



## Differential Pressure under Working Condition

PREPARED: **P.G.A.Engineering**  
 CHECKED:  
 APPROVED:  
 DATE: 08/05/2010

This calculation is according to ISO 5167

Measuring Method or Type	With Flange Tappings		▼
Outside Diameter of Pipe	30		▼
Pipe Schedules Number	XS		▼
Pipe Material	A182 F316L (Forgings)		▼
Device Material	A182 F1 (Forgings)		▼
Fluid Type	Liquid		▼
Flowrate	q	1000	kg/h ▼
Absolute Static Pressure of the Fluid	p	1	ftH <sub>2</sub> O ▼
Device Diameter	d	100	mm ▼
Temperature of the Fluid	t	50	°C ▼
Density at Operating Condition	ρ	50,00	kg/m <sup>3</sup> ▼
Dinamic Viscosity of the Fluid	μ	0,05	cP (CentiPoise) ▼
Isentropic Exponent (C <sub>p</sub> /C <sub>v</sub> )	κ	1,000	
Accuracy	%	0,5	

### CALCULATION

DESCRIPTION	DEF.	Imperial		Metric	
		Values	Unit of Measure	Values	Unit of Measure
<b>INPUT</b>					
Outside Diameter of Pipe	DN	30,000	in	762,00	mm
Pipe Wall Thickness	s	0,500	in	12,70	mm
Inside Diameter of Pipe	D	29,000	in	736,60	mm
Mass Flowrate	q <sub>m</sub>	0,61239513	lb/s	0	kg/s
Absolute Static Pressure of the Fluid	P	0	psi	2989	Pa
Device Diameter	d	3,937	in	100	mm
Diameter Ratio d/D	β	0,13576	-	0,13576	-
Density at Operating Condition	ρ	0,002	lb/in <sup>3</sup>	50,00	kg/m <sup>3</sup>
Temperature of the Fluid	t	122	°F	50	°C
Dinamic Viscosity of the Fluid	μ			0,00005	Pa s
Pipe Reynolds Number	Re <sub>D</sub>	9,60E+03	-	9,60E+03	-
Orefice Reynolds Number	Re <sub>d</sub>	7,07E+04	-	7,07E+04	-
Pipe Mean Coefficient of Thermal Expansion at Operaing Condition	CT <sub>PIPE</sub>	8,58E-06	in/in/°F	1,55E-05	mm/mm/°C
Device Mean Coefficient of Thermal Expansion at Operating Condition	CT <sub>DEVICE</sub>	8,58E-06	in/in/°F	1,55E-05	mm/mm/°C
Allowable Device Stress at Operating Condition	S <sub>P,OP</sub>	30000	psi	207	MPa



## Differential Pressure under Working Condition

PREPARED: **P.G.A.Engineering**  
CHECKED:  
APPROVED:  
DATE: 08/05/2010

This calculation is according to ISO 5167

Modulus of Elasticity at Operating Condition	$E_{OP}$	2,90E+07	psi	200189	MPa
--	----------	----------	-----	--------	-----



## Differential Pressure under Working Condition

PREPARED: **P.G.A.Engineering**  
 CHECKED:  
 APPROVED:  
 DATE: 08/05/2010

This calculation is according to ISO 5167

DESCRIPTION	DEF.	Imperial		Metric	
		Values	Unit of Measure	Values	Unit of Measure
<b>OUTPUT</b>					
Differential Pressure	$\Delta p$	0,00478	psi	32,93	Pa
Discharge Coefficient	C	6,19E-01	-	6,19E-01	-
Uncertainty of Discharge Coefficient	-	0,5642411	%	0,5642411	%
Expansion Factor	$\epsilon$	9,96E-01	-	9,96E-01	-
Uncertainty of Expansion Factor	-	0,0385569	%	0,0385569	%
Pressure Loss	$\Delta \omega$	0,00467	psi	32,19	Pa
Maximum Orifice Thickness	$e_{MAX}$	0,580	in	14,73	mm
Minimum Orifice Thickness	$e_{MIN}$	0,145	in	3,68	mm
Maximum Plate Thickness	$E_{MAX}$	1,450	in	36,83	mm
Minimum Plate Thickness	$E_{MIN}$	0,145	in	3,68	mm
Maximum Device Deformation	$f_{LIM}$	0,001	in	0,02	mm
Minimum Plate Thickness to Ensure Deformation	$E_{f,LIM}$	0,245	in	6,22	mm

### VERIFICATION

Description	Formula	CHECK
Limits of Use for Discharge Coefficient	$d \geq 12,5$	VERO
Limits of Use for Discharge Coefficient	$50 \leq D \leq 1000$	VERO
Limits of Use for Discharge Coefficient	$0,1 \leq \beta \leq 0,75$	VERO
Limits of Use for Discharge Coefficient	$ReD \geq 5000, ReD \geq 170\beta 2D$	VERO
Limits of Use for Expansion Factor	$p_2/p_1 \geq 0,75$	VERO