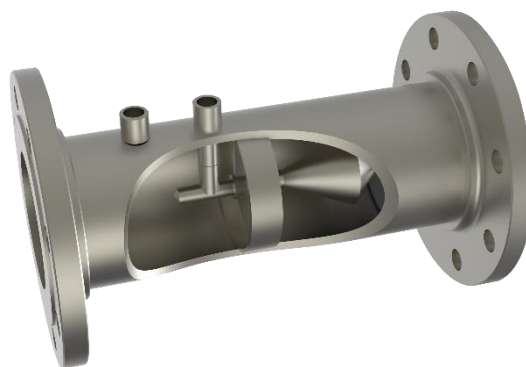


# LGV V-CONE FLOW METER

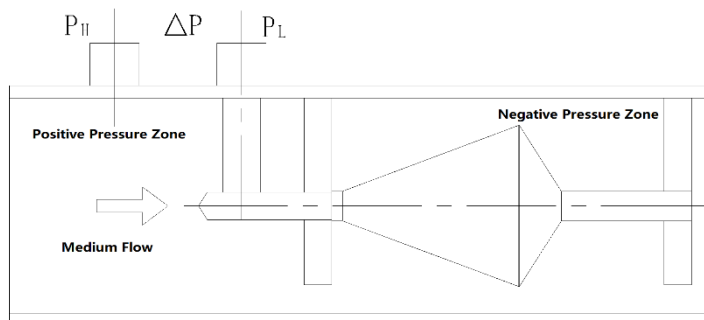
## Summary

LGV V-cone flow meter is the second generation of inner cone flow meter, which is a high-performance differential pressure flow measuring instrument developed by Dandong Top Electronics Instrument (Group) Co., Ltd and Tianjin University. The unique support body and variable cone angle design enable it to deal with various gases, liquids and vapor in metallurgy, chemical, fertilizer, chemical fiber, petroleum, natural gas, electric power, hydraulic, and other industrial enterprises in a short straight pipe section. It has the characteristics of firm cone, short straight pipe section, high measurement accuracy, wide range ratio, small pressure loss, and low installation cost. It is a major breakthrough in the field of flow sensor technology in recent years. It compensates for its own structural defects such as standard flow element like orifice plates, nozzles and venturi tubes, and it has a broad market prospect.



## Operating Principle

LGV V-cone flow meter is to install an inner cone concentric with the pipe in the measuring tube. The inner cone is specially designed and precision processed. When the fluid flows through the inner cone, the flow state is locally contracted and the flow rate increases, the static pressure drops, and the differential pressure  $\Delta P$  is generated before and after the inner cone. Like other differential pressure flow meters, they are based on the law of fluid mass conservation (continuity equation) and energy conservation (Bernoulli equation), and the basic flow equation as follows:



LGV V-Cone Flow Meter Schematic Diagram

$$q_m = \frac{C}{\sqrt{1-\beta_v^4}} \cdot \varepsilon \frac{\pi}{4} \cdot D^2 \cdot \beta_v^2 \sqrt{2\Delta P \rho} \quad q_v = \frac{q_m}{\rho} \quad \beta_v = \sqrt{1 - \frac{d_v^2}{D^2}}$$

$q_m$ : Mass Flow ;;  $q_v$ : Volume Flow ;C: Outflow Coefficient;  $\beta_v$ : Equivalent Diameter Ratio  
 $\rho$ : Fluid Working Density;  $\Delta P$ : Pressure Difference;  $D$ : Pipe Inner Diameter  
 $d_v$  : Maximum Cross-Sectional Diameter of Cone;  
 $\varepsilon$ : Gas Expansion Coefficient (Liquid is 1)

## Technical Parameters

### 1. Main Parameters

Nominal Diameter: DN50~DN1000

$\beta$  Value Range: 0.4~0.85

Nominal Pressure: 0~42.0MPa

Medium Temperature:  $-50^\circ\text{C} \leq T \leq 550^\circ\text{C}$

Wide Range Ratio: 10: 1

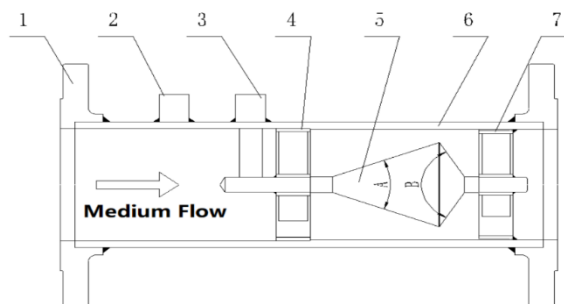
Accuracy:  $\pm 0.5\%$

Reynolds Number:  $8000 \sim 1 \times 10^7$

Applicable Fluid: It is suitable for flow measurement of various gases, liquids, vapor and other fluids.

### 2. Basic Structure

- 1 Flange
- 2 Front Tap
- 3 Back Tap
- 4 Front Stand
- 5 Inner Cone
- 6 Measuring Tube
- 7 Back Stand



LGV V-Cone Basic Structure Diagram

### 3. Product Superior Performance Features

#### 3.1 Combination Optimization Design of Front and Back Cone Angle and Channel of Flow Meter

According to different equivalent diameter ratios and different front and rear cone angles, LGV V-cone flow meter has carried out a large number of experimental studies, and finally determined the optimal combination of front and rear cone angles with different diameter ratios, which makes the range ratio wider and the measurement accuracy higher.

#### 3.2 V-Cone Installation Method and Firmness Design

In order to prevent the flow meter from being impacted and causing the cone to fall off during use, the second-generation V-cone flow meter adopts a cone fixing method with front and back supports, which will

make the cone fixed very firmly and reliably, and reduce cone vibration. Impact on measurement. At the same time, the influence of the front and rear supports on the flow field is fully considered. Ensure measurement accuracy.

### **3.3 Full Study of Expansibility Coefficient**

The design of LGV V-cone flow meter fully considers the influence of the expansibility coefficient  $\epsilon$  on the gas flow measurement. The positive pressure method sonic nozzle gas flow standard device is used to carry out the real flow experiment of the expansion coefficient, and the experimental fitting formula model is obtained through a large number of experiments, which ensures the accuracy of gas flow measurement.

### **3.4 Wide Range (10:1)**

LGV V-cone flow meter is based on the gradual contraction of the side wall to throttle, so that the vortex interference of the entire negative pressure area is well suppressed, and the impact on the static pressure measurement becomes very small, even if it is small in the flow state, a high signal-to-noise ratio can also be obtained, so that the measurement can be performed normally. This is one of the reasons why the measuring range of LGV V-cone flow meter is obviously better than other differential pressure flow meters.

### **3.5 Has the Function of Rectifying Fluid Flow State, so only a very Short Straight Pipe Section is Required (Front 3D Back 2D)**

The unique side wall throttling structure of LGV V-cone flow meter enables various irregular flow distortions in the upstream to be corrected and rectified when the fluid flows through the cone, so that the flow reaching the measurement area forms a regular flow. Therefore, accurate measurement values can be obtained with only a short straight pipe section, which greatly facilitates the user's use.

### **3.6 Low Pressure Loss, Good For Energy Saving**

The structural feature of LGV V-cone flow meter is streamlined flow element, so its pressure loss is small (about 1/3 of the orifice plate), so it has more advantages when it is used to measure the flow of those "low pressure, large flow" fluids. At the same time, a small pressure loss also means a reduction in energy consumption, which is very conducive to the energy saving requirements of enterprises.

### **3.7 Long Service Life and Stable Performance**

The boundary layer effect formed by the unique structure of LGV V-cone flow meter prevents the key parts of the flow element from being worn, so the geometric dimensions can be kept unchanged for a long time, so it can work stably for a long time without calibration; at the same time, the flow meter is not movable. The components (without any electronic devices) are purely mechanical, so they are resistant to high temperature, high pressure, corrosion and vibration.

## **4 Application Scope**

### **4.1 Gas**

Gas (dirty coke oven gas, blast furnace gas, producer gas)

Natural gas, including natural gas with a moisture content of more than 5%; various hydrocarbon gases.

Various rare gases (including those used for process control); Air, including air containing water and other

dust

### 4.2 Vapor

Saturated vapor; superheated vapor

### 4.3 Liquid

Oils, including crude oil (under a certain viscosity)

Water, including purified water and sewage;

Various aqueous solutions, including salt and alkaline aqueous solutions.

## Model Selection Table

Serial Number	Code			Content	
LGV-				V-Cone Flow Element	
	7	16		DN50	2"
	9	18		DN80	3"
	10	19		DN100	4"
	21	52		DN150	6"
	22	53		DN200	8"
	23	54		DN250	10"
	24	55		DN300	12"
	25	56		DN350	14"
	26	57		DN400	16"
	27	58		DN450	18"
	28	59		DN500	20"
		-			
			3	PN16	
			4	PN20(Class150)	
			5	PN25	
			6	PN40	
			7	PN50 (Class300)	
			8	PN63	
			9	PN100	
			10	PN110(Class600)	
			11	PN150 (Class900)	
			12	PN160	
			14	PN260 (Class1500)	
			15	PN420 (Class2500)	
			A	Flange Pipe Type	
			B	Butt Welding Pipe Type	
			C	Other	

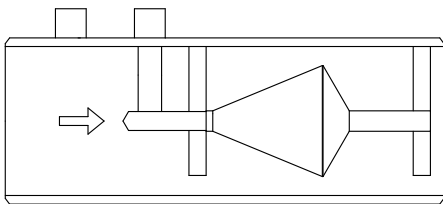
	A	Without Differential Pressure Transmitter
	B	With Differential Pressure Transmitter-Integral Installation
	C	With Differential Pressure Transmitter-Separated Installation

### Example

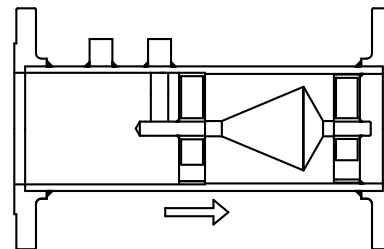
LGV-10-7AA, LGV V-cone flow meter, nominal diameter DN100, nominal pressure 5MPa, flange connection, without differential pressure transmitter.

### Outline Drawing and Installation

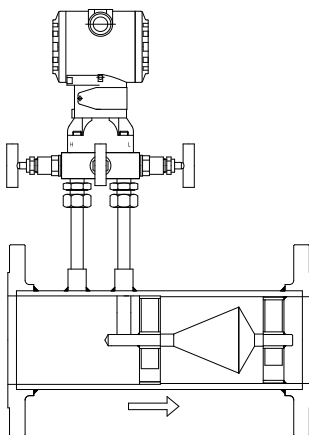
#### 1. Structure Type



Butt Welding Pipe Type

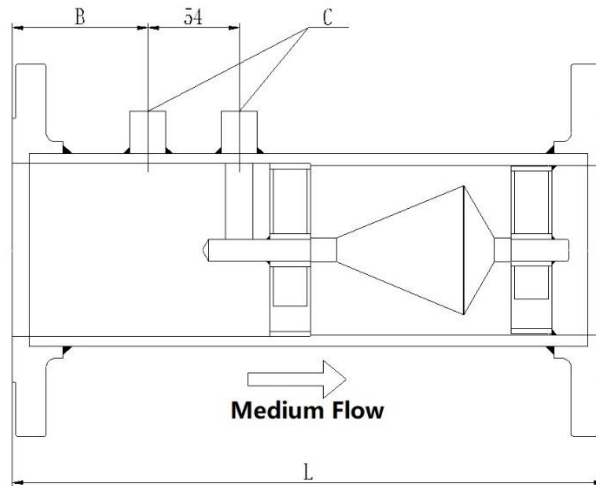


Flange Pipe Type



Integral Installation Type

## 2. Installation Dimension



Nominal Diameter	L (mm)	B (mm)	C
DN50	350	90	1/2NPT
DN80	450	90	1/2NPT
DN100	500	120	1/2NPT
DN150	600	130	1/2NPT
DN200	720	130	1/2NPT
DN250	830	150	1/2NPT
DN300	900	160	1/2NPT
DN350	1120	170	1/2NPT
DN400	1300	190	1/2NPT
DN450	1350	200	1/2NPT
DN500	1400	220	1/2NPT

## 3. Installation Requirements

- 3.1 LGV V-cone flow meter has a certain range of use. Before installation, confirm whether it meets the working conditions of the process (flow, pressure, temperature, etc.)
- 3.2 LGV V-cone flow meter is installed in the pipeline, the flange end face is vertical to the pipeline axis, and the maximum non-verticality is  $\pm 1^\circ$
- 3.3 All gaskets must not protrude from the inner wall of the pipe during installation, otherwise it will cause a large measurement error.

3.4 Any valve that regulates flow should be installed outside the minimum straight pipe length behind the flow element

3.5 The installation of LGV V-cone flow meter must be carried out after the pipeline cleaning and sweeping.

3.6 The installation of LGV V-cone flow meter must meet the requirements of the specified straight pipe section, otherwise the measurement accuracy will be affected.

3.6 If installed in a straight pipeline, the measured medium must flow from bottom to top when the measured medium is liquid.

3.7 Requirements of Front and Back Straight Pipe Section:

<b>Choke</b>	<b>Upstream</b>	<b>Downstream</b>
1 Elbow	3D	2D
2 Elbows	3D	2D
Tee Joint Head	3D	2D
Butterfly Valve	5D	3D
Ball Valve	3D	2D
Reducer	3D	2D
Divergent Tube	4D	3D

## Order Requirements

Please refer to LG type flow element.