THE NEED FOR EVERY INDUSTRY

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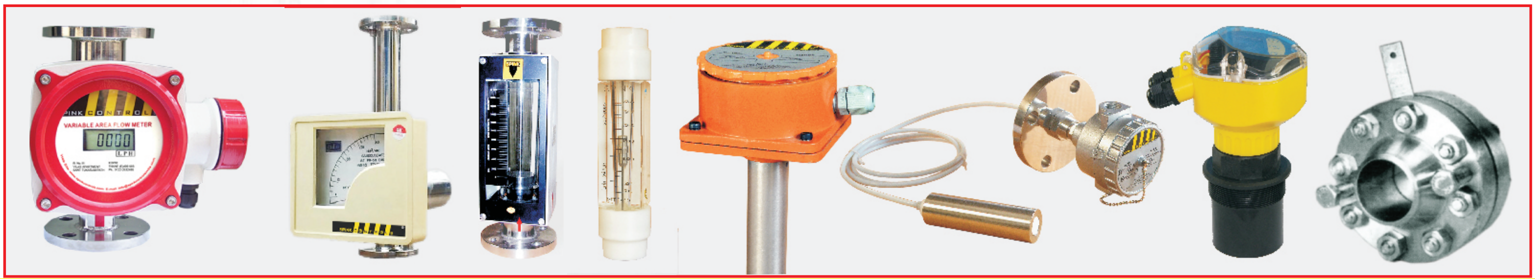
Fluid Flute(Averaging Pitot Tube)



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SPINK CONTROLS ®

The pitot tube produces a Differential pressure (DP) signal proportional to the square of the flow rate in accordance with Bernoulli's theorem. This signal has two components, the high pressure (HP) and the low pressure (LP).

DP= HP-LP

When the fluid impacts the sensor, it creates a high pressure zone, greater than pipe static pressure, in front of the sensor. As the fluid moves past the sensor, it accelerates and a low pressure zone is created to the sides and rear of the sensor. Multiple sensing ports are positioned in the high and low pressure zones and an averaged differential pressure is produced. The DP increases proportionally to the square of the velocity of the fluid.

TECHNICAL SPECIFICATION

Line size	:	150 NB – 750 NB (6'' to 30")
Mounting	:	Sensor Fitted With Flange and Fixed to Mounting Flange on Pipeline
Optional Insert	:	Isolation Valve / Retract Mechanism

Equations to Calculate Differential Pressure in mm of H_2O.

1.Liquid (Volume rate of flow)*

$$\Delta P = (SG_1) \left[\frac{m^3/hr}{0.000396\ K\ D^2}\right]^2$$

2.Liquid & Gas (Mass rate of flow)*

$$\Delta P = (1/\delta) \left[\frac{kg/hr}{0.0125\ K\ D^2}\right]^2$$

3.Gas (Standard Volume rate of flow)*

$$\Delta P = \left[\frac{T\ SG_2}{P}\right] \left[\frac{Nm^3/hr}{0.0191\ K\ D^2}\right]^2$$

4.Gas (Actual volume rate of flow)*

$$\Delta P = (SG_2) \left[\frac{Am^3/hr}{0.0125\ K\ D^2}\right]^2$$

*Thermal Expansion factor of CS pipe = 1 between 0 to 40°C

*Gas Expansion factor assumed to be 1.0 to calculate ΔP

ΔP = dp in mm of H_2O

m^3/hr = cubic meter per hour

kg / hr = Kilogram per Hour

Nm^3/hr = Normal cubic meter per Hour

Am^3/hr = Actual cubic meter per Hour

K = Flow Coefficient of Averaging Pitot Tube

D = Pipe ID in mm

A = Cross Section area in m^2

V = Flow Velocity in m/s

δ = Flow Density in Kg/m^3

For Gas

$$\delta = \frac{P \times 289 \times 1.225}{101.35 \times T}$$

1.225 air density at 15°C and 101.35 KPa

T = °C + 273

P = KPa (ab)

SG_1 = Specific Gravity of Liquid

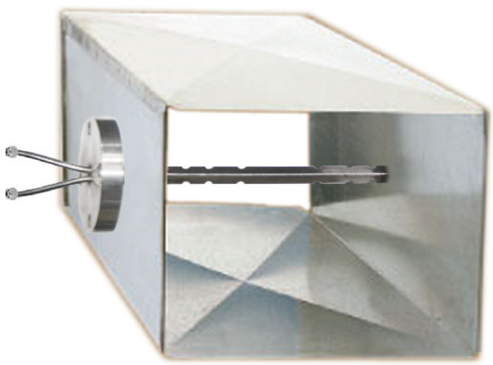
SG_2 = Specific Gravity of Gas

Approximate Flow Rate of Water and Air* with indicated differential pressure for Nominal Pipe size (SCH 40, SCH STD)

NB	Pipe ID	Water	Δ P	Air	K
inch	mm	m^3 / hr	mmc WC	SCFM	
6	154	260	1168	4295	0.624
8	202.7	350	1109	5846	0.646
10	254.5	470	752	7836	0.668
12	303.2	580	563	9791	0.671
14	333.3	700	550	11815	0.678
16	381	820	437	13838	0.682
18	428.6	950	362	16037	0.686
20	477.8	1080	299	18216	0.690
24	574.6	1290	202	21779	0.694
30	742.95	1700	119	28686	0.712

*Air Flow at 15°C and 101.35 KPa

Fluid Flute for Air Duct



Equations to Calculate Differential Pressure, Volume Flow & Velocity

$$\Delta P = (\delta) \left[\frac{V}{4.43\, K^*} \right]^2 \text{ mm of } H_2O$$

$$Q = A \times V \times 3600 \text{ m}^3/\text{hr}$$

$$V = 4.43 \times K^* \sqrt{\Delta P / \delta}$$

* Equivalent Round Diameter of Rectangular Duct = $\sqrt{1.27 \times W \times H}$
Where W & H are in inches. This D can be used to find K from above table

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