

SINCERITY

Beijing Sincerity Automatic Equipment CO., LTD
DMF-1 Series Thermal Mass Flow Meter

Address: Block A, Territory Office, No. 13 District, Beiyuan Road,
Chaoyang District, Beijing, China.
No.8 building, 3rd district, Gaolizhang road, Haidian District,
Beijing, China.

Zip Code: 100107 100095

Fax: +86 (010) 62469399

Tel: +86 (010) 62469399

Contact: Ms. Zoe Pan

Cellphone/ WhatsApp: +86-18600270515

Email: zoe.pan@bjsincerity.com

Web: www.bjsincerity.en.alibaba.com



Thank you for choosing Beijing Sincerity
Your Satisfaction Our Priority
 We address your concerns and find you solutions.

Beijing Sincerity Automatic Equipment CO., LTD is a Joint Venture, reformed from Sinopec and Capital Technology Group in 1999, specializing in the product lines of Coriolis Mass Flow Meter, Density Meter. We also undertake measure related automatic control system, loading and unloading control system. Our company continuously research and develop to keep our products with cutting-edge technology. We dedicate to find the best solution to meet the customer's need, with more focused design we reset the bar for what reliability means in the industry. Our products have been widely used in petrochemical, metallurgical, mining (both stone and sand), pharmaceutical, construction materials, food industry, aircraft, marine construction ,reservoir loading and unloading docks, etc.



DMF-1 Series Thermal Mass Flow Meter

SINCERITY

Contents

Overview	3
Introduction	5
Technical Parameters	8
Cable Connection Methods	9
On-site Instrument Installation	10
Calibration and Operation	13
Parameter Setting	13
Appendix 1	15
Appendix 2	17
Appendix 3	18
Appendix 4	19
Case Application	20
Communication Protocol	21

Company Continuously Pursuits

Efficient customer responses: 24/7 to serve our valuable customer with efficient solution.

We listen to your issue and we find you suitable solution to meet and exceed your expectation.

Quality control system: Each process during manufacturing can be traced, to ensure our high performance products in your hands

Please let us know your challenge...



Beijing Sincerity will provide you the perfect solution to your problems.
 We shall provide you with the most suitable product and most up to date
 technology to support your demands.

Overview

DMF-1-980 Series Thermal Gas Mass Flow Meter is designed based on the thermal diffusion principle. The meter uses the constant temperature difference method to accurately measure of the gas medium. It has the advantages of small size, high digitization, easy 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 above the medium temperature T2. It is used to sense the fluid flow rate, which is called speed sensor. The temperature $\Delta T = T2 - T1$ and $T2 > T1$. When fluid flows, the temperature of T2 drops because the gas molecules collide with the sensor and take away the heat of T2. To maintain ΔT constant, T2 power current should be increased. As the gas flow rate increases more heat will be taken away, the gas flow rate and there is a fixed functional relationship between the gas flow rate and the increased heat. This is the principle of constant temperature difference.



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

ρ_g — Fluid Specific Gravity (related to density, SG)

V — Velocity

K — Coefficient of Balance

Q — Added Heat Amount (Specific heat and structure related)

ΔT — Difference in Temperature

Since the sensor temperature is always about 30°C higher than the temperature of the medium (ambient), the thermal gas flow meter does not require temperature compensation in principle.

Thermal gas mass flow meter is suitable for the medium temperature range of -40-220 °C.

(1) Fluid specific gravity and density are related

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

ρ_g — Medium density under operating conditions (kg/m³)

ρ_n — Density of the medium under standard conditions (101.325 Kpa, 20°C) (kg/m³)

P — Operation Pressure (kPa)

T — Operation Temperature

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

The constant-temperature differential gas mass flow meter is not affected by temperature and is not affected by pressure. The thermal gas mass flow meter is a true direct mass flow meter, and the user does not need to correct the pressure and temperature.

Introduction

Thank you for choosing our company. We independently researched and developed production of thermal gas mass flow meter, The thermal mass flow meter user's manual documents will guide you to use this product correctly and safely. This product is a gas flow measurement of precision electronic Instrument. In order to prevent damage to the instrument and to achieve the best performance and stable operation, please read this manual carefully before installation and debugging.



- ◆ After reading this manual, please keep it properly with this instrument.
- ◆ Please provide this manual to the user's technical department.
- ◆ This manual contains important information on danger, things that needs attention and other important classification.



Warning

Failure to observe this warning may result in personal injury or damage to this instrument and other property.



Danger

Failure to follow this warning may result in personal injury or death or major accidents.

The Following signs below can appear in the instructions below:



The figure on the left shows what could be dangerous;



The figure on the left shows the items that need attention;



The figure on the left shows what is prohibited.



Explosion-proof environment, the use of explosion-proof instruments to confirm the instrument nameplate identification of the explosion-proof certification and temperature group logo, without this logo can not be used for explosive atmosphere instrument.



Instrument explosion-proof temperature group must meet the site explosion-proof and temperature environmental requirements When there are applications where the requirements of explosion-proof, the explosion-proof temperature of the instrument to confirm the group, whether to meet the on-site explosion-proof, temperature requirements.



In Explosive environment it is not allowed to open the charged lid or temper with wiring operation, you must first disconnect the power before operation.




The degree of protection of the instrument to meet the requirements of field conditions Instrument protection level is in accordance with GB4208-93 (equivalent to IEC529) in the relevant requirements for testing and classification. The degree of protection required at the site should be lower or equal to the degree of protection of the instrument to ensure a good working environment of the instrument.





Confirm the type of power supply Users can choose two kinds of power supply for the meter power supply, AC 220V and DC + 24V (goods should indicate). Before installing the power must be confirmed that the type of power supply and instrument match.





Confirm the working environment of the instrument and the temperature of the medium The maximum design temperature of the environment and the medium of the instrument should be lower than the nominal value of the instrument (for the nominal value, refer to "Technical Parameters and Functions" in this manual)


 When the medium temperature is too high, it is forbidden to install and maintain the operation online. When the measuring medium temperature is higher than the human body withstand temperature or higher than the dangerous temperature, it should be shut down or cool down, reach the safe temperature and then operate, no conditions online Operation, operation should be discontinued, so as to avoid danger.

 Confirm instrument working environment Pressure and medium pressure The ambient pressure of the scene and the maximum design pressure of the medium should be lower than the nominal value of the instrument (see "Technical Parameters and Functions" in this manual for the nominal value).

 When the medium pressure is too high, it is forbidden to install and maintain the operation on-line. When the absolute pressure of the measuring medium is higher than 5 standard atmospheric pressure or higher than the dangerous pressure, it should be stopped or depressurized. When reaching the safety pressure, No conditions should be discontinued.

 Additional requirements for special media measurement Some gas media have special characteristics and require users to specify special types of products according to the actual situation on the site. Before installation, users should carefully check whether the product type meets the requirements of the site.

 When the medium is dangerous gas, prohibit the on-line installation and maintenance of the type of gas which may cause harm to the human body when measuring the medium. Prohibit the on-line installation and maintenance. Carry out the related safety treatment so that the scene conditions can be safely installed. No conditions for online operations should be discontinued operation, so as to avoid danger. Such gases as: gas chlorine and so on.

 Do not operate if there is something wrong with the instrument. If there is any problem with the instrument or if it is damaged, please contact our technician or qualified service personnel to inspect it.



Technical Parameters

Thermal gas mass flow meters have the following technical advantages:

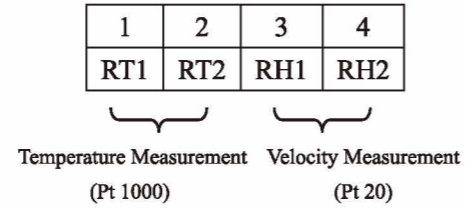
- ◆ True mass flow meter, does not require temperature and pressure compensation for gas flow measurement, easy and accurate measurement. Gas mass flow or standard volume flow can be obtained
- ◆ Wide range ratio, can measure gas flow rate up to 100Nm/s down to 0.1Nm/s gas, can be used for gas leak detection.
- ◆ Anti-seismic performance and long service life. The sensor has no moving parts and pressure sensing parts and is not affected by the vibration on the measurement accuracy.
- ◆ Easy installation and maintenance. With on-site conditions, installation and maintenance can be achieved without stopping production. (needs special customization)
- ◆ Digital design. Integral digital circuit measurement, accurate measurement and easy maintenance.
- ◆ Using RS-485 communication, or HART communication, can realize factory automation and integration

Property	Technical Parameters	
Structure Type	Insertion	Inline type
Medium	Various Gas (Excluding Acetylene Gas)	
Pipeline Parameter	DN50~4000mm	DN10-DN150
Flow Rate Range	0.1~120 Nm/s	
Accuracy	±1~2.5%	
Operation Temperature	Sensor: -40~+220℃ Transmitter: -20~+45℃	
Operation Pressure	Medium Pressure ≤ 2.5MPa	Medium Pressure ≤ 4.0MPa
Power Supply	DC 24V /500mA or AC220V≤ 18W	
Response Speed	1/s	
Output Signal	4-20mA(Optical-isolated, maximum load 500Ω) 、 Pulse 、 RS-485(Optical Isolation) 、 HART Protocol(Need Special Order)	
Alarm (special order required)	1-2road contact point of Electrical relays、 10A/220V/AC、 5A/30V/DC	
Supply Type	Separate (detach type)、 Single unit	
Pipe Material	Carbon steel, stainless steel, plastics, etc.	
Display	4 line, Chinese/English Display	
Display Content	Mass flow, nominal volume flow, cumulative flow, standard time, cumulative operating time, standard flow rate, etc.	
Protection Level	IP65	
Sensor Material	Stainless Steel	Stainless Steel

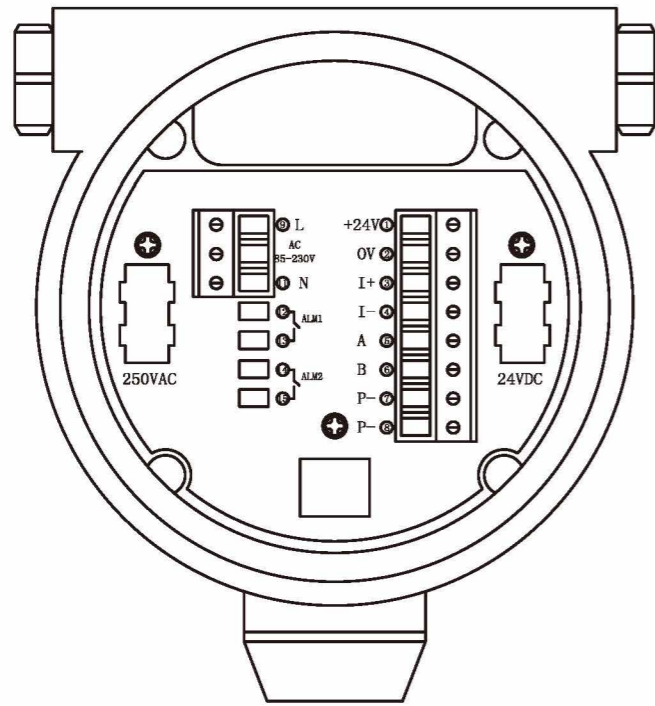
Cable Connection Methods

-  Do not operate with power.
-  Confirm power supply type.


1/ Sensor Terminal







2/ Terminal and Wiring Method



Wiring Instruction :

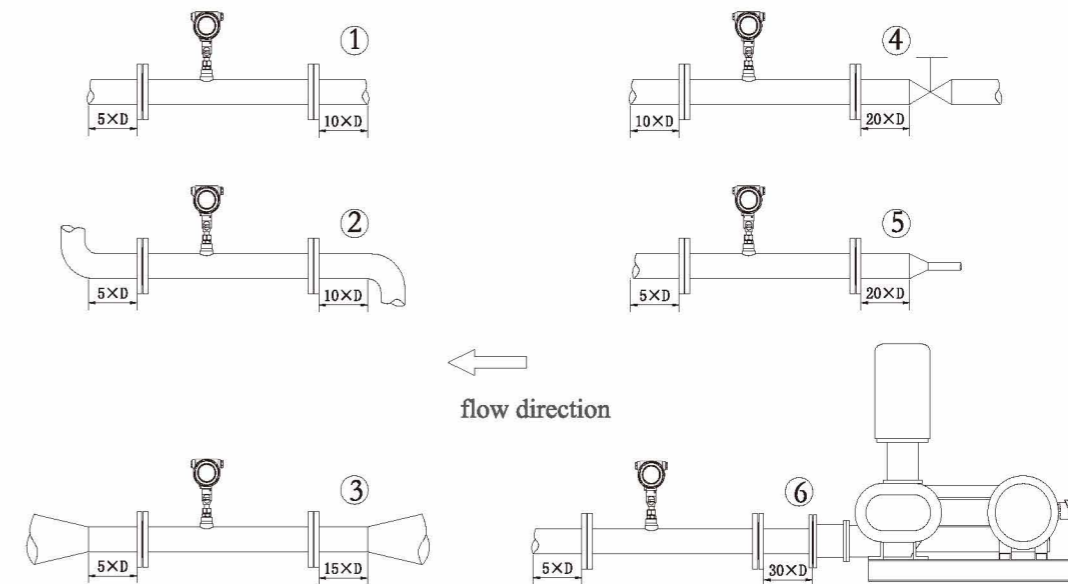
- 24V+/- 24VDC Power Supply (Current should not less than 500mA)
- Fo+/- Frequency Output (instantaneous mass flow or volume flow)
- mA+/- Current Output (instantaneous flow or density optional)
- 485A\485B RS-485 Communication (Baud Rate: "9600", Address: "1")
- GND Signal Shielding
-  Instrument Shell

On-site Instrument Installation

-  If the Instrument is installed outdoor, please add instrument cover, prevent long period of Sun exposure, and rain.
-  Do not install in strong vibration areas.
-  Do not expose to an environment containing a lot of corrosive gases.
-  Do not share power with devices that contaminate the power supply such as inverters and welders. If necessary, install a clean power supply for the converter.

1/ Installation Location and Piping Requirements

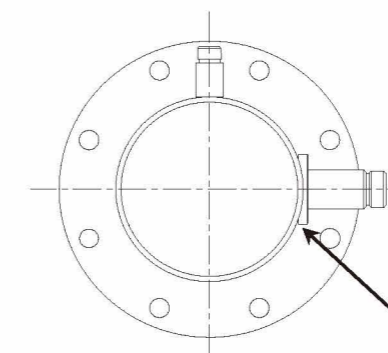
Install the instrument should be away from the elbow, obstacles, adjustable diameter, valves, to ensure a stable flow field, while requiring a long upper limit straight pipe, the former straight pipe length is greater than 10D, after the straight pipe length is greater than 5D. The following figure shows the straight pipe length required for several situations that are often encountered in the field:



Before and after installation requirements

When the site cannot meet the requirements of the straight pipe section, the gas rectifier can be connected in series so as to greatly reduce the requirement for the straight pipe section.

Pipe Installation Type	Figure	Before instrument straight pipe section	After instrument straight pipe section
Horizontal pipe	1	10D	5D
Elbow pipe	2	10D	5D
Enlarge pipe	3	15D	5D
Valve downstream pipe	4	20D	5D
Pipe shrinkage	5	20D	5D
Pipe downstream	6	30D	5D



The base must be wire cut to the same arc as the outer diameter of the pipe before welding. To ensure the sealing of the weld

Figure 7 Ideal base welding position

2/ Thermal Mass Flow Meter Base




Figure 5. Inline mounting soldering base



Figure 6 Simplified welding

 It is forbidden to perform welding operations in explosive environments.

 The environment with special requirements for welding shall be operated in accordance with the relevant requirements.



According to different installation methods, the base can be divided into standard type and simplified type. The base should be located at the top of the pipe section direction and the axis of the base through the hole should be perpendicular to the axis of the pipe. The ideal base welding position and welding process are shown below.

3/ Instrument Installation

Refer to appendix 1 (Simplified thermal mass flow meter)

- 1) Confirm the actual inner diameter and wall thickness of the pipe before installing the compact thermal gas mass flow meter.
- 2) Put the rest of the Thermal gas mass flow meter into the dedicated ball valve and calculate the depth to be inserted based on the actual pipe ID and wall thickness. This step can insert a rough size and hands tighten the nut.
- 3) Turn the sensor link so that the marker arrow is in the same direction as the media flow.
- 4) According to the data measured at the scene, the corresponding scale on the connecting rod of the sensor is converted and the locking nut can be used.
- 5) If you are installing the instrument in landscape orientation, the display can be installed flexibly at 90°180°270° to meet your actual needs on site.

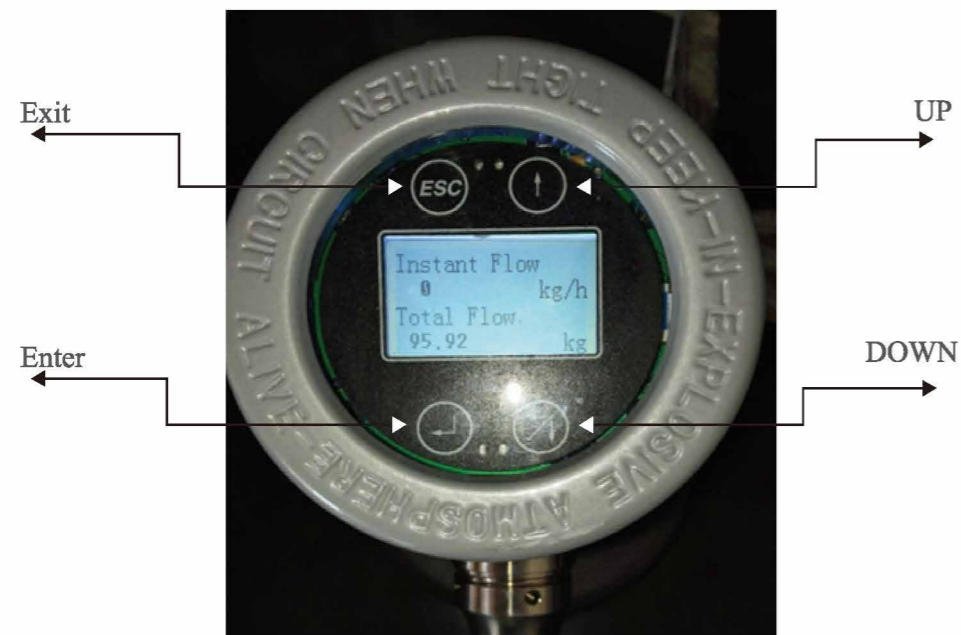
Refer to Appendix 2 (Full-tube type thermal gas mass flow meter)

-  Please confirm again before pre-installation. The connection method of the pipe section prepares flange-related items such as gaskets and bolts.
-  Production must be discontinued before installation and strictly abide by the relevant regulations of the factory.

The full-pipe type instrument has already assembled the sensor on the specialized pipe section correctly at the factory, the user only needs to assemble the pipe to the scene, so it is simpler to install than the insertion type. First select the appropriate mounting point on the pipe and then cut the pipe and install the corresponding flanges and bolts according to the length of the necessary pipe section. Determine the fluid flow rate to be consistent with the flow label identified by the full tube thermal mass flow meter. And the display should be perpendicular to the horizontal plane, the axis of the pipeline should be parallel to the horizontal plane, the error can not exceed $\pm 2.5^\circ$. Finally, the instrument is locked by bolts to secure the connections.

Calibration and Operation

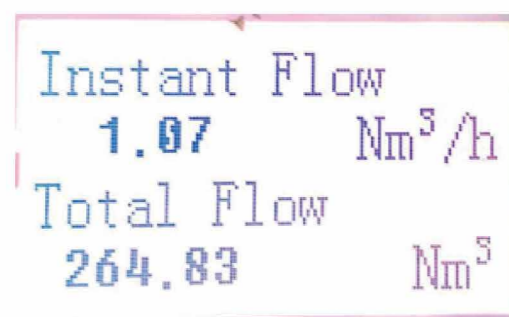
1/ Working State of the Main Interface



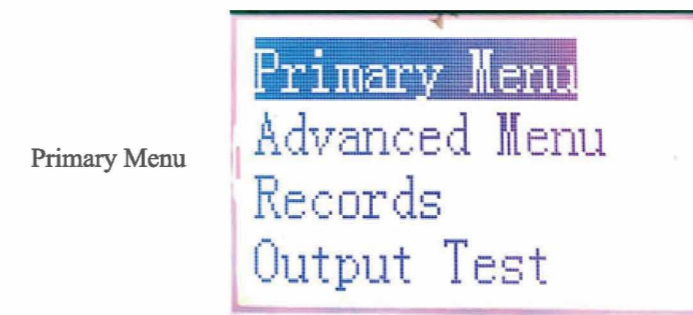
Primary setting Password: "20", Advanced Setting Password: "980".

Parameter Setting

1/ Main Interface Display



2/ Parameter Settings Main Interface



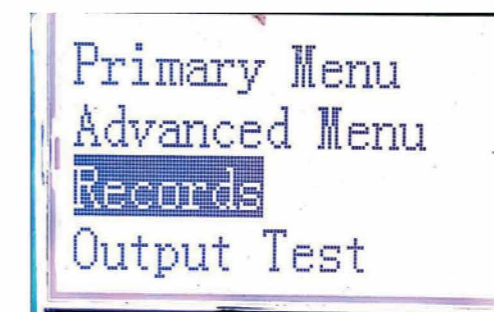
In this interface, press the confirmation key to enter the primary setting, the password "20", you can change the unit, the Cumulative zero, instrument address, baud rate, range changes and other operations

3/ Advanced Menu



Press the Enter key to enter the advanced interface. Press enter to enter advanced settings, enter the password "980" to modify the parameters such as pipe diameter and instrument coefficient.

4/ Records



Under this interface press the confirmation key to enter the view record. You can check the instrument type, the instrument number and so on parameter;

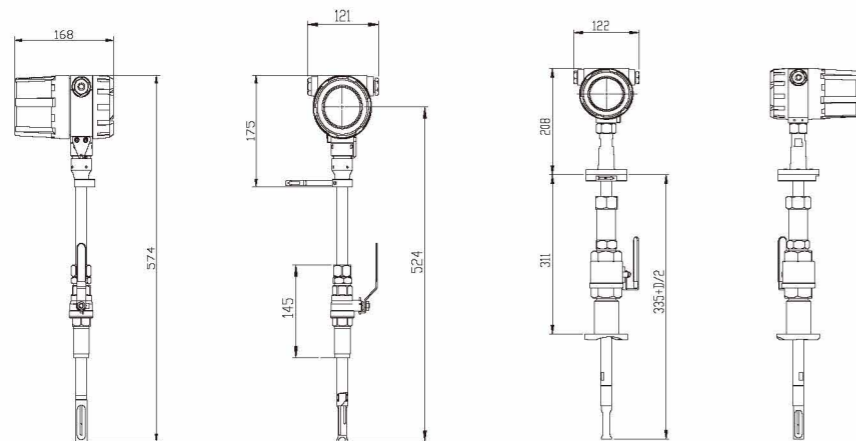
5/ Output Test



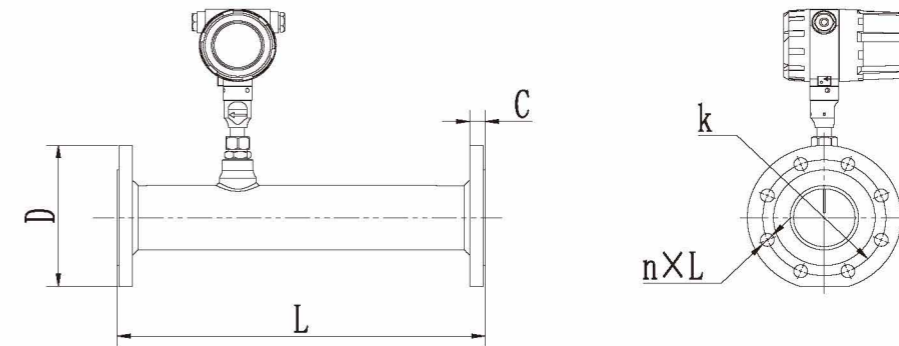
Under this interface press the enter key to enter the output test, can simulate the output (0%~100%) flow the standard current signal (4~20) MA and the standard Frequency signal (0~5) KHz, carries on the detection to the output signal.

Appendix 1 Dimensions

1/ Insertion Type



2/ Inline Type



Pipeline Size	Pressure	Flange Outer Diameter	Center Hole Diameter	Screw Hole	Instrument Pipeline Length
DN	Mpa	D	K	nxL	L
3	4.0		1/4tube end		130
6	4.0		1/8tube end		130
8	4.0		3/8tube end		130
10	1.6	90	60	4×14	280
15	1.6	95	65	4×14	280
20	1.6	105	75	4×14	280
25	1.6	115	85	4×14	280
32	1.6	140	100	4×18	280
40	1.6	150	110	4×18	280
50	1.6	165	125	4×18	280
65	1.6	185	145	4×18	280
80	1.6	200	160	4×18	280
100	1.6	220	180	4×18	280
125	1.6	250	210	4×18	290
150	1.6	285	240	4×22	310

- 1.Flange in the diagram is GB standards HG/T20592-2009. According to HG/T20592-2009 standard processing production.
- 2.For DN 15~ DN 80 it is possible to use threaded connection, please contact the manufacturer for more information.
- 3.In the above chart is according to 1.6Mpa pressure model, any pressure higher than 1.6Mpa please contact the manufacturer for more information.

Appendix 2 Troubleshooting

Problems	Possible Cause	Solution
No Display	1. No Power	Supply power
	2. Meter internal On/Off Switch damaged	Supply 220VAC power supply, power light indicator does not light up, indicate On/Off power switch is damaged
	3. DC 24 power connection reversed	Detect power polarity
	4. Display is aligned	Reinstall the display
	5. Display is damaged	Check power indicator light, if the light is on indicate that the display is broken. Please contact the manufacturer.
Low Velocity	1. Sensor installed reversed	Install the correct sensor direction
	2. Sensor is dirty	Clean the sensor
	3. Sensor Damaged	Send back to the manufacturer
	4. Internal parameter setting is wrong	Check internal parameter settings
Abnormal Flowrate, Big Fluctuations	1. Internal parameter setting is wrong	Check internal parameter settings
	2. Medium property is pulsed	Modify the Filter coefficients
	3. Sensor is dirty	Clean the sensor
	4. Sensor damaged	Send back to the manufacturer
Abnormal 4-20mA Output	1. 20mA wrong range setting	Input 20mA range
	2. Converter problem	Send back to the manufacturer
	3. Wiring is not looped	Check wiring
Abnormal frequency output	1. Frequency setting is incorrect	Set the right frequency
	2. Converter problem	Send back to the manufacturer
	3. Wiring connection damaged	Check wiring connection
Alarm output exception	1. Instrument parameter incorrect	Set the right alarm parameter
	2. The instrument is not equipped with an alarm output function	Contact the manufacturer
	3. Damaged relay	Send back to the manufacturer
Abnormal RS-485 output	1. Baud rate and station number setting is wrong	Input the correct output
	2. Polarity reversal	Change polarity
	3. Cable damaged	Check connection cable

Appendix 3 General Gas Density and Relative Air Conversion Tables

The lab cannot use user's actual medium for calibrating the instrument, normally according to user's actual gas medium flowrate are converted to air flowrate when calibrating in the lab. During the user's first time, the instrument output is the actual gas mass flow or volume flow. The conversion of different gases is performed by the conversion coefficient. The conversion coefficient of single component gas can be checked in the chart below.

	Gases	Specific heat (Calories/g°C)	Density (g/L 0°C)	conversion factor
0	Air	0.24	1.2048	1
1	Ar	0.125	1.6605	1.4066
2	AsH3	0.1168	3.478	0.669
3	BBr3	0.0647	11.18	0.3758
4	BCl3	0.1217	5.227	0.4274
5	BF3	0.1779	3.025	0.4384
6	B2H6	0.502	1.235	0.505
7	CCl4	0.1297	6.86	0.3052
8	CF4	0.1659	3.9636	0.4255
9	CH4	0.5318	0.715	0.7147
10	C2H4	0.3658	1.251	0.5944
11	C2H6	0.4241	1.342	0.4781
12	C3H4	0.3633	1.787	0.4185
13	C3H6	0.3659	1.877	0.3956
14	C3H8	0.399	1.967	0.3459
15	C4H6	0.3515	2.413	0.3201
16	C4H8	0.3723	2.503	0.2923
17	C4H10	0.413	2.593	0.2535
18	C5H12	0.3916	3.219	0.2157
19	CH3OH	0.3277	1.43	0.5805
20	C2H6O	0.3398	2.055	0.3897
21	C3H3Cl3	0.1654	5.95	0.2763
22	CO	0.2488	1.25	0.994
23	CO2	0.2017	1.964	0.7326
24	C2N2	0.2608	2.322	0.4493
25	Cl2	0.1145	3.163	0.8529
26	D2	1.7325	0.1798	0.9921
27	F2	0.197	1.695	0.9255
28	GeCl4	0.1072	9.565	0.2654
29	GeH4	0.1405	3.418	0.5656
30	H2	3.4224	0.0899	1.004
31	HBr	0.0861	3.61	0.994

Appendix 4 Table of Conversion Coefficients for Single Component of Gas (continued table): Uper Flow Range of General Gases (Nm³/h)

Model	Pipeline size(mm)	Air	N ₂	O ₂	H ₂
DMF-1-980-3	3	4	4	2	1
DMF-1-980-6	6	12	12	6	2
DMF-1-980-8	8	21	21	10	3
DMF-1-980-10	10	28	28	14	4
DMF-1-980-15	15	65	65	32	10
DMF-1-980-25	25	175	175	89	28
DMF-1-980-32	32	290	290	144	45
DMF-1-980-40	40	450	450	226	70
DMF-1-980-50	50	700	700	352	110
DMF-1-980-65	65	1200	1200	600	185
DMF-1-980-80	80	1800	1800	900	280
DMF-1-980-100	100	2800	2800	1420	470
DMF-1-980-125	125	4400	4400	2210	700
DMF-1-980-150	150	6300	6300	3200	940
DMF-1-980-200	200	10000	10000	5650	1880
DMF-1-980-250	250	17000	17000	8830	2820
DMF-1-980-300	300	25000	25000	12720	4060
DMF-1-980-400	400	45000	45000	22608	7200
DMF-1-980-500	500	70000	70000	35325	11280
DMF-1-980-600	600	100000	100000	50638	16300
DMF-1-980-700	700	135000	135000	69240	22100
DMF-1-980-800	800	180000	180000	90432	29000
DMF-1-980-900	900	220000	220000	114500	37800
DMF-1-980-1000	1000	280000	280000	141300	48120
DMF-1-980-1200	1200	400000	400000	203480	69172
DMF-1-980-2000	2000	700000	700000	356200	118480

Standard state flow: The flow rate under temperature of 20 °C, pressure of 101.325KPa .

Attention, for the units of instant flow rates: Nm³/h、 Nm³/min、 L/h、 L/min、 t/h、 t/min、 kg/h and kg/min.

Conversion between operating flow and standard flow

$$Q_{\text{standard condition}} = \frac{0.101325 + p}{0.101325} * \frac{273.15 + 20}{273.15 + t} * Q_{\text{working condition}}$$

Q_{standard condition} : Standard state flow (Nm³/h)
 Q_{working condition} : Operating state flow (m³/h)
 t: Working Condition Medium temperature(°C)
 P: Working condition Medium pressure
 (Instrument pressure MPa)

Flow Velocity Calculation:

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

V: Medium Standard condition Velocity (Nm/S)

Q: Standard State flow (Nm³/h)

D: Measuring straight pipeline (mm)

Case Application



Communication Protocol

MODBUS—RTU

Address	Definition	Remark
1000	mass flow	Read Only
1002	Mass Total integer	Read Only
1004	Mass Total Decimal	Read Only
1006	volume flow	Read Only
1008	Total Volume integer	Read Only
1010	Total Volume decimal	Read Only
1012	flow velocity	Read Only
1014	Voltage	Read Only
1016	Zero Point Voltage	Read Only
1018	Slope	Read Only
1020	Filter coefficients	Read Only
1022	storage space remaining	Read Only
1024	Software version number	Read Only
1026	flow range	Read Only
1028	Medium temperature	Read Only
1030	Reserve 2	Read Only
1032	Flow Unit Selection	
1034	Total Unit Selection	
1036	medium	
1038	Conversion factor	
1040	Current output selection	
1042	Current Flow Range	
1044	baud rate	
1046	Current Velocity Range	
1048	Pulse frequency range	
1050	Pulse Flow Range	
1052	Pulse equivalent coefficient	
1054	Frequency output Selection	

Address	Definition	Remark
1056	Lower flow removal	
1058	standard condition density	
1060	Instrument Address	
1062	baud rate	
1064	year	
1066	month	
1068	date	
1070	hour	
1072	minutes	
1074	total clearance	
1076	Inner pipeline	
1078	Instrument coefficient	
1080	Zero Point Voltage input	
1082	Calibration points	
1084	correction points	
1086	Velocity Table Index	
1088	Voltage of velocity table	
1090	Velocity of velocity table	
1092	Fixed table index	
1094	Velocity of correction table	
1096	Coefficient of correction table	
1098	4mA Coefficient	
1100	20mA Coefficient	
1102	working pressure	
1104	language	0-Z;1-E
1106	Model	
1108	instrument number	
1110	Check digit	

Check mode: none

Data bits: 8

Stop bits: 1