

Instruction manual of ESM-3700 Digital Process Indicator consists of two main sections. Explanation of these sections are below. Also, there are other sections which include order information and technical specifications of the device. All titles and page numbers in instruction manual are in "CONTENTS" section. User can reach to any title with section number.

Installation:

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

Operation and Parameters:

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

Also in these sections, there are warnings to prevent serious injury while doing the physical and electrical mounting or using the device.

Explanation of the symbols which are used in these sections are given below.



This symbol is used for safety warnings. User must pay attention to these warnings.



This symbol is used to determine the dangerous situations as a result of an electric shock. User must pay attention to these warnings definitely.



This symbol is used to determine the important notes about functions and usage of the device.

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EU DECLARATION OF CONFORMITY

Manufacturer Company Name : Emko Elektronik A.S.

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

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

Product Name : Digital Process Indicator

Model Number : ESM-3700

Type Number : ESM-3700

Product Category : Electrical equipment for measurement, control and laboratory use

Conforms to the following directives :

73 / 23 / EEC The Low Voltage Directive as amended by 93 / 68 / EEC

89 / 336 / EEC The Electromagnetic Compatibility Directive

Has been designed and manufactured according to the following specifications

EN 61000-6-4:2001 EMC Generic Emission Standard for the Industrial Environment

EN 61000-6-2:2001 EMC Generic Immunity Standard for the Industrial Environment

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

1.Preface

ESM-3700 series Digital Process Indicators are design for measuring the process value. They can be used in many applications with their easy use, alarm output, universal process input properties.

Some application fields which they are used are below:

Application Fields

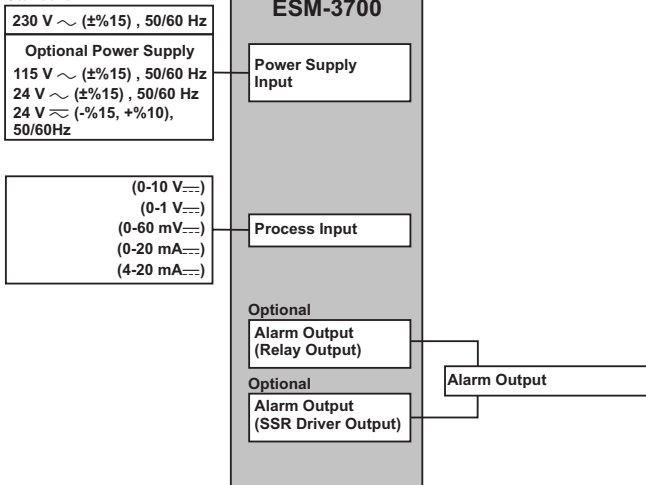
Glass
Plastic
Petro-Chemistry
Textile
Automotive
Machine production sector

Applications

Transmitter application of temperature, pressure, humidity etc.
Speed measurement of motor driver
Current measurement over the shunt resistance

1.1 General Specifications

Standard



1.2 Ordering Information

ESM-3700 (77 x 35 DIN Size)	A	BC	D	E	/	FG	HI	/	U	V	W	Z
		0			/	00	00	/	0	0	0	0

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

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

E	Alarm Output
0	None
1	Relay Output (resistive load 5 A@250 V \sim , 1NO + 1NC)
2	SSR Driver Output (Maximum 10 mA@5 V \approx)

Table - 1

BC	Input Type(\approx Voltage/Current)	Scale
47	0...60 mV \approx	-1999, 9999
46	0...1 V \approx	-1999, 9999
43	0...10 V \approx	-1999, 9999
44	0...20 mA \approx	-1999, 9999
45	4...20 mA \approx	-1999, 9999



\sim \Rightarrow Vac,

\approx \Rightarrow Vdc,

\approx \Rightarrow Vac/dc



In the current measurement mode, the input impedance of the device is 5 Ω .

Because of this reason a voltage input shouldn't be connected to the process input of the device, while the device is in the current measurement mode, otherwise process input can be damaged.



To change the process input type from voltage to current while the device is operating, first separate the voltage input then, change the input type to current and connect to current to the process input.

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 supply switch or a fuse. Use power switch and fuse as required.

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

Keep the power off until all of the wiring is completed so that electric shock and trouble with the unit can be prevented.

Never attempt to disassemble, modify or repair this unit. Tampering with the unit may result in malfunction, electric shock or fire.

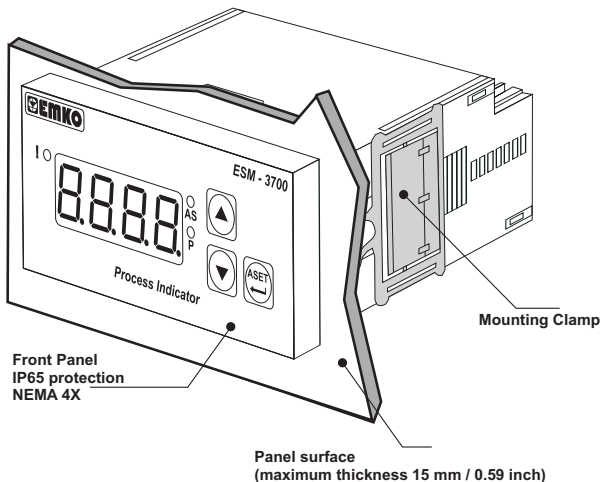
Do not use the unit in combustible or explosive gaseous atmospheres.

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.

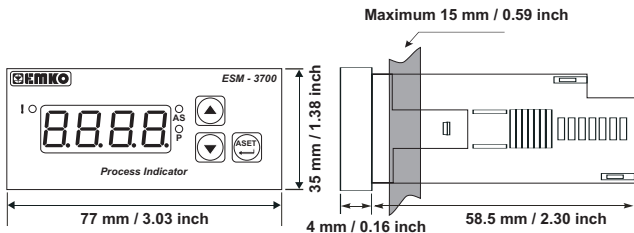
Montage of the product on a system must be done with it's fixing clamps. Do not do the montage of the device with inappropriate fixing clamp. Be sure that device will not fall while doing the montage.

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

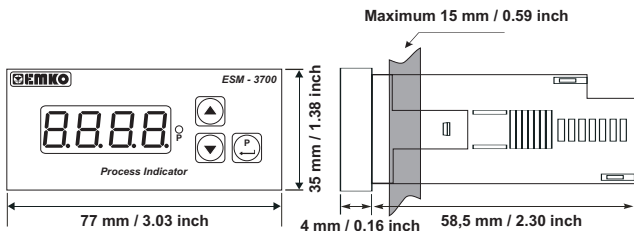
2.1 General Description



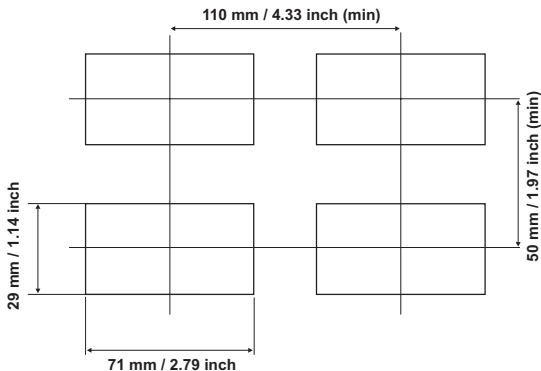
2.2 Front View and Dimensions of ESM-3700 Digital Process Indicator With Alarm Output



2.3 Front View and Dimensions of ESM-3700 Digital Process Indicator Without Alarm Output



2.4 Panel Cut-Out



2.5 Environmental Ratings

Operating Conditions



Operating Temperature : 0 to 50 °C



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



Altitude : Up to 2000 m.



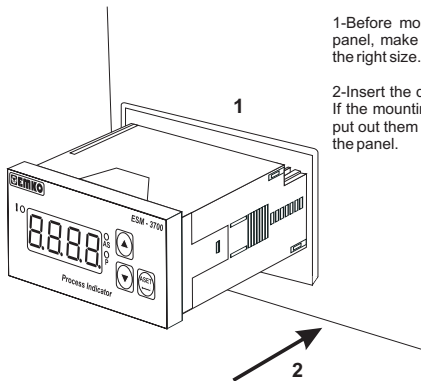
Forbidden Conditions:

Corrosive atmosphere

Explosive atmosphere

Home applications (The unit is only for industrial applications)

2.6 Panel Mounting



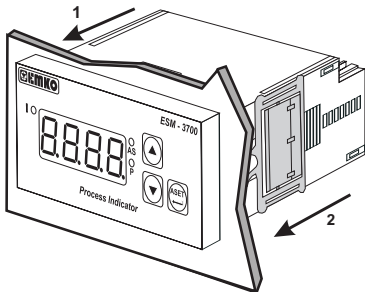
1-Before mounting the device in your panel, make sure that the cut-out is of the right size.

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



During installation into a metal panel, care should be taken to avoid injury from metal burrs which might be present. The equipment can loosen from vibration and become dislodged if installation parts are not properly tightened. These precautions for the safety of the person who does the panel mounting.

2.7 Installation Fixing Clamp



The unit is designed for panel mounting.

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

2- Insert the mounting clamps to the fixing sockets that located left and right sides of device and make the unit completely immobile within the panel

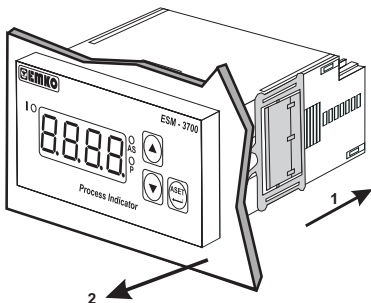


Montage of the unit to a system must be done with it's own fixing clamps. Do not do the montage of the device with inappropriate fixing clamps. Be sure that device will not fall while doing the montage.

2.8 Removing from the Panel



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



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

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

3. Electrical Wiring



You must ensure that the device is correctly configured for your application. Incorrect configuration could result in damage to the process being controlled, and/or personal injury. It is your responsibility, as the installer, to ensure that the configuration is correct.

Device parameters has factory default values. These parameters must be set according to the system's needs.



Only qualified personnel and technicians should work on this equipment. This equipment contains internal circuits with voltage dangerous to human life. There is severe danger for human life in the case of unauthorized intervention.

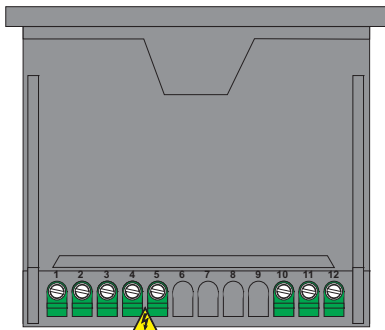


Be sure to use the rated power supply voltage to protect the unit against damage and to prevent failure.



Keep the power off until all of the wiring is completed so that electric shock and trouble with the unit can be prevented.

3.1 Terminal Layout and Connection Instructions



Screw driver
0,8 x 3 mm



Torque
0,5 Nm

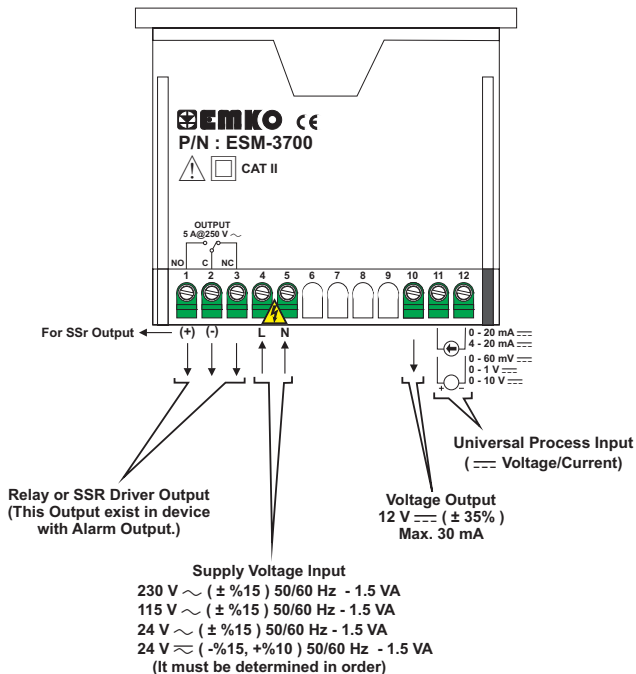


Max. 2.5 mm / 0.098 inch
Wire Size:
14 AWG/1 mm²
Solid /Stranded

3.2 Electrical Wiring Diagram



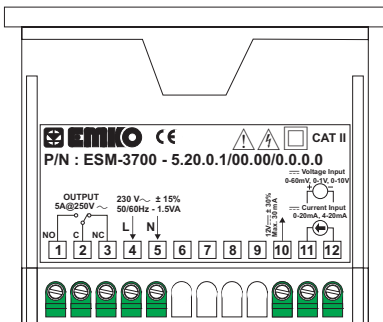
Electrical wiring of the device must be the same as 'Electrical Wiring Diagram' below to prevent damage to the process being controlled and personnel injury.



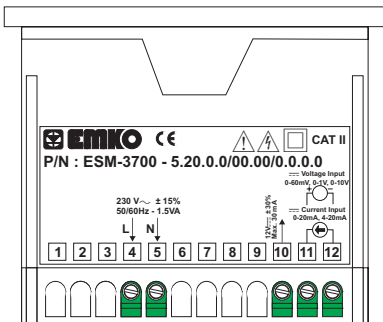
Process Input is in CAT II class.

3.3 View of the Device Label

Device Label for Universal Process Input, 230V ~ Supply Voltage Input and Alarm Relay Output

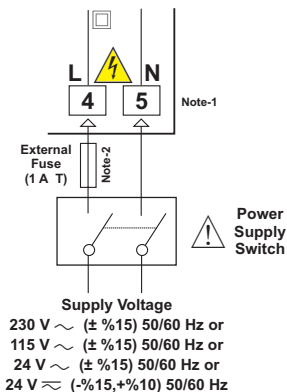


Device Label for Universal Process Input, 230V ~ Supply Voltage Input and Without Alarm Output



3.4 Supply Voltage Input Connection of the Device

Connection of Supply Voltage Input



Note-1: "L" is (+), "N" is (-) for 24V \approx Supply Voltage

Note-2: External Fuse is recommended



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

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



There is no power supply switch or fuse on the device. So a power supply switch and a fuse must be added to the supply voltage input. Power supply switch and fuse must be put to a place where user can reach easily.

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

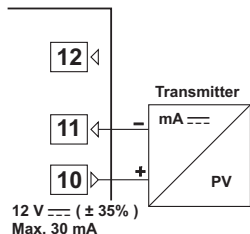
External fuse must be on phase connection in ~ supply input.

External fuse must be on (+) line connection in \approx supply input.

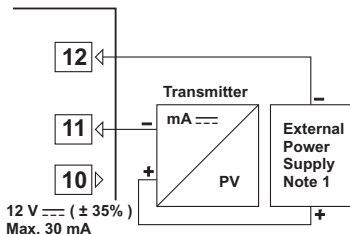
3.5 Process Input Connection

3.5.1 Process Input Connection of Serial Transmitter with Current Output (Loop Powered)

Transmitter connection by using supply voltage on the device



Transmitter connection by using external supply voltage source



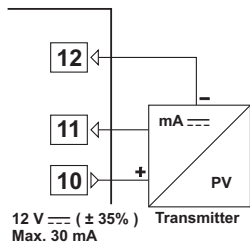
Note 1 : External power supply must be selected according to supply voltage range and required current for transmitter.



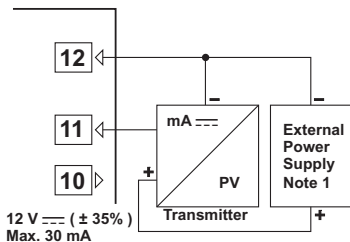
Input Impedance 5Ω .

3.5.2 Process Input Connection of 3-Wire Transmitter with Current Output

Transmitter connection by using supply voltage on the device



Transmitter connection by using external supply voltage source



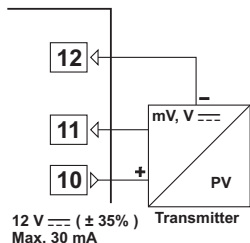
Note 1 : External power supply must be selected according to supply voltage range and required current for transmitter.



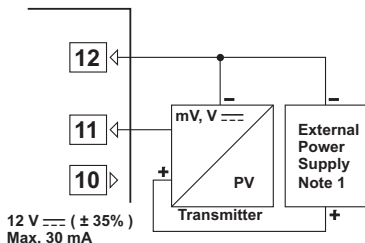
Input Impedance 5Ω .

3.5.3 Process Input Connection of Transmitter with Voltage Output

Transmitter connection by using supply voltage on the device



Transmitter connection by using external supply voltage source

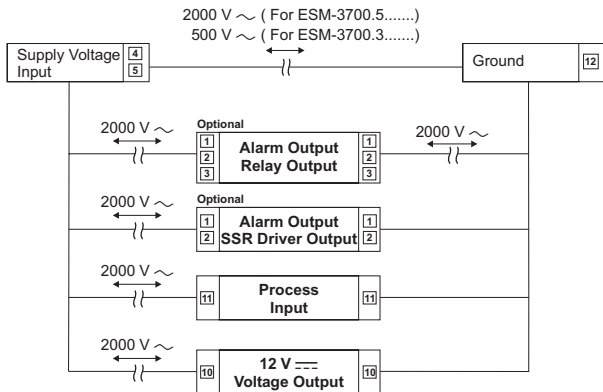


Note 1 : External power supply must be selected according to supply voltage range and required current for transmitter.



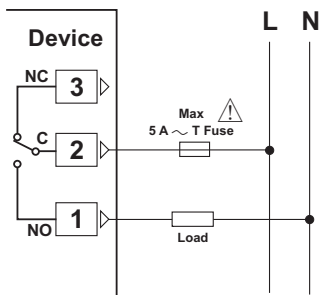
Input Impedance 11 k Ω , For 0...60 mV --- Process Input
 Input Impedance 11 k Ω , For 0...1 V --- Process Input
 Input Impedance 11 k Ω , For 0...10 V --- Process Input

3.6 Galvanic Isolation Test Values of ESM-3700 Digital Process Indicator



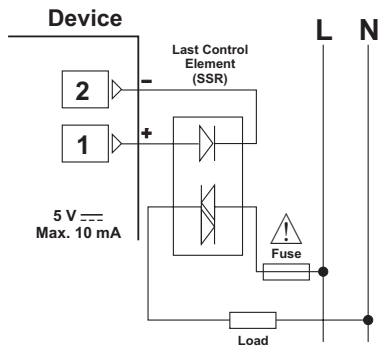
3.7 Alarm Output Connections

3.7.1 Relay Output Connection



Fuses must be selected according to the application.

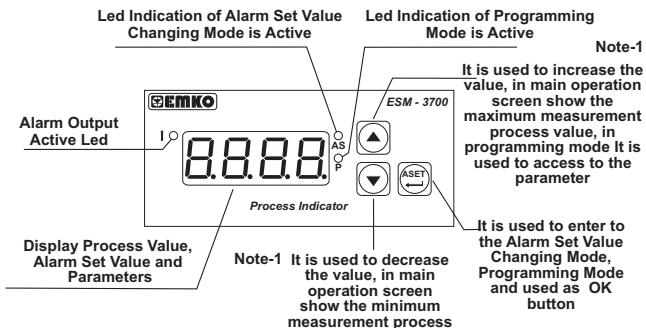
3.7.2 SSR Driver Output Connection



Fuses must be selected according to the application.

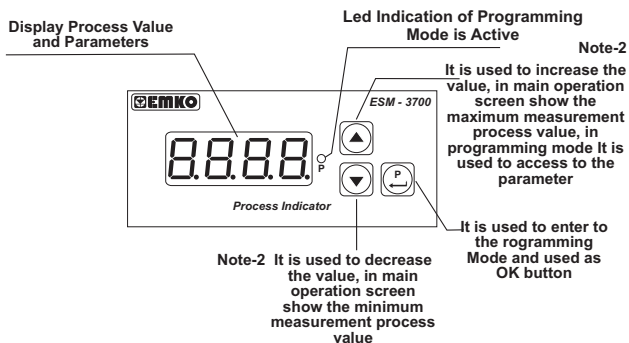
4. Front Panel Definition and Accessing to the Menu

4.1 Front Panel Definition of Device With Alarm Output



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, if increment or decrement button is pressed for 15 seconds continuously, increment and decrement number become 1000.

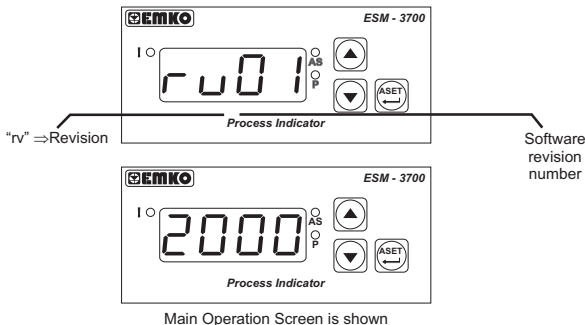
4.2 Front Panel Definition of Device Without Alarm Output



Note-2: 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, if increment or decrement button is pressed for 15 seconds continuously, increment and decrement number become 1000.

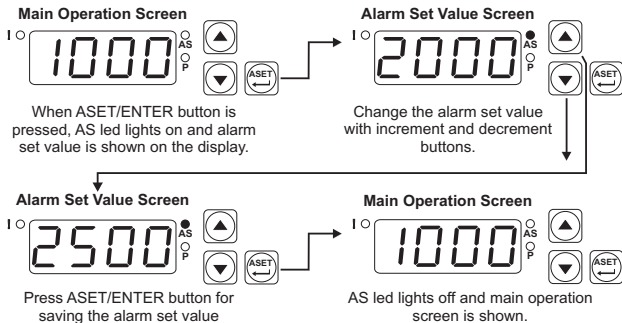
4.3 Observation of Software Revision on the Display

When power is first applied to the digital process indicator, software revision number is shown on the display.



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

4.4 Changing and Saving Alarm Set Value



Alarm set value can be adjusted from low reading adjustment $[EPOL]$ value parameter to up reading adjustment $[EPoH]$ value parameter. **(Alarm set value changing mode is active in devices with alarm output.)**



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

4.5. Programming Mode Parameter List

uASL

Process Input Type Selection Parameter (Default = 0)

Process Input type is determined with this parameter.
It can be adjusted from 0 to 4

0...10 V --- (-1999 ; 9999)

0...1 V --- (-1999 ; 9999)

0...60 mV --- (-1999 ; 9999)

0...20 mA --- (-1999 ; 9999)

4...20 mA --- (-1999 ; 9999)

iFLT

Process Input Filter Selection Parameter (Default = 0)

Process Input filter is determined with this parameter.
It can be adjusted from 0 to 4. Measurement is performed at each;
240 ms for 4...20 mA --- and 0...20 mA --- process input type
150 ms for 0...60 mV --- process Input type
100 ms for 0...1 V --- and 0...10 V --- process Input type

The last measurement value is shown.

The average of last 2 measurement value is shown.

The average of last 4 measurement value is shown.

The average of last 8 measurement value is shown.

The average of last 16 measurement value is shown.

Hold

Display Function Selection Parameter (Default = 0)

In main operation screen displayed process value is determined with this parameter. It can be adjusted from 0 to 2

The measurement process value is shown on the display

The minimum measurement process value is shown continuously on the display

The maximum measurement process value is shown continuously on the display

dPnt

Decimal Point Position Parameter (Default = 0)

Decimal point position is determined with this parameter.
It can be adjusted from 0 to 3

No point.

0.0

0.00

0.000



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

EPoL**Low Reading Adjustment Value Parameter (Default = -1999)**

It defines minimum value for dual point reading adjustment it can be adjusted -1999 to ($[EPoH] - 1$)

EPoH**Up Reading Adjustment Value Parameter (Default = 9999)**

It defines maximum value for dual point reading adjustment it can be adjusted ($[EPoL] + 1$) to 9999

AdJS**Reading Adjustment Selection Parameter (Default = 0)**

It defines which reading adjustment type is active. It can be adjusted from 0 to 1

 0

Selected process input type is read according to the standard reading adjustment.

 1

Selected process input type is read according to the user reading adjustment.

AdJL

and **AdJH** parameters are observed if reading adjustment selection parameter

AdJS

= 1, otherwise these parameters are can not be observed.

AdJL**User Reading Adjustment Low Limit Analogue Value Parameter**

In this parameter, the equivalent voltage or current for low reading adjustment value $[EPoL]$ parameter is determined. (Please refer to section 6.)

AdJH**User Reading Adjustment Up Limit Analogue Value Parameter**

In this parameter, the equivalent voltage or current for up reading adjustment value $[EPoH]$ parameter is determined. (Please refer to section 6.)

AHSt**Alarm Hysteresis Parameter (Default = 0)**

Alarm hysteresis value.

It can be adjusted from 0 to $([EPoH] - [EPoL]) / 2$

RoTS**Alarm Type Selection Parameter (Default = 1)** 1 Proses High Alarm 2 Proses Low Alarm**Rond****Alarm On Delay Time Parameter (Default = 0)**

It can be adjusted from 0 to 99 minutes.

RoFd**Alarm Off Delay Time Parameter (Default = 0)**

It can be adjusted from 0 to 99 minutes.

When this parameter is 99, if increment button is pressed, $[LECH]$ is observed and alarm latching output is selected. To make the alarm latching output passive, decrement button must be pressed in main operation screen.

RoPd**Alarm Delay Parameter After Power On (Default = 0)**

This parameter defines the delay for the alarm is being active after power on.

It can be adjusted from 0 to 99 minutes.

PASS**Programming Mode Accessing Password (Default = 0)**

Password for entering to the programming mode is defined with this parameter. It can be adjusted from 0 to 9999. If it is 0, programming mode is accessed without entering password.

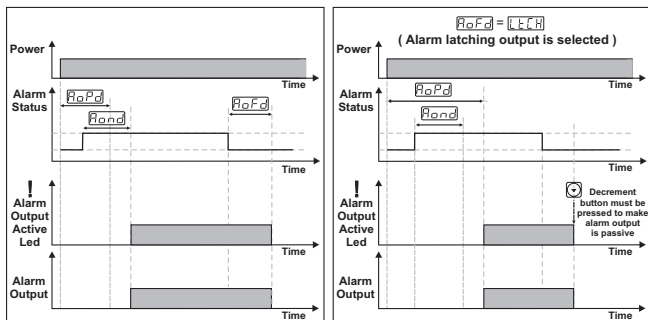


AHSt, **RoTS**, **Rond**, **RoFd**, **RoPd** parameters are active in device with alarm output.

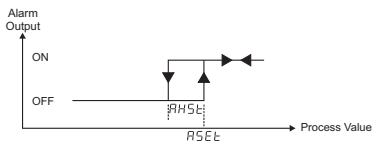


If no operation is performed in Programming mode for 20 seconds, device turns to main operation screen automatically.

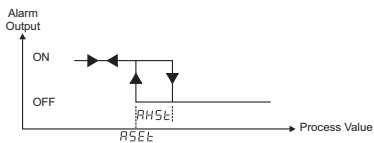
4.6 Operation Graphics of Alarm Output and Alarm Types



Process High Alarm



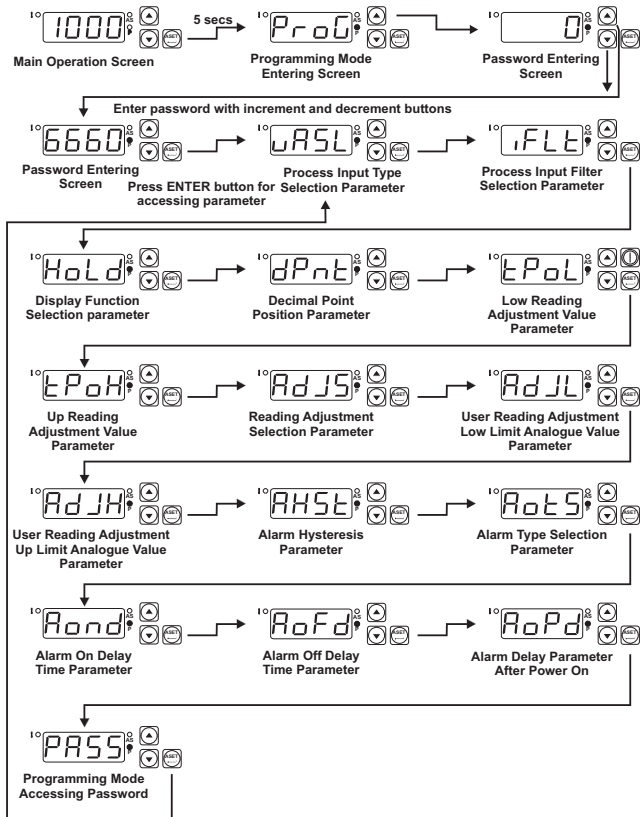
Process Low Alarm



$ASET$ = Alarm Set Value

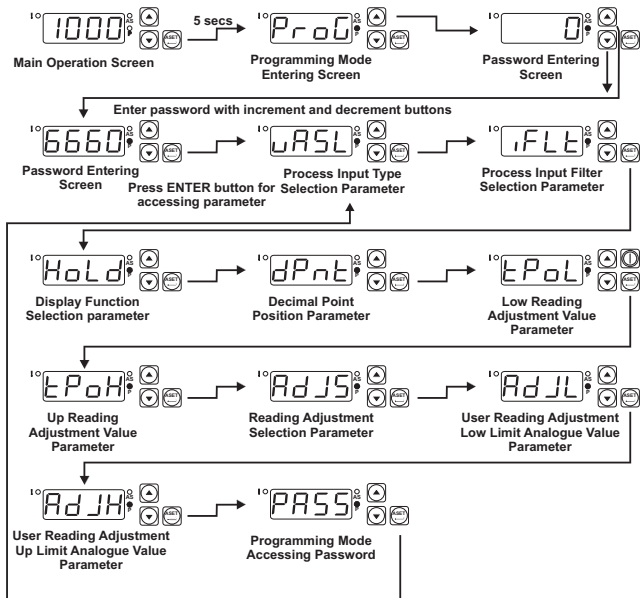
4.7 Easy Accessing Diagram of Programming Mode Parameters

4.7.1 Devices With Alarm Output



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

4.7.2 Devices Without Alarm Output



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

4.8 Entering to the Programming Mode, Changing and Saving Parameters

Main Operation Screen

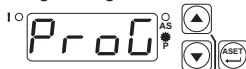


When ENTER button is pressed for 5 seconds. "P" led starts to blink. If programming mode entering password is different from 0, programming mode entering screen **Prog** is observed.

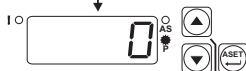
Note-1: If programming mode accessing password is 0, process input type selection parameter **WASL** screen is observed instead of programming mode accessing screen **Prog**.

Note-2: Parameters can be observed by pressing ENTER button in programming mode accessing screen without entering programming mode accessing password. But parameters can not be changed.

Programming Screen



Programming Mode Accessing Screen
Press increment button for accessing to the password entering screen.



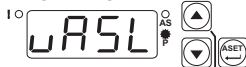
Password Entering Screen
Enter programming mode accessing password with increment and decrement buttons



Password Entering Screen

Press ENTER button for accessing to the parameters

Programming Screen



Process Input Type Selection Parameter
Press increment button for accessing to the parameter value. Press ENTER button for accessing to the next parameter



Process Input Type Selection Value

Change the value with increment and decrement buttons

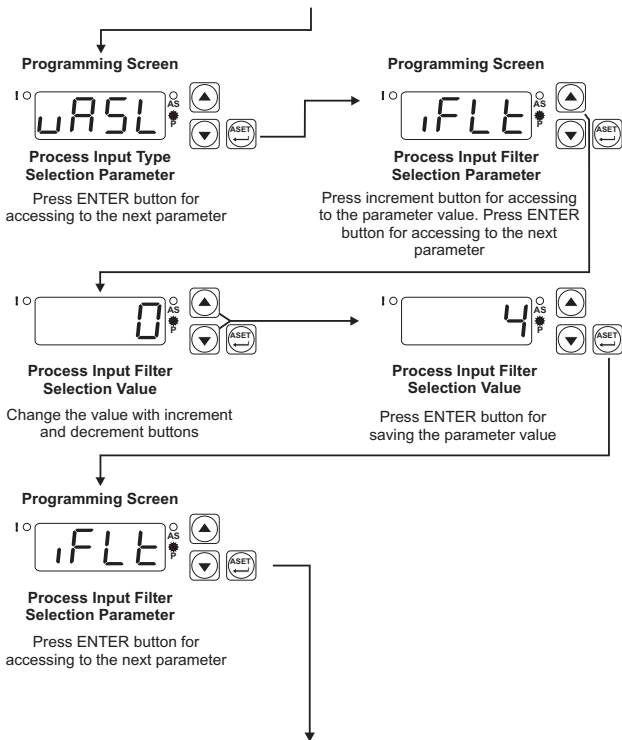


Process Input Type Selection Value

Press ENTER button for saving the parameter value



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



Other programming mode parameters can be accessed with same method explained above, observed and changed

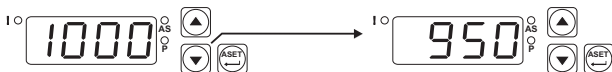


If no operation is performed in Programming mode for 20 seconds, device turns to main operation screen automatically.

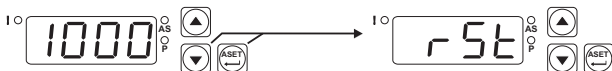
5. Display Functions



In main operation screen, If increment button is pressed then the maximum measurement value is shown on the display



In main operation screen, If decrement button is pressed then the minimum measurement value is shown on the display



In main operation screen, If decrement and ENTER buttons are pressed together the maximum and minimum measurement value are reset to the measurement value at that time. The message `r 5 t` is shown on the display

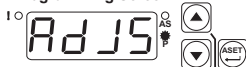
6. Universal Input User Reading Adjustment Operation

Main Operation Screen



Access to the reading adjustment selection parameter as explained in section 4.7.1 and 4.7.2

Programming Screen



Reading Adjustment Selection Parameter

Press increment button for accessing to the parameter value. Press ENTER button for accessing to the next parameter



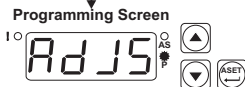
Reading Adjustment Selection Value (Standard reading adjustment is selected)

Change the value with increment and decrement buttons



Reading Adjustment Selection Value (User reading adjustment is selected)

Press ENTER button for saving the parameter value



Reading Adjustment Selection Parameter

Press ENTER button for accessing to the next parameter



User Reading Adjustment Low Limit Analogue Value Parameter

Press increment button for accessing to the user reading adjustment low limit analogue value entering screen. Press ENTER button for accessing to the next parameter



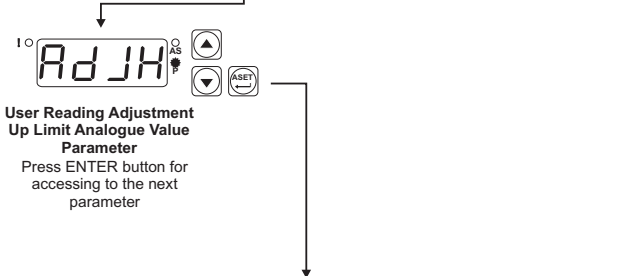
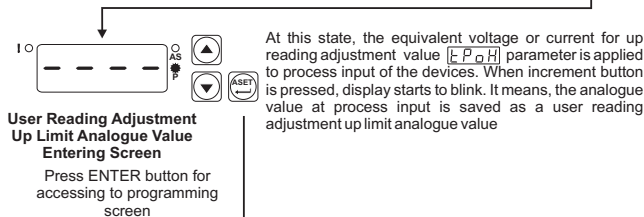
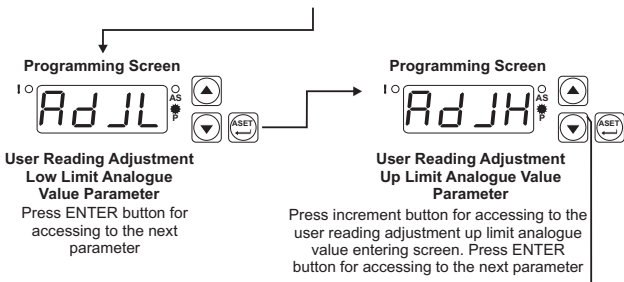
User Reading Adjustment Low Limit Analogue Value Entering Screen

Press ENTER button for accessing to programming screen

At this state, the equivalent voltage or current for low reading adjustment value [E P a I] parameter is applied to process input of the devices. When decrement button is press, display starts to blink. It means, the analogue value at process input is saved as a user reading adjustment low limit analogue value



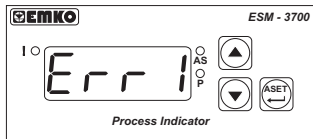
If no operation is performed in Programming mode for 20 seconds, device turns to main operation screen automatically.



i Other programming mode parameters can be accessed, observed and changed

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

7. Failure Messages in ESM 3700 Digital Process Indicator

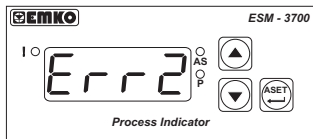


If the equivalent voltage or current applied to the process input while in $[AdjL]$ or $[AdjH]$ parameter for user reading adjustment is out of the standard scale, this error message are shown on the display

Example-1:

For process Input type selected as 0-10 V $_{DC}$, If the applied voltage while in $[AdjL]$ parameter or $[AdjH]$ parameter is lower than 0 V $_{DC}$ or upper than 10 V $_{DC}$, when the decrement or increment button is pressed for saving the analog value this error message is shown on the display and applied voltage value is not saved.

Press any button to clear error message from the display and turn to the user reading adjustment analog value entering screen $[- - - -]$



If the difference between the equivalent voltage or current applied to the process input while in $[AdjL]$ and $[AdjH]$ parameters for user reading adjustment is lower than the %50 of the standard scale, this error message are shown on the display

Example-2:

For process Input type selected as 0-10 V $_{DC}$, If the difference between the applied voltages in $[AdjL]$ and $[AdjH]$ parameters is lower than the 5 V $_{DC}$, when the decrement or increment button is pressed for saving the analog value this error message is shown on the display and applied voltage value is not saved.

Press any button to clear error message from the display and turn to the user reading adjustment analog value entering screen $[- - - -]$

8. Specifications

Devices Type	: Digital Process Indicator
Housing&Mounting	: 77 mm x 35 mm x 62.5 mm Plastic housing for panel Mounting. Panel cut-out 71 x 29 mm.
Protection Class	: NEMA 4X (IP65 at front, IP20 at rear).
Weight	: Approximately 0.16 Kg.
Environmental Rating	: Standard, indoor at an altitude of less than 2000 meters with none-condensing humidity.
Storage / Operating Temperature:	: -40 °C to +85 °C / 0 °C to +50 °C
Storage / Operating Humidity	: 90 % max. (None-condensing)
Installation	: Fixed Installation
Overvoltage Category	: II.
Pollution Degree	: II. Office or workplace, none conductive pollution.
Operating Conditions	: Continuous
Process Input	:0...10 V _{DC} Input Impedance Approximately 11 k Ω Measurement range 0...12 V _{DC} 0...1 V _{DC} Input Impedance Approximately 11 k Ω Measurement range 0...1.2 V _{DC} 0...60 mV _{DC} Input Impedance Approximately 11k Ω Measurement range 0...100 mV _{DC} 0...20 mA _{DC} Input Impedance Approximately 5 Ω Measurement range 0...22 mA _{DC} 4...20 mA _{DC} Input Impedance Approximately 5 Ω Measurement range 0...22 mA _{DC}
Accuracy	: \pm 0.5% of full scale
Sampling Time	: Measurement is performed at each 240 ms for 4...20 mA _{DC} and 0...20 mA _{DC} process input 150 ms for 0...60 mV _{DC} process Input 100 ms for 0...1 V _{DC} and 0...10 V _{DC} process Input
Supply Voltage and Power	:230 V \sim (-%15;+%15) 50/60 Hz. 1.5 VA 115 V \sim (-%15;+%15) 50/60 Hz. 1.5 VA 24 V \sim (-%15;+%15) 50/60 Hz. 1.5 VA 24 V \approx (-%15, +%10) 50/60 Hz. 1.5 VA
12V_{DC} Voltage Output	:12 V _{DC} (\pm 35%) Max. 30 mA
Alarm Relay Output	:5 A@250 V \sim at resistive load (Electrical Life : 100.000 Operation(Full Load))
Optional SSR Output	:Maximum 10 mA@5 V _{DC}
Display	:10 mm Red 4 digits LED Display
LED	: Device with alarm Output: AS(Green), P(Red), Alarm Output Active(Red) 3 mm Device without alarm Output: P(Red) 3 mm
Approvals	:GOST-R, CE