ENGEMASS - S
Mass Flow Meter

Configuration & Use Manual

Ver. 1.5

Content

Attention

Please read this manual carefully before installation and operation. It is a detailed introduction of configuration, principle, specification, installation, etc. of Sealand mass flow meter.

The meter meets the following standards,

EN 60079-0:2012+A11:2013 EN 60079-1:2014 EN 60079-11:2012

IEC 60079-0: 2011 IEC 60079-1: 2014 IEC 60079-11:2011

It is produced according to *National Regulation of Coriolis Mass Flow Meter GB/T 31130-2014* and Ex-proof approved. Each sensor has its own paired transmitter. Please do not change any component in case of failure.

Please cut off the power before installation. Keep junction box intact and wiring correct; make sure no gasket, o-ring or holding screw missing, and electricity ex-proof device in good condition during the installation.

Mark: This is a general manual for Sealand meter, with all configuration described, and some configuration is optional. Please operate according to the meter purchased.

Chapter 1 Specifications

1.1 Introduction

Sealand meter is designed and produced according to world's latest Coriolis technology with better appearance, stability and accuracy to measure mass flow rate of a fluid traveling through a tube, widely applied to alternative energy, oil & gas, chemical, food & beverage, industrial energy, marine, power, pulp & paper, water & wastewater industries, etc.

1.2 Operating Principle

Mass flow meter measures the mass based on Coriolis effort. The operating principle involves inducing a vibration of the tube through which the fluid passes. The vibration, though not completely circular, provides the rotating reference frame that gives rise to the Coriolis effect. While specific methods vary according to the design of the flow meter, sensors monitor and analyze changes in frequency, phase shift & amplitude of the vibrating flow tubes. The changes observed represent the mass flow rate and density of the fluid.

1.3 Features

● Measurement is not influenced by flow density, viscosity, temperature & pressure;

● Low requirement of straight pipe, because nothing inside holds back the flow;

● Low power dissipation; stable zero point; better accuracy;

● Meter is ARM system with 3 calculators to count density, temperature & mass flow rate;

● Transmitter is assembled by surface mounting technology with self-inspection function;

● ATEX approved(excluding Transmitter F210). Cert. No. TPS 18 ATEX 04516 001 X

II 2G Ex db [ib] IIC T6...T1 Gb (Transmitter)

Ex ib IIC T6...T1 Gb (Sensor)

Specific Conditions of Use

1) WARNING-DO NOT OPEN TRANSMITTER WHEN ENERGIZED.

2) When the equipment is installed, precautions shall be taken to ensure the ambient temperature of the transmitter meets the marked temperature range, taking into account process fluid effects.

3) The cable entry holes of transmitter must be connected by means of suitable cable entry devices and which are covered by a separate conformity ATEX/IECEx certificate with the Ex d explosion protection property as the certification and in minimum IP67.

4) The unused entry holes of transmitter must be blanked by means of suitable blanking elements and which are covered by a separate conformity ATEX/IECEx certificate with the Ex d explosion protection property as the certification and in minimum IP67.

5) The external earth connection facility of transmitter shall be connected reliably.

6) For temperature class T2 and T1, to be energized with cable and cable gland suitable for temperature 100°C.

1.4 Operating Environment

Atmospheric pressure: 85kPa~106kPa

Ambient temp.: Refer to Chapter 1.6

Relative humidity: 5%~95%, non condensing

1.5 Operating conditions

Fluid :	Liquid/Gas
Fluid temperature:	-200°C~+200°C (higher temp. model is customizable)
Nominal pressure:	4MPa or 25MPa (Customizable)
Supply voltage:	AC 85~265VAC, 50/60Hz or
	DC 12~24VDC(±5%), 5W
Outputs:	Pulse 0~10KHz, RS-232C, RS-485, 4-20mA & HART (optional)

1.6 Temperature Class

Requirements for each class:

Temp. Class	Fluid Temp.	Min. Ext. Length	Transmitter Operating Temp.	
			Display	No Display
T6	-200~+60°C	10cm	-30~+45°C	
T5	-200~+80°C	10cm	-30~+45°C	
T4	-200~+105°C	10cm	-30~+45°C	
T3	-200~+138°C	10cm	-30~+45°C	
T2	-200~+238°C	50cm	-30~+60°C	-30~+85°C
T1	-200~+388°C	50cm	-30~+60°C	-30~+85°C

Table 1-1 Temp. Class Table

1.7 Model Designation

The mass flow meter consists of a F23 series transmitter and a CG/CNG series sensor.

F23 * * * ***

1 2 3 4 5

1: F23 series transmitter

2: Display

0: without display

1: with display

3: Voltage input

A: AC

D: DC

4: Communication mode

N: Routine

I: 4-20mA

H: HART

5: Sensor caliber (DN006~200)

CNG - **

1 2

1. Specially designed for CNG application

2. Nominal diameter (15, 20)

CG - ***

1 2

1. For all application

2. Nominal diameter (06, 15, 25, 32, 40, 50, 80, 100, 150, 200)

Chapter 2 Composition

The meter consists of mass flow sensor and transmitter, adopting executive standard GB/T 31130-2014.

2.1 Mass flow sensor

Mass flow sensor is a phase-sensitive resonant sensor based on Coriolis effect, composed

of vibration tube, signal detector, concussion driver, structural support, shell, etc.

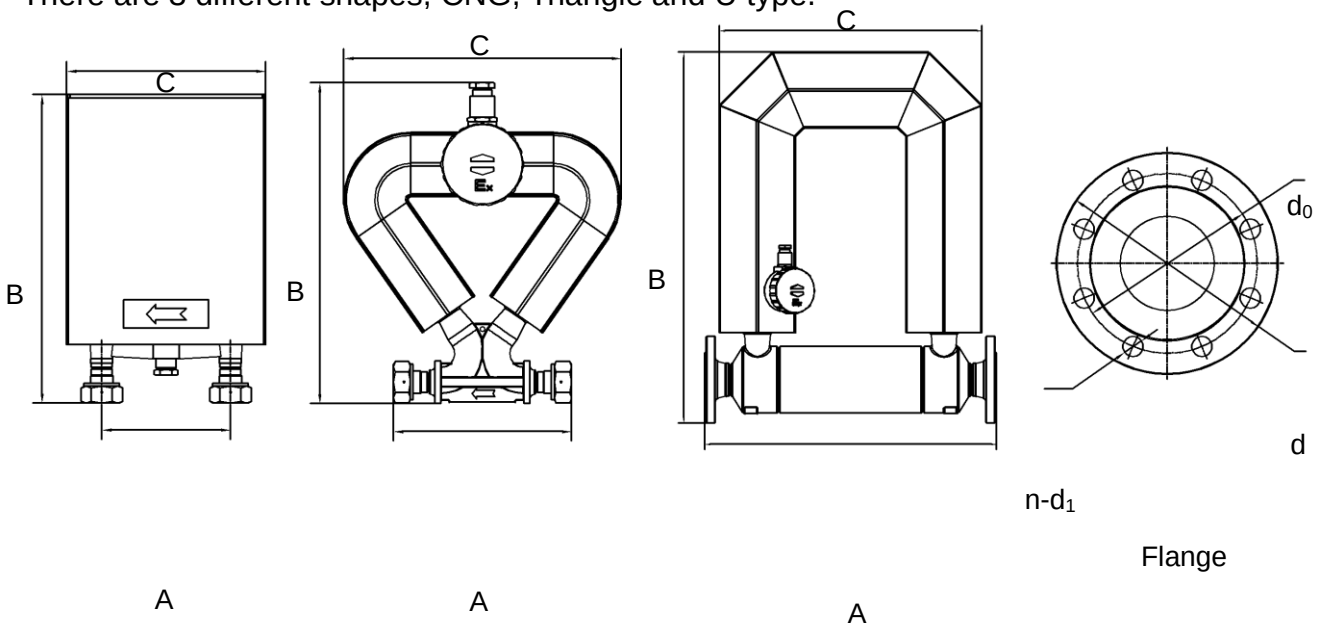
2.1.1 Main parameters

Item	Parameters
Accuracy class	0.1, 0.2, 0.3, 0.5
Vibrating tubes	Stainless steel 316L
Pressure drop	≤0.2MPa
Case protection	IP67
Ex-mark	⟨Ex⟩II2G Ex db ib IIC T1...T6Gb, Ex db ib IIB/IIC T1...T6 Gb

Table 2-1 Main Parameter of Sensor

2.1.2 Sensor Dimension

There are 3 different shapes, CNG, Triangle and U type.



Pic. 2-1 Shape of Sensor

Shape	Model No.	DN	Flow Range (kg/h)	Dimension			Flange (Standard DIN2635)			Bolt
				A	B	C	d	d_0	$n-d_1$	
CNG	CNG-15	15	300~3000	136	326	210				M32*1.5
TRI	CG-06	6	120~1200	162	319	235	95	65	4-φ14	M12
	CG-15	15	300~3000	188	369	293				M32*1.5
CNG	CG-20	20	945~9450	200	472	370				M42*2
TRI	CG-25	25	1200~12000	211	574	448	115	85	4-φ14	M12
U	CG-50	50	3000~60000	556	708	501	165	125	4-φ18	M16
	CG-80	80	75000~150000	830	970	501	200	160	8-φ18	M16
	CG-100	100	12000~2400000	763	1162	709	200	160	8-φ22	M20

Table 2-2 Dimension/ mm

2.2 Mass flow transmitter

Mass flow transmitter is a micro-programming-centered electronic system, which supplies thrust to sensor, transforms sensor signal into mass flow signal & others, and improves

accuracy in accordance with temperature parameter.

It's composed of switching power supplier, guard grating, core processor board, display module, etc., installed in a ex-proof junction box. Switching power supply offers power for transmitter; safe grating isolates sensor and transmitter intrinsically; core processor detects & processes sensor phase signal, sends mass flow signal and process communication.

2.2.1 Main Features

● Capable of configuration modification for different fluids;

● Capable of flow rate, density & temp. measurement;

● Capable of RS-232, RS-485 ModBus, 4-20mA & HART communication;

● Capable of mass total, volume total & density calculation, with 3 calculators;

● Capable of recording real-time total.

2.2.2 Basic Parameters

(1) Transmitter

Power: ≤ 5W

Display: Display with wide angle of view, wide temperature & backlight, to show flow rate, unit, total, alarm, alarm type, etc.

Switches: Optical switches SET & SELECT for all setup & operation.

(2) Setup operation

There are 2 ways for setup, SET/ SELECT & configuration software.

(3) RS-485 & HART communication port

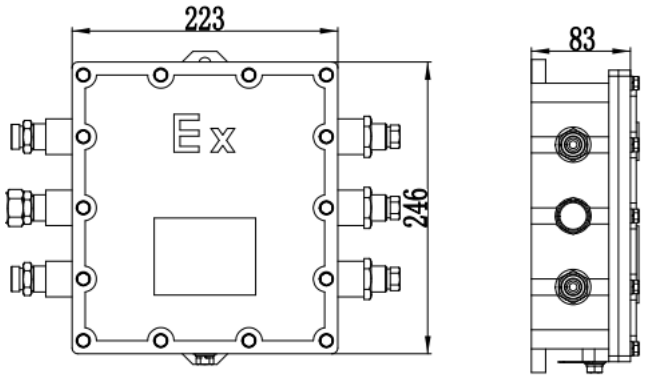
The meter is capable of communication with PLC through RS-485/HART communication port. Please contact us for the protocol if need.

(4) Pulse signal output

It is passive OC gate output, capable of electrical totalizer connection.

2.2.3 Transmitter Dimension

There are 2 different configurations, F210 & F23X.



Pic. 2-2 Dimension of F210

Pic. 2-3 Dimension of F23X

Chapter 3 Installation

There are strict safety requirements for the design, test, and power supply of mass flow meter; thus, please read this manual carefully and do accordingly before installation for safe operation.

3.1 Attention

a) Please take the safety requirements of flow rate, related device and environment into consideration before site selection & installation;

b) Installation and maintenance shall be done by professional technician;

c) Connect sensor with pipes correctly, without any leakage;

d) Take measure to avoid electric shock;

e) Fluid pressure shall be no more than the value marked on nameplate;

f) Installation tools meets safety requirement.

3.2 Before Installation

a) Make sure the flange, case & wire plug undamaged.

b) Make sure the wiring & wiring terminal tight and undamaged.

c) Make sure the model number on nameplate is same as ordered.

Mark	Description	Danger
	EX-Danger Area	Operate according to this manual to meet Ex-proof certificate requirement.
	High Pressure	Possibility of electric shock.
	Routine Danger	Possibility of routine danger which may cause injury.
	Surface Overheating or High Temperature	Possibility of scold.

Table 3-1 Danger Mark

3.3 Installation

3.3.1 Installation Steps

a) Choose correct installation site, taking installation area, pipeline, transmitter location & valve location into consideration;

b) Install the meter according to direction mark on sensor;

c) Install the sensor & transmitter on pipeline;

d) Connect transmitter & sensor with 9-pin cable;

e) Start.

3.3.2 Site selection

a) Sensor stays away from mechanical vibration source, for example, pump. Use flexible pipe to connect meter with pipeline if inevitable. The housing of meter must be standalone, out of touch with any other device. There must be 3 times the size of sensor between 2 sensors if there are many flow meters on the same pipeline, to avoid resonance.

b) Do not install sensor on pipeline that easily expands with hot and contracts with cold, especially near expansion joint, which leads to a worse stability.

c) Sensor stays away from industrial electromagnetic field, such as large generator and transformer, better 5m at least. Such device influences the performance of drive coil and pickoffs. Make sure magnetic field intensity less than 400A/m.

d) Sensor shall be installed on lower pipeline, to be easily full of fluid.

e) Make sure Ex-mark meet application requirements if in hazardous area.

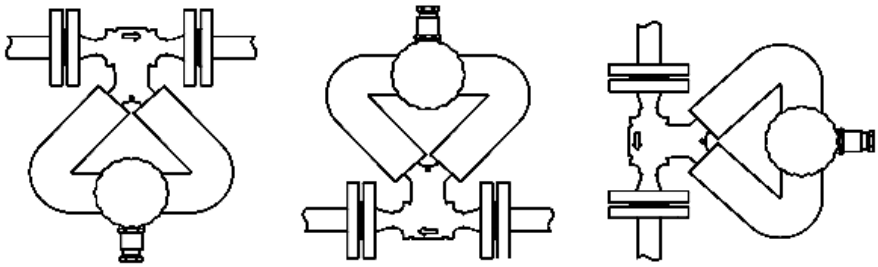
f) Build a sunshade if the meter is under direct solar radiation.

g) Keep the meter from corrosive liquid.

3.3.3 Installation methods

The sensor can not be a support point of the whole pipeline; the pipeline shall support itself. Meanwhile, sensor shall not be under overlarge tension stress during the connection, since pipeline expansion will make this stress heavier.

It is recommended to install the meter as follow according the different fluid.



Liquid Gas Slurry

Pic. 3-1 Installation Methods

a) For liquid, install the sensor downwards, to avoid air gathering in tubes.

b) For gas, install the sensor upwards, to avoid condensate gathering in tubes.

c) For slurry, install the sensor on vertical pipe, to avoid particle gathering in tubes.

3.3.4 Ground

Current signal from sensor is extremely weak, only several millivolt even when full range; thus, sensor shall be well grounded to filter other signals. There are 2 requirements as follows.

a) The electric potential of ground terminal of sensor and transmitter shall be the same as that of fluid.

b) Make the ground zero potential, to reduce interference. It's easy to meet this requirement, because generally the pipeline is metal and grounded itself already. However, the meter shall be grounded itself if there is strong interference. Meter ground cable shall be copper material, with section over 4mm^2, and not connected with common ground cable of motor, etc.; ground resistance shall be less than 10Ω.

3.3.5 Other Requirements

a) Make sure the meter coaxial with pipeline, and axis deviation ≤1.5mm for DN50 or smaller models.

b) Make sure the gasket of high corrosion resistance, and not touch tube interior.

c) Fasten bolt & nut, and make sure the thread intact. Select a suitable torque spanner for the fastening.

d) Isolate the meter during welding or flame cutting of close pipeline, to avoid heating.

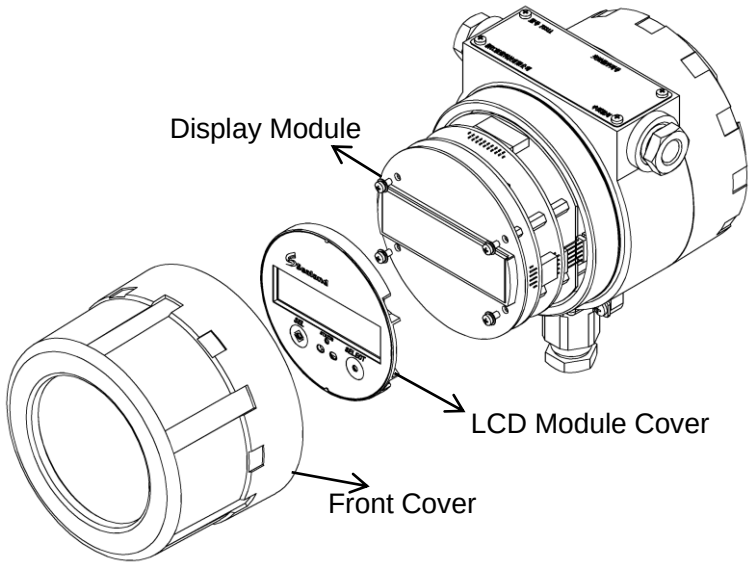
Chapter 4 Wiring & Circuit

4.1 Wiring

Only the sensor-transmitter- connection cable is provided with the meter; please prepare the power cable and others yourself.

4.1.1 Reverse Display Module

This chapter is for transmitter with display. Please rotate the front cover anti-clockwise, remove screws & 6P wire, and reverse the display module if you need the display reverse.

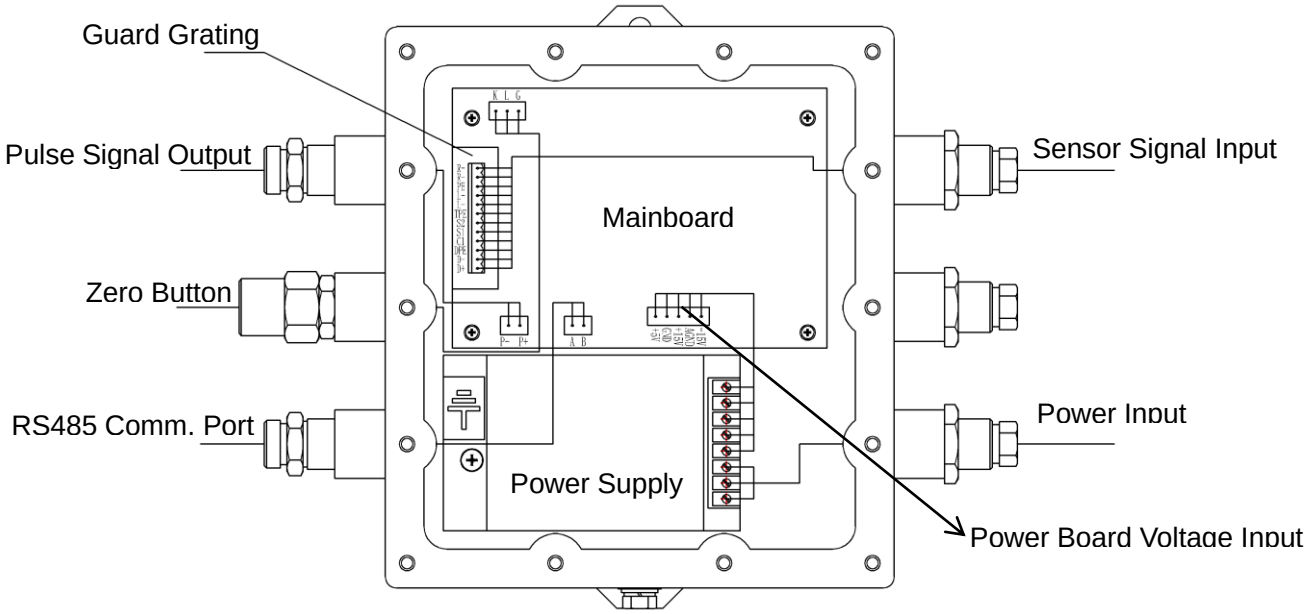


Pic. 4-1 Display Module

4.1.2 Power cable

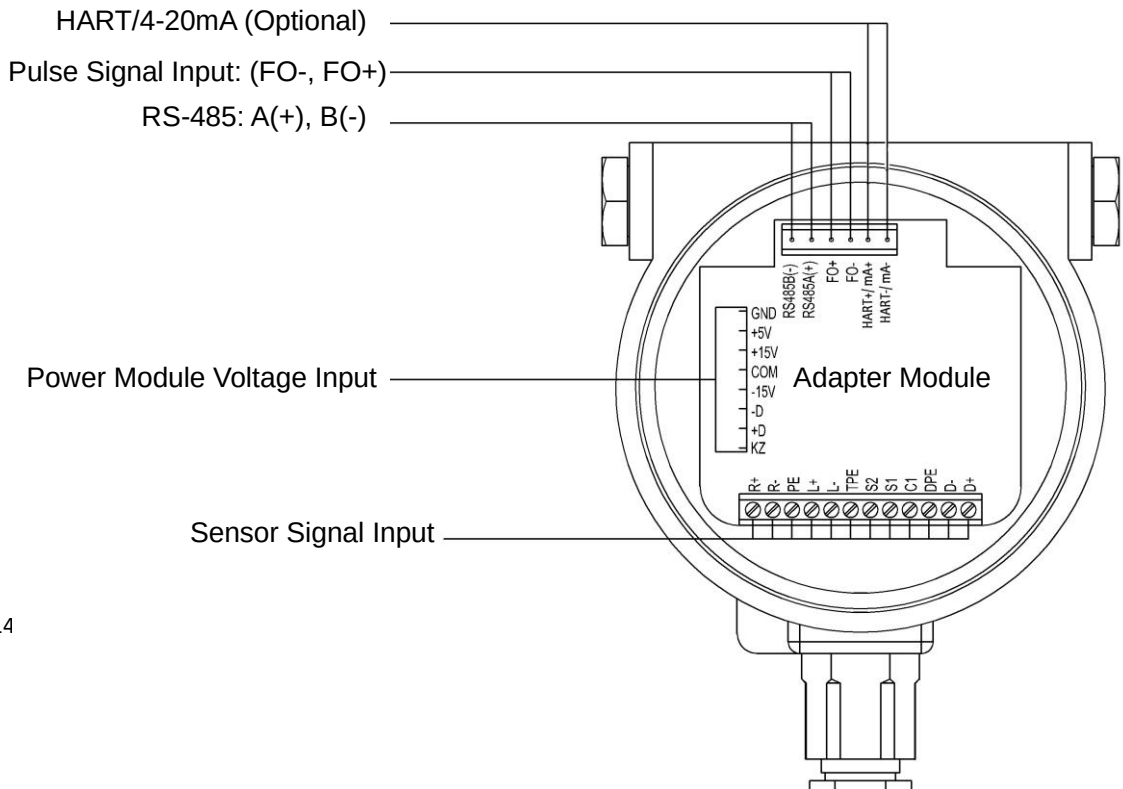
The power supply can be 85~265VAC or 12~24VDC. Section area of power cable shall be more than 0.8mm^2, and length no more than 100m.

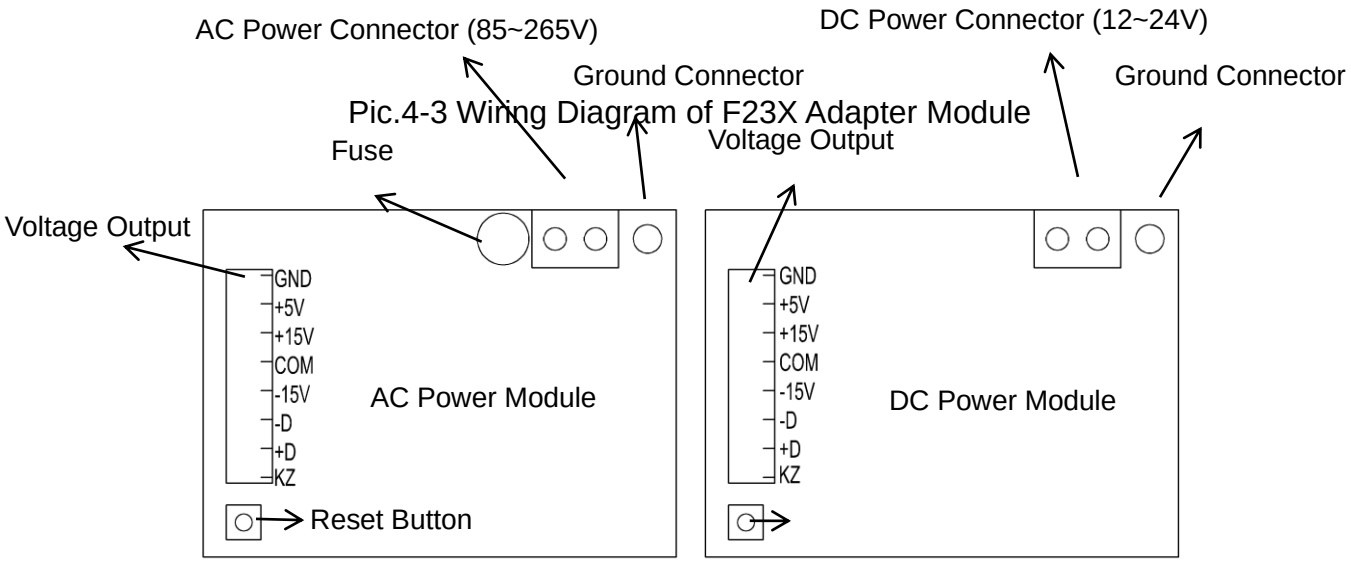
There are 2 kinds of transmitter, F210 & F23X. Please refer to the following diagrams respectively according to the model purchased.



Pic. 4-2 Wiring diagram of F210

Open the back cover of F23X, and you will find power module on the top and adapter module on the bottom.





Pic.4-3 Wiring Diagram of F23X Adapter Module

Pic.4-4 Wiring Diagram of F23X Power Module

4.1.3 Wiring Requirements

a) Cut off power before wiring;

b) Use correct wire;

c) Thread wires correctly: Loosen locknut; remove block board; thread wire through locknut, rubber ring and wire plug all at once; do the wiring; settle wires; tighten locknut.

d) Do not damage insulating layer when pare the cable. Do not pare shielding layer of sensor signal input wire if wirable.

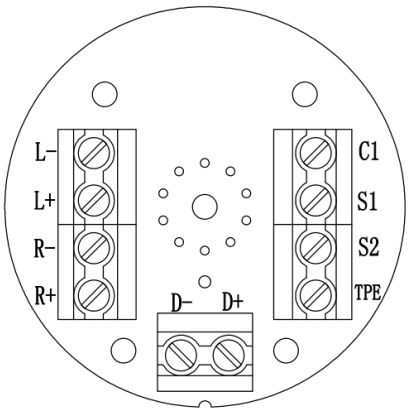
4.2 Circuit

4.2.1 Connection Cable

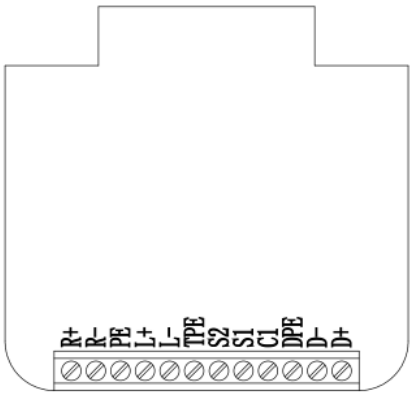
Sensor and transmitter are connected through a 9-pin shielded cable(the shielded cable is divided into 3, so the transmitter end is actually a 12-pin). Do not use other cable for the connection, in case of accuracy failure; do not hang this cable over motor or other power equipment, in case of electromagnetic influence; the max. length could be 150m.

4.2.2 Terminal definition

Open the back cover of the transmitter and junction box of sensor, and you will see the terminals as follows. Please wire accordingly.



Pic. 4-5 Sensor Terminal Board



Pic. 4-6 F23X Transmitter Terminal Board

The definition is as follows.

Code	L+	L-	R+	R-	D+	D-	TPE	S2	S1	C1
Color	Grey	Purple	White	Yellow	Blue	Red	Black (Shield)	Black	Green	Orange
Function	Left pickoff detection		Right pickoff detection		Coil drive		Temp. detection			

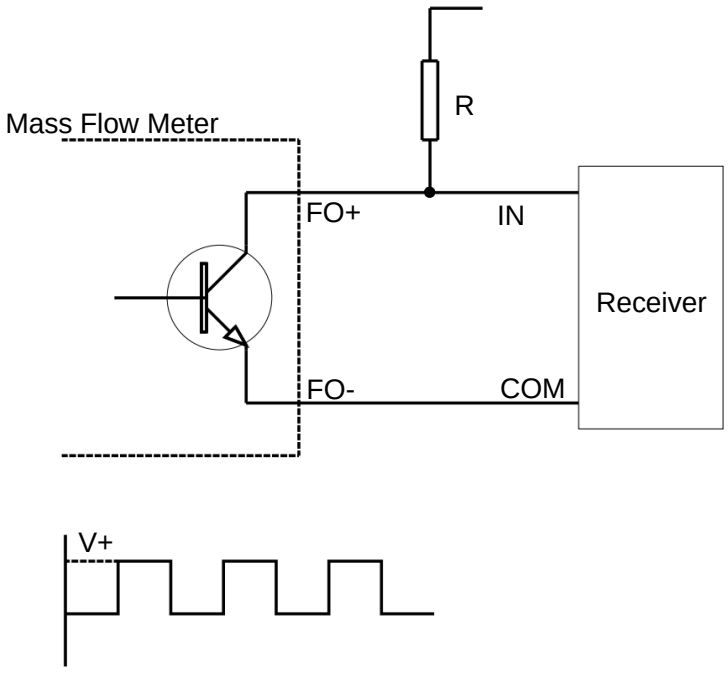
Table 4-1 Sensor Terminal Definition

Code	R+	R-	PE	L+	L-	TPE	S_2	S_1	C_1	DPE	D+	D-
Color	White	Yellow	Black (Shield)	Gray	Purple	Black (Shield)	Black	Green	Orange	Black (Shield)	Blue	Red
Function	Right pickoff detection			Left pickoff detection			Temp. detection			Coil Drive		

Table 4-2 Transmitter Terminal Definition

4.2.3 Connection with Pulse Receiver(Count)

The meter can work with a pulse receiver(Count). The connection is as follows. The resistance value is up to the cable length & the max. input pulse frequency of receiver. Current 10mA is suitable for most receivers; however, you can reduce the resistance value when the cable is long. The max. current could be 50mA. Please use the fixed frequency output function to check if the cable length & resistance value is suitable(refer to Chapter 7.6 for more details).



Pic. 4-7 Connection Diagram for Meter & Pulse Receiver

4.2.4 Start

Please check following items before operation, and operate according to relevant rules.

a) If the meter is damaged during shipment and installation;

b) If the voltage is same as marked on nameplate;

c) If the fuse is correct;

d) If the meter is grounded properly.

If everything is fine, please open all valves, make the pipeline full of liquid and then power on the meter for warm-up for 20min before operation. Finally, conduct zero calibration after first start, and shall do it again if the meter is moved to another site.

Preparation for zero calibration:

a) Power on the meter for approximately 20min for warm-up;

b) Run the process fluid through the sensor until the sensor temperature reaches the normal process operating temperature.

c) Close the shutoff valve downstream from the sensor.

d) Ensure that the sensor is completely filled with fluid and the process flow has completely stopped.

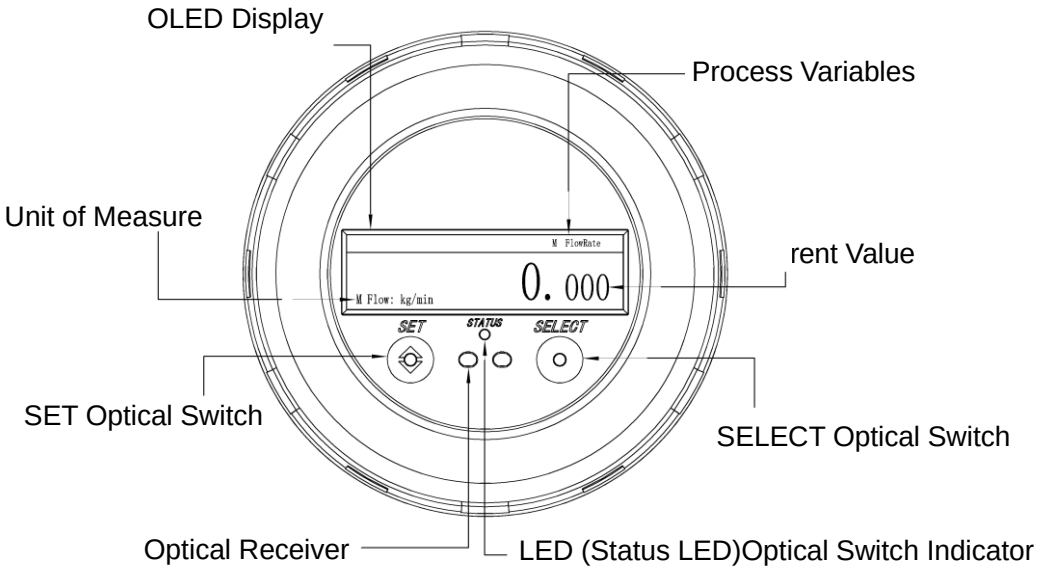
Please refer to Chapter 7.8 for detail operation of zero calibration.

Mark: Zero calibration is quite important, or the accuracy may be bad. It is highly recommended to check the zero point each 3 months, and do zero calibration if the zero point changes a lot.

Chapter 5 Meter Interface

5.1 Operating Interface

There are 2 optical switches(SET & SELECT) on the operating panel, and a bicolor indicator in the middle.

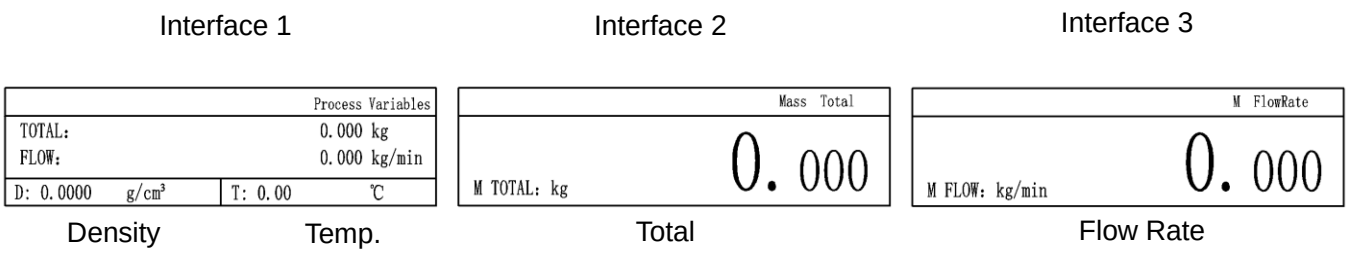


Pic. 5-1 Operating Panel Diagram

5.2 Interfaces

5.2.1 Main Interfaces

There are 3 main interfaces.



Pic. 5-2 Main Interfaces

5.2.2 Setup Interface

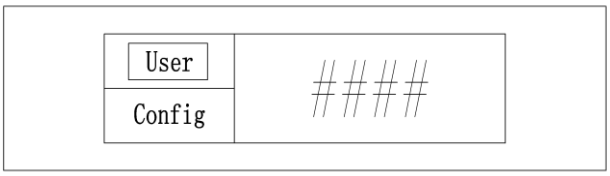
There are 2 options, User & Config.

Use Setup: Display Setup, System Setup, Troubleshooting & Sensor Status.

Config. Setup: Meter Setup, Communication Setup, Pulse Setup, Parameter Backup & Password Setup.

Original password: User 0001; Config. 0002.

Password initialization: Un-plug & plug the meter, press reset button on display board for 3s once it shows version number on screen. All passwords will be initialized as factory set in this way.



Pic. 5-3 Setup Interface

Chapter 6 Configuration Software

Please download the software from Sealand website www.chinasealand.com.

6.1 Connection Between Meter & Computer

Connect the meter and computer with a USB-to-RS485 converter(converter A+ end to transmitter A+ end, B- to B-, and GND to GDN); turn to device manager of the computer to check COM port connected with meter. Start the software, select the right COM port and click **Connect**; do not change any other parameters.

You can click **Connect** on the tool bar to disconnect or connect again; the connection status is shown at the bottom of the software.

6.2 Process Variables Monitoring

This interface comes automatically after the meter and computer are connected, or you can click **Functions** > **Process Variables** on the tool bar to call out. It shows real-time Flow Rate, Total, Density & Temperature.

6.3 Mainboard Information

This interface is to read mainboard number and mainboard real-time operating temperature. Click Functions > Mainboard Info on tool bar to call out.

Chapter 7 Operation

The SET and SELECT optical switches are used to navigate the transmitter display. To activate an optical switch, touch the glass in front of the optical switch or move your finger 1~2mm over the optical switch close to the glass.

The indicator will flash green when the display is timeout, will be solid red when one switch is activated, and will flash red when one switch is activated for 3s(hereafter referred to as long activate). Solid-red or flash-red means that the indicator has identified your operation; thus, please remove your finger afterwards, and do not touch the other optical switch, or it will be recognized as another operation.

The general operation is listed as follows.

On Main Interfaces	Activate SET to alternate mass and volume values.
	Activate SELECT to alternate main interfaces.
	Long activate SELECT to go to Setup Interface.

	Long activate SET for total reset.
Back to Main Interface	Long activate SET & SELECT at the same time.
Select Submenu, Parameters & Numbers	Activate SELECT to select the submenu, parameters or numbers.
	Activate SET to go to submenu or save parameters/numbers.
Save setup	Long activate SET to save the modified setup.
Back or Exit	Long activate SELECT.

Table 7-1 Operation Table

Mark:

1. The display will timeout without any operation in 5 min.

2. During numbers input, the decimal point will come up automatically if the first digit is 0; if not 0, please activate SELECT until decimal point shows up.

7.1 Calibration Factor Setup

There are 2 calibration factors, factory & user. Each meter has its own factory calibration factor marked on calibration certificate & nameplate of sensor, and the original user factor is 1 for all meters. Please use user factor for calibration, and do not change the factory factor.

Formula:

$$\text{New Factor} = \frac{\text{Original Factor}}{1+(\frac{\text{Measured Value} - \text{Real Value}}{\text{Real Value}})}$$

Mark: Customer can use the meter directly without setting new factor, but in the following 2

cases: 1. Transmitter is replaced; 2. There is a big difference between measured value & real value.

● By transmitter

Config > Meter Serup > Meter Parameters > User Cal. Factor > Mass Factor/ Volume Factor > Set > Save.

Detail Steps:

1. Long activate SELECT to go to the Setup Interface;
2. Activate SELECT until **Config** is selected;
3. Activate SET to go to the password input box;
4. Activate SELECT to select the right number, then activate SET to confirm, and it will come to next digit automatically;
5. Activate SET after you input all digits of password to go to the submenu;
6. **Meter Setup** will be selected directly because it is the first item on this submenu(activate SELECT until it is selected, if not);
7. Activate SET to go to the submenu of Meter Setup;
8. Activate SELECT until **Meter Parameters** is selected;
9. Activate SET to go to the submenu of Meter Parameters;
10. Activate SELECT until **User Cal. Factor** is selected;
11. Activate SET to go to the submenu of User Cal. Factor;
12. Activate SELECT to select **Mass Factor** or **Volume Factor**;
13. Activate SET to go to the factor setup interface;

14. Activate SET again to go to the new factor input box;

15. Activate SELECT to select the right number, then activate SET, and it will comes to next digit directly;

16. Long activate SET after you input all digits of the new factor to save the setup.

17. Done;

18. Long activate SELECT to go back, or long activate SET & SELECT at the same time to go to the main interface directly.

● By software

Tool bar > Functions > Configuration > Flow Rate > Factory Cal. Factor/ User Mass. Factor/ User Vol. Factor.

7.2 Density Calibration

● By software

Tool bar > Functions > Calibration > Density Calibration

Every parameter in this interface is calibrated in professional calibration lab. Please do not modify, or consult us if you have to.

7.3 Flow Cutoff Setup

There are some factors that may cause the meter count even when there is no fluid flowing through the sensor, such as the installation, vibration, etc; thus, a min. flow cutoff value is necessary. The meter won't count itself when the flow rate is less than this value.

● By transmitter

Config > Meter Setup > Flow Parameters > Flow Cutoff > Mass Cutoff/ Volume Cutoff.

● By software

Tool bar > Functions > Configuration > Flow Rate > Mass Cutoff/ Volume Cutoff.

7.4 Max. Frequency of Pulse Output Setup

● By transmitter

Config > Pulse Setup > Max. Frequency of Pulse Output.

● By software

Tool bar > Functions > Configuration > Frequency > Max. Fre. Of Pulse Output.

7.5 Pulse Equivalent

The factory set equivalent is suitable for most application. The pulse receiver may not detect the pulse when the value is too small, and it may lead to lack of measurement resolution when it is too big.

How to calculate a suitable equivalent:

$$\text{Pulse Equivalent} = 1.2 * \frac{\text{Max. Real Working Flow Rate}}{\text{Max. Working Frequency of Pulse Receiver}}$$

● By transmitter

Config > Pulse Setup > Pulse Equivalent.

● By software

Tool bar > Functions > Configuration > Frequency > Pulse Equivalent.

7.6 Fixed Frequency Output

This is to output a simulative fixed frequency to help test the count accuracy of pulse receiver and the max. receiving frequency.

● By transmitter

Config > Pulse Setup > Fixed Pulse Output Test > Fixed Frequency Setup.

● By software

Tool Bar > Functions > Output Test > Fixed Frequency Test > Modify > OK > Fixed Output.

7.7 Current Setup (4-20mA/ Optional)

This function is available only when the meter is configured with 4-20mA output.

There are 5 submenus:

Fixed Current Output Value: To set a simulative current value.

Fixed Current Enable: To simulate a current output for test. The current will disappear in 1min; enable again if you need it once more.

Output Options: To select which parameter you need to be inputted as current, including flow rate, density & temperature.

Upper Limit: To set a value for 20mA.

Lower Limit: To set a value for 4mA.

● By transmitter

Config > Current Setup.

● By software

Tool Bar > Functions > Configuration > Current.

7.8 Flow Direction

There are 4 options, forward, reverse, absolute value & bi-direction.

● By transmitter

Config > Meter Setup > Flow Parameters > Flow Direction.

● By software

Tool bar > Functions > Configuration > Flow Rate > Flow Direction.

7.9 Zero Calibration

● By transmitter

There are 2 methods to do zero calibration by transmitter.

1. Config > Meter Setup > Calibration > Zero Calibration > Start. The indicator will flash green during the calibration.

2. Open the back cover, press the reset button on power board, the red light blinks, and then calibration begins. Please kindly note that the meter is not ex-proof if you take off the back cover; thus, please do not conduct this method in hazardous area.

Please refer to Chapter 4.2.4 for the preparation before zero.

● By software

Tool bar > Functions > Calibration > Zero Calibration > Zero.

7.10 Total Reset

There are 2 totals, mass & volume. The other will be reset automatically if either is reset, and the reset is irrecoverable.

● By transmitter

Method 1: on any main interface, long activate SET, and then comes the total reset interface.

Method 2: Config > Meter Setup > Total Reset. There are 2 options here. Go to **Reset Total** for total reset; go to **Setup** if you want the total password-protected.

There are also 2 options for **Setup**. Go to **Password or Not** to enable/ disable the password(the total can be reset without password if disabled); go to **Reset Password** to

change the password. The original password is 0003.

Mark: This password only works for Method 1. This is no need to input password with Method 2.

● By software

Tool Bar > Functions > Total Reset.

7.11 Volume Calculation

Mass flow meter measures mass directly, but it can also show in volume. There are 2 options for volume calculation, by fixed & real-time density. Fixed density is the one you input, which does not change, and the real-time density is the one the meter measures, which changes when the flow, environment, etc. are different.

● By transmitter

Config > Meter Setup > Flow Parameters > Volume Calculation > Density Options > Fixed/ Real-T.

● By software

Tool Bar > Functions > Density Options > Fixed Density/ Real-Time Density > Save.

7.12 Units of Measure

● By transmitter

Config > Meter Setup > Units of Measure.

● By software

Tool Bar > Functions > Configuration > Flow Rate.

The following units are available.

Name	Units Available
Mass Total	G, kg, T, St, lt, lb.
Volume Total	m^3, L, ft^3, barrels, UKgal, USgal.
Mass Flow	lt/day, lt/hour, st/day, st/hour, st/min, lb/day, lb/hour, lb/min, lb/s, T/day, T/hour, T/min, kg/day, kg/hour, kg/min, kg/s, g/hour, g/min, Special.
Volume Flow	ft^3/h, ft^3/min, USgal/day, L/hour, UKgal/h, USgal/h, Bar/day, Bar/h, m^3/hour, m^3/s, m^3/min, Special.
Temp.	C°, °F, K, °R.
Density	g/cm^3, kg/m^3, st/yd^3, lb/in^3, g/L, kg/L, g/mL, lb/ft^3, lb/gal.

Table 7-2 Units Table

7.13 Password Setup

● By transmitter

Config > Password Setup.

7.14 Parameter Backup

● By transmitter

Config > Parameter Backup > Backup/ Restore.

7.15 Languages

Only English & Chinese are available for the moment.

● By transmitter

User > System Setup > Languages.

7.16 Timeout

● By transmitter

User > System Setup > Timeout > Set > Save.

Mark: Set it 0 to make it always on.

7.17 Display Setup

This is to choose what will be shown on main interfaces, mass, volume, or mass & volume. You can activate SET to alternate mass and volume if you choose M&V.

● By transmitter

Use > Display Setup > Set > Save.

7.18 Sensor Status

Please check the following factors if they are the same as marked on nameplate of sensor when transmitter/ sensor is replaced or transmitter is updated. Please modify accordingly if not.

FLOW CAL: Factory Calibration Factor;

D1: Low Density Calibration Value D2: High Density Calibration Value

K1: Low Density Calibration Time K2: High Density Calibration Time

TC: Density Temperature Compensation Factor

● By transmitter

Method 1: On main interface, long activate SET & SELECT at the same time, and it will go to sensor status interface.

Method 2: User > Sensor Status.

● By software

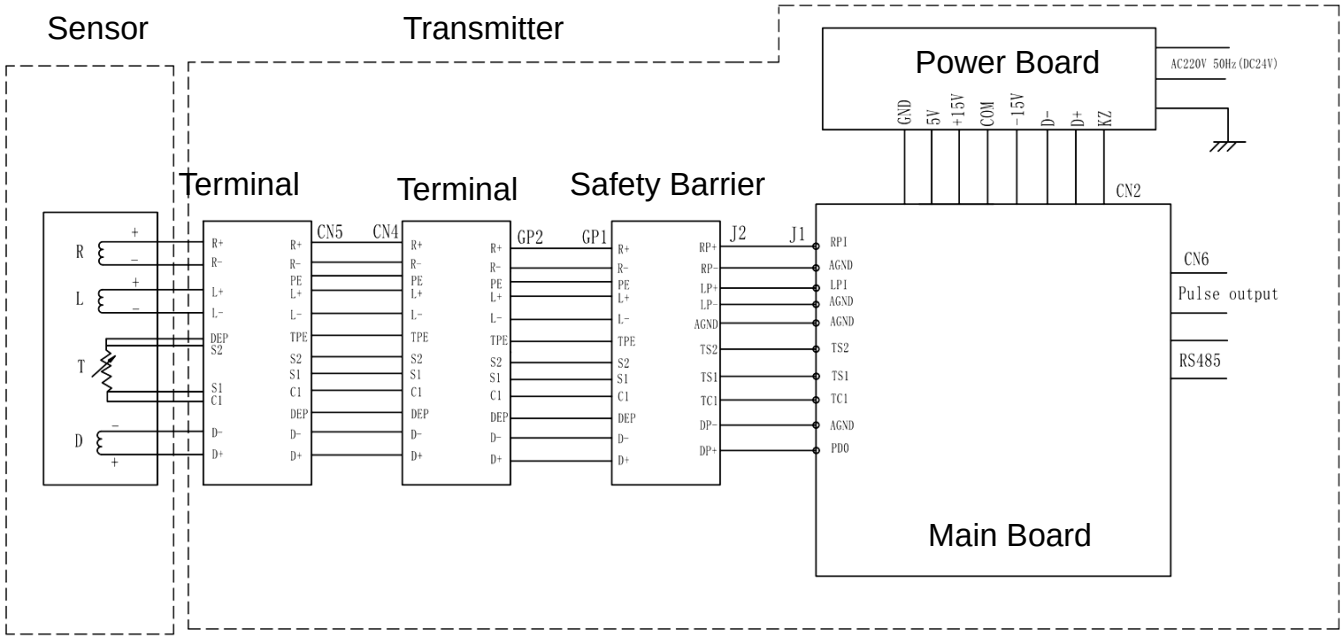
Tool bar > Functions > Configuration > check the parameters under Flow Rate and Density.

Chapter 8 Explosion-proof

●The meter is processed according to Ex-proof standard GB3836.1-2010 and GB3836.4-2010;

●The meter consists of intrinsically safe sensor, transmitter and connection cable. Sensor meets Ex-mark Ex ib IIBT1~T6 Gb/Ex ib II CT1~T6 Gb requirements, and transmitter Ex d[ib] II BT4Gb requirements;

●The sensor is intrinsically safe equipmentcan, with Ex-mark Ex ibIIBT1Gb~T6 Gb/ Ex ibIICT1~T6 Gb, and the transmitter with Ex-mark Ex d[ib]IIBT4Gb



Pic. 8-1 Ex-proof system

●The biggest capacitance from intrinsically safe sensor to transmitter allowed is 0.11μF, the biggest inductance 0.2mH;

Name	Max. Output Voltage/ V	Max. Output Current/ mA	Max. Output Capacitance/ μF
Dirve coil	11.8	100	9.9
Temp. sensor	6.2	43	790
Pickoffs	7.8	54	130

● Ambient temperature: -30~+65°C;

● The meter shall be well grounded during operation;

● Do not replace any component or part inside transmitter without manufacturer's guide;

● Inner diameter of wiring cable shall be φ8.5 or φ12, external diameter between φ8 & φ8.5 or φ8.5 & φ12. Please replace wiring cable if wornout;

● Keep corrosive gas from junction box;

● Do not install or dismount under inflammable gas environment.

● Repairs of the flameproof joints may only be made by the manufacturer or on behalf of the manufacturer and on his own responsibility. Repair in compliance with the values EN/IEC 60079-1 is not accepted.

Chapter 9 Troubleshooting

9.1 Self-diagnosis

The transmitter & software will self-diagnose once powered on/ connected.

The transmitter will show error code immediately on the top of display if there is anything wrong.

1.Error 01: Sensor error; 2.Error 02: Temp. sensor overrun;

3.Error 03: Zero failed; 4.Error 04: Transmitter initializing.

To callout the interface on software, click tool bar > Functions > Status. The light in front is green when everything is fine, but will be red if there is any error.

9.2 Troubleshooting

Error	Possible cause
No display	Maybe the screen is under auto-off status. Check if the voltage between terminal L/+ & N/- is 220V/24V. Check if the wiring between display terminal and mainboard is loosen or wrong.
Transmitter operation failure	Check if the wiring between display and mainboard is loosen or wrong.
No Modbus communication	Check if the communication wiring is loosen or wrong. Check communication port setting.
Unstable zero point	Check if the pipe is full of gas/liquid. Check if there is any bubble inside. Check if the meter is properly grounded. Check if motor, transformer or other electrical equipment is near. Check if the detector is under mechanical pressure. Check if the junction box is kept away from dust and water.
Flow rate accuracy failure	Check if zero point setting is correct. Check if flow unit and min. cutoff value is set properly. Check if the meter is properly grounded. Check if there is any bubble inside. Check if the reference value is correct.
Density accuracy failure	Check if the density unit is set properly. Check if it is fixed density. Check if the pipe is full of fluid, without any other impurity. Check if the temperature measurement is correct. Check if the meter is rusted or corrupted. Check if there is any impurity piled inside.
Temp. accuracy failure	Check the wiring of transmitter. Check if platinum resistor PT100 is correct. Check if the unit is the same.
Signal output failure	Check if the suspicious output signal setting is correct. Check if the output is normal.
Please contact the manufacturer if problem can not be solved.	

Table 9-1 Troubleshooting

Chapter 10 Completeness

The meter consists of sensor, transmitter and the connection cable. Please mark in PO if companion flange is needed. Along with the meter, there are use manual, certificate of qualified product & packing list.

Chapter 11 Transport and Storage

Please keep the meter in good condition during transport, better packed in the original package from the manufacturer.

Please make sure the site meets following requirements, if keep the meter in storage.

a) Waterproof and moisture-proof;

b) With few mechanical vibration and crush;

c) Temperature from -30°C to +65°C;

d) Humidity less than 80%, better about 50%;

e) Please clear up the sensor if storage used one;

f) Performance will be influenced if storage in the open.

Chapter 12 Limited Warranty

Meters are warranted for two years from the date printed on nameplate, within which Sealand will offer technical support and spare parts for free if the meter doesn't work well during proper operation according to the manual. Besides, Sealand will continue to provide life-long maintenance services afterwards.

However, all replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources or environmental conditions, accident, misuse, improper installation, modification, repair, use of unauthorized replacement parts, storage or handling, or any other cause not the fault of Sealand are not covered by this limited warranty, and shall be at buyer's expense. Sealand shall not be obligated to pay any costs or charges incurred by buyer or any other party except as may be agreed upon in writing in advance by Sealand. All costs of dismantling, reinstallation and freight and the time and expenses of Sealand's personnel and representatives for site travel and diagnosis under this warranty clause shall be borne by buyer unless accepted in writing by Sealand. Goods repaired and parts replaced by Sealand during the warranty period shall be in warranty for the remainder of the original warranty period or ninety days, whichever is longer. The limited warranty is the only warranty made by Sealand and can be amended only in a writing signed by Sealand.

The warranties and remedies set forth above are exclusive. There are no representations or warranties of any kind, express or implied, as to merchantability, fitness for particular purpose or any other matter with respect to any of the goods or services.

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