Gas Turbine Flowmeter

User manual

KAIFENG BAITE FLOW INSTRUMENT CO., LTD.

Foreword

User manual

This instruction manual is a guide for the gas turbine flowmeter, please do not use it on other models.
Users who use the gas turbine flowmeter for the first time must read this instruction manual carefully. It will also help the users who have used it to re-understand the knowledge and experience. Please read the contents carefully and apply it in practice after full understanding.
It is recommended that after the equipment starts to operate normally, this instruction manual should be handed over to the equipment operators and maintenance personnel for use, and the operation and production should be carried out according to the requirements of the instruction manual.

The company will continue to research and improve the gas turbine flowmeter products. The content of this instruction manual may sometimes be different from the product and details purchased by the user. If the user has any questions about the purchased product or the content of the instruction manual, please contact Inquiries from our company.

Warn

For your safety, please read the following safety warnings carefully before using the meter.

1. The fluid will not corrode the material of the meter body and air-connected parts.
2. When measuring flammable gas, be careful to prevent fire or explosion.
3.When dealing with harmful gases, the manufacturer's safe operation specifications must be followed.
4. When working in a dangerous environment, correct operation steps must be followed.
5. Do not purge the turbine flowmeter with compressed air.
6. Pay attention to the turbine blades inside the flowmeter, even small scratches or nicks will affect the accuracy.
7. In order to achieve the best effect, the calibration period of the instrument should not exceed 1 year.

Catalog

Ⅰ. Overview

1.1 Application

The temperature and pressure compensated gas turbine flowmeter integrates the gas turbine flow sensor and the flow converter, and the main performance indicators have reached the international advanced level. Ideal for metering and gas trade metering.

1.2 Working Principle

When the airflow enters the flowmeter, it first passes through the special structure of the rectifier and accelerates. Under the action of the fluid, the turbine overcomes the resistance torque and friction torque and starts to rotate. When the torque reaches equilibrium, the rotational speed is stable, the rotational speed of the turbine is proportional to the gas flow rate, and the magnetic field is periodically changed by the magnet on the rotating signal disk, so that the pulse generator outputs a pulse signal whose frequency is proportional to the flow rate. The microprocessor in the converter counts and calculates the pulse signal to obtain the working condition flow, and detects the temperature and pressure of the medium at the same time, converts the working condition volume flow into standard volume flow according to the volume correction model, and accumulates it to obtain the total standard volume.

1.3 Product Structure

The basic structure of the temperature and pressure compensated gas turbine flowmeter is shown in Figure 1-1. It is mainly composed of the meter body, the movement (front guide, middle guide, rear guide), connection base and converter.

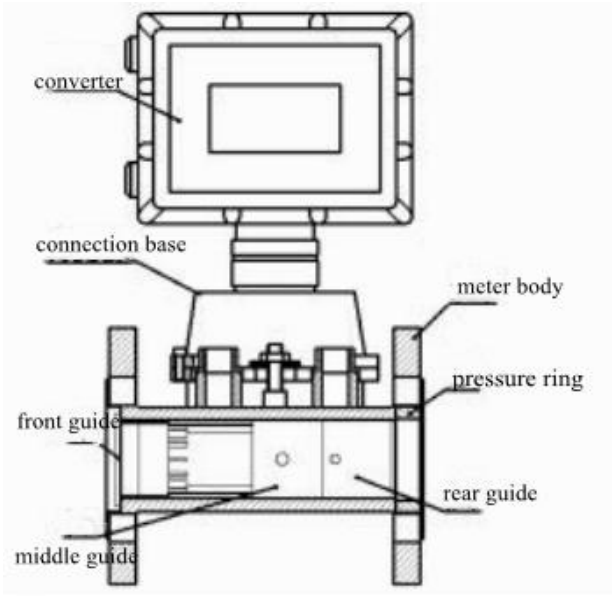


Figure 1-1 Flange connection type turbine flowmeter structure drawing

Ⅱ. Flow Meter Type

2.1 Thread Connection

2.2 Flange connection

Ⅲ. Technical Parameters

3.1 Flow Rate Characteristics

Figure3-1 Flow characteristics comparison table

Caliber *2 (mm)	Conventional flow range (m3/h)		Max pressure loss *1 (kPa)
25	S	4-40	1.5
40	S	6-65	1.5
50	S	5-70	0.5
	L	6-100	1.0
80	S	8-160	1.0
	L	20-400	2.5
100	S	20-400	1.0
	L	32-650	1.5
150	S	50-1000	1.0
	L	80-1600	2.0
200	S	80-1600	0.5
	L	125-2500	1.0
250	S	125-2500	0.5
	L	200-4000	1.5
300	S	200-4000	1.0
	L	325-6500	1.5
Accuracy	Level 1.5 (Level 1.0 needs to be customized)		

Note: *1 The maximum pressure loss is the pressure loss when the flowmeter works at the maximum flow point, the medium is air, and the temperature is normal.

*2 DN20, DN32, DN65, DN125 are non-national standard products and need to be customized.

3.2 Mechanical Characteristics

3.2.1 General Characteristics

Figure 3-2 General features comparison table

Measured medium	No impurities, medium and low flow gas		
Executive standard	Measurement of gas flow in closed pipes - turbine flow sensor (GB/T18940-2003）		
Verification regulation	Turbine Flow Meter（JJG1037-2008）		
Caliber and connection types	Flange connection	SS304	DN25-DN300
	Thread connection	SS304	DN25、DN40、DN50
Flange standard	General standard	GB/T 9113-2000	
	Other standard	International Pipe Flanges	eg：DIN、ANSI、JIS
		Domestic Pipe Flanges	eg：Ministry of Chemical Industry Standard, Ministry of Machinery Standard
Thread standard	General Specifications	Inch pipe thread (Male thread) (refer to standard GB/T7307-2001)	
	Other Specifications	female thread, NPT thread etc.	

Note: *1 Non-national standard flanges need to be customized;

*2 Unconventional inch pipe threads are to be ordered.

3.2.2 Pressure Rating

Figure 3-3 Pressure rating comparison table

Connection type	Caliber range		Conventional pressure rating	Customized pressure rating
Flange	Stainless steel material	DN25-DN100	1.6MPa	＜ 6.3MPa
		DN150、DN200		＜4.0MPa
		DN250、DN300		＜2.5MPa
Thread	DN25、DN40、DN50			＜4.0MPa

3.2.3 Material Description

Figure 3-4 Main component material comparison table

Connection Type	Meter Body	Impeller
Thread	304 (DN25-DN50)	Aluminium alloy
Flange	304 (DN25-DN300)	

Description: * Material of rectifier plate|: Cast aluminum alloy;

*The temperature and pressure compensation type connection base is made of stainless steel;

*The material of the converter shell is die-casting aluminum alloy;

3.3 Electrical Characteristics

Figure 3-5 Electrical characteristics comparison table

Model	Temperature and pressure compensation type	
Power supply	DC24V	3.6V
Power consumption	＜2W	＜800uA
Protection grade	IP65	
Explosion-proof grade	Exd Ⅱ CT6 Gb	
Electrical interface	M20*1.5 Female thread (NPT Thread to be customized)	

3.4 Operating Conditions

Figure 3-5 Operating conditions comparison table

Verification conditions	Calibration equipment	①Standard table method gas flow verification device ②Sonic nozzle gas flow verification device	
	Ambient conditions	Ambient temperature	20℃
		Relative humidity	75%
Use conditions	Medium temperature	-30℃～+80℃	
	Ambient temperature	-20℃～+60℃	
	Relative humidity	5%～90%	
	Atmospheric pressure	86kPa～106kPa	

Ⅳ. Installation Precautions

4.1 Installation Dimensions

4.1.1 Threaded Connection Dimensions

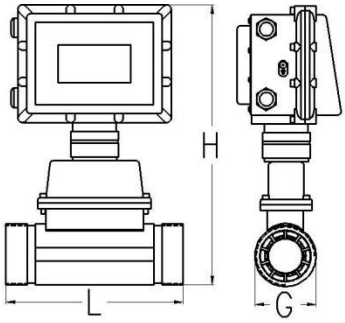


Figure 4-1 Thread connection diagram

Figure 3-4 Thread connection dimension comparison table

Caliber (mm)	L (mm)	H (mm)	G (Male thread)
25	200	310	G2
40	200	310	G2
50	250	325	G2 1/2

4.1.2 Flange Connection Dimensions

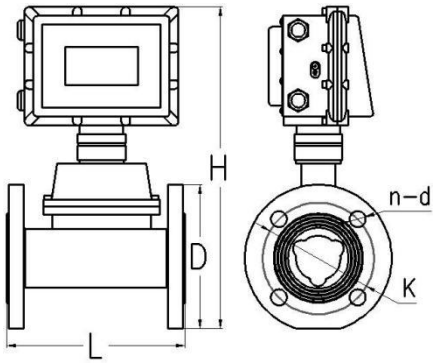


Figure 4-2 Flange connection diagram

Figure 4-2 Flange connection size comparison table

Caliber (mm)	L (mm)	D (mm)	K (mm)	H (mm)	D (mm)	n (hole count)	Standard withstand voltage
25	200	115	85	330	14	4	
40	200	150	110	355	18	4	
50	200	165	125	370	18	4	
65	200	185	145	390	18	4	
80	240	200	160	400	18	8	
100	300	220	180	425	18	8	
125	350	250	210	455	18	8	1.6 MPa
150	350	285	240	485	22	8	
200	400	340	295	545	22	12	
250	400	405	355	605	26	12	
300	400	460	410	670	26	12	

4.2 Matters Needing Attention

4.2.1 Installation Location

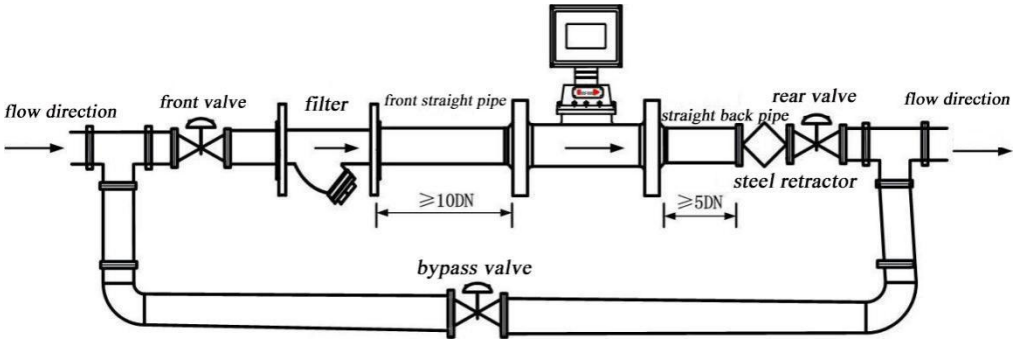


Figure 4-3 Typical Installed Piping System

4.2.2 Installation Precautions

1. It is strictly forbidden to weld the pipeline flange of the flowmeter online. The flowmeter should be removed before welding.
2. Before installing the flowmeter, the debris, welding slag and dust in the pipeline should be cleaned up.
3. In order to facilitate maintenance and not affect the normal transmission of fluid, it is recommended to set up the bypass pipeline as shown in Figure 4-3 above.
4. To prevent impurities from entering the flowmeter, a filter must be installed.
5. The flowmeter should be installed horizontally. It is recommended to install a steel expansion joint (compensator) on the back side of the straight pipe section behind the flowmeter. The expansion joint must meet the requirements of the nominal diameter and nominal pressure of the pipeline design. The expansion joint is used to compensate the pipeline stress and facilitate the installation and disassembly of the flowmeter.
6. If it needs to be installed vertically, it should be specified when ordering, and the product needs to be configured accordingly. When installing and using, the airflow direction should be from top to bottom.
7. When the flowmeter is installed outdoors, it is recommended to add a protective cover to avoid rainwater immersion or scorching sun exposure, which will affect the service life of the flowmeter.
8. There should be no strong external magnetic field interference and strong mechanical vibration around the flowmeter.
9. The flowmeter needs to be grounded reliably, but it must not be shared with the ground wire of the strong power system.

Ⅴ. Wiring Instructions

5.1 Sensor Wiring 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 place

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)

5.2 External Terminal Description

1. Terminal Description

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-485 A

B: RS-485 B

I-: Current output-

I+: Current output+

V+： Power supply DC24V+

V-： Power supply 0V

FL: Pulse output

DL: Equivalent output

IC: Equivalent output (equivalent input of IC card controller)

BC: (IC card controller)

BL: (IC card controller)

GND： Public ground (IC card controller)

IC card controller connection:

IC:Equivalent output+

GND:output-

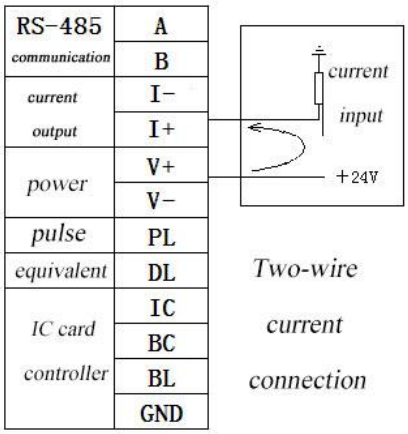
5.3 Current Output DIP Switch Settings

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

Current output type	Dial-up	Wiring
Two-wire	1/2 short connected	+24V、I+
Three-wire	1/2 short connected	+24V、0V、I+
Four-wire	2/3 short connected	+24V、0V、I+、I-

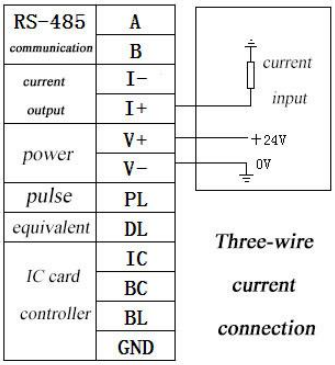
5.4 Output Wiring Instructions

A、Two-wire current connection：



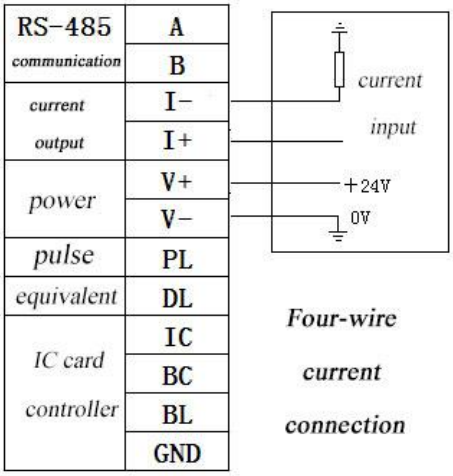
Two-wire current connection

B、Three-wire current connection：



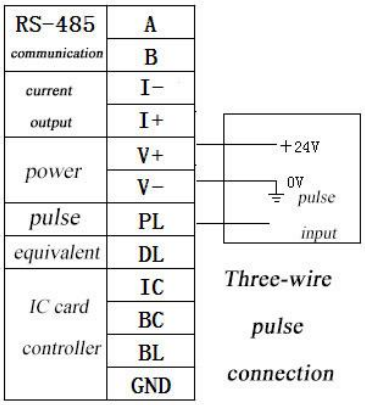
Three-wire current connection

C、 Four-wire current output：

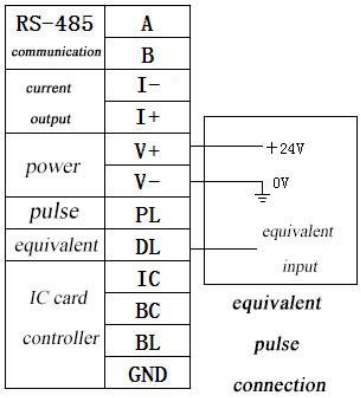


Four-wire current connection

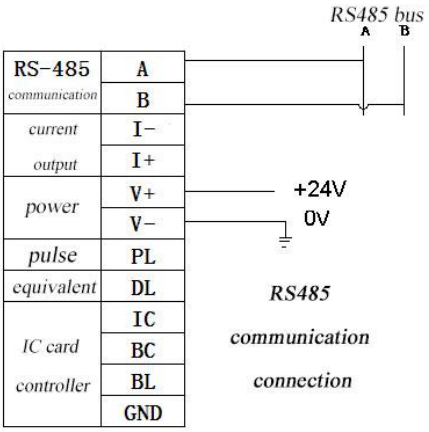
D、Three-wire pulse connection：



E、Three-wire equivalent connection：



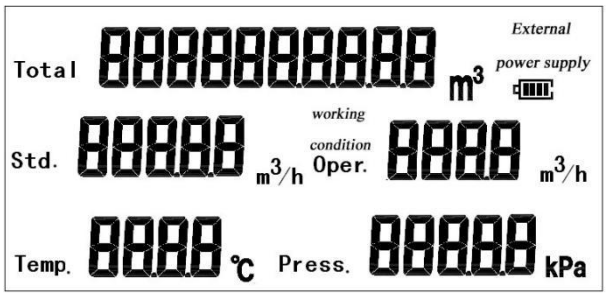
F、 RS485 communication connection：



Ⅵ、Operating Instructions

6.1 Work Status

Self-check is performed when power on. If abnormal, the self-check error interface will be displayed, and it will jump to the main interface after about 1 to 2 seconds. Otherwise, it will jump directly to the main interface. After the main interface is started, the following figure is shown:



Main Interface

1. Total flow: cumulative flow, the displayed value can retain 4 decimal places, the maximum value is 9999999999;
2. Flow rate under working conditions: the minimum display value retains 3 decimal places, and the maximum value is 9999m3/h ;
3. Standard flow rate: the minimum display value retains 3 decimal places, and the maximum value is 99999Nm3/h;
4. Pressure: The minimum value displayed is 3 decimal places, and the maximum value is 99999;
5. Temperature: the display value range is -50℃-300℃;
6. External power supply: display when DC24V power supply;
7. "▭": Battery power prompt, display battery level.

6.2 Key Description

Some parameters need to be manually set by pressing the keys. There are four buttons, the order from left to right is SET, SHT, INC, RST:

Symbol	Name	Function
SET	Set key	1. Enter the parameter setting; 2. Switch and display each parameter item; 3. Confirm to save the new parameter value.
SHT	Shift key	Make each bit of the parameter flash in turn
INC	Add key	Make a bit of the parameter blink from 0 to 9
RST	Escape key	Exit the setting interface and enter the flow display interface

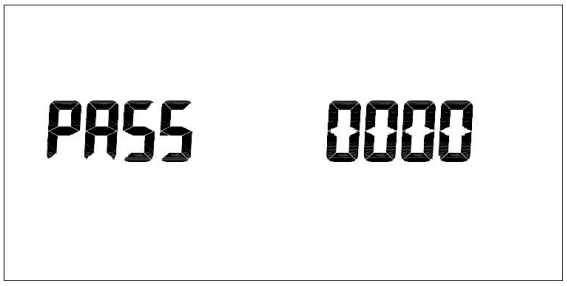
6.3 Parameter Setting

In order to prevent malicious modification of parameters and affect the accuracy, the password must be confirmed before modifying the parameters. When the modification is allowed, the corresponding number will flash to show the difference. To modify the method, press the SET key (SET) until the

LCD shows the password setting, press the shift key (SHT) and the increment key (INC) in sequence, set the value to the password of the corresponding parameter bit by bit from left to right, and then Press SET to confirm.

6.3.1 Password Interface

In order to prevent human error, you need to enter a password to enter this option. The password interface is as follows:



6.3.2 User Parameter Setting:

Set the parameters that need to be set when using, press the SET key (SET) until the LCD shows the password setting, press the shift key (SHT) and the increment key (INC) in sequence, and set the value to "" one by one from left to right 1000", and then press the SET key (SET) to enter the user parameter setting. PASS——password input(1000);

function code/ show	command	key operation				Function description
		SET	SHT	INC	RST	
F0	101	Save in item	shift	change value	exit	Lower cutoff frequency, unit: Hz
FS	102	Save in item	shift	change value	exit	Flow range, unit: Nm^3 /h or m^3 /h;
Gr	103	Save in item	shift	change value	exit	The relative density of natural gas, the first number on the left is the overcompression factor, set to 0 for no correction, and set to 1 for correction; the following values are the relative density settings;
N2	104	Save in item	shift	change value	exit	Molar percentage of nitrogen in natural gas
CO2	105	Save in item	shift	change value	exit	Molar percentage of carbon dioxide in natural gas
CA	106	Save in item	shift	change value	exit	Meter number, the input range is 1-255;
Cr	107	Save in item	——	switch	exit	Communication baud rate, there are 1200, 2400, 4800, 9600, 19200, 38400 for selection
CP	108	Save in item	——	switch	exit	Communication check mode, 0: None, 1: Odd, 2: Even
ST	109	Save in item	shift	change value	exit	Set temperature, unit: ℃, use this for compensation.
SGP/SAP	110	Save in item	shift	change value	exit	Set pressure, unit: KPa. SGP: set gauge pressure, SAP: set absolute pressure, use this to compensate.

function code/ show	command	key operation				Function description
		SET	SHT	INC	RST	
LP	111	Save in item	shift	change value	exit	Local atmospheric pressure, unit: KPa
dc	112	Save in item	shift	change value	exit	Seismic coefficient, input range: 0-9
DT	113	Save in item	shift	change value	exit	Damping time, input range: 0-30
POT	114	Save in item	——	toggle	exit	Pulse output mode, CPU: pulse correction output, pin: sensor original pulse output
EC	115	Save in item	shift	change value	exit	Equivalence coefficient, input range: 0.00001-10
TS	116	Save in item	shift	change value	exit	Media type selection, reference only
TLUN	117	Save in item	shift	change value	exit	Cumulative flow display type selection, cumulative flow communication data selection. Cumulative flow display: 0 is the standard condition, the unit is Nm^3 ; 1 is the working condition, the unit is m^3 . Communication data: 0 is the standard condition, the unit is Nm^3 ; 1 is the working condition, the unit is m^3 .
FLUN	118	Save in item	shift	change value	exit	Display unit selection for working condition and standard condition. Working condition: 0 is m^3 /h; 1 is m^3 /min; standard condition: 0 is Nm3/h, single; 1 is Nm^3 /min.
PUN	119	Save in item	shift	change value	exit	Pressure unit selection: 0 is Kpa, 1 is Mpa
DATE	120	Save in item	shift	change value	exit	Time setting, year, month, day
CLOCK	121	Save in item	shift	change value	exit	Time setting, hour, minute, second
RC	122	Save in item	shift	change value	exit	Enter the value 3, press the set key to restore the factory parameters
ISEL	123	save and exit	shift	change value	exit	Current output variable, "0" is the instantaneous flow output under standard conditions, "1" is the working condition

6.3.3 Factory Parameter Setting

Factory set meter factor, temperature sensor type and factor, pressure sensor type and factor, and current output calibration. The parameters affect the accuracy, and no operation is required in normal use. Press the SET key (SET) until the LCD shows the password setting, press the shift key (SHT) and the increment key (INC) in sequence, set the value to "2000" digit by digit from left to right, and then press the SET key (SET) to enter the user parameter setting. PASS——password input(2000);

function code/ show	command	Key operation				Function description
		SET	SHT	INC	RST	
F1	201	Save in item	shift	change value	exit	Flow segment, frequency 1, unit Hz
C1	202	Save in	shift	change	exit	Flow segment, coefficient 1, unit $1/m^3$

function code/ show	command	Key operation				Function description
		SET	SHT	INC	RST	
		item		value		
F2	203	Save in item	shift	change value	exit	Flow segment, frequency 2, unit Hz
C2	204	Save in item	shift	change value	exit	Flow segment, coefficient 2, unit 1/m³
F3	205	Save in item	shift	change value	exit	Flow segment, frequency 3, unit Hz
C3	206	Save in item	shift	change value	exit	Flow segment, coefficient 3, unit 1/m³
F4	207	Save in item	shift	change value	exit	Flow segment, frequency 4, unit Hz
C4	208	Save in item	shift	change value	exit	Flow segment, coefficient 4, unit 1/m³
F5	209	Save in item	shift	change value	exit	Flow segment, frequency 5, unit Hz
C5	210	Save in item	shift	change value	exit	Flow segment, coefficient 5, unit 1/m³
F6	211	Save in item	shift	change value	exit	Flow segment, frequency 6, unit Hz
C6	212	Save in item	shift	change value	exit	Flow segment, coefficient 6, unit 1/m³
F7	213	Save in item	shift	change value	exit	Flow segment, frequency 7, unit Hz
C7	214	Save in item	shift	change value	exit	Flow segment, coefficient 7, unit 1/m³
F8	215	Save in item	shift	change value	exit	Flow segment, frequency 8, unit Hz
C8	216	Save in item	shift	change value	exit	Flow segment, coefficient 8, unit 1/m³
F9	217	Save in item	shift	change value	exit	Flow segment, frequency 9, unit Hz
C9	218	Save in item	shift	change value	exit	Flow segment, coefficient 9, unit 1/m³
C10	219	Save in item	shift	change value	exit	Flow segment, coefficient 10, flow rate greater than frequency 9, use coefficient 10 for calculation, unit 1/m³
AC	220	Save in item	shift	change value	exit	Average meter factor, unit 1/ m3
TST	221	Save in item	——	switch	exit	Temperature input mode, there are three modes: Pt1000, Pt100, and setting.
TC	222	Save in item	shift	change value	exit	Temperature sensor coefficient
T0	223	Save in item	shift	change value	exit	temperature sensor zero
NT	224	Save in item	——	switch	exit	Standard condition temperature, used for standard condition conversion calculation, there are two options: 0°C and 20°C
PST	225	Save in item	——	switch	exit	Pressure input, AP: absolute pressure sensor, GP: gauge pressure sensor, SAP: set absolute pressure, SGP: set

function code/ show	command	Key operation				Function description
		SET	SHT	INC	RST	
						gauge pressure
PG	226	Save in item	——	switch	exit	Pressure gain, pressure amplification factor, range 0-7.
PC	227	Save in item	shift	change value	exit	Pressure sensor coefficient
P0	228	Save in item	shift	change value	exit	pressure sensor zero
IC	229	Save in item	shift	change value	exit	Current coefficient , obtained by current output calibration
I0	230	save	shift	change value	exit	Current zero point, obtained by current output calibration
SC	231	Save in item	shift	change value	exit	input 3, press the set key to save the parameters as factory parameters
PSS1	232	Save in item	shift	change value	exit	secondary pressure correction, segment pressure 1
PSC1	233	Save in item	shift	change value	exit	Secondary correction of pressure, segmented factor 1, if the pressure is below the value of 1, it is corrected with segmental factor of 1. Pressure Correction Factor = Standard Pressure/Instrument Display Pressure
PSS2	233	Save in item	shift	change value	exit	secondary pressure correction, segment pressure 2
PSC2	235	Save in item	shift	change value	exit	Secondary correction of pressure, segmented factor 2, within the value of pressure 1 to 2, corrected with segmental factor 2
PSS3	236	Save in item	shift	change value	exit	secondary pressure correction, segment pressure 3
PSC3	237	Save in item	shift	change value	exit	Secondary correction of pressure, segmented factor 3, within the pressure value of 2 to 3, corrected with segmental factor 3
PSS4	238	Save in item	shift	change value	exit	secondary pressure correction, segment pressure 4
PSC4	249	Save in item	shift	change value	exit	Secondary correction of pressure, segmented factor 4, within the pressure 3 to 4 values, corrected with segmental factor 4
PSC5	240	保存退出	shift	change value	exit	Secondary correction of pressure, subsection coefficient 5, the pressure value exceeding subsection 4 is corrected with subsection coefficient 5

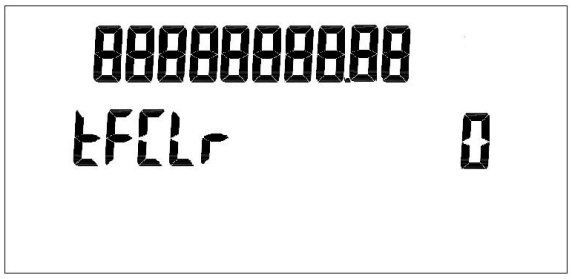
6.3.4 Current Output Calibration

The current output calibration affects the accuracy, and no operation is required for normal use. Press the SET key (SET) until the LCD shows the password setting, press the shift key (SHT) and the increment key (INC) in sequence, set the value to "5000" digit by digit from left to right, and then press the SET key (SET) to enter the user parameter setting.

Current calibration, when the current output is biased, it can be calibrated through this interface. You need to prepare a multimeter, etc., select 4mA, input the data measured by the standard meter into the measured current value, and then press the SET key (SET) to select 20mA, then input the data measured by the standard meter into the measured current value, press the (SET) key to confirm See that the current calibration succeeded.

6.3.5 Total Flow Reset

Set the key (SET) to the LCD to display the password setting, press the shift key (SHT) and the increment key (INC) in sequence, set the value to "3000" bit by bit from left to right, and then press the set key (SET)) to enter the user parameter setting. The interface is as follow:



There are two methods for clearing the total amount:

1. Modify the number to clear, shift through the shift key (SHT), and change the size of the number through the modify key (INC) from left to right until it is cleared;

2. Directly clear , set the value "0" on the right side of TFCLK to "3", and press the SET key (SET) to clear it.

6.4 Password Description

This option can be used to modify user parameters, factory parameters and the password for clearing the accumulated flow. Press the SET key (SET) to display the password setting on the LCD, press the shift key (SHT) and the increment key (INC) in sequence, from Set the value to "6210" digit by digit from left to right, and then press the set key (RST) to enter the password setting. PASS - password input (6210)

Function code/ show	Order	Key operation				Function description
		SET	SHT	INC	RST	
PSET	601	Save in item	shift	change value	exit	User parameter password
PSET	602	Save in item	shift	change value	exit	Factory parameter password
PSET	603	Save in item	shift	change value	exit	Total reset password

Ⅶ、 Troubleshooting

Table 7-1 Failure analysis comparison table

fault phenomenon	Failure analysis	Detection Method and Solution
There is flow through, but the instantaneous flow is zero	The internal parameters of the instrument are modified	Please check whether the parameters of the instrument are correct according to the verification certificate. If the parameters are wrong, please set the correct parameters
When there is no flow through, there is an instantaneous flow display	The pipe stop valve of the instrument is not completely closed	Check the valve
	Severe vibrations in the pipeline	Anti-vibration measures are recommended
	The meter is not well grounded	Please check ground
	There is strong electromagnetic field interference on site, and it is too close to high-power equipment such as inverters, motors, solenoid valves, etc.	By judging whether the instantaneous flow value is the value of electromagnetic interference (Q=3600f/k, f=50Hz, k=the coefficient of the meter), it can be judged whether the meter is affected by the power frequency interference. If it exists, it is recommended to change the installation location.
The meter measures normally, but the measured value is inaccurate	Temperature and pressure acquisition error (temperature and pressure compensation type)	The detection instrument shows whether the temperature and pressure are consistent with the medium in the pipeline. If it is different, the temperature and pressure sensors are damaged.
	There is a problem with the internal parameters of the instrument	Please check whether the parameters are correct according to the verification certificate, if wrong, please set the correct parameters
	Instrument movement damaged	
Normal measurement, on-site LCD display is normal, current output is incorrect	Meter wiring error	If there is no current output, check whether the wiring is wrong
	Instrument range parameter error	If there is current output, but the current value is incorrect, check whether the upper limit of transmission in the instrument parameters is the same as the upper limit of the range marked on the nameplate of the instrument

Appendix

Communication Protocol（RTU）

1. Data Format Description

1.1 Communication Mode

This instrument adopts MODBUS RTU format.

The protocol is used for data communication in master-slave query mode.

1.2 Data Format

The data format is n, 8, 1 (1 start bit, 8 data bits, no parity, 1 stop bit)

Four baud rates are available, 1200, 2400, 4800, 9600

start	address	Function	data	CRC	END
T1-T2-T3-T4	8 bit	8 bit	n*8 bit	16 bit	T1-T2-T3-T4

Among them: T1, T2, T3, T4 are the time intervals between each frame, and the transmission between two frames must be greater than the interval time.

1.3 Correspondence Address

The protocol stipulates that the address of the meter is "0-255", and the "0" address is used for broadcasting. This protocol does not support broadcasting, and other addresses are reserved.

2. Command Description

2.1 This instrument uses one command in the MODBUS protocol:

Command 03	Read single or multiple holding registers

2.2 Data Format

The data in the protocol includes: integer, floating point number

Integers are represented as 16-bit unsigned integers.

32 single-precision floating-point numbers SINGLE format is IEEE754, equivalent to 4 bytes, the order of arrangement is 3-4-1-2.

After conversion to 1234 order, the highest to lowest bits are the 31st, 30th, 29th, „„„ 0 bits respectively.

31	30-23	22-0
S	Exponent	Mantissa

31 bits are the sign bit (S), 1 means the number is negative, 0 vice versa;

30-23 digits, a total of 8 digits are the exponent;

22-0 bits, a total of 23 bits are the mantissa.

Command 3 has the following format (read register command):

MODBUS request：

instrument address	1 BYTE	01-255
function code	1 BYTE	03
initial address	2 BYTE	0-FFFF
number of reads	2 BYTE	1-20
CRC low bits	1 BYTE	
CRC high bits	1 BYTE	

MODBUS response：

instrument address	1 BYTE	01-255
function code	1 BYTE	03
byte count	1 BYTE	N
input state	N*2 BYTE	
CRC low bits	1 BYTE	
CRC high bits	1 BYTE	

Example description:

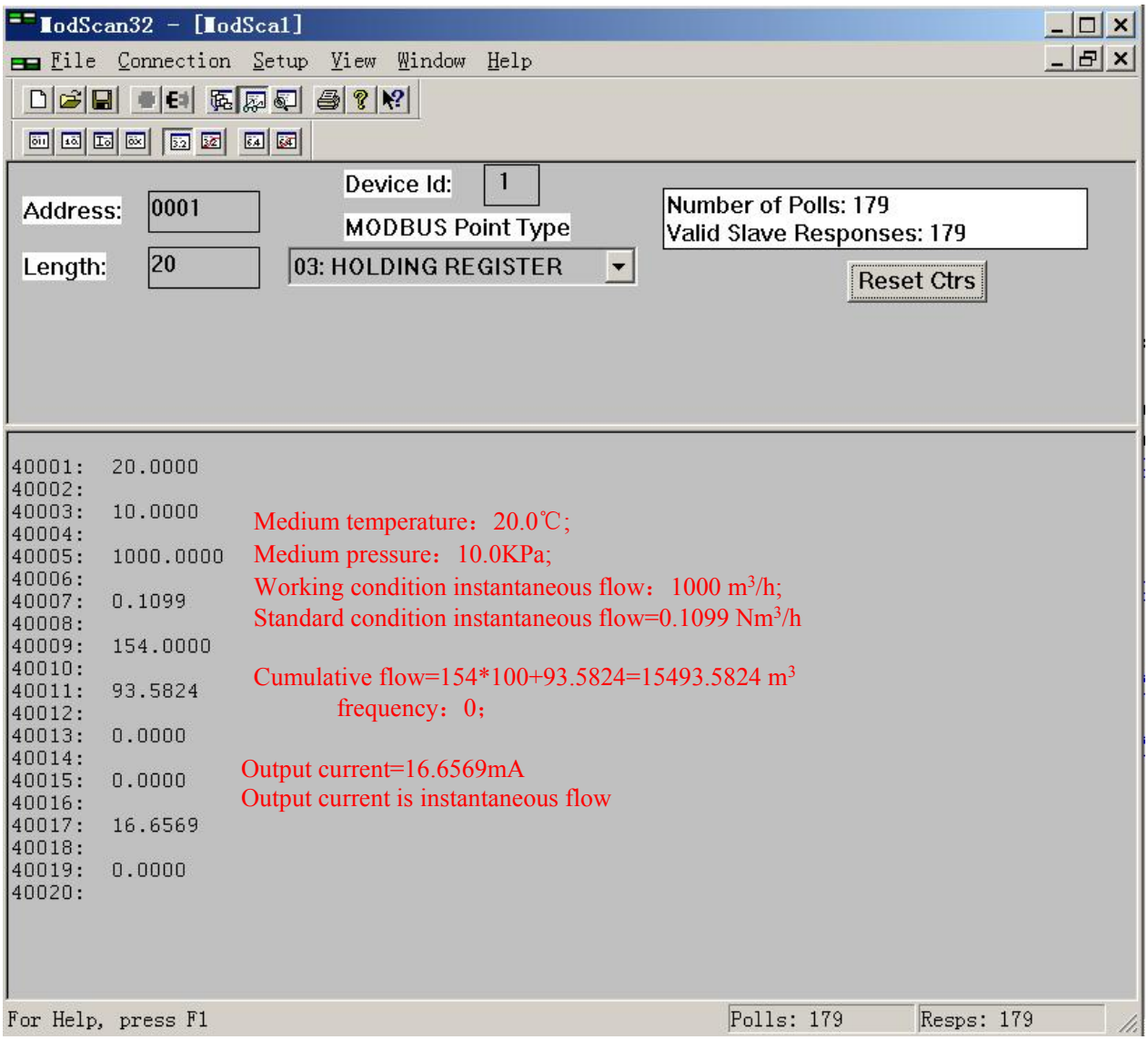
request		response	
domain name	data(HEX)	domain name	data（HEX）
meter address code	01	meter address code	01
function code	03	function code	03
start address high (byte)	00	byte count	08
start address low (byte)	00	high register（0001）	0C
read data high (byte)	00	low register（0001）	E8
read data low (byte)	04	high register（0002）	C2
		low register（0002）	FB
		high register（0003）	C9
		low register（0003）	26
		high register（0004）	C3
		low register（0004）	7B
CRC check	Check code	CRC check	check code

3．Data Item Definition

Attribute	Address	Register length	Data type	Illustrate
R	40001-2	2	SINGLE	temperature(℃)
R	40003-4	2	SINGLE	pressure（kPa）
R	40005-6	2	SINGLE	working condition instantaneous flow（m^3/h）
R	40007-8	2	SINGLE	standard condition instantaneous flow（Nm^3/h）
R	40009-10	2	SINGLE	hundreds of cumulative

				traffic
R	40011-12	2	SINGLE	below the hundred digit of cumulative flow
R	40013-14	2	SINGLE	flow sensor frequency (Hz)
R	40015-16	2	reserve	reserve
R	40017-18	2	SINGLE	4－20mA current output value (mA)
R	40019-20	2	backup	

4. MODSCAN32 Communication interface (03 command):



Temperature：20℃；

Pressure：10KPa；

Working condition instantaneous flow：1000 m^3/h;

Standard condition instantaneous flow per second：0.1099 Nm^3/h；

Hundreds of cumulative traffic：154 Nm^3

Below the hundred digit of cumulative flow：93.5824 Nm^3

Flow sensor frequency: 0Hz

4－20mA current output：16.6569 mA

Read register data (in this example, read out the data displayed by the current header)

Master request：

01	03	00 00	00 14	45 C5
address	function code	start	length	CRC

Slave Response Frame：01 03 28 6B 49 C0 37 88 00 45 E0 FC E0 42 C7 BF FB 45 F3 00 00 40 80 1B 11 42 86 FC 18 44 79 00 00 FF 00 00 00 41 B0 04 00 00 00 4D 43

01 03 28 : address, function code, byte number

6B 49 C0 37 ： -2.86℃； temperature

88 00 45 E0 ： 7185.00 Kpa； pressure

FC E0 42 C7 ： 99.9938 m^3/h； Working condition flow

BF FB 45 F3 ： 7799.9975 Nm^3/h； Standard flow

00 00 40 80 ： 4.0 Nm^3， Cumulative flow hundreds；

1B 11 42 86 ： 67.0528 Nm^3， cumulative traffic below 100 digits； cumulative flow=4.0*100+67.0528=467.0528 Nm^3

FC 18 44 79 ： 999.983Hz， frequency

00 00 FF 00 ： Reserve

00 00 41 B0 ： 22.00 mA current output

04 00 00 00 ： reserve

4D 43 ： CRC check