



## Diameter of Orefice 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 Corner		▼
Outside Diameter of Pipe	3		▼
Pipe Schedules Number	160		▼
Pipe Material	A182 F316 (Forgings)		▼
Device Material	A182 F316 (Forgings)		▼
Fluid Type	Liquid		▼
Flowrate	q	35	m <sup>3</sup> /h ▼
Absolute Static Pressure of the Fluid	p	6	kgF/cm <sup>2</sup> ▼
Differential Pressure	Δp	0,25	bar ▼
Temperature of the Fluid	t	35	°C ▼
Density at Operating Condition	ρ	993,90	kg/m <sup>3</sup> ▼
Dinamic Viscosity of the Fluid	μ	0,77	cP (CentiPoise) ▼
Isentropic Exponent (C <sub>p</sub> /C <sub>v</sub> )	κ	1,000	
Accuracy	%	0,0	

### CALCULATION

DESCRIPTION	DEF.	Imperial		Metric	
		Values	Unit of Measure	Values	Unit of Measure
<b>INPUT</b>					
Outside Diameter of Pipe	DN	3,500	in	88,90	mm
Pipe Wall Thickness	s	0,438	in	11,13	mm
Inside Diameter of Pipe	D	2,624	in	66,64	mm
Mass Flowrate	q <sub>m</sub>	21,3030833	lb/s	10	kg/s
Absolute Static Pressure of the Fluid	P	85	psi	588399	Pa
Differential Pressure	Δp	3,62594	psi	25000	Pa
Density at Operating Condition	ρ	0,036	lb/in <sup>3</sup>	993,90	kg/m <sup>3</sup>
Temperature of the Fluid	t	95	°F	35	°C
Dinamic Viscosity of the Fluid	μ			0,00077	Pa s
Pipe Reynolds Number	Re <sub>D</sub>	1,81E+05	-	1,81E+05	-
Pipe Mean Coefficient of Thermal Expansion at Operating 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
Modulus of Elasticity at Operating Condition	E <sub>OP</sub>	2,90E+07	psi	200189	MPa



## Diameter of Orifice under Working Condition

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DESCRIPTION	DEF.	Imperial		Metric	
		Values	Unit of Measure	Values	Unit of Measure

### OUTPUT

Orefice Diameter	d	1,74198	in	44,25	mm
Diameter Ratio d/D	$\beta$	0,66396	-	0,66396	-
Orefice Reynolds Number	Re <sub>d</sub>	2,72E+05	-	2,72E+05	-
Discharge Coefficient	C	6,11E-01	-	6,11E-01	-
Uncertainty of Discharge Coefficient	-	0,6068209	%	0,6068209	%
Expansion Factor	$\epsilon$	9,81E-01	-	9,81E-01	-
Uncertainty of Expansion Factor	-	0,1487086	%	0,1487086	%
Pressure Loss	$\Delta\omega$	2,00666	psi	13835,46	Pa
Maximum Orifice Thickness	e <sub>MAX</sub>	0,052	in	1,33	mm
Minimum Orifice Thickness	e <sub>MIN</sub>	0,013	in	0,33	mm
Maximum Plate Thickness	E <sub>MAX</sub>	0,131	in	3,33	mm
Minimum Plate Thickness	E <sub>MIN</sub>	0,013	in	0,33	mm
Maximum Device Deformation	f <sub>LIM</sub>	0,000	in	0,00	mm
Minimum Plate Thickness to Ensure Deformation	E <sub>f,LIM</sub>	0,223	in	5,67	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	eD $\geq$ 5000 for 0,1 $\leq$ b $\leq$ 0,56; ReD $\geq$ 16000b <sup>2</sup> for b $>$ 0,5	VERO
Limits of Use for Expansion Factor	$p_2/p_1 \geq 0,75$	VERO