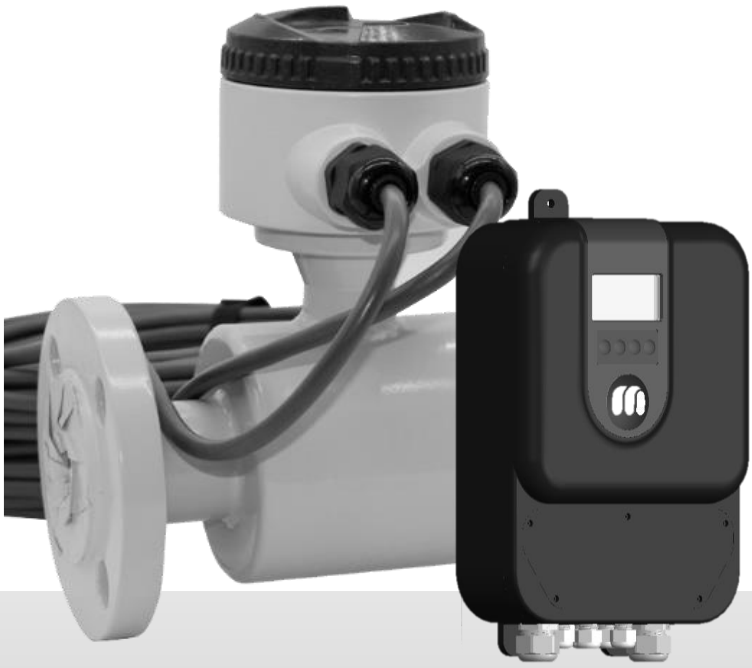
| INSTALLATION & OPERATION MANUAL

# MEF 2100
# Inline Electromagnetic Flow Meter



MIAL® INSTRUMENTS PVT.LTD.
*Measuring & Beyond*

www.mialinstruments.com

# MEF 2100
# Inline Electromagnetic Flow Meter

## Preface

- Thank you for purchasing our product.
- This manual is about the various functions of the product, wiring methods, setting methods, operating methods, troubleshooting methods, etc.
- Please read this manual carefully before operation, use this product correctly to avoid unnecessary losses due to incorrect operation.
- After you finish reading, please keep it in a place where it can be easily accessed at any time for reference during operation.

*NOTE!*
*Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading. We try our best to guarantee that the manual content is accurate, if you find something wrong or incorrect, please contact us. The content of this manual is strictly prohibited from reprinting or copying.*

## About this manual

- Please submit this manual to the operator for reading.
- Please read the operation manual carefully before installing the instrument. On the precondition of full understanding.
- This manual only describes the functions of the product. The MIAL Instruments pvt.ltd. does not guarantee that the product will be suitable for a particular application.

## Warnings and symbols used

*HAZARD!*
*If not taken with appropriate precautions, will result in serious personal injury, product damage or major property damage.*

*WARNING!*
*Pay special attention to the important information linked to product or particular part in the operation Manual*

*CAUTION!*
*Disregarding these instructions can result in damage to the device or to parts of the operator's plant.*

*INFORMATION!*
*These instructions contain important information for the handling of the device.*

## Table of Contents

# 1. INTRODUCTION

## 1.1 PURPOSE OF THE MANUAL

Overview:
Welcome to the user manual for the Mial MEF 2100 - Electromagnetic Flowmeter. This comprehensive guide is designed to assist operators, maintenance personnel, and system integrators in understanding, installing, operating, and maintaining the Mial MEF 2100 - Electromagnetic flow meter effectively.

Objectives:
Clarification of Functionality: This manual aims to provide a clear understanding of the principles and functionality of the Mial MEF 2100 - Electromagnetic Flowmeter. Users will gain insights into its design, components, and how it precisely measures fluid flow.

Guidance for Installation:
Step-by-step instructions and considerations for proper installation are provided to ensure optimal performance. Safety precautions are emphasized to create a secure working environment.

Training and Familiarization:
Users will be guided through the features, controls, and indicators of the flow meter, facilitating efficient operation. This section aims to serve as a valuable training resource for users at various experience levels.

Maintenance and Troubleshooting Assistance:
Learn about routine maintenance procedures and effective troubleshooting techniques. This manual empowers users to address common issues and perform regular maintenance to enhance the longevity of the Mial MEF 2100 - Electromagnetic Flowmeter.

Intended Audience:
This manual is intended for operators, maintenance personnel, and system integrators involved in the installation, operation, and maintenance of the Mial MEF 2100 - Electromagnetic Flowmeter. It is suitable for both novice users seeking basic guidance and experienced professionals looking for specific details.

Important Notes:
Please read through the manual carefully, adhering to safety guidelines and following instructions precisely. If any uncertainties arise during the installation, operation, or maintenance processes, seek assistance from qualified personnel or our customer service / support team.

Reference to Other Documentation:
Refer to the accompanying technical specifications document for in-depth details about the Mial MEF 2100 - Electromagnetic Flowmeter. Additional resources can be found on our website.

## Intended use

*CAUTION!*
*Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.*

*INFORMATION!*
*The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose*

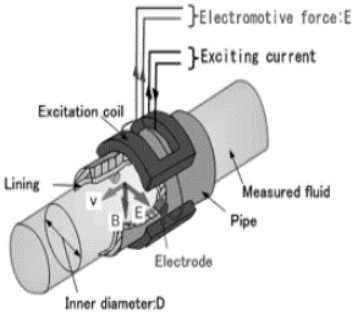
## Certification

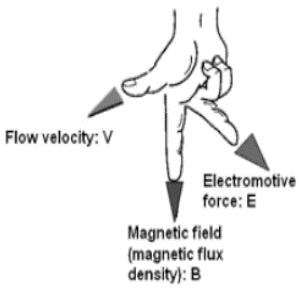
*The manufacturer certifies successful testing of the product by applying the CE marking*

*The manufacturer certifies successful testing of the product by applying the ISO marking*

## 1.2 OPERATING PRINCIPLE

The Electromagnetic flow meter operates by inducing a magnetic field across a pipe through which a conductive fluid flows. Coils or electrodes generate the magnetic field, and as the fluid moves through, it cuts across the field, adhering to Faraday's Law of Electromagnetic induction. This results in the generation of an induced voltage in the fluid, which is picked up by electrodes on the opposite sides of Flow tube. The magnitude of this voltage is directly proportional to the flow rate of the fluid. The meter's electronics process these voltage signals to calculate and display the flow rate. Notably effective for measuring conductive fluids like water, Electromagnetic flow meters are particularly valuable for applications involving abrasive or corrosive substances. The accuracy of the measurements is contingent on factors such as the uniformity of the magnetic field and the conductivity of the fluid being measured. Users should refer to the manufacturer's manual for precise instructions on installation and calibration.



# 1.3 TECHNICAL SPECIFICATIONS*

## Operation and performance

**Flow measurement Technology**

The flow measurement technology of electromagnetic flow meters is based on Faraday's law of electromagnetic induction, where the induced voltage across electrodes is proportional to the fluid velocity, allowing for accurate flow measurement.

**Fluid types**

Electrically conductive fluids such as water

*(Hot Water,Chilled Water,Condensate Water,Domestic Water,Waste Water etc.)*

**Conductivity**

>5us/cm

**Pipe sizes**

15 MM -2000 MM

**Pipe materials**

Metallic and Non Metallic pipes.

**Flow accuracy**

Standard :±0.5%

Optional: ±0.2%

*Achievable with process calibration*

**Repeatability**

Flow:±0.17%

BTU: ±0.27%

**Linearity**

Standard: ±0.5%

Optional: ±0.2%

**Meassuring range**

Max 0-40 ft/s

**Measurement parameters**

Flow Meter- Instantaneous flow rate, totalized flow

**Certification**

Factory calibration certification, CE, ISO

## Electronics

**Enclosures**

ABS

*Use weather proof enclosure while installing the transmitter outside*

**Enclosure IP rating**

IP 65

**EEPROM Memory**

Yes

**Power supply**

24 VDC/2A

*Use 2-amp SMPS when employing AC power*

**Ambient temperature**

32°F to 140°F ( 0℃ to 60℃)

**Relative Humidity**

5- 95% RH

**Standard Analog outputs**

Flow meter- 4-20 mA

*Output programmed for current flow rate. 500 Ω maximum load,*

**Pulse Outputs**

Flow Meter- Pulse

*Programmed for Flow Consumption , Contact pulse Duration -0.1~300 ms*

**Network Connection**

Modbus RTU RS485

**Cable**

10M

## Flow tube specification

**Coil material**

Pure Copper

*99% copper (Cu) content, excellent electrical conductivity, corrosion resistance*

**Process connections**

Standard: ANSI 150 flanges

Optional: ANSI 300 flanges

**Operating temperature**

14°F to 248°F (-10˚C to 120˚C)

**Nominal Pressure**

Standard: 1.6 Mpa

Optional: 2.5 Mpa, 4.0 Mpa,5Mpa

**Flow Tube**

SS 304

**Electrode Material**

Standard: SS 316L

Optional: Hastelloy,Titanium, Tantalum,

**Liner**

Standard: PTFE

Optional: Ebonite, Polyebonite, Polyurethane,PFA

**Flange**

Standard: Carbon Steel

Optional: Stainles steel

**Mountings**

Flanged flow tube

*Specifications are subject to change without prior notice.

**IP rating**

Flow tube : IP68

Tramsmitter : IP 65

## Energy measurement

**Temperature sensor**

PT1000

22°F to 392°F (–30°C–200°C)

*Wetted insertion thermowell*

**Cable**

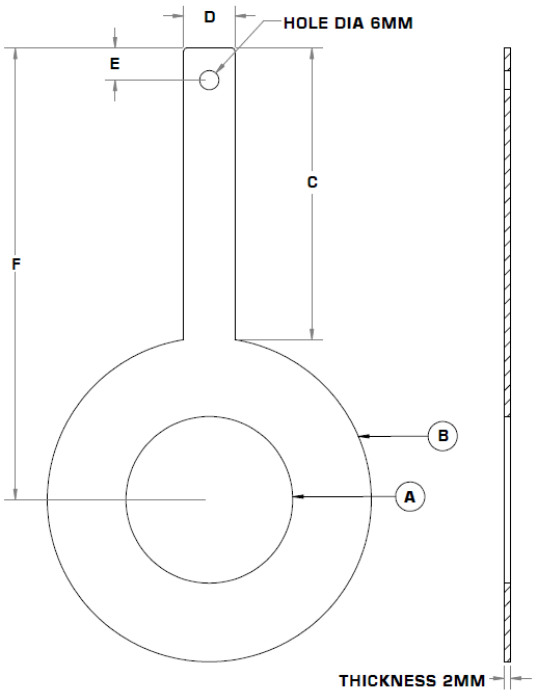
10 M

**Specifications are subject to change without prior notice.*

# 1.4 SUPPLEMENTARY ACCESSORIES THAT COULD BE NEEDED

## 1.4.1 GROUNDING RINGS

Grounding rings may be needed when meters are installed in non-metallic pipes or lined pipes. Placing these rings before and after the meter helps to reduce electrical interference, allowing the meter to function accurately. Mial Instruments provides these grounding rings as an optional accessories.




**GROUNDING RING SIZES**
ALL DIAMENSIONS ARE FOR FLANGE 150#

| SIZE (MM) | A (ID) | B (OD) | C | D | E | F |
|---|---|---|---|---|---|---|
| 15 | 18 | 40 | 50 | 16 | 10 | 70 |
| 20 | 23 | 42 | 60 | 16 | 10 | 81 |
| 25 | 26 | 62 | 60 | 16 | 10 | 91 |
| 32 | 32 | 63 | 60 | 16 | 10 | 91.5 |
| 40 | 40 | 80 | 60 | 16 | 10 | 100 |
| 50 | 52 | 101 | 60 | 16 | 10 | 110.5 |
| 65 | 63 | 104 | 70 | 20 | 10 | 122 |
| 80 | 80 | 130 | 70 | 20 | 10 | 135 |
| 100 | 104 | 158 | 75 | 20 | 10 | 154 |
| 125 | 130 | 187 | 75 | 20 | 10 | 168.5 |
| 150 | 158 | 217 | 75 | 20 | 10 | 183.5 |
| 200 | 206 | 267 | 75 | 20 | 10 | 208.5 |
| 250 | 260 | 328 | 75 | 20 | 10 | 239 |
| 300 | 310 | 375 | 85 | 20 | 10 | 272.5 |

ALL DIAMENSIONS IN MM

# 2 DEVICE DESCRIPTION

## 2.1 SCOPE OF DELIVERY

INFORMATION!
Do a check of the packing list to make sure that you have all the elements given in the order

INFORMATION!
Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

INFORMATION!
The field device will arrive in one standard cartons. The standard carton contains one small corrugated box containing Transmitter Unit. Also, the standard carton box contains Flow Tube ,Product documentation, Test Certificates, Allen key & bolts sets

INFORMATION
The MEF 2100 transmitters and sensor bodies are components of a uniquely calibrated system and must be installed together as per the serial number. Mixing components from other systems will result in significant calibration errors.The transmitter serial number can be found on the sticker on the side of the electronics enclosure, and the sensor serial number is located on the sticker on the sensor body.

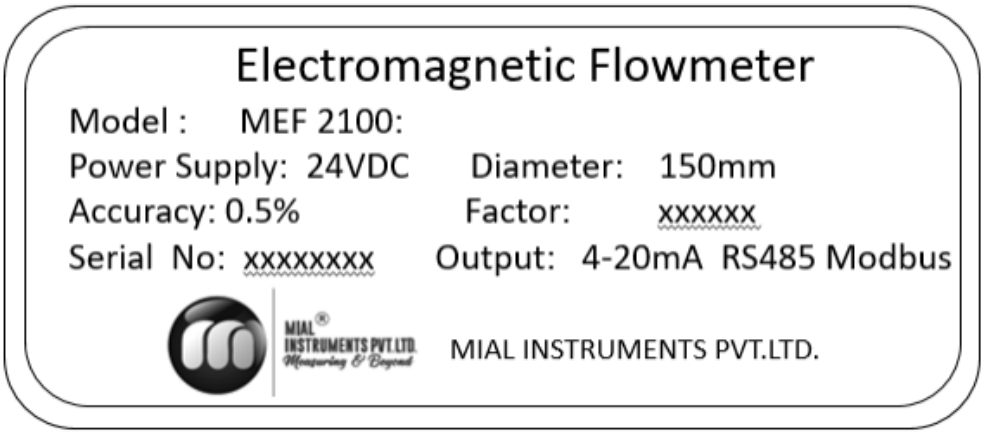
INFORMATION!
Mandatory to loop between the grounding rings by using a proper wire and connect the end of the wire to a ground source in the DDC panel.

INFORMATION!
Grounding Ring will be provided only if the pipe material is Non-Metallic & will be charged additional

## 2.2 NAMEPLATES

INFORMATION!
Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate

### NAMEPLATE FOR THE TRANSMITTER




### NAMEPLATE FOR THE FLOW TUBE

# 3 INSTALLATION

## 3.1 SITE SELECTION

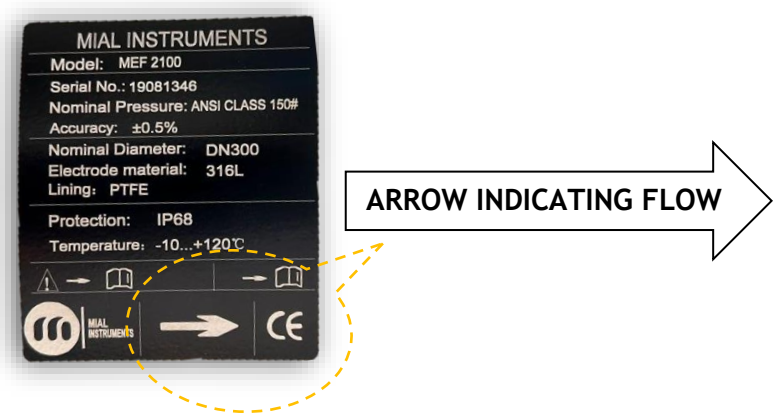
When selecting a site for a flow meter installation, prioritize accessibility for installation and maintenance. Consider environmental factors like temperature and humidity as per guidelines. Ensure the flow profile is stable and the pipe is in good condition. Safety and ease of access for personnel should also be taken into account to optimize meter performance and longevity.

### 3.1.1 BASIC RECOMMENDATIONS

In general guidelines, it's recommended to find a location where the pipe has the longest straight segment with a clear run. This ensures smooth laminar flow of the fluid through the meter, which is crucial for accurate measurement. A longer clear run of pipe minimizes disturbances and turbulence that could affect the meter's performance. This approach helps optimize the meter's accuracy and reliability by providing a stable flow profile for measurement.

### 3.1.2 FLOW DIRECTION

The Mial MEF 2100 Flow meter should be installed ensuring the arrow indicated on the meter points in the direction of flow. When correctly installed, as illustrated, the arrowhead should align with the flow direction. The transmitter display will indicate positive values corresponding to the flow direction indicated by the arrow. If the fluid flows in the opposite direction to the arrow, the display will show negative readings reflecting the reverse flow direction.



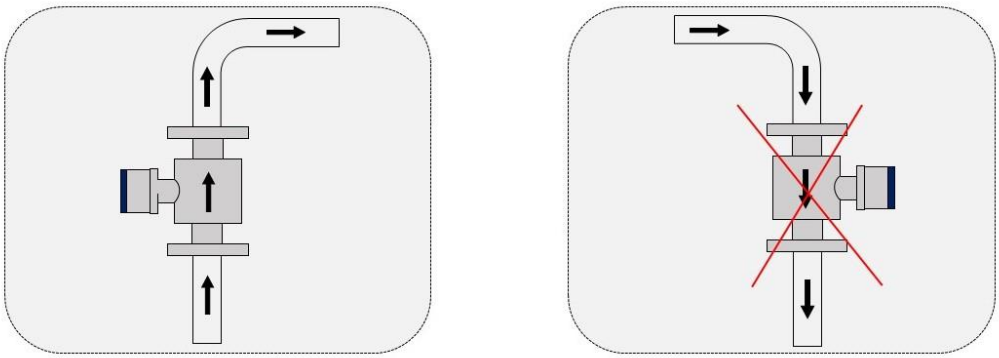

### 3.1.3 INSTALLATION OF REMOTE MOUNT TRANSMITTER

Installing a remote mount transmitter involves placing the unit at a distance where the display is easily visible to the user. It should be positioned away from equipment that may generate electrical interference. The standard cable length from the flow tube to the transmitter becomes 10 meters and it can't be cut or extendable at the site. For the outdoor installation mandatory to provide a non-metallic FRP/GRP enclosure

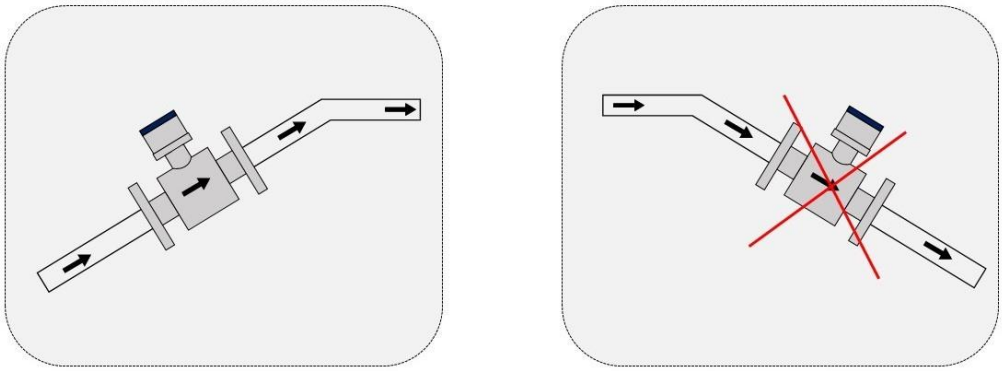
### 3.1.4 STRAIGHT LENGTH REQUIREMENT

The diagrams below demonstrate the minimum straight length necessary to ensure accurate readings from the flow meter. Having additional straight length beyond this minimum requirement offers additional advantages, such as enhanced measurement precision and reduced potential for turbulence or flow disturbances that could affect meter performance. Therefore, maximizing the straight length of the pipe where the flow meter is installed can contribute to optimizing the overall effectiveness and reliability of the measurement process.

**SLOP & VERTICAL LINES**

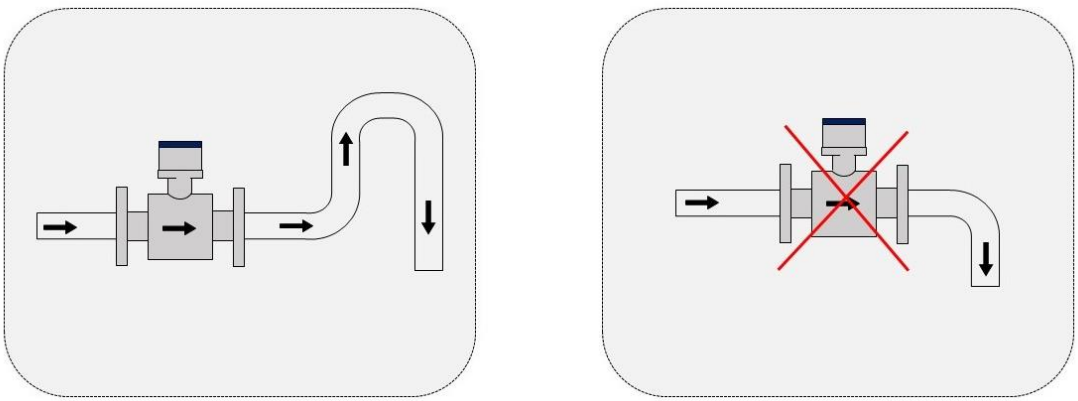


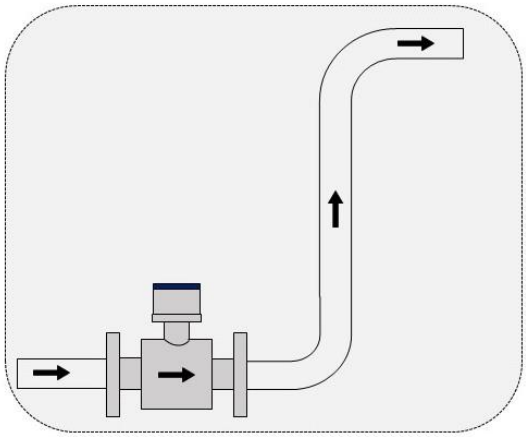
Install at the rising direction

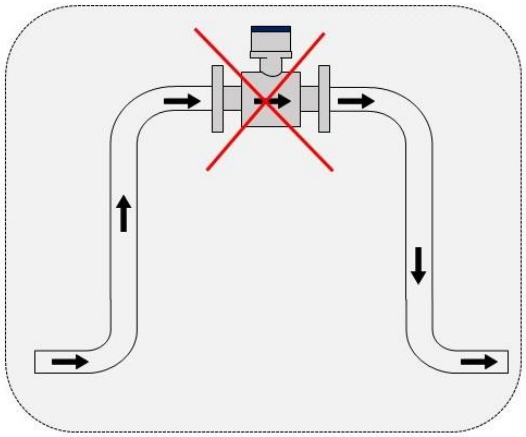


Install at the rising direction

**OPEN FEED OR DISCHARGE**

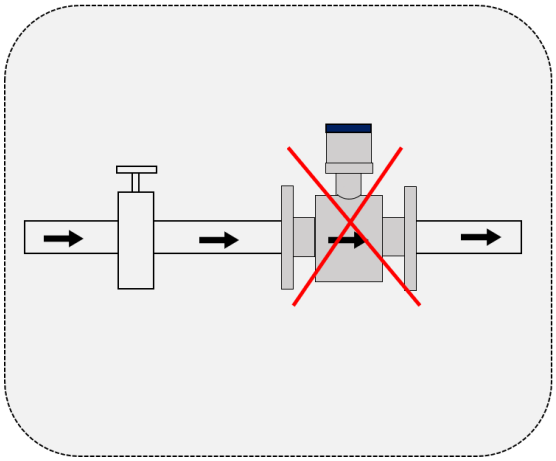


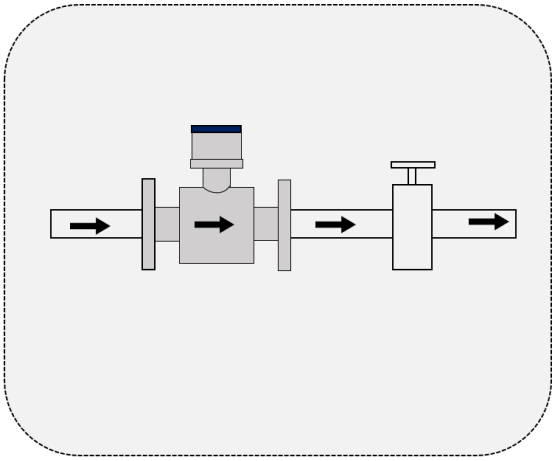




Install at the lowest point when used in open drain pipe

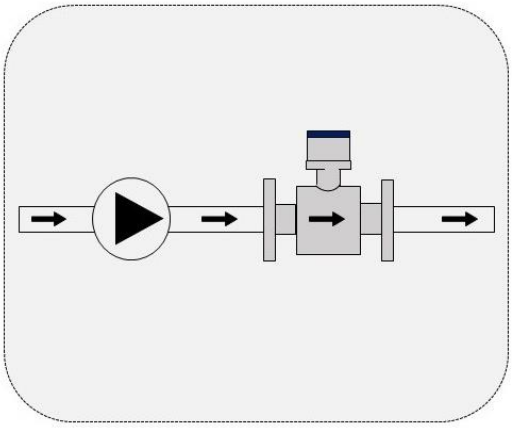
## CONTROL VALVE

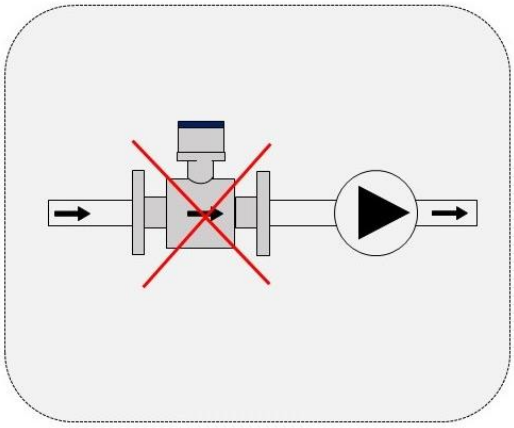




Don't install it at the exit of the valve, install it at the entrance of the valve

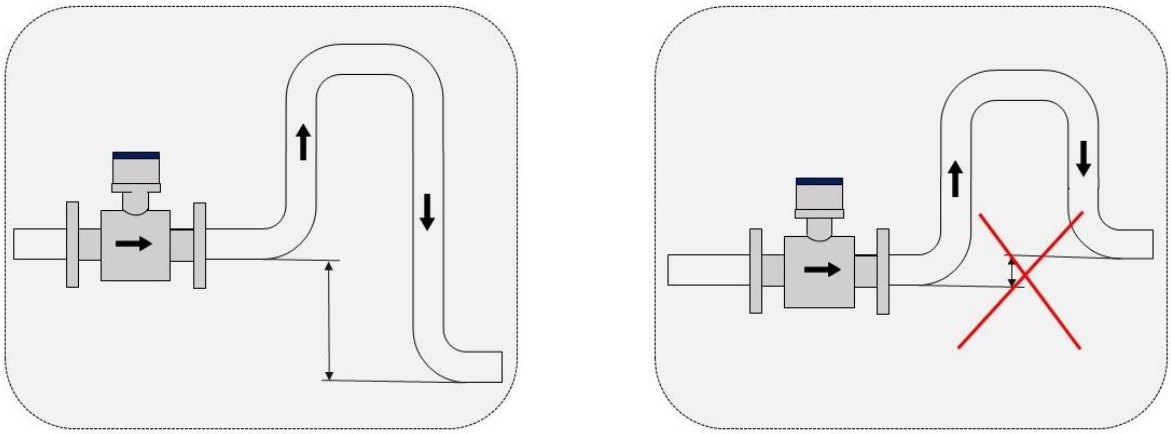
## POSITION OF PUMP





Don't install it at the entrance of the pump, install it at the exit of the pump

### DOWN GOING PIPELINE OVER 5 M /16 FT LENGTH

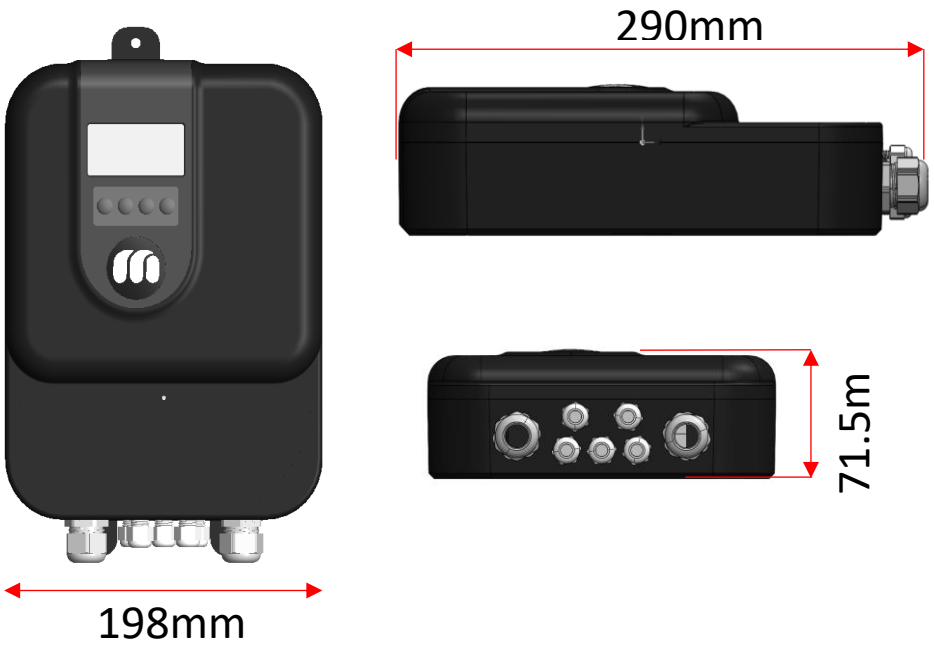


The downstream of flow meter when the drop is more than 5 m

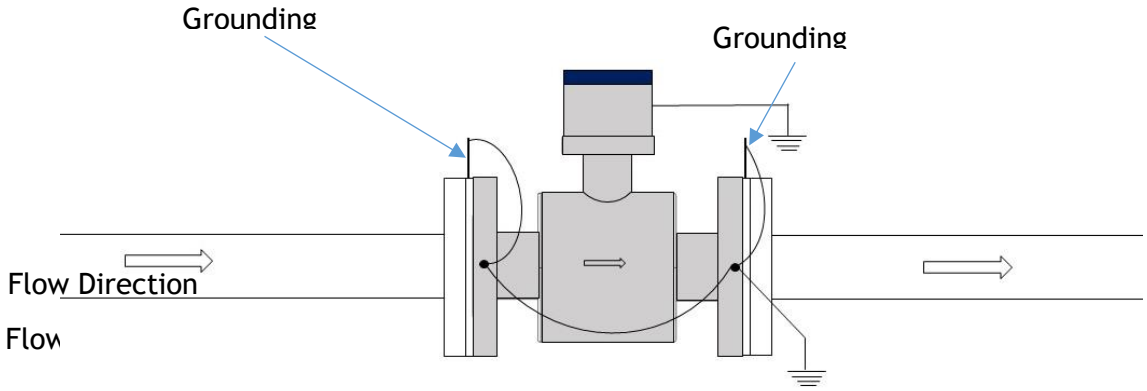
## 3.2 MECHANICAL INSTALLATION

*IMPORTANT NOTE!*
*MEF 2100 transmitters and sensor bodies are two parts of one uniquely calibrated system and must be installed together as per the serial Number . Mixing components from other systems will result in significant calibration errors.*

### 3.2.1 STANDARD TRANSMITTER DIMENSIONS



### 3.2.2 INSTALLATION DRAWINGS FOR NON-CONDUCTIVE PIPE




*CAUTION*
*Make sure to connect the earth wires like the picture shows. If you don't, the meter might not work right.*

**INSTALLATION STEPS**

*WARNING!*
*Only trained workers should install this product, and they must follow all the rules for buildings.*
*.*

1. Clean all flange surfaces well, making sure to remove any old gasket material or adhesive

2. Check all flange surfaces for any bending, dents, or other problems that might stop a good seal.

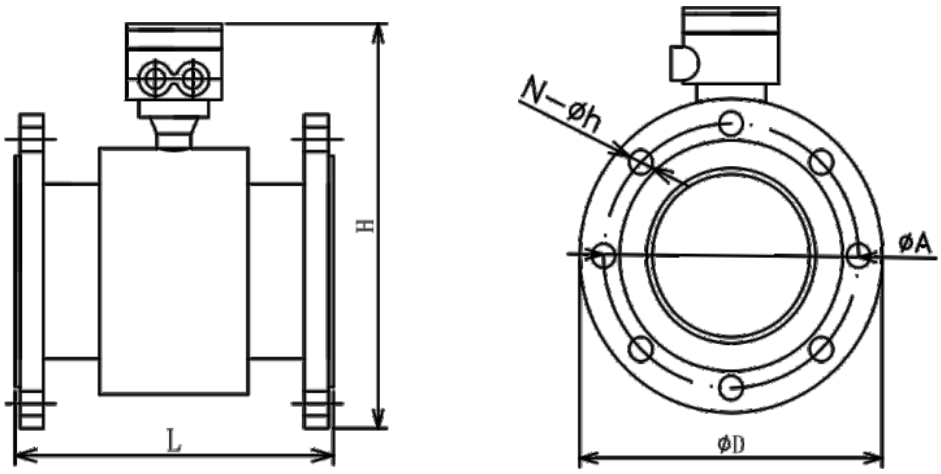
3. Use new bolts, nuts, and strong washers. Before putting them in, apply lubricant to the bolt threads, nuts, washer sides, and under the bolt head. This helps spread pressure evenly on the seal. Be careful not to get any lubricant on the liner or gasket.

4. Place the new gasket in the middle of the liner surface. Make sure the gasket doesn't stick out into where the liquid flows.

5. Use a torque wrench to tighten the bolts in three stages: first 30%, then 60%, and finally 100%. Tighten them in a repeating pattern.

### 3.2.2 FLOW SENSOR DIMENSIONS

**ANSI CLASS 150 FLANGED SENSOR OVERALL DIMENSION**

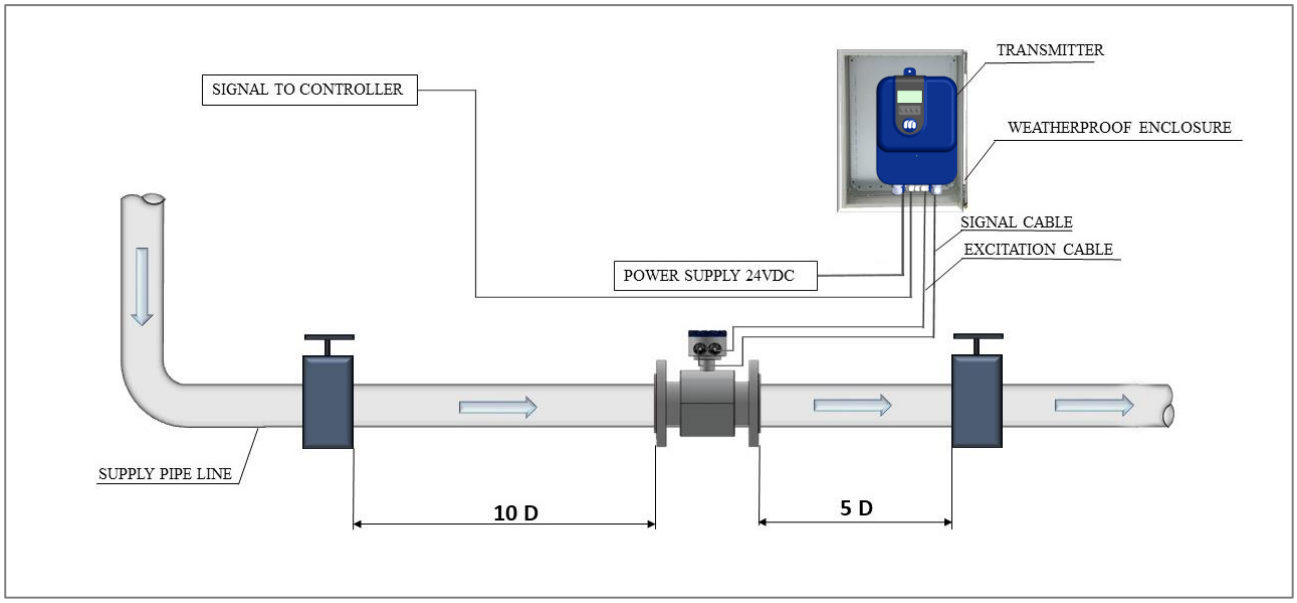



| PIPE SIZE | L | D | A | N- Ø h | H |
|---|---|---|---|---|---|
| DN 15 | 200 | 89 | 60.5 | 4-Ø15.7 | 217 |
| DN20 | 200 | 99 | 69.9 | 4-Ø15.7 | 217 |
| DN25 | 200 | 108 | 79.3 | 4-Ø15.7 | 220 |
| DN32 | 200 | 118 | 88.9 | 4-Ø15.7 | 230 |
| DN40 | 200 | 127 | 98.6 | 4-Ø15.7 | 240 |
| DN50 | 200 | 152 | 120.7 | 4-Ø19.1 | 255 |
| DN65 | 200 | 178 | 139.7 | 4-Ø19.1 | 280 |
| DN80 | 200 | 190 | 152.4 | 4-Ø19.1 | 285 |
| DN100 | 250 | 229 | 190.5 | 8-Ø19.1 | 315 |
| DN125 | 250 | 254 | 215.9 | 8-Ø22.4 | 340 |
| DN150 | 300 | 280 | 241.3 | 8-Ø22.4 | 370 |
| DN200 | 350 | 343 | 298.5 | 8-Ø22.4 | 430 |
| DN250 | 450 | 406 | 362 | 12-Ø25.4 | 495 |
| DN300 | 500 | 483 | 432 | 12-Ø25.4 | 558 |
| DN350 | 550 | 533 | 476.3 | 12-Ø28.4 | 608 |
| DN400 | 600 | 597 | 540 | 16-Ø28.4 | 674 |
| DN450 | 600 | 635 | 578 | 16-Ø32 | 718 |
| DN500 | 600 | 699 | 635 | 20-Ø32 | 775 |

### 3.2.3 INSTALLATION

Installation of this product should be carried out by qualified professionals, ensuring compliance with all relevant local, state, and federal building codes. Begin by thoroughly cleaning all flange surfaces to remove any old gasket material and adhesive residue. Inspect the flange surfaces for any warping, pitting, or imperfections that could affect the seal. Use new bolts, nuts, and hardened washers, and lubricate them to ensure even stress distribution during installation. Be careful to avoid getting any lubricant on the liner .

## INSTALLATION DIAGRAM




To ensure electromagnetic water meters work correctly, install the flow sensor head at the top of a horizontal pipe at the 12 o'clock position. The pipeline must be pressurized and filled entirely with clean water, without any air or particles. Air and particles act as insulators, disrupting the meters' electromagnetic induction and impairing their function. For vertical pipes, install the meter so water flows from bottom to top for optimal performance.

# 4 ELECTRICAL CONNECTIONS

## 4.1 SAFETY INSTRUCTIONS

*DANGER!*
*Only when power is switched off, can we do all the work about electrical connections. Please pay all attention to the power supply on the name plate!*

*DANGER!*
*Observe the national regulations for electrical installations!*


*DANGER!*
*For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.*

*WARNING!*
*Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.*

*INFORMATION!*
*Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.*

*INFORMATION!*
*Connect the cable on connector with similar numeral marking*

## 4.2 CONNECT SIGNAL AND MAGNETIC FIELD CURRENT CABLE

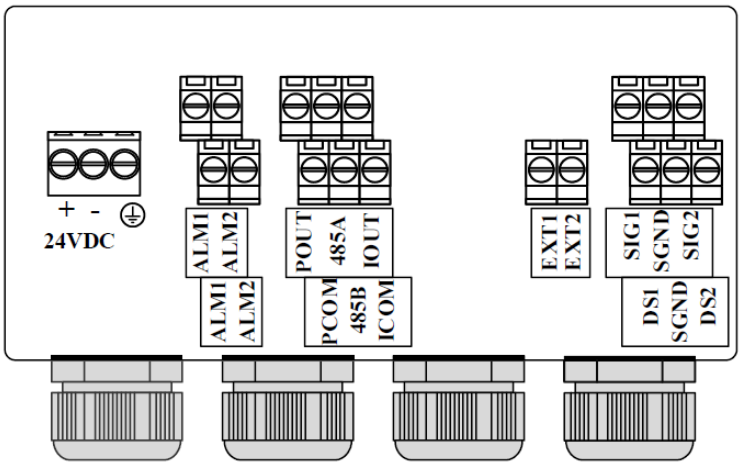
*Danger ！*
*Only when power is cut off can you connect signal and magnetic field current conductor.*

*Danger ！*
*The equipment must be grounded in accordance with regulations so as to protect the operator from electrical shock.*

*Danger ！*
*In case that equipment be used in explosion danger areas, special notes are given to explosion-proof instructions for safety tips.*

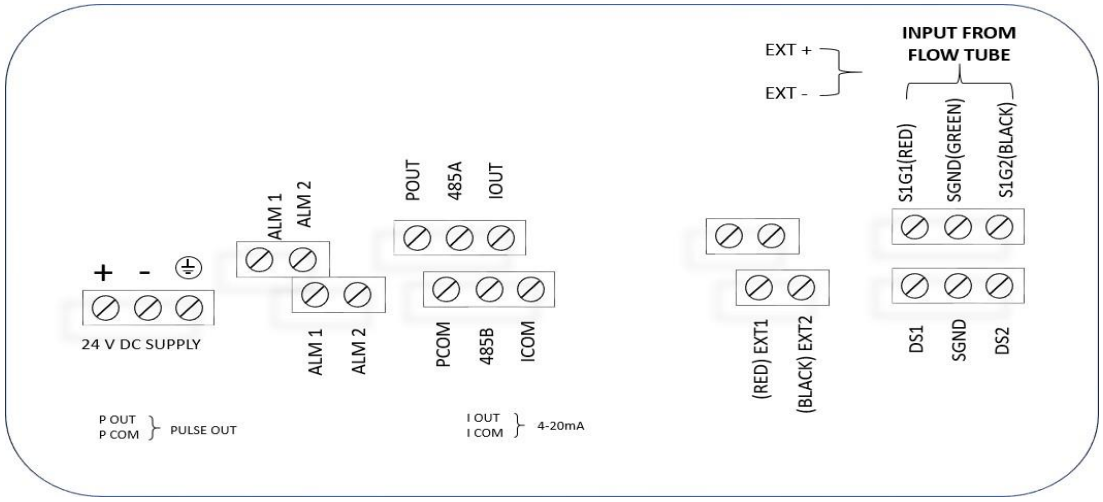
*Warning ！*
*Please strictly observe local occupational health and safety regulations. Only those who have got properly trained are allowed to operate on the electrical equipment*

## 4.3 Remote Type Wiring Instruction




| | |
|---|---|
| 24V+, 24V-: | 24VDC power supply |
| ⏚: | Ground |
| ALM1, ALM2: | Alarm output |
| POUT, PCOM: | Pulse/Frequency output |
| 485A, 485B: | 485 serial communication |
| IOUT, ICOM: | 0-20mA output |
| EXT1, EXT2: | Excitation signal |
| SIG1, SIG2, SGND: | Electrode signal |
| DS1, DS2: | Electrode shield |

## 4.4 MEF 2100 Wiring Diagram and Modbus Register Details




MEF 2100 (Remote) Flow Meter Wiring Diagram

### 4.5 MEF 2100 MODBUS CONFIGURATION DETAILS OF FLOW METER TO BMS

| Function Code | Details | Register Address | Modbus Register | Register Type |
|---|---|---|---|---|
| 04 : Input Register | Flow Rate | 0100 | 30100 | Float |
| | Flow Total | 0108 | 30108 | Integer |
| | Flow Velocity | 0102 | 30102 | Float |
| | Flow Percentage | 0104 | 30104 | Float |

*NB :- Flow Total = 30108 +[30110 / 1000]

{ were; 30110- Flow total Decimal point register }

| | |
|---|---|
| Parity | : None Word |
| Length | : 8 |
| Stop Bit | : 1 |

Note: If your BMS register address starts from '0', please decrement '1' value from every register.

Example: flow rate register is 30100 then it should be configured as 30099

### 4.6 CONNECTED TO POWER

*INFORMATION!*

*It is mandatory to provide an individual 24 VDC, SMPS (Switch Mode Power Supply) for energizing the flow meters. Additionally, it is essential to pull three-core wires (DC+, DC-, and ground) for the 24 VDC input power supply. As these are electromagnetic flow meters, a proper input power supply with an appropriate ground is crucial for their correct operations*

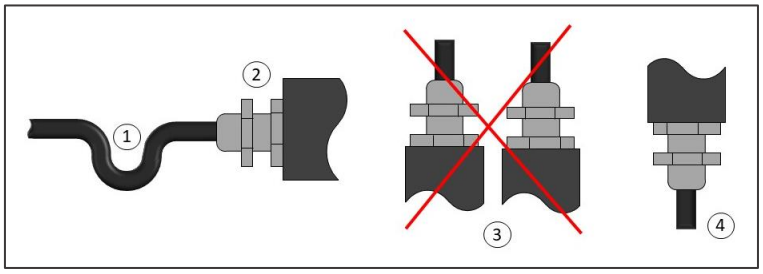
*Danger !*

*The equipment must be grounded in accordance with regulations so as to protect the operator from electrical shock.*

Warning !

*Don't use bolts that hold the pipes together to make electrical connections. These bolts might not connect well because of paint or grease. Instead, use the special earth connections on the flange.*

## 4.7 LAYING ELECTRICAL CABLES CORRECTLY




Keep the housing safe from dust and water

i. Create a loop with the cable just before it reaches the housing.
ii. Securely tighten the screw connection at the cable entry.
iii. Always mount the housing with the cable entries facing downward.
iv. Seal any unused cable entries with a plug.

## 4.8 EARTH CONNECTION

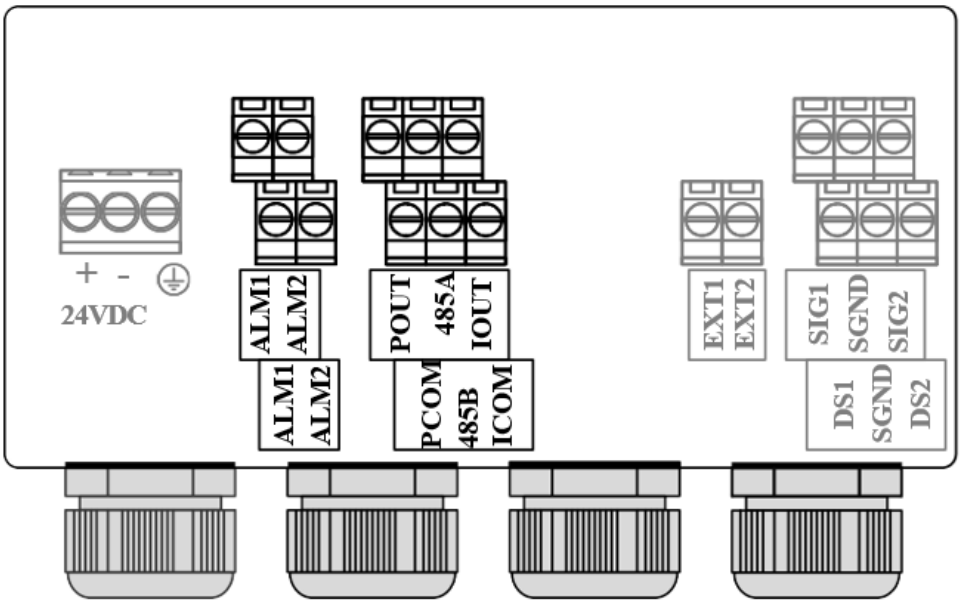
MEF 2100 Flow meters detect small Electrical signals from electrodes when conductive fluid flows through their magnetic field, but electrical noise can interfere. To minimize noise, ensure the pipe, fluid, flow meter body, and transmitter are all connected to the same earth ground with the earth cable as short as possible.

① Provide a quality Earth ground connection to the meter. From best to worst, grounding options include (stranded wire 14-18 AWG):

② Earth grounding rod driven into the ground

③ Earth wire connected directly to the building electrical service panel ground.

## 4.9 OUTPUT INTRODUCTION




### CURRENT OUTPUT

- IOUT、ICOM: 0-20mA output
- Active mode: when load RL ≤ 750Ω；Imax ≤ 22mA
- Current flow percent

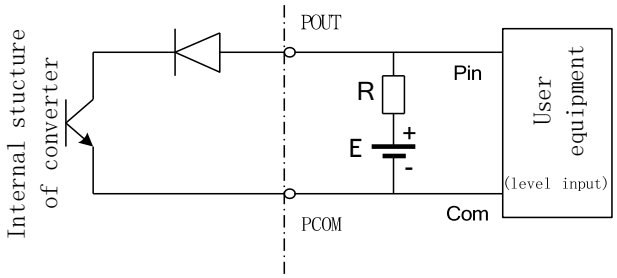
### COMMUNICATION OUTPUT

- 485A、485B: 485 Serial communication output；
- CCOM: 485 Serial communication ground；
- Agreement: ModBus-RTU

### PULSE, FREQUENCY AND ALARM OUTPUT

- ALM1,ALM2: Alarm output terminals
- POUT,PCOM：Pulse/frequency output terminals
- Active mode: High 24V, 5mA drive current
- Output electrical isolation: photoelectric isolation, isolation voltage: > 1000VDC；
- Scale:
- Frequency output: Frequency 2KHz(configurable 0-5kHz) Corresponding to the upper limit of the flow range;
- Pulse output: corresponding flow rate volume of each pulse (configurable), output Pulse width: 0.1ms ~100ms, duty cycle 1:1,
- Fmax<= 5000 cp/s；

- Elementary diagram:




- Additional remarks : pulse output for OC gate output, need external power supply. General counter all wear resistance, signal can be directly connected to the counter.
- Manufacturer recommendations: upper pull resistance R is recommended to use 2 k, 0.5 W resistor, another power E recommended 24 v dc power supply.

# 5 START UP

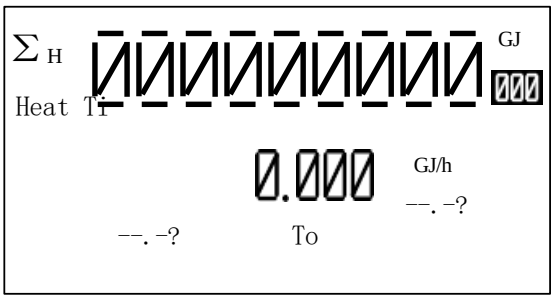
## 5.1 POWER ON

Before powering on the instrument, please ensure that the installation has been completed correctly by checking the following:

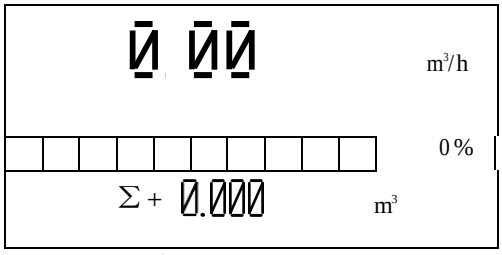
- The meter must be installed in compliance with safety standards.
- The power supply connection must adhere to regulatory requirements.
- Verify that the electrical connections in the power supply are correct.
- Secure the back cover of the converter housing tightly.

## 5.2 CONVERTER STARTUP

The measuring instrument comprises a sensor and a signal converter, with the power supply already set for operation. All operational data and engineering parameters have been configured according to the customer's order. Upon powering on, the instrument will perform a self-check. Once completed, it will immediately begin measuring and displaying the current values.



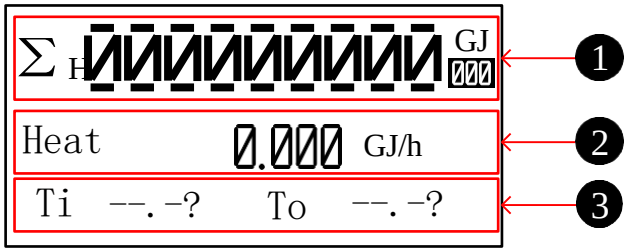

Startup picture BTU screen




Flow screen

# 6 OPERATION

## 6.1 HEAT DISPLAY AND OPERATION BUTTON



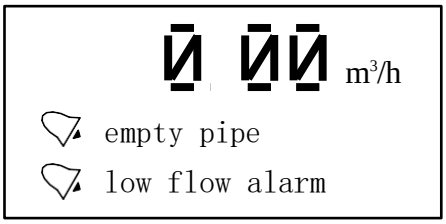

1. Energy line 1 Default：Accu heat
   Optional：Accu heat, Accu cold and Heat.
   Optional (loop)：Accu heat, Accu cold, Heat and OFF.
2. Energy line 2
   Default：Heat
   Optional：Heat, Tin and Tout, Tin, Tout, TD, Flow, Accu heat, Accu cold, Accu fwd, Accu rev, Accu net, Flow vel, MT, Shut num, Shut time, Run time and Real time.
3. Optional (loop)：Heat, Tin and Tout, Tin, Tout, TD, Flow, Accu heat, Accu cold, Accu fwd, Accu rev, Accu net, Flow vel, MT, Shut num, Shut time, Run time, Real time and OFF.

Tips: Heat-related parameters can press ⏎ key to switch between.

Heat display can press ≫ buttons to switch the screen to Flow display.

**TIPS:**

1. You can modify the parameters of [flow line 1/2/3] and [flow line 1/2/3 loop] in flow configuration 12, and the cycle interval of each parameter is 10s.
2. When alarm occurs, the cycle interval of the alarm information (including empty pipe, high flow alarm, low flow alarm, overrun pulse limit alarm and overrun flow limit) screen is 5S and the duration is 2S. This information occupies flow line 2 and 3 in the display screen, as shown in the following figure.



3. Operation keys: mechanical keys

| Signal | Measuring Mode | Menu Mode | Function Mode | Data Mode |
|---|---|---|---|---|
| » | - | switch menu categories | - | Data right shift |
| ↵ | Switch accumulative amount | Switch menu subclass | confirmation | Confirm data |
| △▽ | - | - | selection | Change data |
| » ↵ | Enter menu | Exit menu | - | - |

## 4. Test Flag

1. The test flow rate is disabled by default (allowing the test parameter to be set to "N"). When the test parameter is allowed to be set to "N", the test flag "T" is not displayed. When the test flow rate is turned on (allowing the test parameters to be set to "Y"), the test flag "T" is displayed in the upper left corner of the main interface.

### 6.2 FLOW PARAMETER DISPLAY INTERFACE

Press and hold the button △ for 8 seconds on the main interface to enter the flow parameter display interface, as shown in the following figure. Press the key »

to exit.

```
Fw:F99F1001                    P1
  Flow=0.000       m³/h
 Span=35.0000      m³/h
V=0.0000m/s        Per=0       %
Sv=0.00    mv      DN=50
S0=0.00    mv     MT=3200
  MTtrip=828     Stat=Empt
V0=0.0000  m/        s
```

P1：First page

| Parameter | Meaning |
|---|---|
| Fw | Program version number |
| Flow | Instantaneous flow rate |
| Span | Range |
| V | Velocity of flow |
| Per | Hundred components |
| Sv | Signal mv |
| DN | Caliber |
| S0 | Zero point mv |
| MT | Real time conductivity conversion rate |
| MTtrip | Air traffic control threshold |
| Stat | Air traffic control status |
| V0 | Zero correction flow rate |

Press the key ▽ on the first page of the flow parameter display interface to switch to the second page, as shown in the following figure.

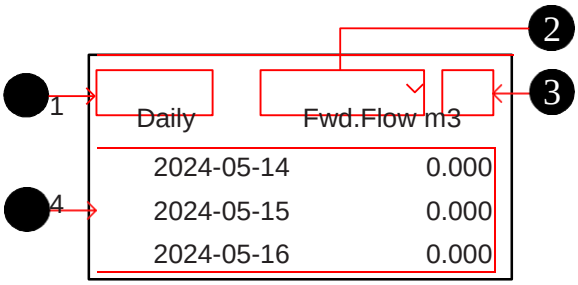
| | |
|---|---|
| Fw:F99F1001 | P2 |
| Ks=1.00000 | Kc=7.27092 |
| Kf=1.00000 | PGA=X3 |
| Ia=0.2500A | EX=6.25Hz |
| Fr=0 | Max=2000 |
| EQ=1.000L/P | |
| ADDR=8 | BAUD=9600 |

P2：The second page

| Parameter | Meaning |
|---|---|
| Fw | Program version number |
| Ks | Sensor coefficient |
| Kc | Converter coefficient |
| Kf | Fullness coefficient |
| PGA | Gain |
| Ia | Exciting current |
| EX | Excitation frequency |
| Pls | Pulse output type |
| Max | Upper frequency limit |
| EQ | Pulse output equivalent |
| ADDR | Correspondence addresses |
| BAUD | Baud rate |

### 6.3 REPORT DISPLAY INTERFACE

Press the key on the main interface to enter the report display interface. Press the key to modify the report type, flow type, etc.




1. Report type Default：Daily
   Optional：Daily,Monthly, Yearly.
2. Flow type
   Default：Fwd.Flow Optional：Fwd.Flow,Rev.Flow.
3. Flow unit
   Default：m3 Optional：m3,kg,t,gal,Igal,Mgal,ft3,bbl,Ibbl,Obbl,L
4. Report content

   Press keys to browse the report

## 6.4 OPERATING INSTRUCTION

Parameter selection and adjustment

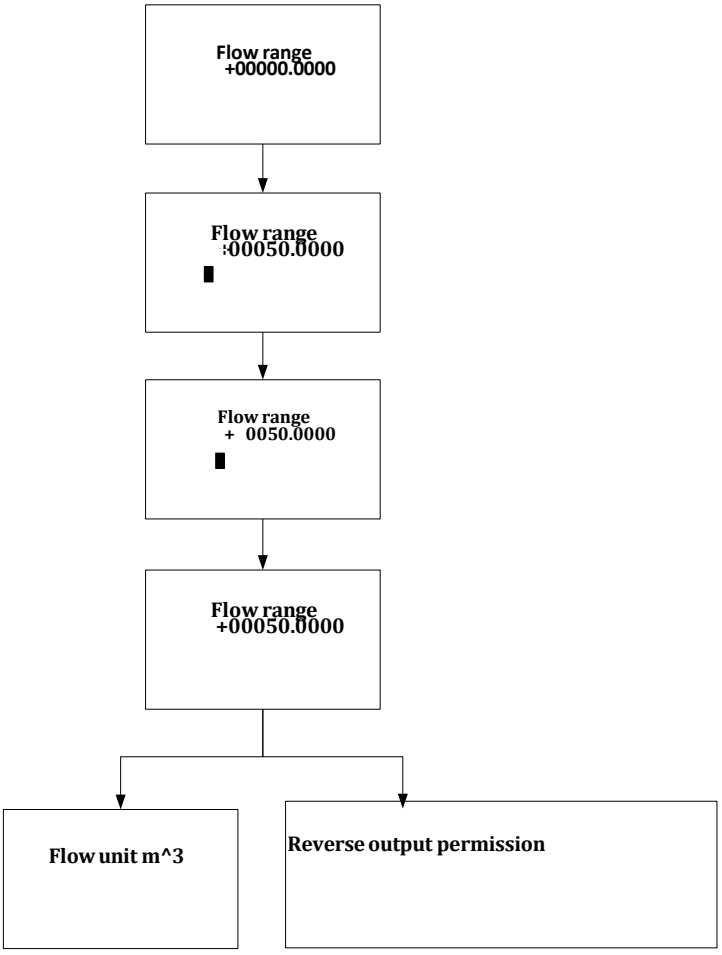
Press » and ⏎ together , enter into parameter setting interface . Password need to be input by then

Initial users password: 200000 (used for modifying the user level parameter ) Initial manufacture password:100000 (used for modifying the manufacture level parameter)

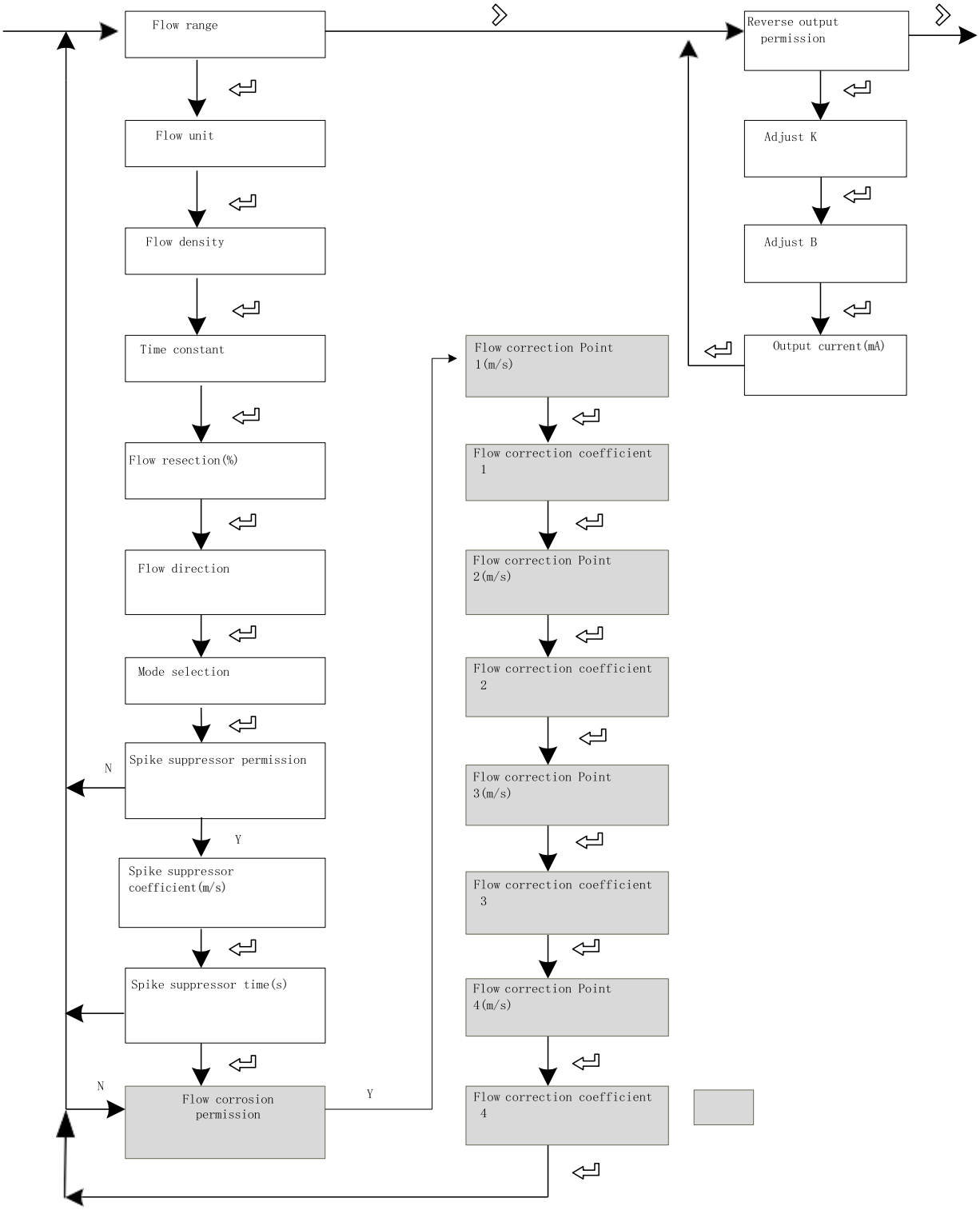
Initial manufacture password:300000 (to set up parameter quickly )

After entering the configuration parameters , the parameters can be modified by the following operation :

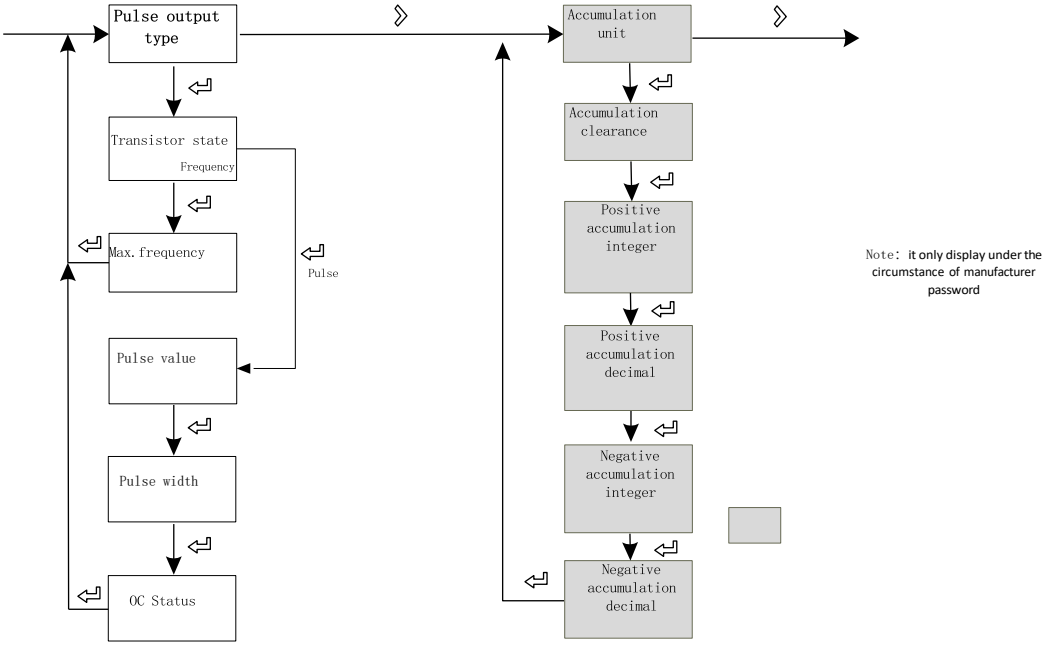
User can conduct the switch operation in the menu by pressing the » button , switch among the parameter item of menu by pressing the ⏎ button, and store a modified parameter value at the same time , adjust the parameter value by pressing the △ and ▽ buttons.



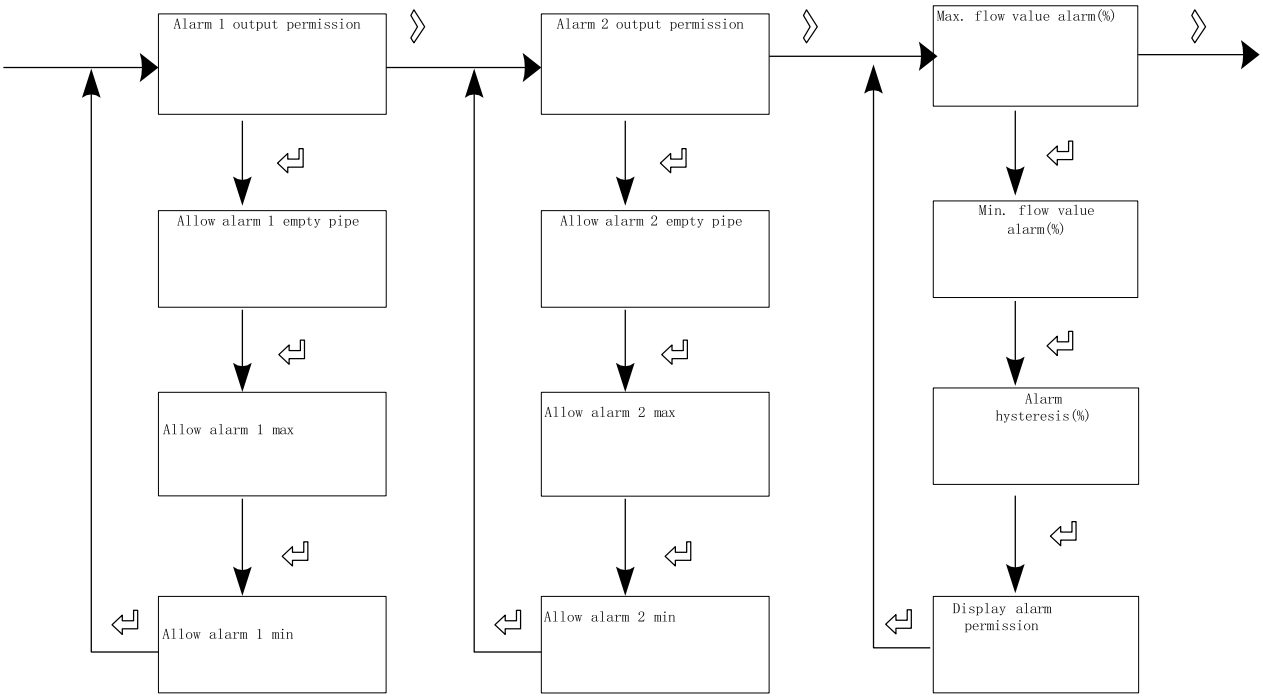
## FLOW SETUP AND ANALOG OUTPUT MENU



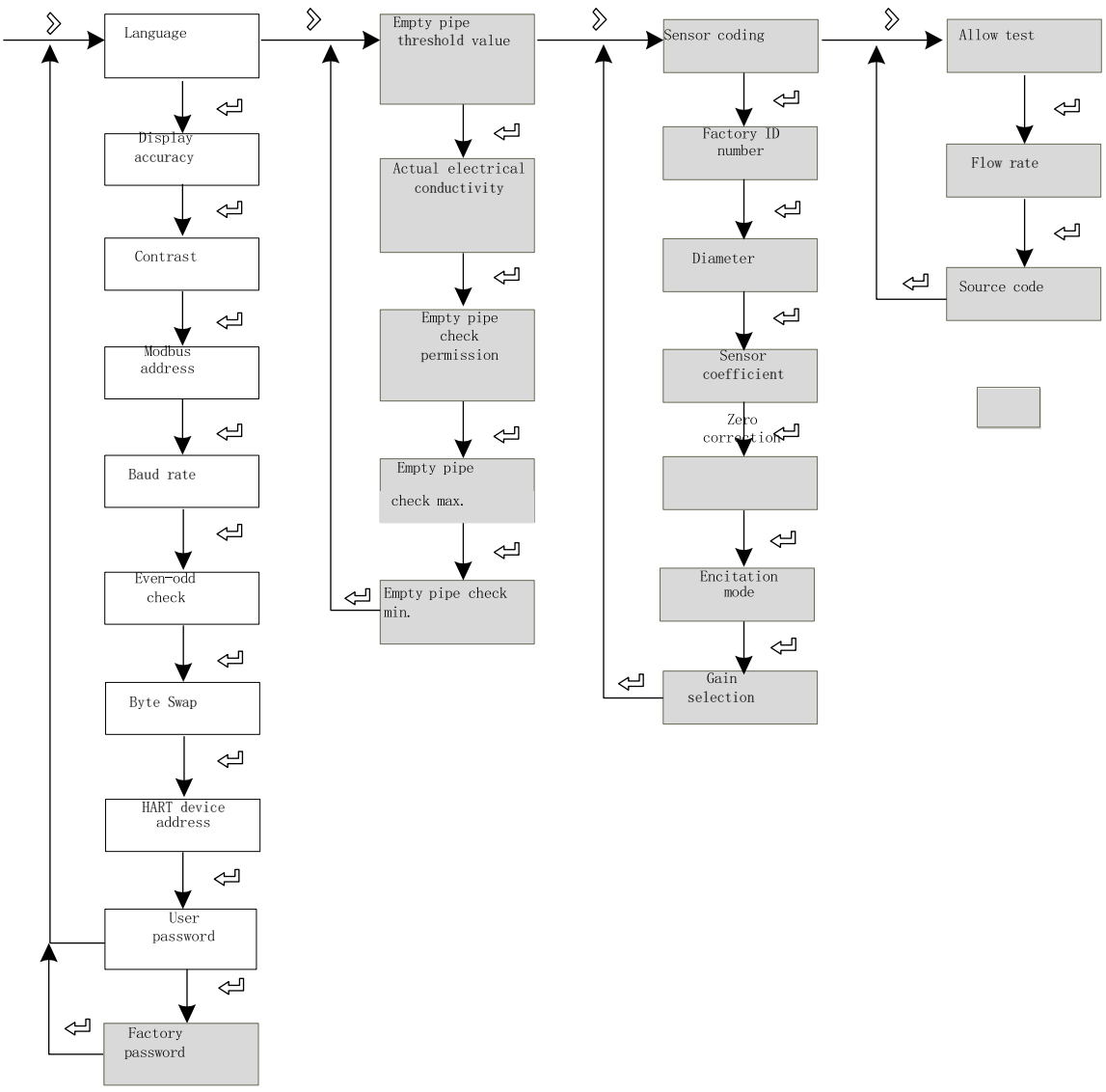
## PULSE OUTPUT AND TOTAL SET MENU




## ALARM SETUP MENU




## SYSTEM FUNCTION, EMPTY PIPE FUNCTION , SENSORS FUNCTION, TEST FUNCTION SETUP MENU


Language
Display accuracy
Contrast
Modbus address
Baud rate
Even-odd check
Byte Swap
HART device address
User password
Factory password
Empty pipe threshold value
Actual electrical conductivity
Empty pipe check permission
Empty pipe check max.
Empty pipe check min.
Sensor coding
Factory ID number
Diameter
Sensor coefficient
Zero correction
Encitation mode
Gain selection
Allow test
Flow rate
Source code

## 6.5 FLOW CONFIGURATION DETAILS

| NO. | Parameter | Setting mode | Password level | Parameter range | Default |
|---|---|---|---|---|---|
| 1-Flow rate | | | | | |
| 1-0 | Flow range | Figure | User | 0-99999 | 35.000 |
| | Set the maximum flow limit value. Used to calculate the frequency, output current limit calculation; Alarm threshold calculation, etc | | | | |
| 1-1 | Flow unit | Option | User | L、m3、Kg、t、 gal、Igal、Mgal 、 ft3、bbl、Ibbl、 Obbl/s、m、h、d | $m^3/h$ |
| | Choose L, m3, gal, Igal such as volume unit, the density will not participate in calculation; Choose Kg, t, such as mass unit, need to cooperate with 1-2 density parameter. | | | | |
| 1-2 | Fluid density | Figure | User | 0.000-99.000 | 1.000 |
| | Used to calculate the mass flow rate, QM =$\rho V_M$ when flow volume unit is volume unit t, this parameter will not be displayed. Density of the unit：$g/cm^3$ | | | | |
| 1-3 | Time constant | Figure | User | 0-99S | 2s |
| | Damping coefficient of the filter, select the parameters of the selected period of time as the average of the instantaneous flow | | | | |
| 1-4 | Flow resection | Figure | User | 0-10% | 1% |
| | Flow volume is regarded as zero if it is below the setting value Zero means not remove | | | | |
| 1-5 | Flow direction | Option | User | Positive, Negative | Positive |
| | Used to change the direction of flow, when the user signal lines negative pole and positive pole are reverse connection, or reverse sensor installation, use this feature | | | | |
| 1-6 | Mode selection | Option | User | Positive,NegativeBid irection | positive |
| | Set the direction of the flow measurement, forward direction indicates only for forward direction measurement flow, reverse indicate only measure the reverse flow, two-way indicate two-way flow measurement | | | | |
| 1-7 | spike suppressor permission | Option | User | Y、N | N |
| | Indicate whether to enable peak inhibition function, this function is applied to the operation condition of the larger jamming signal , is used to filter the jamming signal.When set to N doesn't show 1-8, 1-9 configuration screen.When the range of the signal pulse is greater than 1-8 sets parameters and the time duration is less than 1-9 set time, the system will consider it an interference signal and will not display and measure . | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1-8 | spike suppressor coefficient | Figure | User | 0.001-9.999m/s | 0.8 | |
| | The peak amplitude (it is not shown when peak inhibition allows configuration closing ) | | | | | |
| 1-9 | spike suppressor time | Option | User | 0-9999s | 1 | |
| | Peak duration time(it is not shown when peak inhibition allows configuration closing ) | | | | | |
| 1-10 | Flow correction permission | Option | User | Y、N | N | |
| | Indicates whether start using flow nonlinear correction function.In principle, used for small flow rate less than (0.5 m/s) linear adjustment<br>The functional design with 4 period of correction, is divided into four flow point and correction coefficient. Thecorresponding velocity of correction point must meet：<br>Correction point 1 ≥ Correction point 2 ≥ Correction point 3 ≥ Correction point 4 ≥ 0.<br>Correction calculation is conducted on the original sensor flow coefficient curve correction, therefore, should be closed nonlinear correction function, mark sensor coefficient. Then allow the nonlinear correction function, according to the nonlinear of sensor, setting correction coefficient, piecewise corrected. If the coefficient is right, no need to calibration.<br>The original velocity stand for the real standard velocity, the revised flow velocity is called modified velocity, the modified computation formula is as follows:<br>At the interval of the modified point 1 > The original flow velocity ≥ The modified point 2<br>The modified flow velocity = Correction factor 1 × The original flow velocity<br>At the interval of the modified point 2 > The original flow velocity ≥The modified point 3 The modified flow velocity = Correction factor 2 × The original flow velocity<br>At the interval of the modified point 3 > The original flow velocity ≥ The modified point 4 The modified flow velocity = Correction factor 3× The original flow velocity<br>At the interval of the modified point 4 > The original flow velocity ≥ 0 The modified flow velocity = Correction factor 4× The original flow velocity<br>Note: when set the modified point, should keep the following relationshipModified point 1 ><br>Modified point 2 > Modified point 3 > Modified point 4 > 0The intermediate value of Correction coefficient is 1.0000, if the correction coefficient is greater than 1 , then increase the flow velocity ; if the correction coefficient is less than 1 , then decrease the flow velocity ; | | | | | |
| 1-11 | Flow correction point 1 | Figure | Factory | 0.0-99.999 | 0 | |
| | Flow rate modified point 1, when The flow rate function shut down , this parameter does not display. | | | | | |
| 1-12 | Flow correction coefficient 1 | Figure | Factory | 0.0-99.999 | 1.000 | |
| | Flow rate correction factor 1, when The flow rate function shut down , this parameter does not display. | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 1-13 | flow correction point 2 | Figure | Factory | 0.0-99.999 | 0 |
| | Flow rate modified point 2, when The flow rate function shut down , this parameter does not display. | | | | |
| 1-14 | Flow correction coefficient 2 | Figure | Factory | 0.0-99.999 | 1.000 |
| | Flow rate correction factor 2, when The flow rate function shut down , this parameter does not display. | | | | |
| 1-15 | Flow correction point 3 | Figure | Factory | 0.0-99.999 | 0 |
| | Flow rate modified point 3, when The flow rate function shut down , this parameter does not display. | | | | |
| 1-16 | Flow correction coefficient 3 | Figure | Factory | 0.0-99.999 | 1.000 |
| | Flow rate correction factor 3, when The flow rate function shut down , this parameter does not display. | | | | |
| 1-17 | Flow correction point 4 | Figure | Factory | 0.0-99.999 | 0 |
| | Flow rate modified point 4, when The flow rate function shut down , this parameter does not display. | | | | |
| 1-18 | Flow correction coefficient 4 | Figure | Factory | 0.0-99.999 | 1.000 |
| | Flow rate correction factor 4, when The flow rate function shut down , this parameter does not display. | | | | |
| 1-24 | Flow velocity（m/s） | Figure | Factory | 1.000-24.000 | 12.000 |
| | Used to set the upper limit absolute value of the measured flow rate. The default flow velocity is 12m / s. | | | | |
| 2-Current output | | | | | |
| 2-1 | Adjust K | Figure | User | -99.999~99.999 | 01.000 |
| | Used for adjusting the output current value ，I = Kx + B | | | | |
| 2-2 | Adjust B | Figure | User | -99.999~99.999 | 00.000 |
| | Used for adjusting the output current value ，I = Kx + B | | | | |
| 2-3 | Output current | Display | User | 0.00-20.00 | -- |
| | Display the current output of current value(mA) | | | | |
| 3-Pulse/frequency/alarm output | | | | | |
| 3-0 | Pulse output type | Option | User | Frequency、 Pulse、Alarm (integrated) | Freque ncy |
| | Optional frequency, pulse equivalent/alarm output | | | | |
| 3-1 | Transistor state | Option | User | High level、Low level | High level |
| | Optional High level and Low level output. | | | | |
| 3-2 | Max. frequency | Figure | User | 0-5000 | 2000 |
| | Set the corresponding value of the instantaneous flow upper limit; when select for frequency output, this parameter display. | | | | |
| 3-3 | Pulse value(L/P) | Option | User | 0.001-999.999 | 1.0 |
| | Set the the cumulant that each pulse stands for; When selecting is the equivalent output, this parameter display. | | | | |
| 3-4 | Pulse width | Option | User | 10ms、20ms、 50ms、100ms、200ms、50% | 100ms |
| | Set Pulse width. | | | | |
| 3-5 | OC Status | Option | User | Passive、Active | Active |
| | The OC status can be selected, and the default is active. | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 4-Accumulation | | | | | |
| 4-0 | Accumulation unit | Option | Factory | $m^3$、kg、t、gal、 Igal、Mgal、$ft^3$、 bbl、Ibbl、Obbl、 L | $m^3$ |
| | Accumulation unit. | | | | |
| 4-1 | Accumulation clearance | Option | Factory | Y、N | N |
| | Clear accumulation amount | | | | |
| 4-2 | Positive accumulation integer | Figure | Factory | 0-999999999 | 0 |
| | Set total positive integer part | | | | |
| 4-3 | Positive accumulation decimal | Figure | Factory | 0.0-0.999 | 0.0 |
| | Set total positive decimal part | | | | |
| 4-4 | Negative accumulation integer | Figure | Factory | 0-999999999 | 0 |
| | Set reverse total integer part | | | | |
| 4-5 | Negative accumulation decimal | Figure | Factory | 0.0-0.999 | 0.0 |
| | Set reverse total decimal part | | | | |
| 4-6 | Flow accu magnification | Option | Factory | X1、X10、 X100、X1000、X10000 | X1 |
| | Set flow accu magnification | | | | |
| 4-7 | Positive flow shutfill | Figure | Factory | 0-99999.9999 | 00000.0000 |
| | Set positive flow power outage compensation | | | | |
| 4-8 | Negative flow shutfill | Figure | Factory | 0-99999.9999 | 00000.0000 |
| | Set reverse flow power outage compensation | | | | |
| 5-Alarm contacts 1 | | | | | |
| 5-1 | Alarm1 output permission | Option | User | Y/N | N |
| | Allow touch spot 1 output main switch, when set to N, the following parameters do not display. | | | | |
| 5-3 | Allow alarm1 empty pipe | Option | User | Y/N | N |
| | Allow empty pipe alarm output switch, the system detects empty pipe, contact 1 output alarm signal automatically.<br>When allowed alarm output configuration as N, this parameter does not display. | | | | |
| 5-4 | Allow alarm1 max. | Option | User | Y/N | N |
| | Allow flow rate upper limit alarm output switch , when the instantaneous flow is greater than the flow rate lower limit value, touch spot 1 output alarm signal automatically.<br>The instructions are specific Settings in 7-1.<br>When allowed to alarm output configuration for N, this parameter is not displayed. | | | | |
| 5-5 | Allow alarm1 min. | Option | User | Y/N | N |
| | Allow flow rate lower limit alarm output switch , when the instantaneous flow is less than the flow rate lower limit value, touch spot 1 output alarm signal automatically.<br>The instructions are specific Settings in 7-2.<br>When allowed to alarm output configuration for N, this parameter is not displayed. | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 7-Alarm setup | | | | | |
| 7-0 | Max. flow value alarm | Figure | User | 0-999.9% | 100% |
| | Set the upper limit alarm value, measuring range percentage | | | | |
| 7-1 | Min. flow value alarm | Figure | User | 0-999.9% | 0% |
| | Set the lower limit alarm value, measuring range percentage | | | | |
| 7-2 | Alarm hysteresis | Figure | User | 0-99.9% | 1% |
| | Used to eliminate the alarm when the disturbance<br>Upper limit elimination conditions: instantaneous flow is less than the upper limit alarm value – return difference<br>Lower limit elimination conditions: instantaneous flow is greater than the upper limit alarm<br>value + return difference | | | | |
| 7-3 | Display alarm permission | Option | User | Y/N | N |
| | Allows the alarm message display onto to the main picture switch | | | | |
| 8-System | | | | | |
| 8-0 | Language | Option | User | Chinese/English | Chinese |
| | Set configuration display language | | | | |
| 8-1 | Display accuracy | Figure | User | 0-4 | 2 |
| | The instantaneous volume of decimal digits | | | | |
| 8-2 | Contrast | Figure | User | 0-100% | 50% |
| | Contrast ratio of Liquid crystal display | | | | |
| 8-3 | Modbus address | Figure | User | 1-247 | 8 |
| | Communication agreement instrument address Based on the RS485 protocol Modbus RTU | | | | |
| 8-4 | Baud rate | Option | User | 1200/2400/4800/9600/<br>19200/38400/57600 | 9600 |
| | Baud rate of serial communication verification mode | | | | |
| 8-5 | Even-odd check | Option | User | NONE/ODD/<br>EVEN | NONE |
| | Serial communication verification mode of physical layer | | | | |
| 8-6 | Byte order | Option | User | 2-14-3、3-41-2、<br>4-31-2、1-23-4 | 2-14-3 |
| | Byte switching order for serial communication at the physical layer | | | | |
| 8-8 | User password | Figure | User | 00000-999999 | 000000 |
| | User-level password for viewing and modifying user-level parameter configurations, User initial password: 200000 | | | | |
| 8-9 | Factory password | Figure | Factory | 00000-999999 | 000000 |
| | Factory-level password for viewing and modifying user-level parameter configurations, Factory initial password: 100000 | | | | |
| 8-16 | Record interval | Figure | Factory | 0000-9999 | 0010 |
| | Set Record interval | | | | |
| 8-17 | Remove card | Option | Factory | Y , N | N |
| | Set the Y indicator light to turn off, the card will stop being stored, and the card can be pulled out | | | | |
| 9-Empty tube parameters | | | | | |
| 9-0 | Empty pipe threshold value | Figure | Factory | 0-100% | 50% |
| | Empty tube alarm judgement gate value | | | | |
| 9-1 | Actual electrical conductivity | Display | Factory | | |
| | Display the measured conductivity equivalent of the fluid.<br>For general natural water: equivalent < 200 when tube is full, when empty tube > 200 ( the equivalent is related to the fluid conductivity and the length of measuring line , it is recommended double shielded wire is used when the wiring distance is 20m , otherwise it will affect empty detection function . | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 9-2 | Empty pipe check permission | Option | Factory | Y，N | Y |
| | Set whether open empty detection function | | | | |
| 9-3 | Empty pipe check max. | Figure | Factory | 0-9999 | 1200 |
| | Measured conductivity equivalent value when the tube is empty, default values can be used for general natural water. which need to observe the empty wipe for special fluid is 9-1 value, write in 9-3 | | | | |
| 9-4 | Empty pipe check min. | Figure | Factory | 0-9999 | 200 |
| | Measured conductivity equivalent value when the tube is full, default values can be used for general natural water. which need to observe the empty wipe for special fluid is 9-1 value, write in 9-4 | | | | |
| 9-5 | Empty pipe check hysteresis | Figure | Factory | 0-9999 | 30 |
| | Hysteresis value for empty pipe check, default values can be used within 20 meters of the signal line. | | | | |
| 9-6 | Empty pipe check num | Figure | Factory | 01-10 | 05 |
| | Set the number of empty pipe check. When the empty pipe signal of this number is continuously detected, an empty pipe alarm will be triggered. | | | | |
| 10-Sensor | | | | | |
| 10-0 | Sensor coding | Figure / symbol | Factory | 16 digital | |
| | Used for dentify sensors | | | | |
| 10-1 | Factory ID number | Figure | Factory | 6 digital | |
| | Identification number | | | | |
| 10-2 | Diameter | Option | Factory | 3-2000 | 50 |
| | Sensor size | | | | |
| 10-4 | Sensor coefficient | Figure | Factory | 0-99.99999 | 01.00000 |
| | The flowmeter coefficient was calibrated according to the actual flow volume by sensor manufacture | | | | |
| 10-6 | Zero correction(m/s) | Figure | Factory | -9.9999~9.9999 | +0.0000 |
| | Sensor nonlinear correction when used for small flow (below 0.3 m/s)<br>V is the real-time flow rate displayed above, V (after correction) = V (before correction) + zero correction value | | | | |
| 10-7 | Excitation mode | Option | Factory | 3.125Hz、6.25 Hz、12.5 Hz、25 Hz | 6.25Hz |
| | The choice of excitation frequency: 3.125Hz 、6.25Hz、12.5Hz、25 Hz | | | | |
| 10-9 | Gain selection | Option | Factory | 1/3/9 | 3 |
| | Gain choice: adjust the gain can change the range of flow speed Gain adjustment：1、3、9 | | | | |
| 11-Test | | | | | |
| 11-0 | Allow test | Option | Factory | Y/N | N |
| | Set Y allow simulate velocity, the flag "T" is displayed in the upper left corner of the main interface，After the power failure automatically restored to N. | | | | |
| 11-1 | Flow rate (m/s) | Figure | Factory | -99999.999~+999 99.999 | 1.000 |
| | Set value of flow rate，"11-0 allow test" should be set to "Y" | | | | |
| 11-2 | Source code | Option | Factory | Y/N | N |
| | After setting Y, the original signal code will be displayed in the running screen. This screen also displays the firmware version and product serial number. | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 12-Display | | | | | |
| 12-0 | Flow line 1 | Option | User | Flow、Accu fwd、Accu rev、Accu net | Flow |
| | A parameter can be selected as the display parameter of flow line 1. | | | | |
| 12-1 | Flow line 1 loop | Option | User | Flow、Accu fwd、Accu rev、Accu net、OFF | OFF |
| | You can turn off or select another parameter as the loop display parameter of flow line 1 | | | | |
| 12-2 | Flow line 2 | Option | User | Flow bar、Accu fwd、 Accu rev 、Accu net、 Flow vel、MT | Flow bar |
| | A parameter can be selected as the display parameter of flow line 2. | | | | |
| 12-3 | Flow line 2 loop | Option | User | Flow bar、Accu fwd、 Accu rev、Accu net、 Flow vel、MT、OFF | OFF |
| | You can turn off or select another parameter as the loop display parameter of flow line 2. | | | | |
| 12-4 | Flow line 3 | Option | User | Flow bar、Accu fwd、 Accu rev 、Accu net、 Flow vel、MT | Accu fwd |
| | A parameter can be selected as the display parameter of flow line 3. | | | | |
| 12-5 | Flow line 3 loop | Option | User | Flow bar、Accu fwd、 Accu rev、Accu net、 Flow vel、MT、OFF | OFF |
| | You can turn off or select another parameter as the loop display parameter of flow line 3. | | | | |
| 20-Date/ Time | | | | | |
| 20-7 | Date(YY/MM/DD) | Date | User | | |
| | Set date, year/month/day | | | | |
| 20-8 | Time(HH/MM/SS) | Time | User | | |
| | Set time, hours, minutes, and seconds | | | | |
| 23-Report | | | | | |
| 23-0 | Clear report | Option | Factory | Y/N | N |
| | After setting to Y, clear the report and automatically restore to N | | | | |

## 6.6 QUICK SETUP MENU

1. Press on and at same time ,Instrument parameter is set at the interface.Password need to be input at this time.

   Quickly set the password： 300000

2. The user can use the key to switch between menu pages, use the key and key to adjust the parameter value, then use the key to confirm.
3. The parameters that can be set are shown in the table below.
4. After modification, move to the menu page [exit config], select Y and press on

.

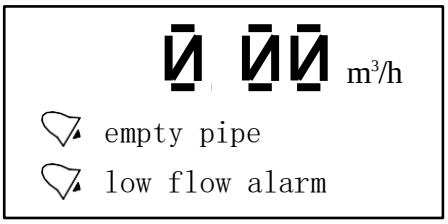
| NO. | Parameter words | Setting mode | Parameter range | default |
|---|---|---|---|---|
| 1 | Diameter(mm) | Option | 3-2000 | 50 |
| 2 | Flow range | Figure | 0-99999 | 35.000 |
| 3 | Sensor coefficient | Figure | 0-99999 | 1.000 |
| 4 | Zero correction | Figure | 0-99999 | 0.0 |
| 5 | Accumulation clearance | Option | Y、N | N |
| 6 | Flow resection(%) | Figure | 0-99% | 1% |
| 7 | Time constant | Figure | 0-99S | 3s |
| 8 | Pulse output type | Option | Frequency 、 Pulse 、 Alarm 、 | Frequency |
| 9 | Max. frequency | Figure | 0~5000.0 | 2000.0 |
| 10 | Pulse value （L/P） | Figure | 0-999999.999 | 1.000 |

# 7. FUNCTIONS

## 7.1 SYSTEM INFORMATION

Flow meter itself has the self-diagnosis function, in addition to the power supply and circuit board hardware failures, it can correctly provide the corresponding alarm message to the fault in general application .

**DISPLAY POSITION IN MEASURING PICTURE**




**System information sheet**

| Display | Alarm content |
|---|---|
| empty pipe | Sensor empty pipe |
| high flow alarm | The current instantaneous flow rate exceeds the setting flow limit |
| low flow alarm | The current instantaneous flow rate is below the setting flow lower limit |
| overrun pulse limit alarm | The pulse output frequency exceeds the setting frequency upper limit |
| overrun flow limit | The current instantaneous flow rate exceeds the setting flow limit |

## 7.2 PULSE/FREQUENCY/CURRENT OUTPUT

**PULSE EQUIVALENT OUTPUT**

It is mainly used for sensor manufacturer coefficient calibration and user measurement use. In the third way configuration parameter Settings:

Pulse equivalent corresponding cumulants, indicate each pulse corresponding to the relevant volume number .

For example：
Parameter setting as 0.1L/p
The current instantaneous flow 3.6m3/h
Number of pulses per second output is ：3.6×1000/3600/0.1 = 10
Notes：
When the parameter is set to 0.4L/p
The current instantaneous flow is3.6m3/h
Number of pulses per second output is：3.6×1000/3600/0.4 = 2.5

Encounter the above situation, the decimal part of 2.5 pulse will automatically get into the next second

output, data loss will not happen.

The pulse equivalent shouldn't be set too small when the pipe flow is small , otherwise it will cause pulse output exceeds the limit, then the main screen will appear [overrun pulse limit alarm] system alarm information. Users need to reset pulse equivalent parameters. Similarly, when the pipe flow is small the selected pulse equivalent cannot too big, otherwise it will cause the instrument to output a pulse for a long time, cause measurement error.

Pulse equivalent output is different from frequency output, pulse output will output a pulse when a pulse equivalent is accumulated enough, so the pulse output is uneven. Counter instrument should be used when measure pulse output, Frequency meter instrument shouldn't be used.

**Frequency output**

It is mainly used for manufacturer coefficient calibration and user measurement use. In the third group configuration parameters setting: frequency corresponding to instantaneous flow rate, upper frequency limit corresponding to max. flow rate.

Note: the maximum frequency set to 5000 Hz

**Current output**

Mainly used for transmitting output to other intelligent instruments, such as: digital display table, recorder, PLC, DCS, etc.

The current output type：0-20mA.

The current valve corresponding to Instantaneous flow rate, 20 mA corresponding to range limit, 0 mA corresponding to range limit.

Conversion relationship

Q real time>0

$$I_{realtime} = \frac{Q_{realtime}}{Q_{max}} 16.00 + 4.00$$

$Q_{real\ time}<0$

$$I_{realtime} = \frac{Q_{realtime}}{Q_{max}} 4.00 + 4.00$$

Notice：

Unit：mA

Q real time Indicate the instantaneous flow

### 7.3 SERIAL COMMUNICATION

This instrument provides a standard RS485 serial communication interface, using the international standard Modbus-RTU communication protocol that supports 04 Read Input Registers command.

## Register address

| Parameter | Type | Address | Explanation |
|---|---|---|---|
| Instantaneous flow rate | float | 100 | |
| Instantaneous flow velocity | float | 102 | |
| Flow percentage | float | 104 | 50 stands for 50% |
| Electric conductivity | float | 106 | |
| Forward flow accumulation of integer | ulong | 108 | |
| Forward flow accumulation of decimal | ulong | 110 | The decimal part magnifies 1000 times 123stand for 0.123 |
| Reverse flow accumulation of integer | ulong | 112 | |
| Reverse flow accumulation of decimal | ulong | 114 | The decimal part magnifies 1000 times 123stand for 0.123 |

Note: float/ulong/long type data, Communication transmission in byte order2-1-4-3; ushort type data Transmission in accordance with 2-1.

**Communication configuration**

Mailing address：1-247; Default address：8;
Baud rate： 1200、2400、4800、9600、19200、38400、57600;
The default baud rate：9600; Check: no check, odd parity,
parity;
Default no check;
For 32-bit data (long plastic or floating point) arranged in the communication frame; Example：Long integer 16909060(01020304H)： 03 04 01 02
Floating number 4.00(40800000H)： 00 00 40 80

**Readout real-time quantity floating-point communications, example:**

Real time Floating point Numbers readout Send message：08 04 00 63
00 02 81 4C
Return message：08 04 04 22 6E 41 3F 79 61(Instantaneous flow rate：11.95)

Forward flow rate accumulate readout Send message：08 04 00 6B
00 04 80 8C
Return message：08 04 08 00 6C 00 00 00 7B 00 00 D6 8E (The cumulative integer ：108, Cumulative decimal：0.123, Accumulation：108.123)

### 7.4 FIRMWARE UPGRADE INSTRUCTIONS

1. Connect the instrument and computer through RS485 serial communication interface, open [DFU firmware online upgrade] software, and click [next].
2. Enter the [1/5 open upgrade package] interface, click the folder and select

the given upgrade package file. The file name is: current version → upgrade version, and the format is [. dfu], such as [F99F1000 → F99F1001. dfu], then click [next]

3. Enter the [2/5 communication configuration] interface and select [serial port], [communication address], [baud rate], [verification method] (It is consistent with the parameters set in the instrument).
4. Enter the [3/5 connect instrument] interface, confirm that the [instrument string code] is the firmware version of the current instrument, and click [next].
5. Enter the [4/5 upgrade warning] interface and enter the [upgrade authorization code] provided by the manufacturer. To upgrade the 485 communication firmware online, you should first adjust the instrument screen to [11-2 Source code], select [Y], and then click [next] of DFU software.
6. Enter the [5/5 download firmware] interface, wait for the firmware upgrade to display [finish], and click [finish]. Enter the instrument configuration interface and confirm the firmware version in the upper right corner

## 7.5 OPERATION INSTRUCTIONS OF FLOW CORRECTION FUNCTION

In principle, used for small flow rate less than (0.5 m/s) linear adjustment. Correction calculation is conducted on the original sensor flow coefficient curve correction, therefore, should be closed nonlinear correction function, mark sensor coefficient. Then allow the nonlinear correction function, according to the nonlinear of sensor, setting correction coefficient, piecewise corrected. If the coefficient is set right, no need to calibration.

The functional design with 4 period of correction, is divided into four flow point and correction coefficient.

**The corresponding velocity of correction point must meet：**

Correction point 1 ≥ Correction point 2 ≥ Correction point 3 ≥ Correction point 4 ≥ 0. The original velocity stand for the real standard velocity, the revised flow velocity is called modified velocity, the modified computation formula is as follows:

- The original flow velocity ≥ The modified point 1 The flow velocity keep unchangeable.
- At the interval of the modified point 1 ＞The original flow velocity ≥ The modified point 2

  The modified flow velocity = Correction factor 1 × The original flow velocity
- At the interval of the modified point 2 ＞The original flow velocity ≥The modified point 3

  The modified flow velocity = Correction factor 2 × The original flow velocity
- At the interval of the modified point 3 ＞The original flow velocity ≥ The modified point

4

The modified flow velocity = Correction factor 3× The original flow velocity

- At the interval of the modified point 4＞The original flow velocity ≥ 0

  The modified flow velocity = Correction factor 4× The original flow velocity Note: when set the modified point, should keep the following relationship Modified point 1 ＞ Modified point 2 ＞ Modified point 3 ＞ Modified point 4 ＞ 0The intermediate value of Correction coefficient is 1.0000, if the correction coefficient is greater than 1 , then increase the flow velocity ; if the correction coefficient is less than 1, then decrease the flow velocity.

**Case1:**

The original flow velocity:0~0.4m/s, correction factor changes to 1.2.

**Parameter setting**

| Flow correction point 1 | Flow correction point 2 | Flow correction point 3 | Flow correction point 4 |
|---|---|---|---|
| 0.4 | 0 | 0 | 0 |
| Flow correction coefficient 1 | Flow correction coefficient 2 | Flow correction coefficient 3 | Flow correction coefficient 4 |
| 1.2 | 1 | 1 | 1 |

**The modified flow velocity**

| The original flow velocity | The modified flow velocity |
|---|---|
| 0~0.4m/s | 1.2 × The original flow velocity |

**Case2:**

The original flow velocity:0.2~0.4m/s, correction factor changes to 0.9. The original flow velocity:0.4~0.5m/s, correction factor changes to 1.1.

**Parameter setting**

| Flow correction point 1 | Flow correction point 2 | Flow correction point 3 | Flow correction point 4 |
|---|---|---|---|
| 0.5 | 0.4 | 0.2 | 0 |
| Flow correction coefficient 1 | Flow correction coefficient 2 | Flow correction coefficient 3 | Flow correction coefficient 4 |
| 0.9 | 1.1 | 1 | 1 |

**The modified flow velocity**

| The original flow velocity | The modified flow velocity |
|---|---|
| 0.2~0.4m/s | 0.9 × The original flow velocity |
| 0.4~0.5m/s | 1.1 × The original flow velocity |

**Case4:**

The original flow velocity:0.1~0.2m/s, correction factor changes to 0.9. The original flow velocity:0.3~0.4m/s, correction factor changes to 1.1.

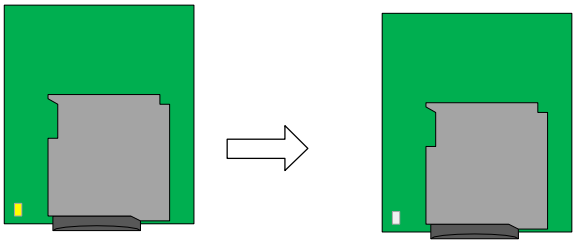
**Parameter setting**

| Flow correction point 1 | Flow correction point 2 | Flow correction point 3 | Flow correction point 4 |
|---|---|---|---|
| 0.4 | 0.3 | 0.2 | 0.1 |
| Flow correction coefficient 1 | Flow correction coefficient 2 | Flow correction coefficient 3 | Flow correction coefficient 4 |
| 1.1 | 1 | 0.9 | 1 |

**The modified flow velocity**

| The original flow velocity | The modified flow velocity |
|---|---|
| 0.1~0.2m/s | 0.9 × The original flow velocity |
| 0.3~0.4m/s | 1.1 × The original flow velocity |

## 7.6 TF CARD OPERATION



Storage status Stop storage

Insert the TF card into the slot, the indicator light will light up, and the TF card will start storing data. In configuration 8-17, change the removed card to Y, the indicator light goes off, and the TF card stops storing. In configuration 8-16, the recording interval can be modified, ranging from 1 to 9999 seconds

# ANNEXURE 1 - Flow range and velocity table

| SIZE(mm) | FLOW RANGE & VELOCITY TABLE | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0.1 M/S | 0.5 M/S | 1 M/S | 3 M/S | 5 M/S | 10 M/S | 12 M/S |
| DN10 | 0.02 | 0.14 | 0.28 | 0.84 | 1.41 | 2.82 | 4.24 |
| DN15 | 0.06 | 0.31 | 0.63 | 1.9 | 3.18 | 6.36 | 9.54 |
| DN20 | 0.11 | 0.56 | 1.13 | 3.39 | 5.65 | 11.31 | 16.96 |
| DN25 | 0.17 | 0.88 | 1.76 | 5.3 | 8.83 | 17.67 | 26.5 |
| DN32 | 0.28 | 1.44 | 2.89 | 8.68 | 14.47 | 28.95 | 43.42 |
| DN40 | 0.45 | 2.26 | 4.52 | 13.57 | 22.62 | 45.23 | 67.85 |
| DN50 | 0.7 | 3.53 | 7.06 | 21.2 | 35.34 | 70.68 | 106.02 |
| DN65 | 1.19 | 5.97 | 11.94 | 35.83 | 59.73 | 119.46 | 179.19 |
| DN80 | 1.8 | 9.04 | 18.09 | 54.28 | 90.47 | 180.95 | 271.44 |
| DN100 | 2.82 | 14.13 | 28.27 | 84.82 | 141.37 | 282.74 | 424.11 |
| DN125 | 4.41 | 22.08 | 44.17 | 132.53 | 220.89 | 441.78 | 662.68 |
| DN150 | 6.36 | 31.8 | 63.61 | 190.85 | 318.08 | 636.17 | 954.27 |
| DN200 | 11.31 | 56.54 | 113.09 | 339.29 | 565.48 | 1131 | 1696.47 |
| DN250 | 17.67 | 88.35 | 176.71 | 530.14 | 833.57 | 1767.2 | 2650.72 |
| DN300 | 25.44 | 127.23 | 254.46 | 763.4 | 1272.4 | 2544.7 | 3817.03 |
| DN350 | 34.63 | 173.18 | 346.36 | 1039.1 | 1731.8 | 3463.6 | 5195.41 |
| DN400 | 45.23 | 226.19 | 452.38 | 1357.2 | 2262 | 4523.9 | 6785.83 |
| DN450 | 57.25 | 286.27 | 572.55 | 1717.7 | 2862.8 | 5725.6 | 8588.32 |
| DN500 | 70.68 | 353.42 | 706.85 | 2120.6 | 3534.3 | 7068.6 | 10602.9 |
| DN600 | 101.8 | 508.93 | 1017.9 | 3053.6 | 5089.4 | 10179 | 15268.2 |
| DN700 | 138.5 | 692.72 | 1385.4 | 4156.3 | 6927.2 | 13854 | 20781.6 |
| DN800 | 181 | 904.77 | 1809.6 | 5428.7 | 9047.8 | 18096 | 27143.4 |
| DN900 | 229 | 1145.1 | 2290.2 | 6870.7 | 11451 | 22902 | 34353.3 |
| DN1000 | 282.7 | 1413.7 | 2827.4 | 8482.3 | 14137 | 28274 | 42411.5 |

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