Deltafluid
LA MESURE DE VOS EXIGENCES

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Datasheet
D – D/2 flowmeter

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- ✓ Orifice plate mounted between flanges
- ✓ Bosses located at 1D upstream and 0.5D downstream of the orifice plate
- ✓ Suitable solution for piping diameters from 6''
- ✓ Orifice plate design based on ISO5167, ASME.MFC.3M industry standards
- ✓ Accuracy, repeatability and reliability of the flow element
- ✓ No need of calibration
- ✓ Easy and quick installation and commissioning
- ✓ Very long life-time product
- ✓ Robust, cost-effective and maintenance-free system

Fig 1 : Example primary element Sharp edge orifice plate

Fig 2 : D-D/2 flowmeter

Contents

D – D/2 pressure taps are often used on large diameter pipings : it's a cheap and easy-to-install solution from 6''

Applications - standards

Standards	ISO5167, ASME.MFC.3M
Fluid temperature	-110°C to +800°C
Type of fluid	Gas, steam, liquid (single-phase fluids)
Nominal diameters	ND50 to ND1000 according ISO5167-1 (from 2 up to 40 inches)
Maximum operating pressure	Limited by the flange rating

Features

Ratio pressure loss	42% to 95% of $\Delta P^{(1)}$
Accuracy	<1% to 2,5% depending on the installation
Material orifice plate	Stainless steel, Inconel, Monel, Hastelloy, PTFE, Duplex, Superduplex, Titanium, Tantalum, PVC, etc
Type of orifice flanges	Slip-on
Type of pressure taps	Pressure taps located at D and D/2 : - the upstream pressure tap is located at a distance of D from the upstream face of the orifice plate - the downstream pressure tap is located at a distance of 0.5D from the upstream face of the orifice plate The D value included in the standard corresponds to the ID (internal diameter) of the piping. Bosses for pressure taps are manufactured directly on the upstream and downstream piping.
Material orifice flanges	Stainless steel, Carbon steel, Inconel, Monel, Hastelloy, PTFE, Duplex, Superduplex, etc
Type of gaskets	Flat seal (spiral wound gasket, graphite, PTFE) or RTJ (mild steel, stainless steel, monel alloy…)

(1) Depending on the type of orifice plate and on the ß value – see relevant datasheet for details

Mounting

Assembly	Orifice plates between flanges (RF or RTJ)
Centering of orifice bore relative to piping	Distance e between the centerline of the orifice and the centerline of the pipe in the direction parallel to the pressure tapping : $e \leq 0{,}002\ 5D / (0{,}1 + 2{,}3\ \beta^4)$
Process connection	D-D/2 flowmeter mounted between straight sections (variable lengths regarding β and obstacles located up and downstream – see table 1 here-after)

Limits of use

Radius taps	$d \geq 12.5$ mm $0.1 \leq \beta \leq 0.75$ $Re_D \geq 5000$ for $0.1 \leq \beta \leq 0.559$ $Re_D \geq 16.000\ \beta^2$ for $\beta > 0.559$

Deltafluid supply includes the orifice plate; it can include as well the flanges and the bosses for upstream and downstream pressure taps.

Orifice plate between flanges with upstream and downstream pressure taps located on the pipings (upstream boss at a distance of D and downstream boss at 0.5D)

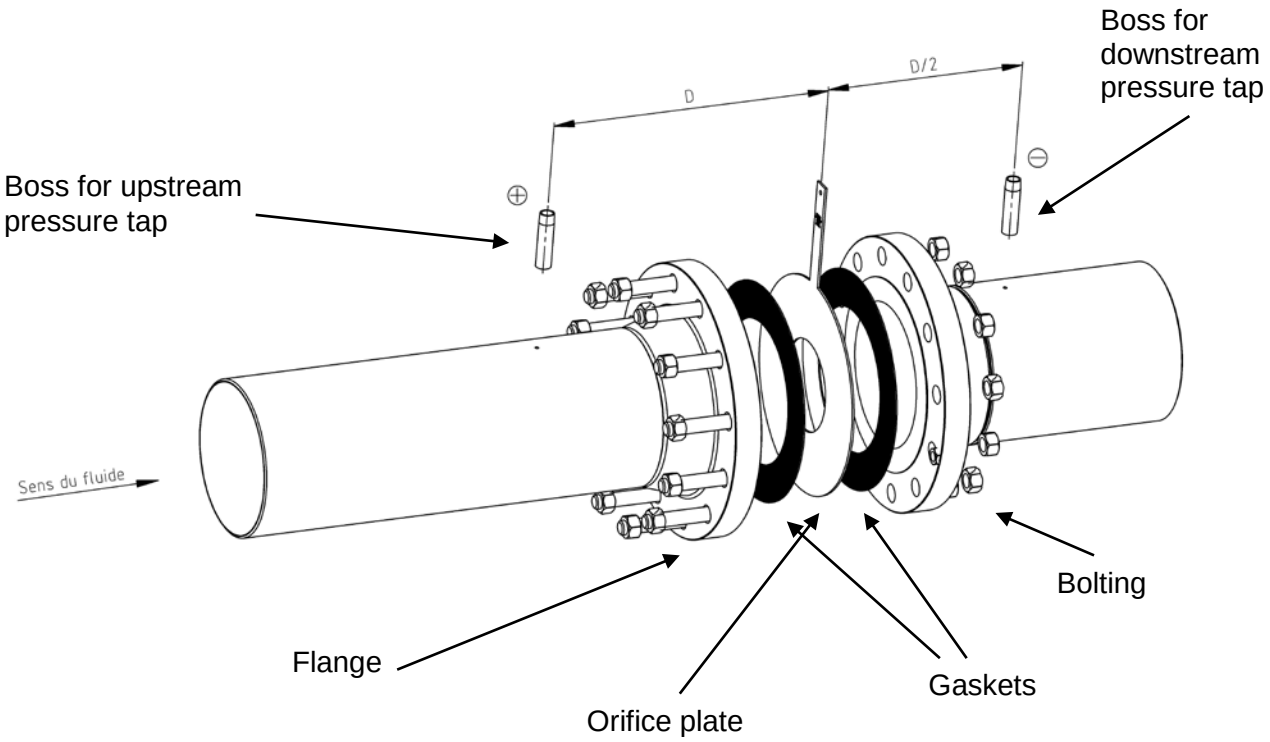
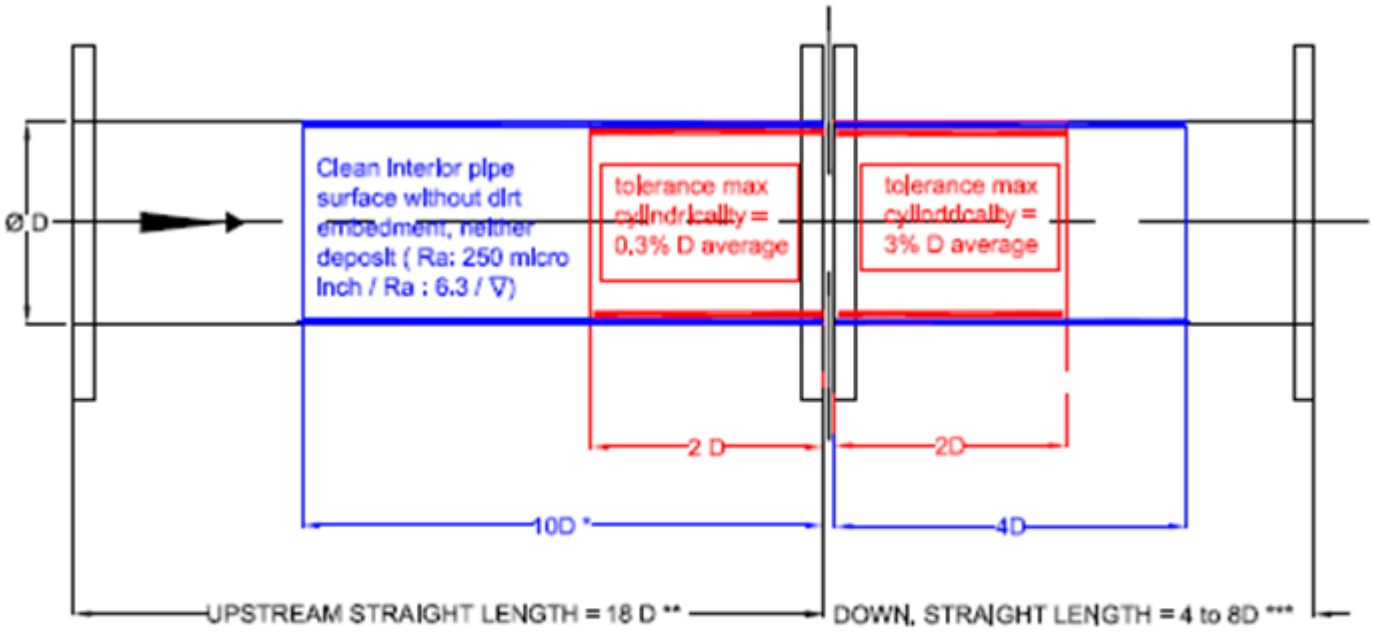


Fig 3 : D – D/2 flowmeter assembly

Installation requirements

Pipe alignment	Straight pipe if deviation from a straight line < 0,4% over its length
Upstream pipe roughness	Ra to be respected on a length ≥10D See diagram here under See ISO5167-2 standard
Circularity of the upstream pipe	D ≤ D ± 0,3% D on a length ≤ 2D
Circularity of the downstream pipe	D ≤ D ± 3% D on a length ≤ 2D

See diagram on next page.



* for straight lengths between 2D to 10D, no additional uncertainty in the discharge coefficient is involved provided that the maximum tolerance on cylindricality does not exceed 0,3%D

** minimum distance from the primary element to the nearest upstream fitting with a 19-tube bundle flow straightener

*** minimum length between the primary element and the nearest downstream fitting depending on the d/D value

Fig 4 : Roughness and cylindricality criterion

Delta D - D/2		MAIN CODE							
D - D/2 flowmeter	XX	XXX	X	XX	XX	XXX	XXXXX	XXX	XXX
Type of upstream face									
Sharp Edge	SE								
Conical Entrance	CO								
Quarter Circle	QC								
Eccentric	EC								
Segmental	SG								
Multi holes	MH								
Type of face									
Raising Face		RF*							
Ring Torque Joint		RTJ							
for RTJ :									
Male			M						
Female**			F						
in 1 piece or in 2 pieces									
Monobloc				MO					
Screwed - *see plate support material*				SC					
Type of finishing									
Polished 1 face					P				
Polished 2 faces					2P				
Others - SPECIFY					O				
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			

	MAIN CODE								
	XX	XXX	X	XX	XX	XXX	XXXXX	XXX	XXX
Rating									
150#							A150		
300#							A300		
600#							A600		
900#							A900		
1500#							A1500		
2500#							A2500		
PN10							D10		
PN16							D16		
PN25							D25		
PN40							D40		
PN63							D63		
PN100							D100		
Plate material									
Stainless steel 304								SS4	
Stainless steel 316								SS6	
Inconel								INC	
Monel								MON	
Hastelloy								HLY	
PTFE								PTF	
Duplex								DPX	
Superduplex								SDX	
Others - SPECIFY								O	
Plate support material	*for OP RTJ screwed*								
Stainless steel 304									SS4
Stainless steel 316									SS6
carbon steel									CS
Soft iron									SI
Others - SPECIFY									O

* D-D/2flowmeter-XX-RF can be assembled with simple or double & male or female facing depending on the flange

** Pipe schedule or inner diameter ID to be specified

OPTIONAL CODE	XX	XXX	XXX	X	XX	X
Flanges*(1)						
Slip on	SO					
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				
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			
Gaskets						
Flat				F		
Graphite				G		
Spiral wound				S		
PTFE				P		
Others				O		
Boltings material						
Carbon steel					CS	
Stainless steel					SS	
Others					O	
Piping*(3)						
Upstream						U
Downstream						D

*(1) OP-SE-RF can be assembled with simple or double & male or female facing depending on the flange

*(2) Type of carbon steel to be specified

*(3) Process connection to be specified

Table 1 - Straight lengths

Required straight lengths between orifice plates and fittings – without flow conditioners

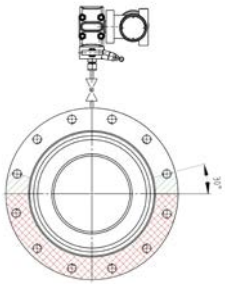
Values expressed as multiples of internal diameter, D

Diameter ratio d/D	UPSTREAM SIDE OF PRIMARY ELEMENT												DOWN STREAM OF PRIMARY ELEMENT
β	single 90° bend or two 90° bends in any plane (S>30D)	Two 90° bends in the same plane: S-config. 30D>S>10D	Two 90° bends in the same plane: S-config. 10D>S	Two 90° bends in perpen-dicular planes 30D>S>5D	Two 90° bends in perpen-dicular planes 5D>S	Simple 90° tee with or without an extension	Simple 45° bend or 2 bends in the same plane : S-config (S>2D)	Concentric reducer 2D to D over a length of 1,5D to 3D	Concentric expander 0,5D to D over a length D to 2D	Full bore ball valve or gate valve fully open	Abrupt symetrical reduction	Thermometer pocket or well of Ø < 0,03 D	Fittings (columns 2 to 11) and the densitometer pocket
1	2	3	4	5	6	7	8	9	10	11	12	13	12
<0,2	6 3	10	10	19 18	34 17	3	7	5	6	12 6	30 15	5 3	4 2
0,40	16 3	10	10	44 18	50 25	9 3	30	5	12 8	12 6	30 15	5 3	6 3
0,50	22 9	18 10	22 10	44 18	75 34	19 9	30 18	8 5	20 9	12 6	30 15	5 3	6 3
0,60	42 13	30 18	42 18	44 18	65 25	29 18	30 18	9 5	26 11	14 7	30 15	5 3	7 3,5
0,67	44 20	44 18	44 20	44 20	60 18	36 18	44 18	12 6	28 14	18 9	30 15	5 3	7 3,5
0,75	44 20	44 18	44 22	44 20	75 18	44 18	44 18	13 8	36 18	24 12	30 15	5 3	8 4

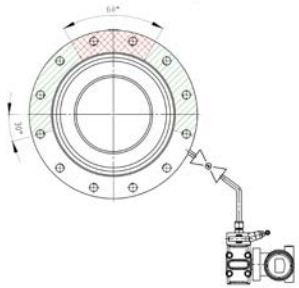
Notes:
The minimum straight lengths required are the lengths between various fittings located upstream and downstream of the orifice plate and the orifice plate itself.
Straight lengths shall be measured from the upstream face of the orifice plate.
First column for each fitting gives lengths corresponding to « zero additional uncertainty » values (cf standard ISO 5167.1)
Second column for each fitting gives lengths corresponding to “0,5% additional uncertainty” values (cf standard ISO 5167.1).
S represents the distance between two accessories

Orientation of the primary element

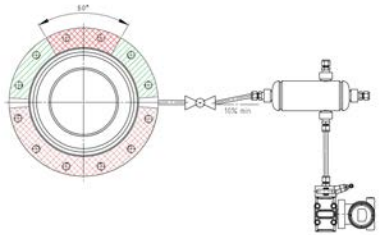
Horizontal line



Gas



Liquid

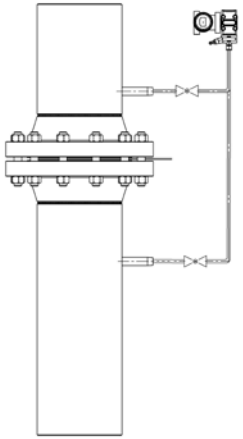


Steam

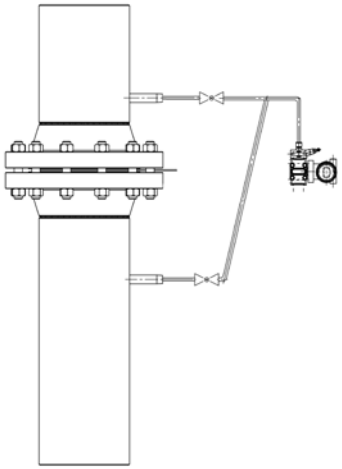
With liquid applications, the transmitter must be mounted below the pipe. This ensures that air bubbles rise back to the process pipe and thus do not influence the measurement.

With gas applications, the transmitter must be mounted above the pipe. This ensures that any condensate flows back into the process pipe and thus does not influence the measurement

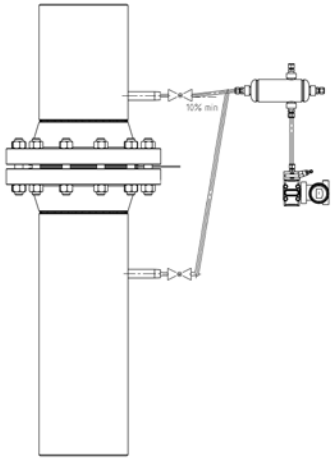
Vertical line



Gas



Liquid



Steam

With steam applications, two condensate pots should be used. They must be mounted on the same level so that the pipes between the transmitter and the condensate pots must be completely filled with water. The transmitter must be placed below the pipe.