F211x-Ex & F212x-Ex Series

Explosion-proof Thermal Mass Flow meter

· Instruction Manual ·

Version : 1.01

Experts in Compressed Air & Fluid Measurement

Fast · Accurate · Management

Preface

- Dear customer, thank you for choosing our products.
- This manual is a description of the use range, functions, installation and operation methods, troubleshooting, and maintenance of the product.
- The user must read this operation manual completely before using the device to properly use the product.
- After you read it, keep it in an accessible place for the next operational reference.

Notice

- YUA Instruments is not responsible for damage caused by unauthorized changes to the equipment without reviewing the operation manual or violating the provisions of this operation manual, and the instrument guarantee will be automatically voided.
- YUA Instruments is not responsible for incidental damage caused by transportation, equipment performance, or mishandling.
- YUA Instruments do not promise the suitability of this equipment for any application not described herein.
- YUA Instruments have tried to make the information in this manual correct. If you find any problems, you are welcome to contact us.
- The contents of this manual are forbidden to be reproduced, copied, or modified without permission.

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1 Safety Instructions

1.1 General Safety Instructions



Danger!

Compressed air!

Any contact with rapid air leaks or pressurized parts of the compressed air system can lead to significant injury or even death.

- Never exceed the recommended pressure range.
- Make sure air tools & hoses are in good condition.
- Ensure the system is not under pressure when performing repair & maintenance.



Danger!

Power voltage!

Any contact with the electrical parts of the product can lead to significant injury or even death.

- Consider all electrical installation-related regulations.
- Any power connections must be disconnected when performing repair & maintenance.
- Any electrical work on the system is to be performed by authorized personnel only.



Attention!

Operating conditions!

Please check the permissible operating conditions. Any operation beyond these limits could potentially cause measurement failure or even damage the instrument or the entire system.

- Please review national standards and regulations during the preparation and installation process.
- The product is prohibited for use in explosive areas.
- Ensure the product operates within the allowed working conditions.



Caution!

Product malfunction!

Incorrect handling and improper transport could cause product malfunction.

- Unauthorized disassembly of the product is prohibited.
- Use correct and appropriate tools to operate to product.
- In case the product malfunctions, please stop using it and contact customer support.

1.2 Storage and Transport Safety

- It is recommended to use the product's original packaging for storage and transport.
- Ensure the product operates at a temperature of -30 ··· +60 °C.
- Avoid exposure to sunlight and UV rays.

1.3 Battery Safety

- Do not use accessories or chargers not recommended by the manufacturer.
- The built-in battery cannot be dismounted. Please contact the manufacturer for repair if necessary.
- When the device reaches the end of its life, follow local guidelines for proper disposal or recycling. Do not dispose of the device with regular trash.

2 Product Overview

2.1 Application

F211x-Ex & F212x-Ex flow meter is based on thermal measurement technology. It can measure the standard flow, mass flow, consumption, and gas temperature directly.

Explosion-proof structure design, applicable to harsh environments:

Explosion-proof class: Ex db IIC T6 Gb / Ex tb IIIC T80°C Db

Protection code: IP67

No moving parts, stable signal, vibration proof, high reliability, long-term measuring accuracy

Full-digital signal processing is used instead of the conventional analog bridge design, resulting in a wider range and more accurate measurement.

The low measuring limit can reach 0.1Nm/s, and the turndown ratio can reach 1:2500. It has a wider measuring range than common flow meters on the market, making it suitable for measuring extremely volatile flow, low-flow bypass, and the gas consumption of single equipment.

With the innovative, intelligent diagnosis technology, it can sense the sensor pollution online and protect the sensor from overheating

2.2 Features

- ✓ Full-digital signal processing, higher accuracy, long-term stability
- ✓ Based on the thermal flow measurement principle, it's not required to compensate gas pressure and temperature, integrated temperature measurement
- ✓ With an ultra-wide 1:2500 turndown ratio, the measuring range is from 0.1 Nm/s to 250 Nm/s
- ✓ Explosion-proof class: Ex db IIC T6 Gb / Ex tb IIIC T80°CDb
  Protection code: IP67
- ✓ The capacitive touch 2.0" IPS LCD with an ultra-wide view
- ✓ Bluetooth function for wireless flow meter configuration and data transmission
- ✓ Standard Modbus RTU (RS485) interface, 4 to 20 mA current and pulse output
- ✓ Insert type F211x-Ex: Suitable for pipes with diameters from DN20 to DN1000, and can be installed under pressure via a 1/2" ball valve.
- ✓ Pipe type F212x-Ex:
  Pipe size: DN15, DN20, DN32, DN40, DN50, DN65, DN80
- ✓ The process for connection: R-type thread, Flange EN1092-1, ANSI / B16.5

2.3 Technical Data

Flow	
Measuring Range	0(0.1) … 250 Nm/s

Accuracy	±(1.5% RD + 0.3% FS) [1% RD Option]
Sampling Rate	> 20 Samples / sec
Medium	Compressed air, nitrogen, oxygen, carbon dioxide and other non-condensing gases
Reference Conditions	20 °C, 1 bar(a) -ISO 1217 (Configurable)
Display	
Display	2.0" IPS LCD with capacitive touch
Power	
Power	18 ... 30 VDC, 5W @ 24VDC
Output	
4~20 mA Output (Standard)	Flow rate / Temperature (Configurable)
Pulse Output (Standard)	Consumption / Alarm
Digital Output (Standard)	Modbus RTU (RS485)
Wireless Communication	Bluetooth (Standard) Hart (Option) Wi-SUN & IOT-4G (Select one)
Operating Environment	
Environment Temperature	-30 ... +60 °C
Medium Temperature	-40 ... +80 °C
Operating Pressure	F211x-Ex: 0 ··· 1.7 MPa(a) F212x-Ex: 0 ··· 1.7 MPa(a) (4.0/6.3 MPa.a Option)
Explosion-proof Class & Protection Code	
Explosion-proof Class	Ex db IIC T6 Gb / Ex tb IIIC T80°C Db
Protection Code	IP67
Other	
Process Connection	G1/2" (ISO 228-1) (F211x-Ex Insert type)
EMC	Compliant with IEC 61326-1
Pole / Pipe Section Material	SUS304 (Standard) SUS316 (Option)

2.4 Measuring Range

F211x-Ex Measuring Range:

Inch	DN	ID (mm)	Min Flow (Nm^3/h)	Max Flow -Std (Nm^3/h)	Max Flow -High (Nm^3/h)
3 / 4	20	20	0.1	135	282
1	25	25	0.2	212	441
$1^{1/4}$	32	32	0.3	347	723
$1^{1/2}$	40	40	0.5	542	1131
2	50	50	0.7	848	1767
$2^{1/2}$	65	65	1.2	1433	2986
3	80	80	1.8	2171	4523
4	100	100	2.8	3392	7068
5	125	125	4.4	5301	11044
6	150	150	6.4	7634	15904
8	200	200	11.3	13571	28274
10	250	250	17.7	21205	44178
12	300	300	25.4	30536	63617

* For more pipe sizes and flow ranges, please consult sales

F212x-Ex Measuring Range:

Inch	DN	ID (mm)	Min Flow (Nm^3/h)	Max Flow (Nm^3/h)
1 / 2	15	15	0.06	76
3 / 4	20	20	0.1	135
1	25	25	0.2	212
$1^{1/4}$	32	32	0.3	347
$1^{1/2}$	40	40	0.5	542
2	50	50	0.7	848
$2^{1/2}$	65	65	1.2	1433
3	80	80	1.8	2171

* For more pipe sizes and flow ranges, please consult sales

3 Dimension & Installation

3.1 Dimension (in mm)

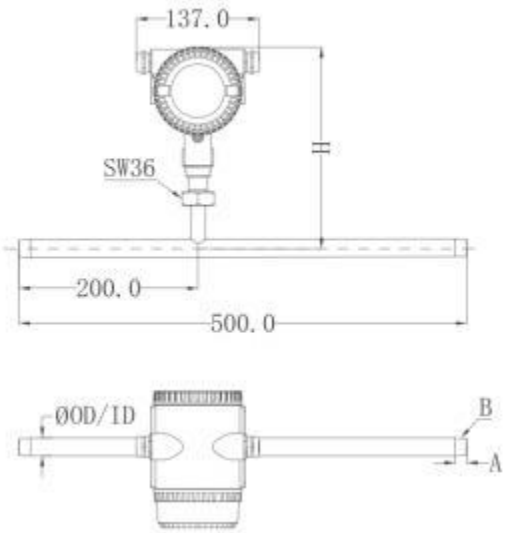


Figure 3-1 F212x-Ex Thread-type Dimension Schematic

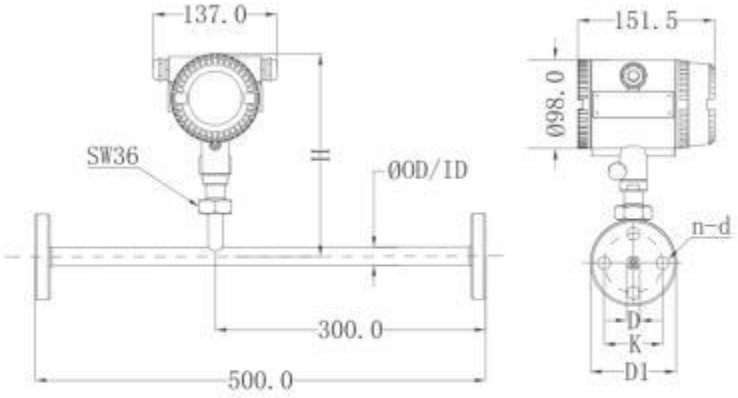


Figure 3-2 F212x-Ex Flange-type Dimension Schematic

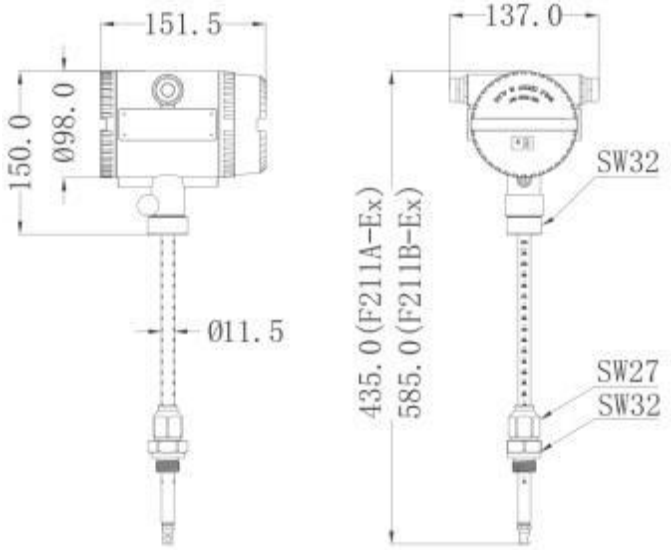


Figure 3-3 F211x-Ex Dimension Schematic

F212x-Ex Detailed Dimension of Thread-type

DN	Inch	A Thread Length (mm)	B Male Thread (mm)	H Pipe Center to Top of Housing (mm)

15	**1 /2**	⩾13.2	R1/2"	226
20	**3/4**	⩾14.5	R3/4"	225
25	**1**	⩾16.8	R1"	224
32	**$1^{1/4}$**	⩾19.1	$R1^{1/4"}$	226
40	**$1^{1/2}$**	⩾19.1	$R1^{1/2"}$	226
50	**2**	⩾23.4	R2"	226

F212x-Ex Detailed Dimension of Flange-type

DN	Inch	D Pipe Inner Diameter (mm)	D1 Flange Outer Diameter (mm)	K Screw Hole Center Distance (mm)	H Pipe Center to Top of Housing (mm)	n Number of Flange Holes	d Screw Ole Diameter (mm)
15	**1 /2**	15	95	65	226	4	14
20	**3/4**	20	105	75	225	4	14
25	**1**	25	115	85	224	4	14
32	**$1^{1/4}$**	32	140	100	226	4	18
40	**$1^{1/2}$**	40	150	110	226	4	18
50	**2**	50	165	125	226	4	18

3.2 Installation Procedure

- Installation site and environment selection

In order to achieve the rated detection accuracy, in addition to the instrument body, the installation environment must also meet the technical requirements.

The measurement point must be located in a long straight section of pipe and fulfil the minimum length requirements upstream and downstream (see below for specific data). Place the sensor in the center of the pipe at the point of installation, with the measurement direction in line with the direction of airflow.

Any burrs, seams, bends or other obstructions that may cause reverse or forward eddy currents, resulting in data distortion.

The F211x-Ex & F212x-Ex Explosion-proof thermal mass flow meters are intended for indoor use only. For outdoor installation, avoid direct sunlight, rain and snow.

Attention:

F211x-Ex & F212x-Ex Explosion-proof thermal mass flow meters use the thermal mass flow principle for detection. They operate without regard to pressure or temperature effects on flow rate and flow rate, and therefore do not require temperature and pressure compensation. The F211A-Ex is only suitable for detecting clean gases, and should be installed in pipelines that have been processed by a post-processing system

(including filters and refrigeration dryers / adsorption dryers), and of course further back in the transfer pipeline and drying point. Supersaturated and condensed gas environments, such as piping between the compressor and the treatment, will generate liquid water, which can cause deviations in the detection results and deterioration of the sensor, and therefore can only be installed temporarily in exceptional cases. If the meter becomes contaminated or inaccurate as a result, it will need to be cleaned and calibrated appropriately. If the meter is damaged or needs to be cleaned, it is not covered by the warranty, and we will provide the service for a fee.

F211x-Ex installation steps

- Measurement point selection

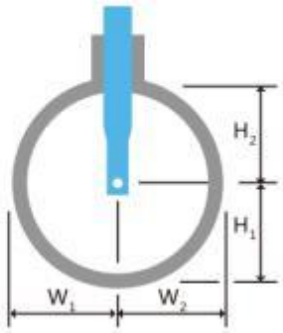


Figure 3-4 Schematic Diagram of Measuring Point Selection

figure above, $H_1=H_2=W_1=W_2=½D$

Of these, W_1 and W_2 are controlled by relying on welding the short wire tip perpendicular to the pipe cut, and H_1 and H_2 are controlled by relying on the depth of insertion (calculating, measuring and observing the scale and adjusting it).

- Straight pipe section requirements

In order to measure accurately, the flow meter upstream and downstream must leave enough straight pipe section, the upstream should not affect the distribution of fluid flow rate of parts, Figure 3-5 for a variety of piping conditions flow meter before and after the minimum length of straight pipe section requirements.

(*DN：Nominal Diameter)

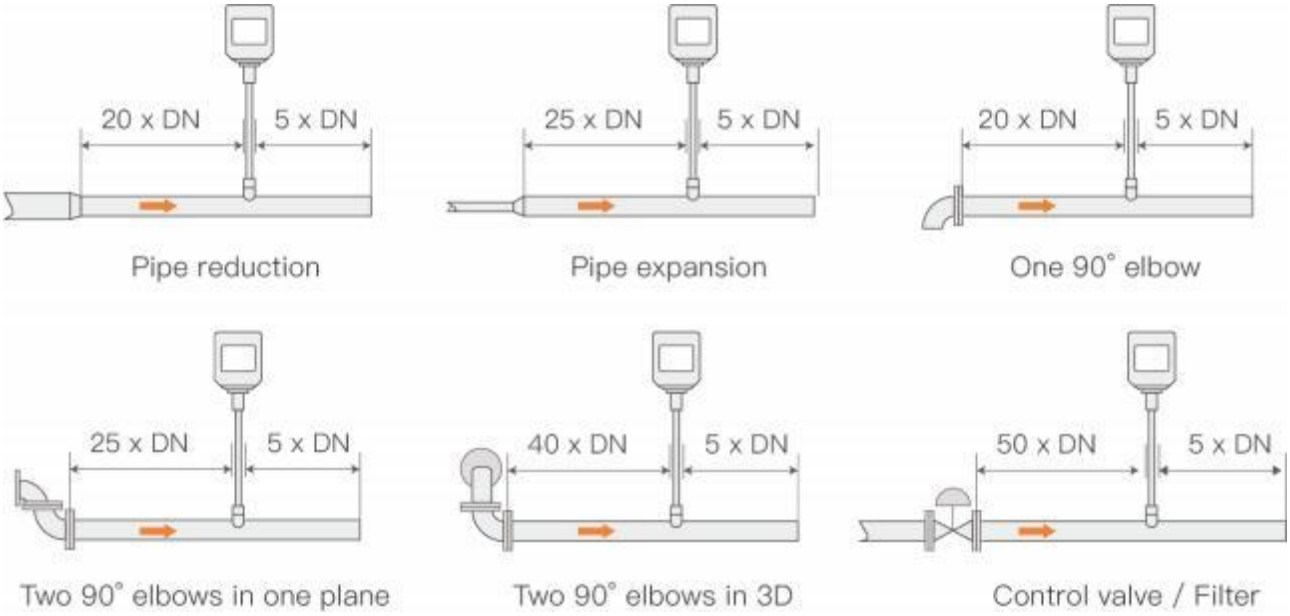


Figure 3-5 Straight Pipe Section Installation Requirements

- Power ready

F211x-Ex Explosion-proof thermal gas mass flow meter is powered by 24 VDC. If the site does not have DC 24V 5W power supply conditions, you need to choose a special power converter, please contact us to buy.

Please leave the connecting cable at an appropriate length to avoid stress.

- Welding wire heads

The specification of the tap is the national standard tapping pipe, G%" male thread (should be matched with the ball valve). After welding, the distance from the outer end of the tap to the pipe should be ≤ 30 mm. it is impossible to remove the tap after it isYUAed, so please avoid using thin-walled or squeezed compression diameter of the tap. Extension or auxiliaryYUAtures can be used to ensure the verticality of the wire head during welding. Avoid welding through the pipe, as burrs on the inner wall may cause turbulence and affect the accuracy of the test. The weld should be uniform and firm without air holes.

- Open hole

When drilling holes, please ensure that the pipeline is fully released, otherwise, special pressure hole opener must be used, please contact us to purchase. The hole diameter should be Φ>13.2 mm, smooth and burr-free, and co-centered with the wire head.

- Installation of ball valves

Ball valve mounting is recommended. This mounting will allow the F211x-Ex to be dismantled under pressure, making it easier for temporary testing, post-calibration and maintenance. Use a stainless steel two-piece full bore ball valve with an internal diameter > 13.2 mm. be sure to use a G%" thread, otherwise the meter will not be securely connected or the connector thread will be damaged. When connecting the ball valve, make

sure that the valve is open with the handle pointing towards the meter head.

Attention:

With ball-less mounting, the F211x-Ex can be used normally, but will result in the inability to be removed with pressure, affecting recalibration or sealing of the mounting ports during maintenance. And, of course, installation with pressure is not available.

- Installation

Please loosen the flow meter lock nut appropriately and push the lock nut and connector to the side of the sampling hole. The F211x-Ex uses an end face seal. Place the O-ring on the end face of the connector, connect and tighten the connector so that the connector and the valve end face press against the O-ring to get a good seal. Please keep the flow meter arrow in line with the gas flow direction.

Use a ruler to measure the outer diameter of the pipeline OD, use a ruler to measure the distance between the pipeline and the upper surface of the ball valve X, and calculate the installation height data.

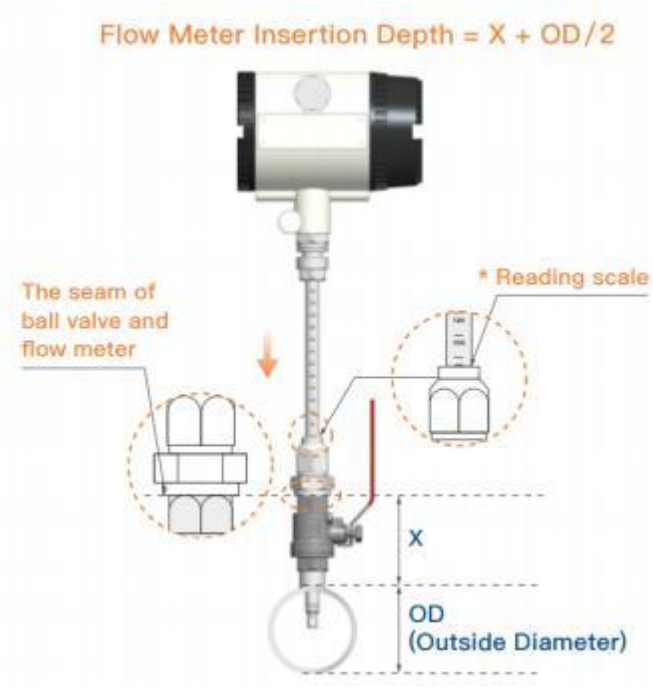


Figure 3-6 Schematic Diagram of Insertion Depth Calculation

Installation Height (IH) =X(mm)+ ½OD

Open the valve, push the F211x-Ex down slowly and read the insertion scale at the top edge of the locknut so that the insertion scale is equal to the IH value calculated above. Considering that the lock nut will continue to drop about 1 mm when it is locked, adjust the insertion depth by inserting more of the corresponding height.

Use the direction adjusting ruler to make fine adjustments to keep the same direction with the airflow, and the deviation angle should be ≤2°. Direction adjusting ruler is attached with 1-2 pcs in the accessories of the flow meter.

Review the insertion depth and direction to ensure that it is correct and then tighten the lock nut (20~30 Nm)

F212x-Ex installation steps

Straight pipe section installation requirements **(same as F211x-Ex)**

Installation

Before installation, please make sure that the width of the piping is equal to the length of the flow meter piping.

Load the flow meter (note that the direction of the flow meter marking and the direction of the fluid is consistent, and the flow meter body and the pipeline must be centered, the same diameter) with bolts to the flow meter isYUAed in the pipeline flange, the installation is complete!

3.3 Electrical Wiring

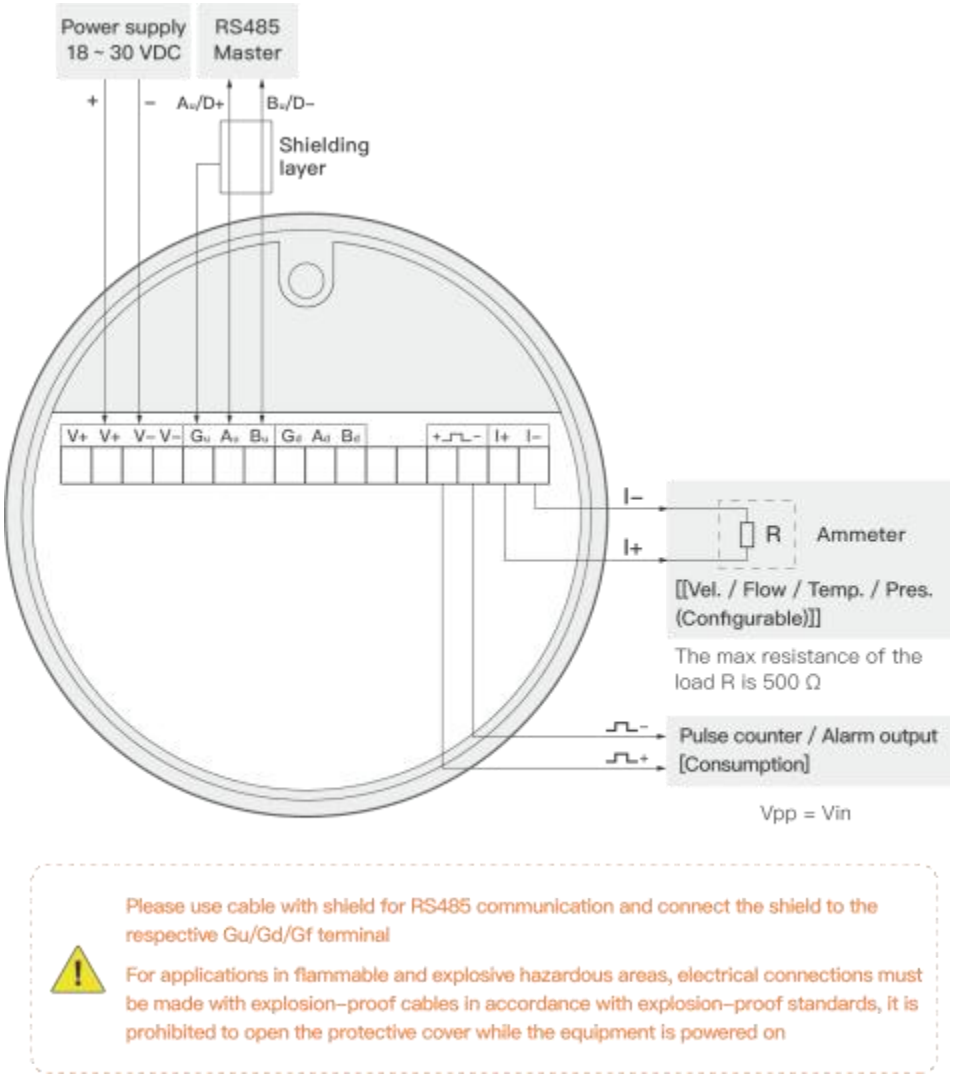


Figure 3-7 Standard Flow meter Connection

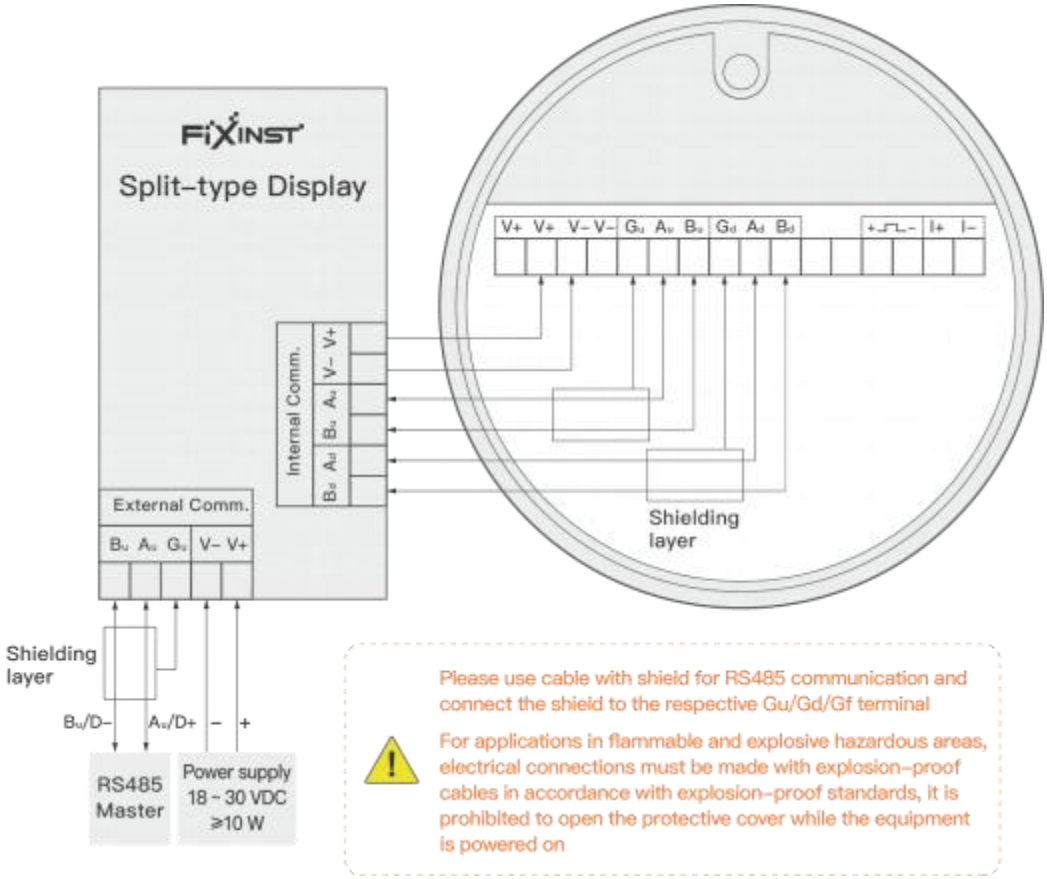


Figure 3-8 Split-type Flow meter Connection

4 Operation

4.1 Start-up

When meter is powered on, it starts to operate automatically according to the memorized settings.

4.2 User Interface Operation

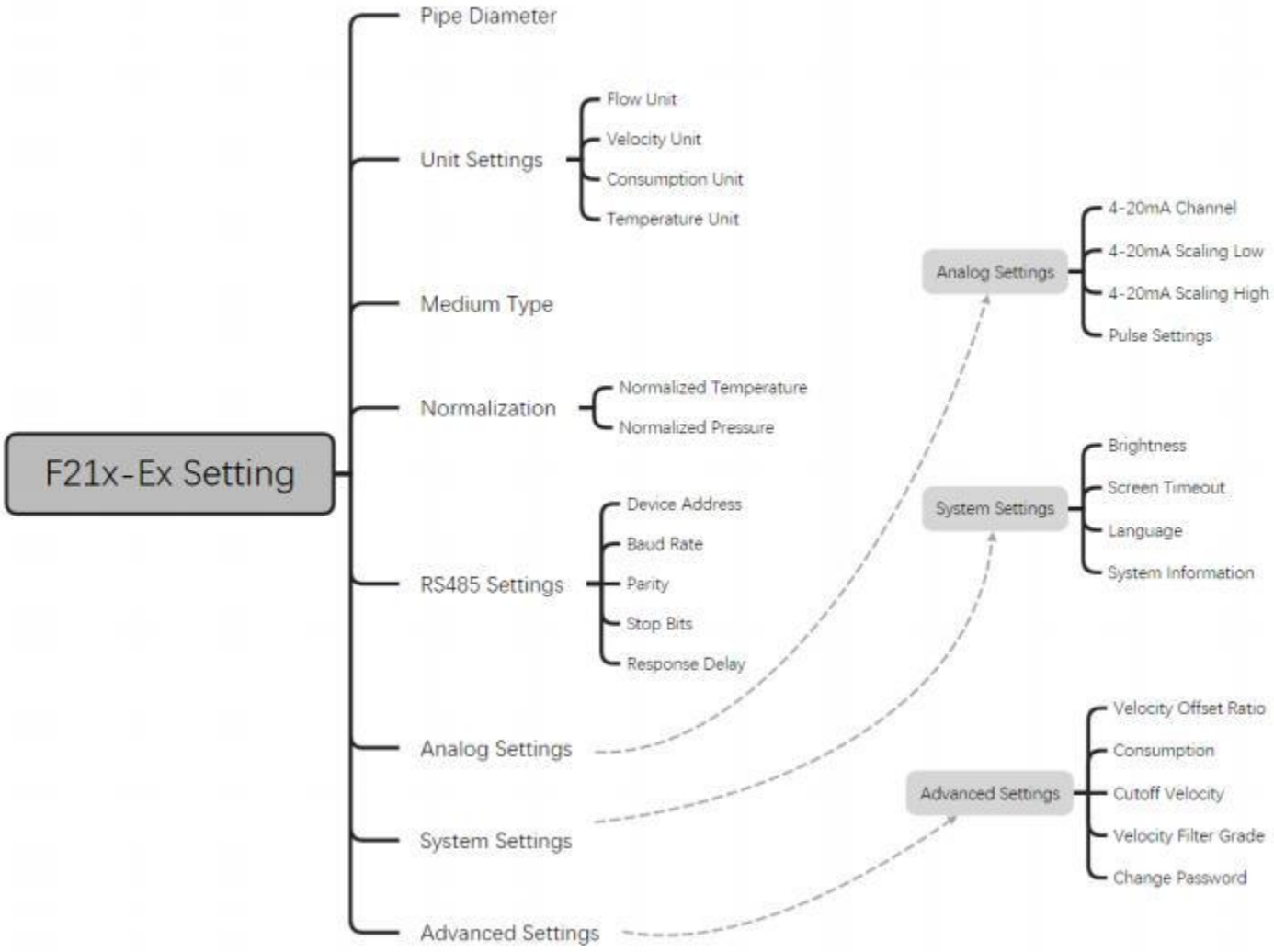
The default page of the display interface shows the flow detection contents, which are instantaneous flow rate and cumulative volume.



Figure 4-2 F211x-Ex & F212x-Ex Main Interaction Interface

F211x-Ex & F212x-Ex Explosion-proof thermal mass flow meters feature an IPS touch screen and easy to understand WYSIWYG operation. You can unlock and click the setup button at any time during operation to enter the setup screen.

4.3 Setting Menu


F21x-Ex Setting
Pipe Diameter
Unit Settings
Flow Unit
Velocity Unit
Consumption Unit
Temperature Unit
Medium Type
Normalization
Normalized Temperature
Normalized Pressure
RS485 Settings
Device Address
Baud Rate
Parity
Stop Bits
Response Delay
Analog Settings
System Settings
Advanced Settings
Analog Settings
4-20mA Channel
4-20mA Scaling Low
4-20mA Scaling High
Pulse Settings
System Settings
Brightness
Screen Timeout
Language
System Information
Advanced Settings
Velocity Offset Ratio
Consumption
Cutoff Velocity
Velocity Filter Grade
Change Password

5 Signal Output

5.1 Analog Output

F211x-Ex & F212x-Ex series flow meters come standard with a 4 ~ 20 mA output. 4 mA corresponds to 0 Nm/s, 20 mA corresponds to the maximum flow rate of the model (see "Range" for standard models, non-standard models are subject to factory Calibration Certificate File).

Output channels can be modified by meter display module or service kit or RS485.

After using the built-in recorder to record or output, the instantaneous flow rate can be calculated according to the flow rate and pipe diameter. If the external recorder is used, the 4 ~ 20 mA engineering quantity can be directly set to 0 and the maximum flow rate to obtain the record of the flow rate; it can also be set to 0 and the corresponding maximum instantaneous flow rate to obtain the record of the instantaneous flow rate.

$$\text{Prompt Flow (Nm}^3\text{/min)} = \pi \times (\tfrac{1}{2}\ \text{ID})^2\ \text{(mm)} \times \text{Velocity (Nm/s)} \times 10^{-6} \times 60$$

5.2 Pulse Output

F211x-Ex & F212x-Ex Explosion-proof thermal mass flow meters emit a pulse signal equal to the amplitude of the input voltage for every unit of flow (selectable from 1 ~ 999 m^3 on request).

5.3 Modbus Output

F211x-Ex & F212x-Ex Explosion-proof thermal mass flow meters support RS485 communication.

5.3.1 Communication Parameters

The factory setting parameters are as follows.

Address: 1

Baud rate: 9600

Data length: 8, Parity bit: None, Stop bit: 1

Response timeout: 1 second

Response delay: 0 ms

Frame interval: 7 characters

5.3.2 Storage Register Definitions

Logical Channels, Data and Holding Registers

- Holding register data can be read with Modbus instruction 0x03
- Available Modbus Instruction 0x06 Write Single Holding Register, 0x10 Sequential Write Multiple Holding Registers

_ Available Modbus Instruction 0x05 Write Coil Registers

5.3.3 Process Data Format

- Supports two data types: IEEE 754 floating point and unsigned integer.
  floating point format

Number (with decimals)	IEEE 754 Floating Point	Register N		Register N + 1	
		High	Low	High	Low
123.4	0x42F6CCCD	0xCC	0xCD	0x42	0xF6

unsigned integer

Number (decimal system)	IEEE 754 Floating Point	Register N		Register N + 1	
		High	Low	High	Low
123456789	0x075BCD15	0xCD	0x15	0x07	0x5B

5.3.4 Byte Order

_ The format of the data is little-endian, with the least significant bit transmitted first.
32 bit: CD AB
64 bit: GH EF CD AB

5.3.5 Holding Register: Process Data Address Table

Register Address	Data Type	Byte Length	Data	Unit	Read/Write	Applicable Flow meter Model
0	FLOAT_L	4	nominal flow rate		R	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
2	FLOAT_L	4	nominal flow rate		R	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter

Register Address	Data Type	Byte Length	Data	Unit	Read/Write	Applicable Flow meter Model
4	DOUBLE_L	8	Cumulative nominal flow rate		R W: Write "0" to clear value	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
8	FLOAT_L	4	temperature		R	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow Mete F231x-V Vortex Flow meter
10	FLOAT_L	4	gauge pressure		R	F20x Pitot Tube Flow meter F21x-Ex Explosion-proof Thermal Mass Flow Mete F231x-V Vortex Flow meter
12	FLOAT_L	4	working flow rate		R	F20x Pitot Tube Flow meter F231x-V Vortex Flow meter
14	FLOAT_L	4	working flow rate		R	F20x Pitot Tube Flow meter F231x-V Vortex Flow meter
16	DOUBLE_L	8	Cumulative working Flow rate		R W: Write "0" to clear value	F20x Pitot Tube Flow meter F231x-V Vortex Flow meter
20	FLOAT_L	4	Medium Density		R	F20x Pitot Tube Flow meter F231x-V Vortex Flow meter
22	UNSIGNED LONG	4	Cumulative nominal flow (4 bytes)		R W: Write "0" to clear value	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter

Register Address	Data Type	Byte Length	Data	Unit	Read/Write	Applicable Flow meter Model
						F231x-V Vortex Flow meter
24	UNSIGNED LONG	4	Cumulative Conditional Flow Rate (4-Bit Byte)		R W: Write "0" to clear value	F20x Pitot Tube Flow meter F231x-V Vortex Flow meter
26	UNSIGNED INT	2	Gas Medium Types		R/W: 0: Air (default) 1: O_2 2: N_2 3: H_2 4: CO 5: CO_2 6: SF_6 7: Ar 8: He 9: N_2O 10: CH_4 11: C_2H_6 12: C_3H_8 13: C_4H_{10}	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
27	UNSIGNED INT	2	Flow Unit		R/W: 0: m^3/h(Nm^3/h) 1: m^3/min (Nm^3/min) (default) 2: m^3/s (Nm^3/s) 3: l/min (Nl/min) 4: l/s (Nl/s) 5: cfm (Ncfm) 6: kg/h 7: kg/min 8: kg/s	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter

Register Address	Data Type	Byte Length	Data	Unit	Read/Write	Applicable Flow meter Model
28	UNSIGNED INT	2	Flow Rate Unit		R/W: 0: m/s (Nm/s) (default) 1: ft/s (Nft/s)	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
29	UNSIGNED INT	2	Cumulative Flow Units		R/W: 0: m^3 (Nm^3) (default) 1: ft^3 (Nft^3) 2: kg	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
30	UNSIGNED INT	2	Temperature Unit		R/W: 0: ℃(default) 1: ℉	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
31	UNSIGNED INT	2	Pressure Unit		R/W: 0: Pa 1: hPa 2: kPa (default) 3: MPa 4: mbar 5: bar 6: psi	F20x Pitot Tube Flow meter F231x-V Vortex Flow meter
32	FLOAT_L	4	Pipe Inner Diameter	mm	R/W	F20x Pitot Tube Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
34	FLOAT_L	4	Standard Temperature	℃	R/W: Default value 20 °C	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter

Register Address	Data Type	Byte Length	Data	Unit	Read/Write	Applicable Flow meter Model
						F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
36	FLOAT_L	4	Standard Pressure	kPa	R/W: Default value 100 kPa	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
38	UNSIGNED INT	2	Filter Level		R/W: (Default value 5) F20x / F21x / F22x:1~255, F23X-V: 1 ~ 32	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
39	FLOAT_L	4	① Flow Factor		R/W: The flow factor cannot be set to a value less than 0. The default value 1.	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
41	FLOAT_L	4	Current atmospheric pressure	kPa	R/W: Default value 101.325 kPa For correction of gauge pressure	F20x Pitot Tube Flow meter F231x-V Vortex Flow meter
43	UNSIGNED INT	2	Automatic drainage		R/W: 0: close 1: turn on (default)	F20x Pitot Tube Flow meter

Register Address	Data Type	Byte Length	Data	Unit	Read/Write	Applicable Flow meter Model
56	DOUBLE_L	8	Reverse cumulative nominal flow		R W: Write "0" to clear the accumulated flow	F20x Pitot Tube Flow meter
60	DOUBLE_L	8	Reverse cumulative condition flow		R W: Write "0" to clear the accumulated flow	F20x Pitot Tube Flow meter
64	UNSIGNED LONG	4	Reverse Cumulative nominal Flow (4-byte data type)		R W: Write "0" to clear the accumulated flow	F20x Pitot Tube Flow meter
66	UNSIGNED LONG	4	Reverse Cumulative condition Flow (4-byte data type)		R W: Write "0" to clear the accumulated flow	F20x Pitot Tube Flow meter
70	FLOAT_L	4	Cutoff Flow Rate	m/s Nm/s	R/W: (Default value 0) The cut-off flow rate cannot be set to a negative value F23x-V: working flow rate F20x / F21x / F22x: nominal flow rate	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
72	FLOAT_L	4	② Vortex Instrumentation Coefficients	P/L	R/W	F231x-V Vortex Flow meter
74	FLOAT_L	4	② Vortex Frequency	Hz	R	F231x-V Vortex Flow meter
101	UNSIGNED INT	2	software version		R	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass

Register Address	Data Type	Byte Length	Data	Unit	Read/Write	Applicable Flow meter Model
						Flow meter F231x-V Vortex Flow meter
102	UNSIGNED INT	2	hardware version		R	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter
103	DOUBLE_L	8	Product Serial Number		R	F20x Pitot Tube Flow meter F21x / F22x Thermal Mass Flow meter F21x-Ex Explosion-proof Thermal Mass Flow meter F231x-V Vortex Flow meter

Note：

① **Flow factors** are used to correct the flow indication：

$$\text{Flow value} = \text{Flow measurement} \times \text{Flow factor}$$

e.g.: $\text{Flow measurement} = 50\ \text{Nm}^3/\text{min}$

$\text{Flow factor} = 0.8$

SO $\text{Flow value} = 50 \times 0.8 = 40\ \text{Nm}^3/\text{min}$

② $\text{vortex Frequency output/Meter Factor} = \text{operating Flow Rate(L/s)}$

An example write command is as follows：

Floating point number v=123.4 its corresponding hex 0x42F6 CCCD. write this value to device address 1, holding register address 36 (pressure single point calibration offset)

Send Modbus commands：01 10 0024 0002 04 CCCD 42F6 EE0D

01: Device Address

10: Function code 16 in hexadecimal

0024: Keep register address 36 in hexadecimal

0002: Number of holding registers to be written

04: Number of holding register bytes (0x42F6 CCCD total 4 bytes)

CCCD: Floating point low 16 bits

42F6: Floating point high 16 bits

EE0D: CRC

Device Response：01 10 0024 0002 01C3

01: device address

10: Function code 16 in hexadecimal

0024: Keep register address 36 in hexadecimal

0002: Number of holding registers already written

01C3: CRC

5.3.6 Holding Register: Address Table for Communication Settings

Register Address	Data Type	Byte Length	Unit	Details	Default	Read/Write
50	UNSIGNED INT	2		Device Restart (write 1 to restart the device)		Write
51	UNSIGNED INT	2		device address(1…247)	1	Read/Write
52	UNSIGNED INT	2	bps	baud: 12 = 1200 bits/s 24 = 2400 bits/s 48 = 4800 bits/s 96 = 9600 bits/s 144 = 14400 bits/s 192 = 19200 bits/s 384 = 38400 bits/s 560 = 56000 bits/s 576 = 57600 bits/s 1152 = 115200 bits/s	96	Read/Write
53	UNSIGNED INT	2		parity bit 0 = none 1 = Odd Checksum 2 = Even checksum	0	Read/Write
54	UNSIGNED INT	2		stop bit 1: 1 bit 2: 2 bit	1	Read/Write
55	UNSIGNED INT	2	ms	Response timeout: 0…255 ms 1 ms/step Range of values: 0…255	0	Read/Write

Note:
These settings only take effect when a 1 is written to register 50, and then the Modbus master has to change its own communication settings to communicate with the slave.

5.3.7 Coil Register Address Table

Coil Address	Data Type	Byte Length	Unit	Details	Default	Read/Write
0	UNSIGNED INT	2		Restart Modbus communication Write: 0x0000 = no effect 0xff00 = Restart Read: always 0	0	Read/Write

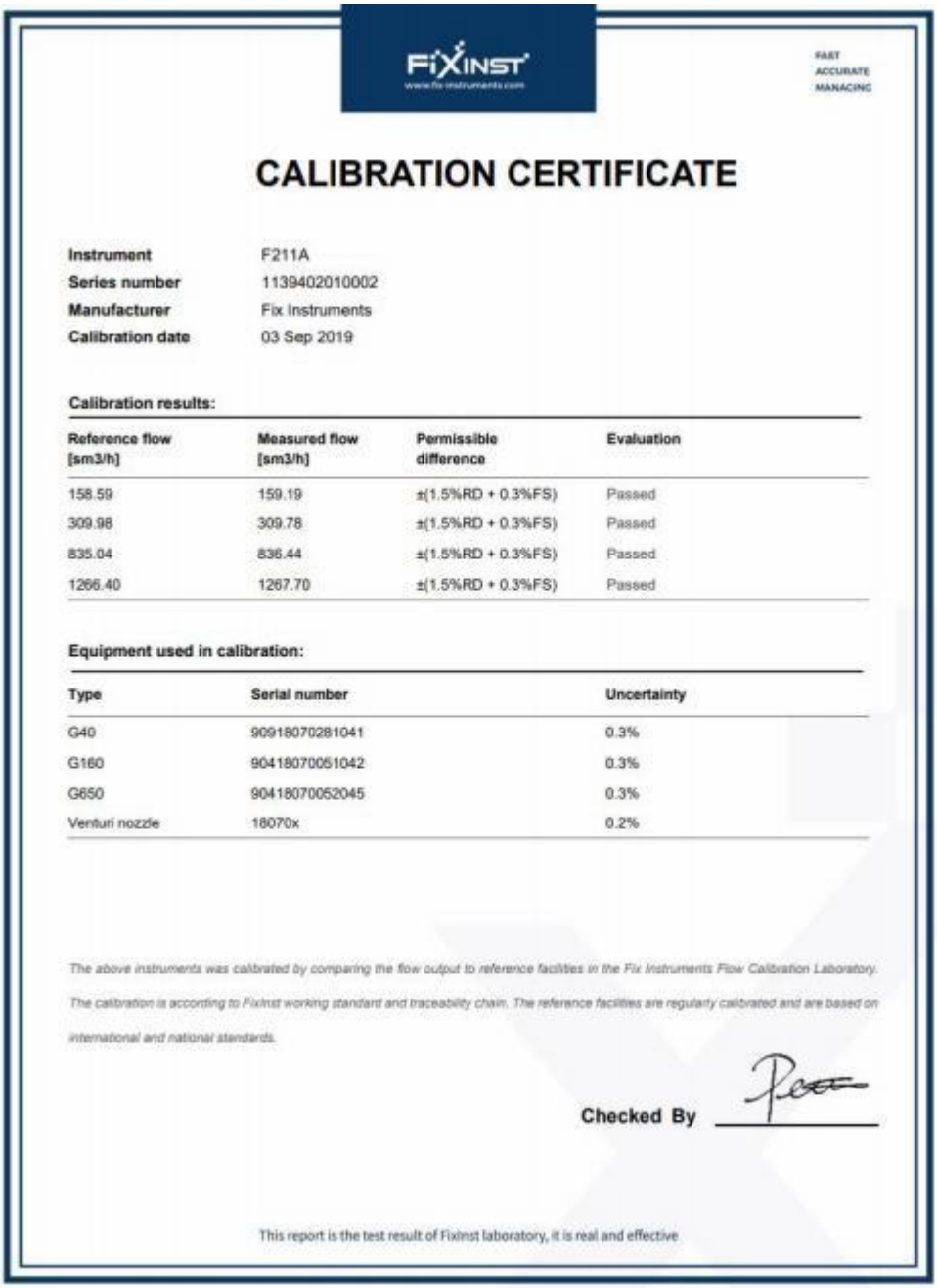
6 Calibration & Maintenance

6.1 Calibration

The product is factory calibrated and the calibration certificate is attached to the product.

Since the measurement accuracy of the product is affected by the on-site environment (oil, high humidity, or other impurities can affect the accuracy), we recommend the user perform calibration once a year.

Calibration service is not covered by the product guarantee. Please contact the manufacturer in case calibration is required.



FIXINST
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FAST
ACCURATE
MANAGING

CALIBRATION CERTIFICATE

Instrument	F211A
Series number	1139402010002
Manufacturer	Fix Instruments
Calibration date	03 Sep 2019

Calibration results:

Reference flow [sm3/h]	Measured flow [sm3/h]	Permissible difference	Evaluation
158.59	159.19	±(1.5%RD + 0.3%FS)	Passed
309.98	309.78	±(1.5%RD + 0.3%FS)	Passed
835.04	836.44	±(1.5%RD + 0.3%FS)	Passed
1266.40	1267.70	±(1.5%RD + 0.3%FS)	Passed

Equipment used in calibration:

Type	Serial number	Uncertainty
G40	90918070281041	0.3%
G160	90418070051042	0.3%
G650	90418070052045	0.3%
Venturi nozzle	18070x	0.2%

The above instruments was calibrated by comparing the flow output to reference facilities in the Fix Instruments Flow Calibration Laboratory. The calibration is according to FixInst working standard and traceability chain. The reference facilities are regularly calibrated and are based on international and national standards.

Checked By

This report is the test result of FixInst laboratory, it is real and effective

Figure 6-1 Flow meter Calibration Certificate (for Reference Only)

6.2 Maintenance

- Dry towel with some neutral detergent shall be used regularly to wiping flow meter to sharpen the reading. Do not clean the flow meter using caustic soda, gasoline and other solvents.
- It is recommended to mount the flow meter in a well-ventilated place convenient for reading, observation and maintenance.
- Inspection shall be conducted regularly to check any potential leakage or damages.
- The flow meter should be factory-checked and repaired to maintain the accuracy.

7 Warranty Terms

Dear Customer:

Thank you for choosing YUA products. We have always been committed to providing our customers with high-quality, high-performance instrumentation products to meet your needs in a variety of application scenarios.

In order to ensure your satisfaction after purchasing the product, please read the following after-sales terms and conditions carefully, so that you can correctly and efficiently apply for the warranty service when needed.

7.1 Warranty Period

12 months from product shipment.

7.2 Warranty Coverage

1、Warranty period due to the product's own problems caused by performance failures, confirmed by the seller's test, will provide free maintenance services; human misuse or due to the site of the product working conditions and the product type does not match the damage caused by the exceptions.

The following are not covered by warranty:

① Product damage caused by force majeure factors (such as natural disasters, etc.).

② Products due to natural wear and tear, rough handling caused by the appearance of damage, scratches or wear (such as impact caused by the loss of paint, surface bumps, etc.).

③ Damage caused by disassembling the product without the Company's consent or unauthorized changes in the use of the product.

④ Damage to the product caused by repair or modification not authorized by the company.

⑤ Damage caused by improper use of the product by the user or operation in violation of the instructions.

⑥ Products purchased from unauthorized sources.

2、For non-warranty or non-warranty product failure, we will provide paid repair services, the specific cost depends on the actual situation.

7.3 Warranty Certificate

Users are required to provide valid proof of purchase (e.g., invoice, receipt, etc.) and product serial number when applying for warranty service.

7.4 Warranty Channels

Users can apply for after-sales warranty service by filling out our after-sales treasure system or contacting customer service personnel.