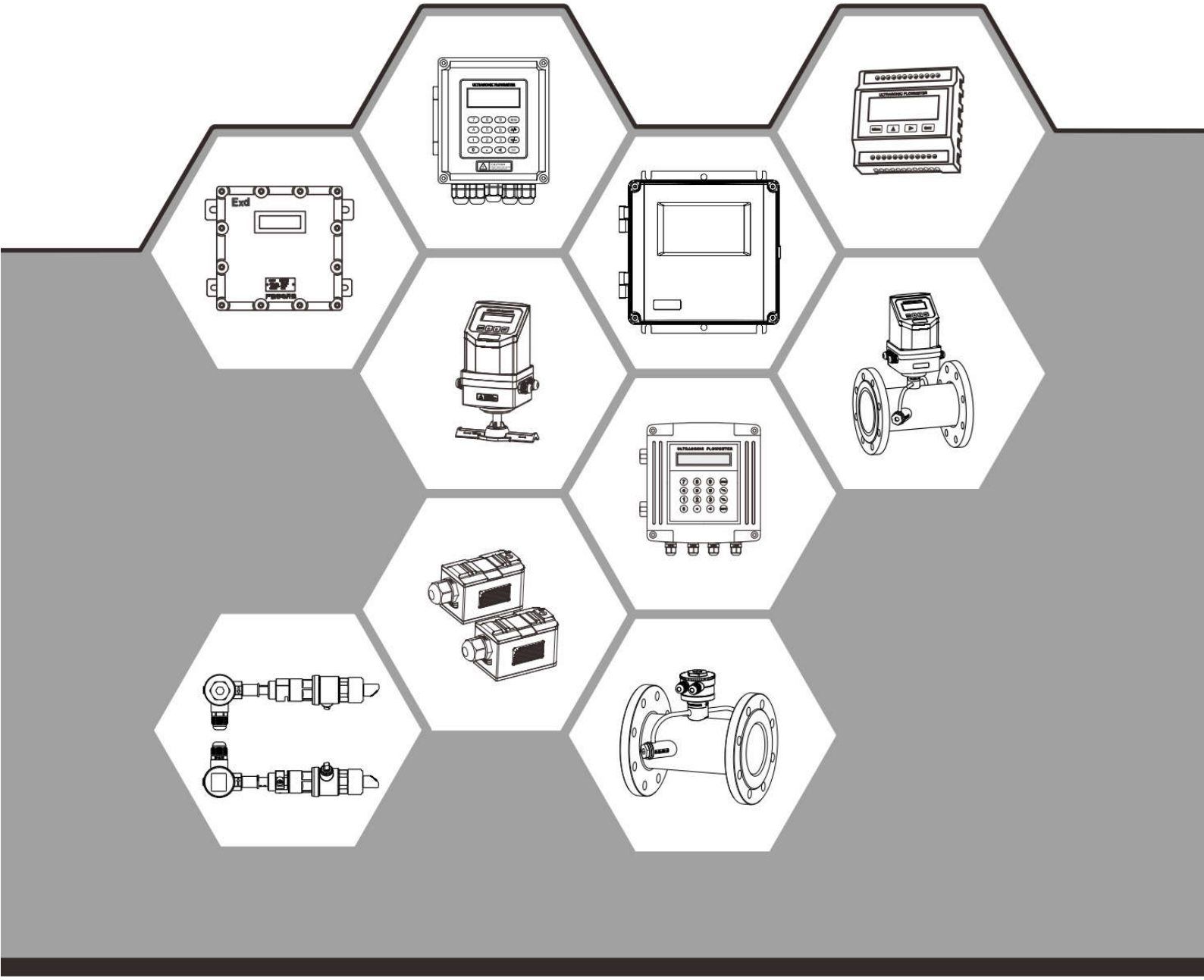
Multi-Channel Ultrasonic Flow/ Heat Meter

User Manual



Parameter	
Measurable liquid	Most single phase liquids. Less than 8% particles or bubbles.
Piping material	Stainless steel, carbon steel, PVC, PPR, cement
ambient temperature	-40℃～ +60℃
Measured fluid temperatures	-35℃～ +160℃
Flow rate range	Velocity Range 0.1 to 7.0 m/s
Measurement accuracy	±1%
Sensitivity	0.01m/s.
Measurement repeatability	±0.2%
Degree of protection	IP65 /IP68
Power source	AC85 ~ 265V/DC7 ~ 36V;
LCD display	160 * 32 dot LCD screen
Keyboard input	4 keys/16 keys
Serial communication	RS485/MODBUS/M-BUS/HART protocol
Flow output	4-20 mA/Frequency/OCT Pulse/Relay Output

Introduction

The new generation of ultrasonic flow meter is based on the principle of time difference method, the hardware core uses ARM processor, and the internal high-speed ADC is used for signal sampling. The cross-correlation algorithm is used to obtain the time difference and calculate the flow. A large number of internal self-developed algorithms make the calculation efficiency very high, and can obtain more accurate data in 64 complete operations in one second. In addition, FRAM memory is also used for data storage. With the excellent anti-interference ability, the flow meter can still work stably and reliably in the harsh electromagnetic interference environment.

Instrument Installation

Installation of Ultrasonic Sensor

Ultrasonic sensors are generally divided into two types: external clamp on type and insertion type. The installation methods of the two flow meters are described below.

1. Installation of Clamp on Sensor

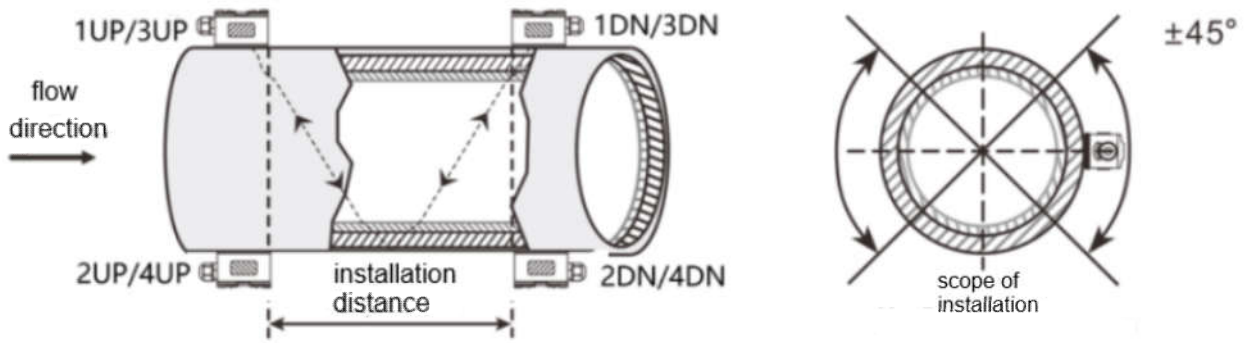
For external clamp on sensor, pipeline and fluid parameters shall be set according to pipeline conditions at M11 ~ M22.

Select the model according to the label on the sensor in M23

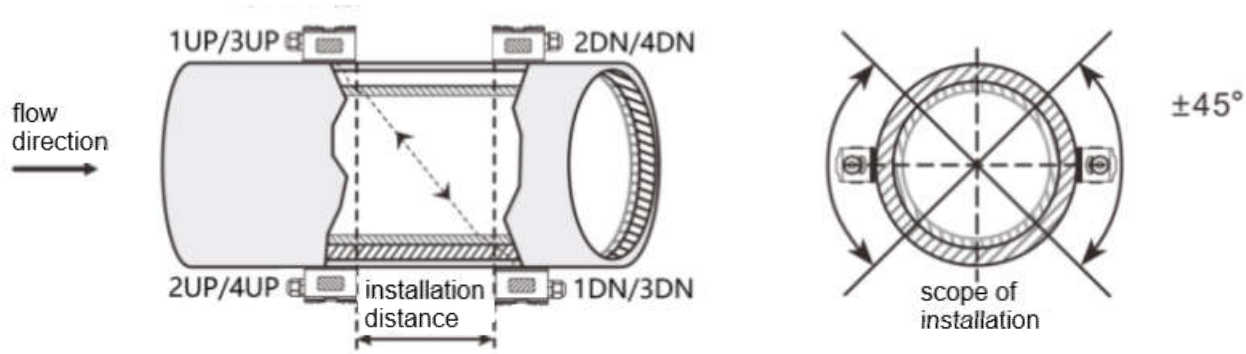
When selecting the installation method in M24, we usually recommend the V method (the probe is on the same side), because it is the easiest to install but requires a longer distance.Z method is used when the installation distance of straight pipe is not enough or the signal strength is too low. N method and W method are suitable for relatively small pipes (DN10 ~ DN20).

Check the installation distance (the distance from the top of the sensor to the top) at M25, and install the sensor according to the installation distance and the installation method.Before installing the sensor, keep the pipeline clean and smooth, polish it if necessary, and coat the sensor with the couplant attached with the machine.

Installation diagram of sensor V type (top view)



Installation diagram of sensor type Z (top view)



2. Installation of Insertion Sensor

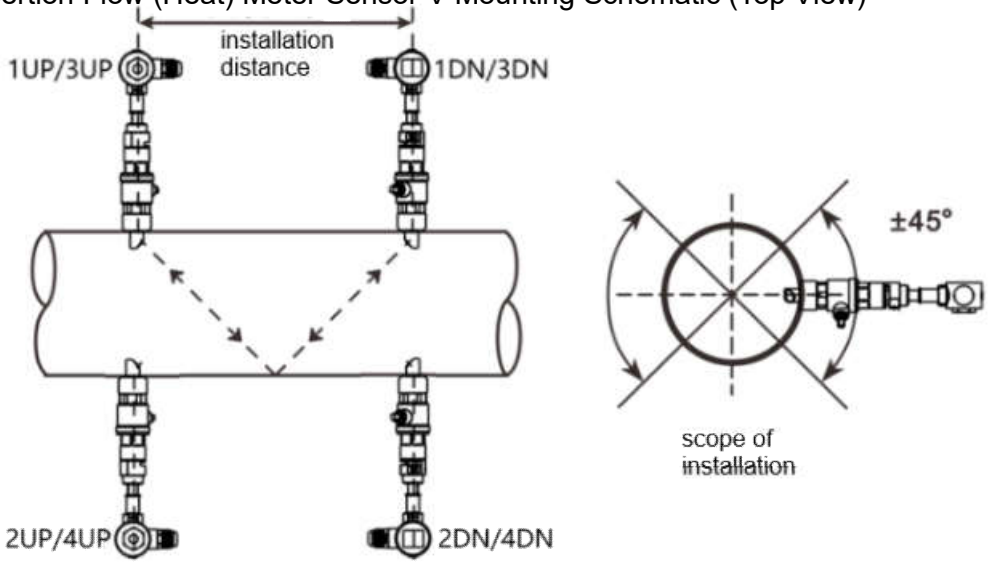
When inserting the sensor, set the pipeline and fluid parameters according to the pipeline conditions at M11 ~ M22.

Select the model according to the label on the sensor in M23

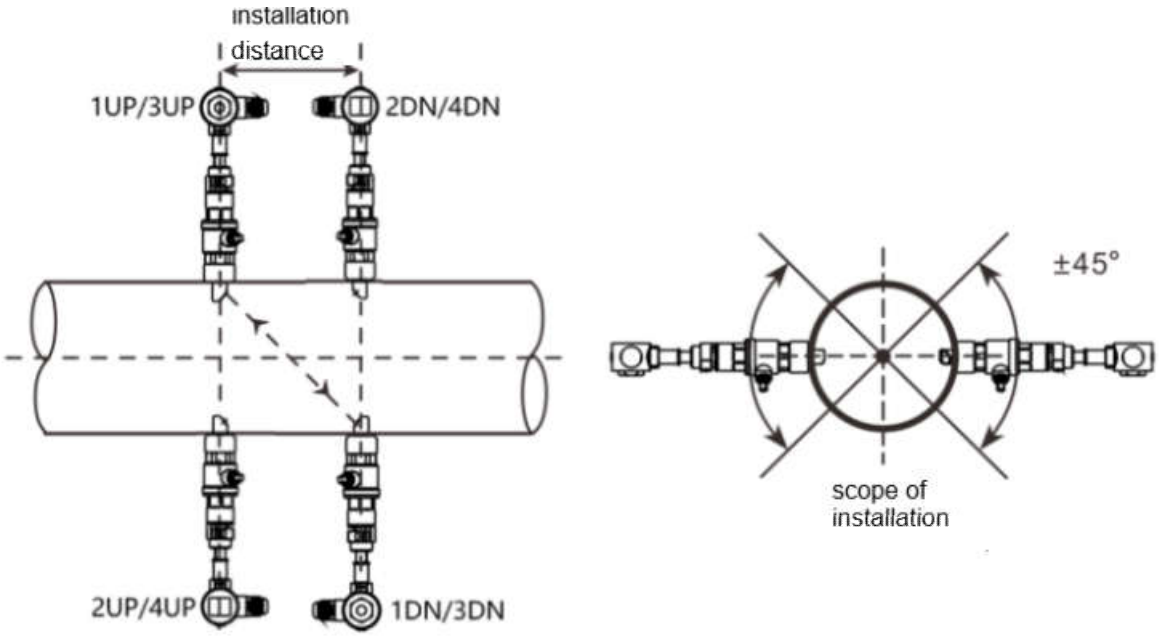
When selecting the installation method in M24, we usually recommend the V method (the probe is on the same side), because it is the easiest to install but requires a longer distance.The Z method is used when the installation distance of the straight pipe is not enough or the signal strength is too low.N method and W method are not recommended (the most small bore DN50 of the inserted sensor is too small to be installed)

Check the installation distance (the distance from the center of the sensor to the center) at M25, and install the sensor according to the installation distance and the installation method.Before installation, it is necessary to locate the installation point, weld the attached ball valve base, install the ball valve and open the hole.Consult the manufacturer for specific operation.

Insertion Flow (Heat) Meter Sensor V-Mounting Schematic (Top View)

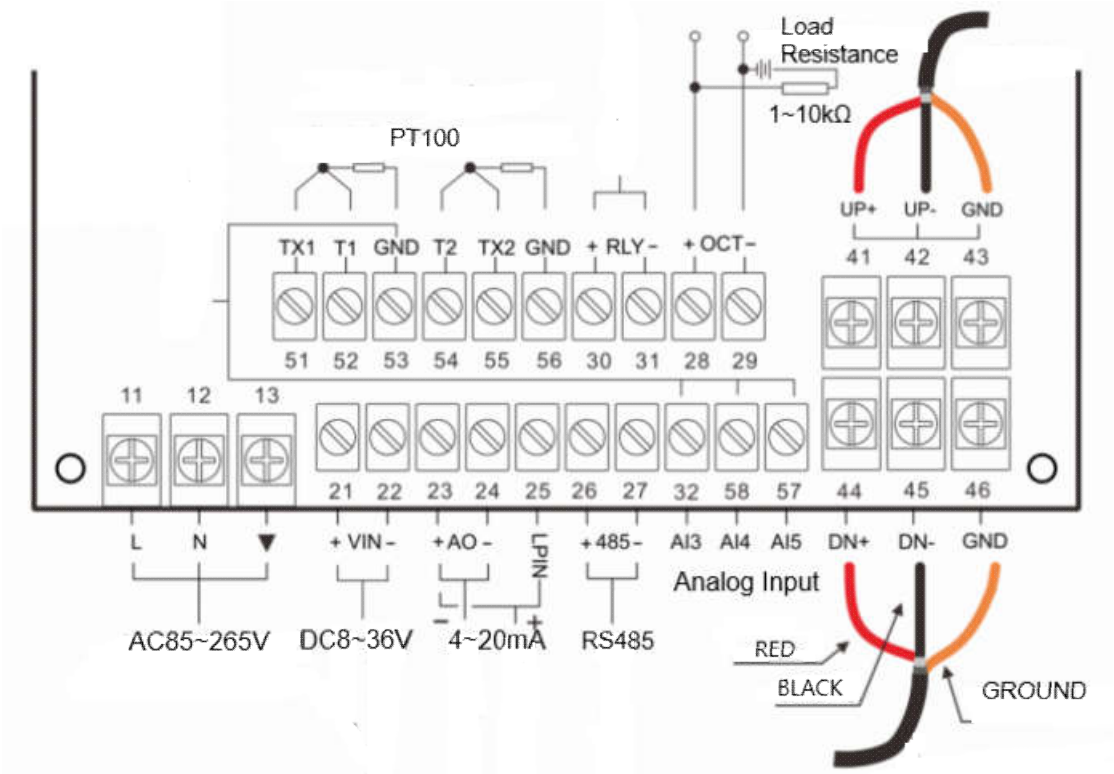


Insertion Flow (Heat) Meter Sensor Type Z Installation Diagram (Top View)

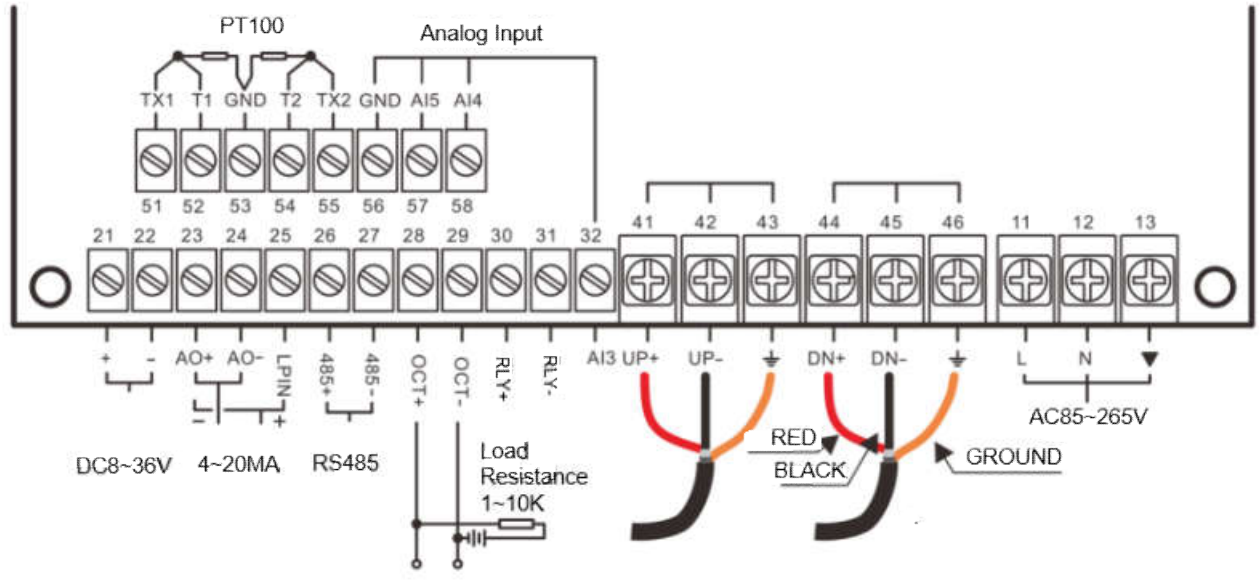


Wiring Diagram

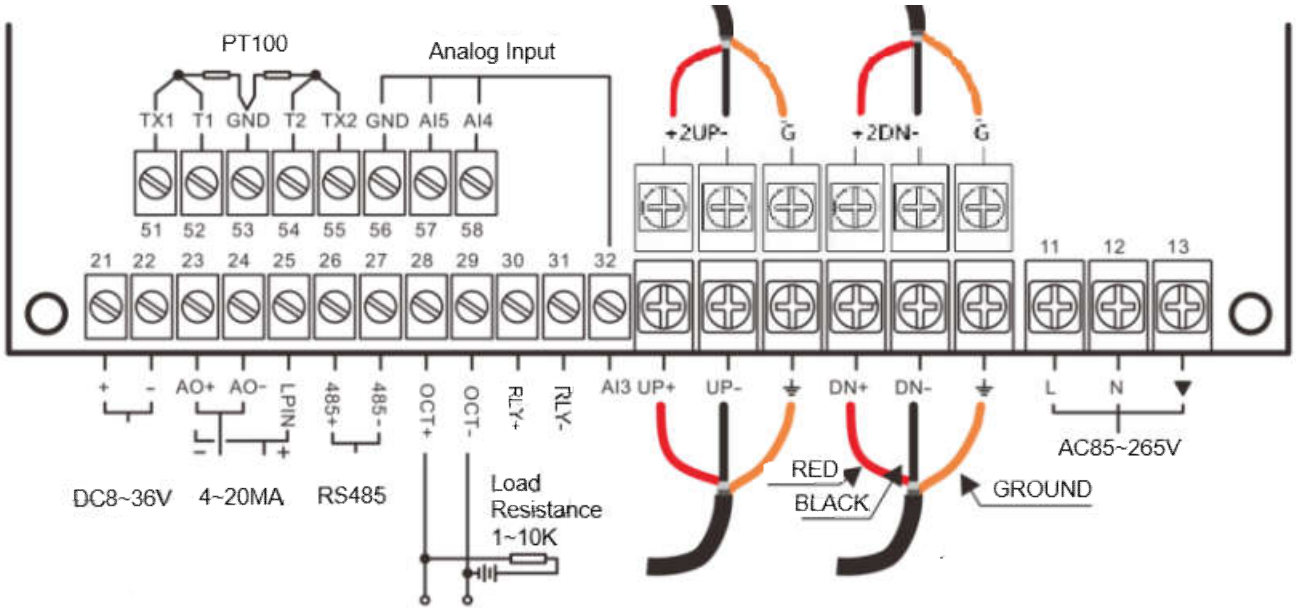
1. Wiring diagram of blue plastic shell single-channel wall-mounted flow meter



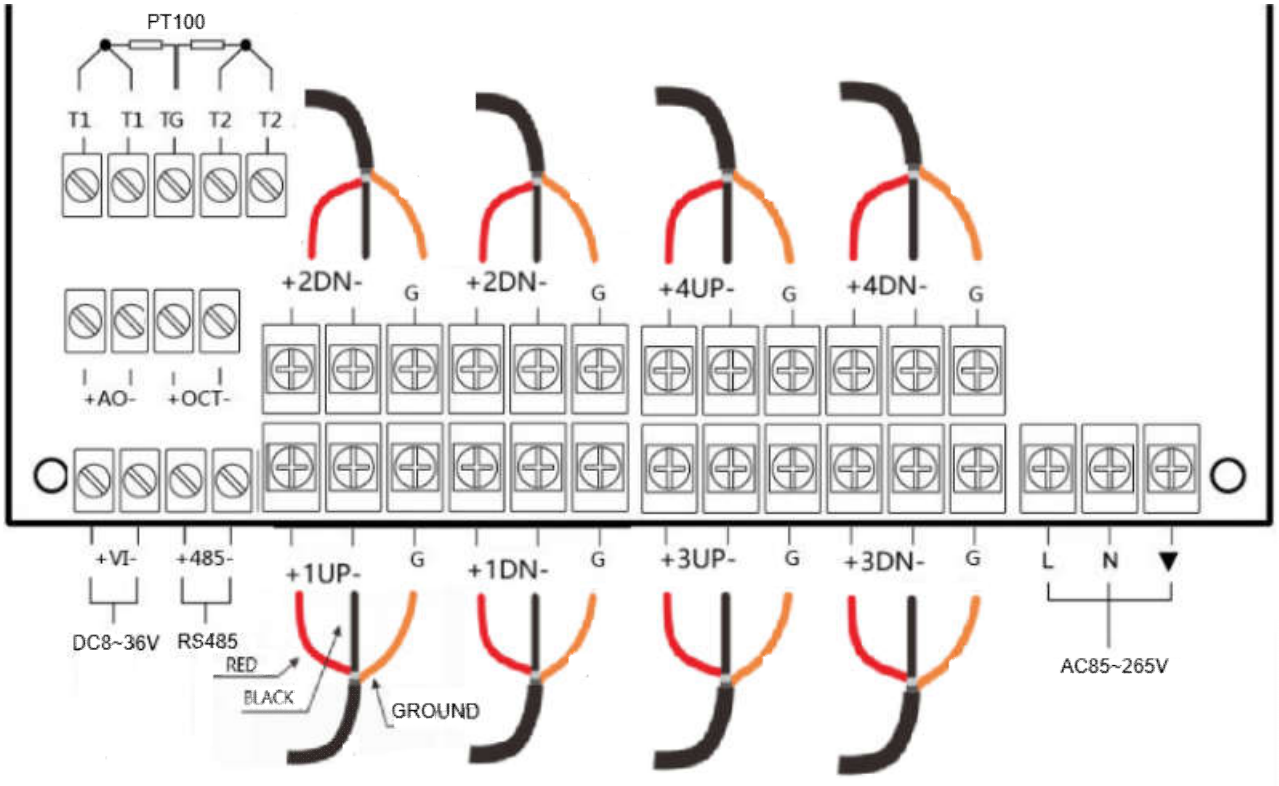
2. Wiring diagram of white aluminum shell single-channel wall-mounted flow meter



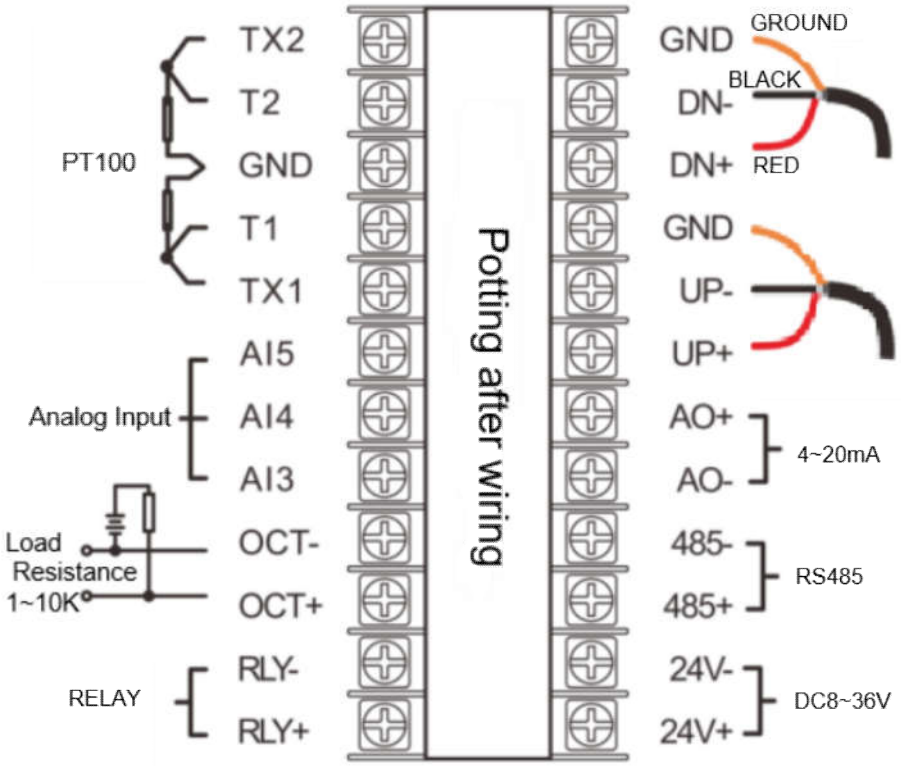
3.Wiring diagram of dual-channel host



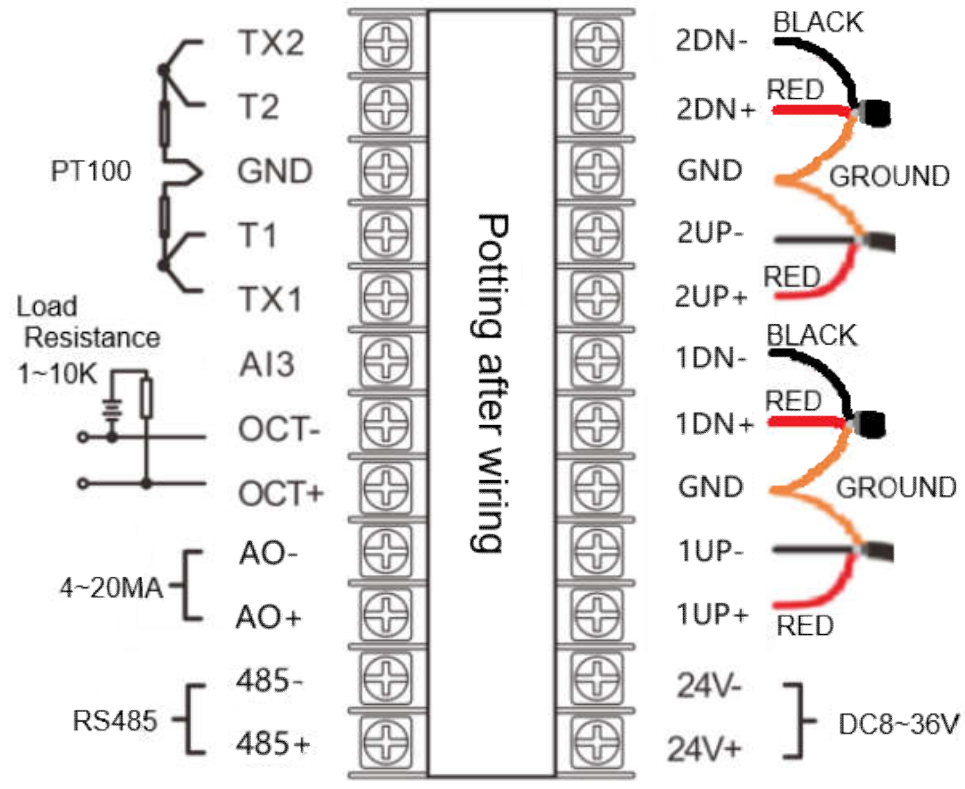
4.Four-channel host wiring diagram



5.Functional host wiring diagram (single channel)



6.Functional host wiring diagram (dual channel)



Menu Details

Menu	Details
M00	Display the flow, Total NET and status (* R = Ready, * I = ill, * H =Hold, * P = Parity Error)
M01	Display The flow ,Velocity and status (Flow direction can be adjusted by M83)
M02	Display the flow, Total positive and status (the Total positive has 9 digits, maximum = 999999999)
M03	Display the flow,Total negative status
M04	Display system time, flow and status
M05	Display heat and total energy
M06	Display the total heat and total cooling
M07	Display T1, T2 temperature and resistance value (PT100/PT1000)
M08	Display the working status code, normal is "----------".
M09	Display today's, this month's, this year's net total flow, press the ENT key to switch
M10	Sets the perimeter of the pipe
M11	Sets the outside diameter of the pipe
M12	Set Pipe Wall Thickn
M13	Sets the inside diameter of the pipe
M14	Select the pipe material
M15	Set the speed of sound for a custom material
M16	Select the lining type
M17	Set Custom Liner Sound Velocity
M18	Sets the lining thickness
M19	Set the roughness of the pipe (generally enter 0)
M20	Select the type of fluid
M21	Sets the speed of sound for the custom fluid
M22	Sets the viscosity coefficient for the custom fluid
M23	Select the sensor type
M24	Select the sensor installation method
M25	Display sensor installation distance
M26	Save common parameters to flash for direct calling in the future (10 addresses)
M27	Load saved parameters into memory (10 addresses)
M28	Signal quality cutoff below which traffic displays 0 and is normally set to 60

M29	Signal strength cutoff below which traffic displays 0, normally set to 60
M30	Select the metric or imperial unit of length
M31	Select flow unit
M32	Select Cumulative Flow Unit
M33	Number of decimal places in the cumulant.
M34	Maximum allowable flow
M35	Positive accumulator switch, the positive flow is 0 after it is off
M36	Negative accumulator switch, the negative flow is 0 after it is off
M37	Accumulator clear
M38	Manual Accumulator
M39	System language
M40	Damping time
M41	Set the low flow rate cutoff value (recommended value 0.05)
M42	Setting the static zero (must be done with the fluid at rest)
M43	Reset static zero (no password required for operation)
M44	Manual zero offset
M45	User meter factor
M46	RS485 communication address
M47	System setting lock
M48	Multi-point polyline correction (password is 1234)
M49	485 receive view, showing part of the content received by the 485 interface
M50	Timed data printout settings
M51	Timing data output time setting
M52	Timing print data output interface selection
M53	AI3, AI4 display values
M54	AI5 Display Value
M55	Current loop output mode selection
M56	Current loop 4 mA equivalent
M57	Current loop 20 mA equivalent
M58	Current loop and frequency output test (frequency output test M78 must select 19)
M59	Current current value

M60	System time setting
M61	Electronic serial number and version number
M62	Set the baud rate check bit and stop bit (1200 ~ 19200)
M63	Communication protocol selection
M64	AI3 equivalent setting
M65	AI4 equivalent setting
M66	AI5 equivalent setting
M67	OCT frequency output range selection
M68	Lower frequency output limit
M69	Frequency output upper limit
M70	Backlight time (range: 0 ~ 60 seconds, 0 = no backlight, > 60 backlight normally on)
M71	Contrast (may not be valid for some LCDs)
M72	Alarm # 1 Low Limit
M73	Alarm # 1 High Limit
M74	Alarm # 2 Low Limit
M75	Alarm # 2 High Limit
M76	OCT output equivalent and pulse width setting (pulse width range 1 ~ 1000mS)
M77	Relay output equivalent and pulse width setting (pulse width range: 200mS ~ 1000mS)
M78	OCT output options
M79	Relay Output Option
M80	Quantitative controller trigger sources
M81	Quantitative Controller
M82	View historical data
M83	Instrument type selection (flow direction can be adjusted through this menu)
M84	Select a thermal unit
M85	Select the temperature input source.
M86	T1, T2 temperature compensation settings
M87	Negative accumulation heat switch
M88	Cumulative Heat Decimal Digits
M89	Temperature difference cutoff value
M90	Signal strength and signal quality The multichannel version cycles through the channel

M91	Sound path ratio, multi-channel version displays each channel cyclically
M92	Fluid speed of sound, multi-channel version shows each channel cyclically
M93	Flight time and time difference
M94	Maximum time difference setting range (1000 nS by default, please adjust under the guidance of the manufacturer)
M95	Ultrasonic transmitting power adjustment, small bore (DN40 and below) can adjust the transmitting power to 30% to increase the signal quality
M97	Reynolds number and dominant frequency coefficient
M98	Receiving waveform display, easy to view the receiving signal
M99	Factory parameter setting entrance (password is 5860, F01 ~ F06 can be set after entering)
F01	Factory instrument correction factor
F02	Modify cumulants
F03	Analog Input Calibration
F04	Analog Output Calibration
F05	Simulation operation function
F06	Clear Day-Month-Year History

Common problems and solutions

Questions	Solution
Ultrasonic Flow Meter Is Ready?	(1) There must be fluid in the pipes (2) The M1 ~M24 must be consistent with the actual situation. (3) M90 UP&DN ≥ 60 and difference ≤ 0.5; Signal quality ≥ 60
no flow in the pipeline, but the flow meter is measuring.	(1) Set the signal cutoff value through M28 to be greater than the signal when the pipe is empty (2) Set the signal quality cutoff value greater than 60 through M29
The actual flow is the opposite of the displayed flow	(1) Check whether the sensor is connected reversely (2) Flow direction adjustment by M83
Fluid is static but Displays the flow	(1) Determining that the fluid is not flowing (2) zero setting operation of M42.
flow fluctuation	Set damping time of M40.
Displays the flow and There is actually a deviation	Correction by M45 or linearization by M48
Deviation between measured temperature and actual temperature	Compensated by M86
Can the OCT or relay equivalent be adjusted?	(1) M76 can adjust OCT equivalent and pulse width (2) M77 can adjust the equivalent and pulse width of the relay
How many digits can the cumulative flow display at most?	Cumulative flow maximum energy display-999999999 ~ 999999999
Communication protocol How to choose	The communication protocol is automatically identified, and the fixed protocol can also be selected through M63.
Buzzer beeps once per second M00 display * P	Program check failed, need to upgrade again
How to judge False signal	False signals can be effectively judged by viewing the received waveform through the M98 menu Receive the correct waveform, the front is almost straight, the waveform is larger than one, the number should be more than 5, if there is a false waveform, please reinstall the probe, or contact the manufacturer Correct waveform: Incorrect waveform:  

MODBUS communication protocol

1. Basic Modbus register address table

Register address	Number of registers	Variable name	Data format	Explain
01-02	2	Instantaneous flow	floating-point	Units: controlled by M31
03-04	2	Transient heat	floating-point	Units: controlled by M84
05-06	2	Instantaneous flow rate	floating-point	Unit: m/s
07-08	2	Fluid sound speed	floating-point	Unit: m/s
09-10	2	Positive cumulative flow	32-bit integer	Unit: controlled by M32
11-12	2	Fractional part of positive cumulative flow	floating-point	Unit: controlled by M32
13-14	2	Negative cumulative flow	32-bit integer	Unit: controlled by M32
15-16	2	Fractional part of negative cumulative flow	floating-point	Unit: controlled by M32
17-18	2	Positive heat accumulation	32-bit integer	Units: controlled by M84
19-20	2	Fractional part of positive heat accumulation	floating-point	Units: controlled by M84
21-22	2	Negative heat accumulation	32-bit integer	Units: controlled by M84
23-24	2	Fractional part of negative heat cumulant	floating-point	Units: controlled by M84
25-26	2	Net cumulative flow	32-bit integer	Unit: controlled by M32
27-28	2	Fractional part of net cumulative flow	floating-point	Unit: controlled by M32
29-30	2	Net heat accumulation	32-bit integer	Units: controlled by M84
31-32	2	Fractional part of net heat accumulation	floating-point	Units: controlled by M84
33-34	2	Water supply temperature T1	floating-point	Unit
35-36	2	Return water temperature T2	floating-point	Unit
37-38	2	Analog Input A3 Value	floating-point	Transformed dimensionless data
39-40	2	Analog input A4 value	floating-point	Transformed dimensionless data
41-42	2	Analog input A5 value	floating-point	Transformed dimensionless data
43-44	2	Analog Input A3 Current Value	floating-point	Unit: mA
45-46	2	Analog Input A4 Current Value	floating-point t number	Unit: mA
47-48	2	Analog Input A5 Current Value	floating-point	Unit: mA

49-50	2	Lock screen password	BCD code	
53-55	3	Instrument date and time	BCD code	Seconds, time, day, month, year, low in front
66-67	2	Test the floating-point value	floating-point	Always returns 1. 234567.
68-69	2	Test the long integer value	32-bit integer	Always returns the 123456789
89-90	2	Current current loop output current values	floating-point	Unit: mA
125-126	2	Floating-point form of today's cumulative traffic	floating-point	Unit: controlled by M32
127-128	2	Floating-point form of cumulative traffic of this month	floating-point	Unit: controlled by M32
137-138	2	Integer portion of today's cumulative traffic	32-bit integer	Unit: controlled by M32
139-140	2	Fractional part of today's accumulated traffic	floating-point	Unit: controlled by M32
141-142	2	Integer part of this month's cumulative traffic	32-bit integer	Unit: controlled by M32
143-144	2	Decimal part of accumulated traffic of this month	floating-point	Unit: controlled by M32
145-146	2	Integer part of this year's cumulative traffic	32-bit integer	Unit: controlled by M32
147-148	2	Decimal part of this year's cumulative traffic	floating-point	Unit: controlled by M32
173-174	2	Current frequency output value	floating-point	Unit Hz
175-176	2	Same as 89-90, for compatibility with previous protocol	floating-point	Unit: mA
181-182	2	Current temperature difference	floating-point	Unit
1437	1	Current instantaneous flow unit	16-bit integer	Values 0-35 refer to table (1)
1438	1	Current Cumulative Flow Unit	16-bit integer	Values 0-8 refer to Table (2)
1439	1	Current Cumulative Traffic Decimal Digits	16-bit integer	
1440	1	Current Cumulative Heat Decimal Digits	16-bit integer	
1441	1	Current thermal energy unit	16-bit integer	Values 0-4 refer to Table (3)
1442	1	Instrument address	16-bit integer	0-255

2. Common commands and replies

(1) Read the instantaneous flow rate (Register 01-02), and the displayed value of the instantaneous flow rate is 1. 234567

Send: 01 03 00 00 00 02 C4 0b

Address control start length check

Received: 01 03 04 06 51 3F 9e 3B 32

Address control byte number low word high word check

Resolution result: 3F 93 06 51 = 1. 234567 (this number is a single-precision floating-point number and needs to be converted by software)

(2) Read the cumulative flow rate (register 09-12). The display value of the cumulative flow rate meter is 1. 234567.

Send: 01 03 00 08 0004 C5 CB

Address control start length check

Receive: 01 03 08 00 01 00 00 32 58 3E 70 1b F8

Address Control Byte Count Low Word High Word Low Word High Word Check

Resolution result: (09-10 registers) 00 00 00 01 = 1 (11-12 registers) 3e 70 32 58 = 0. 234567 add two values = 1. 234567