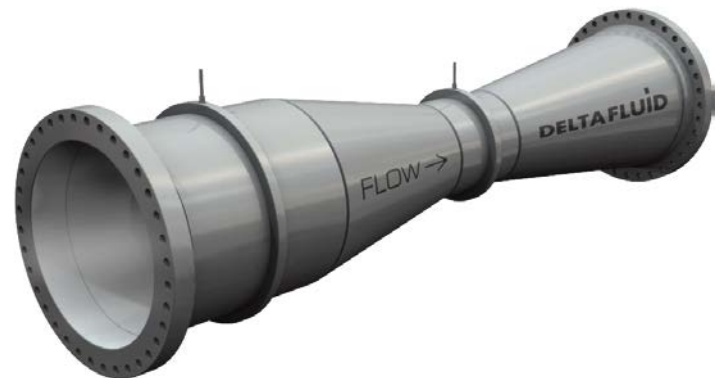


Datasheet *Venturi tube*

Rev.3 Feb 2015

- ✓ Venturi tube design based on ISO5167, ASME.MFC.3M and ISO TR15377 :2007 industry standards
- ✓ No need for calibration – standardised principle
- ✓ Accuracy, repeatability and reliability of the flow element
- ✓ Very low pressure loss
- ✓ Low requirements in terms of upstream and downstream lengths
- ✓ Suitable for all types of fluids, large flow range
- ✓ Very long life time
- ✓ Different types of venturi tubes : machined from a bar stock or rolled and welded from a metal sheet



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The venturi tube consists of a gradually decreasing convergent inlet followed by a cylindrical throat and a gradually expanding conical section called the “divergent”. The conical section allows the fluid to nearly regain its original pressure.

Due to the fact that a major part of the output pressure is regained, the venturi tube is particularly suited for the measurement of flow rates in systems where a low pressure differential is needed.

The venturi tube is a robust, reliable device. It can measure a wide range of clean liquids and gases. It ensures the lowest pressure loss in the family of primary flow elements as well as the lowest upstream and downstream straight lengths requirements.

Deltafluid offers different types of venturi tubes :

- Smaller sized units are machined from a unique bar stock.
- Larger sized units are manufactured from rolled and welded sheets.
- Cast venturi tubes can be manufactured as well; they can be made by casting in a sand mould or by other methods which leave a finish on the surface of the convergent section similar to that produced by sand casting. The throat is machined and the junctions between the cylinders and cones are rounded (rounded angles according to standards) for optimised flow.

They are supplied in one piece with integral pressure tapping points.

Applications

	Fluid types					
	Gas		Liquid			Steam
	Clean	Dirty	Clean	Viscous	Dirty	

Venturis

welded	++	+	++		+	++
machined	++	+	++		+	++

suitable +
recommended ++

Technical specifications

Applications – standards

Standards	ISO5167, ASME.MFC.3M, ISO TR15377 :2007
Fluid temperature	According specifications
Fluid types	Liquid, gas and steam
Nominal diameter	ND50 to ND1200 according ISO5167-4 standard (2...48 inches) Venturi tubes outside the scope of the standard available on request
Nominal pressure rating	According specifications

The device is dimensionally checked in compliance with the manufacturing quality controls. Manufacturing is possible according the european directive PED 97/23 CE requirements.

Features

Angle of the divergent section	7 to 15°
Angle of the convergent section	21 ± 1°
Ratio pressure loss	11 to 21 of ΔP $\beta=0,4$ (depending on the divergent section) 4 to 8% of ΔP $\beta=0,75$
Accuracy	0,5 to 1,5% according installation
Material	Carbon steel, Stainless steel, Monel, Hastelloys, Inconels, Titane, Tantale, PVC, etc
Calibration	No special need (standardised principle) May be performed on request

Mounting

Assembly	Between flanges (RF or RTJ) or butt welding or hub connection
Piping connection	Between straight lengths (variable lengths regarding β and obstacles located up and downstream – see table here-after)
Type of gaskets	Flat seal (sipral wound gasket, graphite, PTFE) or RTJ (mild steel, stainless steel, monel alloy...)
Alignment	Distance e between the centrelines of the upstream pipe and of the venturi tube : $e \leq 0,005 D$ Angular alignment of the venturi tube centreline with respect to the upstream pipe centreline : $< 1^\circ$

Technical description

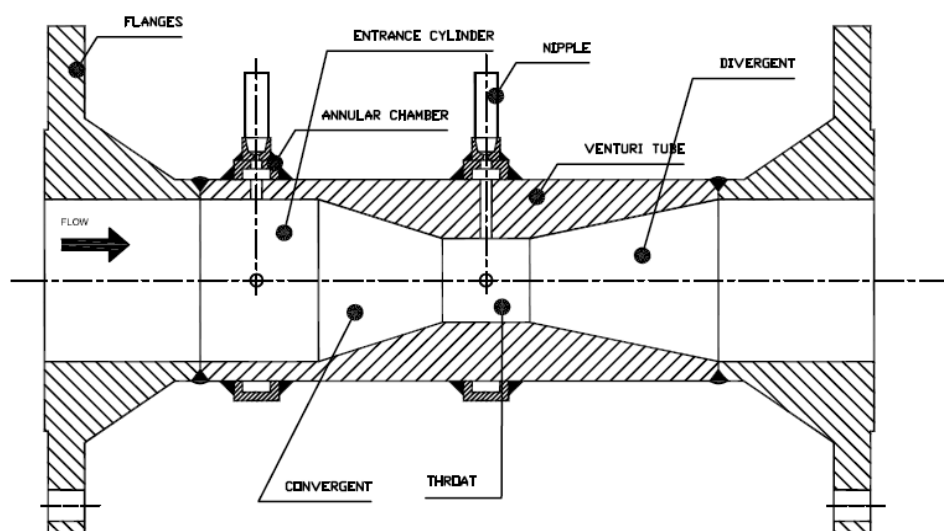
Roughness criterion	Throat all types of venturi tubes : $R_a < 10^{-4} d$ Machined venturi tubes : - Entrance cylinder and convergent section : $R_a < 10^{-4} d$ Welded sheet venture tubes : - Entrance cylinder, convergent section : $R_a \leq 5 \cdot 10^{-4} D$ Cast convergent section venturi tubes : - Convergent section : $R_a < 10^{-4} D$
Diameter D	Entrance cylinder diameter D : measured in the plane of the upstream pressure tapings
Cylindricity of diameter D	No diameter along the entrance cylinder shall differ by more than 0,4% from the value of the mean diameter
Diameter d	Cylindrical throat diameter d : measured in the plane of the throat pressure tapings.
Cylindricity of diameter d	No diameter along the throat shall differ by more than 0,1% from the value of the mean diameter
Truncated venturi tube	A venturi tube is called : - truncated when outlet diameter of divergent section $<$ diameter D - not truncated when outlet diameter of divergent section = diameter D The divergent section may be truncated by about 35% of its length without significantly modifying the pressure loss of the device.

Limits of use

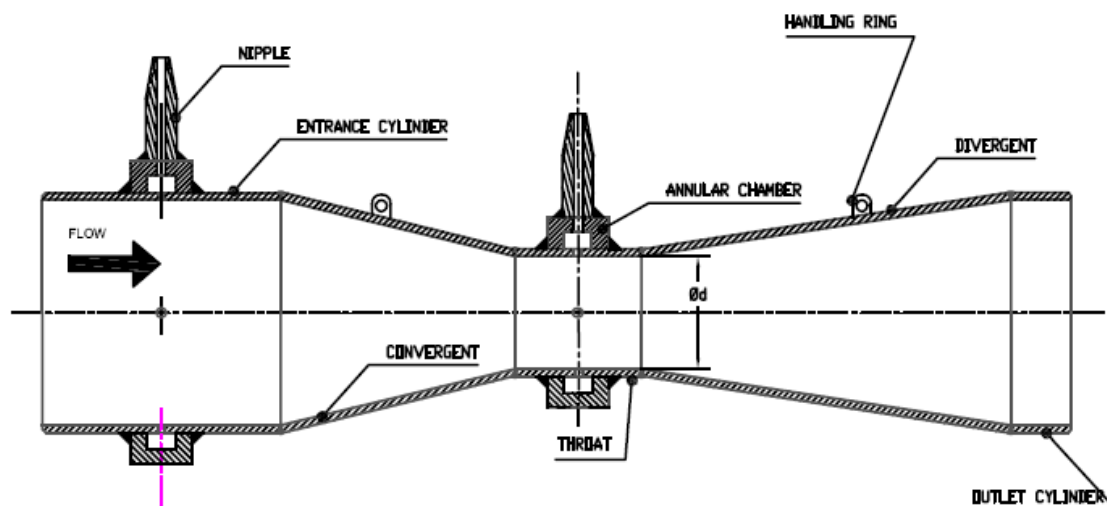
Machined venturi tube	β	0,40 0,75
	Re_D	$2 \cdot 10^5$ 10^6
	ND	50 250 mm
Venturi tube from rolled and welded sheet	β	0.40 0.70
	Re_D	$2 \cdot 10^5$ 10^6
	DN	200 1200 mm
Venturi tube as cast	β	0,30 0,75
	Re_D	$2 \cdot 10^5$ $2 \cdot 10^6$
	DN	100 800 mm

Drawings

Machined venturi tube



Venturi tube from rolled and welded sheet



Ordering information – MAIN CODE

Delta VT-	MAIN CODE									
Venturi Tube	X	XXX	XXX	XXX	X	X	XX	XX	XXXXX	XXX
Type of venturi										
Rolled and welded from metal sheets	W									
Machined from a bar stock	M									
Nominal diameter										
DN15 - 1/2"			1							
DN20 - 3/4"			0,75							
DN25 - 1"			1							
DN32 - 1"1/4			1,25							
DN40 - 1"1/2			1,5							
DN50 - 2"			2							
DN65 - 2"1/2			2,5							
DN80 - 3"			3							
DN100 - 4"			4							
DN125 - 5"			5							
DN150 - 6"			6							
DN200 - 8"			8							
DN250 - 10"			10							
DN300 - 12"			12							
DN350 - 14"			14							
DN400 - 16"			16							
DN450 - 18"			18							
DN500 - 20"			20							
DN600 - 24"			24							
Pipe Schedule										
5-5S			5							
10-10S			10							
20			20							
30			30							
40S-Std			STD							
40			40							
60			60							
XS-80S			XS							
80			80							
100			100							
120			120							
140			140							
160			160							
XXS			XXS							
Material										
Stainless steel 304				SS4						
Stainless steel 316				SS6						
Inconel				INC						
Monel				MON						
Hastelloy				HLY						
PTFE				PTF						
Duplex				DPX						
Superduplex				SDX						
Others - SPECIFY				O						
Annular chamber										
with annular chamber					Y					
without annular chamber					N					
Number of pressure tapings										
2 pressure tapings						2				
4 pressure tapings						4				
Others - SPECIFY						O				
Types of pressure tapings										
1/2NPTF							NP			
1/2BSP							BS			
SW							SW			
Others - SPECIFY							O			

Delta VT-	MAIN CODE									
Venturi Tube	X	XXX	XXX	XXX	X	X	XX	XX	XXXXX	XXX
Process connection										
Butt welding									BW	
Flanges - <i>type of flanges see options</i>									FL	
Rating	<i>for flange assembly</i>									
150#									A150	
300#									A300	
600#									A600	
900#									A900	
1500#									A1500	
2500#									A2500	
PN10									D10	
PN16									D16	
PN25									D25	
PN40									D40	
PN63									D63	
PN100									D100	
Type of face	<i>for flange assembly</i>									
Raising face										RF
Ring Torque Joint										RTJ

Ordering information – OPTIONS

OPTIONAL CODE	XX	XXX	X	XX	XX	XX	X
Flanges*⁽¹⁾							
Welding neck	WN						
Slip on	SO						
Socket welding	SW						
Hub connector	HC						
Others	O						
Flanges material							
ASTM A105		105					
A350LF2		350					
Carbon steel* ⁽²⁾		CST					
Stainless steel 304		SS4					
Stainless steel 316		SS6					
Inconel		INC					
Monel		MON					
Hastelloy		HLY					
PTFE		PTF					
Duplex		DPX					
Superduplex		SDX					
Other		O					
Gaskets							
Flat			F				
Graphite			G				
Spiral wound			S				
PTFE			P				
Others			O				
Boltings material							
Carbon steel				CS			
Stainless steel				SS			
Others				O			
Manifold							
3-way direct mounting					3D		
3-way remote mounting					3R		
5-way direct mounting					5D		
5-way remote mounting					5R		
DP Transmitter							
Standard						SD	
Multivariable						MV	
Temperature sensor*⁽³⁾							
With temperature sensor							Y
Without temperature sensor							N
* ⁽¹⁾ VT- with RF face can be assembled with simple or double & male or female facing depending on the flange							
* ⁽²⁾ Type of carbon steel to be specified							
* ⁽³⁾ Type of temperature sensor to be specified							

Straight lengths

Required straight lengths for venturi tubes

Values expressed as multiples of internal diameter D

Diameter ratio $\beta = d/D$	UPSTREAM LENGTHS FROM THE PLANE OF THE UPSTREAM PRESSURE TAPPINGS												DOWNSTREAM FROM THE PLANE OF THE THROAT PRESSURE TAPPINGS
	Single 90° bend	Two or more 90° bends in the same plane	Two or more 90° bends in different planes	Reducer 1,33D to D over a length of 2,3D	Expander 0,67D to D over a length of 2,5D	Reducer 3D to D over a length of 3,5D	Expander 0,75D to D over a length of D	Full bore ball or gate valve fully open	Temperature pockets of $\emptyset < 0,13 D$				Fittings (columns 2 to 10) or densitometer pockets
β	2	3	4	5	6	7	8	9	10				11
0,30	8 3	8 3	8 3	4	4	2,5	2,5	2,5	4				4
0,40	8 3	8 3	8 3	4	4	2,5	2,5	2,5	4				4
0,50	9 3	10 3	10 3	4	5 4	5,5 2,5	2,5	3,5 2,5	4				4
0,60	10 3	10 3	10 3	4	6 4	8,5 2,5	3,5 2,5	4,5 2,5	4				4
0,70	14 3	19 3	19 3	4	7 5	10,5 2,5	5,5 3,5	5,5 3,5	4				4
0,75	16 8	22 8	22 8	4	7 6	11,5 3,5	6,5 4,5	5,5 3,5	4				4

Nota:

The minimum straight lengths required are the lengths between various fittings located upstream and downstream of the primary element and the primary element itself,

Upstream straight lengths shall be measured from the plane of the upstream pressure tapings of the venturi tube.

Downstream pressure tapings shall be measured from the plane of the throat pressure tapings of the venturi tubes.

First column for each fitting gives lengths corresponding to « zero additional uncertainty » values (cf standard ISO 5167.4)

Second column for each fitting gives lengths corresponding to "0,5% additional uncertainty" values (cf standard ISO 5167.4).