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User's Manual Supmea

Thermal Gas Mass Flowmeter

U-MF-SUP-EN2

CONTENTS

※Safety Information※

Thank you for purchasing our quality Thermal Gas Mass Flowmeter with independent research and development.
We have written this guide to provide the persons responsible for the installation, operation and maintenance of your flow meter with the product specific information they will need.In order to prevent damage to instrument and make the instrument in the best performance and stable operation, please read this manual thoroughly before installation.

◇Please have a safekeeping of this manual and together with the instrument after reading.

◇Please pass this manual to technical department of end user to keep.

◇This manual classifies important grade of safety attentions by Caution and Warning.

Attention

Error operation in case of ignoring the tips might cause the personal injury, or damage to the instrument and property.

Warning

Error operation in case of ignoring the tips might cause the personal injury or major accident.

This manual contents the following icons:

Indicates safety attentions which are dangerous.

Indicates safety attentions which are.needed to pay attention to.

Indicates safety attentions which are.forbidden.

Select explosion-proof instrument for explosive environment application

Confirm whether the nameplate of instrument has the identifiers of explosion-proof certification and temperature class, the instrument can’t be used in explosive environment without those identifiers.

The explosion-proof temperature class of instrument must meet the explosion-proof and temperature of environmental requirements on site

When the instrument is in used explosion-proof environment, make sure that the explosion-proof certification and temperature class of instrument meet to the requirements on site.

No opening while working in explosive environment

Before wirings, please power instrument off.

The protection class of instrument must meet the working condition requirements on site

The requirement of protection class on site should be under, or the same as the protection class of instrument to ensure that the instrument is working fine.

Confirm the power type

Customers can select the power type: 220VAC or 24VDC (Please state it when ordering). Please confirm the power type before installation.

Confirm the working environment of instrument and medium temperature

The environment on site and the maximum medium temperature should be under the nominal value of instrument. (The details of nominal value are shown in Part 2 Specifications.)

No hot-tapped installation and maintenance while the medium temperature is too high

When temperature of measuring medium is higher than the temperature that human can bear, or higher than the temperature of possible danger, should shut down or do cooling process to reach a safety temperature, and then do hot-tapped operation. If there are no conditions to do hot-tapped operation, should shut down to avoid dangers.

Confirm the ambient pressure of instrument and medium pressure

The ambient pressure on site and the maximum medium pressure should be under the nominal value of instrument. (The details of nominal value are shown in Part 2 Specifications.)

Hot-tapped installation and maintenance while the medium pressure is too high

When absolute pressure of measuring medium is higher than 5 times standard atmospheric pressure, or higher than the pressure of possible danger, should shut down or do reducing pressure to reach a safety pressure, and then do hot-tapped operation. If there are no conditions to do hot-tapped operation, should shut down to avoid dangers.

Extra requirements of special medium

The properties of some gas are special, it is needed to order special product, please check the manual of special product thoroughly to make sure whether it meets the requirements on site before installation.

No hot-tapped installation and maintenance while the medium is dangerous gas

When the medium may cause injury to humans, no hot-tapped installation and maintenance, should shut down or do security processing to reach a safety condition, and then do hot-tapped operation. If there are no conditions to do hot-tapped operation, should shut down to avoid dangers. The dangerous gases are such gas and chlorine, etc.

If doubting that the instrument in the event of failure, please do not operate it

If there are something wrong with the instrument or it had been damaged, please contact us.

1. summarize

Thermal gas mass flow meter is designed on the basis of thermal dispersion, and adopts method of constant differential temperature to measuring gas flow. It has advantages of small size, easy installation, high reliability and high accuracy, etc.

The meter contains two platinum resistance temperature sensors. The thermal principle operates by monitoring the cooling effect of a gas stream as it passes over a heated sensor. Gas flowing through the sensing section passes over two sensors one of which is used conventionally as a temperature sensor, whilst the other is used as a heater. The temperature sensor monitors the actual process values whilst the heater is maintained at a constant differential temperature above this by varying the power consumed by the sensor. The greater the gas velocity, the greater the cooling effect and power required to maintain the differential temperature. The measured heater power is therefore a measure of the gas mass flow rate.

The format of gas velocity and power is shown as below:

$$V = \frac{K[Q/\Delta T]^{1.87}}{\rho_g} \quad \text{......(1)}$$

Where ρ_g --specific gravity of medium

V--velocity

K--balance coefficient

Q--heater power

ΔT--is differential temperature

The medium temperature range of meter is -40℃～220℃.

In the format (1), the specific gravity of medium is related to the density:

$$\rho = \rho_n \times \frac{101.325 + P}{101.325} \times \frac{273.15 + 20}{273.15 + T} \quad \text{......(2)}$$

Where:ρ_g--medium density in working condition（kg/m^3）

P_n-- medium density in standard condition,101.325kPa and 20℃（kg/m^3）

P--pressure in working condition（kPa）

T--temperature in working condition （℃）

In the formats (1) and (2), there is a certain functional relationship between the velocity and pressure in working condition, medium density, the temperature in working condition.

Due to the sensor temperature is always 30℃ higher than the medium temperature (environment temperature), and the meter adopts method of constant differential temperature, therefore the meter do not need to do temperature and pressure compensation in principle.

2 Specifications

2.1 Features

- Measuring the mass flow or volume flow of gas
- Do not need to do temperature and pressure compensation in principle with accurate measurement and easy operation.
- Wide range: 0.5Nm/s～100Nm/s for gas. The meter also can be used for gas leak detection
- Good vibration resistance and long service life. No moving parts and pressure sensor in transducer, no vibration influence on the measurement accuracy.
- Easy installation and maintenance. If the conditions on site are permissible, the meter can achieve a hot-tapped installation and maintenance. (Special order of custom-made)
- Digital design, high accuracy and stability
- Configuring with RS485 or HART interface to realize factory automation and integration

2.2 Technical Data Sheet

Description	Specifications
Measuring Medium	Various gases (Except the acetylene)
Pipe Size	DN10～DN4000mm
Velocity	0.1～100 Nm/s
Accuracy	±1.5%
Working Temperature	Sensor: -40℃～+220℃ Transmitter: -20℃～+45℃
Working Pressure	Insertion Sensor: medium pressure≤ 1.6MPa Flanged Sensor: medium pressure≤ 1.6MPa Special pressure please contact us
Power Supply	Compact type: 24VDC or 220VAC, Power consumption ≤18W Remote type: 220VAC, Power consumption ⩾19W
Response Time	1s
Output	4-20mA (optoelectronic isolation, maximum load 500Ω), Pulse, RS485 (optoelectronic isolation) and HART
Alarm Output	1-2 line Relay, Normally Open state, 10A/220V/AC or 5A/30V/DC
Sensor Type	Standard Insertion, Hot-tapped Insertion and Flanged
Construction	Compact and Remote
Pipe Material	Carbon steel, stainless steel, plastic, etc
Display	4 lines LCD Mass flow, Volume flow in standard condition, Flow totalizer, Date and Time, Working time, and Velocity, etc.
Protection Class	IP65
Sensor Housing Material	Stainless steel (316)

3. Structure diagram

3.1 Appearance

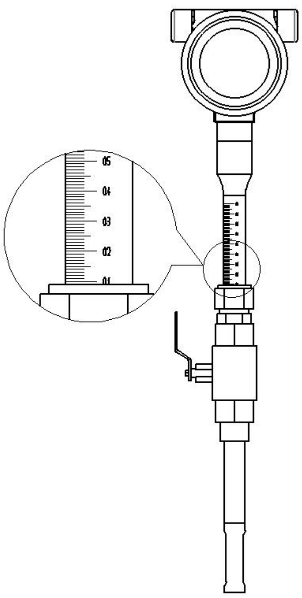


Fig. 1 Standard Insertion Flow Meter

(Pipe size DN50-DN1000)

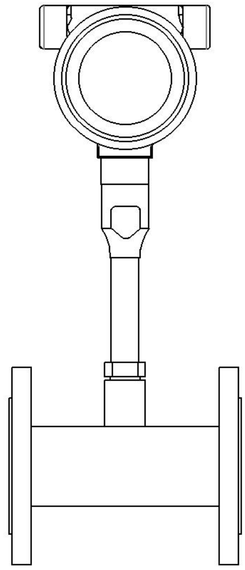


Fig. 2 Flanged Flow Meter

(Pipe size DN10-DN80)

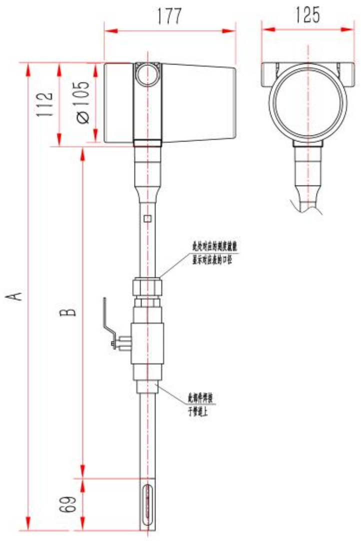
Structure description:

A) When the integrated plug-in diameter is less than 1000mm, it should be inserted into the axis of the pipeline to be tested, so the length of the measuring rod depends on the size of the measuring pipe. When the diameter exceeds 1000mm, it can be inserted between 1/8 and 1/2.

B) The one-piece full-pipe type can adopt flange connection, thread connection and snap-fit connection. The flange connection conforms to the national standard HGT 20592-2009 steel pipe flange. See appendix 2. Other connections are available online.

3.2 Structure size chart

Dimensions of standard insertion sensor：



Nominal diameter	A	B
DN65-DN200	431	250
DN250-DN500	551	370
DN500 以上	811	630

Figure3 Insertion flow meter

The dimensions of flanged sensor：

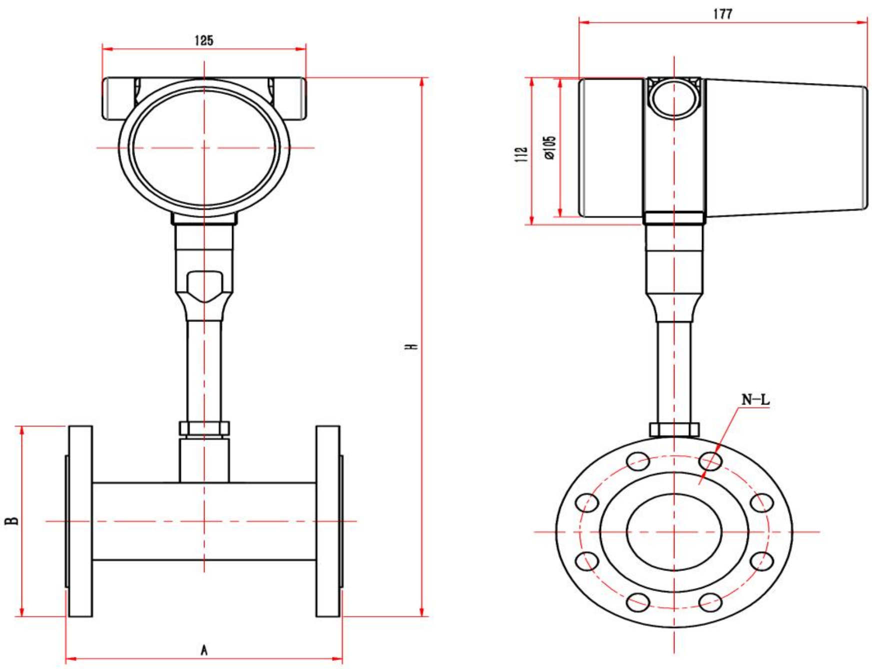


Figure 4 Flanged flow meter

The pipe section and flange are welded by welding process. The flange specification adopts HGT 20592-2009 standard. For details, please refer to the following figure.

HGT 20592-2009 Steel pipe flange PN1.6Mpa (16bar) flat, raised panel flat welded steel pipe flange

PN1.6Mpa Plane and surface plate flat welding steel pipe flanges (Unit: mm)

Nominal Diameter（DN）	High（H）	Installation length（A）	Flange outer diameter（B）	The number of bolts（N）	Bolt
10	329	170	90	4	M12
15	332	170	95	4	M12
20	337	170	105	4	M12
25	342	170	115	4	M12
32	354	170	140	4	M16
40	359	170	150	4	M16
50	370	170	165	4	M16
65	388	190	185	8	M16
80	661	190	200	8	M16
100	671	200	220	8	M16
125	686	200	250	8	M16
150	704	200	285	8	M20
200	731	200	340	12	M20
250	760	240	405	12	M24

1. The flange adopts the national standard HGT 20592-2009 steel pipe flange standard. And in accordance with HGT 20592-2009 steel pipe flange standard processing and production.

2. Pipe thread connection can be used for DN15～DN80, but it can only be implemented after reaching a technical agreement with the instrument provider.

3. Only the highest rated pressure data of 1.6Mpa is given in the table, and the pressure higher than the rated pressure can be customized, but it can only be implemented after technical consultation with the instrument provider.

4. Pipe segment installation dimensions of DN100 and above can only be produced after consultation with the instrument supplier.

4.Cable installation method

No operation when the meter is working

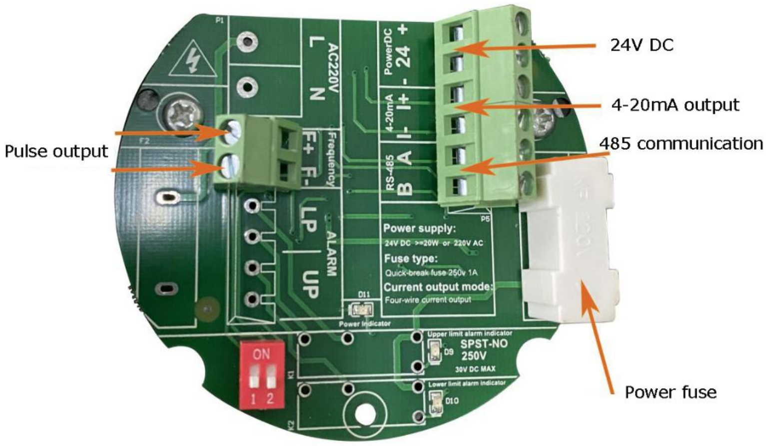
Confirm the power supply type

4.1 Instruction of Sensor Wirings

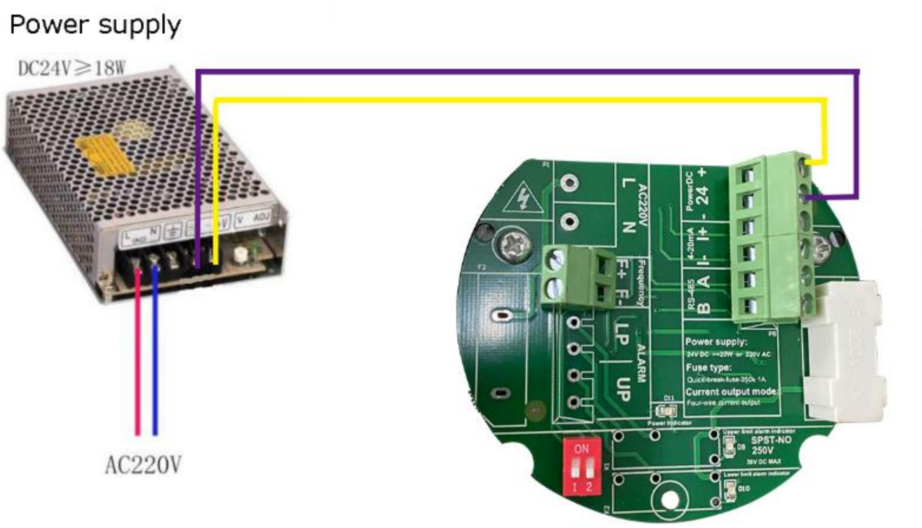
1	2	3	4
RT1	RT2	RH1	RH2

Temperature sensor (Pt1000)   Heater (Pt20)

4.2 Terminal description and wiring method

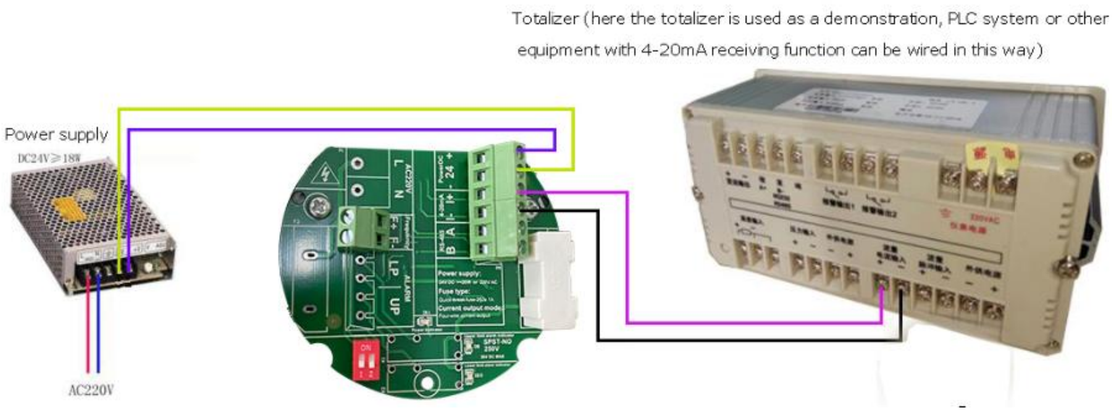


4.3 The power supply connection



4.4 Flowmeter output wiring

Four-wire 4-20mA current output



5. Installation

5.1 Installation Position

⚠ If the instrument is installed outdoors, the instrument sunshade should be added to avoid sunlight and rain.

🛇 Prohibit installation in strong vibration.

🛇 It is forbidden to be exposed to an environment containing a large amount of corrosive gas.

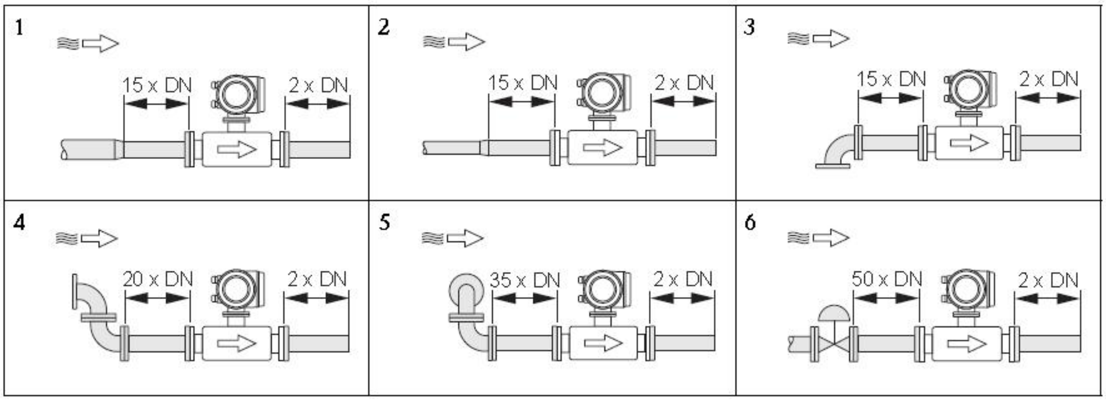
🛇 Do not share power with frequency converters, electric welders and other devices that pollute the power source. If necessary, install a clean power source for the converter.

5.2 Installation location and requirements for pipeline

1. When installing the instrument, keep away from elbows, obstacles, variable diameters, and valves to ensure a stable flow field. One side requires a longer upper limit straight pipe, the front straight pipe length is greater than 10D, and the rear straight pipe section length is greater than 5D. The following figure shows the length of straight pipe required for several situations frequently encountered on site:

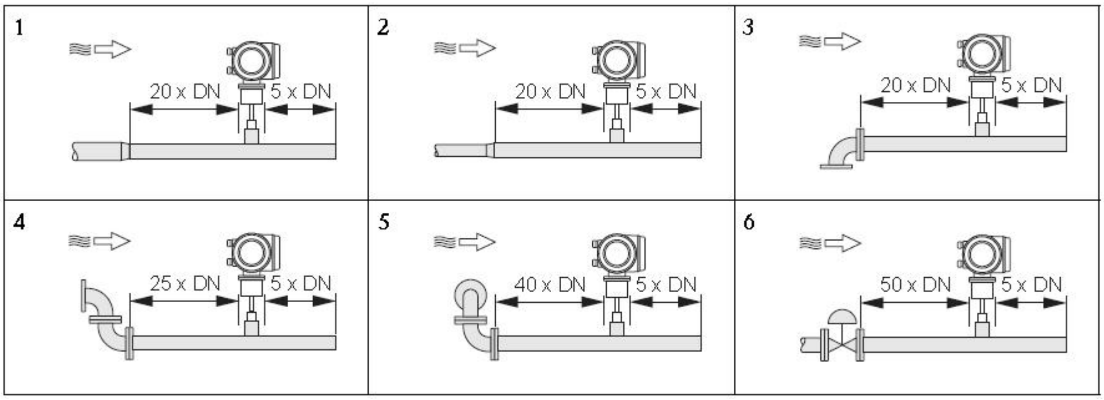
The minimum recommendations for inlet and outlet runs (without flow conditioner) are:

Flanged sensor



1 = Reduction, 2 = Expansion, 3 = 90° elbow or T-piece, 4 = 2 × 90° elbow, 5 = 2 × 90° elbow (3-dimensional), 6 = Control valve.

Insertion sensor



1 = Reduction, 2 = Expansion, 3 = 90° elbow or T-piece, 4 = 2 × 90° elbow, 5 = 2 × 90° elbow (3-dimensional), 6 = Control valve or pressure regulator.

A specially designed perforated plate flow conditioner can be installed if it is not possible to observe the inlet runs required.

5.3 Installation Steps

The base of thermal flowmeter

Figure5 The base of standard insertion type

No welding in explosive environment

Carry out the welding operation in accordance with the requirements of special environment.

When installing, place the base on the top of pipe, and make the through-hole of base be perpendicular to axis of pipe. The good welding location of base and welding process is as below.

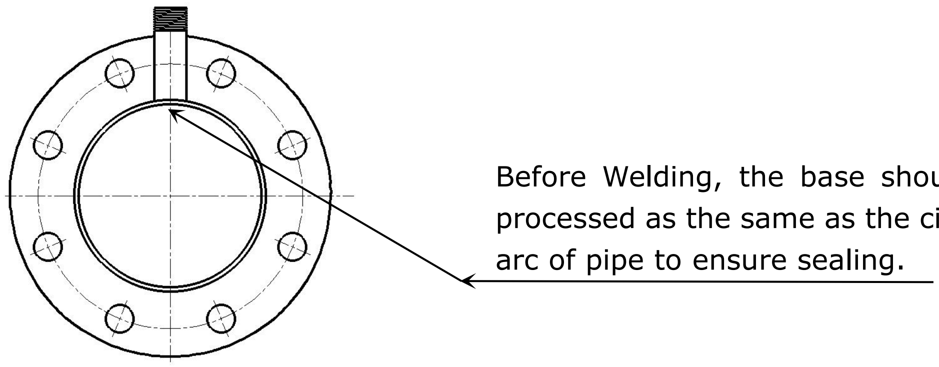


Figure6 Good welding location of base

Refer to Figure 3 (plug-in thermal gas mass flow meter)

1) Please confirm the actual inner diameter and wall thickness of the pipe before installing the plug-in thermal gas mass flowmeter.

2) Put the rest of the thermal gas mass flowmeter into the special ball valve together, and calculate the depth to be inserted according to the actual pipe inner diameter and wall thickness. In this step, you can insert a rough size and tighten the nut by hand.

3) Rotate the sensor connecting rod so that the marked arrow is the same as the flow direction of the medium.

4) Convert the corresponding scale on the sensor connecting rod according to the data measured on the spot, and then tighten the nut.

Refer to Figure 4 (full-tube thermal gas mass flow meter)

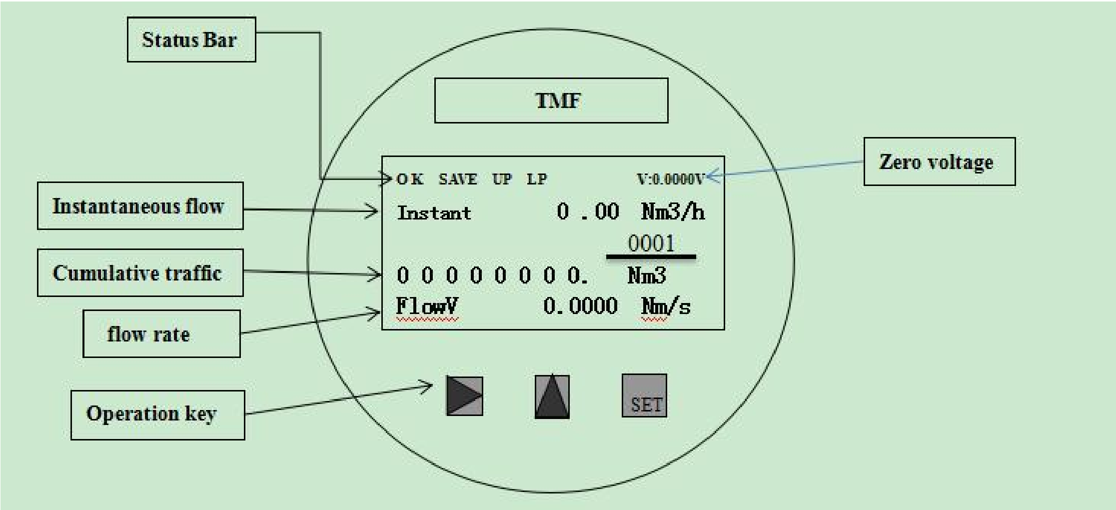
Please confirm again before pre-installation: the connection method of the pipe section, prepare the flange connection related items such as gaskets and bolts.

Production must be stopped before installation and the relevant regulations of the factory must be strictly followed.

The full-pipe type instrument has been correctly assembled with the sensor on the dedicated pipe section at the factory, and the user only needs to assemble the pipe to the site, so the on-site plug-in installation is simpler. First select the appropriate installation point on the pipeline, then cut the pipeline according to the length of the necessary matching pipe section, and install the corresponding flanges and bolts. Determine the fluid flow rate to be consistent with the flow rate mark marked on the full-tube thermal gas mass flow meter. And the display screen should be perpendicular to the horizontal plane, and the pipe axis should be parallel to the horizontal plane, and the error should not exceed ±2.5°. Finally, the instrument should be locked with bolts.

6. Operation and Programming

6.1 Main interface under working condition



The prompt line:

1. The meter will perform self-check after power on, if the meter is running normally, it will prompt OK.

2. Different units can be selected according to different needs, including: NL/h, t/m, Nm³/h, NL/m, t/h, kg/m, g/s, L/h, Nm³/m, kg/h, and many other units.

3. The maximum accumulated flow is an 8-bit integer, and it will be automatically reset to zero after exceeding it, and the accumulated number of times will be accumulated in the overflow flag in the common parameter query.

4. If the unit is changed during use, if it is not cleared to zero, the previous accumulated flow value will not automatically switch, but the accumulated value afterwards is after the change.

5. The instrument has three buttons. The main function of SHIFT is the shift function, which is the function of modifying the value. SET is the function of confirming the change. For specific use, please refer to the following introduction.

Note: Non-air media may require zero point calibration. Refer to page 15 for operation.

6.2 Parameters Setup

6.2.1 Main Menu

O K SAVE UP LP		V:0.0000V
Instant	0 .00	Nm3/h
		0001
0 0 0 0 0 0 0 0.		Nm3
Flow V	0. 0000	Nm/s

Under this interface，press （Shift） button to enter the setup menu;

6.2.2 Parameter setting main interface

Press (Shift Select Menu)key

1.Common Functions
2.Common parameters
3.Common parameters

Passwards:2010

In the main interface, press the SHIFT key to enter the main menu interface. You can use the SHIFT key to select the corresponding menu item and press the SET key to enter.

Frequently used function query does not require a password, the other two have to enter the password, press the SHIFT key to transfer to the corresponding menu item, then press SET to enable the password input, then press to adjust the password, and then the SET key to shift and confirm.

6.2.3 parameter setting

1.Common Functions
2.Common parameters
3.Common parameters

Passwards:2010

In the main interface, press the SHFIT key to enter the main menu interface. Press the SET key to move the cursor to the password, then press the ▲ key to change the corresponding password, and then press the SET key again to shift, and enter the password 2010 in sequence.

Language ： 0

Chinese

Language selection, to set the language of the setting and display interface, select by pressing the ▲ key, there are English and Chinese.

SET

Caliber

Calibration 080

Actual 00080

Equivalent pipe inner diameter, set the inner diameter of the pipe measured by the instrument, the square pipe needs to be converted into the equivalent inner diameter input. The unit is millimeters.

During the modification process, only need to change the actual column, do not change the calibration column at will

SET

Unit

Nm3/h

The final unit of the instrument is selected, and the unit can be adjusted by modifying the value behind the unit.

Mailing address

01

485 communication address, it is meaningful only if it is set on the instrument with 485 communication function.

Flow Coefficient
P/m3

01.000

The meter correction coefficient K, the coefficient defaults to 1, if you want to adjust the flow rate as a whole, you can adjust this position, and the final flow rate
Q=Q original*K

SET

Full flow

00001000.0000

Full-scale flow, mainly the maximum value corresponding to 20mA at 4-20mA output, does not affect the meter display

SET

Density

Kg/m3

01.000

The density of the medium is mainly used when calculating the mass flow rate of the medium.

SET

Conversion coeffient

01.000

Conversion coefficient, due to the air calibration used during calibration, flow conversion is required in actual use. The coefficient is obtained by experiment, and the conversion coefficient of common gases has been attached in the manual.

SET

Zero voltage

0.0000

The zero-point voltage value when the meter is in a static state, used to adjust the zero drift of the meter.

SET

Lower cut

000.0

The lower limit is cut off, and there is a part of the static flow caused by interference or other factors in the static state. By appropriately modifying this parameter, the flow rate lower than this parameter is not displayed.

Flow clear

clear

Clear the accumulated flow. In this interface, directly press the middle button to reset.

SET

Passward:

0000

The instrument password can be modified here. Press SET again to complete the setting and exit to the main interface.

SET

Sensor

000.0

The manufacturer's parameters cannot be modified when the customer uses them on site

SET

Factory date

00-00-00

Used to set the factory time

SET

Current Channel

flow

Current channel: you can choose the flow or flow rate corresponding to the 4-20mA full scale, pay attention to use with the full flow item

Press the set button again to return to the main interface

Steps to calibrate zero voltage value:

1. Install the instrument on the pipeline.

2. Close the back valve, and then open the front valve to fill the pipeline with the medium.

3. Press SHIFT on the main interface, then the menu interface appears

4. Press the SHIFT key to select common function query

5. Press the SET key to enter the display voltage value interface, as follows

Voltage： 0.6545V   Overflow flag：0

6. When the voltage value is stable, then press.

Note: Do not perform zero point calibration in any running state, otherwise the flow may be seriously inaccurate

Appendix 1 Troubleshooting and Repair

Fault	Cause	Solution
No display	1. No power supply	Get power supply
	2.SMPS is damaged	Get power supply, if the power indicator light is out, it means that the SMPS is damaged, Please contact supplier.
	3.The wirings of DC24V are reversed	Check the wirings, make the wirings right
	4.The position of LCD is wrong	Reinstall the LCD
	5.The LCD is damaged	Check the power indicator light. If the light is on, it means that the LCD is damaged. Please contact supplier
Low velocity	1.The wirings of sensor are reversed	Rewiring or reinstall the sensor
	2.The sensor is dirty	Clean sensor
	3.The sensor is damaged	Return to supplier
	4.Some parameters of flow setting are wrong	Check the parameters setting
Abnormal velocity and large fluctuation	1. Some parameters of velocity setting are wrong	Check the parameters setting
	2. Fluid properties is pulsating in turn	Adjust the system filter
	3. The sensor is dirty	Clean sensor
	4. The sensor is damaged	Return to supplier
Abnormal 4-20mA output	1. The setting of 20mA range is wrong	Right settings
	2.The Transmitter has fault	Return to supplier
	3.The connection is not a loop circuit	Check the connection
Abnormal frequency output	1. Some parameters of frequency setting are wrong	Right settings
	2. The Transmitter has fault	Return to supplier

	3.The connection cable is damaged	Check the connection
Abnormal alarm	1. Some parameters of setting are wrong	Right settings
	2.The meter has no alarm function	Contact supplier
	3.The relay is damaged	Return to supplier
Abnormal RS485 output	1. The settings of baud rate and address are wrong	Right settings
	2. The wirings are reversed	rewiring
	3. The connection cable is damaged	Check the connection

Appendix 2 The Density and Conversion Coefficient of Common Gas

According to different gas on site, the calibration in lab translates the flow rate of actual gas on site into flow rate of air, and then begins to calibrate the flow rate at present. Therefore, when using the meter on site, the meter displays mass flow or volume flow of actual gas.

When translating the flow rate of gas into flow rate of air, there is a conversion coefficient table of different gas.

Table 1 The Density and Conversion Coefficient of Common Gas

	Gas	Specific heat (Kal/g*℃)	Density (g/l, 0℃)	Conversion Coefficient
0	Air	0.24	1.2048	1.0000
1	Argon (Ar)	0.125	1.6605	1.4066
2	Arsine (AsH_3)	0.1168	3.478	0.6690
3	Boron Tribromide (BBr_3)	0.0647	11.18	0.3758
4	Boron Trichloride (BCl_3)	0.1217	5.227	0.4274
5	Boron Trifluoride (BF_3)	0.1779	3.025	0.5050
6	Borane (B_2H_6)	0.502	1.235	0.4384
7	Carbon Tetrachloride (CCl^4)	0.1297	6.86	0.3052

8	Carbon Tetrafluoride (CF_4)	0.1659	3.9636	0.4255
9	Methane (CH_4)	0.5318	0.715	0.7147
10	Ethylene (C_2H_4)	0.3658	1.251	0.5944
11	Ethane (C_2H_6)	0.4241	1.342	0.4781
12	Allylene (C_3H_4)	0.3633	1.787	0.4185
13	Propylene (C_3H_6)	0.3659	1.877	0.3956
14	Propane (C_3H_8)	0.399	1.967	0.3459
15	Butyne (C_4H_6)	0.3515	2.413	0.3201
16	Butene (C_4H_8)	0.3723	2.503	0.2923
17	Butane (C_4H_{10})	0.413	2.593	0.2535
18	Pentane (C_5H_{12})	0.3916	3.219	0.2157
19	Carbinol (CH_3OH)	0.3277	1.43	0.5805
20	Ethanol (C_2H_6O)	0.3398	2.055	0.3897
21	Trichloroethane ($C_3H_3Cl_3$)	0.1654	5.95	0.2763
22	Carbon Monoxide (CO)	0.2488	1.25	0.9940
23	Carbon Dioxide (CO_2)	0.2017	1.964	0.7326
24	Cyanide (C_2N_2)	0.2608	2.322	0.4493
25	Chlorine (Cl_2)	0.1145	3.163.	0.8529
26	Deuterium (D_2)	1.7325	0.1798	0.9921
27	Fluoride (F_2)	0.197	1.695	0.9255
28	Germanium Tetrachloride ($GeCl_4$)	0.1072	9.565	0.2654
29	Germane (GeH_4)	0.1405	3.418	0.5656
30	Hydrogen (H_2)	3.4224	0.0899	1.0040
31	Hydrogen Bromide (HBr)	0.0861	3.61	0.9940
32	Hydrogen Chloride (HCI)	0.1911	1.627	0.9940
33	Hydrogen Fluoride (HF)	0.3482	0.893	0.9940
34	Hydrogen Iodide (HI)	0.0545	5.707	0.9930
35	Hydrogen Sulfide (H_2S)	0.2278	1.52	0.8390
36	Helium (He)	1.2418	0.1786	1.4066
37	Krypton (Kr)	0..0593	3.739	1.4066
38	nitrogen (N_2)	0.2486	1.25	0.9940

39	Neon (Ne)	0.2464	0.9	1.4066
40	Ammonia (NH_3)	0.5005	0.76	0.7147
41	Nitric Oxide (NO)	0.2378	1.339	0.9702
42	Nitrogen Dioxide (NO_2)	0.1923	2.052	0.7366
43	Nitrous Oxide (N_2O)	0.2098	1.964	0.7048
44	Oxygen (O_2)	0.2196	1.427	0.9861
45	Phosphorus Trichloride (PCI_3)	0.1247	6.127	0.3559
46	Phosphorane (PH_3)	0.261	1.517	0.6869
47	Phosphorus Pentafluoride (PF_5)	0.1611	5.62	0.3002
48	Phosphorus Oxychloride ($POCI_3$)	0.1324	6.845	0.3002
49	Silicon Tetrachloride ($SiCI_4$)	0.127	7.5847	0.2823
50	Silicon Fluoride (SiF_4)	0.1692	4.643	0.3817
51	Silane (SiH_4)	0.3189	1.433	0.5954
52	Dichlorosilane (SiH_2CI_2)	0.1472	4.506	0.4095
53	Trichlorosilane ($SiHCI_3$)	0.1332	6.043	0.3380
54	Sulfur Hexafluoride (SF_6)	0.1588	6.516	0.2624
55	Sulfur Dioxide (SO_2)	0.1489	2.858	0.6829
56	Titanium Tetrachloride ($TiCI_4$)	0.1572	8.465	0.2048
57	Tungsten Hexafluoride (WF_6)	0.0956	13.29	0.2137
58	Xenon (Xe)	0.0379	5.858	1.4066

Appendix 3 Upper Range Value of Common Gas

(Unit: Nm^3/h. The follow table can be extended)

Nominal Diameter(mm)	**Air**	**Nitrogen（N_2）**	**Oxygen（O_2）**	**Hydrogen(H_2)**
15	65	65	32	10
25	175	175	89	28
32	290	290	144	45
40	450	450	226	70
50	700	700	352	110
65	1200	1200	600	185
80	1800	1800	900	280
100	2800	2800	1420	470
125	4400	4400	2210	700
150	6300	6300	3200	940
200	10000	10000	5650	1880
250	17000	17000	8830	2820
300	25000	25000	12720	4060
400	45000	45000	22608	7200
500	70000	70000	35325	11280
600	100000	100000	50638	16300
700	135000	135000	69240	22100
800	180000	180000	90432	29000
900	220000	220000	114500	77807
1000	280000	280000	141300	81120
1200	400000	400000	203480	91972
1500	600000	600000	318000	101520
2000	700000	700000	565200	180480

Flow range				
Nominal Diameter (mm)	**Air（Nm³/h）**	**Extended range**	**Oxygen（O2）**	**Combustible gas**
10	0.5-28	0.03-30	0.5-14	0.5-5
15	0.5-65	0.07-65	0.5-32	0.5-10
20	0.5-100	0.12-110	0.5-55	0.5-20
25	0.5-175	0.18-180	0.5-89	0.5-28
32	0.5-290	0.3-290	0.5-144	0.5-45
40	0.5-450	0.5-450	0.5-226	0.5-70
50	1-600	0.5-700	0.7-352	0.7-110
65	1.5-1000	1-1200	1.2-600	1.2-185
80	2-1500	1.5-1800	2-900	2-280
100	3-2300	3-2800	3-1420	3-470
125	4.5-3500	4-4400	4.5-2210	4.5-700
150	6.5-5200	6-6300	6.5-3200	6.5-940
200	12-9000	12-11500	12-5650	12-1880
250	18-14500	18-17500	18-8830	18-2820
300	25-21000	25-25000	25-12720	25-4060
350	35-28000	35-34500	35-17000	35-5600
400	45-36500	45-45000	45-22600	45-7200
450	60-46500	60-57000	60-29000	60-9200
500	70-57000	70-70000	70-35300	70-11280
600	100-81000	100-101000	100-50600	100-16300
700	140-110000	140-138000	140-69000	140-22100
800	180-150000	180-180000	180-90000	180-29000
900	230-185000	230-230000	230-115000	230-36500
1000	290-230000	290-280000	290-140000	290-45500
2000	1150-900000	1150-1130000	1150-560000	1150-185000

The flow rate in standard condition: The flow rate is in the condition of 20℃ temperature and 101.325kPa pressure.

The unit of flow rate is optional: Nm^3/h, Nm^3/min, L/h, L/min, t/h, t/min, kg/h or kg/min.

The reduction formula of flow rate in working condition and flow rate in standard condition:

$$Q_s = \frac{0.101325 + p}{0.101325} * \frac{273.15 + 20}{273.15 + t} * Q_n$$

Flow velocity calculation formula :

$$V = Q/(\pi * (\frac{D}{2}/1000)^2)/3600$$

Q_s: The flow rate in standard condition (Nm^3/h).

Q_n: The flow rate in working condition (m^3/h).

T: The medium temperature in working condition (℃).

P: The medium pressure in working condition (Gauge pressure, MPa).

V: Medium standard condition flow rate (Nm/s)

Q: Standard state flow rate (Nm^3/h)

D: Measuring pipe diameter (mm)