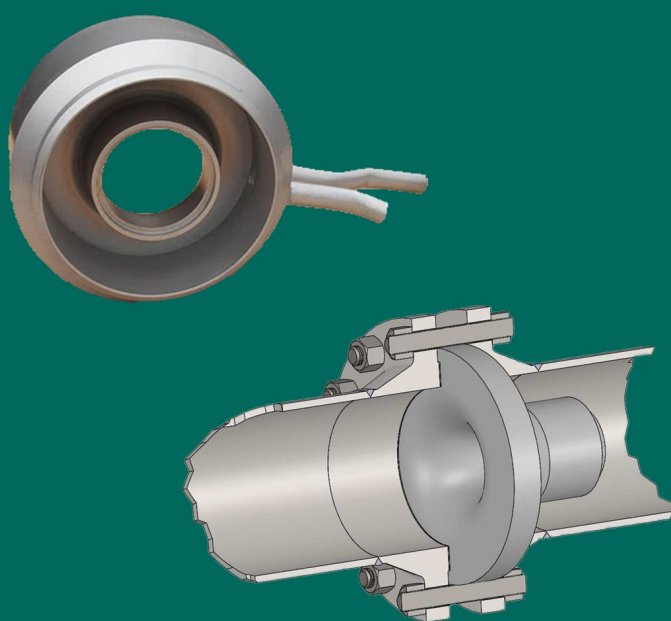




FLOW MEASURING WITH FLOW NOZZLE





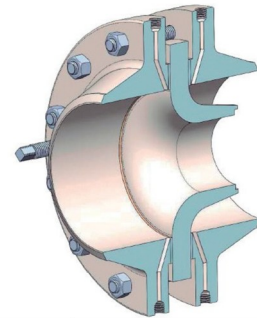
Introduction

The flow nozzle is used for high velocity flow measurement where erosion or cavitation would wear or damage an orifice plate. It does not rely on a sharp edge (that can degrade over time) for accuracy, therefore offering excellent long-term accuracy and it is often used for flow testing on steam-raising plant. The discharge coefficient of a flow nozzle is such that a nozzle can measure approximately 55 % higher flow rates than an orifice plate with a similar beta ratio and designed differential pressure.

Applications & Type

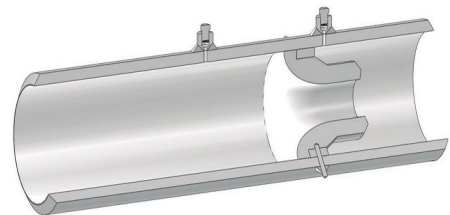
ISA1932 nozzle

the inlet profile is a quarter-circle with a cylindrical throat for use with corner tapings.



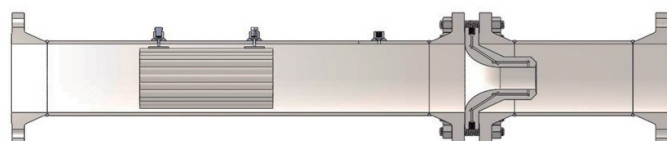
Long radius nozzle

the inlet profile is a quarter-ellipse with a cylindrical throat. The ellipse can have one of two aspect ratios (low or high), depending on the beta ratio. Tappings are typically 1 pipe diameter (D) upstream and 1/2 D downstream of the inlet, but the downstream tapping position on some low ratio versions can differ.



Throat tap nozzle

the inlet profile is a quarter-ellipse with a cylindrical throat. The upstream tapping is in the pipework, 1 D from the inlet; the downstream tapping is within the cylindrical throat and the connection to it is on the circumference of the nozzle ring. The design is usually conforms to ASME PTC-6, with the nozzle mounted within a run of pipework, the upstream section of which includes a flow straightening element.





Specification

Pipeline size range (standard)

50 to 600 mm (2 to 24 in.)

Accuracy

Typical discharge coefficient uncertainty is between ± 0.8 and ± 2 %, depending on nozzle design and beta ratio. These values apply when within Reynolds Number limits specified in ISO 5167-3:2003; uncertainty is greater if outside of these limits.

Repeatability

± 0.2 %

Process connection

- Weld-in
- Within metering pipe sections
- Between flanges,

Impulse connections

Several standard options are available for the connection of the meter to the transmitter:

- Threaded (female or male)
- weldolet
- Flange (B16.5)
- Socket weld

Welding Pressure

retaining welds are completed following the ASME Section IX

Temperature and pressure rating

Dependent on the design, the materials of construction and the process and / or tapping connection rating

Output signal

Minimum straight pipe requirements

For standard uncertainty, with-

out the use of flow straighteners:

Upstream Typically between 10 and 46 D (but can be up to 80 D) from the nozzle inlet face

Downstream Typically between 4 and 8 D from the nozzle inlet face

Actual requirements are depending upon the upstream fitting combination and the beta ratio. Refer to EN ISO 5167-4 for detailed information.



Compensation

Alongside differential pressure Δp , pressure p and temperature T are test variables of flow q . If there are no strong fluctuations in pressure and temperature, then the accuracy of the differential pressure signal is fully sufficient for the majority of measuring points. There is then no need for any Compensation.

With some applications, particularly in the gas and steam sectors, a special compensation is required. A change in pressure and/or temperature leads to a change in density. If this is not taken into account, total accuracy may be reduced.

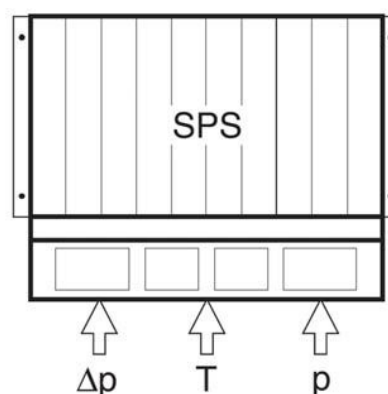
The following parameters are required for compensation:

- Gases: compensation of P and T
- Saturated steam: either P or T are compensated
- Superheated steam: compensation of P and T
- Liquids: compensation of T (very rare)

Both on the process side and on the system side, there are two possibilities for implementing compensation (large differences

in price and effort).

The process variables are fed into the (available) PLC or Flow Computer. The flow equations are programmed there. With this solution the investment costs are low, but the commissioning costs are increased.





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