Turbine flowmeter

Supmea

Headquarters

5th floor,Building 4,Singapore Hangzhou Science Technology Park,No. 6 street,
Hangzhou Economic Development Area,Hangzhou 310018,China

Singapore

2 Venture Drive #11-30 Vision Exchange Singapore

info@supmea.com
www.supmea.com
Supmea Automation Co.,Ltd.

Preface

Thank you for purchasing liquid turbine flow meter. Please read this manual carefully before operating and using it correctly to avoid unnecessary losses caused by false operation.

Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate, if you find something wrong or incorrect, please contact us.
- This product is forbidden to use on explosion-proof occasions.

Version

U-SUP-LWGY-B-EN2

Confirm the contents of the package

After opening the packaging box, please confirm the contents of the packaging before starting the operation. If you find any errors in the model and quantity or physical damage to the appearance, please contact our company.

Product List

Product packaging content

Number	Item	Quantity	Remarks
1	Flow meter/flow sensor	1	
2	Instructions	1	
3	Certificate	1	

Precautions

Users are expected to keep the "Product Qualification Certificate" properly and do not lose it.

Contents

Chapter I Product Overview 1
1.1 Product Introduction 1
1.2 Working Principle 2
1.3 Technical Parameters 3
Chapter II Structure and Installation 4
2.1 Structure 4
2.2 Basic Parameters and Installation Dimensions 6
2.3 Installation 8
Chapter III Converter Wiring Instructions and Debugging 12
3.1 Type Converter Wiring Instructions 12
3.2 N2 Converter Wiring Instructions 12
3.3 Wiring Instructions for A-Type Converter 12
3.4 Wiring Instructions for G-Type Converter 13
3.5 Wiring Instructions for E-Type Converter 19
3.6 Debugging 25
Chapter IV Maintenance and Overhaul 33
4.1 Precautions for Use 33
4.2 Possible Faults and Elimination Methods of Flow Meters 34
Chapter V Warranty and After-Sales Service 36
Chapter VI Communication Protocol 37
6.1 Description of G-Type RS485 Communication Protocol 37
6.2 Description of E-Type RS485 Communication Protocol 39

Chapter I Product Overview

1.1 Product Introduction

The liquid turbine flow meter is connected to a flow sensor and converter to achieve various functions such as pulse output, current output, and on-site display. Flow meters have the characteristics of high accuracy, wide measurement range, long service life, and simple operation and maintenance. They can be widely used in industries such as food, medicine, petrochemicals, metallurgy, and paper-making, and are ideal instruments for flow measurement.

Flow meters are suitable for liquids that do not corrode stainless steel 304, 2Cr13, corundum (Al_2O_3), hard alloys, etc., and have no impurities such as fibers or particles.

If the user requires a special type of flow meter, it can be supplied through an agreement.

1.2 Working Principle

When the measured liquid flows through the flow meter sensor, its internal impeller rotates with the help of liquid kinetic energy. At this time, the impeller blades cause periodic changes in the magnetic resistance in the detection device. Therefore, an electrical pulse signal proportional to the flow rate is induced at both ends of the detection coil, amplified by the preamplifier, and sent to the display unit. The micro-controller system in the display unit performs calculations based on the measured number of pulses and the instrument coefficient K of this flow meter, and displays the instantaneous flow rate and cumulative total amount.

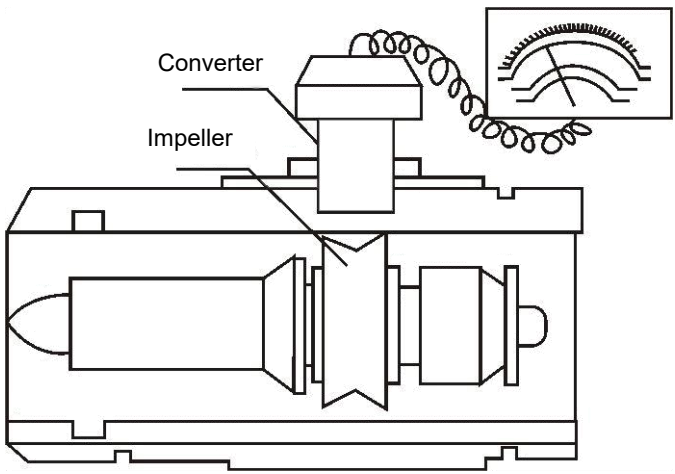


Fig. 1

The relationship between instrument coefficient and instantaneous flow rate, frequency, pulse number, and cumulative total is：

K=f/Q and K=N/V

In the formula：

f—Flow signal frequency（Hz）

Q—Instantaneous flow rate（m3/s, or /L/s）

N—Number of pulseV—Total volume（m3）

K—Instrument coefficient（1/m3 or 1/L）

1.3 Technical Parameters

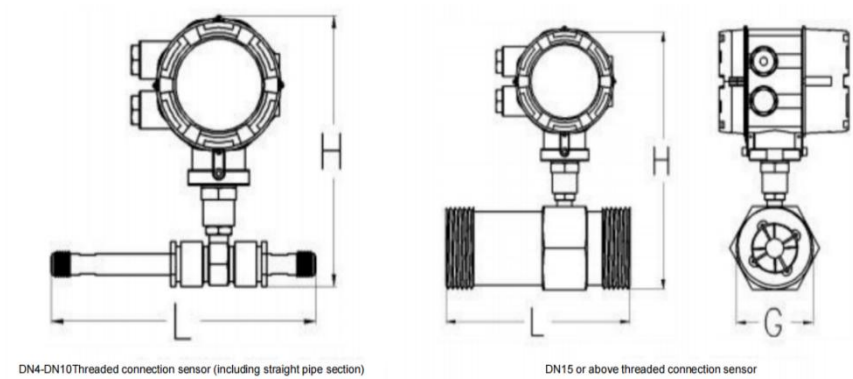
Table 1

Model	Parameters
Measurement Medium	Liquids (such as water, liquefied petroleum gas, refined oil, light crude oil, organic liquids, inorganic liquids, etc.) without fiber or particle impurities
Nominal Diameter	DN4 - DN200mm
Measurement Accuracy	Level 0.5, Level 1.0
Viscosity	Less than 5 × 10-6m2/s (for liquids greater than 5 × 10-6m2/s, the flow meter must be calibrated for real liquid before use)
Medium Temperature	-20℃~+120℃ (Stainless steel measuring tube)
Environmental Conditions for Use	Ambient Temperature：-20℃~+60℃ Relative Humidity：5%～90%
Atmospheric Pressure	86kPa～106kPa
Power Supply	3.6V lithium battery、24VDC 、220VAC
Output Signal	Pulse output, 4-20mA output, Modbus communication, Hart
Protection Grade	IP65 (IP67, IP68 protocol supply, pulse converter probe IP00)

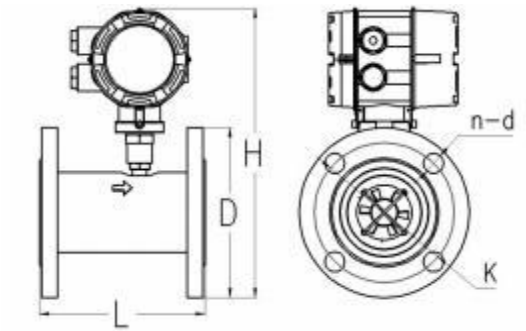
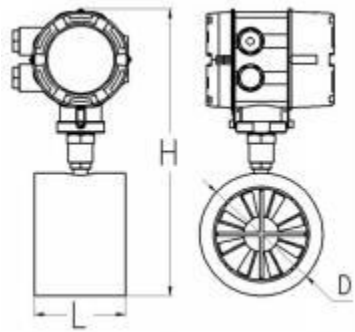
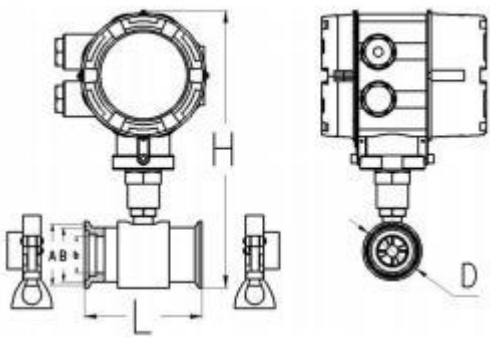
Chapter II Structure and Installation

2.1 Structure

Table 2

<table>
<tr><td colspan="5">Liquid Turbine Flowmeter</td></tr>
<tr><td rowspan="2">Schematic image</td><td>N1(Pulse Converter Probe)</td><td>  </td><td>G (Intelligent Instrument)</td><td>  </td></tr>
<tr><td>N2/A(No display with pulse/current meter)</td><td>  </td><td>E(Isolation intelligent instrument)</td><td>  </td></tr>
<tr><td colspan="5">Schematic diagram of connection method</td></tr>
<tr><td colspan="5">Threaded type</td></tr>
<tr><td colspan="5"> 

DN4-DN10Threaded connection sensor (including straight pipe section)
DN15 or above threaded connection sensor</td></tr>
</table>

Flange type

Clamp on Type

Clamp Type


2.2 Basic Parameters and Installation Dimensions

2.2.1 Threaded Connection Parameters

Table 3

Nominal diameter (mm)	Voltage Resistance Level （MPa）	L (mm)	H（mm）				G (External thread)
			N1	N2/A	G	E	
4	6.3	225	145	145	190	210	G1/2
6	6.3	225	145	145	190	210	G1/2
10	6.3	345	150	150	190	210	G1/2
15	6.3	75	150	150	195	215	G1
20	6.3	85	155	155	200	220	G1
25	6.3	100	160	160	205	225	G1 1/4
32	6.3	140	180	180	225	245	G2
40	6.3	140	185	185	230	250	G2
50	6.3	150	190	190	235	255	G2 1/2

2.2.2 Flange Connection Parameters

Table 4

Nominal diameter (mm)	Voltage Resistance Level (MPa)	L (mm)	D (mm)	K (mm)	H（mm）				d (mm)	N (Number of Holes)
					N1	N2/A	G	E		
15	1.6	75	95	65	175	180	225	245	14	4
20	1.6	85	105	75	185	190	235	255	14	4
25	1.6	100	115	85	200	195	240	260	14	4
32	1.6	140	140	100	210	215	260	280	18	4
40	1.6	140	150	110	195	220	265	285	18	4
50	1.6	150	165	125	230	235	280	300	18	4
65	1.6	170	185	145	255	260	305	325	18	8
80	1.6	200	200	160	260	265	310	330	18	8
100	1.6	220	220	180	285	285	330	350	18	8

Nominal diameter (mm)	Voltage Resistance Level (MPa)	L (mm)	D (mm)	K (mm)	H（mm）				d (mm)	N (Number of Holes)
					N1	N2/A	G	E		
125	1.6	250	250	210	310	315	360	380	18	8
150	1.6	300	285	240	345	345	390	410	22	8
200	1.6	350	340	295	395	400	445	465	22	12

2.2.3 Clamping Connection Parameters

Table 5

Instrument Caliber （mm）	L （mm）	D （mm）	H （mm）			
			N2	A	G	E
15	55	53	X		275	225
20	60	53			280	230
25	60	58			285	235
32	70	66			290	240
40	70	72			300	250
50	70	92			315	265
65	80	100	210	210	255	275
80	90	112	225	225	270	290
100	100	137	250	250	295	315
125	120	165	275	275	320	340
150	150	190	300	300	345	365
200	150	242	350	350	395	415

2.2.4 Clamp Connection Parameters

Table 6

Instrument Caliber (mm)	Voltage Resistance Level （MPa）	L (mm)	D (mm)	A (mm)	B (mm)	b (mm)	H （mm）			
							N2	A	G	E
4	1.0	50	50.5	46	40.5	4	150	150	195	215
6	1.0					6	150	150	195	215
10	1.0					10	150	150	195	215
15	1.0	100				15	160	160	205	225
20	1.0					20	160	160	205	225
25	1.0					25	165	165	210	230
32	1.0	120				32	165	165	210	230
40	1.0	140	64	59.5	53.5	40	180	180	225	245
50	1.0	150	77.5	73.5	68	50	190	190	235	255
65	1.0	170	91	86.5	80.5	65	205	205	250	270
80	1.0	200	106	101.5	94	80	220	220	265	285
100	1.0	220	130	124	118	100	240	240	285	305

2.3 Installation

2.3.1 Installation Location

The pipeline must be completely filled with liquid. It is important to keep the pipeline completely filled with liquid at all times, otherwise the flow display may be affected and measurement errors may occur.

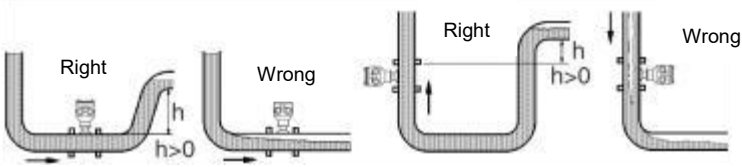


Fig. 2

Avoid bubbles. If bubbles enter the measuring tube, the flow display may be affected, which may lead to measurement errors.

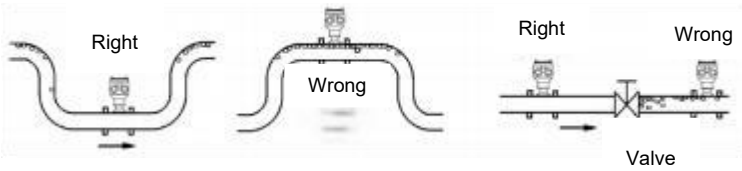


Fig. 3

2.3.2 Installation Site and Requirements

（1）The sensor should be installed in a location that is easy to maintain, with no vibration, strong electromagnetic interference, or thermal radiation in the pipeline.

（2）Horizontal installation of sensors requires that the pipeline should not have any visible tilt (generally within 5 °), and vertical installation of sensors should also have a verticality deviation of less than 5°. In places where the flow cannot be stopped, a bypass pipe and a reliable shut-off valve (see Figure 4) should be installed, and the measurement should ensure that the bypass pipe is leak free.

（3）At the location where the sensor is installed in the newly laid pipeline, a short pipe is first connected to replace the sensor. After the "line sweeping" work is completed and the pipeline is confirmed to be clean, the sensor can be officially connected.

（4）If the fluid contains impurities, a filter should be installed on the upstream side of the sensor, and the pipeline should be regularly cleaned to discharge sediment impurities; If the measured liquid contains gas, a gas eliminator should be installed on the upstream side of the sensor.The discharge and exhaust ports of filters and air purifiers should be connected to a safe location.

（5）When installing sensors outdoors, measures should be taken to avoid direct sunlight and rain.

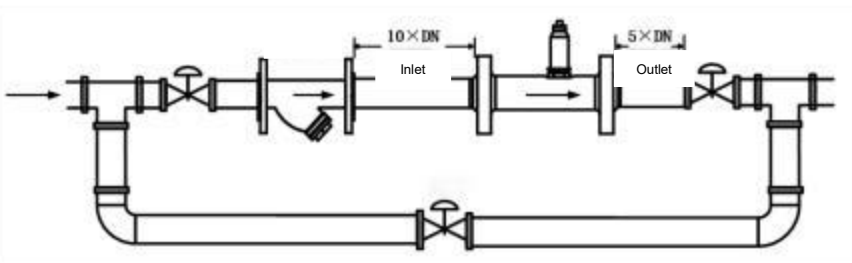
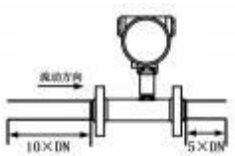
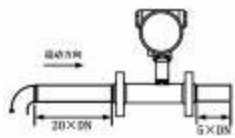
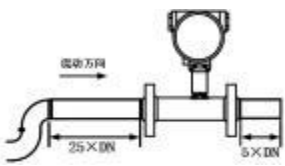
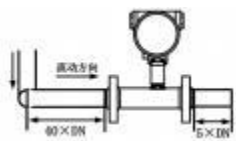
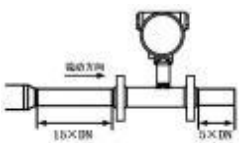
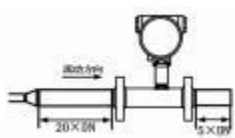


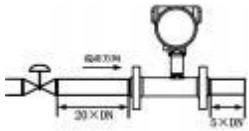
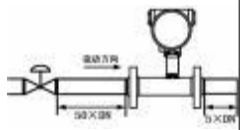
Fig. 4

2.3.3 Required Length of Upstream and Downstream Straight Pipe Sections

Turbine flow meter is sensitive to the distortion of flow velocity distribution and rotational flow in the pipeline. When entering the sensor, turbulence should be fully developed. Therefore, necessary straight pipe sections or rectifiers should be equipped according to the type of upstream flow resistance components of the sensor. The length of the straight pipe sections in the inlet and outlet sections is required, as shown in the table.

Table 7

Type of Inlet Obstruction Component	Installation Condition		Type of Inlet Obstruction Component	Installation Condition	
	Inlet Section	Exit Section		Inlet section	Exit section
General situation			90 degree bend		
Two 90 degree bent feet on the same plane			Two 90 degree bent feet on different planes		
Contracted pipe			Expander		

Type of Inlet Obstruction Component	Installation Condition		Type of Inlet Obstruction Component	Installation Condition	
	Inlet Section	Exit Section		Inlet section	Exit section
Fully open the valve			Half open valve		

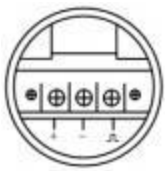
Chapter III Converter Wiring Instructions and Debugging

3.1 Type Converter Wiring Instructions

Table 8

Wire Color	Symbol Name	Wiring Content
Red	24V+	Power Supply：24 V+
Black	Power Supply	GND
Blue	**Pulse**	**Output Signal**

3.2 N2 Converter Wiring Instructions



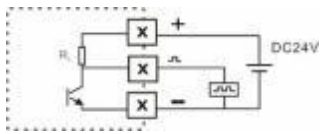


Fig. 5

3.3 Wiring Instructions for A-Type Converter

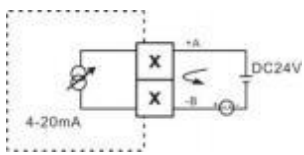


Fig. 6

3.4 Wiring Instructions for G-Type Converter

Table 9

Power Supply Mode	Display	Output Mode							
		Pulse	Equivalent Pulse	Current					RS485
				Two-Wire 4-20 mA	Three-Wire 4-20 mA	Three-Wire 0-20 mA	Four-Wire 4-20 mA	Four-Wire 0-20 mA	
Battery	●								
DC24V	●	●	●	●	●	○			●
Battery +DC24V	●	●	●	●	●	○			●
DC24V	●	●	●				●	○	●
	Symbol Description：●standard configuration ○Optional								

3.4.1 DC24V Power Supply Wiring Instructions

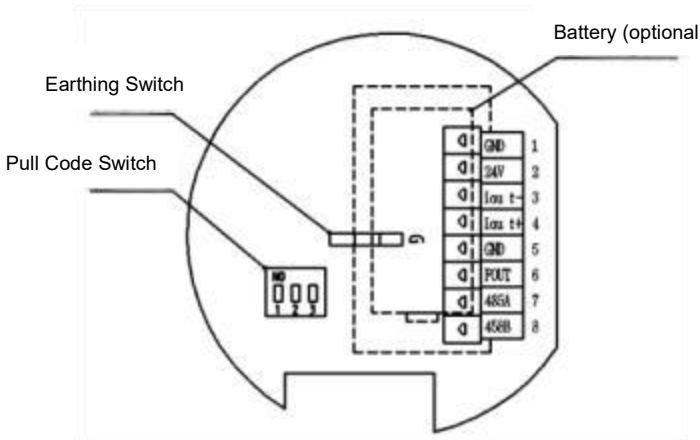


Fig. 7

（1）Terminal Description

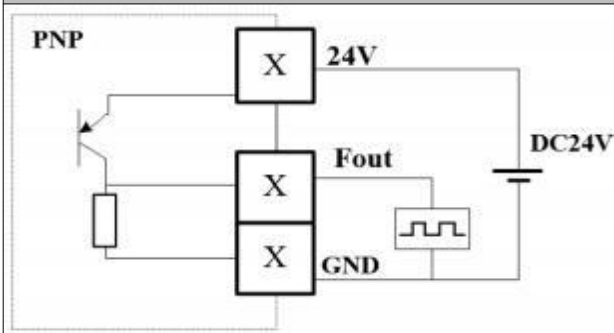
Table 10

Terminal Number	Terminal Identification	Terminal Description	Remarks
1	GND	24V external power supply negative pole	
2	DC24	24V external power supply positive pole	
3	Iout-	Current output terminal	Two/three wire 4-20mA output and three wire 0-20mA function, refer to Table 11 when using
4	Iout+	Current output terminal	
5	GND	24V external power supply negative pole	
6	FOUT	Pulse output terminal	Pulse or equivalent pulse output, depending on the status of the dip switch, see section 3.4.2 (3) dip switch instructions for details
7	485A	RS485 communication A-end	
8	485B	RS485 communication B-end	

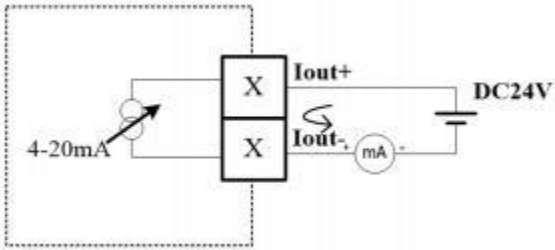
（2）DC24V wiring instructions

Table 11

DC24V Wiring Diagram

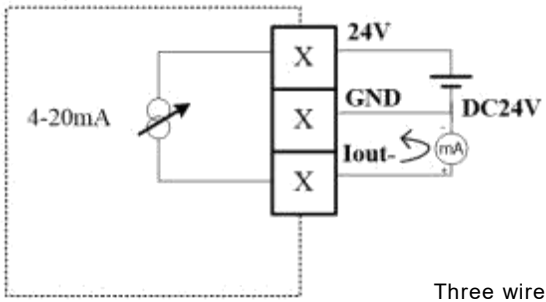


Pulse/Equivalent Pulse Output



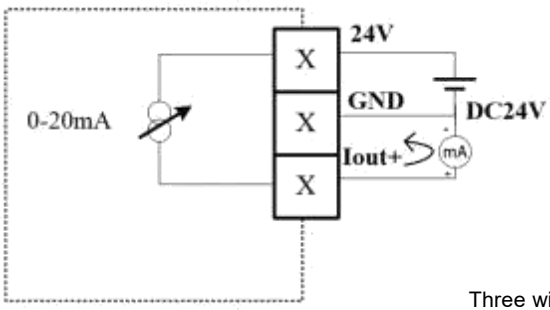
Two wire 4-20mA current output

Note: Current load resistance ≤ 500 Ω



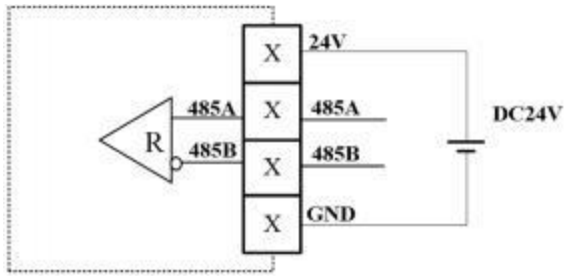
Three wire system 4-20mA current output

Note: Current load resistance ≤ 500 Ω



Three wire system 0-20mA current output

Note: Current load resistance ≤ 500 Ω



RS485 communication output

Note: The communication protocol format is MODBUS-RTU protocol

3.4.2 AC220V Power Supply Wiring Instructions

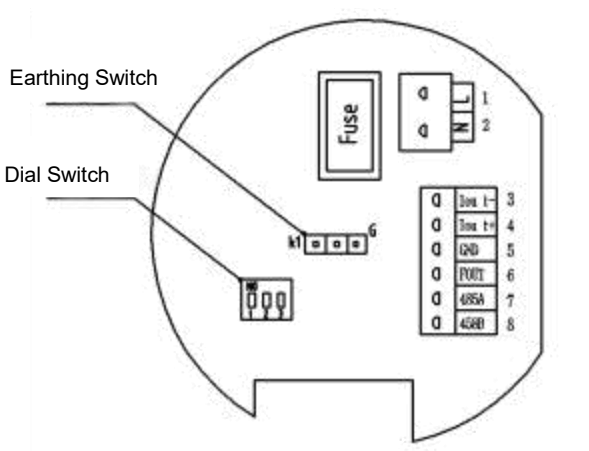


Fig. 8

（1）Terminal Description

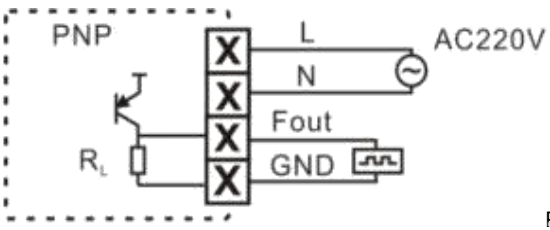
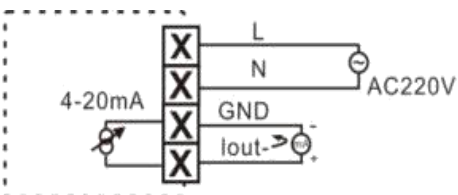
Table 12

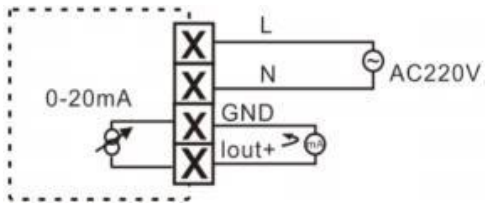
Terminal Number	Terminal Identification	Terminal Description	Remarks
1	L	AC220V External power supply	
2	N	AC220V External power supply	
3	Iout-	Current output terminal	Four wire 4-20mA output and four wire system

Terminal Number	Terminal Identification	Terminal Description	Remarks
4	Iout+	Current output terminal	Create 0-20mA function, refer to Table 13 for usage
5	GND	Current/pulse output ground terminal	
6	FOUT	Pulse output terminal	Pulse or equivalent pulse output, depending on the status of the dip switch, see section 3.4.2 (3) dip switch instructions for details
7	485A	RS485 communication A-end	
8	485B	RS485 communication B-end	

（2）AC220V Wiring Instructions

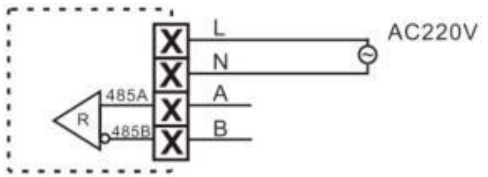
Table 13

AC220V Wiring Diagram
 Pulse/Equivalent Pulse Output Note: High level amplitude>22V, low level amplitude<0.8V, pulse frequency ≤ 3000Hz
 Four wire system 4-20mA current output Note: Current load resistance ≤ 500 Ω



Four wire system 0-20mA current output

Note: Current load resistance ≤ 500 Ω



RS485 communication output

Note: The communication protocol format is MODBUS-RTU protocol

（3）Instructions for Dip Switch

“1-ON; 2-OFF; 3-OFF”: Pulse output (corresponding to function code F-7 screen parameters, see debugging instructions in the table for details);

“1-OFF; 2-ON; 3-OFF”：Equivalent pulse output；

“1-OFF; 2-OFF; 3-ON”：Reserve；

Dialing corresponds to the frequency output interface FOUT.

3.5 Wiring Instructions for E-Type Converter

Table 14

Power Supply Mode	Display	Output Mode						
		Pulse	Equivalent Pulse	Current			RS485	Hart
				Two-Wire 4-20mA	Three-Wire 4-20mA	Three-Wire 0-20mA		
Battery	●							
DC24V	●	●	●	●	●		●	
Battery +DC24V	●	●	●	●	●		●	
DC24V	●	●	●			●	●	
Battery +DC24V	●	●	●			●	●	
DC24V	●			●				●

3.5.1 Wiring Instructions for DC24V Power Supply

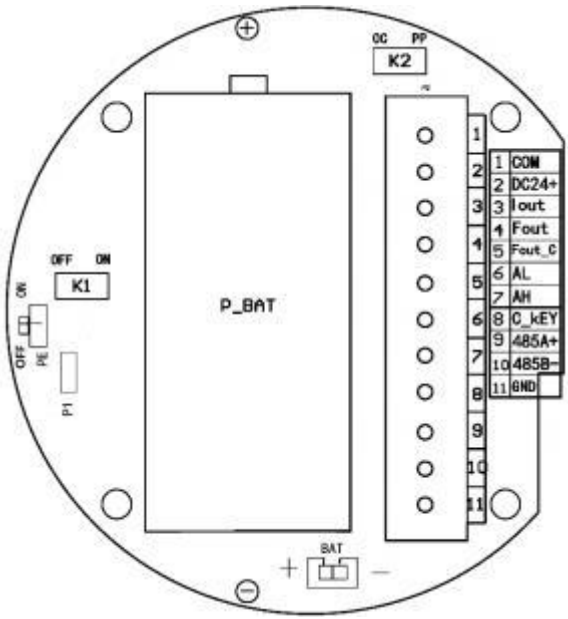


Fig. 9

（1）Terminal Description

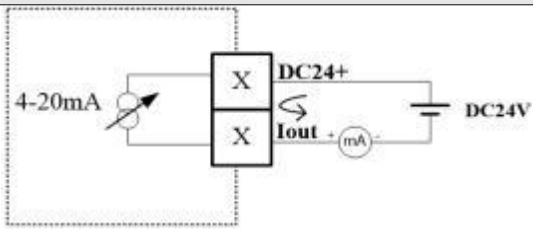
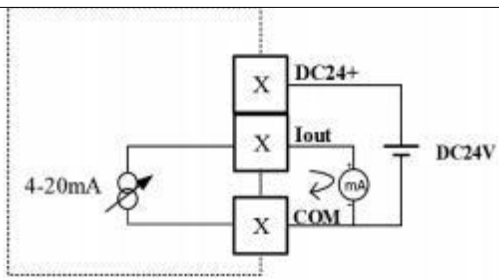
Table 15

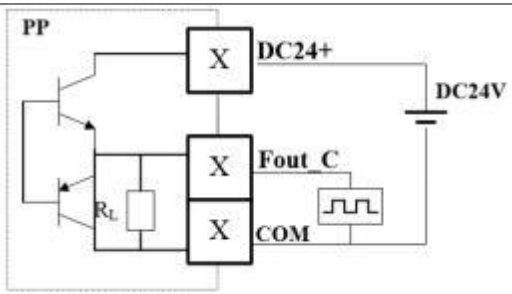
Terminal Number	Terminal Identification	Terminal Description	Remarks
1	COM	24V Negative pole of power supply	
2	DC24+	24V Positive pole of power supply	Loop power supply positive pole
3	Iout	Current output terminal	Loop power supply negative pole
4	Fout	Calibrate pulse output	Only for use during calibration
5	Fout_C	Pulse or equivalent pulse output	Parameter function code P7 screen selection output mode
6	AL	Lower limit alarm identifier	
7	AH	Upper limit alarm identifier	
8	C_KEY	External button wiring	Used in conjunction with GND

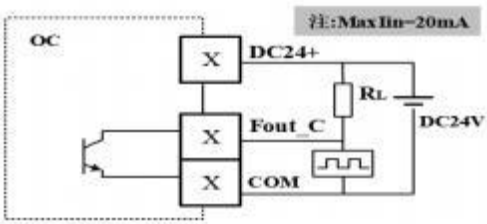
Terminal Number	Terminal Identification	Terminal Description	Remarks
		positive terminal	
9	485_A	RS-485 communication A end	
10	485_B	RS-485 communication B-end	
11	GND	External button wiring negative terminal	Used in conjunction with C_KEY

（2）DC24V Power Supply Wiring Instructions

Table 16

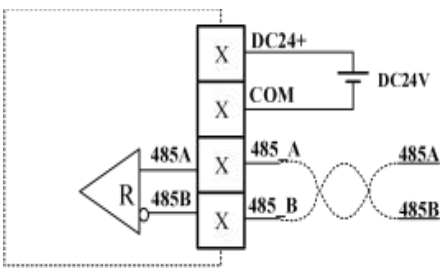
DC24V Wiring Diagram
 Two wire 4-20mA current output Note: Current load resistance ≤ 500 Ω
 Three wire 4-20mA current output Note: Current load resistance ≤ 500 Ω





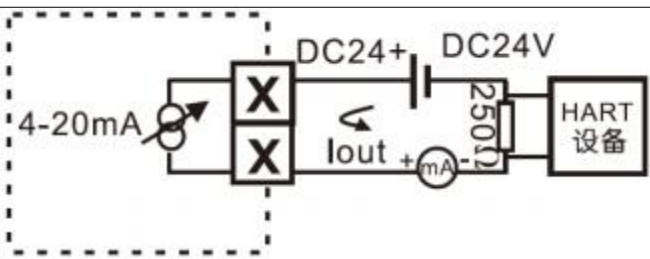
Three wire pulse output

Note: High level amplitude>22V, low level amplitude<0.8V, pulse frequency ≤ 3000Hz



RS485 communication output

Note: The communication protocol format is MODBUS-RTU protocol



HART communication output

（3）Pulse Output Description

- . As shown in Table 10, the "pulse output mode selection switch" corresponds to the output terminal Fout_C, and the output mode can be selected from push-pull PP output or OC output mode through K2. The corresponding operation is shown in Table 3-10. The pulse output mode is set according to the parameters of the P-7 screen.

Table 17

Position Number	Switch Symbol	Switch Description
K2	PP	Push-pull(I≦20mA)
	OC	OC Output(I≦20mA/V≦24V)

- The output terminal Fout is a calibration frequency output interface, which fixes the output original frequency.

Table 18

Position Number	Switch Symbol	Switch Description
K1	ON	Turn on battery power supply
	OFF	Turn off battery power supply

3.5.2 Battery Power Supply Wiring Instructions

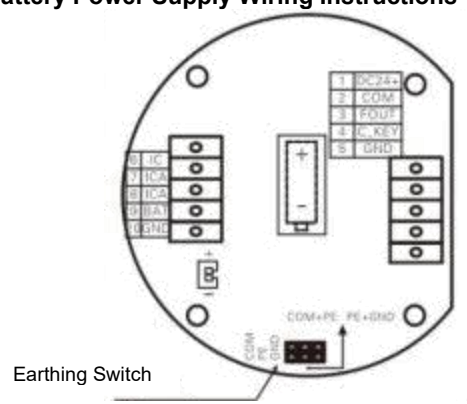


Fig. 10

（1）Terminal Description

Table 19

Terminal Number	Terminal Identification	Terminal Description	Remarks
1	DC24+	24V Positive pole of power supply	Only for use during calibration
2	COM	24V Negative pole of power supply	
3	FOUT	Calibrate pulse output	
4	C_KEY	External button wiring positive terminal	Connect external buttons, short press to display software version number and communication parameters, long press (5 seconds or more) to reset accumulated quantity to zero
5	GND	External button wiring negative terminal	Used in conjunction with C_KEY
6	IC		Reserve
7	ICAL		Reserve
8	ICAH		Reserve
9	BAT		Reserve
10	GND	External button wiring negative terminal	Used in conjunction with C_KEY

3.6 Debugging

3.6.1 Debugging Instructions for G-Type Converter

1、Button Description

" **OK** " is the page down browsing key and the modification confirmation storage key;

" → **"** is the shift key;

" ↑ **"** is the add key and page up; '

" Esc " is the exit key (without saving changes).

2、Password Interface Description

Fig. 11

Enter the password on the password interface and change the instrument parameter password to 1234; Accumulated traffic reset password 5555.

3、Menu Description

Table 20

Function Code	Parameter Significance	Specific setting Instructions
F-1	Unit selection settings	0: Set the instantaneous flow unit to m^3/h and the cumulative flow unit to m^3
		1: Set the instantaneous flow unit to L/h and the cumulative flow unit to L
		2: Set the instantaneous flow unit to L/min and the cumulative flow unit to L
		3: Set the instantaneous flow rate unit to US Gal/min and the cumulative flow rate unit to US Gal
		4: Set the instantaneous flow unit to UK Gal/min and the cumulative flow unit to UK Gal

Function Code	Parameter Significance	Specific setting Instructions
		5: Set the instantaneous flow unit to US Gal/h and the cumulative flow unit to US Gal
		6: Set the instantaneous flow unit to UK Gal/h and the cumulative flow unit to UK Gal
		7: Set the instantaneous flow unit to kg/h and the cumulative flow unit to kg
		8: Set the instantaneous flow unit to t/h and the cumulative flow unit to t
		9: Set the instantaneous flow unit to ft^3/h and the cumulative flow unit to ft^3
F-2	Damping time setting	0-99: Set the damping time to 0-99 seconds
F-3	Traffic transmission upper limit	Set the maximum display flow rate, which is the saturation value, corresponding to the flow rate value of 20mA, with the same unit as the F-1 screen
F-4	Minimum flow cutoff function setting	Set the minimum display flow rate (i.e. when the instantaneous flow measurement is less than this value, the instrument reading is 0), in the same unit as the F-1 screen
F-5	Upper limit setting of instrument input frequency	When the frequency value exceeds the upper limit, it is equal to the upper limit frequency value, with an accuracy of 0.1Hz
F-6	Medium density setting	When the unit is set as a mass unit, the density of the liquid to be tested needs to be set, and the density ρ unit is g/cm ³
F-7	Pulse output mode setting	1: Output original pulse 2: output correction pulse
F-8	Equivalent pulse setting (note: the unit of equivalent pulse is consistent with the cumulative unit of P-1 screen)	0.001: Output one pulse per 0.001 unit volume
		0.01: Output one pulse per 0.01 unit volume
		0.1: Output one pulse per 0.1 unit volume
		1: Output one pulse per unit volume
		10: Output one pulse per 10 units of volume
		100: Output one pulse per 100 units of volume
		1000: Output one pulse per 1000 units of volume

Function Code	Parameter Significance	Specific setting Instructions	
F-9	Equivalent pulse width setting	The equivalent pulse width should be set to multiples of all 5 within the range of 0005-2000, in milliseconds.	
F-10	Mail address	RS485	Communication address
F-11	Baud rate setting	RS485	Baud rate settings: 1200, 2400, 4800, 9600, 19200
			Verification method setting: n (no verification); O (Odd Check); E (even check)
			Data length: 7, 8
			Stop bit length: 1, 2
F-12	Accumulated quantity setting	View the current cumulative amount (without real-time refresh), which can be modified to any value	
P1	Set the first point of instrument coefficient compensation	The first line displays the correction frequency of the first point, with no decimal F1	
		The second line displays the coefficient error of the first point, accurate to six decimal places K1	
P2	Set the second point of instrument coefficient compensation	The first line displays the correction frequency of the second point, with no decimal F_2	
		The second line displays the coefficient error of the second point, accurate to four decimal places K_2	
P3	Set the third point of instrument coefficient compensation	The first line displays the third point correction frequency without decimal F_1	
		The second line displays the coefficient error of the third point, accurate to four decimal places K_3	
P4	Set the fourth point of instrument coefficient compensation	The first line displays the fourth point correction frequency without decimal F_3	
		The second line displays the coefficient error of the fourth point, rounded to four decimal places K_4	
P5	Set the fifth point of instrument coefficient compensation	The first line displays the fifth point correction frequency, with no decimal F_5	
		The second line displays the coefficient error of the fifth point, accurate to four decimal places K_6	
P6	Set the sixth point of instrument coefficient compensation	The first line displays the sixth point correction frequency, with no decimal F_7	
		The second line displays the coefficient error of the sixth point, accurate to four decimal places K_8	
P7	Set the seventh point of instrument	The first line displays the seventh point correction frequency, without decimal F_9	

Function Code	Parameter Significance	Specific setting Instructions
	coefficient compensation	The second line displays the coefficient error of the seventh point, accurate to four decimal places K_9
P8	Set the eighth point of instrument coefficient compensation	The first line displays the eighth point correction frequency without decimal F_{10}
		The second line displays the coefficient error of the eighth point, accurate to four decimal places K_{10}
P9	Set instrument coefficient compensation point 9	The first line displays the corrected frequency, which cannot be modified
		The second line displays the instrument coefficient, unit: times/L, K

3.6.2 Debugging Instructions for E-Type Converter

1. Button Description：

"OK" Page down browsing key、Modify the confirmation storage key；

"→" Shift key；

"↑" Add key and page up；

"Esc" Escape key (Do not save modified content).

2. Password Interface Description：

Modify the parameters of instrument P1-P14 with "1234", modify the parameters of instrument P16-P26 with "1010", reset the accumulated flow to zero with "5555", and modify the parameters of instrument P15 screen with "9999". When the password is entered incorrectly, the P1-P26 screen parameters can be viewed, but the parameters cannot be modified.

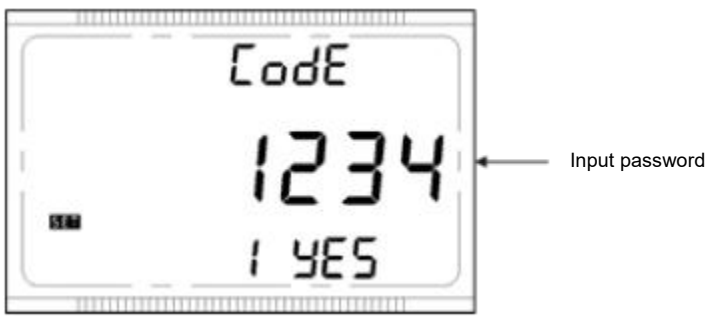


Fig. 12

3. Menu Description

Table 21

Function Code	Parameter Significance	Specific Setting Instructions
P--1	Unit selection settings	0: Set the instantaneous flow unit to m^3/h and the cumulative flow unit to m^3
		1: Set the instantaneous flow unit to L/h and the cumulative flow unit to L
		2: Set the instantaneous flow unit to L/min and the cumulative flow unit to L
		3: Set the instantaneous flow rate unit to US Gal/min and the cumulative flow rate unit to US Gal
		4: Set the instantaneous flow unit to UK Gal/min and the cumulative flow unit to UK Gal
		5: Set the instantaneous flow unit to US Gal/h and the cumulative flow unit to US Gal
		6: Set the instantaneous flow unit to UK Gal/h and the cumulative flow unit to UK Gal
		7: Set the instantaneous flow unit to kg/h and the cumulative flow unit to kg
		8: Set the instantaneous flow unit to t/h and the cumulative flow unit to t
		9: Set the instantaneous flow unit to ft^3/h and the cumulative flow unit to ft^3
		10: Set the instantaneous flow unit to US bPd and the cumulative unit to US bPd (note: this cumulative unit is not displayed on the main screen)
P--2	Damping time setting	0-99: Set the damping time to 0-99 seconds
P--3	Traffic transmission upper limit	Set the maximum display flow rate, which is the saturation value, corresponding to the flow rate value of 20mA, in the same unit as the P-1 screen
P--4	Minimum flow cutoff function setting	Set the minimum display flow rate (i.e. when the instantaneous flow measurement is less than this value, the instrument reading is 0), in the same unit as the P-1 screen
P--5	Upper limit setting of instrument input frequency	When the frequency value exceeds the upper limit, it is equal to the upper limit frequency value, with an accuracy of 0.1Hz
P--6	Medium density setting	When the unit is set as a mass unit, the density of the liquid to be tested needs to be set, and the density ρ unit is g/cm^3

Function Code	Parameter Significance	Specific Setting Instructions	
P--7	Pulse output mode setting	0: Turn off pulse output 1: Output correction pulse 2: Output equivalent pulse (corresponding to output terminal Fout_C)	
P--8	Equivalent pulse setting (note: the unit of equivalent pulse is consistent with the cumulative unit of P-1 screen)	0.001: Output one pulse per 0.001 unit volume	
		0.01: Output one pulse per 0.01 unit volume	
		0.1: Output one pulse per 0.1 unit volume	
		1: Output one pulse per unit volume	
		10: Output one pulse per 10 units of volume	
		100: Output one pulse per 100 units of volume	
		1000: Output one pulse per 1000 units of volume	
P--9	Equivalent pulse width setting*3	The equivalent pulse width should be set to 1-2000 in milliseconds	
P--10	Communication method selection setting	0: Select 485 communication 1: Select Hart communication	
P--11	Communication parameter selection and setting	RS485	Mailing address: 1-255
			Baud rate settings: 1200, 2400, 4800, 9600, 19200
			Verification method setting: n (no verification); O (Odd Check); E (even check)
			Data length: 7, 8
			Stop bit length: 1, 2
		Hart	Can set communication address
P--12	Alarm upper limit setting	Yes/No: Turn on/off this function	
		1% -100%: percentage setting relative to the upper limit of traffic	
P--13	Alarm lower limit setting	Same as' Alarm upper limit setting '	
P—14	Backlight Setting	0: Under any power supply mode, the backlight is always off	
		1: When powered by the battery, the backlight automatically lights up and only turns on when operated with a button. It will automatically turn off after 20 seconds without a button; When using a two -wire power supply, the backlight is always off;	

Function Code	Parameter Significance	Specific Setting Instructions
		Always on when powered by a three wire system
		2: When powered by the battery, the backlight remains on continuously; When using a two-wire power supply, the backlight is always off; Always on when powered by a three wire system.
P--15	Accumulated quantity setting	After entering the corresponding password correctly, the accumulated amount can be modified
P--16 F--1	Set the first point of instrument coefficient compensation	The first line displays the correction frequency of the first point, with no decimal F_1
		The second line displays the coefficient error of the first point, accurate to four decimal places K_1
P--17 F--2	Set the second point of instrument coefficient compensation	The first line displays the correction frequency of the second point, with no decimal F_2
		The second line displays the coefficient error of the second point, accurate to four decimal places K_2
P--18 F--3	Set the third point of instrument coefficient compensation	The first line displays the third point correction frequency without decimal F_1
		The second line displays the coefficient error of the third point, accurate to four decimal places K_3
P--19 F--4	Set the fourth point of instrument coefficient compensation	The first line displays the fourth point correction frequency without decimal F_3
		The second line displays the coefficient error of the fourth point, rounded to four decimal places K_4
P--20 F--5	Set the fifth point of instrument coefficient compensation	The first line displays the fifth point correction frequency, with no decimal F_5
		The second line displays the coefficient error of the fifth point, accurate to four decimal places K_6
P--21 F--6	Set the sixth point of instrument coefficient compensation	The first line displays the sixth point correction frequency, with no decimal F_7
		The second line displays the coefficient error of the sixth point, accurate to four decimal places K_8
P--22 F--7	Set the seventh point of instrument coefficient compensation	The first line displays the seventh point correction frequency, without decimal F_9
		The second line displays the coefficient error of the seventh point, accurate to four decimal places K_9
P--23 F--8	Set the eighth point of instrument coefficient compensation	The first line displays the eighth point correction frequency without decimal F_{10}
		The second line displays the coefficient error of the eighth point, accurate to four decimal places K_{10}
P--24 F	Set instrument coefficient * 4	The first line displays the corrected frequency, which cannot be modified

Function Code	Parameter Significance	Specific Setting Instructions
		The second line displays the instrument coefficient, with the unit shown in the P-26 screen parameters
P--25	Parameter setting screen	This setting screen is reserved
P--26	Unit selection for compensation coefficient	0-P/L；1-P/m^3

4. Quick Key Operation Instructions

Backlight control shortcut key“ ”：When the backlight is in on mode, press and hold for 5 seconds to turn off the backlight; When the backlight is in off mode, press and hold for 5 seconds to turn on the backlight.

5. ERR Error Explanation

Table 22

Symbol Display	Display Meaning	Processing Method
Err0	Data storage error	Replace the circuit board
Err1	Low Battery	Replacing the battery
Err2	Low battery level and data storage error	After replacing the battery, turn on the machine and check. If there is another error, replace the circuit board

Chapter IV Maintenance and Overhaul

4.1 Precautions for Use

(1) When using, the tested liquid should be kept clean and free of impurities such as fibers and particles.

(2) At the beginning of each use of the flow meter, the inlet valve should be slowly opened to fill the pipeline with liquid, and then the downstream outlet valve should be slowly opened. It is strictly prohibited for the sensor to be impacted by high-speed fluid when it is in a liquid free state. Otherwise, the sensor may be damaged!

(3) It is recommended that the maintenance cycle of the flow meter should not exceed six months. During maintenance, clean the impeller and internal parts of the sensor, and be careful not to damage them. Pay attention to the correct position of each component during assembly.

(4) When the flow meter is not in use, the liquid inside the sensor should be cleaned, and protective covers should be added at both ends of the sensor to prevent dust and dirt from entering, and stored in a dry place.

(5) The configured filter should be cleaned and replaced regularly. When not in use, the internal liquid should be cleaned, covered with a dust cover, and stored in a dry place.

(6) The transmission cable of the flow meter can be laid overhead or buried underground (iron pipes should be installed when buried).

4.2 Possible Faults and Elimination Methods of Flow Meters

The general faults and elimination methods that may occur with flow meters are shown in the table below, and the maintenance cycle should not exceed six months.

Table 23

Fault Phenomenon	Fault Analysis	Solutions
There is flow passing through, and the instantaneous flow of the instrument is zero	1. Wiring error.	Check the instrument wiring.
	2. The internal parameters of the instrument have been modified.	Test instrument parameters according to the calibration certificate.
	3. The signal acquisition coil is damaged, which affects the transmission of signals. Even if there is flow passing through, the signal cannot be transmitted to the converter.	Use a magnetic screwdriver to slide the signal acquisition coil.
	4. The impeller is stuck.	Check the impeller.
When there is no flow passing through the instrument, the instrument will display instantaneous flow	1. There is severe vibration in the pipeline.	Suggest adding shock absorption measures.
	2. Is the instrument well grounded.	Check the grounding.
	3. There is magnetic field interference on site, such as frequency converters, motors, solenoid valves, etc. (50HZ power frequency interference on site. To a certain extent, it may affect the use of instruments. The calculation of power frequency interference Q=3600f/k (f=50HZ, k=instrument coefficient).	By calculation, it can be determined whether the instrument has power frequency interference, and it is recommended to change the installation position.
	4. The pipeline shut-off valve of the instrument is not completely closed.	Check the valve.
The instrument is measuring normally, but the measurement value is inaccurate	1. There is an issue with the internal parameters of the instrument.	Test instrument parameters according to the appraisal certificate.
	2. The on-site pipeline does not meet the requirements, contains gas or has high viscosity.	Strictly follow the installation instructions and precautions in the manual.

Fault Phenomenon	Fault Analysis	Solutions
	3. There is a problem with the instrument movement. When the instrument is removed and the impeller is blown with the mouth, it should run smoothly and quickly.	If damaged, it is recommended to contact the manufacturer.

Chapter V Warranty and After-Sales Service

Our company promises to customers that the hardware accessories provided during the supply of this instrument have no defects in material and manufacturing process.

Starting from the date of purchase of the instrument, if we receive notification from the user regarding such defects during the warranty period, our company will provide unconditional free maintenance or replacement for products that are indeed defective. We guarantee that all non customized products can be returned or exchanged within 7 days.

Disclaimer

During the warranty period, product malfunctions caused by the following reasons are not within the scope of the three guarantee service:

(1) Improper use by the customer resulted in product malfunction.

(2) The customer's self disassembly, repair, and modification of the product resulted in product malfunction.

After-sales service commitment:

(1) We promise to respond and handle customer technical questions within 2 hours after receiving them.

(2) We promise to provide test results within 3 working days and repair results within 7 working days after receiving the instruments for factory repair.

Chapter VI Communication Protocol

6.1 Description of G-Type RS485 Communication Protocol

1. Description

This instrument adopts MODBUS_STU format.

The default data format is n, 8, 1 (1 start bit, 8 data bits, no parity, 1 stop bit), and supports parity check, 2 stop bits, and other options.

The default baud rate is 9600, with five options available: 1200, 2400, 4800, 9600, and 19200.

The instrument address is decimal "01-247", and the "0" address is used for broadcasting. This protocol does not support broadcasting.

This instrument uses the 0x03 command in the MODBUS protocol:

Table 24

Command 03 (HEX)	Read single or multiple registers

The data type in the protocol is single precision floating-point number float, formatted as IEEE754, and the data is sorted from high to low.

The format of command3 is as follows(read register command):

MODBUS request

Table 25

Instrument Address	1 BYTE	01-F7
Function Code	1 BYTE	03
Start Address	2 BYTE	0-FFFF
Read Quantity	2 BYTE	N（01-7D）
CRC Low Bit	1 BYTE	
CRC High Bit	1 BYTE	

MODBUS response

Table 26

Instrument Address	1 BYTE	01-F7
Function Code	1 BYTE	03
Byte Count	1 BYTE	N*2
Input Status	N*2 BYTE	
CRC Low Bit	1 BYTE	
CRC High Bit	1 BYTE	

Error Response

Table 27

Instrument Address	1 BYTE	01-F7
Function Code	1 BYTE	83
Error Code	1 BYTE	01、02、03（See Note 1）
CRC Low Bit	1 BYTE	
CRC High Bit	1 BYTE	

Note 1: 01. Register address error 02. Register length error 03. CRC error

2. Definition of Data Items

Table 28

Attribute	Address (Hexadecimal)	Register length (Character)	Data Type	Description
Read Only	0001	2	float	Instantaneous flow rate
Read Only	0003	2	float	Accumulated flow rate
Read Only	0005	2	float	Battery voltage, in volts

6.2 Description of E-Type RS485 Communication Protocol

1. Description

This instrument adopts MODBUS_STU format.

The default data format is n, 8, 1 (1 start bit, 8 data bits, no parity, 1 stop bit), and supports parity check, 2 stop bits, and other options.

The default baud rate is 9600, with five options available: 1200, 2400, 4800, 9600, and 19200.

The instrument address is decimal "01-255", and the "0" address is used for broadcasting. This protocol does not support broadcasting, and other addresses are reserved.

This instrument uses the 0x03 command in the MODBUS protocol:

Table 29

Command 03 (HEX)	Read single or multiple registers

Data types in the protocol:

Single precision floating-point number float, formatted as IEEE754, with data from high to low.

Double precision floating-point number, formatted as IEEE754, with data from high to low.

The unsigned integer 'unsigned int' ranges from 0 to 65535.

The format of command 3 is as follows (read register command):

MODBUS request

Table 30

Instrument Address	1 BYTE	01-FF
Function Code	1 BYTE	03
Start Address	2 BYTE	0-FFFF
Read quantity	2 BYTE	N（1-7D）
CRC Low Bit	1 BYTE	
CRC High Bit	1 BYTE	

MODBUS response

Table 31

Instrument Address	1 BYTE	01-FF
Function Code	1 BYTE	03
Byte Count	1 BYTE	N*2
Input Status	N*2 BYTE	
CRC Low Bit	1 BYTE	
CRC High Bit	1 BYTE	

Error response

Table 32

Instrument Address	1 BYTE	01-FF
Function Code	1 BYTE	83
Error Code	1 BYTE	01、02、03（See Note 1）
CRC Low Bit	1 BYTE	
CRC High Bit	1 BYTE	

Note 1: 01. Register address error 02. Register length error 03. CRC error

2. Definition of Data Items

Table 33

Attribution	Name	Address (Hexadecimal)	Register Length (words)	Data Type	Description
Read-only	Accumulated flow rate	0000	4	Double float	Accumulated traffic in dual precision floating-point format
Read-only	Accumulated flow rate	0004	2	float	Accumulated traffic in single precision floating-point format
Read-only	Instantaneous flow rate	0006	2	float	

Attribution	Name	Address (Hexadecimal)	Register Length (words)	Data Type	Description
Read-only	Instantaneous flow rate Unit	0008	1	unsigned int	0:m3/h 1:L/h 2:L/min 3:US Gal/min 4:UK Gal/min 5:US Gal/h 6:UK Gal/h 7:kg/h 8:t/h 9:ft3/h
Read-only	Battery voltage	0009	2	float	Unit：V

Communication example: (Instrument address is 01)

Table 34

Read Command	01 03 0004 0004 05C8	CRC low bit first, simultaneously reading cumulative flow and instantaneous flow
Return Data	01 03 08 42 84 00 00 （Accumulated flow rate=66） 00 00 00 00 （Instantaneous flow rate=0） D4 36	Floating point number with high bit first, CRC with low bit first