PFS-OP Orifice Plate for Flow Measurement

General Description:
The PFS-OP orifice plate in line sizes from ½" and above is one of the most common differential producer type flow elements for the measurement of clean liquids, gasses and low-velocity vapor (steam) flow. Of the many design varieties described in technical manuals, codes and standards, the most prevalent configuration in the United States of America is the square-edged concentric paddle type orifice plate in combination with flange tapped carriers.
This design offers the optimum flexibility for applications with many diverse existing piping schemes as well as considerable economies available in terms of capital investment associated with the initial purchase of equipment. The design provides the means for relatively easy replacement of the orifice plate when necessitated by changes in the nominal flow rates in a given application installation or as might be required due to deterioration of accuracy performance of the installation.
The operation of the flow element is based upon the Bernoulli principle and relies upon the comparison of the pressure upstream and downstream (differential pressure) of the constriction represented by the orifice plate bore to infer the rate of flow of the line fluid through the bore diameter. Unlike other differential pressure flow elements such as venture type meters where the line fluid upstream and downstream of the constriction are generally and variously conditioned the energy consumed by the line fluid flowing through the orifice metering

Applications:
The PFS-OP is designed to measure full pipe, clean gasses or liquids over extreme temperature or low velocity vapor or steam. Typical applications include potable water, high pressure steam, combustion air, compressor surge control, oxygen & nitrogen measurement for air separation plants, petrochemical and chemical plants process measurement and control (alcohol, ethylene, chlorine, etc.)

Material of Construction:
Typical material selections for standard application orifice plates are 304 or 316 stainless steel. Other options for material selection are Monel, Hastelloy, Titanium and brass. All equipment is available cleaned for oxygen service if required.
All plates are stamped with identification data including material grade, bore size, line size, flange rating and tag number.

Design and Manufacturing Standards:
- All materials are mill certified and of first quality
- All applicable codes and standards are considered such as A.G.A, the I.S.A., the A.N.S.I., and A.P.I. recommendations.
- Each orifice plate is manufactured with strict adherence to ISO 9001 certification standards thereby applying numerous inspections at key points in the production process assuring the squareness and sharpness of the bore edge remains well within the tolerances permitted by the above referenced codes and standards.

Product Specifications:

Accuracy:
- +/-1.0% to +/-5.0% of full scale.
  (The accuracy of the orifice plate is directly contingent upon the presence of the sharp edge in the orifice bore. Any deterioration to this bore edge will cause immediate and unpredictable loss of accuracy.)

Range Ability:
10:1 or more depending on secondary group capabilities and arrangement.

Operating Conditions:
Line Fluid Capability:
- Gas or liquid full pipe flow.
- Clean with minimal particulate contamination.

Temperature Range:
- Cryogenic to Superheated Steam.
  -400°F to 1250°F (as limited only by the materials of construction and capabilities of the associated secondary device(s) used.)

Line Pressure Capacity:
- From full vacuum to the limits of materials.

Line Size Capability:
- Unlimited, between 1/2" and above.

Beta Ratio Capability:
- Custom sized and designed for Beta ratio range between 0.30 through 0.75.

Pipe Reynolds Number \(R_e\) Capability:
- Discharge coefficient is constant above 75,000 \(R_e\).
- Discharge coefficient bias and random error between 12,000 \(R_e\) and 75,000 \(R_e\) is empirically established and highly repeatable.

Permanent Pressure Loss:
- Varies from 3% of differential and up depending on application conditions, beta ratio, and exit cone truncation ratio and can be engineered to meet your requirements.

PFS Orifice Model Numbers:
PFS-OP Orifice Plate
PFS-OFU Orifice, Union, Flanged
PFS-OFU Orifice, Union, Flanged, Run

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In installations other than the Integral Orifice design, the orifice plate is held between a set of flanges, known as an orifice flange union, separated by suitable gaskets. These flange unions are specially machined to include the appropriate pressure tap sets that in conjunction with the orifice plate, will provide a means of obtaining the high and low pressure signals, and thus the differential.

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**Technical Data**

**PFS-OP**

- **High Pressure Tap**
- **Raised Face Flange (typ.)**
- **Low Pressure Tap**

**Upstream Orifice Flange Union**

- **Gasket**
- **Orifice Plate**
- **Gasket**

**Downstream Orifice Flange Union**

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**Square Edge Concentric**

Clean liquid, gas, vapor line fluids. Suitable for standard service requirements and with special material selection for harsh service.

**Quadrant Edged**

For high viscosity, low Reynolds number applications. Plate thickness and rounded edge contribute to greater durability and useful plate life.

**Eccentric Bore**

When bore is tangent to 98% of top line I.D. then entrained gases will pass the orifice. When at bottom, entrained solids will pass.

**Segmental Bore**

For fluids containing heavy sediments, B is 98% of line I.D. and H is height of circular segment.

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### Technical Specifications

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