

LGP BALANCED FLOW METER (MULTI-HOLE ORIFICE FLOW METER)

Summary

The LGP balanced flow meter is a throttle device researched based on the standard orifice. Its sensor is a round plate throttle rectifier with many holes installed on the cross-section of the tube. The size of the holes and their location is produced according to test data and is named as function holes. The sensor of the balance flow meter can realize flow balance measurement. Obviously, it can decrease the eddy current, reduce the dead zone effect, decrease the flows kinetic energy loss, and reduce the signal volatility of the tapping position which is caused by the eddy current. With the features of high precision, short straight pipe needed, little drop pressure, the balanced flow meter is widely used in gas, chemical, refinery industries etc.

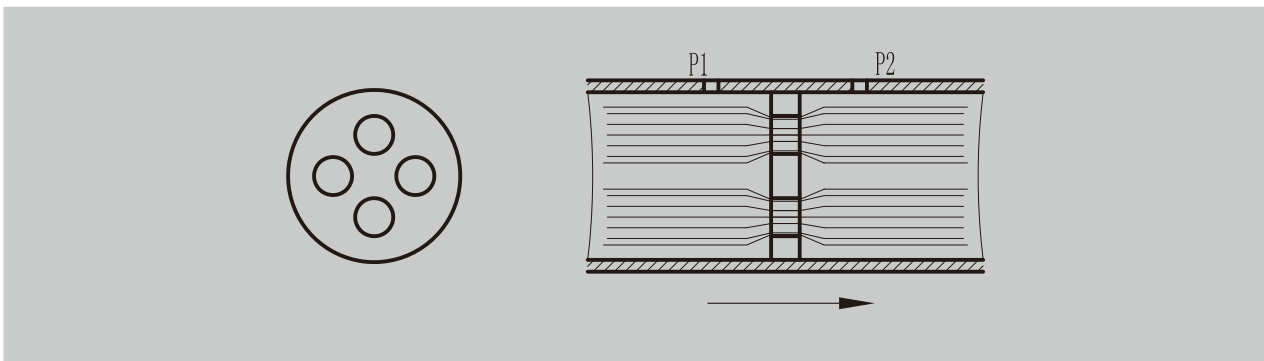


Operating Principle

LGP balance flow meter working principle is same as orifice, and basing on Bernoulli equation of the law of conservation of energy, when the flow passes through the function hole on the round plate, the flow will be balance adjusted, the eddy current will be minimized, performing the ideal flow, and gained the stable different pressure signal by tapping device.

$$q_m = \frac{C}{\sqrt{1-\beta^4}} \varepsilon \frac{\pi}{4} d^2 \sqrt{2\Delta p \rho_1}$$

In the formula, α is the flow coefficient. It can be seen from the above relationship that if the orifice area and fluid density are constant, the flow rate is proportional to the square root of the pressure difference, that is, as long as the pressure difference is measured, the flow rate can be calculated. The flow element measures the fluid flow rate based on this principle.



Formula:

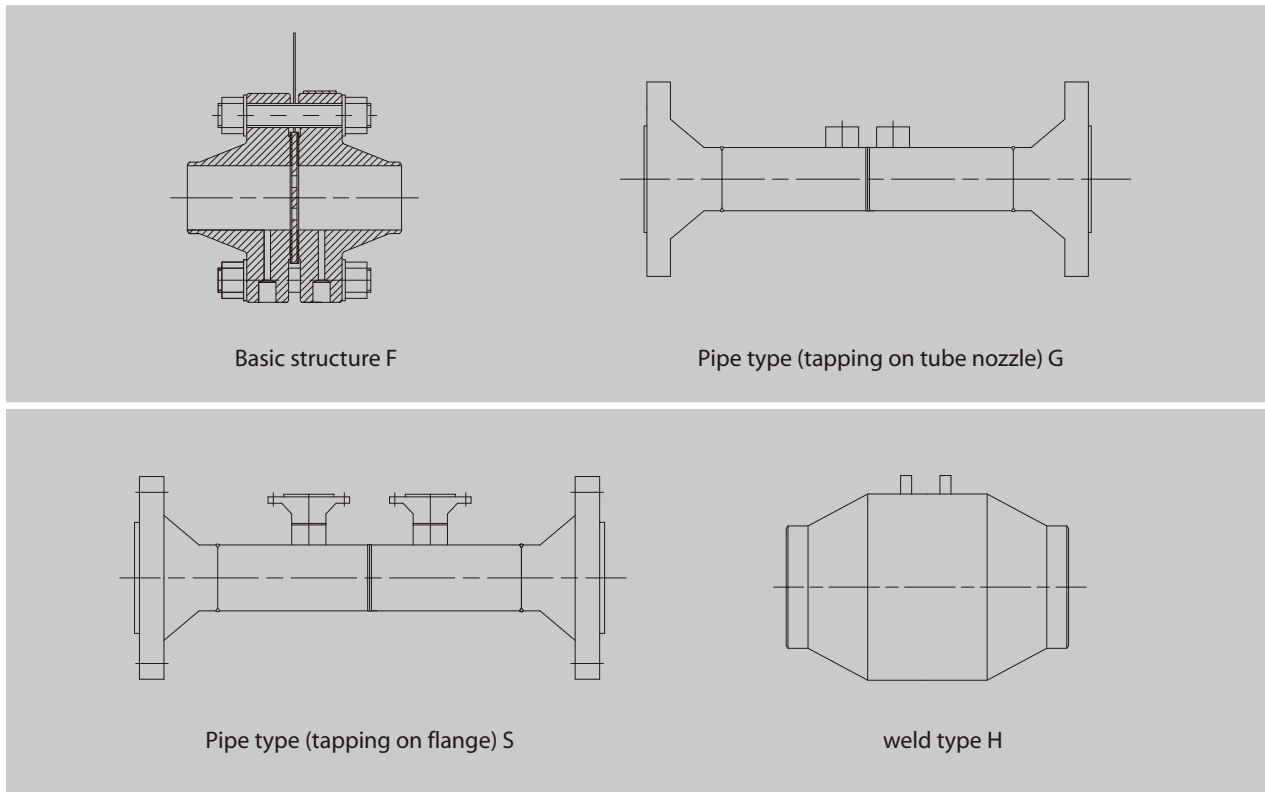
- q_m ---actual flow kg/s, C --(BFM) outlet coefficient
- ε ---BFM gas expansion coefficient, Δp ---actual different pressure value, pa
- ρ_1 ---flow medium density, kg/m³, d ---BFM equivalent orifice diameter, m
- β --- BFM equivalent diameter ratio is the ratio of the equivalent orifice diameter to the inner diameter of the pipeline.

Volume flow is calculated according to the following formula:

Formula: $q_v = \frac{q_m}{\rho}$

- ρ ---Density of fluid when measuring volume flow rate, kg/m³
- q_v ---Volume flow m³/s

Outline Drawing and Parameters



Product Features

1. High precision

- The LGP balance flow meter has the feature of many symmetry holes structure, hence, it can balance the flow, decrease the eddy current, vibration and signal noise, and also, increase the stability of the flow.

2. No strict requirement on straight pipe

- LGP balance flow meter can make the flow balance, restore two times faster than orifice pressure, and no strict requirement on the straight pipe. In most situation, the straight pipe can be 0.5D to 2D, so that the LGP balance flow meter can save a big quantity of straight pipe.

3. Low permanent pressure loss

- The many symmetry holes of the LGP balance flow meter balances the design. It decreases the friction of the performed eddy current and turbulent flow, reduces the kinetic energy loss, in the same measurement condition, and no decrease the different pressure. It can decrease 1/2 or 1/3 permanent pressure loss compared to traditional throttle device.

4. Wide range ratio

- Compared to the traditional throttle device, the LGP balance flow meter largely increases the measurement range ratio.

5. Good repetitive and stability

- The LGP balance flow meter can make the flow balanced and stable. It can also enhance the flows repetitive nature. The LGP balance flow meter contains many flow holes and dispersion the strength with no polishing on the sharp angle, and its β value does not change. It is very excellent with long stability.

6. Widely application

- The working temperature and pressure of the LGP balance flow meter depends on the pipe and flange material and grade. It is suitable for high pressure and temperature conditions. The LGP balance flow meter can be used for the measurement of gas & liquid, paste, and solid particles. The Balance flow meter is a completely symmetrical design, therefore, it can measure the bidirectional flow.

Technical Parameters

- Accuracy : $\pm 0.5\%$
- Repeatability : $\pm 0.2\%$
- Range ratio: 10: 1
- Working pressure: 0~ 42MPa
- Temperature: $-196\text{ }^{\circ}\text{C} \leq T \leq 650\text{ }^{\circ}\text{C}$
- Requirement on straight pipe: Front 3~4D Rear 2D
- Instrument caliber: DN25~DN500
- Reynolds number range: $500 \sim 1 \times 10^7$

Application Scope

1. The condition which requires high flow measurement precision and wide range

- LGP balance flow meter after flow calibration, and makes the sensor accuracy 0.5%, meanwhile normal range is 10:1

2. Steam flow measurement

- For the condensate in the steam; when it condenses in the standard orifice, it affects the measuring accuracy of the flow meter. When starting or stopping, the pressured steam will impact on condensate which causes water hammer. This makes a compact sound. The standard orifice will be deformed after the impact of the water hammer. The LGP balance flow meter has holes around; this allows the condensate from the steam to pass through at bottom hole. In essence, this prevents the formation of the water hammer, and also avoids the deformation and curve of the orifice.

3. The flow of low-temperature medium

- In this situation, the low temperature medium passes through the orifice, gasification is serious, and makes the measurement dysfunctional. Whereas in the LGP balance flow meter, due to the little drop in pressure, it ensures the stability and precision of the measurement.

4. The condition of the gas effusion

- The large caliber orifice flow meter which is used for the measurement of compressed air usually has water on its orifice which affects the measurement accuracy. For solving this problem, we need to install the orifice device on a vertical pipe, or use segmental orifice or eccentric orifice. For the LGP balance flow meter, due to its holes structure, it can solve the accumulated water from the source before it reaches orifice. This is because this is its original feature and there is no need for special processes.

5. Impurities in liquid condition

- When the flow contains the impurities, the standard throttle device will be less accurate due to the solids sedimentary and its polishing on the sharp edge. For the LGP balance flow meter, due to its holes structure, it helps in eliminating the solids sedimentary. Also, due to its natural balance (i.e. no sharp edge), it can solve the sharp edge polishing problem. This means it is better suited to solve the problem of impurities in the flow.

6. Bi-directional measurement conditions

- The design of the LGP balance flow meter both upstream and downstream is symmetric. There is no downstream deviation angle of the standard orifice, thus it can be used for bidirectional flow measurement. It totally solves the hard problem of bidirectional flow measurement.

Model Selection Table

Series No.	Specification Code		Contents
LGP			Balance flow meter
	F		Basic
	G		Pipe type (tapping on pipe nozzle)
	S		Pipe type (tapping on double flange)
	H		Welding type
	T		Others
	-		
		026	DN25
		04	DN40
		05	DN50
		08	DN80
		10	DN100
	
		50	DN500
		01	PN16
		02	Class150
		03	PN25
		04	PN40
		05	Class300
		06	PN63
		10	PN100
		11	Class600
		15	Class900
		16	PN160
		25	Class1500
		42	Class2500
		A	Without transmitter
		B	With transmitter separated type
		C	With transmitter integrated type
		S	With transmitter integrated type

Example

LGPF-1005A balance flow meter, nominal caliber DN100, basic, pressure class 300, no transmitter.

The Installation of Balance Flow Meter

1. No need to consider the flow direction for the installation of LGP balance flow meter.
2. When LGP balance flow meter is installed in horizontal pipe, pressure taking port should be in the horizontal pipe center line within a range of 45, installed in a vertical pipe, pressure in different elevation will produce additional pressure head, and it should be resolved by the transmitter after installation, reset to zero.
3. When LGP balance flow meter is measuring the flow of high viscosity, easy crystallization, coking or solid particles, and the outlet pressure should be self-heated or externally heated, and the isolation vessel should be set up.
4. LGP balance flow meter's upstream and downstream must have a straight pipe with a certain length and no resistance.
5. The requirement for front-back straight pipe

Block flow device	Upstream	Downstream
One curved head	3D	2D
Two curved head	4D	2D
Three section head	3D	2D
Full open gate valve	4D	2D
Full open ball valve	3D	2D
Continuous shrink tube	3D	2D
Continuous enlarge tube	3D	2D

Ordering Information

Please see LG model flow measurement throttle device