



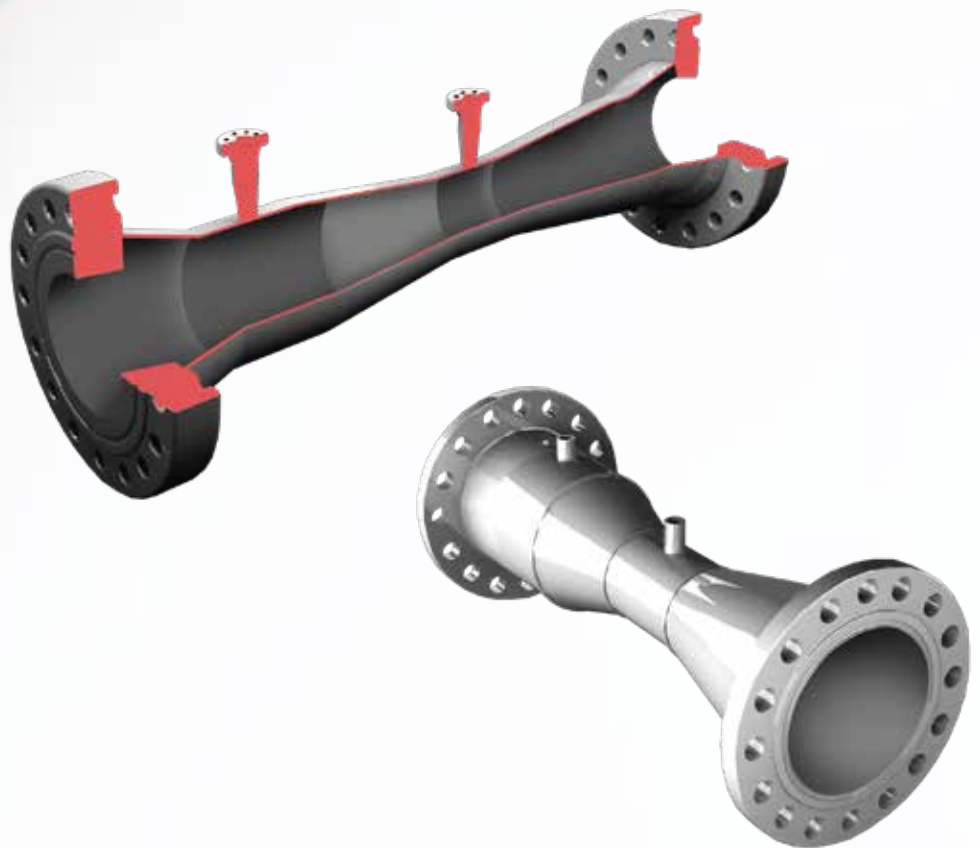
Technology Solutions

# TEK-DP 1640A

## Venturi Tube



FLOW



## Introduction

Tek-DP 1640A Venturi Tubes are differential pressure flow measurement devices particularly designed for the measurement of non-viscous, clean single-phase liquids and gases. The prominent features of Venturi Tubes include low permanent pressure loss, no moving parts, no abrupt flow restrictions and minimal upstream and downstream pipe length requirement.

Venturi Tubes are often used in processes where permanent pressure loss is not tolerable and where maximum accuracy is needed in case of highly viscous liquids.

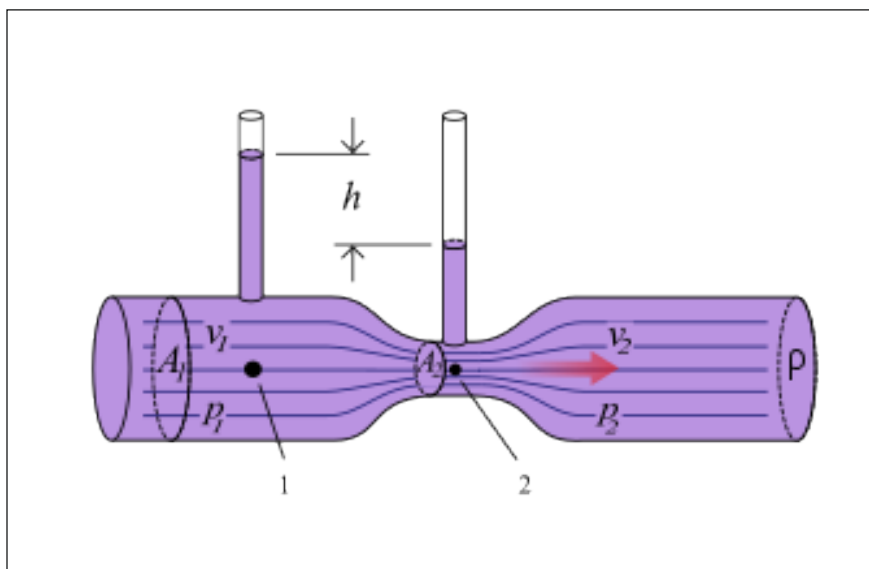
Tek-DP 1640A Venturi Tubes consist of a gradually decreasing convergent nozzle at the upstream and a gradually increasing diffuser section at downstream. Due to this characteristic design, they have the capability to regain a major part of the input pressure unlike other primary flow elements. The minimal pressure loss makes venturi tubes ideal for the systems with low pressure differential.

Tek-DP 1640A Venturi Tubes are available in various models for single phase gas, liquid applications, steam, slurries and wet gas applications.

Tek-DP 1640A series provides consistent accuracy, maximum pressure recovery, and sustained performance for a variety of applications where permanent pressure loss is intolerable.

## Measuring Principle

The Venturi measures a fluid's flow rate by reducing the cross-sectional flow area in the flow path and generating a pressure difference. After the pressure difference is generated, the fluid is passed through a pressure recovery exit section where up to 80% of the differential pressure generated at the throat is recovered.



Bernoulli described this relation between the differential pressure and flow rate by equation,

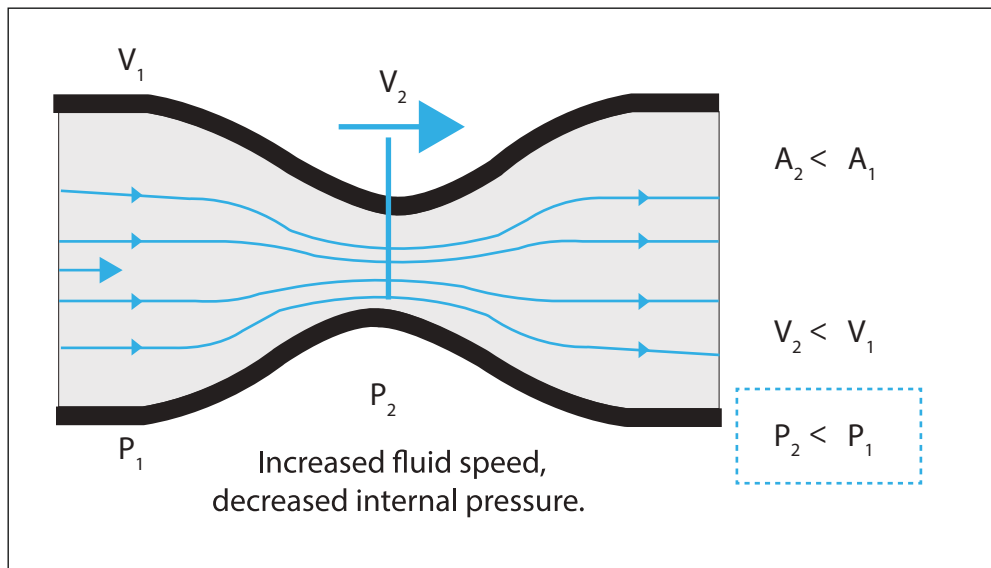
$$\Delta p \propto Q_m^2$$

The differential pressure generated,  $\Delta p$ , is proportional to the square of mass flow rate,  $Q_m$ . In simple terms, for a given size of restriction, higher the  $\Delta p$ , higher is the flow rate.

## Operation

A Venturi Tube is nothing but a tubular section with a constriction in it. It has a convergent nozzle at upstream and a divergent diffuser section at downstream which is responsible for creating a venturi effect in the flowing fluid.

The Venturi Tube is placed inside the pipe or is positioned between the two flanges. It is ensured that the pipeline is completely filled with a fluid while operating the device. A differential pressure sensor is attached between the two points, 1 & 2, for determining the differential pressure of a fluid.



As the fluid enters the upstream part of the Venturi Tube, the flow contracts and is accelerated due to the gradual decrease in cross-sectional area, creating a pressure loss.

The pressure drop varies with the fluid flow rate. The DP sensor measures the pressures of the upstream and downstream flow. The differential pressure ( $P_1 - P_2$ ) is proportional to the flow rate and can be determined by mathematical equations and appropriate calibration.

At the downstream, the flow regains its volume before leaving the Venturi Tube due to the diffusing section. This way, the Venturi Tube ensures maximum pressure recovery.

## Tek-DP 1640A Series Venturi Tubes

Tek-DP 1640A series Venturi Tubes are available in following designs.

- **Classical Venturi**

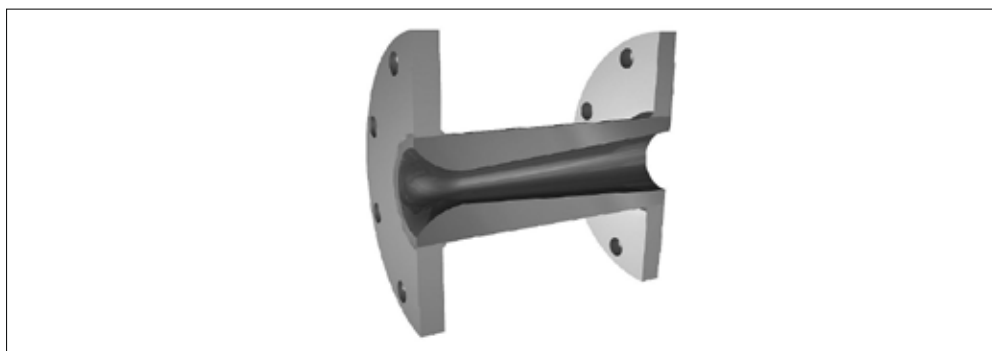
The convergent inlet is like a truncated cone.



The Classical Venturi is used in gas and fluid flow applications, where low pressure loss is a primary requirement. Classical Venturi Tubes prevent sediment clogging.

- **Nozzle Venturi**

The convergent inlet matches with the structure of a flow nozzle.



The Venturi nozzles are suitable in the measurement of superheated fluid, steam and gas where the pressure gradient is below critical and the flow pattern is steady.

## Features

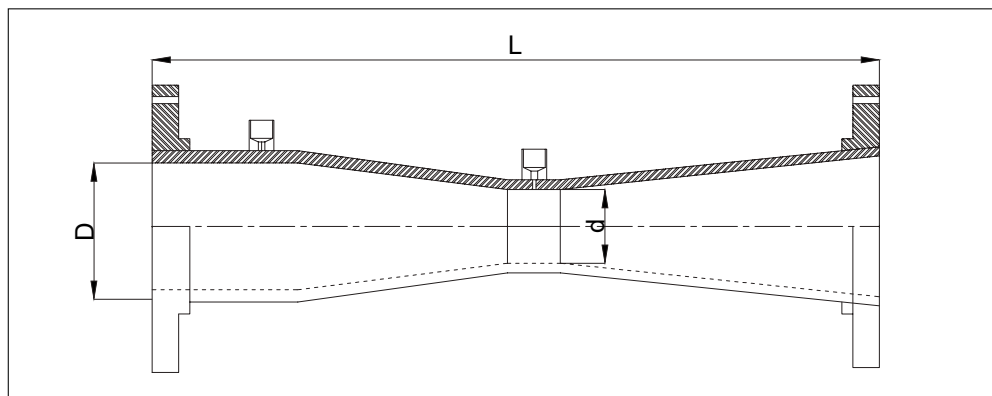
- Designs in accordance with ASME and ISO Standards.
- Durable and optimized design, simple configuration.
- Suitable for high-pressure, high-velocity, non-viscous, erosive process media.
- Reduced piping cost.
- Highest pressure recovery or lowest permanent pressure loss.
- Accuracy  $\leq \pm 0.5$  % of the actual flow rate.
- Repeatability 0.1%.
- Minimal upstream and downstream lengths.
- Available in all pipe sizes and a wide range of materials.

## Applications

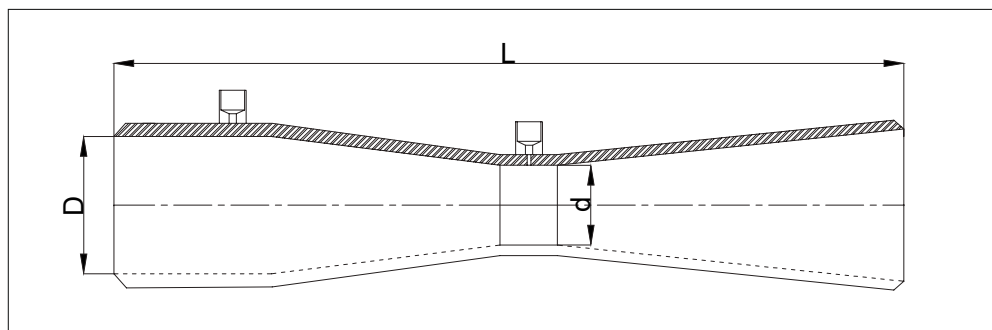
- Water and sewage plants.
- Slurry flows in mining, chemical plants.
- Power Generation.
- Hydrocarbon, Liquid & Gas Process.
- LNG Trains.
- High Accuracy Custody Transfer, Fiscal and Allocation Flow Metering.
- Compressor Stations.
- Cryogenics.

## Dimensional Drawing

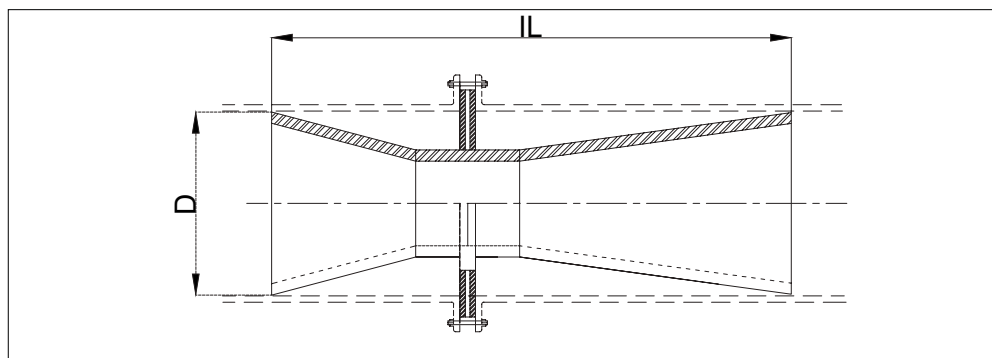
### Flanged Type



### Weld-in Type



### Insertion Type



## Specifications

### Venturi Meter for normal liquids

Venturi Material	All standard materials available
Tap Connections	Two ½" NPT standard, Flanged, socket welded, butt welded, valves
Turn Down	10:1 Standard
Venturi Tube Sizes	1" to 48", Custom size available on order
Beta Ratio	Typically 0.4 to 0.75
End Connections	#150 - #2500 RF/RTJ, SO/WN Flanges or Beveled ends
Operating Temperature	Standard at -40° to 200° F, optional -325°F to 1200°F
Operating Position	Vertical, horizontal
Process Products	Liquids, liquid hydrocarbons, Steam, Gases, Cryogenics
Assembly Type	Flange, Weld in, Insertion type
DP Transmitter	Tek-Bar 3110A

### Venturi Meters for wet gases

Venturi Material	All standard materials available
Tap Connections	Three ½" NPT standard, Flanged end, socket welded, butt welded, valves
Venturi Tube Sizes	1" to 48", Custom size available on order
Beta Ratio	Typically 0.4 to 0.75
Turn Down	10:1 Standard
End Connections	#150 - #2500 RF/RTJ, SO/WN Flanges or Beveled Ends
Operating Temperature	Standard at -40° to 200° F, optional -250° to 1200° F
Operating Position	Vertical, horizontal
Process products	Gases
Assembly Type	Flange, Weld in, Insertion type
DP Transmitter	Tek-Bar 3110A

## TekValSys

Tek-Trol Venturi's can be supplied with a unique, Powerful, Industrially Proven, Patented Validation/Diagnostics System.

### Basic Operation:

- A Downstream Pressure Tap Allows 3 DP's to be Read.
- The Pressure Field Through the Meter is Monitored.
- The Diagnostic System Multiplies the Meters Capability.
- 3 DP's are Compared to Assure Correct Meter and DP Transmitter Operation.
- A Simple Live Diagnostics Plot is Shown in the Control Room.

### Venturi Flow Meter Problems that Produce a Warning with Diagnostics Include:

1. Incorrect Inlet or Throat Diameter Keypad Entry.
2. Two-Phase Flow.
3. Excessive Flow Disturbance Upstream of the Meter.
4. Contamination Build Up Through the Meter.
5. Blocked Impulse Lines.
6. Saturated DP Transmitter.
7. Drifting DP Transmitter.
8. Incorrect Discharge Coefficient Keypad Entry.
9. Incorrectly Spanned DP Transmitter.

## Model Chart

Example	Tek-DP 1640A	0050	A	01	A	01	A	03	A	03	A	01	A	MTR	Tek-DP 1640A-0050-A-01-A-01-A-03-A-03-A-01-A-MTR
Series	Tek-DP 1640A														Venturi Tube
Size		0015 0020 0025 0040 0050 0065 0080 0100 0150 0200 0250 0300 0350 0400 0450 0500 0600 0700 0800 0900 1200													1/2" 3/4" 1" 1 1/2" 2" 2 1/2" 3" 4" 6" 8" 10" 12" 14" 16" 18" 20" 24" 28" 32" 36" 48"
Meter Body			A B C D E F G H X												Carbon Steel (Standard) Low Temp CS 304L SS 316L SS Duplex 2205 Duplex 2507 Chromemoly CrMo P11 Chromemoly CrMo P22 Special
Pipe Schedule				01 02 03 04 05 06 07 08 09 10 11 12 13 XX											STD (Standard Pipe SCH) 10S 10 20 30 40S 40 80S 80 120 160 XS XXS Special
Process Connection					A B C D E F G H I W X										Raised Face Slip On Raised Face Weld Neck RTJ Slip On RTJ Weld Neck Hubs API Beveled End Socket NPTF (Upto 3" Only) Wafer Style (Upto 4" Only) Special
Pressure Rating						01 02 03 04 05 06 07 08 09 XX									150# 300# 600# 900# 1500# 2500# NPT (3000#) Socket Beveled End Special

Example	Tek-DP 1640A	0050	A	01	A	01	A	03	A	03	A	01	A	MTR	Tek-DP 1640A-0050-A-01-A-01-A-03-A-03-A-01-A-MTR
Throat Material of Construction							A B C D E F G H X								Carbon Steel Low Temp CS 304L SS 316L SS Duplex 2205 Duplex 2507 Chromemoly CrMo P11 Chromemoly CrMo P22 Special
Pressure Taps Size								01 02 03 04 05 XX							1/4" 3/8" 1/2" 3/4" 1" Special
Pressure Tap Style									A B C D F H V X						3000psi NPT 6000psi NPT 3000psi Socket 6000psi Socket Flanged Hubs Valves Special
Beta										01 02 03 04 05 06 07 XX					0.45 0.50 0.55 0.60 0.65 0.70 0.75 Special
Additional Meter Taps (D/S)											A B C X				None Temperature Tap (3D) Validation/Diagnostic Tap (6D) Special
Flow Transmitters/Computers												01 02 03 04 05 06 XX			None (Customer Supplied) Tek-Bar 3110 (Liquids) - Smart DP Tek-Bar 3800 (MVT Steam & Compressed Gases) Tek-FC 8000 (Natural Gas - Flow Computer) TekValsys DPRO (Insitu Flow Validation) TekValsys DPRO WFGM (Wet Gas) Special
Calibration													A B C D X		Dry (ISO 5167) Water Air Multiphase Special
Options														MTR MC PMI COC HYD XRT DPT MPT O2C TAG UMR DMR FMR CDE MRB DFT CPC	Material Test Report EN3.1 Material Cert EN2.1 Positive Material Identification (NDE) Certificate of Conformity Hydro Test X-Ray Dye Penetrant Magnetic Particle Testing O2 Cleaned SS TAG PLATE Upstream Meter Run - 1PC Downstream Meter Run - 1PC Meter Run with Flow Contioner Plates - 2PC Certified Drawing Electronic (As Built) Manufacturing Record Book Dry Film Thickness - Custom Paint Spec Custom Product Code

# Customer Service & Support



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