Intelligent Gas Turbine Flowmeter

User's Manual

January 2018

Contents

1. Product Introdcution

LWQ gas turbine flowmeter is a kind of velocity flow meter that accurately measures gas flow. It has the advantages of simple and light structure, high measurement accuracy, good repeatability, wide measurement range, convenient installation and maintenance, etc. It is widely used in the measurement of various gases such as natural gas, city gas, propane, butane, air, nitrogen and other gases in petroleum, chemical industry, metallurgy, aviation, scientific research and other departments and industrial fields. Due to its high precision and good repeatability, the instrument is suitable for trade measurement and industrial process detection.

When the gas turbine flowmeter is measured online, its medium density changes with the change of temperature and pressure. In order to measure accurately, the temperature and pressure of the medium must be tracked and detected at the same time, and the volume flow under different working conditions must be converted into the volume flow under the standard state or the agreed state.

Since the flowmeter integrates temperature, pressure and flow sensors, tracks and detects the medium temperature and pressure on line, and performs automatic compensation and compression factor correction operation, it has excellent low-pressure and high-pressure metering performance, and is especially suitable for the measurement of various single-phase gases, such as natural gas and other gases. According to different requirements of users, the company provides turbine flow meters with different precision grades.

2. Main Features

1) High precision, good repeatability, small pressure loss and good seismic performance;
2) Use high-quality bearings, with small friction resistance, good sealing performance and hand name;
(3) Integrating a microprocessor, a flow sensor, a high-precision temperature sensor and a pressure sensor, directly measuring the flow rate, the temperature and the pressure of the measured gas, and automatically performing flow tracking compensation and compression factor correction operation;
4) The instrument has pulse signal and analog signal output, and can directly realize centralized collection and real-time management of computer data through RS485 communication interface or GPRS system.
5) Low power consumption, internal battery power supply or external power supply;
6) It has a real-time data storage function, which can prevent data loss during battery replacement or sudden power failure. In the power failure state, internal data can be stored permanently.
7) It can be used with IC card prepayment system to facilitate trade settlement.

3.Technical Performance

3.1 Accuracy Class

Class 1.0: qmax-0.2max ±1.0% 0.2max-min ±2.0%

Class 1.5: qmax-0.2max ±1.5% 0.2max-min ±3.0%

Products that are not specially marked shall be delivered in accordance with Class 1.5 precision. For other precision, special instructions shall be required for customization when ordering.

3.2 Model, specification and basic parameters of flowmeter (see Table 1)

Model	Nominal Diameter DN(mm)	Flow Range(m3/h)	Max pressure loss （kPa）	Initial flow （m3/h）	Connection type
LWQ-25	25	2.5-25		1	Flange (thread)
LWQ-25		4-40		2	
LWQ-40	40	5-50		1.8	
LWQ-50	50	6-65	0.7	2.5	Flange
LWQ-50		10-100	0.7	2.5	
LWQ-80	80	13-250	0.3	6	
LWQ-80		20-400	0.8	6	
LWQ-100	100	20-400	0.2	8	
LWQ-100		36-650	0.5	8	
LWQ-125	125	35-700	0.5	12	
LWQ-150	150	32-650	0.4	15	
LWQ-150		50-1000	1.7	15	
LWQ-200	200	80-1600	0.2	35	
LWQ-200		130-2500	0.9	35	
LWQ-250	250	130-2500	0.2	40	
LWQ-250		200-4000	0.5	50	
LWQ-300	300	300-6000	1.5	50	

Table 1

3.3 Conditions of Use

3.3.1 Standard condition: P=101.325kPa T=293.15k

3.3.2 Conditions of use:

A. ambient temperature:-25 ~+80 ℃

B. medium temperature:-20 ~+60 ℃

C. relative humidity: 5-95%

D. atmospheric pressure: 86 kpa-106 kpa

3.4 Electrical Performance Indicators

3.4.1 Working power supply

A. Internal instrument power supply: 1 3.6VDC lithium battery, which can work normally when the battery voltage is 3.1 ~ 3.6 v;

B Internal GPRS power supply: a 6.6VDC lithium battery, which can work normally when the battery voltage is 5.0 ~ 6.6 v;

C. External power supply:+24 VDC 15%, ripple ≤ 5%, suitable for 4 ~ 20ma output, pulse output, RS-485, etc.

D. External power supply (solar energy) GPRS power supply:+5vdc--+7vdc.

3.4.2 Overall power consumption:

External power supply, < 1W

Internal instrument power supply, average power consumption ≤ 1mW, can work continuously for more than 5 years.

Internal GPRS power supply: according to the daily average number of communications (2-12), it can work continuously for one to five years.

3.4.3 Pulse Output Mode

1) Base meter pulse signal: (used for calibration of instrument):

Directly outputting the original pulse signal of the base meter detected by the flow sensor through an amplifier, wherein the high level is more than or equal to ≥20V and the low level ≤1V。

2) Modified working condition pulse signal (or standard volume flow):

Set by software, the default is the volume flow pulse output of the modified working condition, with amplitude values of: high level ≥20V and low level ≤1V.

3) Equivalent Pulse Signal (for IC Card Controller Input):

A.TTL output amplitude is 0 ~ 3v, output pulse width ≥50ms.

B.OC output.

3.4.4 Current Output:

4 ~ 20mA Standard Analog Current Output Function

It is directly proportional to the standard volume flow rate, 4mA corresponds to 0 Nm3/h, 20mA corresponds to the maximum standard volume flow rate (this value can be set).

The output form is: two-wire system

3.4.5 RS485 Communication

Through the internal RS485 standard interface, it can be connected with host computers such as personal computers and PLC for serial communication. It can display medium pressure, temperature, instantaneous flow rate, accumulated standard flow rate, battery voltage, etc.

4.The Function Of Meter Header

1. Interface with temperature/pressure sensor. The temperature can be connected with Pt100 or Pt1000, and the pressure can be connected with gauge pressure or absolute pressure sensor.

2. The output signals are diversified, and two-wire 4-20mA output, three-wire pulse output, equivalent output and 485 communication can be selected according to customer requirements.

3. It has excellent non-linear correction function and greatly improves the linearity of the instrument.

4. It has software spectrum analysis function, which improves the anti-interference and anti-seismic capability of the instrument.

5. Ultra-low power consumption, a dry battery can maintain full performance for at least 3 years;

6. The working mode can be switched automatically, with battery power supply, two-wire system and three-wire system;

7. Self-checking function, rich self-checking information; It is convenient for users to overhaul and debug.

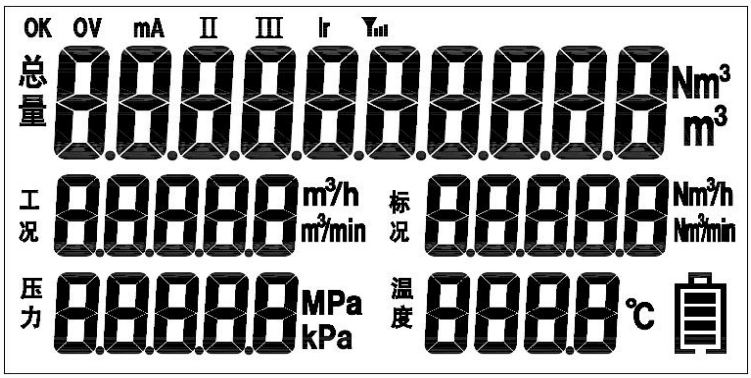
8. It has independent password setting. Parameters, total amount reset and calibration can set passwords of different levels, which is convenient for users to manage.

5. Flow usage and setting

Version 1

5.1 Working Status

When the meter is powered on, it will perform self-test. If the self-test is abnormal, the self-test error interface will be displayed (the self-test interface description refers to the self-test menu), and it will jump to the main interface after about 1~2 seconds. Otherwise it will jump directly to the main interface. The main interface starts as shown below:



1 "OK": the running status of the instrument is displayed in real time. If "OK" is normally displayed, the fault display "ERR";

2 "OV": overflow of instrument operation parameters; if overflow of instrument operation parameters displays "OV", it will be blank if normal (overflow includes negative parameters that cannot be negative, zero parameters that cannot be zero, and the data is out of the range of representation);

3 "mA": meter current output overflow flag, if current overflow displays "mA", if normal display is blank;

4 "II" and "III": operation power supply mode shows that if it is in battery mode, the current battery quantity is displayed; if it is in two-wire current output connection, the number symbol "II" is displayed; if it is in three-wire system, the number symbol "III" is displayed;

5 "IR": remote control key prompt; if this sign prompt appears, remote control key can be used;

6" “: wireless communication, indicating communication signal strength;

7 “总量” :Total Amount， cumulative flow, the display value can be reserved with 5 decimal places, and the maximum value is 9999999999; Units are m3 and Nm3 for selection; Flow rate under

8 “工况” ：Working conditions，the display value shall be kept at least 3 decimal places, and the maximum value shall be 99999m3/h;

9 “标况 “：Standard temperature and pressure flow，the display value shall be kept at least 3 decimal places and the maximum value shall be 99999 Nm3/h;

10 “压力：Pressure，the display value shall be kept at least 3 decimal places, and the maximum value shall be 99999. The units are Kpa and Mpa for selection.

11 “温度” :Temperature, the display value ranges from-50℃ to 300℃;

12 "  “: Operation power supply mode display, power supply prompt for battery, and battery power display.

5.2 Key Description

The instrument performs parameter setting by pressing the button. Generally, some parameters are manually set by the button when using. The instrument has four buttons.

The order from left to right is K1,K2,K3,K4. The buttons are as follows:

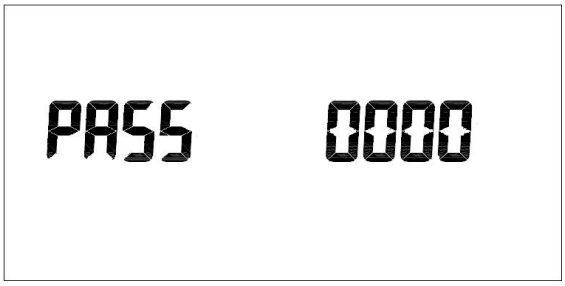
Symbol	name	function
K1	setting key	1. Enter parameter setting; 2. Switch to display each parameter item; 3. Confirm and save the new parameter value after modifying and setting parameters.
K2	shift key	causes each of the parameters to flash in turn
K3	add-key	key Cycles a bit from the parameter from 0 to 9
K4	exit key	Exit the parameter setting interface and enter the flow display interface.

5.3 Parameter settings

In order to prevent malicious modification of the instrument parameters and affect the measurement accuracy, the instrument has a multi-level password function. When setting or modifying parameters, the corresponding password must be confirmed first. After confirmation, the parameters can be set and modified. When a certain bit of the parameter is allowed to be modified and set, the corresponding number is flashed to show the difference. Parameter setting method, press the SET button (K1) to display the password setting on the LCD, press the shift button (K2) and the add-key button (K3), and set the value to the password of the corresponding parameter from left to right. Then press the K1 button to confirm.

5.3.1 Flow parameter settings

Set the option to set the operation parameters required for the instrument to work. In order to prevent human error, entering this option requires a password. After entering the correct password, you will enter the corresponding parameter setting interface. The password interface is as follows:



5.3.2 User parameter settings

The user parameters mainly set the parameters that need to be set when the meter is used, and the field user can modify it. Press the SET button (SET) to display the password setting on the LCD, press the shift button (SHT) and the add-key button (INC), set the value to “1000” bit by bit from left to right, and then press the SET button (SET) Enter the user parameter settings.
PASS - password input (1000);

function code/ display	NO.	Key operation				functional description
		K1	K2	K3	K4	
F0	101	Save changes	Shift	Change value	quit	Lower cutoff frequency, unit: Hz
FS	102	Save changes	Shift	Change value	quit	Flow range, unit: Nm3/h or m3/h; The flow range corresponds to a current output of 20 mA;
Gr	103	Save changes	Shift	Change value	quit	The relative density of natural gas, dimensionless, is provided by the gas analysis report. The setting options are divided into two parts. The first number on the left is the super compression factor correction or no correction, the setting is 0 for no correction, the setting is 1 correction; the latter value is relative density setting;
N2	104	Save changes	Shift	Change value	quit	The mole percent of nitrogen in natural gas. This parameter is provided by the gas analysis report;
CO2	105	Save changes	Shift	Change value	quit	The mole percent of carbon dioxide in natural gas. This parameter is provided by the gas analysis report;
CA	106	Save changes	Shift	Change value	quit	The serial number of the communication is the meter number, and the input range is 1-255.
Cr	107	Save changes	——	change	quit	Communication baud rate, available in 1200, 2400, 4800,9600, 19200,38400
CP	108	Save changes	——	change	quit	Communication check mode, 0: none, 1: odd, 2: even
ST	109	Save changes	Shift	Change value	quit	Set the temperature in °C. Use this temperature value to compensate when the temperature sensor is damaged or the temperature is set.
SGP/SAP	110	Save changes	Shift	Change value	quit	Set the pressure in KPa. SGP: Set gauge pressure, SAP: Set absolute pressure, use

function code/ display	NO.	Key operation				functional description
		K1	K2	K3	K4	
						this pressure value to compensate when the pressure sensor is damaged or the pressure is set value.
LP	111	Save changes	Shift	Change value	quit	Local atmospheric pressure, unit: KPa
dc	112	Save changes	Shift	Change value	quit	Seismic coefficient, input range: 0-9
DT	113	Save changes	Shift	Change value	quit	Damping time, input range: 0-30
POT	114	Save changes	——	change	quit	Pulse output mode, CPU: pulse correction output, pin: sensor raw pulse output
EC	115	Save changes	Shift	Change value	quit	Equivalent coefficient, input range: 0.00001-10
TS	116	Save changes	Shift	Change value	quit	Media type selection, only reference, this item is not developed.
TLUN	117	Save changes	Shift	Change value	quit	Cumulative flow display type selection, cumulative flow communication data selection. The first value (cumulative flow display type): 0 is the cumulative condition, the unit is Nm3; 1 is the cumulative condition, the unit is m3. The second value (cumulative flow communication data): 0 is the cumulative communication output of the standard condition, the unit is Nm3; 1 is the cumulative communication output of the working condition, the unit is m3.
FLUN	118	Save changes	Shift	Change value	quit	oper. condition and Std. condition display unit selection. The first value (unit of oper.): 0 is m3/h; 1 is m3/min; the second value (unit of Std.): 0 is Nm3/h, single; 1 is Nm3/min.
PUN	119	Save changes	Shift	Change value	quit	Pressure unit selection: 0 is Kpa, 1 is Mpa
DATE	120	Save changes	Shift	Change value	quit	Time setting, year, month, day
clock	121	Save changes	Shift	Change value	quit	Time setting, hour, minute, second
rc	122	Save changes	Shift	Change value	quit	Restore the factory parameters, enter the value 3, press the set button to restore the setting parameters to the factory parameters.

5.3.3 Initial parameter setting

Initially set the meter factor, temperature sensor type and coefficient, pressure sensor type and coefficient and current output calibration. Setting the parameters in the factory menu affects the performance and accuracy of the meter. It is not necessary to operate the parameters in this menu during normal use. Press the SET button (K1) to display the password setting on the LCD, press the shift button (K2) and the add-key button (K3), set the value to “2000” from left to right, and press the SET button (K1) Enter the user parameter settings.

PASS - password input (2000);

function code/ display	No.	Key operation				Functional description
		K1	K2	K3	K4	
F1	201	Save changes	Shift	Change value	quit	Flow segmentation, frequency 1, unit Hz
C1	202	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 1, unit 1/m3
F2	203	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 2, unit Hz
C2	204	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 2, unit1/ m3
F3	205	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 3, unit Hz
C3	206	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 3, unit 1/ m3
F4	207	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 4, unit Hz
C4	208	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 4, unit 1/ m3
F5	209	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 5, unit Hz
C5	210	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 5, unit 1/ m3
F6	211	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 6, unit Hz
C6	212	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 6, unit1/ m3
F7	213	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 7, unit Hz
C7	214	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 7, unit 1/ m3
F8	215	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 8, unit Hz

function code/ display	No.	Key operation				Functional description
		K1	K2	K3	K4	
C8	216	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 8, unit 1/ m3
F9	217	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 9, unit Hz
C9	218	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 9, unit 1/ m3
C10	219	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 10, and flow greater than frequency 9, are all calculated with a factor of 10, and the coefficients are set to the coefficients of the same maximum frequency. Unit 1/m3
AC	220	Save changes	Shift	Change value	quit	Average meter factor in 1/m3
TST	221	Save changes	——	Change	quit	Temperature input mode, there are three modes: Pt1000, Pt100, and setting.
TC	222	Save changes	Shift	Change value	quit	Temperature sensor coefficient
T0	223	Save changes	Shift	Change value	quit	Temperature sensor zero
NT	224	Save changes	——	Change	quit	Standard temperature, used for standard condition conversion calculation, available in 0°C and 20°C
PST	225	Save changes	——	Change	quit	Pressure input, AP: absolute pressure sensor, GP: gauge pressure sensor, SAP: set absolute pressure, SGP: set gauge pressure
PG	226	Save changes	——	Change	quit	Pressure gain, pressure amplification factor, range 0-7.
PC	227	Save changes	Shift	Change value	quit	Pressure sensor coefficient
P0	228	Save changes	Shift	Change value	quit	Pressure sensor zero
IC	229	Save changes	Shift	Change value	quit	Current coefficient, calibrated by current output
I0	230	Save	Shift	Change value	quit	Current zero, calibrated by current output
SC	231	Save changes	Shift	Change value	quit	Save the initial parameter settings, enter the value 3, press the set button to save the set parameters as factory parameters.

5.3.4 Total reset

Set the button (K1) to the LCD to display the password setting, press the shift button (K2) and the add button (K3), set the value to “3000” from left to right, and press the SET button (K1). Enter the user parameter setting interface as follows:

There are two ways to clear the total amount. One is to modify the number to be cleared. Shift the shift key (K2) and change the number from the left to the right by the modifier key (K3) until it is cleared. The other is To clear directly, set the value "0" on the right side of TFCLK to "3", and press the K1 button to clear it.

5.4 Password

This option can be used to modify the user parameters, factory parameters and passwords for cumulative flow clearing. Press the SET button to display the password setting on the LCD. Press the shift button (SHT) and the add-in button (INC). Set the value to "6210" from left to right and press the SET button to enter the password setting.

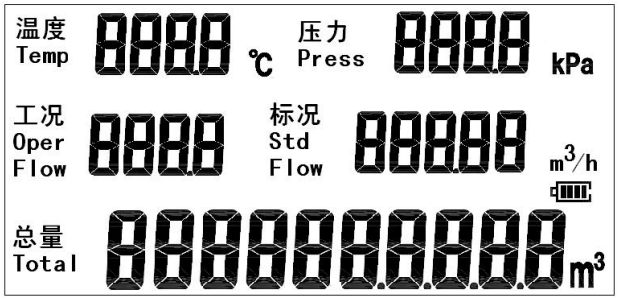
PASS——password input （6210）;

function code/ display	No.	Key operation				Functional description
		K1	K2	K3	K4	
PSET	601	Save changes	Shift	Change value	quit	User parameter password
PSET	602	Save changes	Shift	Change value	quit	Factory parameter password
PSET	603	Save changes	Shift	Change value	quit	Total clear password

Version 2

5.1 Working status

When the meter is powered on, it will perform self-test. If the self-test is abnormal, the self-test error interface will be displayed (the self-test interface description refers to the self-test menu), and it will jump to the main interface after about 1~2 seconds. Otherwise it will jump directly to the main interface. The main interface starts as shown below:



1 Total: Cumulative flow, the display value can retain 4 decimal places, the maximum value is 9999999999; when the display display condition accumulates, m3 will be displayed. When the display shows the accumulated condition, m3 will not be displayed.

2 oper. flow: The displayed value is kept at least 3 decimal places, and the maximum value is 9999m3/h;

3 Std. flow: The display value is a minimum of 3 decimal places, and the maximum value is 99999Nm3/h;

4 Pressure: The displayed value is a minimum of 3 decimal places. The maximum value is 9999. The unit has Kpa for selection. The pressure range is 0-20000Kpa (gauge pressure). When this range is exceeded, the pressure will flash.

5 Temperature: The displayed value range is -50 °C - 300 °C. Outside this range, the temperature (Temp) will flash;

6 “ Runs the power mode display, provides a battery power prompt, and displays the battery level.

5.2 Key Description

The instrument performs parameter setting by pressing the button. Generally, some parameters are manually set by the button when using. The instrument has four buttons. The order from left to right is SET, SHT, INC, RST. The buttons are as follows:

Symbol	name	function
SET	setting key	1. Enter parameter setting; 2. Switch to display each parameter item; 3. Confirm and save the new parameter value after modifying and setting parameters.
SHT	shift key	causes each of the parameters to flash in turn
INC	add-key	key Cycles a bit from the parameter from 0 to 9
RST	exit key	Exit the parameter setting interface and enter the flow display interface.

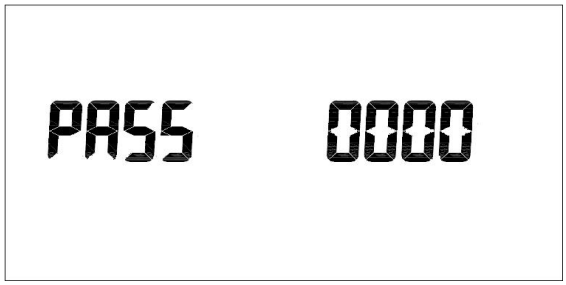
5.3 Parameter settings

In order to prevent malicious modification of the instrument parameters and affect the measurement accuracy, the instrument has a multi-level password function. When setting or modifying parameters, the corresponding password must be confirmed first. After confirmation, the parameters can be set and modified. When a certain bit of the parameter is allowed to be modified

and set, the corresponding number is flashed to show the difference. Parameter setting method, press the SET button (SET) to display the password setting on the LCD, press the shift button (SHT) and the add-key button (INC), and set the value to the password of the corresponding parameter from left to right. Then press the SET button to confirm.

5.3.1 Flow parameter settings

Set the option to set the operation parameters required for the instrument to work. In order to prevent human error, entering this option requires a password. After entering the correct password, you will enter the corresponding parameter setting interface. The password interface is as follows:



5.3.2 User parameter settings

The user parameters mainly set the parameters that need to be set when the meter is used, and the field user can modify it. Press the SET button (SET) to display the password setting on the LCD, press the shift button (SHT) and the add-key button (INC), set the value to “1000” bit by bit from left to right, and then press the SET button (SET) Enter the user parameter settings.
PASS - password input (1000);

function code/ display	NO.	Key operation				functional description
		SET	SHT	INC	RST	
F0	101	Save changes	Shift	Change value	quit	Lower cutoff frequency, unit: Hz
FS	102	Save changes	Shift	Change value	quit	Flow range, unit: Nm3/h or m3/h; select the current output variable according to the “ISEL(123)” option. The flow range corresponds to a current output of 20 mA;
Gr	103	Save changes	Shift	Change value	quit	The relative density of natural gas, dimensionless, is provided by the gas analysis report. The setting options are divided into two parts. The first number on the left is the super compression factor correction or no correction, the setting is 0 for no correction, the setting is 1 correction; the latter value is relative density setting;

function code/ display	NO.	Key operation				functional description
		SET	SHT	INC	RST	
N2	104	Save changes	Shift	Change value	quit	The mole percent of nitrogen in natural gas. This parameter is provided by the gas analysis report;
CO2	105	Save changes	Shift	Change value	quit	The mole percent of carbon dioxide in natural gas. This parameter is provided by the gas analysis report;
CA	106	Save changes	Shift	Change value	quit	The serial number of the communication is the meter number, and the input range is 1-255.
Cr	107	Save changes	——	change	quit	Communication baud rate, available in 1200, 2400, 4800,9600, 19200,38400
CP	108	Save changes	——	change	quit	Communication check mode, 0: none, 1: odd, 2: even
ST	109	Save changes	Shift	Change value	quit	Set the temperature in °C. Use this temperature value to compensate when the temperature sensor is damaged or the temperature is set.
SGP/SAP	110	Save changes	Shift	Change value	quit	Set the pressure in KPa. SGP: Set gauge pressure, SAP: Set absolute pressure, use this pressure value to compensate when the pressure sensor is damaged or the pressure is set value.
LP	111	Save changes	Shift	Change value	quit	Local atmospheric pressure, unit: KPa
dc	112	Save changes	Shift	Change value	quit	Seismic coefficient, input range: 0-9
DT	113	Save changes	Shift	Change value	quit	Damping time, input range: 0-30
POT	114	Save changes	——	change	quit	Pulse output mode, CPU: pulse correction output, pin: sensor raw pulse output
EC	115	Save changes	Shift	Change value	quit	Equivalent coefficient, input range: 0.00001-10
TS	116	Save changes	Shift	Change value	quit	Media type selection, only reference, this item is not developed.
TLUN	117	Save changes	Shift	Change value	quit	Cumulative flow display type selection, cumulative flow communication data selection. The

function code/ display	NO.	Key operation				functional description
		SET	SHT	INC	RST	
						first value (cumulative flow display type): 0 is the cumulative condition, the unit is Nm3; 1 is the cumulative condition, the unit is m3. The second value (cumulative flow communication data): 0 is the cumulative communication output of the standard condition, the unit is Nm3; 1 is the cumulative communication output of the working condition, the unit is m3.
FLUN	118	Save changes	Shift	Change value	quit	oper. condition and Std. condition display unit selection. The first value (unit of oper.): 0 is m3/h; 1 is m3/min; the second value (unit of Std.): 0 is Nm3/h, single; 1 is Nm3/min.
PUN	119	Save changes	Shift	Change value	quit	Pressure unit selection: 0 is Kpa, 1 is Mpa
DATE	120	Save changes	Shift	Change value	quit	Time setting, year, month, day
clock	121	Save changes	Shift	Change value	quit	Time setting, hour, minute, second
rc	122	Save changes	Shift	Change value	quit	Restore the factory parameters, enter the value 3, press the set button to restore the setting parameters to the factory parameters.
ISEL	123	Save exit	Shift	Change value	quit	Current output variable, “0” is the instantaneous flow output of the standard condition, and “1” is the instantaneous flow output of the working condition.

5.3.3 Initial parameter setting

Initially set the meter factor, temperature sensor type and coefficient, pressure sensor type and coefficient and current output calibration. Setting the parameters in the factory menu affects the performance and accuracy of the meter. It is not necessary to operate the parameters in this menu during normal use. Press the SET button (SET) to display the password setting on the LCD, press the shift button (SHT) and the add-key button (INC), set the value to “2000” from left to right, and press the SET button (SET) Enter the user parameter settings.

PASS - password input (2000);

function code/ display	No.	Key operation				Functional description
		SET	SHT	INC	RST	
F1	201	Save changes	Shift	Change value	quit	Flow segmentation, frequency 1, unit Hz
C1	202	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 1, unit 1/m3
F2	203	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 2, unit Hz
C2	204	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 2, unit1/ m3
F3	205	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 3, unit Hz
C3	206	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 3, unit 1/ m3
F4	207	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 4, unit Hz
C4	208	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 4, unit 1/ m3
F5	209	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 5, unit Hz
C5	210	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 5, unit 1/ m3
F6	211	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 6, unit Hz
C6	212	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 6, unit1/ m3
F7	213	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 7, unit Hz
C7	214	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 7, unit 1/ m3
F8	215	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 8, unit Hz
C8	216	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 8, unit 1/ m3
F9	217	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 9, unit Hz
C9	218	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 9, unit 1/ m3

function code/ display	No.	Key operation				Functional description
		SET	SHT	INC	RST	
C10	219	Save changes	Shift	Change value	quit	Flow segmentation, coefficient 10, and flow greater than frequency 9, are all calculated with a factor of 10, and the coefficients are set to the coefficients of the same maximum frequency. Unit 1/m3
AC	220	Save changes	Shift	Change value	quit	Average meter factor in 1/m3
TST	221	Save changes	——	Change	quit	Temperature input mode, there are three modes: Pt1000, Pt100, and setting.
TC	222	Save changes	Shift	Change value	quit	Temperature sensor coefficient
T0	223	Save changes	Shift	Change value	quit	Temperature sensor zero
NT	224	Save changes	——	Change	quit	Standard temperature, used for standard condition conversion calculation, available in 0°C and 20°C
PST	225	Save changes	——	Change	quit	Pressure input, AP: absolute pressure sensor, GP: gauge pressure sensor, SAP: set absolute pressure, SGP: set gauge pressure
PG	226	Save changes	——	Change	quit	Pressure gain, pressure amplification factor, range 0-7.
PC	227	Save changes	Shift	Change value	quit	Pressure sensor coefficient
P0	228	Save changes	Shift	Change value	quit	Pressure sensor zero
IC	229	Save changes	Shift	Change value	quit	Current coefficient, calibrated by current output
I0	230	Save	Shift	Change value	quit	Current zero, calibrated by current output
SC	231	Save changes	Shift	Change value	quit	Save the initial parameter settings, enter the value 3, press the set button to save the set parameters as factory parameters.

5.3.4 Current output calibration

The current output calibration affects the performance and accuracy of the meter, and the parameters in this menu do not need to be operated during normal use. Press the SET button (SET) to display the password setting on the LCD, press the shift button (SHT) and the add-key button (INC), set the value to “5000” from left to right, and press the SET button (SET) Enter the user parameter settings.

When the current is calibrated and the current output is deviated, the current output can be calibrated through this interface. Calibration requires preparation of a related measuring instrument such as a multimeter. If there is no measuring instrument, please do not calibrate the current. Calibration current: Select 4mA. At this time, input the measured data of the standard meter into the measured current value, and then press the SET button to select 20mA. At this time, input the measured data of the standard meter and press the (SET) key to confirm. I saw that the current calibration was successful.

5.3.5 Total reset

Set the button (SET) to the LCD to display the password setting, press the shift button (SHT) and the add button (INC), set the value to “3000” from left to right, and press the SET button (SET).) Enter the user parameter setting interface as follows:

There are two ways to clear the total amount. One is to modify the number to be cleared. Shift the shift key (SHT) and change the number from the left to the right by the modifier key (INC) until it is cleared. The other is To clear directly, set the value "0" on the right side of TFCLK to "3", and press the SET button to clear it.

5.4 Password

This option can be used to modify the user parameters, factory parameters and passwords for cumulative flow clearing. Press the SET button to display the password setting on the LCD. Press the shift button (SHT) and the add-in button (INC). Set the value to "6210" from left to right and press the SET button to enter the password setting.

PASS——password input （6210）；

function code/ display	No.	Key operation				Functional description
		SET	SHT	INC	RST	
PSET	601	Save changes	Shift	Change value	quit	User parameter password
PSET	602	Save changes	Shift	Change value	quit	Factory parameter password
PSET	603	Save changes	Shift	Change value	quit	Total clear password

6.Wiring Method

6.1 Sensor terminal description

1	2	3	4	9	10	11	12	13	14
VCC	S1	S2	GND	IP+	VP+	VP-	IP-	T1	T2

Flow signal　　Pressure Sensor　　Temperature Sensor

The instrument accepts the processed signal and can supply power to the signal processing board.
The wiring method is as follows:
VCC: Power supply 3V
S1: Frequency input
GND: Public GND
Pressure Sensor：
IP+：Pressure sensor power supply+；
VP+：Pressure sensor signal +；
VP-，pressure sensor signal-；
IP-，pressure sensor power supply-；
Temperature Sensor（Pt100 or Pt1000）：
T1：　Pt100（1）
T2：　Pt100（2）

6.2 External terminal description

1.Wiring Terminals

1	2	3	4	5	6	7	8	9	10	11	12
A	B	I-	I+	V+	V-	PL	DL	IC	BC	BL	GND

A:　RS-485communication A
B:　RS-485communication B
I-:　Current output-
I+:　Current input+
V+：Power supply DC24V+
V-：Power supply　0V
FL: Pulse output
DL: Equivalent output
IC: Equivalent output（IC card controller equivalent input）
BC:　（IC card controller）
BL:　（IC card controller）
GND：Public GND（IC card controller）

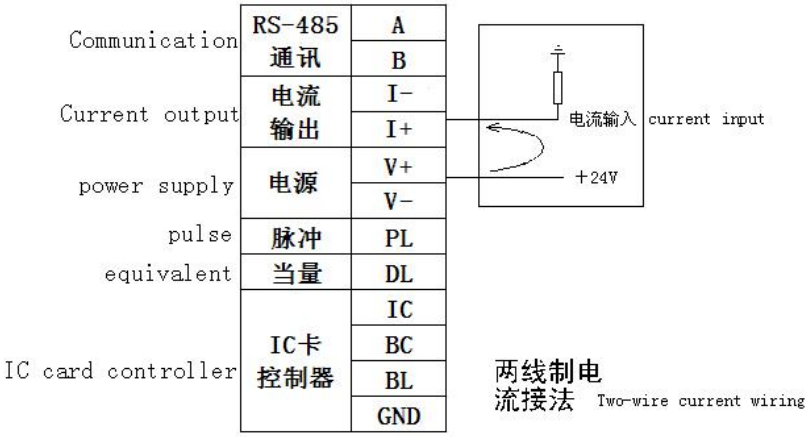
IC card controller wiring：
IC:Equivalent output+
GND:output-

2.Current output dial switch setting
There are three types of 4-20mA current output (two lines, three lines, four lines). The circuit board needs to adjust the jumper cap switching current output type. The setting method is as follows：

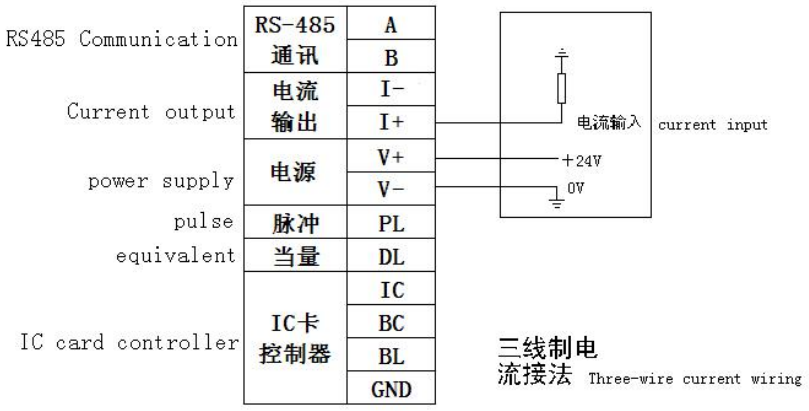
Current output type	Dial code	wiring
Two-wire current	1/2 short	+24V、I+
Three-wire current	1/2 short	+24V、0V、I+
Four-wire current	2/3 short	+24V、0V、I+、I-

6.3.Output wiring instructions

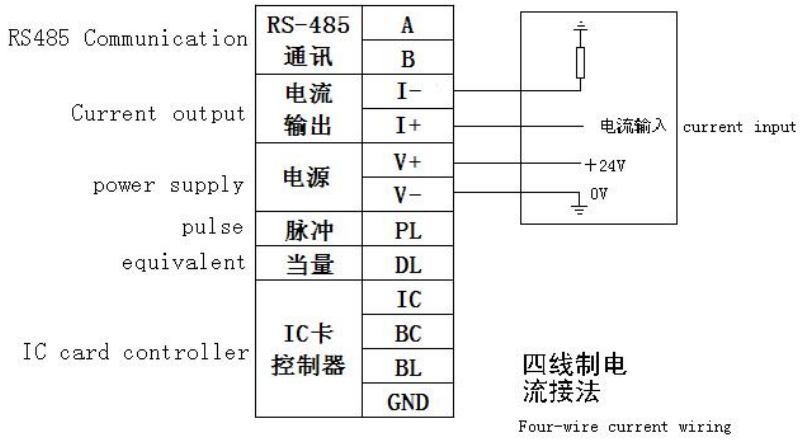
a. Two-wire current connection：



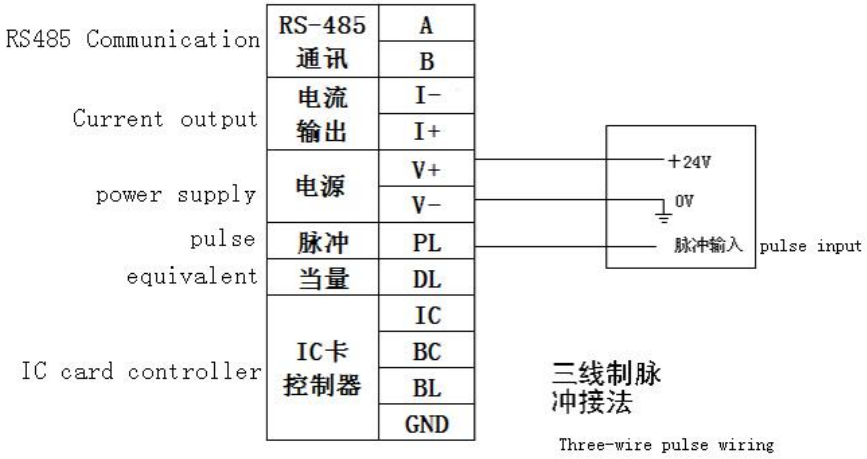
b. Three-wire current connection：



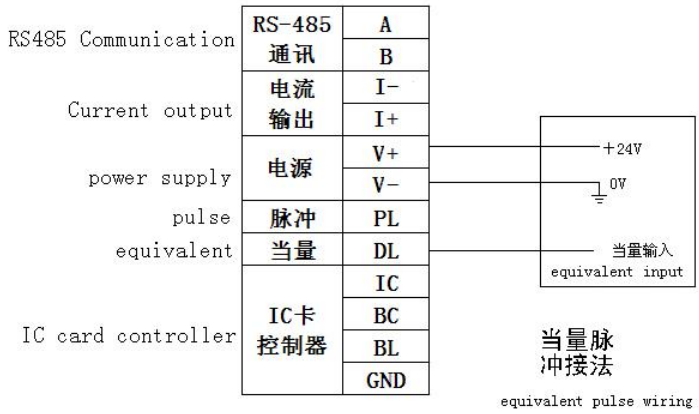
c. Four-wire current output：



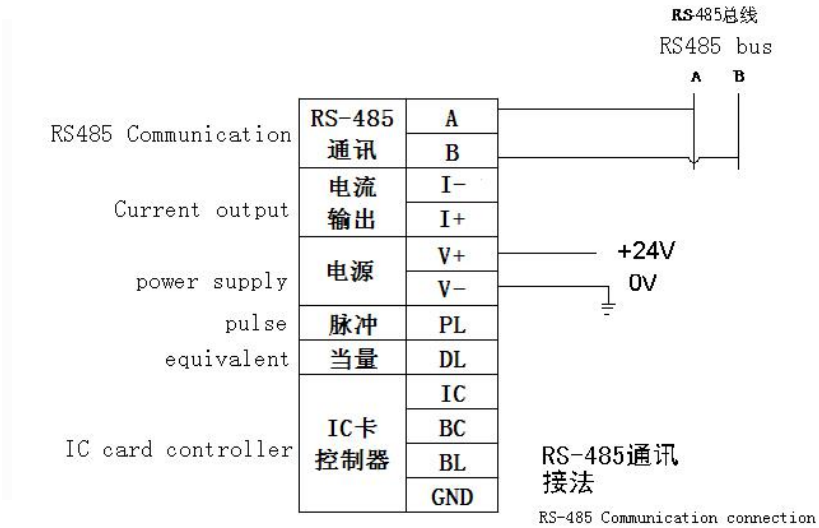
d.Three-wire pulse connection：



e.Three-wire equivalent connection：



f.RS485 Communication connection：



7.Selection and Installation

7.1 Flowmeter Selection

7.1.1 Scope of Use

1) Where the required flow range is less than that in accordance with Table 1 and the initial flow is relatively strict.

2) There is no fluid medium with short interval time and large flow fluctuation amplitude

3) Suitable for natural gas, city gas, compressed air, nitrogen, etc.

7.2. Determination of Specifications

The user shall estimate the maximum and minimum volume flow rate of the pipeline according to the gas transmission rate of the pipeline and the temperature and pressure range that the medium may reach, and correctly select the flowmeter specification. When both calibers of flowmeter can cover the lowest and highest volume flow, small calibers shall be selected if the pressure loss allows. A standard state of the time limit for a project flow range and medium pressure, calculate the flow range under the working state, selection formula is as follows:

Qg=Zg/Zn*Pn/(Pg+Pa)*Tg/Tn*Qn=101.325/(Pg+Pa)*(1/Zn/Zg)*(Tg/293.15)Qn

Type:

Tg: the absolute temperature (k) under the medium working condition;

Pg: the medium pressure (kpa); Pa is the local atmospheric pressure (kpa);

Qg: the volume flow rate (m3/h) under working conditions;

Qn: the volume flow rate (Nm3/h) in the standard state;

Zn and Zg respectively represent the compression coefficient under the standard state and the compression coefficient under the working condition.

Due to the large calculation step size, the data in the table are calculated according to the natural gas real density Gr=0.600 and the mole fractions of nitrogen and carbon dioxide are both 0.00. When the medium pressure is lower than 0.1Mpa, it can be estimated by Zn/Zg=1.00.
The selection calculation shall be based on the formula.

7.3 Selection Examples

It is known that the actual working pressure of a certain gas supply pipeline is 0.5 MPa ~ 0.6 MPa (gauge pressure), the medium temperature range is-10 ~+40 ℃, and the peak gas supply amount is 400 ~ 500 Nm3/h. The local atmospheric pressure is 101.3kPa, and it is required to determine the caliber of the flowmeter.

Analysis: Since the flow range given in Table 1 above is the flow range under actual working condition, the standard temperature and pressure flow should be converted into the working condition flow first, and the appropriate caliber should be selected.

Calculation: When the medium pressure is the lowest and the temperature is the highest (the influence of natural gas compression factor may not be considered in the estimation and selection), the medium has the maximum volume flow when it is in the peak period of gas supply, so there are:

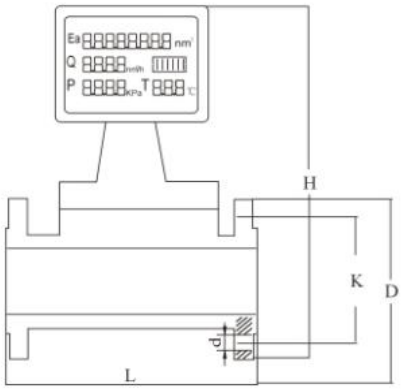
$$Q_{\max} = Q_0 \cdot \frac{P_0}{P} \cdot \frac{T}{T_0} = 9500 \times \frac{101.325}{101.3+1000} \times \frac{273.15+40}{293.15} = 933.7 m^3/h \quad (2)$$

Similarly, when the medium pressure is the highest and the temperature is the lowest, it has the minimum volume flow when it is in the gas supply valley period, so there are:

$$Q_{\min} = 4000 \times \frac{101.325}{101.3+1500} \times \frac{273.15+(-10)}{293.15} = 227.2 m^3/h \quad (3)$$

That is, the flow range of medium under working condition is 227.2 ~ 933.7m3/h, which is found in table 1. LWQ-150B should be selected.

7.3.1 Flowmeter Profile (Figure 1)



7.3.2 Overall dimensions of flowmeter (see Table 2)

Table 2

Model	Nominal diameter (mm)	L	D	K	n	d	Bolt specification	Press rating (MPa)
LWQ-25	25	200	115	85	4	Φ14	M12×50	4.0
LWQ-40	40	200	150	110	4	Φ18	M16×55	
LWQ-50	50	200	165	125	4	Φ18	M16×60	
LWQ-65	65	200	185	145	4	Φ18	M16×65	1.6
LWQ-80	80	240	200	160	8	Φ18	M16×70	
LWQ-100	100	300	220	180	8	Φ18	M16×80	
LWQ-125	125	300	250	210	8	Φ18	M16×80	
LWQ-150	150	450	285	240	8	Φ22	M20×80	
LWQ-200	200	450	340	295	12	Φ22	M20×90	
LWQ-250	250	450	403	355	12	Φ26	M24×90	
LWQ-300	300	450	460	410	12	Φ26	M24×100	

8. Installation Precautions

8.1 Installation and Precautions of Flowmeter

● When installing the gas turbine flow meter, the user should install the filter in front of the meter. Note: Any damage to the impeller bearing caused by not installing the filter is not covered by the warranty.

● Before using the instrument, the pipeline shall be cleaned in advance.

Note: Any damage to the impeller bearing caused by not cleaning the pipeline or not cleaning the pipeline is not covered by the warranty.

● The installation site of the meter shall have sufficient space to facilitate the inspection and maintenance of the flowmeter, and shall meet the requirements of the flowmeter. Environmental requirements.

● When the flowmeter needs remote signal transmission, it shall be connected to external power supply (8 ~ 24) strictly according to the requirements of "electrical performance index" VDC, it is strictly prohibited to directly connect 220VAC or 380VAC power supply at the signal output port.

● When using the instrument, slowly open the valve. After the pipeline is filled with gas, open the large valve again to prevent impeller damage.

● In case of temperature and pressure compensation, the pressure sensor valve on the instrument shall be opened first.

● When the flowmeter is installed outdoors for use, it is recommended to add a protective cover to prevent rainwater intrusion and sun exposure from affecting the flowmeter. The service life of.

● There shall be no strong external magnetic field interference and strong mechanical vibration around the flowmeter.

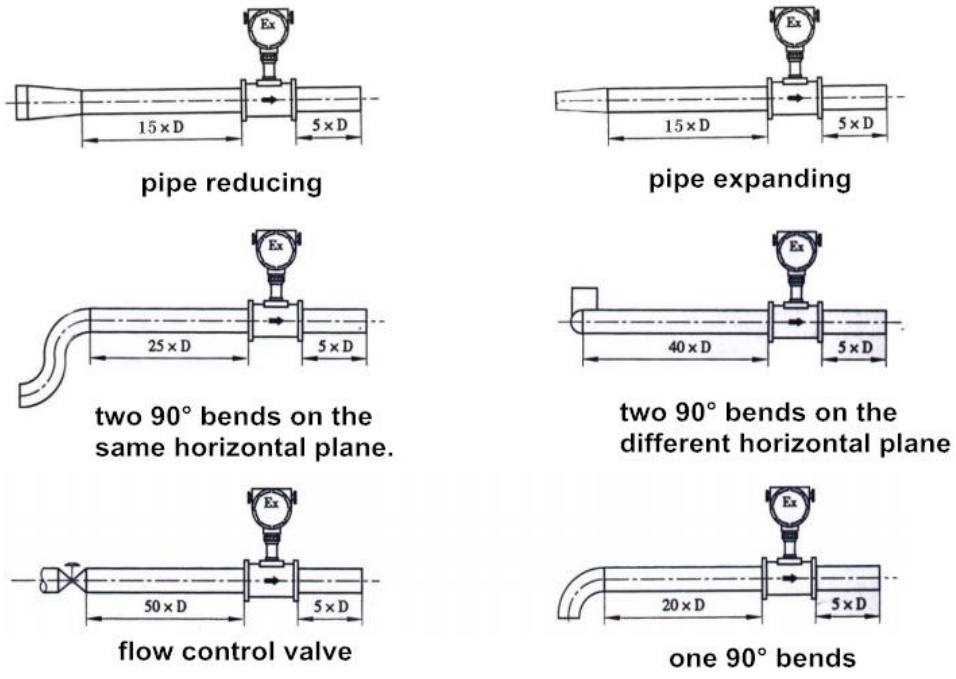
● When installing the flowmeter, it is strictly prohibited to directly conduct electric welding at its inlet and outlet flanges to avoid burning out the internal parts of the flowmeter.
● During pipeline construction, consideration should be given to installing expansion pipes or bellows to avoid serious stretching or fracture of flowmeter.
● The sensor can be installed at vertical, horizontal or any inclined position according to the flow direction sign.
● The flowmeter shall be installed coaxially with the pipeline and prevent sealing piece and butter from entering the inner cavity of the pipeline.
● When using external power supply, the flowmeter must have reliable grounding, and must not share the ground wire with the high-voltage power system, and be installed or inspected in the pipeline. During repair, the ground wire of the electric welding system shall not be overlapped with the flowmeter.

8.2. Requirements for straight pipe sections

In order to ensure accurate measurement, there must be a long enough straight pipe section upstream of the flowmeter, and the upstream flow distribution should not be disturbed as much as possible. If there are control and throttling devices, it is better to install them downstream. The length of the straight pipe section is expressed by multiple of the inner diameter d of the pipe, and the requirements for the smallest straight pipe section upstream and downstream are as follows:

● Upstream: 10d (10 diameter)
● Downstream: 5D (5 diameter)

If there are elbow, diameter reduction, diameter expansion, valve and other conditions upstream of the flowmeter, a longer straight pipe section is required. The specific conditions are as follows (as shown in fig. 2).



(Figure 2) Form and Size Requirements of Upstream and Downstream Pipelines

● Requirements for piping The inner diameter of upstream and downstream piping at the installation point of flowmeter shall be the same as that of flowmeter, which shall meet the requirements of the following formula:

0.98D ≤ DN ≤1.05D

Type: D is the inner diameter of flowmeter

DN is pipe inner diameter

Piping shall be concentric with flowmeter with coaxial deviation not more than 0.05DN

● Treatment of pipeline vibration The flowmeter shall be prevented from being installed on the pipeline with mechanical vibration. If it is necessary to install the flowmeter, vibration reduction measures must be taken. Hose transition can be added, or pipeline fixing support points and shock-proof pads can be added at 2D upstream and downstream of the flowmeter.

8.3 Use and Replacement of Built-in Battery

● Battery power display

When the battery shows only one cell, the user is required to replace the battery within one month. When only the battery shape symbol is displayed, power is turned on The battery has run out of power and must be replaced immediately.

● Battery replacement method

Open the back cover of the intelligent flow totalizer, loosen the three screws on the battery cover plate, unplug the battery socket, and take out the battery. Replace the battery and reinstall it.

8.4 Installation Requirements for Explosion-proof Sites

● The flowmeter shall have reliable grounding. Explosion-proof grounding shall not be shared with protective grounding of high-voltage power system.

● When testing power supply on site, AC power supply is not allowed to be grounded.

● Under any circumstances, users are not allowed to change explosion-proof circuits, components and explosion-proof types.

● The external power supply must be cut off before opening the converter cover.