



2019F097-34

# LWQZ Gas Turbine Flowmeter



## Instruction Manual



# HEFEI JINGDA INSTRUMENT CO.,LTD

The enterprise has passed ISO9001 quality management system certification



Dear customer:

Thank you very much for using our company's Gas Turbine Flowmeter !

Before use, please read this instruction manual carefully.

## 1. Precautions before use

### 1.1 Open box inspection

When users receive this product, they should check the integrity of the external packaging when opening the box, verify the quantity and specifications of the items inside the box according to the packing list, and check the integrity of the instruments and accessories.

Random file:

- a. Packing list: one copy
- b. User manual: one copy
- c. Product Qualification Certificate: One copy

### 1.2 Handling and Storage

To prevent damage, do not open the packaging of the flowmeter before it is transported to the user's location of use.

- (1) Handle with care during transportation and do not allow rough handling.
- (2) The storage location should meet the following conditions:
  - a. Rainproof and moisture-proof.
  - b. Cannot be subjected to mechanical vibration or impact.
  - c. The ambient temperature range is  $-20^{\circ}\text{C}\sim+55^{\circ}\text{C}$ .
  - d. The relative humidity of the environment should not exceed 80%.
  - e. The environment does not contain corrosive gases.

## 2. Usage conditions

This flowmeter can ensure high accuracy when installed correctly under appropriate flow, pressure, and temperature conditions. Please read this user manual carefully for usage conditions.

## 3. Overview

The LWQ gas turbine flowmeter produced by our company does not come with a mechanical counter and is suitable for measuring various gases in the gas and industrial fields, such as natural gas, city gas, etc. LPG、Propane, butane, air, nitrogen, etc. The instrument has high accuracy and good repeatability, especially suitable for trade measurement.

The LWQ intelligent gas turbine flowmeter is equipped with temperature and pressure compensation function, which directly converts the operating flow rate into the standard flow rate.



The flowmeter adopts a powerful new microprocessor, with high calculation accuracy and reliable performance. It is an ideal instrument for gas metering in petroleum, power, metallurgy, industrial and civilian boilers, urban natural gas, gas pressure regulating stations, and gas trade metering.

This product complies with the GB/T 18940-2003 "Measurement of Gas Flow in Closed Pipelines - Turbine Flowmeters" standard and JJG 1037 "Calibration Regulations for Turbine Flowmeters".

#### 4. Product features

·Integrating high-precision temperature, pressure, and flow sensors with an intelligent flow integrator, it can detect the temperature, pressure, and flow of the medium, and perform automatic flow tracking compensation and compression factor correction, directly detecting the standard volume flow rate and total standard volume of the gas.

·Independent movement design, good interchangeability, and easy maintenance.

·High accuracy, good repeatability, and a range ratio of up to 20:1

·Adopting imported precision bearings, with high accuracy and good stability.

·Adopting advanced microcontroller technology and high-performance integrated chips, the whole machine has powerful functions and superior performance.

·The circuit adopts surface mount technology, with a compact structure and high reliability.

·Adopting advanced low-power technology, both internal and external power sources can work, resulting in low overall power consumption.

·Adopting a high contrast LCD display, it can display standard volume total (mass), standard instantaneous flow (mass), operating condition instantaneous flow, battery capacity display symbol, temperature value, pressure value, date and time, and has fault display alarm.

·It adopts floating-point operation and automatic correction of six segment instrument coefficients, and has fault self diagnosis and alarm functions.

·The flowmeter is equipped with pulse signal output and can also output 4-20mA standard analog signal according to user needs.

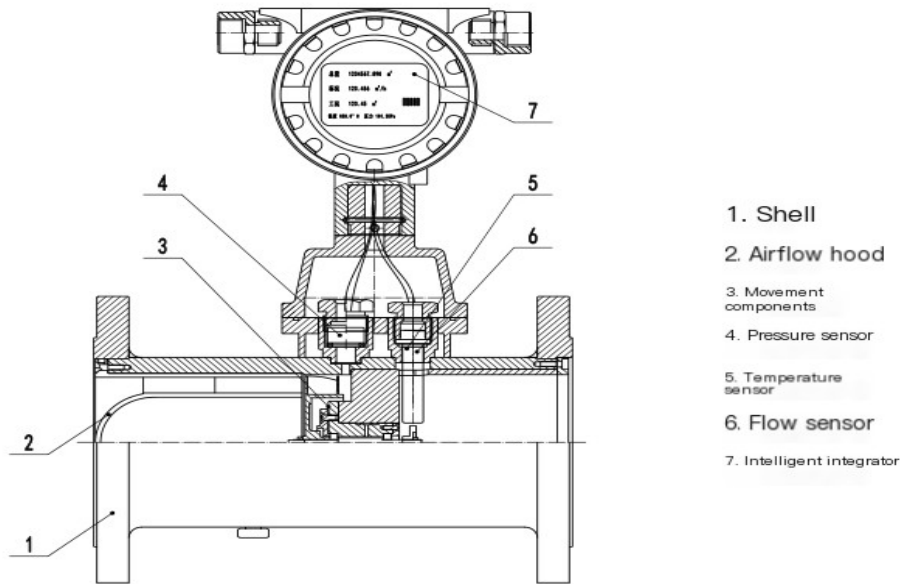
·Equipped with real-time data storage function, it can prevent data loss during battery replacement and sudden power failure; In the event of a power outage, internal parameters can be permanently saved; It is also possible to query a large amount of historical data on the operation of the flowmeter.

·The instrument comes with a real-time database and can form a meter reading network through RS-485 communication interface, facilitating centralized data collection and real-time management.



## 5. Structure and working principle

### 5.1 Flowmeter structure



### 5.2 Working principle

The working principle of LWQ gas turbine flowmeter: The measured gas entering the instrument is accelerated by the flow guide body with cross-sectional contraction, and then acts on the turbine blades through the inlet channel, causing the turbine to rotate. By periodically changing the magnetic resistance of the sensor through the magnet on the rotating transmission disk, the sensor senses a pulse signal proportional to the fluid volume flow rate. The signal is amplified and shaped by a preamplifier, and the pressure and temperature signals detected by the pressure and temperature sensors are simultaneously transmitted to the volume integrator for processing and display.

## 6. Main technical parameters

### 6.1 Flowmeter specifications, basic parameters, and performance indicators (see Table 1)



Table 1

Model Specifications	Nominal diameter DN(mm)	Initial flow rate (m <sup>3</sup> /h)	Flow range (m <sup>3</sup> /h)	Nominal pressure (MPa)	Accuracy grade (Grade)	Remarks
LWQZ-25	25	≤0.6% Q <sub>max</sub>	4-40	1.6 2.5 4.0	Grade 1.0 0.2Q <sub>max</sub> ≤ Q ≤ Q <sub>max</sub> ± 1.0% Grade 1.5 Q <sub>min</sub> ≤ Q < 0.2Q <sub>max</sub> ± 2.0% 0.2Q <sub>max</sub> ≤ Q ≤ Q <sub>max</sub> ± 1.5% Q <sub>min</sub> ≤ Q < 0.2Q <sub>max</sub> ± 2.5%	Medium temperature: -10 °C~+60 °C Environmental temperature: -20 °C~+55 °C Atmospheric pressure: 70Kpa~106KPa Relative humidity: 5~95%
LWQZ-50A	50		7~70			
LWQZ-50B	50		10~100			
LWQZ-50C	50		15~150			
LWQZ-80A	80		8~160			
LWQZ-80B	80		13~250			
LWQZ-80C	80		20~400			
LWQZ-100A	100		13~250			
LWQZ-100B	100		20~400			
LWQZ-100C	100		32~650			
LWQZ-150A	150		32~650			
LWQZ-150B	150		50~1000			
LWQZ-150C	150		80~1600			
LWQZ-200A	200		50~1000			
LWQZ-200B	200		80~1600			
LWQZ-200C	200		130~2500			

Note: Q<sub>max</sub> is the maximum operating volume flow rate

## 6.2 Measurement medium

Various gases such as natural gas, city gas, alkanes, and industrial inert gases.

## 6.3 Electrical performance indicators:

### a. Working power supply:

Internal power supply: One 3.6V lithium battery with real-time display of battery capacity on the screen. The battery can work normally when the voltage is within 3.0~3.6V. When the voltage is below 3.0V, there is no battery capacity grid display and the battery needs to be replaced.

External power supply: +24VDC ± 15%, ripple ≤ 50mV. When connected to the external power supply, the internal power supply automatically disconnects and the entire machine is powered by the external power supply.

### b. Output mode (requires external power supply+24V):

Output of working condition pulse signal (three wire system): directly amplify and output the working condition pulse signal detected by the flow sensor, with an amplitude of 20-24V and a transmission distance of ≤ 300m.

4mA~20mA standard analog signal output: The 4mA~20mA standard analog signal linearly corresponds to (0~Q<sub>max</sub>) m<sup>3</sup>/h (standard instantaneous flow), with a flow range set by the instrument, a transmission distance of ≤ 1500m, and a power supply of +24VDC external power supply.



RS-485 interface signal output: directly connected to the upper computer, it can remotely transmit the temperature, pressure, instantaneous flow rate, standard volume flow rate, and instrument related parameters of the measured medium.

6.4 Whole machine power consumption:

a. Internal power supply: The average power consumption is 3mw, and one lithium battery (15Ah) can be used for at least two and a half years.

b. External power supply: The overall power consumption of the machine is ≤ 1W.

6.5 Real time data storage function:

In order to meet the needs of data management, real-time data storage functions have been added, including:

- a. Monthly net traffic for the past 12 months.
- b. Net daily traffic for the past 360 days.

The above stored data can be read using a laptop or desktop computer through the RS-485 interface, and data reports and curve graphs can be generated for analysis according to user needs.

6.6 Explosion proof rating: ExdIIBT4Gb Protection rating: IP66.

7. Dimensions and Installation of Flowmeter

7.1 The external dimensions of the flowmeter are shown in the external dimension diagram of the table, and the external dimension markings of the flowmeter are shown in Table 2,

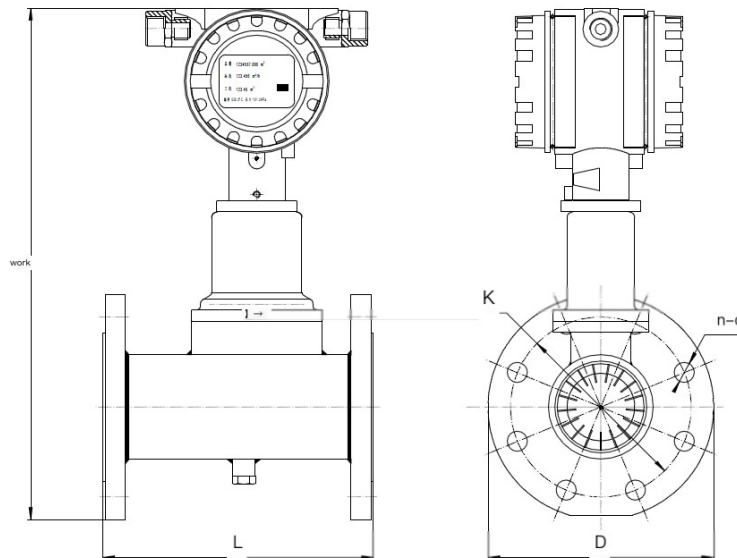


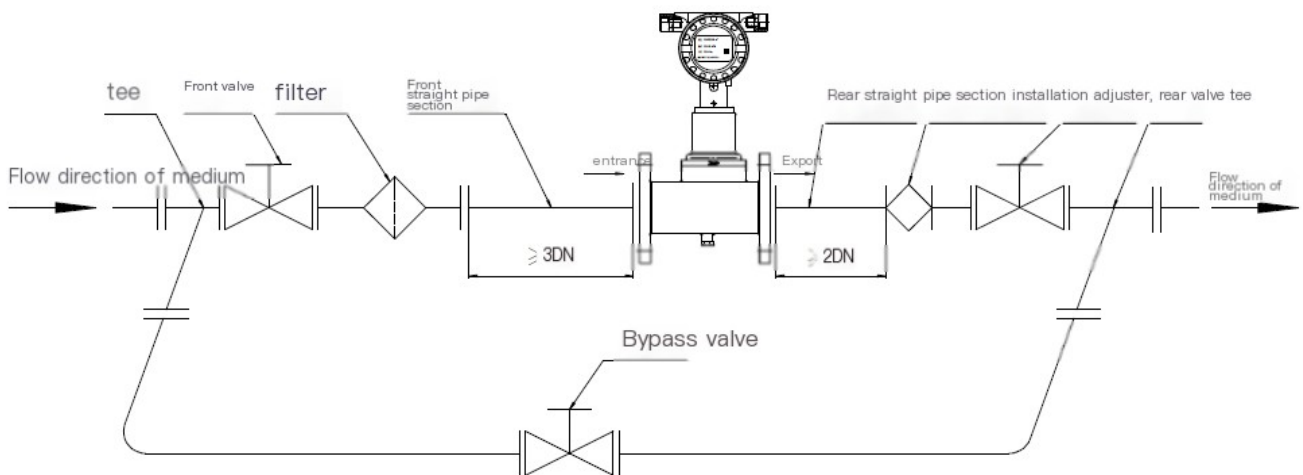
Table 2

Model	Diameter	L	1.6MPa	2.5MPa	4.0MPa	H	Remarks
-------	----------	---	--------	--------	--------	---	---------



			D	K	n-d	D	K	n-d	D	K	n-d		
LWQ-25	25	200	115	85	4-Ø14	115	85	4-Ø14	115	85	4-Ø14	364	Flange standard HG/T20592
LWQ-50	50	200	165	125	4-Ø18	165	125	4-Ø18	165	125	4-Ø18	390	
LWQ-80	80	240	200	160	8-Ø18	200	160	8-Ø18	200	160	8-Ø18	440	
LWQ-100	100	300	220	180	8-Ø18	235	190	8-Ø22	235	190	8-Ø22	450	
LWQ-150	150	450	285	240	8-Ø22	300	250	8-Ø26	300	250	8-Ø26	510	
LWQ-200	200	600	340	295	12-Ø22	360	310	12-Ø26	375	320	12-Ø26	565	

## 7.2 Installation of Flowmeter



**Figure 4 Pipeline Installation Configuration Diagram**

7.3 During the installation and use of flowmeters, the following aspects should also be noted:

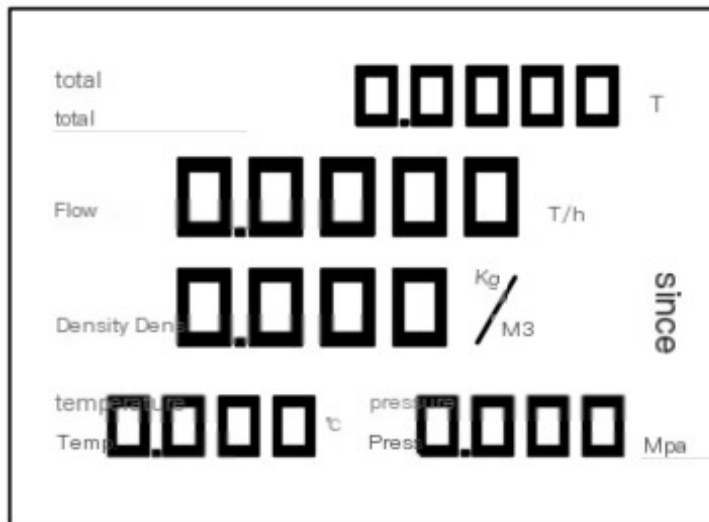
- When installing outdoors, the upper part should be covered to prevent rainwater from entering and direct sunlight from affecting the performance and service life of the flowmeter;
- There should be no strong magnetic field interference or mechanical vibration around the flowmeter;
- The flowmeter needs to be reliably grounded, but must not share the ground wire with the high-voltage system;
- Do not open the flowmeter at will, or arbitrarily twist the various lead interfaces and temperature/pressure sensor interfaces;
- According to the flow direction of the pipeline, the direction of the flow accumulator can be rotated by an angle. When rotating, do not rotate in one direction, and control the distance between the tightening nut and the connecting body to be less than 2mm;
- The installation of explosion-proof flow meters should be carried out in accordance with the relevant provisions of GB3836, with reliable grounding. Relevant safety regulations should be followed during installation and maintenance;



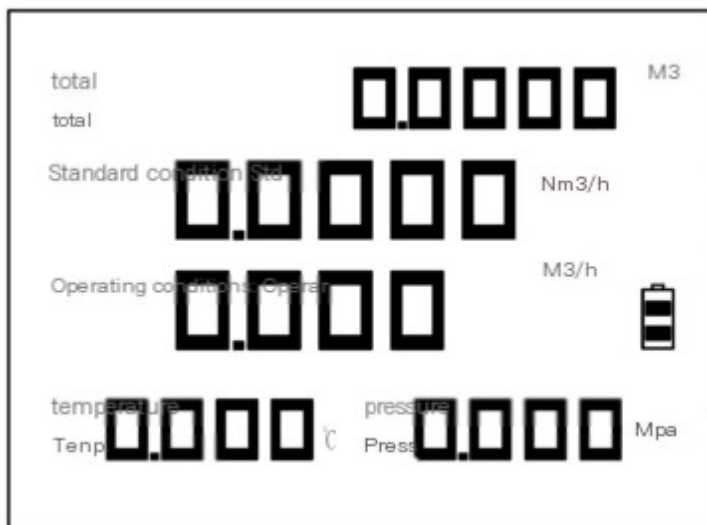
- g. The front end of the flowmeter must be equipped with a filter to prevent pipeline impurities from damaging the flowmeter;
- h. Do not rinse the inside of the flowmeter with water to avoid damaging it.

### 8. Instructions for use

#### 8.1 Display content in working state



Measurement of steam medium



Measurement of ordinary gas medium

Total Quantity: Quality/Standard Volume Total Quantity, with ten digits and one automatic decimal point, can display up to four decimal places. Units:m<sup>3</sup>,L,T,Kg。

Standard condition: instantaneous flow rate of standard volume, six digits, one automatic decimal point, up to four decimal places can be displayed, units: m<sup>3</sup>/h, L/h, T/h, Kg/h.

Working condition: instantaneous flow rate of working condition volume, five digits, one automatic decimal point, up to three decimal places can be displayed, units:m<sup>3</sup>/h, L/h, T/h, Kg/h.

Flow rate: When measuring steam, display instantaneous flow rate with six digits, one



automatic decimal point, up to four decimal places, in units of T/h and kg/h.

Density: Real time density of steam displayed during steam measurement, in kg/m<sup>3</sup>.

Temperature: The displayed value is - xxx. x °C to XXXX °C, with one symbol, four digits, and one automatic decimal point. The unit is °C.

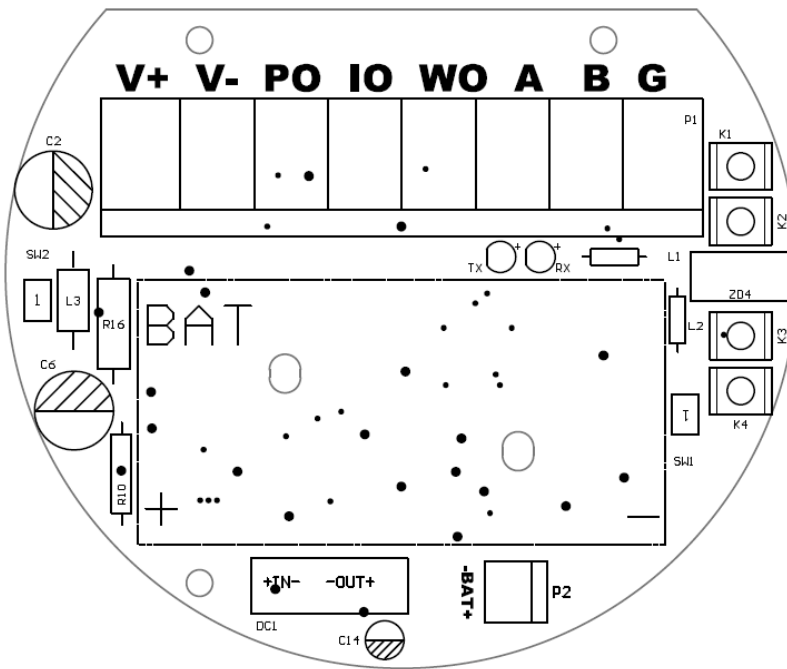
Pressure: Four digits, one decimal point. The minimum displayed value can retain one decimal place, and the maximum value is 9999MPa. When exceeded, the displayed value flashes, in MPa.



: Battery level indicator, half grid display when battery level is low, user needs to replace battery. (No battery level indicator box when connected to an external power source)

### 8.2 Parameter Setting of Flowmeter

Open the back cover of the monitor, the instrument panel has four buttons: increase (K1), shift (K2), confirm (K3), and return (K4), as shown in the following figure



- K1: Increase
- K2: Shift
- K3: Confirm
- K4: Return

Add key (K1): The flashing digit increases.

Shift key (K2): The flashing position shifts to the left.

Confirm key (K3): Enter the password input interface, confirm and modify parameters.

Return key (K4): Exit the modification interface and finally store the parameters.

### 8.3 Flowmeter interface settings

The code, definition, and operation of each parameter of the flowmeter are shown in the table below, and users are not allowed to change them arbitrarily.



Menu	Show contents	Function definition	Remarks
Password input Interface	Pad-XXXX	Password input	The correct password allows for parameter modification Otherwise, only various parameters can be browsed The initial password is 1 You can change this password in the following menu
	F XXXX	Real time frequency	Read-only
	DXX	Alarm sign	Read only
F01	XX XX XX XX XX	Beijing time	Year Month Day Hour The setting range for the year is from 00 to 99 Modifiable
	Nyc XX	Software compensation mode 0~07	00: No compensation, no correction 01: C compensation, Z not corrected (take 1); 02: C compensation, Z correction takes a constant, operated by keyboard; 03: C compensation, Z correction, automatic calculation of Z parameters 04: C compensation, saturated steam pressure compensation mode only measures pressure 05: C compensation, saturated steam temperature compensation mode only measures temperature 06: C compensation, automatic steam state judgment mode 07: C compensation, steam density setting mode, density needs to be set
	P xx	Pressure compensation value	On the basis of the original pressure -/+XX
	T xx	Temperature compensation value	On the basis of the original temperature -/+XX
	C-X.XXXXX	Z coefficient setting Z coefficient refers to the compression factor of natural gas	Default is 1 Adjustable range 0.5~1.9999
F02	DM XX	Damping coefficient	1~64S, There is an impact on current output
	PE XX	Temperature and pressure collection cycle	Unit: s Default value 05 s Set range 2-20s
	Un X	Flow unit setting	1 L 2 M3 3 kg 4 T
	D-XXXXXX_X	Gas density setting	Unit: kg/M3 Valid when the unit is set to KG/T Steam metering is used as a backup density Used for medium density in other measurements, carefully set _Representing the decimal point _The X at the end represents the number of decimal places
F03	FL XXX	Frequency cutoff setting	Remove small frequencies
	CL n	Total accumulated amount reset to zero	0 reset>0 unclear
	JZ X	AD acquisition calibration	0 calibration>0 non calibration The temperature sensor needs to be disconnected during calibration, otherwise it



			may cause acquisition errors
F04	Pv xxxx.x	Maximum output mv value of pressure sensor	This value is the output voltage value of the pressure sensor under 4ma excitation current. If the parameter table shows 1ma, please multiply the parameter by 4 before inputting
	HXX.XX	Upper limit pressure alarm value	Unit Mpa
	LXX.XX	Lower limit pressure alarm value	Unit Mpa
	PU X	Pressure display unit	Reserved function
F05	Pk x.xxxx	Adjustment coefficient of pressure sensor	Adjust the reference current deviation value to default 1 Adjustment range 0.5~1.9999
	Pxxx.xx	Local atmospheric pressure value	Set the range of 86~110kpa, and call the default 101.32 for the gauge pressure sensor
	Pm xx.x	Maximum measuring range of pressure sensor	Unit Mpa
	Pdx	Type of pressure sensor	1 Absolute pressure sensor 2 gauge pressure sensors
F06	Tk x.xxxx	Adjustment coefficient of temperature sensor	Adjust the reference resistance deviation value to default 1
	HT XXX	Upper limit temperature alarm value	Unit °C Maximum 405 °C
	LT XXX	Lower limit temperature alarm value	Unit °C
	Td x	Temperature sensor type	Reserved function
F07	L_P Xx.xx	Calibration output pulse equivalent	0.01~99.99m3 (or T) default 1.00
	Opd x	Pulse output mode	Pulse output under working condition 1, with a high-level pulse width of less than 0.5ms 2 Modulation pulse output 1 Output pulses according to the set pulse coefficient Pulse high-level width less than 0.5ms 3 calibration pulses output 400us
	Cn XXX	Postal address	Set up to 1-256, default is 01
	RTDX	485 output mode	0 RS485 communication output off RS485 communication protocol Ver2.0 RS485 Communication Protocol Ver1.0 (MODBUS_STU) - Default
F08	2na XXXXX X	20ma corresponds to flow rate	The unit is the same as the set unit
	XXXXX	4ma calibration	At this point, the displayed value is the actual AD value, with a maximum setting of 60000
	XXXXX	20ma calibration	Same as above, the maximum setting is 90000
	Ma X	20ma corresponds to the setting of total quantity properties	0 standard flow rate 1. Operating condition flow rate
F19	Pad XXXX	Password 20	Enter 20 to enter the instrument coefficient modification interface If the password is entered correctly, the menu will cycle between F20 and F29 Press the exit button on the display (non modification interface) to return to the normal modification interface
F20	A-XXXXXX_ X	Average instrument coefficient	When OPD-2, output pulses according to this instrument coefficient
F21	XXXXXX_X	The first instrument	



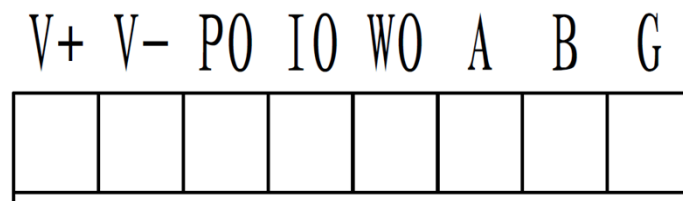
		coefficient	
	XXXX	Segmented frequency	Below this frequency, use this instrument coefficient for this range
F22	XXXXXX_X	Second section instrument coefficient	
	XXXX	Segmented frequency	
F23	XXXXXX_X	Third section instrument coefficient	
	XXXX	Segmented frequency	
F24	XXXXXX_X	The fourth section instrument coefficient	
	XXXX	Segmented frequency	
F25	XXXXXX_X	Fifth section instrument coefficient	
	XXXX	Segmented frequency	
F26	XXXXXX_X	The sixth section instrument coefficient	
	XXXX	Segmented frequency	
F50	Pad XXXX	New password	
	NO/YES	Determine whether to modify	
F51	Ftr x	Factory settings	2. Restore factory settings (password correct)
	NO/YES	Determine if	

#### \*Fault display instructions

Fault location	Reason for malfunction	Fault code (displayed)
D0	Pressure exceeds the maximum range of the sensor	D0
D1	Pressure exceeds the maximum alarm pressure set by the user	D1
D2	The pressure is less than the minimum alarm pressure set by the user	D2
D3	The temperature exceeds the maximum alarm temperature set by the user	D3
D4	The temperature exceeds the maximum allowable temperature ZQT-MAX	D4
D5	Low battery	D5

#### 8.4 Internal wiring method of flow integrator

Before wiring operation, the 24V external power supply should be disconnected first, and live operation is never allowed. Connect the wires according to the following diagram.



The functions of each lead marking are as follows:

V+ :Positive pole of pulse/analog output power supply;

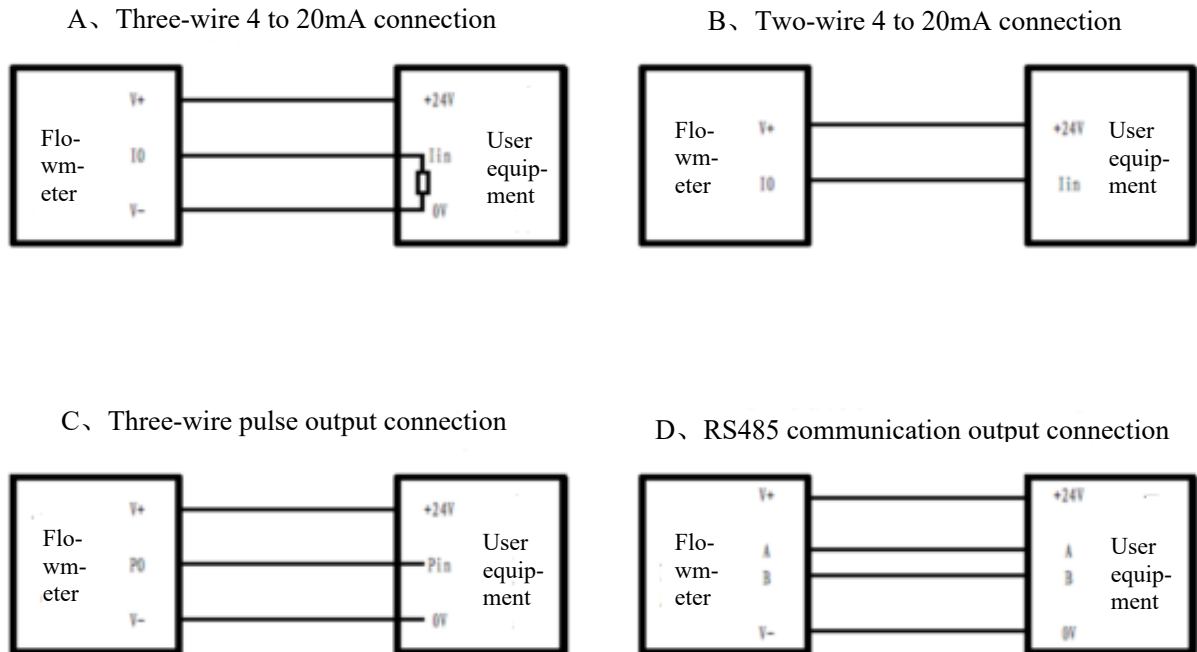
V- :Pulse output external power supply pole;negative



PO:Pulse Output (PNP); IO:4mA~20mA output; A. B-RS485 communication line;

G-Communication shielded wire WO :Pulse Output (NPN);

### 8.5 System wiring diagram



### 8.6 Instructions for using the current output section of 4mA~20mA

The maximum resistance of the two-wire 4mA~20mA current output circuit is 50-500  $\Omega$

The maximum resistance of the three wire 4mA~20mA current output circuit is 50-800  $\Omega$

### 8.7 Use of Power Supply

3.6V lithium batteries can generally be used for 30 months. The battery level indicator shows that there is no power when the voltage is below 3.0V, and the user needs to replace the battery. When replacing, open the lead seal and unscrew the back cover to remove the old battery and insert a new one (pay attention to the battery polarity!), then cover the back cover.

### 8.8 Fluid conditions

a. The measured fluid should be a gas without vortices (including air), and free of impurities such as large particles and fibers (cannot measure gas-liquid mixed flow);

b. The flow rate and pressure range of the measured fluid should be within the range specified by the flowmeter;

## 9. Precautions for use

9.1 Before installing the flowmeter, the pipeline should be cleaned of debris such as fragments, welding slag, stones, dust, etc;

9.2 When the flowmeter is put into operation, the valve should be slowly opened or closed to prevent damage to the pipeline and instruments caused by instantaneous gas flow impact;

9.3 It is not allowed to open the back cover or change the internal parameters of the flowmeter



during operation, otherwise it will affect the normal operation of the flowmeter;

9.4 If the output signal is an analog signal, in order to improve its accuracy, users should set the corresponding value according to the actual maximum standard volume flow rate when using it;

## **10. Precautions for using explosion-proof products**

This product is an explosion-proof product, and the following precautions should be taken when using it:

10.1 The product casing is equipped with a grounding terminal, and users should ensure reliable grounding when using the product.

10.2 On site installation and maintenance must comply with the warning message 'Open the cover after disconnecting the power supply'.

10.3 There should be no harmful gases present at the installation site that can corrode aluminum alloys.

10.4 The maximum allowable temperature of the tested medium is +60 °C.

10.5 Repairs and battery replacements must be carried out in a safe place, and repairs can only be carried out when the installation site confirms the absence of flammable gases.

10.6 When installing, using, and maintaining products, users must comply with the relevant provisions of GB50058-92 "Design Code for Electric Power Installations in Explosive and Fire Hazardous Environments" and "Electrical Safety Regulations for Explosive Hazardous Areas of the People's Republic of China".

10.7 When using an external power source or external signal, the outer diameter of the rubber cable should be  $\phi 7 \sim \phi 8$ ; If external power supply and external signal are not used, the cable outlet hole must be sealed tightly with a blind plate.

10.8 When the product is used outdoors, a waterproof cover must be added.

## JINGDA service concept

- Ensure that customers rest assured to choose fine large products.
- The convenience of customers is the trust of enterprises.
- Every day a company loses a customer is another day it loses a market.
- Service first find their own problems, giving priority to the interests of customers.
- Customers will not use JINGDA products, it is not the customer's fault, but our service work is not done.

## JINGDA service principle

- Process first, analyze later.
- Act first, talk later.
- Get it right the first time.



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