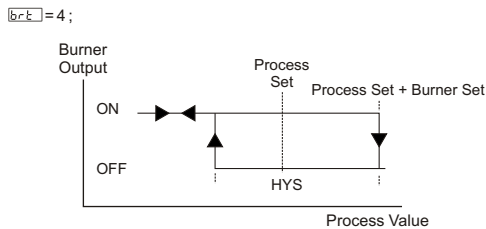
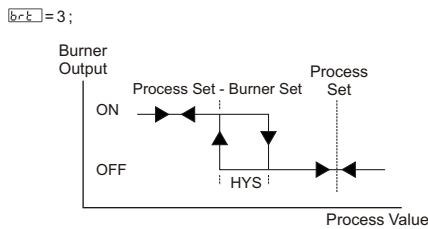
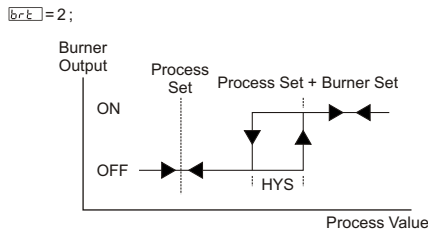
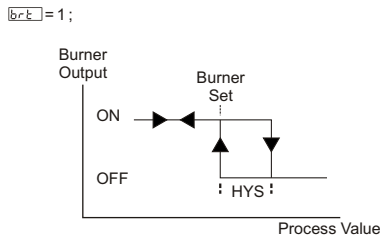
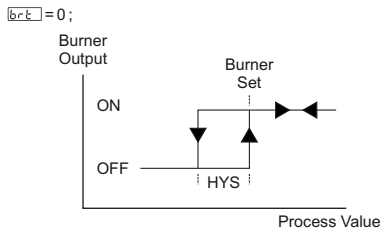
You can check the motorized valve when device on Manual mode. Manual operation needs to measure of motorized valve opening time to description in ULTT parameter.

AUTO TUNE



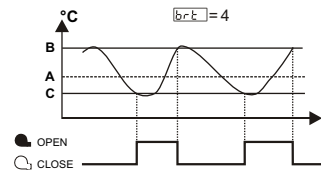
While pressed up&down arrows together 5 seconds AT led will active and AUTO TUNE starts. Motorized valve will go to minimum and maximum points for identify auto tune. For a while Auto tone finish and proportional band starts.

Burner Operation Type



Operation of The Device

Only small amounts of heat are drawn from the boiler. A 2-position controller maintains the setpoint, switching the burner on and off.



- A = Process Set
- B = Process Set + Burner Set
- C = Process Set + (Burner Set Value - Burner Set Hysteresis Value)

Read Input Register

MODBUS ADDRESS:30001 Process Variable

MODBUS ADDRESS:30002 Output Power

MODBUS ADDRESS:30003 Set Value

MODBUS ADDRESS:30007 Leds : 0.bit Motorized Valve Closing Led,
1.bit Value Led (V),
2.bit Motorized Valve Opening Led,
3.bit Burner Output Led,
5.bit Fahrenheit Led(°F),
6.bit Centigrade Led(°C),
9.bit Auto Led,
10.bit Man Led,
13.bit Auto Tune Led (AT),
15.bit Set Led(SV)

MODBUS ADDRESS:30008 Errors : 0.bit Sensor Break,
1.bit Reading Value Overflow from UpL,
2.bit Reading Value Underflow from LoL,
3.bit Tuning can't ended before 8 hours,
4.bit Reading heater current value exceeded current set value

MODBUS ADDRESS:30009 Decimal Point Selection

MODBUS ADDRESS:30015 Instrument Type & Revision Number
Reading Value : XXYY
XX : Instrument Type
25 = 4453
26 = 7753
27 = 9953
28 = 4953
29 = 9453
YY : Revision Number

MODBUS ADDRESS:30024 Calculating Current Value

MODBUS ADDRESS:30025 PID Proportional Calculating Value

MODBUS ADDRESS:30026 PID Integral Calculating Value

MODBUS ADDRESS:30027 PID Derivative Calculating Value

MODBUS ADDRESS:30028 Valve Position Calculating Value

Ordering Information

ESM-4453 (48x48 DIN 1/16)	A	B	C	D	E	F	G	H	I	U	V	W	Z
ESM-4953 (96x48 DIN 1/8)	2	0	1	1	0	1	0	1	0	0	0	0	0
ESM-7753 (72x72 DIN Sizes)													
ESM-9953 (96x96 DIN 1/4)													
ESM-9453 (48x96 DIN 1/8)													

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

20	Configurable(Table-1)	Scale	Table-1
----	-----------------------	-------	---------

D Serial Communication

1	RS-232	Product Code	EMC-X00
2	RS-485	Product Code	EMC-X10

E Output-1 (Alarm)

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

FG Module-1

01	Relay Output Module	Product Code	EMO-X00
----	---------------------	--------------	---------

HI Module-2

01	Relay Output Module	Product Code	EMO-X00
----	---------------------	--------------	---------

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

BC Input Type(RTD)

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)

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