ENELSAN ELECTROMAGNETIC FLOWMETER
USER MANUAL AND INSTALLATION INSTRUCTIONS

The electromagnetic flowmeters produced by ENELSAN are designed to measure liquid flow with high precision. These devices are durable, long-lasting, and suitable for industrial applications. The user manual includes detailed instructions for installation, operation, maintenance, and troubleshooting.

***WARNING**: Before using the device, carefully read this manual and follow all instructions. Incorrect installation or use may lead to injury or permanent damage to the device.*

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ENELSAN User Manual

1. SAFETY INSTRUCTIONS

1.1. Intended Use

- A minimum conductivity of 20 µS/cm is required to measure demineralized water. For other liquids, the minimum conductivity value should be 5 µS/cm.
- The device can be safely used as long as the usage specified in this manual is not exceeded. However, using it for any other purpose puts both personal safety and the integrity of the device at risk.
- ENELSAN is not responsible for damages caused by improper use.

1.2. Installation, Commissioning, and Operation

- This device must only be installed, commissioned, and maintained by authorized and experienced professionals (such as electrical technicians), in accordance with the instructions provided in this manual.
- The device must be installed with the power off and free of external loads.
- The device can only be replaced when explicitly permitted in this manual.
- Repair operations should be carried out using original spare parts and only when explicitly allowed in this manual.
- When welding work is carried out on the pipe, the welding device should not be grounded through the flowmeter itself.

1.3. Operational Safety

- The device is designed with the latest technology and is delivered ready for safe use from the factory. All relevant regulations and standards have been followed.
- Technical personnel must ensure that the device is correctly wired and grounded.

1.4. Safety Symbols and Warnings

- ***WARNING:*** *An incorrect action may cause serious injury or dangerous situations. Careful adherence to the instructions is required.*
- ***CAUTION:*** *An incorrect operation may cause errors or damage to the device. Follow the instructions exactly as stated.*
- ***NOTE:*** *A specific operation or procedure may have an indirect effect on the device's operation or may lead to an unexpected response.*

2. PRODUCT TECHNICAL INFORMATION

2.1. General Features

Table 1: TECHNICAL INFORMATION

TECHNICAL INFORMATION	
ELECTRONIC UNIT	
Power Supply	85-264VAC, 24 VDC(Optional),
Output	Standard (4-20 mA, 0-10V, Frequency, Darbe, RS 485) 0V-10V,0V-5V, 4mA-20mA,0mA-20mA 0mA-24mA
Communication	Wi-fi, Bluetooth, Lora (Optional), HART(Optional), RS 485 MODBUS, Profibus (Optional)
Contact	2 pieces
Protection Class	IP67, IP68(Optional)
Display	64*128 Graphic LCD
Cable Connection	M18*1,5
Warning	Coil Warning, Empty Line Warning
Measurement Ranges	0.1-15 M/S
Process Temperature	-10....+80 C Ebonite -10....+70 C Soft Rubber -20....+150 C PTFE -20....+120 C Black PTFE -40....+180 C Ceramic
Ambient Temperature	-20 - +60 C (Depending on Process Temperature)
MATERIAL	
Sensor Body	Die-Cast Aluminum Mold (Standard) Stainless Steel 1.4301 (Optional) Carbon Steel (Optional)
Flanges	Painted Steel ST 337-2 (Standard) Stainless Steel 1.4301 (Optional)
Measurement Electrode	1.4404 Stainless Steel, Hastelloy C22, Titanium and Tantalum, Platinum Rhodium
Grounding Electrode	1.4404 Stainless Steel, Hastelloy C22, Titanium and Tantalum, Platinum Rhodium
Internal Coating	Ebonite (Hard Rubber), Soft Rubber, PTFE, Black PTFE, Ceramic
Connection Box	Stainless Steel (Available in certain models)
Converter Box	Cast Aluminum
MOUNTING CONDITIONS	
Line Filling	The line must be fully filled.
Input Output Distance	No straight pipe distance is required.
Grounding Ring	Available upon request.

2.2. Mechanical Dimensions

2.2.1. Sensor

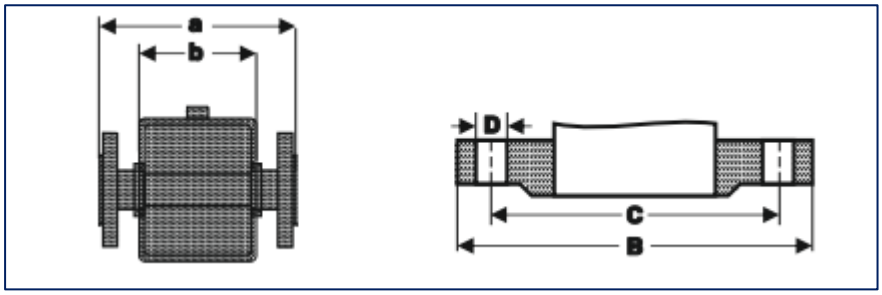

Figure 1: Sensor Technical Drawing

2.2.2. Transmitter

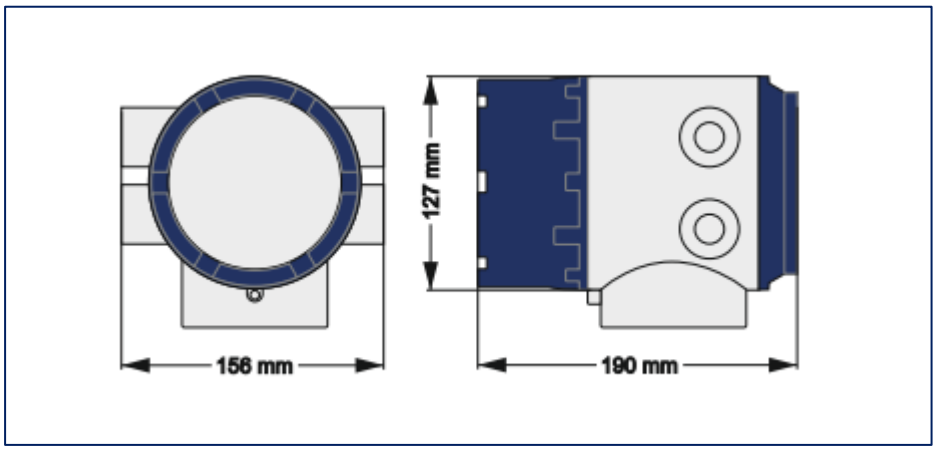

Figure 2: Transmitter Technical drawing

2.3. Position of Flange Gaskets

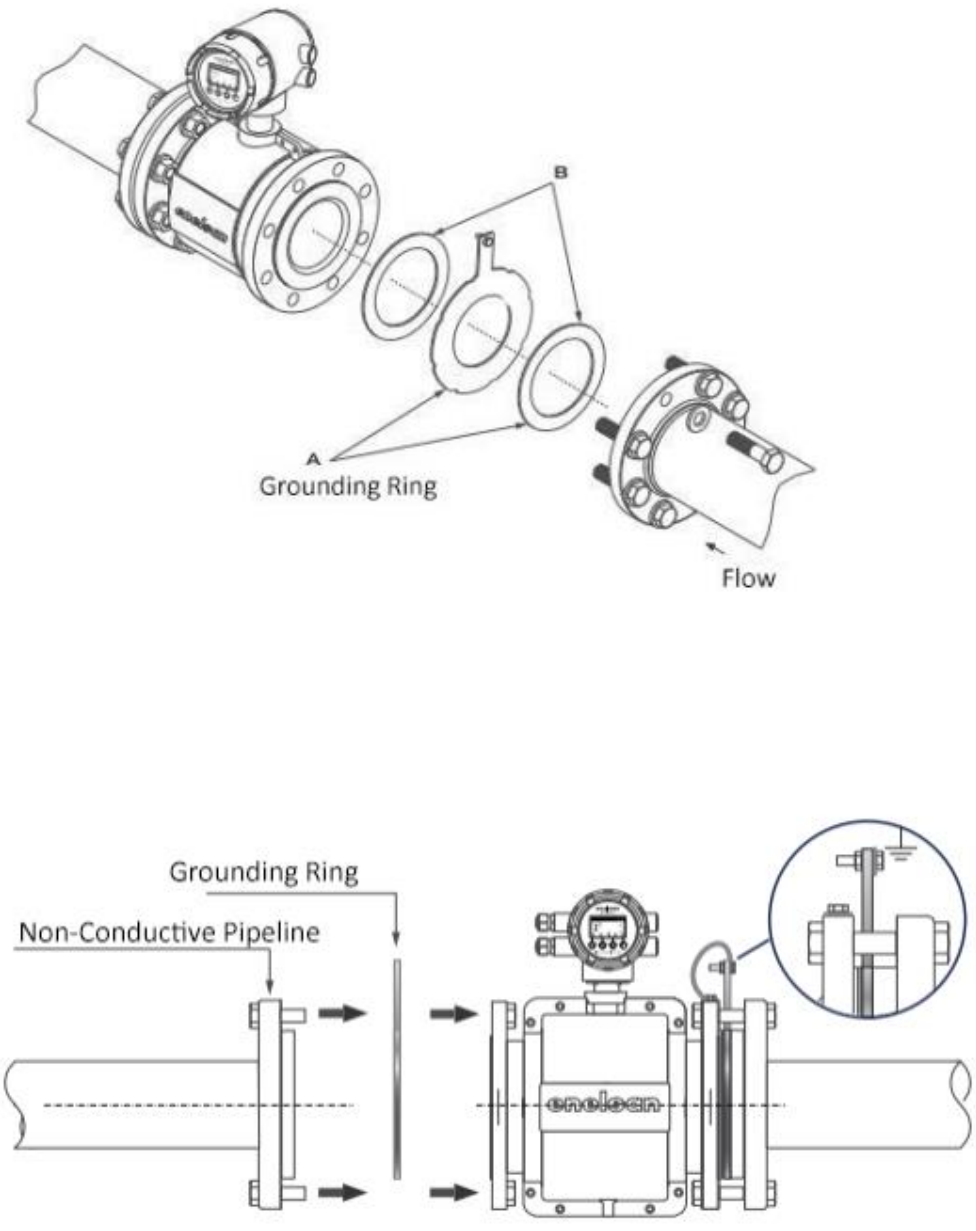

Figure 3: Position of Flange Gaskets

2.4. Connection Dimensions

Table 2: Connection Dimensions

DN (mm)	Pressure Class	Device Outer Diameters		Flanges					
		a	b	B	C	Do	D	Core Hole Count (d)	Bolt Diameter
15	4.0 MPa (40Bar)	150	82	95	65	60	14	4	M12
20		150	78	105	75	65	14	4	M12
25		200	78	115	85	75	14	4	M12
32		200	74	140	100	85	18	4	M16
40		200	74	150	110	100	18	4	M16
50		200	86	165	125	110	18	4	M16
65		200	92	185	145	125	18	8	M16
80		200	92	200	160	145	18	8	M16
100	1.6 MPa (16Bar)	250	114	220	180	160	18	8	M16
125		250	114	250	210	180	18	8	M16
150		300	136	285	240	210	22	8	M20
200	1.0 MPa (10Bar)	350	156	340	295	240	22	8	M20
250		400	202	395	350	295	22	12	M20
300		500	230	445	400	350	22	12	M20
350		500	278	505	460	400	22	16	M20
400		600	320	565	515	460	26	16	M24
450		600	374	615	565	515	26	20	M24
500		600	388	670	620	565	26	20	M24
600		600	408	780	725	620	30	20	M27
700		700	520	895	840	725	30	24	M27
800	0.6MPa (6Bar)	800	580	1015	950	840	33	24	M30
900		900	660	1115	1050	950	33	28	M30
1000		1000	720	1230	1160	1050	36	28	M33
1200		1200	1130	1455	1380	1160	39	32	M36
1400		1400	1260	1675	1590	1340	42	36	M39
1600		1600	1450	1915	1820	1560	48	40	M45
1800		1800	1640	2115	2020	1760	48	44	M45
2000		2000	1820	2325	2230	1970	48	48	M45
2200		2200	1990	2550	2440	2180	55	52	M52
2400		2400		2760	2650	2390	55	56	M52
2600		2600		2960	2680		55	60	M52
2800		2800		3180	2882		55	64	M52

3. SCREEN AND BUTTON USAGE

3.1. Home Screen

Measurement data and status are displayed as follows:

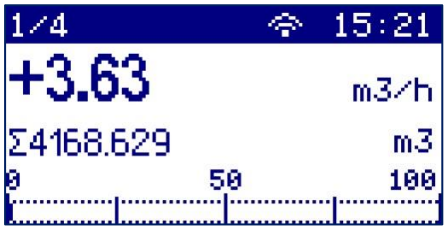

Figure 4: Home Screen

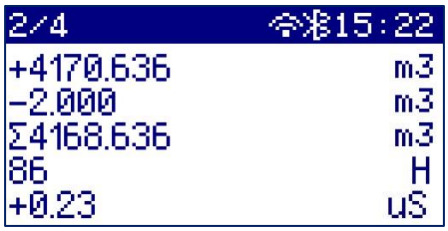

Figure 5: Home Screen 2

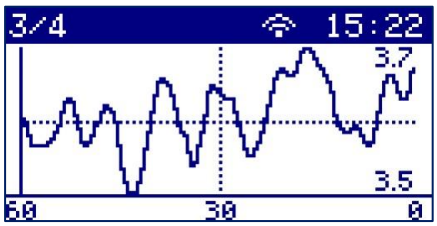

Figure 6: Graph screen

3.2. ICONS

Wi-Fi icon

Bluetooth icon

Login icon

Empty Pipe icon

3.3. Buttons and Screen

3.3.1. Button Functions

The converter has 4 buttons: ESC, Up, Down, and Enter.
The button functions on the measurement screen are as follows:

The user can modify the values of the rows on the measurement screen, define value ranges, and adjust the graph size on the graphic screen.
• When the "Enter" button is pressed for 3 seconds on the home screen, the password interface will be displayed.

The general functions of the buttons are as follows:

Figure 7: Buttons

Usage Method: *Press the button and release it. A single-button operation works as follows:*
1-) ESC Button: *Return to the previous menu / cancel editing.*
2-) Down Button: *Decrease the selected value by 1 / go to the previous menu.*
3-) Up Button: *Increase the selected value by 1 / go to the next menu.*
4-) Enter Button: *Enter / save the parameter.*

3.4. Password Entry

Example of password entry process for button operations:

1) When the device is on the home screen (normal display mode), press and hold the Enter button for 3 seconds to display the password entry screen.
2) Enter the password on this screen. (For passwords at different levels, please refer to the parameter settings section.)
3) Press the Up button to increase the number in the cursor field by 1.
4) Press the Down button to move the cursor to the left.
5) After completing the password, press the Enter button. If the password is correct, the parameter settings will open.

Figure 8: Password Entry screen

***NOTE:** To return to the measurement screen at any stage, press and hold the Enter button for 3 seconds.*

3.5. Browsing the Menu

1) Settings Screen

The settings screen is used to display and select parameters, as shown below:

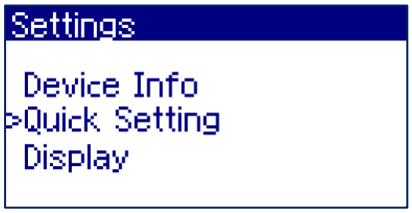

*Figure 9: **Settings Screen***

The settings screen contains the following options:

- Quick Settings
- Outputs
- Alarm Records
- Collector
- Communication
- Sensor
- Service
- Device Information

The user can easily adjust parameters by selecting the desired option in the Settings tab. Use the up and down arrow keys to navigate the menu, and press enter to open an item.

3.6 Browsing Parameters

1) Quick Settings

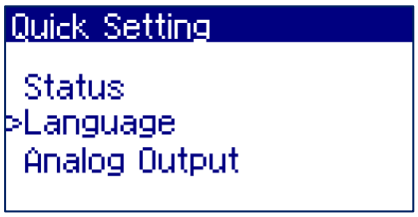

Figure 10: Quick Settings

The Quick Settings tab contains the following options:

- **Language**: The user can change the screen language.

- **Analog Output**: The user can adjust the following parameters:
    - Measurement Options
    - Measurement Mode
    - Unit
    - Low Setting
    - High Setting
    - Output Scale
    - Type

- **Total**: The user can adjust the following parameters:
    - Unit
    - Decimal

- **Density**: The user can adjust the following parameters:
    - Unit
    - Decimal

- **Digital Output**: The user can adjust the following parameters:
    - Function
    - Unit
    - Pulse Factor
    - Pulse Direction
    - Pulse Duration
    - Output Polarity

- **Status**: The user can adjust the following parameters:
    - Activation
    - Status Items
    - Flow Direction
    - Flow Value Settings
    - Overflow
    - Low Flow
    - Low conductivity
    - Total Positive Adjustment
    - Total Negative Adjustment

The user can easily change parameters by selecting the desire option from the Quick settings tab. Use the up and down arrow keys to navigate and Enter button to access the menu.

2) Display

Figure 11: Display settings

This tab contains the following options:

• Contrast
• Home Page
• Page 1
• Graphic Page
• Graphic Width
• Backlight

The user can adjust the screen contrast via the Contrast option. Changes to the home page layout are available thought the home page option. Page 1 option allows adjustment of row positions, graphics sizes, and another layout settings. Users can easily make these adjustments by selecting the desired option. Use the up and down arrow buttons to navigate and the enter button to access the menu.

3) Alarm Outputs

Under the Status and Alarm headings, the following options are available:

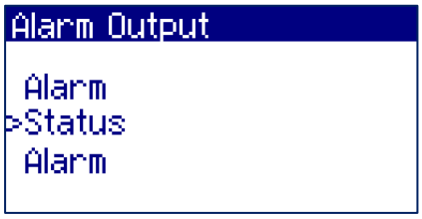

Figure 12: Alarm Settings

- **Status**

The user can modify the following parameters:

- o Activation
- o Status Items
- o Flow Direction
- o Flow Value Settings
- o Overflow
- o Under Flow
- o Lower Resistance
- o Total Positive Adjustment
- o Total Negative Adjustment

- **Alarm**

The user can modify the following parameters:

- o Activation
- o Flow Direction
- o Flow Value Settings
- o Overflow
- o Under Flow
- o Lower Resistance
- o Total Negative Adjustment
- o System Alarm

System Alarm: This heading includes the following options:

- o Coil Alarm
- o Measurement Alarm

The user can select the desired parameter under the Status and Alarm headings for adjustment. Use the up and down arrow buttons to navigate and the Enter button to access the menu.

4) Alarm Records

This heading includes the options "Delete Records" and "Configuration":

Figure 13: Alarm Records

- **Delete Records:** The user can clear log records from this section.
- **Configuration:** The user can adjust the following parameters:

    a. Sensor Fault
    b. Coil Fault
    c. Empty Pipe

To adjust settings, navigate to the ‘Delete Record’ or ‘Configuration’ headings and select the desired parameter. Use the up and down arrow buttons to move through the options and press the enter button to open the selected menu.

5) Communication

Under the Communication heading, the following options are available:

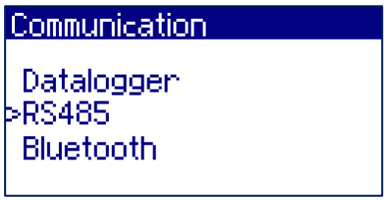

Figure 14: Communication Settings

- **RS485**

The user can modify the following parameters:

- Address
- Baud Rate
- Parity
- Stop Bit

- **Bluetooth**
  The user can modify the following parameters:
  - Activation
  - Information

- **Wi-Fi**
  The user can modify the following parameters:
  - Information
  - QR Code
  - Mode Station
    - Network List
    - AP Name
    - Password
  - Access Point (AP)
    - AP Name
    - Password
  - Network
    - IP Mode
    - IP Address
    - Gateway
    - Subnet Mask
    - TCP Port

- **Datalogger**

The user can modify the following parameters:

- Activation
- Server Address
- Server Port
- Recording Interval

The user can choose a parameter from the communication section to adjust. Navigate using the up and down arrows, and press Enter to access the menu.

6) Factory Settings

WARNING: *This section is restricted to authorized service personnel only. Any adjustments made by the user in this section will void the device's warranty.*

4. INSTALLATION AND COMMISSIONING

4.1. Installation Instructions

- **Preparing the Installation Area:** Ensure the area where the device will be mounted is clean, dry, and vibration-free. The mounting surface must sturdy enough enough to support the weight of the device.
- **Check Connection Points:** Ensure that the piping and electrical connections comply with the device's connection standards.
- **Things to Consider During Installation:**
    - The flow direction of the device is indicated by an arrow. Ensure that this direction matches the flow direction in the piping.
        - Check that all seals are in place and correctly installed**.**

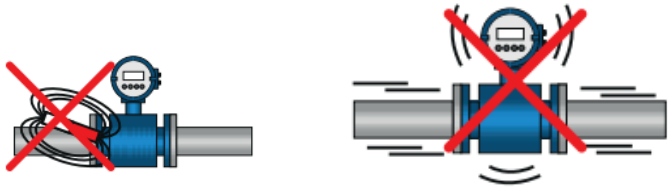

Figure 15: Installation Instructions

4.2. Commissioning Procedure

- **Power Connection**: The device's power source must comply with the voltage and frequency ranges specified on the label on the machine.

- **Initial Tests:**

    - When the device receives power, an automatic system check will be performed. During this process, you may see written messages on the screen.
    - After the system checks itself, it will start measuring.
- **Calibration**: After installation, check the device's calibration settings and adjust them to the appropriate values if necessary.

- **Error Conditions**: If any error messages appear, refer to the troubleshooting section of the manual for details.

5. INSTALLATION INSTRUCTIONS

5.1. Preparation

- When you are the preparing the flowmeter before installation, clean the installation area of the device and ensure the piping is compatible.
- If necessary, clean the piping to remove any sediment or debris.

5.2. Position Selection

- **Horizontal Installation**: The device should be installed so that the electrode plane is horizontal. This minimizes the negative effects of air bubbles.
- **Vertical Installation:** The device should be installed with the flow direction upwards. This prevents the accumulation of solid sediments in the device.

WARNING *The flow direction is indicated by an arrow on the device. Ensure the correct direction for proper installation.*

5.3 Installation Types

5.3.1. T-shaped Pipe Installation

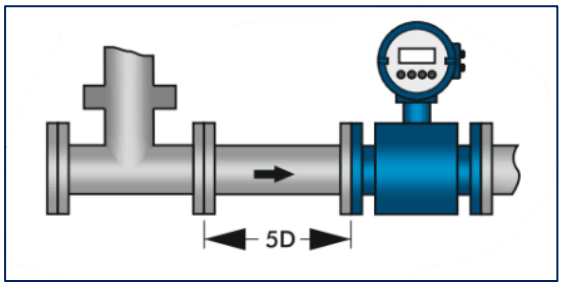

Figure 16: T-shaped Pipe Installation

In this type of installation, it is essential to ensure that the flow in the pipeline is continuous and linear for the device to function properly. Therefore, a 5D distance should be left at the inlet of the device and a 3D distance at the outlet. This ensures stable flow and accurate measurements by the device. Additionally, to prevent vibration in the pipeline, the mounting points should be securely fixed.

5.3.2. 90° Elbow Installation

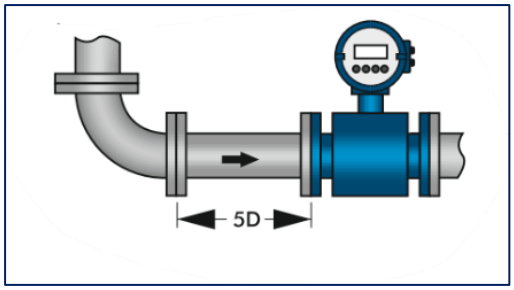

Figure 17: 90° Elbow Installation

In elbow connections, turbulence may occur due to the change in flow direction. To minimize this turbulence, the device should be installed at least 5D away from the elbow. This distance is sufficient to stabilize the flow and increase measurement accuracy

5.3.3. Expansion Pipe

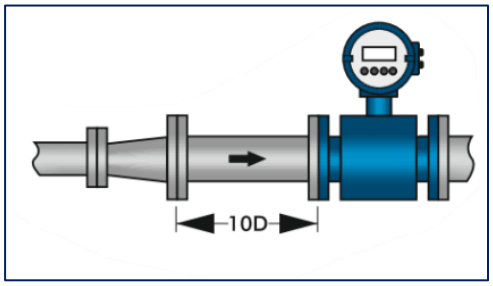

Figure 18: Expansion Pipe

At points in the piping where expansion occurs, the flow requires a longer distance to stabilize. Therefore, if the device is installed immediately after an expansion pipe, there should be at least 10D distance between the device and the expansion point. This prevents turbulence and irregularities that could affect the device’s accuracy.

5.3.4. Various Valves

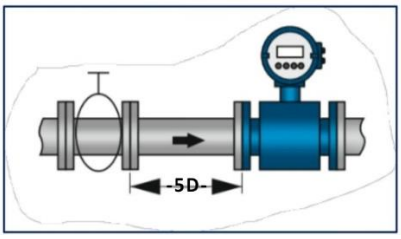

Figure 19: Various Valves

Flow disturbances occurring immediately after valves can negatively affect measurement accuracy. Therefore, at least 5D distance should be left between the valve and the device for correct operation. A minimum of 3D distance should be maintained at the device's outlet. These rules are critical to ensure the device's precision and long-term durability.

5.3.5 Curved Pipes Installation

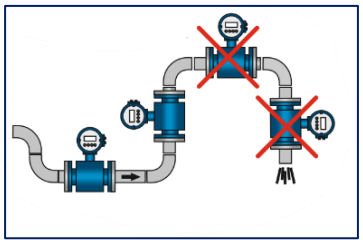

Figure 20: Curved Pipes Installation

If there are bends in the piping, the turbulence caused by the slopes should not affect the device. Therefore, the device should be installed at least 10D away from the bends. Also, ensure the device is properly aligned during installation.

5.3.6. Pipes Not Fully Filled

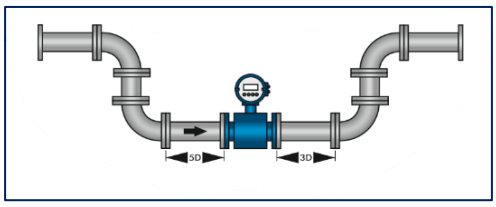

Figure 21:Pires Not Fully Filled:

Electromagnetic flowmeters can only measure accurately when the piping is fully filled. If the pipe is not completely full, measurement errors may occur. Therefore, ensure the piping is at full capacity when the device is installed, and check for proper fill levels.

5.3.7 Open-ended Piping Installation

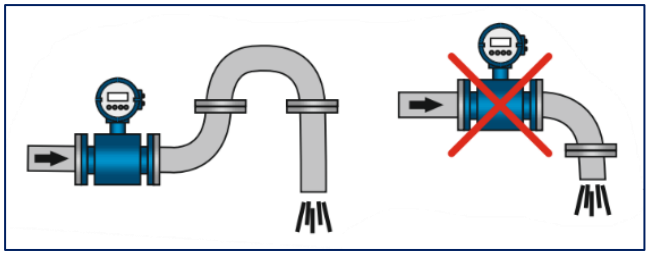

Figure 22: Open-ended Piping Installation

In open-ended pipes, the device should be installed at a point where the pipe is fully filled. To ensure stable flow, leave enough distance at the outlet of the device. This prevents turbulence and ensures accurate measurements.

5.3.8. Valves Fully Open

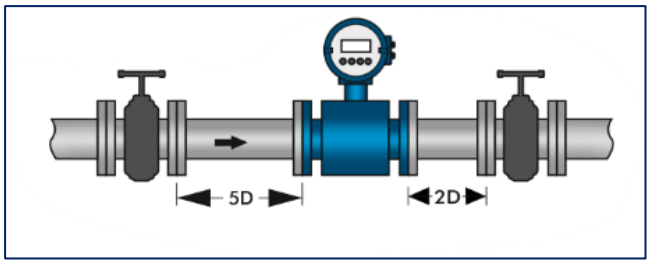

Figure 23: Valves Fully Open

Valves located in the piping where the device is installed should be fully open during measurement. Partially closed valves can cause turbulence in the flow, which will decrease measurement accuracy.

***NOTE** For installation visuals, refer to the relevant diagrams.*

5.4. Connections

- Connect the device's flanges tightly using appropriate seals. Ensure the flanges are properly aligned and sealed.
- Connect the electrical wires according to the manual. Ensure the wire ends are placed in the correct terminals and the connections are tight. It's important to ensure that wire ends are not oxidized and are clean during electrical connections

***WARNING** The device should be de-energized when making electrical connections. Always turn off the power source before making electrical connections to prevent accidents.*

5.5 Grounding

- Ensure the grounding line is solid and free from sources of interference. Grounding is crucial for the correct operation of the electromagnetic flowmeter and electrical safety.
- When grounding, connect an appropriate cable to the device's grounding terminal and connect it to the system's general grounding line.
- If the device is used in areas with high interference sources, it is recommended to use shielded cables and ensure the cable shields are properly grounded.
- The grounding cable must be connected to a copper plate with an area larger than 1.6 mm^2 and a resistance of less than 10 Ω to the PE terminal.

5.6 Check

- Check all connections and installations. Ensure the connection points are tight and properly sealed.
- The flow direction of the device is indicated by an arrow; please verify that this direction is correct. Incorrect flow direction may cause the device to display negative values, and if the parameters related to this issue are not properly adjusted, it could result in errors in the output parameters.
- When checking the electrical connections, ensure that the supply voltage matches the values specified in the device's technical specifications. Also, check the cable connections for risks of over-tension or loosening.

6. CONNECTION INSTRUCTIONS

6.1. Connection Diagram

When making electrical connections, follow these steps:

Power and Signal Cables: Power and signal cables must be placed correctly into the terminal block on the device. The markings on the terminal block indicate which cable should be connected to which terminal.

FIELDBUS Systems: If the device is connected to a FIELDBUS network, ensure that the additional terminals are correctly connected. Incorrect FIELDBUS connections can lead to communication issues.

Connection Check: Ensure that all cables are tightly connected to the terminal and that the wire ends are clean and free of oxidation.

The terminal block can be seen when the converter's rear cover is removed.

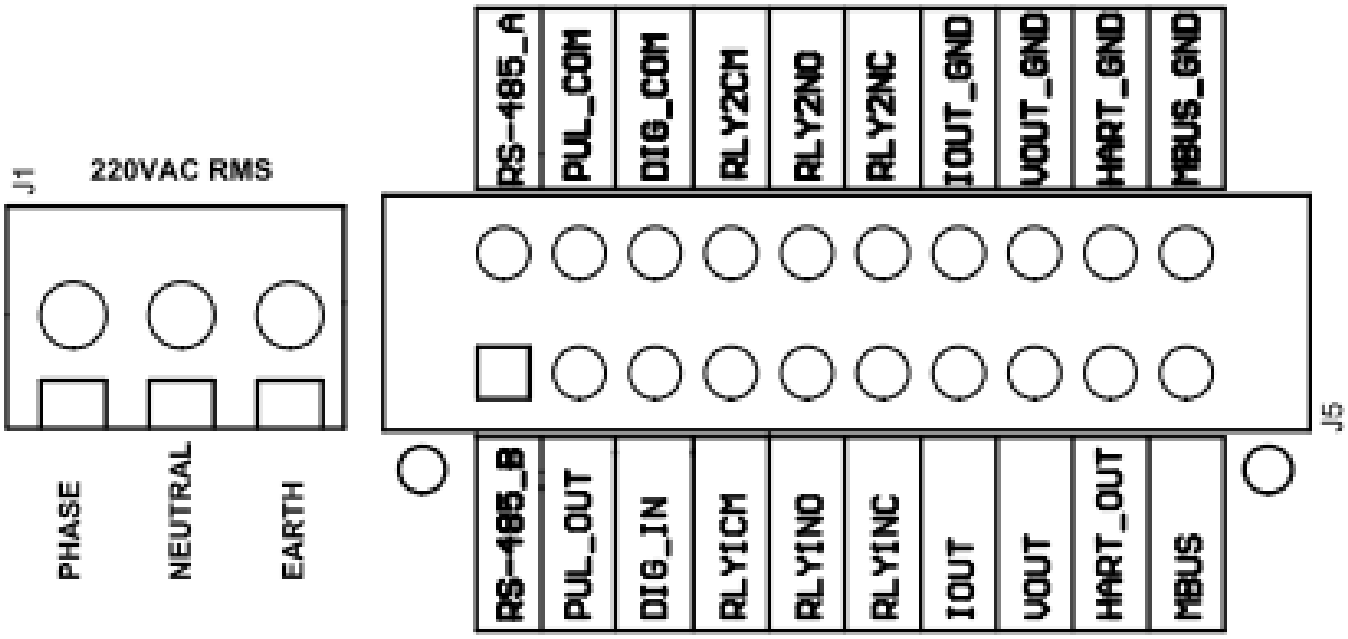

Figure 24: connection cable terminal

Symbols and descriptions of connections:

Table 3: Connection Cable Terminal

PHASE	85-264VAC Power Supply
NEUTRAL	85-264VAC Power Supply
EARTH	Earth
VOUT: (+)	0V-10V,0V-5V Output Voltage (Positive)
VOUT_GND:	Output Voltage (Grounded)
RS-485_A:	RS485 A Communication Input Signal
RS-485_B:	RS485 B Communication Input Signal
HART_OUT	HART Communication Signal
HART_GND	HART Communication Signal Grounding
MBUS	MODBUS Communication Signal.
MBUS_GND	MODBUS Communication Signal Grounding
IOUT:	4~20mA, 0-24mA,0-20mA Output Current (Positive)
IOUT_GND:	4~20mA, 0-24mA, 0-20mA Output Current (Grounded)

PUL_OUT	Pulse Output
PUL_COM	Common Connection of Pulse Output
RLY1CM	Common Connection Point of Relay 1
RLY1NC	Normally Closed Contact Connection of Relay 1
RLY1NO	Normally Open Contact Connection of Relay 1
RLY2CM	Common Connection Point of Relay 2.
RLY2NC	Normally Closed Contact Connection of Relay 2
RLY2NO	Normally Open Contact Connection of Relay 2
DIG_IN	Digital Input
DIG_COM	Digital Grounded

6.1.1. MODBUS Communication Connection

MODBUS communication supports the RS485 standard, and the cable connection is depicted below. In an RS485 network, termination with a 120 Ω resistor is typically required at each end of the communication line to prevent signal reflection. Only one terminal resistor should be used per device, such as a USB to RS485 converter, Flowmeter. However, this feature can be modified using a selectable resistor if needed.

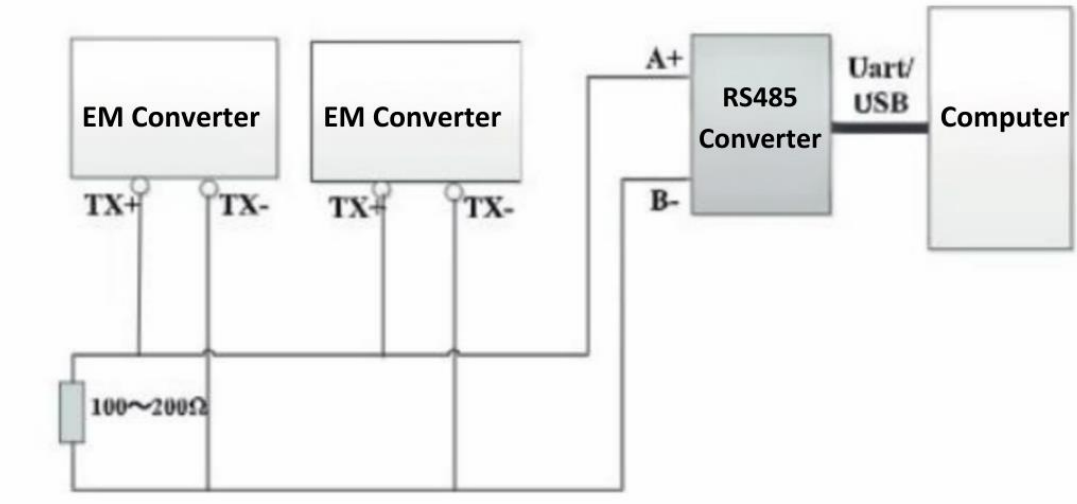

Figure 25 : MODBUS Communication Connection

Table 4 MODBUS Adress Table

Data Name	Adres (HEX)	Adres (Decimal)	Len	Data Type
Flow	0X0019	25	2	Float
Total Positive	0X001B	27	2	Int32
Total Negative	0X001F	31	2	Int32
Total Net	0X0023	35	2	Int32
Empty Pipe	0X0016	22	1	Uint16

6.1.2. HART Communication Connection

The HART communication cable connection is shown below.

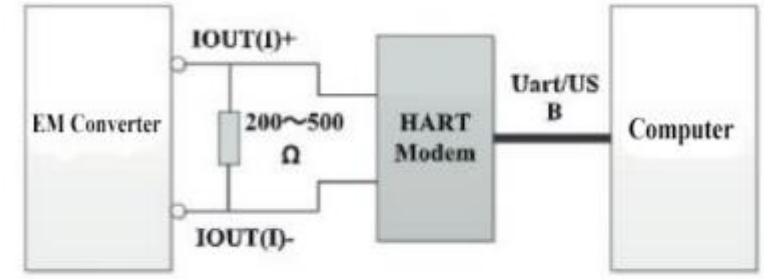

Figure 26: HART Communication Connection

6.1.3. Wi-Fi Communication Connection

The user can connect to the device via Wi-Fi by using the QR code. The QR code generated by the device provides the connection details quickly and easily. Below are the steps to connect:

1. Scan the QR Code.
2. Scan the QR code generated by the device using a QR code reader.

After scanning the QR code, the device's connection details will appear on your screen. Confirm the connection to communicate with the device quickly.

Additionally, the default password provided for the device's Wi-Fi connection is 123456789. You can connect using this password.

Figure 27: QR Code

6.1.4. BLUETOOTH Communication Connection

The device is equipped with Bluetooth connectivity. For more detailed information and step-by-step instructions, please refer to the ENELSAN application manual.

WARNING *Incorrect electrical connections can damage the device. Every stage of the electrical connection process must be done carefully. Connecting to the wrong terminals, especially, can permanently damage the device.*

7. POST-CONNECTION CHECK

- Are the cables or devices damaged (visual inspection)?
- Is the supply voltage consistent with the information on the nameplate?
- Do the cables used meet the necessary technical specifications?
- Are the installed cables properly routed, ensuring sufficient voltage dissipation and safety?
- Is the cable route fully isolated without loops and crossings?
- Are all terminal screws tightly secured?
- Have all measures for grounding and potential balancing been correctly applied?
- Are all cable entries installed, tightened, and properly sealed?
- Are the cables routed in loops as “water-resistant”?
- Have all housing covers been installed and securely tightened? For devices with FIELDBUS communication:
- Are all connection components (T-junction boxes, connection boxes, connectors, etc.) correctly connected?
- Is each FIELDBUS segment terminated with a bus terminator at both ends?
- Has the maximum length of the FIELDBUS cable been observed according to the technical specifications?
- Is the FIELDBUS cable fully shielded and properly grounded?

8. HARDWARE SETTINGS

To ensure the device operates correctly, the following hardware settings are recommended:

8.1. Calibration and Sensor Settings

- **Zero Calibration**: After the initial installation, adjust the device's zero point. This is crucial for accurate measurements.
- **Sensitivity Level**: Adjust the sensor's sensitivity according to the properties of the liquid being measured. For example, more sensitivity may be required for liquids with low conductivity.

8.2. Power and Output Settings

Supply Voltage: Ensure the device's supply voltage is within the range specified by the factory. Low or high voltage may affect the device's performance.
Current Output: There are three selectable current outputs; 4~20mA, 0~20mA and 0~24mA**.**
When 4~20mA output is selected, it can drive a 600Ω resistor.
The current output wiring is shown below:

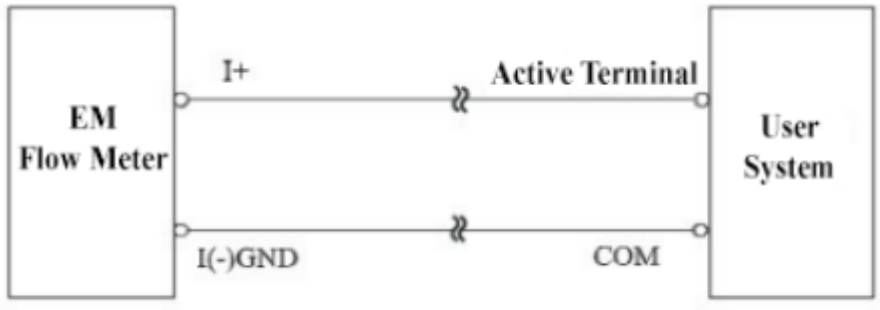

Figure 28: current Output cable connection

8.3. Alarm Parameters

Error Codes:

Table 5 : Alarm Error Codes

F01:	Power Failure or Power Off Alarm
F02:	Power On or Power Connected Alarm
F03:	Empty Pipe Alarm
F05:	Coil Fault Alarm
F06:	Sensor Fault Alarm
F07:	Current Output Loop Error
F08:	Incorrect Set Value
F09:	Current Output Range Alarm
F10:	Pulse Output Width Alarm
F11:	Low Conductivity Alarm
F12:	Analog Processor Fault
F13:	Log Reset Alarm
F14:	Unstable Flow Alarm

8.3.1. F01 Power Failure or Power Off Alarm

This alarm indicates that the device's power source has been cut off or the device has been completely powered off. When there is an interruption or fault in the electrical connection, this alarm is triggered. Ensure the power source is functioning properly and check the connections.

8.3.2. F02 Power on or Power Connected Alarm

This alarm indicates that the device is connected to the power source or has been powered on. This alarm is activated when the power connection is properly established, and the device is active. If the device is off, ensure that the power source is correctly connected.

8.3.3. F03 Empty Pipe Alarm

Empty Pipe Active/Inactive: The converter can detect the empty pipe condition thanks to its features. If the pipe is empty during the alarm, the analog and digital outputs will be set to zero, and the flow display will also show zero.

1. Ensure that the electrode signal cables are correctly connected.
2. Make sure the flow tube (sensor) is fully filled.

3. Temporarily short-circuit Electrode 1, Electrode 2, and Body Ground terminals. If the empty pipe alarm does not appear, the converter is not faulty. Contaminated electrodes, low liquid conductivity, or an incorrect empty pipe coefficient may be the issue. Gradually increase the empty pipe coefficient until the alarm ceases.

4. Check that the electrode terminals are in good condition. Ensure that the resistance between Electrode 1, Body Ground and Electrode 2, Body Ground is less than 50 kΩ during measurement.

8.3.4. F05 Coil Fault Alarm

This alarm indicates a malfunction of the electrical coil within the device potentially due to damage or connection issues. To address this, examine the coil connection and assess the coil's operating conditions. Replacement may be necessary if defects are found.

8.3.5. F06 Sensor Fault Alarm

This alarm is activated when the device's sensors are not functioning properly. There may be connection issues, calibration errors, or faults in the sensors. Check the sensors and confirm they are operating correctly.

A) Sensor Triggering Error

1. Check the sensor triggering cable connections.
2. Verify the accuracy of the sensor electrode wiring.
3. If there is no issue in steps 1 and 2, the converter may be faulty. Contact the manufacturer.

B) Flow Measurement Permission Error

1. Check the grounding connection.
2. Ensure the sensor signal cables are correctly connected.
3. Make sure the line is completely full.
4. Check the sensor diameter and coefficient parameter settings.

8.3.6. F07 Current Output Loop Error

This alarm indicates an issue with the current output loop of the device. If an error occurs during the current output, this alarm will be triggered. Check the current output circuit and ensure the system is working properly.

8.3.7. F08 Incorrect Set Value

This alarm indicates that the settings in the device are incorrect or incompatible. Ensure that any changes made to the settings are correct and check the parameters again. Incorrect settings can cause the device to malfunction.

8.3.8. F09 Current Output Range Alarm

This alarm is activated when there is a discrepancy or abnormality in the current output scale. Ensure that the current output scale settings are correct.

8.3.9. F10 Pulse Output Width Alarm

This alarm is triggered when there is an issue with the pulse output width settings. Ensure that the pulse width settings for the device's output are correctly configured.

8.3.10. F11 Low Conductivity Alarm

This alarm is triggered when the measured conductivity falls below normal values. Low conductivity may indicate a problem with the system and should be checked.

8.3.11. F12 Analog Processor Fault

This alarm is triggered when an error occurs in the analog processor. The processor's

8.3.12. F14 Unstable Flow Alarm

This alarm is activated when there are irregularities or instability in the flow values. The system must be checked to stabilize the flow.

9. SOFTWARE SETTINGS

To ensure the device operates at maximum efficiency, the following software settings are recommended:

9.1. Initial Configuration

User Logins: When logging into the device's software, information such as the username and password must be entered.

A 4-tier password protection system prevents unauthorized setting changes. Passwords at viewer, user, and expert levels are for user, while the service-level password is for the manufacturer. Users with the service-level password can alter passwords at viewer, user, and expert levels. The password tiers and the parameters users can modify based on their access level. Please see the levels listed below:

Table 6: Password Level

User Password Level	Access Rights	Password Nature	Predefined Password
Viewer	Users can view the listed menu parameters but cannot change them	Can not Change	00000
User	Users can view and change the listed menu parameters.	Can Change	
Expert	Users can view and change the listed menu parameters.	Can Change	
Service	The manufacturer password can access all menus and change all settings.	Can Change	

NOTE: *Contact the support team to obtain your initial password.*

WARNING: *The password cannot be recovered from the device menu if forgotten.*

Senior staff should have the service-level password. The expert-level password resets total flow. Viewer and user passwords are assigned to authorized users.

Viewer Password: This is the first-level password. Users logged in with this password can only view parameters and cannot make changes.

User Password: This is the second-level password. Users with this password can view and modify parameters.

9.2 Measurement Parameters

• **Flow Range**: The upper limit value of the flow range is set, and the lower limit is automatically set to "0". Therefore, the flow range value is used as the range for percentage flow, frequency output, and current output.

- **Percentage Flow** = (Measurement Value / Flow Range) * 100%.
- **Frequency Output** = (Measurement Value / Flow Range) * Frequency Range.
- **Current Output** = (Measurement Value / Flow Range) * Current Upper Scale + Zero Current.

NOTE: *Pulse output is not affected by this parameter.*

• **Balancing Time**: Adjust the measurement balancing time to minimize fluctuations in measurements due to sudden flow changes.

Flow Direction: The flow direction parameter is used to select the flow direction allowed by the converter. There are three options available: Forward Flow, Reverse Flow, and Measurement Mode Off.

1. **Forward Flow**: Only positive flow is measured (flow > 0.0); if the flow is negative, the positive and negative total values are not added, and both frequencies.

2. **Reverse Flow**: Only negative flow is measured (flow < 0.0); if the flow is positive, the totals are not combined, and both frequencies.

Current Output Mode: The flow meter converter has 3 current output modes: 04mA-20mA, 0mA-20mA, or 0mA-24mA

Pulse Coefficient: The pulse coefficient refers to the number of pulses corresponding to one unit of flow and can be adjusted between 0.001 and 1000.0.

Pulse Width: The pulse width refers to the width of the pulse's peak and can be adjusted between 0.1 ms and 1000.000 ms.
Frequency Range: The frequency range parameter represents the maximum frequency or pulse value. The unit of this parameter selection is Hz

9.3. Data Transfer Settings

• **Connection Protocols**: Configure communication protocols such as MODBUS, Profibus, or other protocols through the software interface.

- **MODBUS Addressing**: The electromagnetic flow converter supports RS485 MODBUS RTU serial communication. The selectable range is from 1 to 247, with the default address being 1.

- **MODBUS Baud Rate**: 1200, 2400, 4800, 9600, 19200, 38400 bps, with the default value set to 19200 bps.

- **MODBUS Parity**: Used to set the parity bit for serial ports in MODBUS communication: None (No Control), Odd (Odd Control), Even (Even Control). The default value is None (No Control).

- **MODBUS Stop Bit**: Used to select the stop bit in MODBUS serial communication: 1 or 2 bits. The default value is 1 bit.

• **Memory Data Upload**: Portable external memory is used for importing and exporting device parameters.
By inserting the external memory into the new device, users can recover old settings and continue using the flow meter without changing settings.

Table 7: Electromagnetic Converter Parameters

Parameter Name	**Adjustment Method**	**Parameter Range**	**Defined Value**
QUICK SETTINGS			
Language	Selectable	English, Turkish	Turkish
Analog Output Measurement Options	Selectable	Flow, % Ratio, Conductivity	Flow
Analog Output Measurement Mode	Selectable	Forward/Backward, Forward, backward	Forward/Backward
Analog Output Flow Unit	Selectable	M^3/s, L/s, L/m, L/h, Lb/h, Lb/m, Lb/s, t/h, t/m, t/s, Kg/h, Kg/m, Kg/s, Gal/h, Gal/s, Ugal/h, Ugal/m, Ugal/s, Ft^3/h, Ft^3/m, Ft^3/s,	L/s
Analog Output Scale	Enter Value	1.000~999999.000	1.00000
Analog Output Mode	Selectable	0V-10V, 0V-5V, 4mA-20mA,0mA-20mA 0mA-24mA	4-20mA
Total Decimal Unit	Selectable	X.XX, X.XXX, X.XXXX, X.XXXXX	X.XXX
Analog Output Low Setting	Enter Value		0.00000
Analog Output High Setting	Enter Value		0.00000
Flow Unit	Selectable	m^3/h, m^3/m, m^3/s, L/s, L/m, L/h, Lb/h, Lb/m, Lb/s, t/h, t/m, t/s, Kg/h, Kg/m, Kg/s, Gal/h, Gal/m, Gal/s, Ugal/h, Ugal/m, Ugal/s, Ft^3/h, Ft^3/m, Ft^3/s	m^3/h
Flow Decimal	Selectable	X, X.XX, X.XXX, X.XXXX, X.XXXXX	X.XX
Flow Direction	Selectable	Forward, backward	Forward
Low Flow Filter Value Activation	Selectable	ACTIVE/PASSIVE	PASSIVE
Flow Maximum	Enter Value	0.000~1000.000	360.00000 m^3/h
Flow Damping	Enter Value	1~1000	30 s
Kalman Filter	Selectable	ACTIVE/PASSIVE	ACTIVE
Density Value	Enter Value		1.00000
Density Unit	Selectable	Kg/m^3, gr/cm^3	Kg/m3
Digital Output Function	Selectable	Off, Pulse, Frequency	OFF
Digital Output Unit	Selectable	M3, L, Kg, Lb, t, Gal, Ugal, Ft^3	L
Pulse Direction	Selectable	Negative, Positive, Net	Net
Pulse Factor	Selectable	10L, 1L, 100cc, 10cc, 1cc,	1L
Pulse Width	Enter Value	0.100~1000.000	2.00000ms
Digital Output Polarity	Selectable	High, Low	Low

Status Activation	Selectable	On- OFF	OFF
Status Options	Selectable	Off, Empty Pipe, Coil Alarm, No Current Loop	OFF
Flow Direction	Selectable	Off, Forward, backward	OFF
Flow Value Set	Enter Value	0.000~1000.000	0.0000m^3/h
High Flow	Enter Value	0~1000	0
Low Flow	Enter Value	0~1000	0
Low Conductivity	Enter Value	0.000~1000.000	0.00000uS
SCREEN			
Contrast	Enter Value	3~5	4
Main Screen	Selectable	1 Line, 2 Lines, 3 Lines	1 Lines
Page 1	Selectable	1 Lines, 2 Lines, 3 Lines, 4 Lines, 5 Lines	1 Lines
Graph Page	Selectable	ACTIVE/PASSIVE	ACTIVE
Graph Period	Enter Value	1~120	1
Backlight	Selectable	ACTIVE/PASSIVE	ACTIVE
OUTPUT			
Analog Output Measurement Options	Selectable	Flow, % Ratio, Conductivity	Flow
Analog Output Measurement Unit	Selectable	M^3/s, L/s,L/m, L/h, Lb/h, Lb/m, Lb/s, t/h, t/m, t/s Kg/h, Kg/m, Kg/s, Gal/h, Gal/m, Gal/s, Ugal/h, Ugal/m, Ugal/s, Ugal/h, Ft^3/h, Ft^3/m, Ft^3/s	L/s
Analog Output Scale	Enter Value	1.000~999999.000	1.00000
Digital Output Polarity	Selectable	High, Low	LOW
Digital Output Function	Selectable	Off, Pulse, Frequency	PULSE
Digital Output Unit	Selectable	m^3, L, Kg, Lb, t, Gal, Ugal Ft	L
Digital Output Pulse Factor	Selectable	10L, 1L, 100cc, 10cc, 1cc,	1L
Digital Output Pulse Direction	Selectable	Negative, Net	Net
Digital Output Pulse Width	Enter Value	0.100~1000.000	2.00000ms
ALARM			
Activation	Selectable	On, Off	OFF
System Alarm			
Coil Alarm	Selectable	ACTIVE/PASSIVE	PASSIVE
Converter Alarm	Selectable	ACTIVE/PASSIVE	PASSIVE
Flow Direction	Selectable	On, Off	OFF
High Flow	Enter Value	0~100	0
Low Flow	Enter Value	0~100	0
Low Conductivity	Enter Value	0.000~1000.000	0.00000uS
ALARM RECORD			
Configuration			
Empty Pipe	Selectable	On, Off	ON
Coil Alarm	Selectable	On, Off	ON

Electrode Alarm	Selectable	On, Off	ON
Control Input	Selectable	Off, Total Clear, Clear Errors, Flow Reading	OFF
COMMUNICATION			
RS485			
Adres	Enter Value	1~247	1
Baud Rate	Selectable	Automatic, 4800, 9600, 19200, 38400,57600, 115200,	19200
Parity	Selectable	None, Even, Odd	None
Stop Bit	Selectable	0.5, 1, 1.5, 2,	1
Bluetooth			
Activation	Selectable	On/off	On
Mode	Selectable	Station, AP, off	AP

9.4. Software Update

Follow the steps below to update the device's software:

1. Enter the device menu and check the current software version.
2. **Update methods:** USB, Wi-Fi, or MODBUS upload.

WARNING: *Take precautions against power interruptions during the update process.*

10. ADDITIONAL INFORMATION

Choosing the appropriate product for industrial applications is crucial to ensuring both process efficiency and accuracy. Incorrect product choices can lead to errors, with studies showing that up to%70 of issues arise from wrong selection and installation mishaps. Consequently, it's essential to focus on these key factors:

10.1. Tips for Correct Product Selection

In industrial settings, selecting the correct product is vital. The selection can be made accurately by considering the fallowing information:

1) Fluid Properties:

a. The name and chemical properties of the fluid should be determined in detail.

b. The minimum, maximum, and normal flow rate (or speed) of the fluid should be evaluated.

c. The temperature and pressure ranges in which the fluid will operate must be compatible with the device's tolerances.

2) Pipeline Conditions:

a. Verify if the pipeline is operating under vacuum. If so, ensure that the chosen devices are designed for vacuum conditions.

b. Minimize vibration, impact, and mechanical stress that could cause disturbance. It is well-established that vibrations can significantly affect devices.

3) Installation Rules:

a. Magnetic fields can affect the measurement accuracy of the device, so during installation, the device should be kept away from these fields.

b. Secure the device’s connections, particularly in vertical setups, to ensure the fluid flows upward properly.

c. Ensure the pipelines are compatible full where the device is installed; air bubbles or low filling can cause errors.

Important considerations for Installation and Use:

- Protect the device from vibrations and impact
- Keep it away from strong magnetic fields.
- Follow installation instruction closely, using the catalogs provided for reference.

11. COMMON MISTAKES AND SOLUTION RECOMMENDATIONS

11.1. No Display on the Screen

1. Verify the power connection.
2. Inspect the power fuse.
3. Confirm the power voltage.

11.2. Empty Pipe Alarm

1. Ensure that the electrode signal cables are correctly connected.
2. Make sure the flow tube (sensor) is fully filled.
3. Temporarily short-circuit Electrode 1, Electrode 2, and Body Ground terminals. If the empty pipe alarm does not appear, the converter is not faulty. Contaminated electrodes, low liquid conductivity, or an incorrect empty pipe coefficient may be the issue. Gradually increase the empty pipe coefficient until the alarm ceases.
4. Check that the electrode terminals are in good condition. Ensure that the resistance between Electrode 1, Body Ground and Electrode 2, Body Ground is less than 50 kΩ during measurement.

11.3. Flow Measurement Permission Error

1. Check the grounding connection.
2. Ensure the sensor signal cables are correctly connected.
3. Make sure the line is completely full.
4. Verify the sensor's diameter and coefficient parameter settings.

11.4. Sensor Integrity Check

Measure the yellow and green cables with a multimeter set to the ohm position. The resistance should be between 45 and 80 ohms. If you measure higher resistance values or an open circuit, there may be a winding fault. ***Contact the manufacturer.***

Check between the yellow and green cables and the sensor chassis using the multimeter in the ohm position. An open circuit should appear. If a resistance value is present, there's leakage between the winding and the chassis. Liquid might have entered the sensor. ***In this case, contact the manufacturer.***

If the line is empty or the sensor is detached, measure the electrode cables with a multimeter in ohms. An open circuit should appear. If it does not, the electrodes might be broken. Liquid might have penetrated the sensor. ***Contact the manufacturer***

12. Appendix: Flow Rate and Verification Table

Table 8: Flow Rate and Verification Table

DN (mm)	ÇAP	MİN DEBİ(m3/h)	MAX DEBİ (m3/h)	HASSSAS ÖLÇÜM ARALIĞI
DN15	1/2''	0.18	8.5	0.6-1.8
DN20	3/4''	0.35	15	1.2-3.2
DN25	1''	0.6	22	1.8-4.8
DN32	11/4''	0.85	35	2.8-8.0
DN40	11/2''	1.3	55	4.2-15.0
DN50	2''	2.2	85	6.8-22.0
DN65	21/2''	3.6	150	13-32
DN80	3''	5.5	210	18-48
DN100	4''	8.5	320	28-48
DN125	5''	13	550	42-130
DN150	6''	18	750	58-180
DN200	8''	32	1500	120-320
DN250	10.	52	2020	180-480
DN300	12.	78	3010	250-700
DN350	14''	100	4010	350-900
DN400	16''	140	5050	440-1400
DN500	20''	220	7880	650-2000
DN600	24''	300	10030	950-2800
DN700	28''	420	18000	1500-3500
DN800	32''	550	22000	1800-4800
DN900	36''	700	28000	2400-6000
DN1000	40''	850	32000	2800-8000
DN1200	48''	1200	48000	3800-14000
DN1400	56''	1600	58000	5000-16000
DN1600	64''	2200	88000	6500-22000

13. TECHNICAL SUPPORT

For any questions or issues, you can contact the ENELSAN technical support team:

- Telephone: +90 216 599 01 23/ +90 530 051 25 49
- E-Posta: servis@enelsan.com
- Web: https://www.enelsan.com/
- Working Hours: Monday-Friday/ 08.00-18.00

WARNING: *Have your product serial number available when contracting technical support.*

Please ensure you read this manual thoroughly and adhere to the installation and usage guidelines. Following these instructions carefully will help maximize the lifespan of your device.