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Thermal Gas Mass Flow Meter

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1. Overview

The thermal gas mass flow meter is designed based on the principle of thermal diffusion, which uses the constant temperature difference method to accurately measure the gas. The utility model has the advantages of small volume, high digitization degree, convenient installation and accurate measurement.

The sensor part consists of two reference grade platinum resistance temperature sensors. When the instrument is working, one sensor continuously measures the medium temperature T1; the other sensor self-heats to the medium temperature T2, which is used to sense the fluid flow rate, called the speed. sensor. The temperature ΔT=T2-T1, T2>T1, when there is fluid flowing, the gas molecules collide with the sensor and take away the heat of T2, so that the temperature of T2 is lowered. To keep ΔT unchanged, it is necessary to increase T2. The supply current, the faster the gas flow rate, the more heat is removed, and the gas flow rate and the added heat have a fixed function relationship. This is the principle of constant temperature difference.

$$V = \frac{K\left[Q / \triangle T\right]^{1.87}}{\rho_g} \qquad \text{.....(1)}$$

Among them ρ_g— Fluid specific gravity (related to density)

V — Flow rate

K — Balance factor

Q — Heating amount (related to specific heat and structure)

ΔT — Temperature difference

Since the temperature of the sensor is always automatically higher than the medium temperature by about 30℃, the thermal gas flow meter does not require temperature compensation in principle.

Thermal gas mass flow meter for medium temperature range is -40-450℃。

(1) Fluid specific gravity and density

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

among them

ρ_g — Dielectric density under working conditions (kg/m^3)

ρ_n — Medium density under standard conditions (101.325 Kpa、20℃) (kg/m^3)

P — Working condition pressure (kPa) T — Working temperature (℃)

It can be seen from equations (1) and (2) that the relationship between flow rate and operating pressure, gas density, and operating temperature has been determined.

The constant temperature differential heat mass flow meter is not only affected by temperature, but also is not affected by pressure. The thermal gas mass flow meter is a true direct mass flow meter, and the user does not have to correct the pressure and temperature.

2. Features:

- Thermal gas mass flow meters have the following technical advantages:
- The real mass flow meter does not require temperature and pressure compensation for gas flow measurement, and the measurement is convenient and accurate. A mass flow rate of the gas or a standard volume flow can be obtained.
- Wide range ratio, can measure gas flow rate up to 120Nm / s down to 0.1Nm / s, can be used for gas leak detection.
- The seismic performance is good and the service life is long. The sensor has no moving parts and pressure sensing parts and is immune to the influence of vibration on the measurement accuracy.
- Easy to install and maintain. Non-stop production installation and maintenance can be achieved where field conditions permit. (requires special customization)
- Digital design. The overall digital circuit measurement, accurate measurement and convenient maintenance.
- RS-485 communication enables factory automation and integration.

- Oxygen, nitrogen, hydrogen, chlorine and multi-component gas measurements.
- blast furnace gas, coke oven gas measurement.
- Gas flow measurement of natural gas, liquefied gas, flare gas, etc.
- Primaryand secondary air flowmeasurements of blast furnaces in thepower plant.
- Flow measurement of downhole ventilation or exhaust system in Yanzhou Mine.
- Flue gas measurement.
- Compressed air measurement.

3.Technical performance

performance	Technical Parameters	
structure type	Plug-in	Pipeline
Measuring medium	Common steady-state gases (unstable media such as acetylene and boron trichloride are not measurable)	
Pipe diameter range	DN65～4000mm	DN15～2000mm
Flow rate range	0.1～120Nm/s	
Accuracy	±1～2.5%	
Operating temperature	sensor：-40～+450℃ converter：-20～+45℃	
Working pressure	Medium pressure≤4.0MPa(≥4.0MPa Agreement supply)	Medium pressure≤1.6MPa(≥4.0MPa Agreement supply)
Power supply	(DC 24V)>=12W	
Responding speed	1s	
Output signal	4-20mA(1500V Optical isolation, Maximum load500ohm) ,RS-485(1500V Optical isolation)	

Call the police	1-2 normally open contacts	
Type of supply	Integrated structure	
Pipe material	Carbon steel, stainless steel, plastic, etc.	
Live display	Four-line LCD display	
Display content	Mass flow rate, standard volume flow rate, cumulative flow rate, standard flow rate, etc.	
Protection level	IP65、IP67、IP68	
Sensor material	stainless steel	Stainless steel, carbon steel

4. Pipe and plug-in structure dimensions

4.1 Flange mounting size Unit: mm

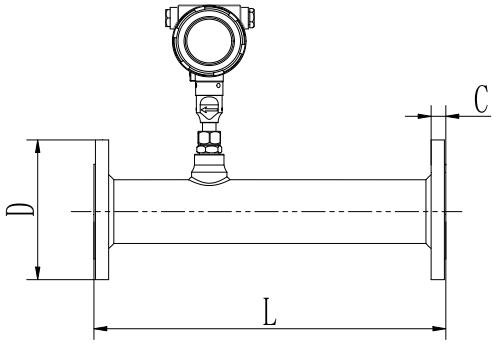


Figure 1

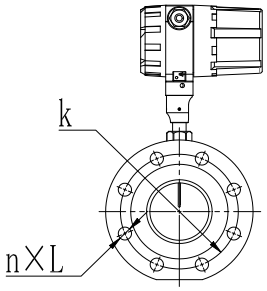


Figure 2

GB/T9119-2000 PN1.6Mpa(16bar) Flat, protruding panel flat welded steel pipe flange

Nominal diameter	Flange outer diameter	Center hole diameter	Screw hole	Thread specification	Flange thickness	Instrument installation length
DN	D	K	n*L		C	L
15	95	65	4*14	M12	12	160
20	105	75	4*14	M12	14	160
25	115	85	4*14	M12	14	160
32	140	100	4*18	M16	16	160
40	150	110	4*18	M16	16	180
50	165	125	4*18	M16	18	180
65	185	145	4*18	M16	20	180
80	200	160	8*18	M16	20	180
100	220	180	8*18	M16	20	200
125	250	210	8*18	M16	20	200
150	285	240	8*22	M20	22	200
200	340	295	12*22	M20	22	200
250	405	355	12*26	M24	24	200
300	460	410	12*26	M24	24	200

4.2 Card mounted mounting size Unit: mm

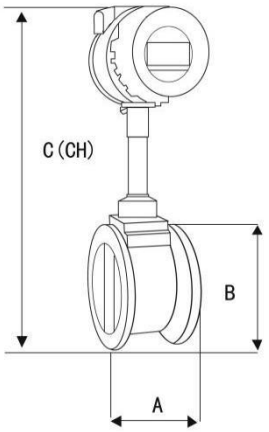


Figure 3

Caliber DN	B	C (CH)	A
15-25	55	390(455)	70
32	55	390(455)	70
40	80	385(440)	85
50	90	390(450)	85
65	105	400(470)	85
80	120	420(480)	85
100	140	440(500)	85
125	165	465(530)	90
150	194	490(560)	100
200	248	545(610)	102
250	300	595(650)	115
300	350	645(710)	130

(1) For DN15 ~ DN80 can be used pipe thread connection.

(2) Only the maximum rated pressure data of 1.6Mpa is given in the table, and it can be customized above the rated pressure.

(3) The integral full tube can be flanged, threaded and snap-fit.

4.3 Plug-in mounting size Unit: mm

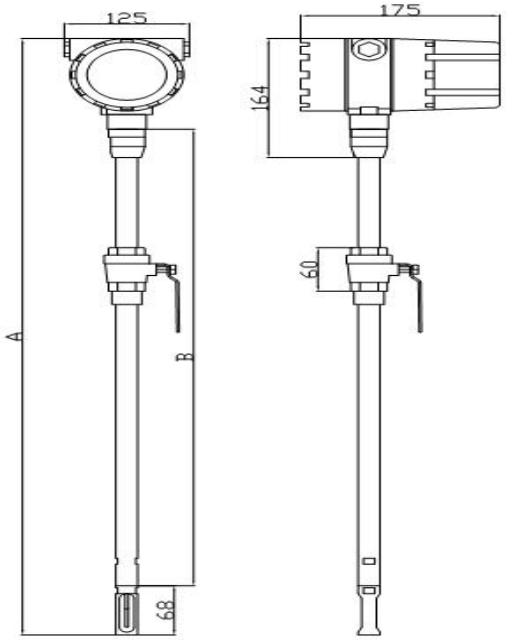


Figure 4

(1) The integral plug-in type should be inserted into the axis of the pipe to be tested, so the length of the measuring rod depends on the diameter of the measuring

pipe. It should be stated when ordering.

（2）If it cannot be inserted into the pipe axis, the factory will provide the calibration factor to complete the accurate measurement.

5.Option

1.The flow range

Thermal gas mass flow meter range table

caliber	Base range (air) （Nm^3/h）	Extended range (air)（Nm^3/h）	Oxygen base range（Nm^3/h）	Combustible gas range（Nm^3/h）
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

Note：

1）Determination of the upper and lower limits of the range：

A Determination of the lower limit: Since the lower limit of the thermal gas mass flow meter can measure extremely low flow rates, such as 0.1 Nm/s, it is not necessary

to consider the lower limit in the selection.

B Determination of the upper limit: Generally, the choice is higher, and there should be more than 20%. Because the actual flow is easy to estimate the error.

C Mixing gas range: For mixed gas, the user should give the molar ratio of the standard and the mixed gas (the percentage of each component to the total flow), and then the range is determined by the manufacturer. It is usually calibrated with air and then multiplied by a conversion factor.

D Explosion-proof product upper limit: 1) the maximum flow rate is preferably less than 17m/s.

2) Standard state flow: flow at a temperature of 20 ° C and a pressure of 101.325 KPa.

3) The unit of instantaneous flow rate can be Nm3/h, Nm3/min, L/h, L/min, t/h, t/min, kg/h and kg/min.

4) Conversion of working condition flow and standard condition flow:

$$Q_{\text{Standard condition}} = \frac{101.325 + P}{101.325} \times \frac{273.15 + 20}{273.15 + T} Q_{\text{Working condition}}$$

$Q_{\text{Standard condition}}$: Standard state flow ($Nm^3/h$)

$Q_{\text{Working condition}}$: Working condition flow (m^3/h)

T: Working medium temperature (℃)

P: Working medium pressure (gauge pressure KPa)

5) Flow rate calculation formula

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

V: medium standard flow rate (Nm/S) Q: standard state flow (Nm3/h) D: measuring pipe diameter (mm)

6. Installation

6.1 Cable installation method

Terminal block description and wiring method:

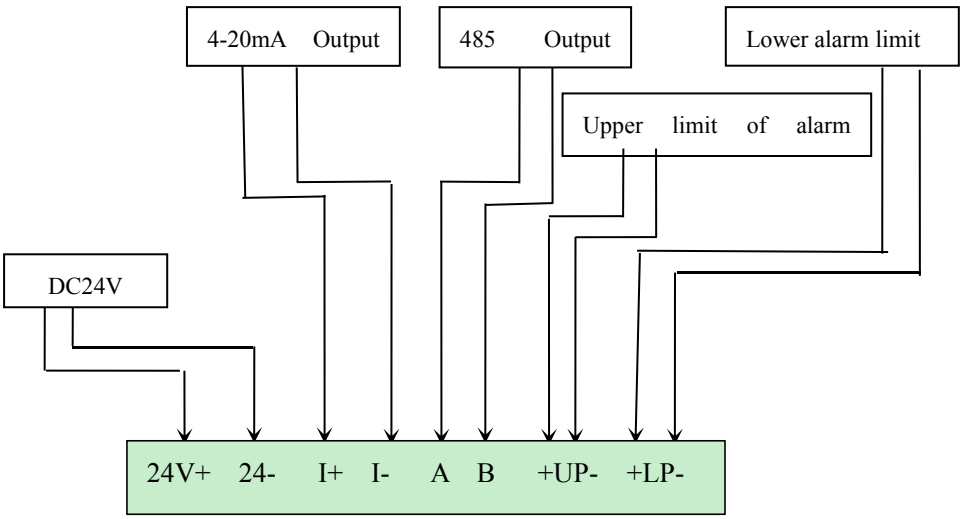


Figure 5

6.2 Field instrument installation

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

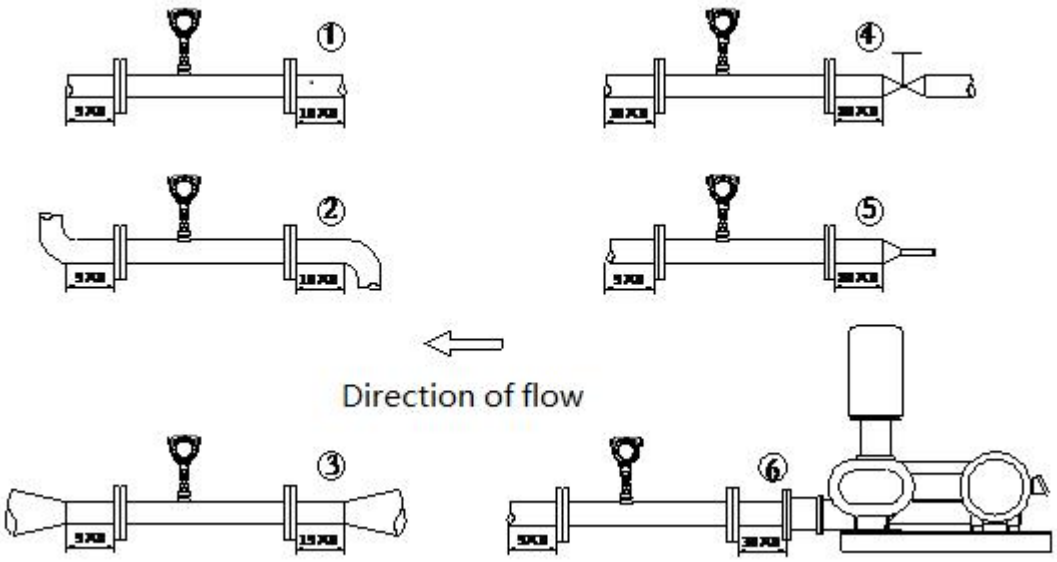
Do not install in places subject to strong vibration.

Do not expose to an environment containing a large amount of corrosive gases.

Do not share the power supply with equipment that pollutes the power supply such as inverters or welders. If necessary, install a clean power supply for the converter.

6.2.1 Installation location and requirements for piping

(1) When installing the instrument, keep away from elbows, obstacles, reducers, and valves to ensure a stable flow field. On the other side, a long upper straight pipe is required. The front straight pipe length is greater than 10D, and the rear straight pipe length is long. More than 5D. The following figure shows the length of the straight pipe required for several situations that are often encountered in the field:



Straight pipe section before and after installation

Figure 6

Pipe installation type	Serial number	Front straight pipe	Straight pipe section	
Horizontal Pipe	1	10D	5D	
Bent pipe	2	10D	5D	
Head tube	3	15D	5D	
Downstream of the valve	4	20D	5D	
Shrink tube	5	20D	5D	Medium pressure≤ 4MPa
Downstream of the pump	6	30D	5D	
Responding speed	1s			
Output signal	4-20mA(photoelectric isolation, maximum load500Ω)、RS-485(lightning protection)			
Alarm	1-2 normally open contacts、24V/0.5A			
Structure type	Plug-in and pipeline			
Type of supply	Split structure, integrated structure			
Pipe material	Carbon steel, stainless steel, plastic, etc.			
Live display	Four-line LCD display			
Display content	Mass flow rate, standard volume flow rate, cumulative flow rate, standard flow rate, etc.			
Protection level	IP65、IP67、IP68			
Sensor material	Stainless steel, carbon steel			

（2）When the site can not meet the requirements of the straight pipe section, the gas rectifier can be connected in series to greatly reduce the requirements for the straight pipe section.。

7. Debugging and running

7.1. Main interface under working status (as shown below)

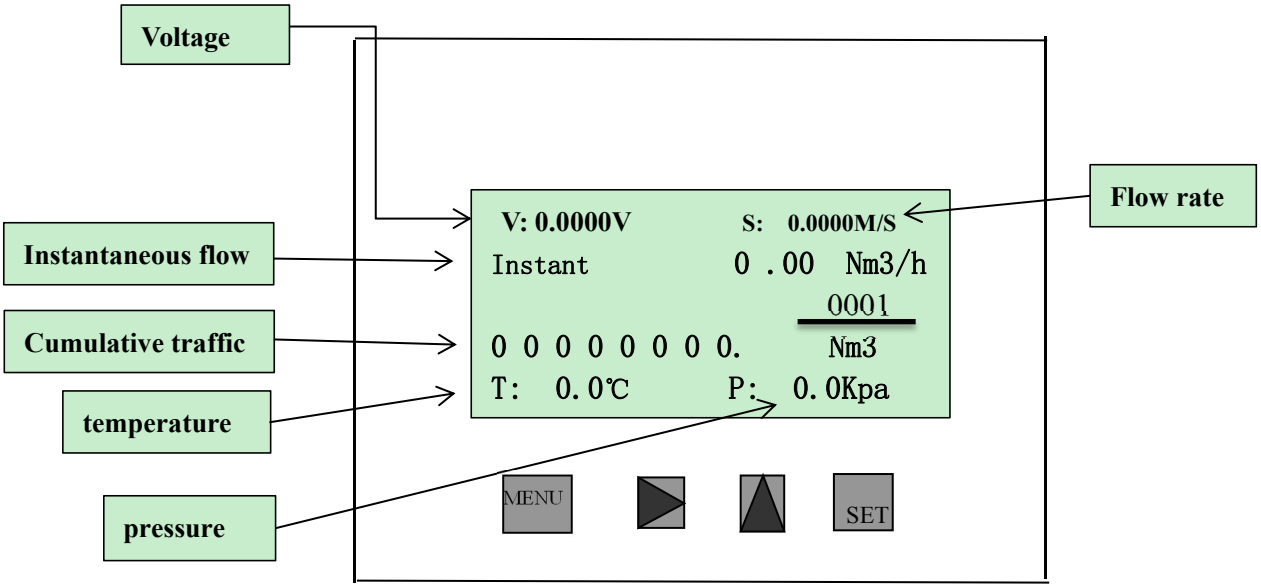


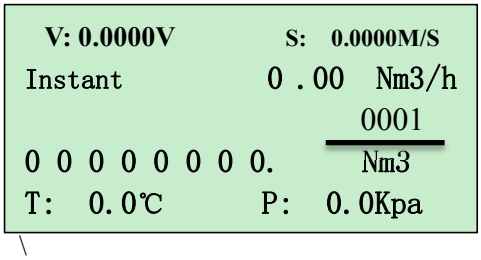
Figure 8

Prompt line:

The instrument uses the buttons to set the parameters. Generally, you need to use the buttons to manually set some parameters during installation. The meter has three buttons, from left to right, B1, B2, B3 and B4. Normally, B4 is the key to return to the main menu (can be returned under any menu), B1 is the shift key, B2 addition key, B3 confirm save and page change button, B3 is the confirm and shift button in the password menu.

7.2.Parameter settings

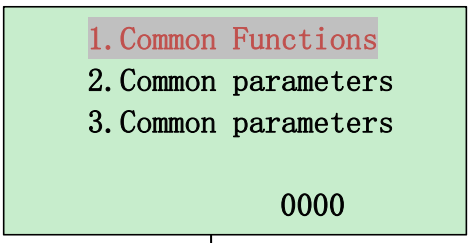
7.2.1 Main page display



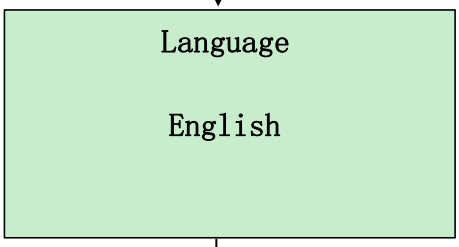
Under this interface , press (Shift) button to enter the setup menu;

7.2.2 Parameter setting main interface

Press (Shift Select Menu)key

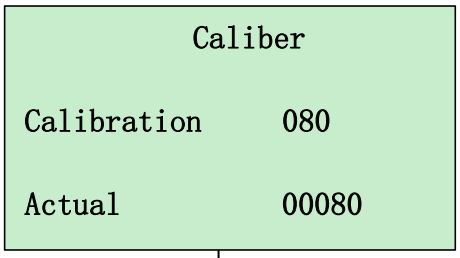


In the main interface, press to enter the main menu interface. You can use the shift keys to select the corresponding menu item and press SET to enter.

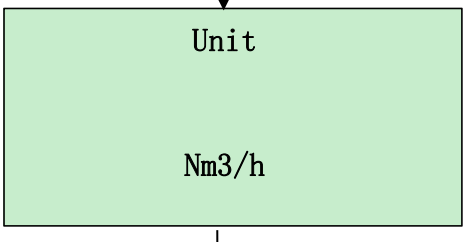


In the main menu of the main interface, press SET to enter the common menu interface. Press SET to save and go to the next menu, press to move the cursor position, and, to modify the parameters.

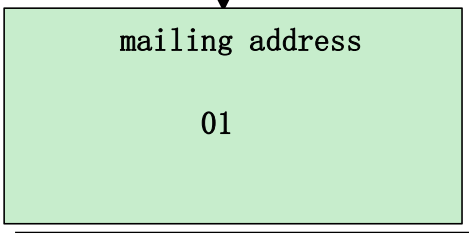
The default is English display.



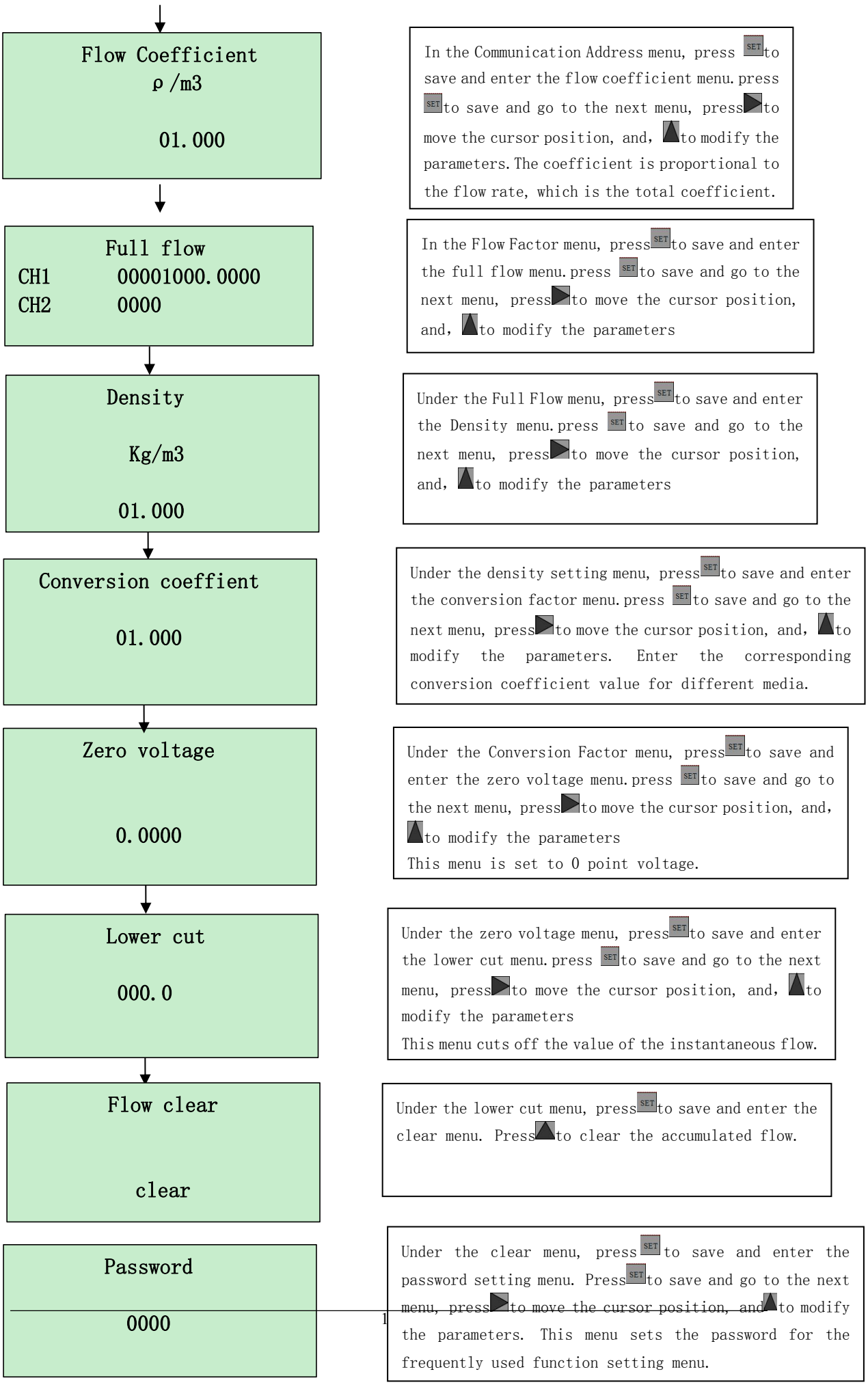
Under the language menu, press SET to save and enter the caliber menu. Press SET to save and go to the next menu, press to move the cursor position, and to modify the parameters.

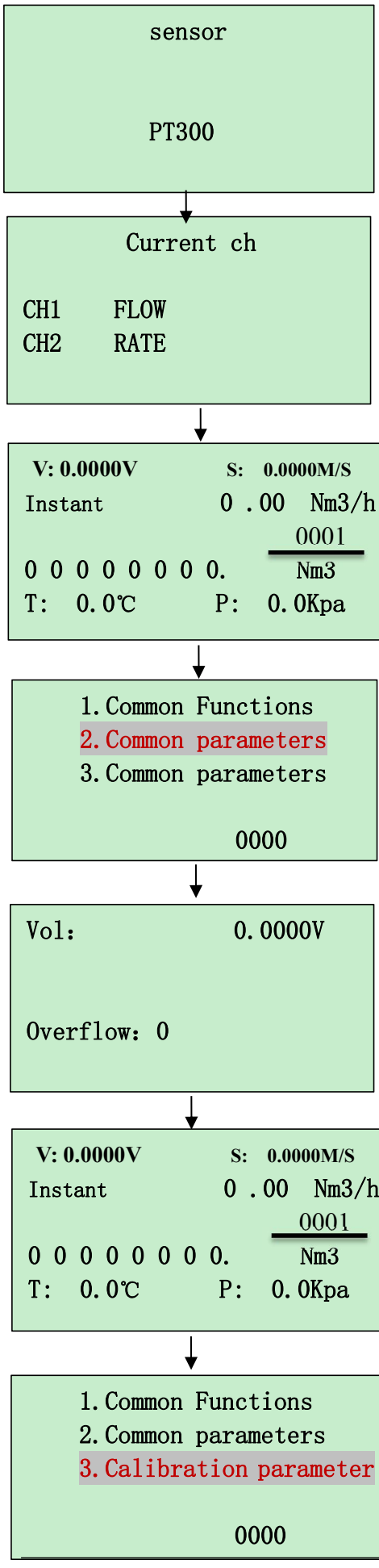


Under the caliber menu, press SET to save and enter the unit menu. Press SET to save and go to the next menu, press to move the cursor position, and, to modify the parameters.



Under the unit menu, press SET to save and enter the communication address menu. press SET to save and go to the next menu, press to move the cursor position, and, to modify the parameters.


Flow Coefficient
ρ /m3
01.000
In the Communication Address menu, press SET to save and enter the flow coefficient menu. press SET to save and go to the next menu, press ▶ to move the cursor position, and, ▲ to modify the parameters. The coefficient is proportional to the flow rate, which is the total coefficient.
Full flow
CH1 00001000.0000
CH2 0000
In the Flow Factor menu, press SET to save and enter the full flow menu. press SET to save and go to the next menu, press ▶ to move the cursor position, and, ▲ to modify the parameters
Density
Kg/m3
01.000
Under the Full Flow menu, press SET to save and enter the Density menu. press SET to save and go to the next menu, press ▶ to move the cursor position, and, ▲ to modify the parameters
Conversion coeffient
01.000
Under the density setting menu, press SET to save and enter the conversion factor menu. press SET to save and go to the next menu, press ▶ to move the cursor position, and, ▲ to modify the parameters. Enter the corresponding conversion coefficient value for different media.
Zero voltage
0.0000
Under the Conversion Factor menu, press SET to save and enter the zero voltage menu. press SET to save and go to the next menu, press ▶ to move the cursor position, and, ▲ to modify the parameters
This menu is set to 0 point voltage.
Lower cut
000.0
Under the zero voltage menu, press SET to save and enter the lower cut menu. press SET to save and go to the next menu, press ▶ to move the cursor position, and, ▲ to modify the parameters
This menu cuts off the value of the instantaneous flow.
Flow clear
clear
Under the lower cut menu, press SET to save and enter the clear menu. Press ▲ to clear the accumulated flow.
Password
0000
Under the clear menu, press SET to save and enter the password setting menu. Press SET to save and go to the next menu, press ▶ to move the cursor position, and ▲ to modify the parameters. This menu sets the password for the frequently used function setting menu.



Under the password setting menu, press the SET key to save and enter the sensor setting menu. Press SET to save and enter the next menu, press ▶ to move the cursor position, and ▲ to modify the parameters. This menu sets the sensor, just select the corresponding sensor.

Under the sensor menu, press the SET key to save and enter the current channel setting menu. Press SET to save and enter the next menu, press ▶ to move the cursor position, and ▲ to modify the parameters. This menu sets the corresponding parameters of the current channel output, just select the corresponding parameters. Press SET in this menu to return to the main page.

In this interface, double-click to select the common parameter query.

In this interface, press SET to enter the common parameter query menu.

Under the Query menu, press SET to save and re-enter the main page display. Press ▲ to calibrate the zero point. Zero calibration is to calibrate the piping in a closed, non-ventilated condition. The overflow flag is 1 when the flow rate exceeds 100000000. When this bit is greater than 10, it is automatically cleared. When the accumulated flow is cleared, this bit is also cleared. Press SET under this menu to return to the main page.

In this interface, press three times to select the calibration parameter settings.

In this interface, press SET to enter the calibration parameter password input.

Appendix 1 Troubleshooting

Problem	Possible causes	Processing method
No display	1. No power transmission	Turn on the power
	2. The instrument switch power module is damaged	Turn on the 220VAC power supply, the power indicator is off, indicating that the switch power supply is damaged.
	3.DC24V power supply reverse	Detect power polarity
	4. The display is inserted	Re-inserted display
	5. Display damage	Check the display
Low flow rate	1. The probe direction is reversed	Properly install the probe orientation
	2. The sensor is dirty	Cleaning sensor
	3. Sensor damage	Return to supplier
	4. The flow parameter setting is incorrect.	Check parameter settings
Abnormal flow rate and large fluctuation	1. The flow rate parameter is set incorrectly	Check flow rate parameter settings
	2. Fluid properties are pulsating turns	Adjust filter coefficient
	3. The sensor is dirty	Cleaning sensor
	4. Sensor damage	Return to supplier
4-20mA output is abnormal	1 20mA range setting is incorrect	Correctly set the 4MA 20mA range value
	2. Converter failure	Return to supplier
	3. Wiring is not looped	Check wiring
Alarm output is abnormal	1. The instrument parameters are set incorrectly	Correct setting of alarm parameters
	2. The meter is not configured with alarm output function	Contact Supplier
	3. Normally open electric shock damage	Return to supplier
RS-485 output is abnormal	1. Is the baud rate correct for 9600?	Correct input
	2. Polarity reverse	Change polarity
	3. Cable damage	Check the connection line
Inaccurate traffic	On-site media changes, especially hydrogen,	Enter the common parameter query to reset the zero point.
	Causes the zero voltage to change.	Then modify the total coefficient according to the customer experience value
		Or modify the coefficient in segments.

Appendix 2 Table of Density and Relative Air Conversion Coefficient of General Gases

At present, the laboratory cannot calibrate the mass flow according to the gas actually used by the user, and usually performs calibration according to the flow rate of the actual use gas of the user into the flow of the air. When the user is in use, the direct output shows the mass flow or volume flow of the actual gas used.

The conversion of different gases is carried out by means of a conversion factor, and the conversion coefficient of a single component gas can be checked. As shown in the following table:

0	Air	**0.24**	**1.2048**	1. 0000
1	Argon Ar	**0.125**	**1.6605**	1. 4066
2	Arsenic AsH3	**0.1168**	**3.478**	0. 6690
3	Boron tribromide BBr3	**0.0647**	**11.18**	0. 3758
4	Boron trichloride BCl3	**0.1217**	**5.227**	0. 4274
5	Boron trifluoride BF3	**0.1779**	**3.025**	0. 4384
6	Borane B2H6	**0.502**	**1.235**	0. 5050
7	Carbon tetrachloride CCl4	**0.1297**	**6.86**	0. 3052
8	Carbon tetrafluoride CF4	**0.1659**	**3.9636**	0. 4255
9	Methane CH4	**0.5318**	**0.715**	0. 7147
10	Acetylene C2H2	**0.4049**	**1.162**	0. 5775
11	Ethylene C2H4	**0.3658**	**1.251**	0. 5944
12	Ethane C2H6	**0.4241**	**1.342**	0. 4781
13	Propyne C3H4	**0.3633**	**1.787**	0. 4185
14	Propylene C3H6	**0.3659**	**1.877**	0. 3956
15	Propane C3H8	**0.399**	**1.967**	0. 3459
16	Butyne C4H6	**0.3515**	**2.413**	0. 3201
17	Butene C4H8	**0.3723**	**2.503**	0. 2923
18	Butane C4H10	**0.413**	**2.593**	0. 2535
19	Pentane C5H12	**0.3916**	**3.219**	0. 2157
20	Methanol CH3OH	**0.3277**	**1.43**	0. 5805
21	Ethanol C2H6O	**0.3398**	**2.055**	0. 3897
22	Trichloroethane C3H3Cl3	**0.1654**	**5.95**	0. 2763
23	Carbon monoxide CO	**0.2488**	**1.25**	0. 9940
24	Carbon dioxide CO2	**0.2017**	**1.964**	0. 7326
25	Cyanide gas C2N2	**0.2608**	**2.322**	0. 4493
26	Chlorine Cl2	**0.1145**	**3.163.**	0. 8529
27	Helium D2	**1.7325**	**0.1798**	0. 9921
28	Fluorine gas F2	**0.197**	**1.695**	0. 9255
29	Neodymium tetrachloride GeCl4	**0.1072**	**9.565**	0. 2654
30	Decane GeH4	**0.1405**	**3.418**	0. 5656
31	Hydrogen H2	**3.4224**	**0.0899**	1. 0040
32	Hydrogen bromide HBr	**0.0861**	**3.61**	0. 9940

33	Hydrogen chloride HCl	**0.1911**	**1.627**	0. 9940
34	Hydrogen fluoride HF	**0.3482**	**0.893**	0. 9940
35	Hydrogen iodide HI	**0.0545**	**5.707**	0. 9930
36	Hydrogen sulfide H2S	**0.2278**	**1.52**	0. 8390
37	Helium He	**1.2418**	**0.1786**	1. 4066
38	Helium Kr	**0..059 3**	**3.739**	1. 4066
39	Nitrogen N2	**0.2486**	**1.25**	0. 9940
40	Helium Ne	**0.2464**	**0.9**	1. 4066
41	Ammonia NH3	**0.5005**	**0.76**	0. 7147
42	Nitric oxide	**0.2378**	**1.339**	0. 9702
43	Nitrogen dioxide	**0.1923**	**2.052**	0. 7366
44	Nitrous oxide	**0.2098**	**1.964**	0. 7048
45	Oxygen O2	**0.2196**	**1.427**	0. 9861
46	Phosphorus trichloride PCl3	**0.1247**	**6.127**	0. 3559
47	Phosphine PH3	**0.261**	**1.517**	0. 6869
48	Phosphorus pentafluoride PF5	**0.1611**	**5.62**	0. 3002
49	Phosphorus oxychloride POCl3	**0.1324**	**6.845**	0. 3002
50	Silicon tetrachloride SiCl4	**0.127**	**7.5847**	0. 2823
51	Silicon tetrafluoride SiF4	**0.1692**	**4.643**	0. 3817
52	Silane SiH4	**0.3189**	**1.433**	0. 5954
53	Dichlorosilane SiH2Cl2	**0.1472**	**4.506**	0. 4095
54	Trichlorosilane SiHCl3	**0.1332**	**6.043**	0. 3380
55	Sulfur hexafluoride SF6	**0.1588**	**6.516**	0. 2624
56	Sulfur dioxide SO2	**0.1489**	**2.858**	0. 6829
57	Titanium tetrachloride TiCl4	**0.1572**	**8.465**	0. 2048
58	Tungsten hexafluoride WF6	**0.0956**	**13.29**	0. 2137
59	Helium Xe	**0.0379**	**5.858**	1. 4066

Appendix3 Common gas range upper limit(Nm^3/h)(the table below can be expanded)

Caliber (mm)	air	Nitrogen	Oxygen	Hydrogen
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

Appendix 4 Thermal Mass Flowmeter Selection Table

Thermal gas mass flow meter selection table

Spectrum								Description
TMF								Thermal gas mass flow meter
Nominal diameter	× × ×	3 digits, see attached table						Nominal diameter
Connection method		F	Fully tubular only					Flange connection
		K	Fully tubular only					Flange card type
		J	Insert type only					Simple insertion type
		Q	Insert type only					Ball valve insertion type
		L	Fully tubular only					Threaded type
		G	Fully tubular only					Clamp connection type
Pressure Level			A					1.6MPA
			B					2.5MPA
			C					4.0MPA
			D					6.3MPA
			E					其他
proper temperature				A				-40~200℃
				B				-40~450℃
Explosion proof					P			normal type
					B			Explosion-proof
output signal						1		4~20mA current output
						2		RS-485 communication
Selection Description	For example: TMF100FAAP1 full-tube type thermal gas mass flow meter, the diameter is DN100, flange type connection, nominal pressure 1.6MPa, maximum temperature 200 degrees, normal type, 4-20mA current signal output.							

coding	010	015	020	025	032	040	050	065	080	100	125	150	200	250	300
Nominal diameter	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300
coding	350	400	450	500	600	700	800	900	A10	A12	A14	A16	A18	A20	A22
Nominal diameter	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2200