

Orifice Plates

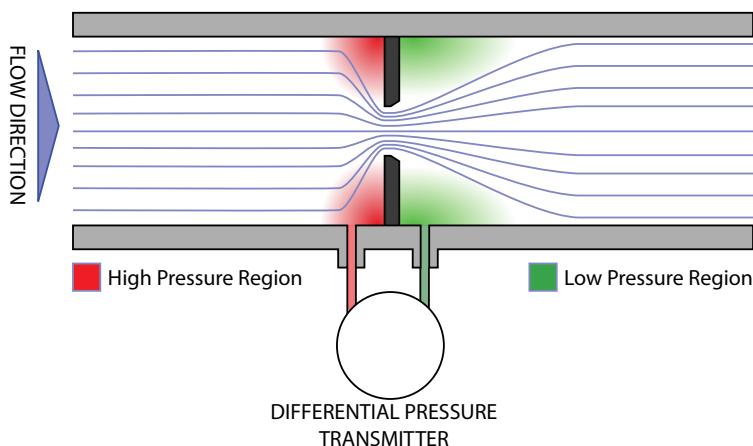
Measuring Your Flow Using DP Across An Orifice Plate

Method

According to Bernoulli's Principle, if you increase the speed of a flow you decrease its pressure - a fact that we can exploit to measure flow using DP elements such as orifice plates. An orifice plate is a precisely machined obstruction in your pipework.

As shown in the picture below, when your media reaches the orifice, it is forced through a narrow hole in the center of the plate. By reducing your flow path like this, you see changes in the speed and pressure of your media - on one side of the plate the pressure is high, while on the other side the pressure is comparatively low. The faster your media moves, the greater the difference in pressure.

This means that when your plate is built correctly, you can calculate your flow speed based on the difference in the pressures between the two sides of the plate.



Advantages

- Suitable for both liquids and gasses
- Extremely Accurate
- No Moving Parts
- Low Cost

Disadvantages

- Not suitable for liquids with suspended solids or dirty gasses
- Precisely calculated - most orifice plates are designed and built around specific applications.
- Requires a constant pressure and temperature in gas applications in order to be accurate - unless you use a multi-variable transmitter

Considerations

Adding an orifice plate does causes some permanent pressure drop in your system.

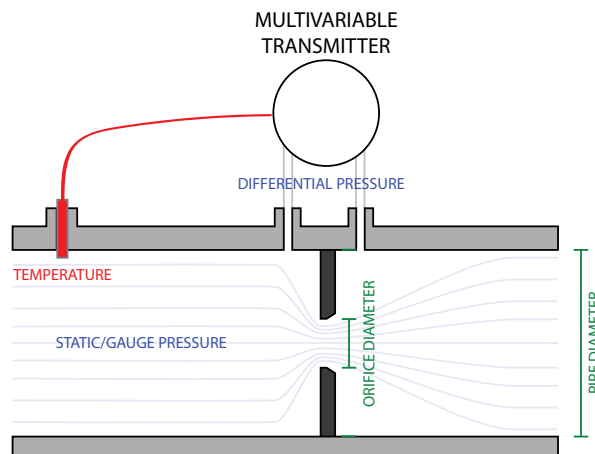
Note: Image examples are for liquid flows. Gas flows would have the transmitter at the top.

Multi-Variable Transmitters on Gas Applications

Rather than simply measuring the differential pressure, these transmitters also measure your current static pressure and process temperature and compensate for the changes this causes in your gas.

Some even compensate for the shrinkage or expansion of your pipework with different pressures and can cater for the fact that your orifice plate and pipework may expand at different rates.

They provide exceptional gas-flow accuracy.





Averaging Pitot Tubes

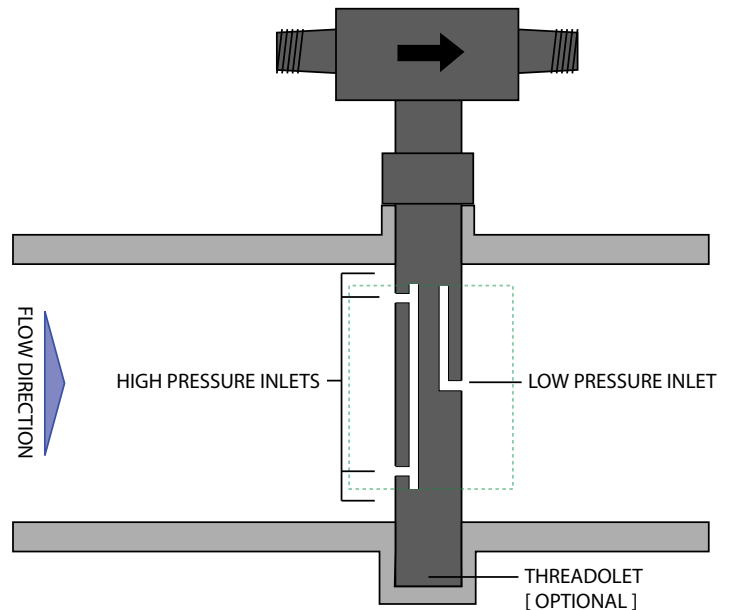
An Insertion Solution to DP Flow Measurement

Method

Averaging pitot tubes use exactly the same measuring concept as orifice plates (creating a differential pressure that is directly related to flow rate), but do so using a different design of element.

Where your pipework needs to be cut completely to install an orifice plate, a pitot tube is an insertion device - you simply drill one (or two) tapping points into your pipework and slide the tube in.

Pitot tubes are specifically designed to generate a high amount of differential pressure for your flow, so they are an excellent alternatives for where you do not want to install a full plate in your line.



The tubes come in a number of different shapes and sizes from different manufacturers, each designed to optimise the sensitivity of the device to certain applications.

Advantages Compared To Orifice Plates

- Easier to install, insert and remove
- Much lower pressure drop

Disadvantages Compared To Orifice Plates

- More sensitive to dust, dirt or other debris in your process
- Pitot tubes are unsuitable for some high-velocity applications
- Produce lower pressures than orifice plates

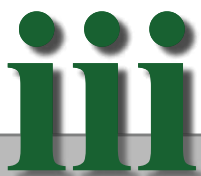
Considerations

Adding an averaging pitot tube to your system has a far lower pressure drop than an orifice plate, but it does still cause some drop to your system pressure.

Averaging pitot tubes can be installed into your pipework and held by just the one tapping point, but if high flows or pressure shocks are expected, we suggest securing it on both sides of the pipe using a socket on either side of the unit.

You can also purchase these with a manifold at the top - this allows you to mount your transmitter directly to the tube.

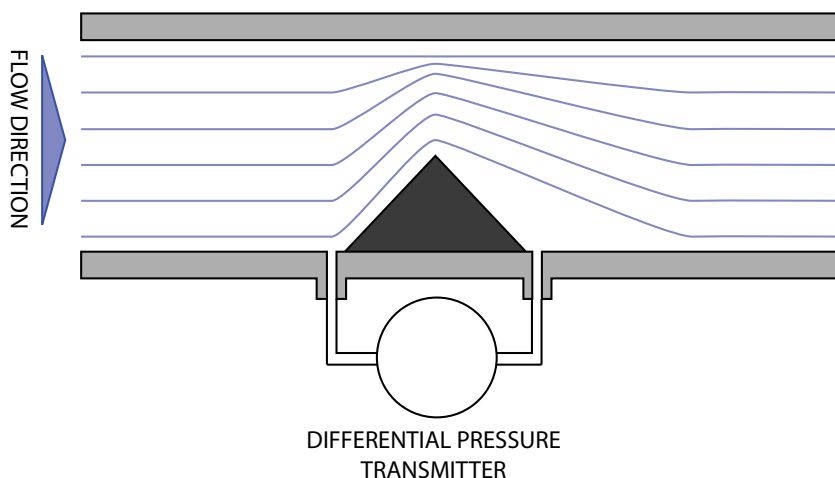
Multivariable transmitters are also suitable for use with pitot tubes.



Other DP Primary Elements

Other Primary Elements for DP Flow Measurement

Wedge Flow Restrictions



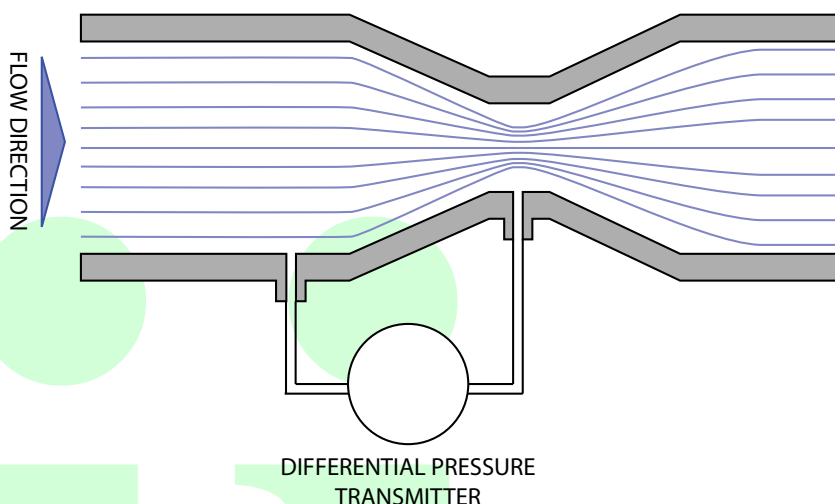
Advantages Compared To Orifice Plates

- More resistant to abrasion (although as the wedge degrades, accuracy will drop)

Disadvantages Compared To Orifice Plates

- Not suitable for low flow rates
- Generally less accepted than orifice plates

Venturi Flow Restrictions



Advantages Compared To Orifice Plates

- More resistant to abrasion
- Less pressure drop

Disadvantages Compared To Orifice Plates

- Large and heavy - can be difficult to install and requires a long, straight flow path
- Much higher construction and installation costs