

User Manual

FY/JC 70 A / O 15/07 v 1.6



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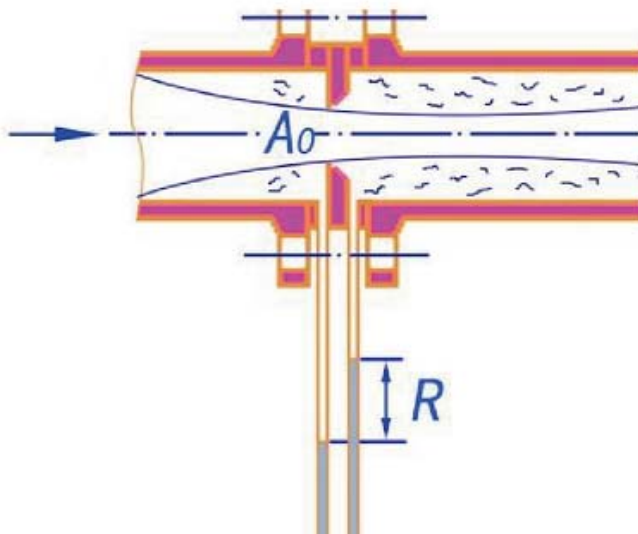
1、 Summary

The differential pressure flowmeter with throttling device is a kind of flowmeter with long history, rich theoretical and practical data, mature use and wide application range. It consists of a throttling device, a differential pressure transmitter and a display instrument. People use the throttling device to make the fluid produce differential pressure in the pipeline, which is transmitted to the differential pressure transmitter through the signal pipeline and transformed into The current signal is then fed into the display instrument to show the instantaneous and cumulative flow of the fluid in the pipe. The flow rate can be adjusted by means of the regulating instrument.

The throttling device is simple in structure, accurate in measurement, reliable in operation and convenient in maintenance.

2、 Operation Principle

The throttling device is a man-made device that causes throttling in a fluid flow pipe (as shown in figure 1).When the measured flow body passes through the throttling device, a local contraction is caused, the flow beam is concentrated, the flow rate increases, and the static pressure decreases, resulting in a static pressure difference on the orifice plate and on both sides of the downstream.This static pressure difference shows a certain functional relationship with the flow rate. The larger the flow rate is, the larger the static pressure difference will be. Therefore, the flow rate can be measured by measuring the differential pressure.



3、 Type, specification and flange standard

(一) Varieties and specifications

1、 Throttling device

Name	Pressure way		DN (mm)	PN (MPa)
Pore Plate	Angle Way	Ring Casing	50~500	1.6、 2.5、 6.4
		Drill		
	Flange Way			
	Span Way			1、 1.6

2、 Throttling Component

Name		DN (mm)	PN (MPa)
Nozzle	ISA1932	50~500	6.4、 10
	major axis		
Eight slots plate		50~500	6.4、 10
Eight slot nozzle		50~500	6.4、 10
High pressure orifice		50~500	6.4、 10
Segmental orifice		50~500	1、 1.6、 2.5
Double orifice		50~500	1.6、 2.5
1/4 Round hole plate		50~500	1.6、 2.5

3、Key parts information

Name	Material	QTY	Unit
Throttling component	SS304	1	bulk
Globe valve	WCB or SS304	2	piece
flange	WCB or SS304	1	pair
Positive and negative ring chamber	WCB or SS304	1	pair
condensator	WCB or SS304	2	piece

4、Flange standard is optional

- ① National standard : GB/T9115.1、 9119-2000 ;
- ② HG : HG20593~20595-97 ;
- ③ Machining according to customer's drawing or other flange standard.

4、 Installation

In order to ensure that the output differential pressure of the throttling device can be reliably and correctly transmitted to the differential pressure transmitter, the installation of the throttling device and its accessories in the signal line shall be conducted in accordance with the following installation principles.

1、 Basic requirements for installation :

- ① Before installation, check whether the design data meets the installation position requirements.
- ② New piping system must be installed after piping flushing.
- ③ The upper and lower sides of the throttling device shall be guaranteed to have straight pipe sections of a certain length. The specific requirements are shown in table 1.

- ④ When the throttles are installed in a pipe, the center of the choke shall coincide with the center of the pipe, and the coaxiality error shall not exceed $0.015 D$ ($1 / \beta 1$). And shall ensure that the throttling transverse and vertical pipe axis, vertical degree of deviation between plus or minus 1° .
- ⑤ When installing the throttle body, note that the upstream side of the throttle body (marked "+" on the pressure ring chamber) should flow towards the fluid.
- ⑥ The sealing gasket used for the throttle and flange shall not penetrate into the inner wall of the pipe after being clamped.
- ⑦ The throttling device must be installed strictly, and leakage is not allowed at all connection points.

The distance of straight pipe section required for installation

5D before 10D

5D after 20D expansion

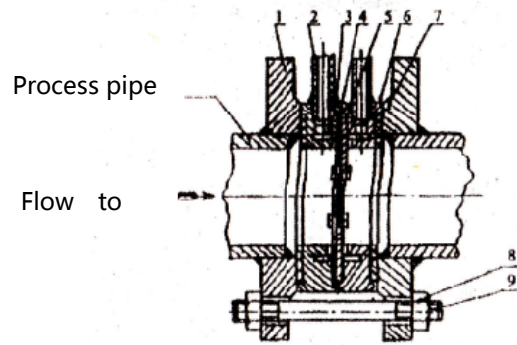
5D before 10D bend

2、Determination of pressure opening

The pressure extraction method of the throttling device generally includes Angle connection (ring chamber, borehole) pressure extraction, flange pressure extraction and $d-d / 2$ pressure extraction.

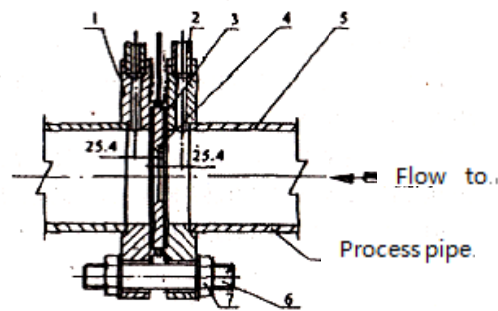
① When the throttle device adopts Angle joint (ring chamber) pressure extraction, Angle joint (drilling hole) pressure extraction and flange pressure extraction, etc., the pressure extraction port has been determined by the instrument manufacturer. Users can connect the pressure guide pipe of the throttle device to the differential pressure signal pipeline.

1) Angle connection (ring chamber) pressure extraction and mounting diagram



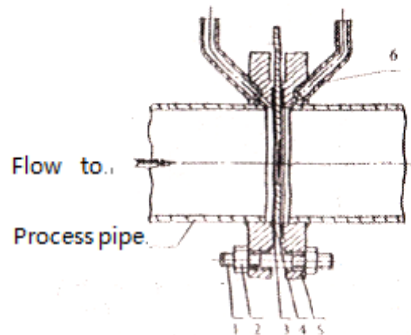
- 1.Flange 2. Pressure guide tube 3. Positive ring chamber 4. Pad 5. Throttle piece 6. Negative ring chamber 7. Pad 8. Nut 9

2) installation drawing of flange extraction



- 1.Flange 2. Pressure pipe 3. Pad 4. Throttle piece 5. Pipe 6. Stud 7. Nut

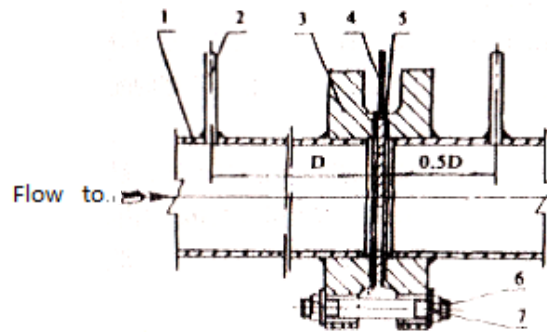
3) Angle joint (drill hole) pressure drawing installation



1. Stud 2. Nut 3. Pad 4. Throttle piece 5. Flange 6. Pressure pipe

4) D-D/2 pressure mounting diagram

When the $d-d / 2$ pressure extraction method is adopted, the upstream and downstream pressure pipe and the downstream pressure pipe are respectively drilled and welded on the pipe at $D/2$ on the downstream side of the flow piece, and are connected with the differential pressure signal pipe.(D is pipe diameter)



1. Pipe 2. Pressure pipe 3. Flange 4. Throttle piece 5. Pad 6. Stud 7. Nut

5) Diagram of pressure access position

When the throttling device is installed on the horizontal or inclined measuring pipe, the position of the pressure port is determined according to the difference of the measured flow body.



When the measured flow body is a liquid, when the measured flow body is a gas,

when the measured flow body is a vapor, it is less than or equal to 45

When the measuring pipe is vertical, the position of the pressure taking mouth is on the plane of the pressure taking device, and the direction can be arbitrarily selected. When measuring the flow as steam, two condensers must be on the same horizontal surface, so that the liquid level has equal height and remains constant.

3. Installation of differential pressure signal pipeline

The differential pressure signal pipeline refers to the pressure pipeline connecting the throttling device and the differential pressure transmitter. It is an important part of measurement in the differential pressure flow meter. Great attention should be paid to the configuration and installation of the differential pressure signal pipeline.

The material of the pipe should be made of different materials, such as pressure resistance and corrosion resistance, according to the property of the measured flow body. The inner diameter of the pipe should be no less than 6mm and the length should be less than 16m.

The inner diameter of the pressure pipe of the tested liquid at different lengths is shown in table 2, for reference when choosing.

Table 2 internal diameter and length of pressure pipe (mm)

Pipe Length	>16,000	16,000~45,000	45,000~90,000
Pipe Inner \varnothing			
Media			
water、vapor、Dry gas	7~9	10	13
Wet gas	13	13	13
Low, medium viscosity oil	13	19	25
Dirty liquid or gas	25	25	38

②The signal line shall be laid vertically or obliquely, and the inclination shall not be less than 1:12.

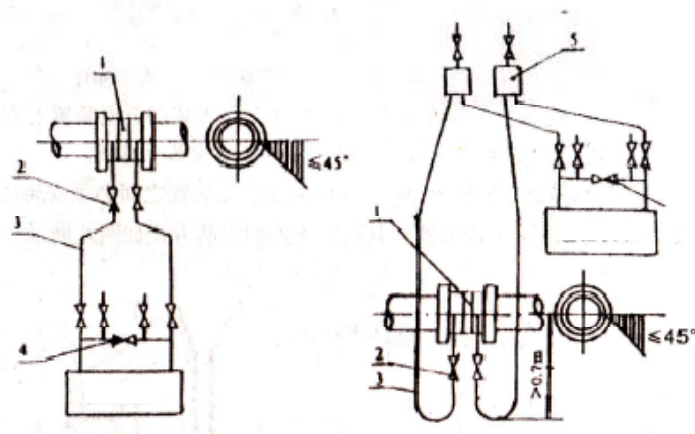
Fluid with higher viscosity should be inclined more. When the transmission distance of the differential pressure signal is greater than 30m, the pipe shall be tilted in sections, and the collector and settler shall be set respectively at the highest and lowest points.

③ In order to avoid distortion of differential pressure signal transmission, positive and negative signal lines should be placed as close as possible. Frost prevention measures should also be taken in severe cold regions. Electric heating or steam insulation can be used, but it is necessary to prevent the superheated gasification of the measured fluid and the generation of gas in the signal pipeline, resulting in the formation of false differential pressure.

4. Connection of throttling device and differential pressure transmitter :

According to the property of the measured flow body and the relative installation position of the throttling device and the differential pressure transmitter, the differential pressure signal pipeline can be laid in the following ways:

When the detected fluid is liquid, the installation of the signal pipeline is shown in FIG. 1.

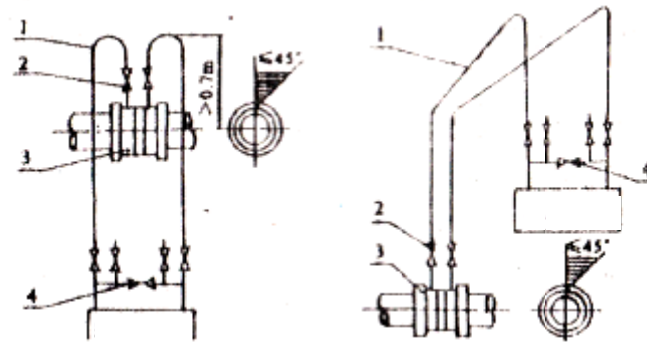


1. Throttling device 2. Globe valve 3. Signal pipeline 4. Three valve set 5. Air collector

(a) Instrument below the throttling device (b) Instrument above the throttling device

FIG. 1. When the measured flow body is liquid, the signal pipeline is installed

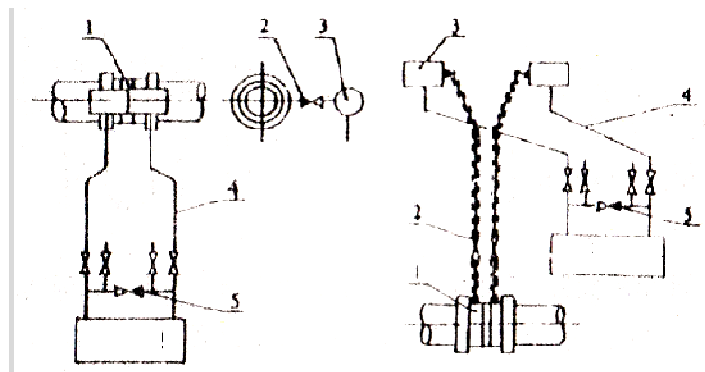
When the incoming flowmeter is a gas, the installation of its signal pipeline is shown in figure 2.



1. Signal pipeline 2. Globe valve 3. Throttling device 4. Three valve sets

(a) Instrument below the throttling device (b) Instrument above the throttling device

FIG. 2. When the measured flow volume is gas, the signal pipeline is installed. When the flow meter is water vapor, two condensers at the same height must be installed between the meter and the throttling device. The installation of the signal pipeline is shown in FIG. 3.



1. Throttling device 2. Globe valve 3. Condenser 4. Signal pipeline 5 tri-valve set

(a) Instrument below the throttling device (b) Instrument above the throttling device

FIG. 3 schematic diagram of signal pipeline installation when the measured flow body is water vapor

In case of corrosive liquid or gas, there must be a separator between the instrument and the throttling device

The isolator and the signal pipeline behind it are injected with the isolation liquid, which is

required to be in the liquid phase of the isolator and ensure that the measured corrosive fluid does not enter the high and low pressure chamber of the instrument.

5 、 Maintenance

Throttling device and signal pipeline system and front and rear pipe sections shall be checked at least once a year, and dirt shall be removed and reported for replacement

Waste components to ensure their normal operation.

5、 Ordering instructions

1. The company supplies complete set of throttling devices.

Users can also order single throttle piece, but should provide the installation profile size of throttle piece.

2. The throttling device is designed and manufactured according to the characteristics of the measured flow body provided by the user and relevant standards. Therefore, when ordering the throttling device and the throttling component, the specification sheet should be filled in in detail or the data corresponding to the content requirements of the specification sheet should be provided.

Please note the following:

The specification sheet is an important basis for the execution of the contract. The data must be correct and consistent.

When the measured flow volume is a gas, the reference of flow value and fluid density should be selected correctly, otherwise it will have a great impact on the measurement results.

The volume percentage of the mixture shall be equal to 100%.

3. If the user calculates the opening diameter of the throttle piece (d_{20}) by himself, the name of the fluid, pipe specification, flange standard (size) and installation method shall be provided at the same time.

4. Please specify in the contract when the user needs to install the upstream and downstream straight pipe sections.

6、 Service scope

1. For the convenience of user installation, the company supplies fpf50-g meter complete set device meter cabinet, which has the function of automatically carrying out pressure, temperature compensation calculation and displaying the accumulated (instantaneous) flow value through the intelligent chip inside the intelligent flow integrator according to the change of working condition in the measurement process.

2. According to the requirements of the user, the user can choose supporting instruments (such as differential pressure transmitter, pressure transmitter, temperature sensor, intelligent flow meter and digital display instrument, etc.), and provide installation, testing and other technical services.

7、 Selection of the code

Sensor code									Transmitter code				optional	Description
FPF50	-X	X	()	-X	X	X	()	X	-X	X	-X	X	—X	-range (m3/h)
Take pressure way	-F													Flange
	-H													Ring
	-Z													Drill
	-J													Span
Type	K													standard orifice plate
	D													multi-hole orifice
	H													Balance orifice plate
Caliber/Size		DN												DN50-DN3000
Piping material				-T										Carbon Steel
				-N										SS 304
				-L										SS 316
				-X										Negotiation
Temperature level				1										-50~+80°C
				2										-50~+180°C
				3										-50~+280°C
				4										-50~+550°C
Protection grade				1										IP65
				2										IP67
Classes.				PN										Digital representation
Structure				Y										All-in-one
				F										Split type
				G										Cabinet machine
Power supply				-1										220V AC
				-2										24V DC
Signal output				1										4~20MA
				2										4~20MA+HART
Electrical interface				-M										M20*1.5
				-G										G1/2"
				-N										1/2" NPT
Precision grade				A										1.0
				B										0.5
Accessories: three valve set, temperature/differential pressure/pressure transmitter, condensation pipe, signal line (m)														

Illustration

Model: FPF50-FK(DN100)-T11(PN10)Y-22-GB-40m3/h

Flange pressure standard orifice diameter DN100, ontology material: carbon steel, the throttling parts material: stainless steel 304, temperature range: 0-80 ° C, protection grade: IP65, level of pressure: 1.0 MPa, structure forms: one-piece, power supply, 24 v DC output: 4-20 ma + HART, electrical interface: G1/2 ", the level of accuracy: 0.5, accessories: differential pressure transmitter, three valve group, cut-off valve and throttle, whole set for the integration of orifice flowmeter range: 40 m3 / h.



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