

Datasheet Venturi tube

- ✓ 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											
	G	as		Liquid	Steam							
	Clean	Dirty	Clean	Viscous	Dirty							
Venturis												
welded	++	+	++		+	++						
machined	++	+	++		+	++						

suitable + recommended +

Technical specifications

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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 (248 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 β=0,4 (4 to 8% of ΔP β=0,75	(depending on the divergent section)
Accuracy	0,5 to 1,5% according installat	ion
Material	Carbon steel, Stainless steel, I Titane, Tantale, PVC, etc	Monel, Hastelloys, Inconels,
Calibration	No special need (standardised May be performed on request	l principle)

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 : $e \le 0,005 \text{ D}$ Angular alignment of the venturi tube centreline with respect to the upstream pipe centreline : <1°

Technical description

Roughness criterion	Throat all types of venturi tubes : $Ra < 10^{-4} d$ Machined venturi tubes : - Entrance cylinder and convergent section : $Ra < 10^{-4} d$ Welded sheet venture tubes : - Entrance cylinder, convergent section : $Ra \le 5 10^{-4} D$ Cast convergent section venturi tubes : - Convergent section : $Ra < 10^{-4} D$
Diameter D	Entrance cylinder diameter D : measured in the plane of the upstream pressure tappings
Cylindricality 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 tappings.
Cylindricality 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.



BUREAU VERITAS Certification



Limits of use

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

Machined venturi tube



Venturi tube from rolled and welded sheet



Drawings

Ordering information – MAIN CODE

Delta VT-		M	AIN CO	DE	•					
Venturi Tube	х	xxx	ххх	xxx	x	х	xx	xx	xxxxx	ххх
Type of venturi										
Rolled and welded from metal sheets	w									
Machined from a bar stock	М									
Nominal diameter		•								
DN15 - 1/2"		1								
DN20 - 3/4"		0,75								
DN25 - 1"		. 1								
DN32 - 1"1/4		1,25								
DN40 - 1"1/2		15								
DN50-2"		2,5		-		-				
DN65 - 2"1/2		25								
DN80 - 3"		<u>-</u> ,9 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										
5-55			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				-4						
Stainless steel 304				SS4						
Stainless steel 316				556						
Inconel				INC				-		
Monel				MON		-		-		
nastelloy										
PIFE								-		
Duplex						-		-		
Superduplex				SDX				-		
Annular chember	1	1		0		-				
with annular chamber					v	-				
without appular chamber					T N	-				
Number of pressure tanings					IN	J				
2 pressure tannings						2				
4 pressure tappings						4				
Athers - SPECIEV						0				
Types of pressure tappings						<u> </u>				
1/2NPTF							NP			
1/2BSP							BS			
SW							SW			
Others - SPECIEV							0			
							~	1	I	

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Delta VT-		1	MAIN C	ODE						
Venturi Tube	Х	XXX	XXX	XXX	Х	Х	XX	XX	XXXXX	XXX
Process connection		•			·	•	•			
Butt welding								BW		
Flanges - type of flanges see options								FL		
Rating	for fl	ange assen	nbly							
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	for fl	ange assen	nbly							
Raising face										RF
Ring Torque Joint										RTJ





Ordering information – OPTIONS

Flanges* ⁽¹⁾ W Welding neck WN Slip on SO Socket welding SW Hub connector HC Others O Flanges material Image material ASTM A105 105 ASTMA105 50 ASTMA105 50 Carbon steel* ⁽²⁾ CST Stainless steel 304 SS4 Stainless steel 316 SS6 Inconel INC Monel MON Hastelloy HY PTFE PTF Duplex DPX Superduplex SDX Others O Gaskets F Flat F Graphite G Spiral wound S PTFE P Others O Stainless steel G Spiral wound S PTFE SS Others O Stainless steel G Synay direct mounting G <t< th=""><th>OPTIONAL CODE</th><th>ХХ</th><th>XXX</th><th>Х</th><th>XX</th><th>XX</th><th>ХХ</th><th>Х</th><th></th></t<>	OPTIONAL CODE	ХХ	XXX	Х	XX	XX	ХХ	Х	
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Socket welding SW S	Slip on	SO							
Hub connectorHCHCHCOthersOIIFlanges material105IIASTM A105105IIA350LF2350IICarbon steel * ⁽²⁾ CSTIStainless steel 304SS4IStainless steel 316SS6IInconelINCIMonelMONIHastelloyHLYIPTFEPTFIDuplexDDXISuperduplexSDXIOtherOIGasketsIIFlatFIGraphiteGISpiral woundSIPTFEPOthersOBoltings materialCSStainless steelSSOthersOManifoldIAway direct mountingSD3-way direct mountingSDS-way direct mounti	Socket welding	SW							
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Flanges material	Others	0							
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Stainless steel 316 SS6	Stainless steel 304		SS4						
InconelINC <t< td=""><td>Stainless steel 316</td><td></td><td>SS6</td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Stainless steel 316		SS6						
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5-way remote mounting 5R Image: SR DP Transmitter SD Image: SD Standard SD SD Multivariable MV Image: SD Temperature sensor* ⁽³⁾ Image: SD Image: SD With temperature sensor Image: SD Y	5-way direct mounting					5D			
DP TransmitterStandardSDMultivariableMVTemperature sensor*(3)With temperature sensorImage: SDVImage: SDVV	5-way remote mounting					5R			
Standard SD Multivariable MV Temperature sensor* ⁽³⁾ Image: Constraint of the sensor	DP Transmitter								
MultivariableMVTemperature sensor*(3)MVWith temperature sensorMV	Standard						SD		
Temperature sensor* ⁽³⁾ Y	Multivariable						MV		
With temperature sensor Y	Temperature sensor* ⁽³⁾								
	With temperature sensor	-						Y	
Without temperature sensor N	Without temperature ser	nsor						N	
$^{*(1)}$ VT- with RF face can be assembled with simple or double & male or female facing	$*^{(1)}$ VT- with RF face can b	e asser	nbled w	ith sim	ple or d	ouble &	male o	r femal	e facing
depending on the flange	depending on the flange								_
* ⁽²⁾ Type of carbon steel to be specified	* ⁽²⁾ Type of carbon steel t	o be sp	ecified						

 $*^{(3)}$ Type of temperature sensor to be specified

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Straight lengths

Required straight lengths for venturi tubes

Values expressed as multiples of internal diameter D

Diameter ratio β = d/D	UPSTREAM LENGTHS FROM THE PLANE OF THE UPSTREAM PRESSURE TAPPINGS															DOWNSTREAM FROM THE PLANE OF THE THROAT PRESSURE TAPPINGS			
β	Single 90° b	end	Two o 90° be the s pla	r more ends in same ane	Two o 90° be diffe pla	r more ends in erent nes	Reducer 1,33D to D over a length of 2,3D	Expa 0,67D to a length	Expander 0,67D to D over a length of 2,5D		hander to D over h of 2,5D Reducer 3D to D over a length of 3,5D		er 3D Expander ver a 0,75D to D n of over a length g D of D		Full bore ball or gate valve fully open	Temperature pockets of Ø < 0,13 D			Fittings (columns 2 to 10) or densiotometer pockets
1	2		3	3	4	4	5	6	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 <mark>2,5</mark>	2,	5	3,5 <mark>2,5</mark>	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 <mark>3,5</mark>	5,5 <mark>3,5</mark>	4			4		
0,75	16	8	22	8	22	8	4	7	6	11,5 <mark>3,5</mark>	6,	5 4,5	5,5 <mark>3,5</mark>	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 tappings of the venturi tube.

Downstream pressure tappings shall be measured from the plane of the throat pressure tappings 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).



