# LG-WQL Standard Venturi

## I. Overview

The venturi tube is a throttling flow sensor developed based on the Venturi effect and is a standard throttling device. According to the structure, the venturi is divided into standard venturi and general venturi.

Standard (classic) venturi tubes are divided into standard venturi with rough casting shrinkage section, standard venturi with machined shrinkage section, and standard venturi with rough welded iron plate shrinkage section according to their manufacturing methods.

The standard venturi is designed and manufactured according to the national standard GB/T2624-2006, and tested according to the national standard JJG640-94.

General Venturi series flow sensor not only inherits the advantages of standard Venturi tube, such as high accuracy, good repeatability, low pressure loss, and short straight pipe required, but also has the advantages of small device and anti-blocking. It can be used for the measurement of complex flow problems such as two-way flow, mixed phase flow, low velocity, large pipe diameter, and special-shaped pipes.

## II. Measuring principle

The fluid filled with the pipeline, when it flows through the throttle in the pipeline, the flow velocity will form a local contraction at the throat of the venturi, so the flow velocity increases and the static pressure decreases, so pressure is generated before and after the throat of the venturi. difference. The greater the fluid flow rate, the greater the pressure difference generated, so that the flow rate can be measured according to the pressure difference. This measurement method is based on the flow continuity equation (the law of conservation of mass) and the Bernoulli equation (the law of conservation of energy).

Flow calculation formula：

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

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

In the formula: qm, qv——respectively mass flow (kg/s) and volume flow (m3/s);

C——Outflow coefficient;

ε——Expansibility coefficient;

d——The opening diameter of the throttle, m;

β——diameter ratio, β=d/D;

D——pipe inner diameter, m;

ρ1——The density of the measured fluid, kg/m3;

Δp——Differential pressure, Pa;

## III. Features

1. The standard (classic) venturi tube is designed and manufactured according to the national standard GB/T2624, and is a standard throttling device verified according to the national standard JJG640, without calibration.
2. In the standard throttling device, the upstream and downstream straight pipe sections required by it are the shortest and the permanent pressure loss is the smallest.
3. Stable performance and high reliability.
4. Accurate calculation and low energy consumption.
5. It can be used for various dirty media such as liquid, gas, steam and two-phase flow.
6. Simple structure, easy installation and convenient maintenance.
7. The length of the standard venturi body is about 2 to 5 times the pipe diameter.

## IV. Main technical parameters

1. Nominal diameter: 50mm≤DN≤3000mm
2. Shrinkage section of rough casting: 100mm≤DN≤1600mm

Mechanical processing shrinkage section: 20mm≤DN≤250mm

Shrinkage section of thick welded iron plate: 100mm≤DN≤3000mm

3. Throttle aperture ratio β: 0.3≤β≤0.75

Rough casting shrinkage section: 0.3≤β≤0.75

Mechanical processing shrinkage section: 0.4≤β≤0.75

Shrinkage section of rough welded iron plate: 0.4≤β≤0.7

4. Reynolds number range: 2×105≤ReD≤2×106

Rough casting contraction section: 2×105≤ReD≤2×106

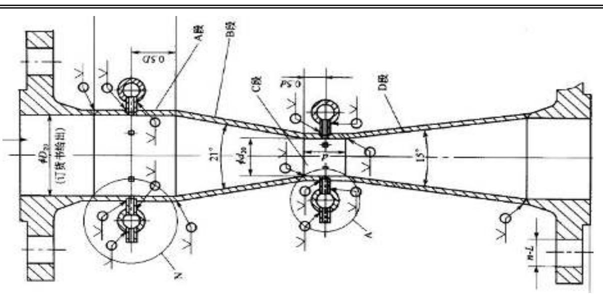
Mechanical processing shrinkage section: 2×105≤ReD≤106

Shrinkage section of rough welded iron plate: 2×105≤ReD≤2×106

5. Accuracy level: 0.5, 1, 1.5, 2
6. Working pressure: Nominal pressure: PN≤42Mpa
7. Medium temperature: -50℃≤t≤500℃
8. Reference standards: GB/T2624-2006, JJG640-94 and ASME PTC 19.5-2004
9. Connection method: flange connection, welding, thread

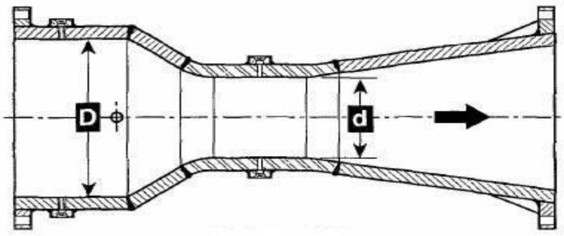
## V. Structure and main technical parameters

According to the manufacturing process and use, the venturi is divided into: standard venturi, general venturi, venturi flow tube, small diameter venturi, rectangular venturi and other structures. The detailed structure is as follows:

| Structure type | |
|---|---|
| The standard (classic) Venturi tube is composed of an inlet cylindrical section A, a conical contraction section B, a cylindrical throat C, and a conical diffusion section E. The diameter of the cylinder section A is D, and its length is equal to D; the contraction section B is conical and has an included angle of $21^{\circ} \pm 1^{\circ}$; the throat C is a circular cylinder section with a diameter d, and its length is equal to d; the divergent section E It has a conical shape with a spread angle of $7^{\circ} \sim 15^{\circ}$. |  |

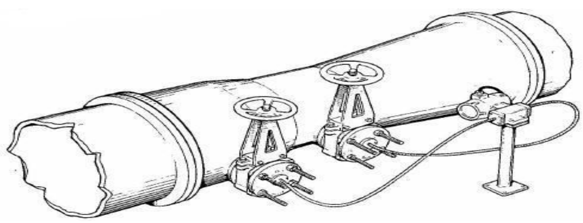
**The general-purpose venturi**, like the standard venturi, is composed of an inlet cylindrical section A, a conical contraction section B, a cylindrical throat C, and a conical diffusion section E.

**The general-purpose venturi** adopts the method of changing the contraction angle of the standard venturi and the length of the diffusion section to make it have the advantages of venturi, greatly shortening the length of the body, and effectively reducing the pressure loss.



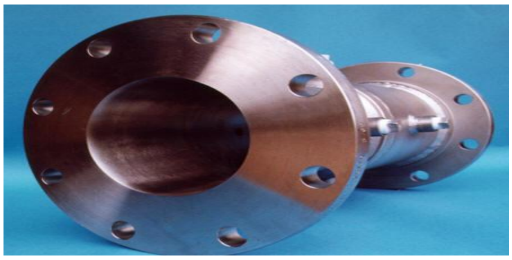

**The Venturi flow tube** is also composed of an inlet cylindrical section A, a conical contraction section B, a cylindrical throat C, and a conical diffusion section E.

**The Venturi flow tube** adopts a special pressure method to make it widely used in the flow measurement of dirty media and mixed-phase flow.



**The small diameter venturi** is composed of an inlet cylindrical section A, a conical contraction section B, a cylindrical throat C, and a conical diffusion section E.

**The small diameter venturi** adopts an integrated mechanical processing method to measure the fluid flow of small diameters. At the same time, it can use a variety of materials to meet the requirements of the on-site working conditions, and can meet various connection methods such as welding, flange connection, and threaded connection.



**The rectangular venturi** is composed of an inlet cylindrical section A, a conical contraction section B, a cylindrical throat C, and a conical diffusion section E.

**Main technical parameters of rectangular venturi:**

Nominal diameter: DN=1.13×(WH)0.5≤6000mm

Inlet diameter ratio W/H: 0.5≤W/H≤2.0

Throat diameter ratio w/h: 0.5≤w/h≤2.0

Equivalent β value: 0.44≤β=(w/h)0.5/(W/H)0.5≤0.74

Reynolds number range: 2×105≤ReD≤2×107

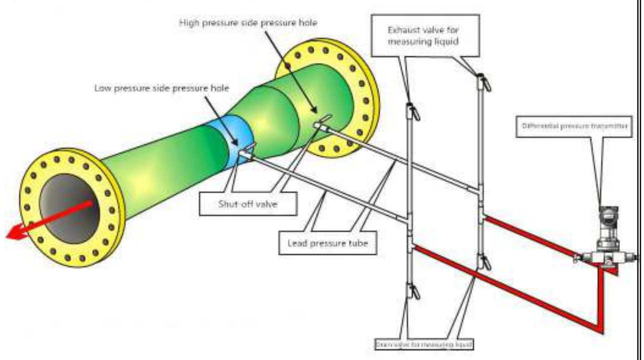
Accuracy: ±1% Repeatability: ±1%

Working pressure: 0～25Mpa

Working temperature: -100℃～500℃

Turndown ratio: 1:10

**Rectangular venturi is mainly used in power plant air supply and suction, heating furnace air supply and suction occasions.**

<table>
<tr><th colspan="2">Installation method</th></tr>
<tr><td></td><td>
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<tr><td>Integrated installation</td><td>Split installation</td></tr>
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## VI. Model marking method:

LG-WQL-DN□  Venturi Flowmeter

LG——Basic model; -WQL——Venturi flowmeter

DN□——Nominal diameter (㎜) For example, DN200 is the nominal diameter of 200 mm.