

## JC010 Thermal mass gas flow meter

### Introduction

The principle is that a fluid flowing past a heated temperature sensor removes a known quantity of heat as it passes. In a thermal flowmeter, the fluid has to pass two temperature sensors. One sensor obtains a reference value by measuring the actual process temperature. The second sensor is a heating element and it receives precisely as much energy as is needed to compensate for dispersed heat and maintain a precisely defined temperature difference.

The higher the mass flow past the heated temperature sensor, the more heat is dissipated and the more power has to be input to the element to maintain the temperature difference. Heating current, therefore, is a measure of the mass flow of the gas.

Due to the sensor temperature is always 30°C 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.



## Appearance

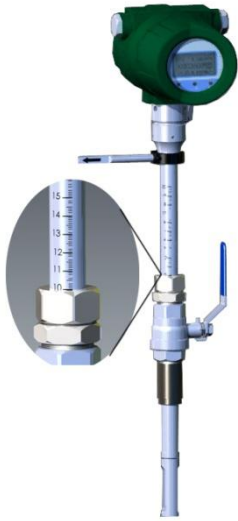


Fig. 1 Standard Insertion Flow Meter  
(Pipe size DN100-DN500)



Fig. 2 Flanged Flow Meter  
(Pipe size DN10-DN80)



Fig. 3 Hot-tapped Insertion Flow Meter

(Pipe size DN100-DN4000. Special requirements please contact us)

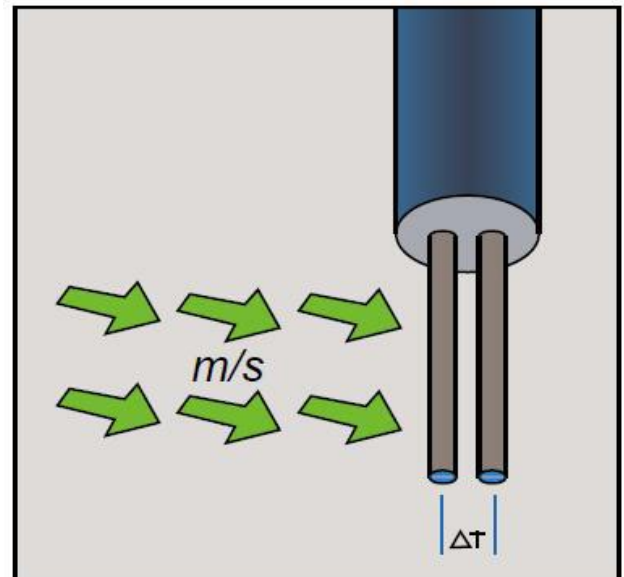
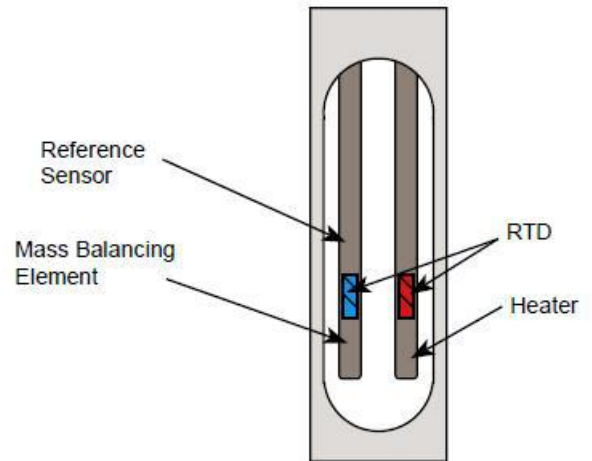
The insertion sensor of compact insertion flow meter should be inserted to axis of pipe, and the length of the insertion sensor is decided by pipe size, please confirm the pipe size when ordering. If the insertion sensor can't be inserted to axis of pipe, the manufacturer will provide a calibration factor to achieve an accurate measurement.

## Working Principle

The sensing element includes two resistance-type temperature detector (RTD), which are protected by heat casings. When measuring gas, one RTD (heated RTD) is heated, and another one (reference RTD) measures temperature of gas. When the sensor is in medium with no flow, the two RTD will have a temperature difference ( $\Delta T$ ) because of action of heater. And when the medium flows, molecule of medium will take away some heat from heated RTD because of the principle of heat conduction, and temperature of reference RTD will remain the same. Power of heated RTD ( $\Delta P$ ), temperature difference ( $\Delta T$ ), and mass flow of gas ( $Q$ ) have function relation, which is as follows:

$$\Delta P / \Delta T = K_1 + K_2 \cdot (Q) K_3$$

Based on the above function, it can be divided into temperature detection method and power measurement detection method according to different variable. The former, also known as the constant power method, refers to keep constant power ( $\Delta P$ ) of heating temperature sensors to provide heat, then measures the temperature difference value ( $\Delta T$ ) that changes with flow; the latter, also known as the constant temperature difference method, refers to keep constant temperature difference ( $\Delta T$ ) between heating element and measured fluid, then controls and measures the power ( $\Delta P$ ) of heating temperature sensors, and the power consumption will increase with the increment of flow.



Thermal mass flow meter is a kind of instrument that uses heat transfer principle, heat exchange relation between flowing fluid and heat source, to measure mass flow of gas.

It can be divided into heat distribution effect and heat dissipation effect according to the heat effect that gas affects heat source of sensing element.

Thermal mass flow meter uses heat dissipation effect to directly measure mass flow of gas, which makes it have advantages of little pressure loss, wide measurement range, high accuracy, high repeatability, and no moving parts and so on. And the significant advantages makes thermal mass flow meter become popular in industrial process control in both domestic and international industry.

## Features

1. Measure mass flow, no need for humidity and pressure compensation.
2. Large rangeability, flow velocity: 0.1 Nm/s~100Nm/s.
3. No pressure drops, applicable to any section pipe.
4. Anti-corrosion, applicable to corrosive gas.
5. Online installation and maintenance.
6. Measures mass flow directly - without additional pressure and temperature inputs
7. Accurate measurement and operation at very low gas pressures and flow rates
8. Negligible pressure drop

### Display

Users can use buttons on the display to select measuring unit, and can set current time, history run time and other parameters. The display mode is flexible. It can also cumulatively calculate flow and store the data in the EEPROM memory, then the data will not be lost even when power is failure.

### Pipeline Area Compensation

It will reduce the area that fluid passes after the sensor is inserted into pipe, which affects the measurement accuracy. JC010 will automatically compensate according to the area to further improve the measurement accuracy.

### Self-diagnostic Function

We have adopted a variety of technical measures to protect the probe of JC010, but the bad working condition is still likely to damage the probe. Self-diagnostic function of JC010 can be able to diagnose whether the probe is in normal working condition.

### Temperature Compensation

JC010 thermal mass flow meter is based on the technology of thermal diffusion, and does not need temperature and pressure compensation in theory. But in field application, the heat conduction characteristic of gas will happen tiny change because of different temperature. JC010 thermal mass flow meter measures temperature of gas through built-in temperature sensor, and according to the properties of gas, it eliminates the influence that the tiny change caused to measurement accuracy in different temperature.



### Optional STP condition

JC010 can directly measure mass flow of gas according to the standard pressure and temperature (STP). Its configuration software can let users change the STP condition according to their own requirements.

**Process Connection Type:**  
 screw connection, flange connection, ferrule connection.

**Multi-option for Joint Lever:**  
 the length can be maximum 3m according to users' requirement, and material can be 304, 316 and so on.

**Multi-option for Joint Lever:**  
 can optionally select locking device and ball valves and so on, which makes more easy online disassembly.

**Protective casing of probe:**  
 sensor are installed in a protective casing, which effectively protects the sensor and avoids deformation that caused in transportation and installation process.

## Technical parameters

	Insert type	Pipe type
Medium	Single gas ( except acetylene gas) or mixed gas of fixed	
Pipe size	DN80-6000mm	DN15-2000mm
Velocity	0.1Nm/s~100Nm/s ( standard working condition 20 °C 101.33Kpa)	
Accuracy	±1%	
Medium temperature	-40~200°C	
Pressure	2.5Mpa	4.0Mpa
Power supply	AC220V or DC24V for integral converter and AC220V for split converter.	
Response time	≅ 1s	
Signal output	4~20mA RS-485, Modbus	
Display	Instantaneous flow , mass flow , volume flow , cumulative flow , Beijing time, running time.	
Sensor IP code	IP68	
Converter IP code	IP67 for integral type IP 65 for split hanging type IP 52 for split box type	
Explosion proof degrade	Exd II CT 4	

## Order Table

Code	Description	Remark
JC010	Thermal mass gas flow meter	
Dn15,Dn20 ....	Diameter :DN15 to 6000	
F	In line integral type	Structure
I	In line seperated type	
PI	Insertion integral type	
PL	Insertion seperated type	
T	Threaded ,such as 1/2"NPT	Connection
F	Flange , such as 2",ANSI	
W	Welded seat	
B	Welded seat + ball valve	
A0	Without explosion-proof	Explosion-proof
A1	With Explosion-proof	
T1	-20 to 150 ° C Standard	Working temperature
T2	-20 to 200 ° C High temperature	
P0	Negative pressure	Working pressure
P1	0-1.0Mpa	
P2	0-.1.6 Mpa	
P3	0-2.0 Mpa	
P4	0-3.0Mpa	
D	24 VDC	Power supply
A	220 VAC	
O	Other	
0	None	Signal output
1	4-20ma	
2	RS 485	
3	4-20ma + Hart	
L	With LCD	Display
O	Without LCD	
B	316SS	Sensor material
L	HC	
C	Ti	
O	Other	

## Detail

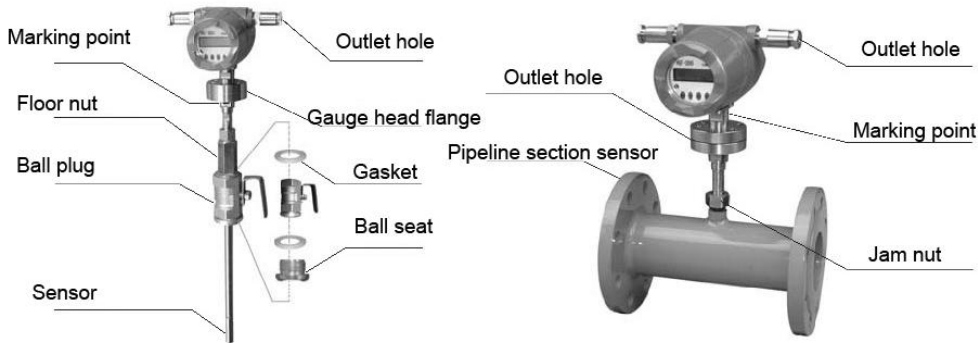


Fig 1. All-in-one plug type

Suitable for pipeline with caliber DN80mm and above

Fig 2. All-in-one section type

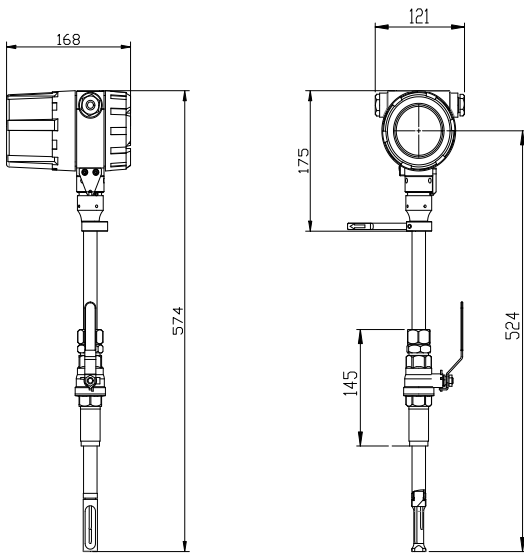
Suitable for pipeline with caliber DN15mm and above

- ① All-in-one plug type should be inserted in axes of the measured pipeline, therefore, the length of overcasting staff depends on the caliber of the measured pipeline, which should be specified when ordering. If impossible, the manufacture will offer calibration coefficient to accomplish accurate measurement.
- ② All-in-one section type employs flanged connection, in accordance with GB/T9110-2000(details see appendix 2).

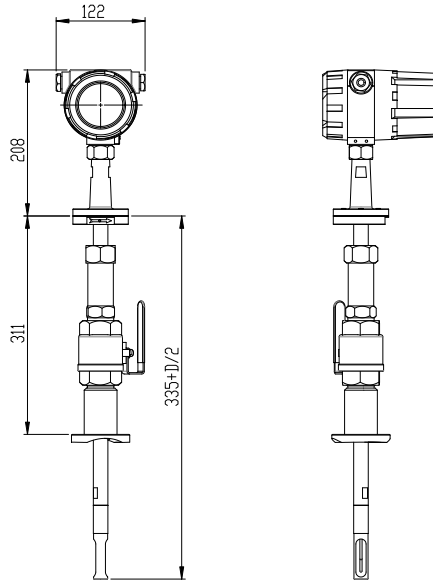


**Dimension**

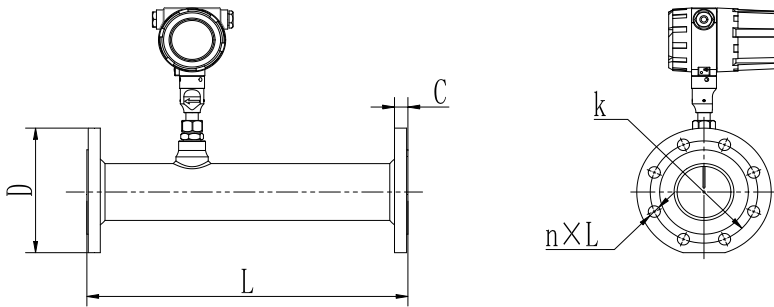
Dimensions of standard insertion sensor



Dimensions of hot-tapped insertion sensor



The dimensions of flanged sensor



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

Nominal Diameter	Flange Outer diameter	Center Hole	Screw Hole	Screw Thread	Sealing Face		Flange Thickness	Pipeline Length
					d	f		
DN	D	k	n×L				C	L
15	95	65	4×14	M12	46	2	14	200
20	105	75	4×14	M12	56	2	16	200
25	115	85	4×14	M12	65	2	16	200
32	140	100	4×18	M16	76	2	18	200
40	150	110	4×18	M16	84	2	18	200
50	165	125	4×18	M16	99	2	20	200
65	185	145	4×18	M16	118	2	20	200
80	200	160	8×18	M16	132	2	20	200
100	220	180	8×18	M16	156	2	22	200

For DN15-DN80, the meter can be made with threading to connect.

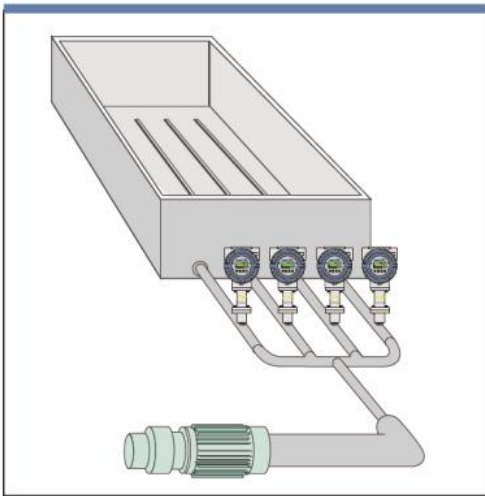
The above table is used for rated pressure of 1.6MPa. If the rated pressure is more than 1.6MPa, please contact us for special order.

Note: the chart only shows data with rated pressure no higher than 1.0Mpa, and tailor-make

For special length, please mark when order

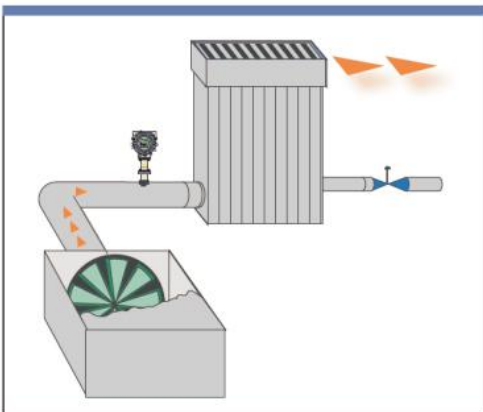
## Application

Oxygen, nitrogen, hydrogen, chlorine and mixed gas blast furnace gas, flue gas, biogas, compressed air, natural gas, liquefied gas, primary and secondary air and etc.



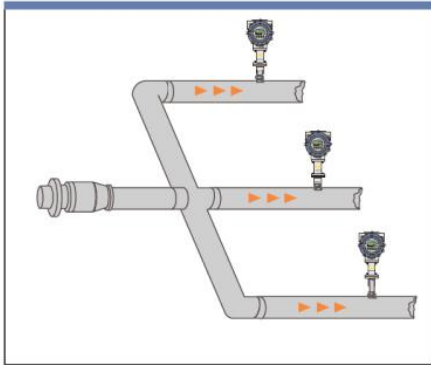
### ← Measuring Aeration Rate In Sewage Treatment

The Power consumption of blast aeration system in sewage treatment plant generally takes up more than 50% power consumption of the entire plant , so it is the key to energy saving for entire plant , and the most significant way of energy saving is air capacity control of each pipeline .With the characteristics of simple disassembly and wide range ratio, JC010 is the best choice of measuring and cotrolling aeration rate .



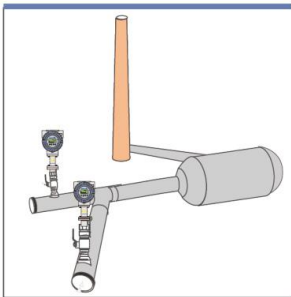
### ← Measuring Boiler Combustion /natural gas

Effective measuring flow rate and total value of fuel gas that sent into boiler , heater or other furnace , and sending these data to DCS system , not only can modify the flow of natural gas , but aslo can calculate the internal distribution and heat emission rate , etc . By precise measurement . JC010 realizes optimization of burning and reduces the discharge of pollution gas



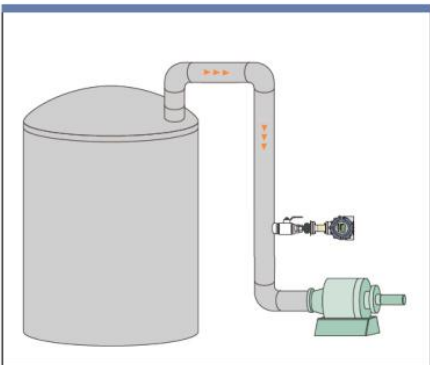
← **Measuring compressed air**

A new air compressor will convert 90% electrical energy to heat energy, and only 10% will be converted to compressed air, which makes the compressed air be ten times expensive than electricity. Measuring flow of compressed air can improve the efficiency of system. And measuring the gas flow distribution at each process pipe can better reduce the energy consumption and cost



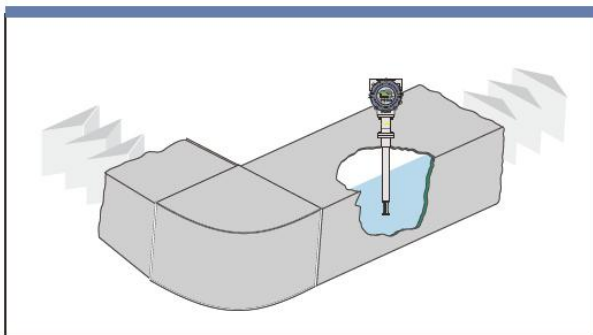
← **Measuring torch gas pipeline**

It can measure the flow of torch gas pipeline at different pipe section



← **Measuring biogas/fermentation gas**

Biogas and the exhaust gas in fermentor are a mixture of saturate methane and carbon dioxide. Because their flow and pressure are low, they are often difficult to use other flow meter to measure their flow. Because of the outstanding characteristic of low velocity sensitive, thermal mass flow meter become the optional choice to measure this kind of gas



← **Measuring gas in square pipe or other straight pipe**

Because of its insertion pipe, JC010 can be easily installed on square or other special-shaped pipe. By setting the pipe type and cross-sectional area in menu, it can measure gas flow in pipe.