UNICONTROLS™

DNV NABCB

ISO 9001-2008 QMS

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UNICONTROLS ....*manufacturer of primary flow elements*

Products

Orifice Plates* Orifice Flange Unions* Flow Nozzles* Low Loss Flow Tubes* Venturi Tubes* Unnibars * / Accessories

UNICONTROLS provides numerous services for our customers including bore calculations, flow-versus-differentialcurves,temperature/pressure correctioncurves,cavitationanalysis, and laboratory flowcalibrations.Our engineeringdepartmentwelcomesthechallenge presentedbycomplicatedflowproblemsfound in liquids,steam,and gases.We also offercomputer software for enginees to run bore calculations for orifice plates, flow nozzles, or venturi tubes(U.S.or S.I.units).The software uses the latest ASME andISO references to ensure the best calculation accuracy.

Orifice Plates

UNICONTROLS bores andsands its orificeplates tocomply to the latest ASME, ISO, ISA, and AGA recommendations. Paddle type plates are for use with orifice flange unions, while universal typeplates areforuseinorificefittings and plateholders.

In addition to concentricsharp-edgedboredplates,we also can provide plates with eccentric, segmental, or quadrant-edged bores. For flow restriction,wedesignmulti-stageorifice assemblies to minimize noise and eliminate cavitations. Virtually all sizes and materials are available to meet yourneeds and applications.

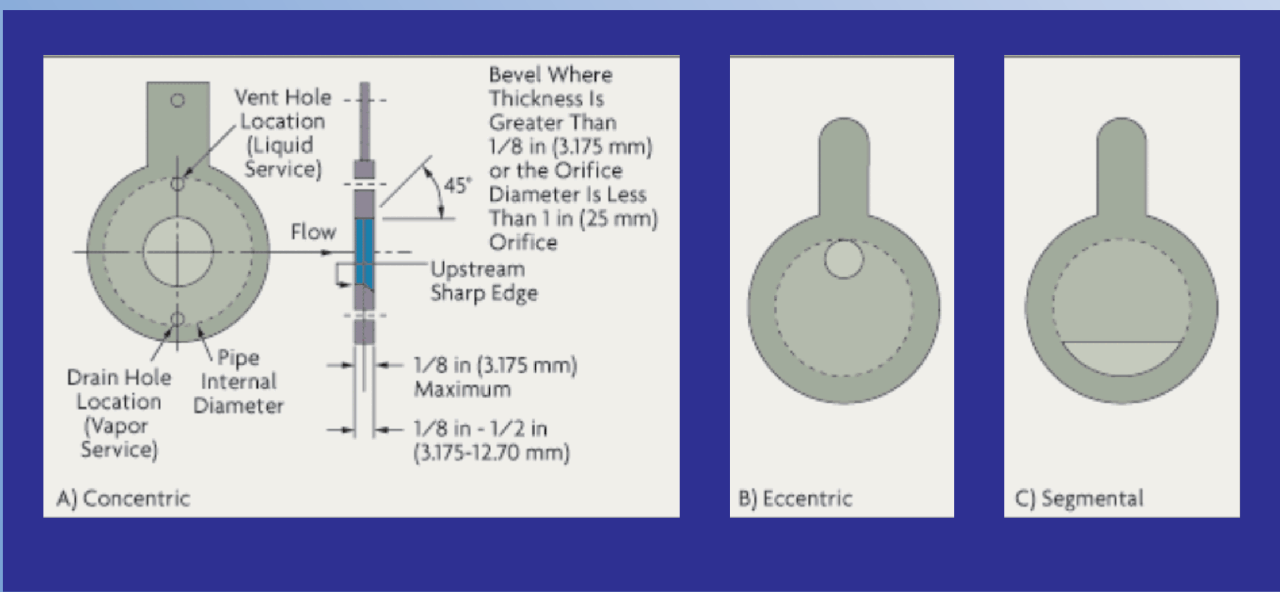
Sizing the Orifice Plate

The orifice plate is commonly used in clean liquid, gas, and steam service. It is available for all pipesizes, and if the pressure drop it requires is free, it is very cost-effective for measuring flows in larger pipes(over 6"diameter). The orifice plate is also approvedby many standards organizations for the custody transfer of liquids and gases.

The orifice flow equations used today still differ from one another, although the various standards organizations are working to adopt a single,universally accepted orificeflow equation. Orifice sizing programs usually allow the user to select the flow equation desired from among several.

The orifice plate can be made of any material, although stainless steel is the most common. The thickness of the plate used (1/8-1/2")is a function of the line size, the process temperature, the pressure, and the differential pressure. The traditional orifice is a thin circular plate (with a tab for handling and for data), inserted into the pipeline between the two flanges of an orifice union. This method of installation is cost-effective,but it calls for a process shutdown whenever the plate is removed for maintenance or inspection. In contrast, an orifice fitting allows the orifice to be removed from the process without depressurizing the line and shuttingdown flow. In such fittings, the universal orifice plate, a circular plate with no tab, is used.

The concentric orifice plate has a sharp (square-edged) concentric bore that provides an almost pure line contact between the plate and the fluid, with negligible friction drag at the boundary. The beta (or diameter) ratios of concentric orifice plates range from 0.25 to 0.75. The maximum velocity and minimum static pressure occur s at some 0.35 to 0.85 pipe diameters downstream from the orifice plate. That point is called the vena contracta. Measuring the differential pressure at a location close to the orifice plate minimizes the effect of pipe roughness, since friction has an effect on the fluid and the pipe wall.



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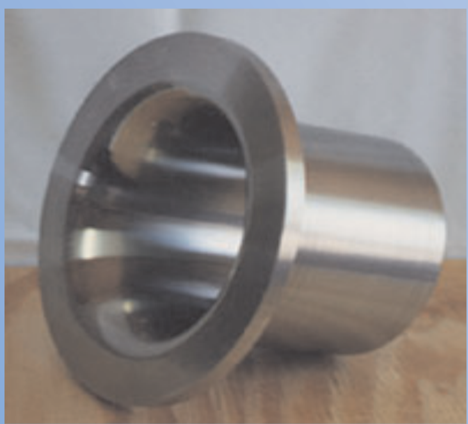
Flange-tap orifice flanges provide an economical and accurate means of flow measurement. We offer them in welding neck, slip-on, socket weld, and threaded type using all materials in all sizes. These orifice flanges meet the recommended tolerances of ASME, AGA, and ANSI. We furnish them with stud bolts, nuts, jackscrews, and gaskets. For the ANSI 150# rating, we can provide corner-tap orifice flanges to reduce weight and cost.

Orifice Flange Unions

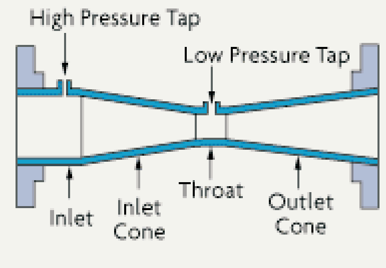


Flow Nozzles

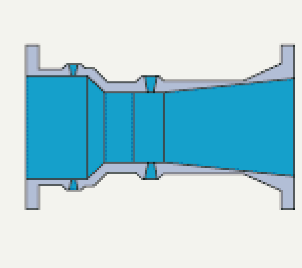
Carrier Ring

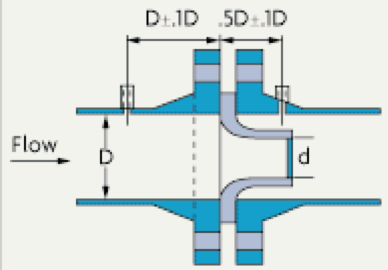
UNICONTROLS designs and manufactures its flow nozzles in accordance with ASME and ISO recommendations to ensure a maximum accuracy in flow measurement. They are available in flanged, weld-in, and holding-ring types using pipe-tap or throat-tap designs for line size up to 24". Standard materials are carbon steel, chrom-moly, and stainless steel.

Pipe Union



A) Short-Form Venturi Tube


B) Universal Venturi



C) Flow Nozzle

UNICONTROLS Venturi & Flowtubes

UNICONTROLS Venturi tubes are available in sizes up to 72", and can pass 25 to 50% more flow than an orifice with the same pressure drop. Furthermore, the total unrecovered head loss rarely exceeds 10% of measured d/p. The initial cost of venturi tubes is high, so they are primarily used on larger flows or on more difficult or demanding flow applications. Venturies are insensitive to velocity profile effects and therefore require less straight pipe run than an orifice. Their contoured nature, combined with the self- scouring action of the flow through the tube, makes the device immune to corrosion, erosion, and internal scale build up. In spite of its high initial cost, the total cost of ownership can still be favourable because of savings in installation and operating and maintenance costs.

The classical Herschel venturi has a very long flow element characterized by a tapered inlet and a diverging outlet. Inlet pressure is measured at the entrance, and static pressure in the throat section. The pressure taps feed into a common annular chamber, providing an average pressure reading over the entire circumference of the element. The classical venturi is limited in its application to clean, non-corrosive liquids and gases.

In the short form venturi, the entrance angle is increased and the annular chambers are replaced by pipe taps . The short-form venturi maintains many of the advantages of the classical venturi, but at a reduced initial cost, shorter length and reduced weight. Pressure taps are located 1/4 to 1/2 pipe diameter upstream of the inlet cone, and in . the middle of the throat section. Piezometer rings can be used with large venturi tubes to compensate for velocity profile distortions. In slurry service, the pipe taps can be purged or replaced with chemical seals, which can eliminate all dead-ended cavities.

There are several proprietary flow tube designs which provide even better pressure recovery than the classical venturi. The best known of these proprietary designs is the universal venturi . The various flow tube designs vary in their contours, tap locations, generated d/p and in their unrecovered head loss. They all have short lay lengths, typically varying between 2 and 4 pipe diameters. These proprietary flowtubes usually cost less than the classical and short-form venturis because of their short lay length. However, they may also require more straight pipe run to condition their flow velocity profiles.

Flowtube performance is much affected by calibration. The inaccuracy of the discharge coefficient in a universal venturi, at Reynolds numbers exceeding 75,000, is 0.5%. The inaccuracy of a classical venturi at Re > 200,000 is between 0.7 and 1.5%. Flowtubes are often supplied with discharge coefficient graphs because the discharge coefficient changes as the Reynolds number drops. The variation in the discharge coefficient of a venturi caused by pipe roughness is less than 1% because there is continuous contact between the fluid and the internal pipe surface.

The high turbulence and the lack of cavities in which material can accumulate make flow tubes well suited for slurry and sludge services. However, maintenance costs can be high if air purging cannot prevent plugging of the pressure taps and lead lines. Plunger-like devices (vent cleaners) can be installed to periodically remove buildup from interior openings, even while the meter is online. Lead lines can also be replaced with button-type seal elements hydraulically coupled to the d/p transmitter using filled capillaries. Overall measurement accuracy can drop if the chemical seal is small, its diaphragm is stiff, or if the capillary system is not temperature-compensated or not shielded from direct sunlight.

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UNICONTROLS venturi tubes can measure the flow of almost all liquids, steam, and gases. We design and fabricate them using ASME and ISO recommendations to produce a specified differential for a designed flowrate to ensure a low permanent pressure loss, a wide rangeability, and an extremely high accuracy. Furthermore, flange-end, weld-end, or insert type venturis can be provided in carbon steel, chrom-moly, stainless steel, or other materials on request for line sizes 1/2" upto 60".

Venturi Tubes

Low Loss Flow Tubes

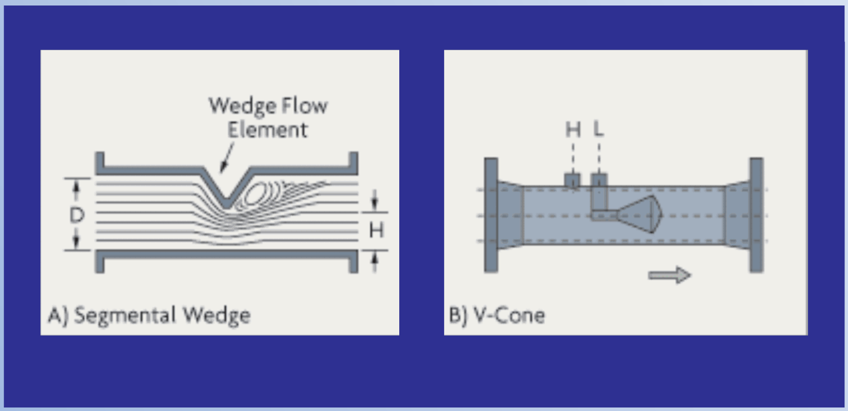
UNICONTROLS low loss flowtubes offer the ultimate in simplicity and efficiency while allowing the lowest permanent pressure loss. These flowtubes also still provide high accuracy and wide rangeability. They are ideal for water and sewage treatment plants where low pressure loss is critical. The standard construction uses carbon steel with a stainless steel or bronze throat liner. Furthermore, we construct these tubes as a flange-end, weld-end, or insert type.

Venturi-Cone Element

The venturi-cone (V-cone) element is another proprietary design that promises consistent performance at low Reynolds numbers and is insensitive to velocity profile distortion or swirl effects. Again, however, it is relatively expensive. The V-cone restriction has a unique geometry that minimizes accuracy degradation due to wear, making it a good choice for high velocity flows and erosive/corrosive applications.

The V-cone creates a controlled turbulence region that flattens the incoming irregular velocity profile and induces a stable differential pressure that is sensed by a downstream tap. The beta ratio of a V-cone is so defined that an orifice and a V-cone with equal beta ratios will have equal opening areas where d is the cone diameter and D is the inside diameter of the pipe.

With this design, the beta ratio can exceed 0.75. For example, a 3-in meter with a beta ratio of 0.3 can have a 0 to 75 gpm range. Published test results on liquid and gas flows place the system accuracy between 0.25 and 1.2% AR.



UNICONTROLS Segmental Wedge Elements

The UNICONTROLS segmental wedge element is a device designed for use in slurry, corrosive, erosive, viscous, or high -temperature applications. It is relatively expensive and is used mostly on difficult fluids, where the dramatic savings in maintenance can justify the initial cost. The unique flow restriction is designedto last the life of the installation without deterioration.

Wedge elements are used with 3-in diameter chemical seals, eliminating both the lead lines and any dead-ended cavities. The seals attach to the meter body immediately upstream and downstream of therestriction. They rarely require cleaning, even in services like dewatered sludge, black liquor, coal slurry,fly ash slurry, taconite, and crude oil. The minimum Reynolds number is only 500, and the meter requires only five diameters of upstream straight pipe run. The segmental wedge has a V-shaped restriction characterized by the H/D ratio, where H is the height of the opening below the restriction and D is the diameter. The H/D ratio can be varied to match the flow range and to produce the desired d/p. The oncoming flow creates a sweeping action through the meter. This provides a scouring effect on both faces of the restriction, helping to keep it clean and free of buildup. Segmental wedges can measure flow in both directions, but the d/p transmitter must be calibrated for a split range, or the flow element must be provided with two sets of connections for two d/p transmitters (one for forward and one for reverse flow). An uncalibrated wedge element can be expected to have a 2% to 5% AR inaccuracy over a 3:1 range. A calibrated wedge element can reduce that to 0.5% AR if the fluid density is constant. If slurry density is variable and/or unmeasured, error rises.

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SELF AVERAGING BAR

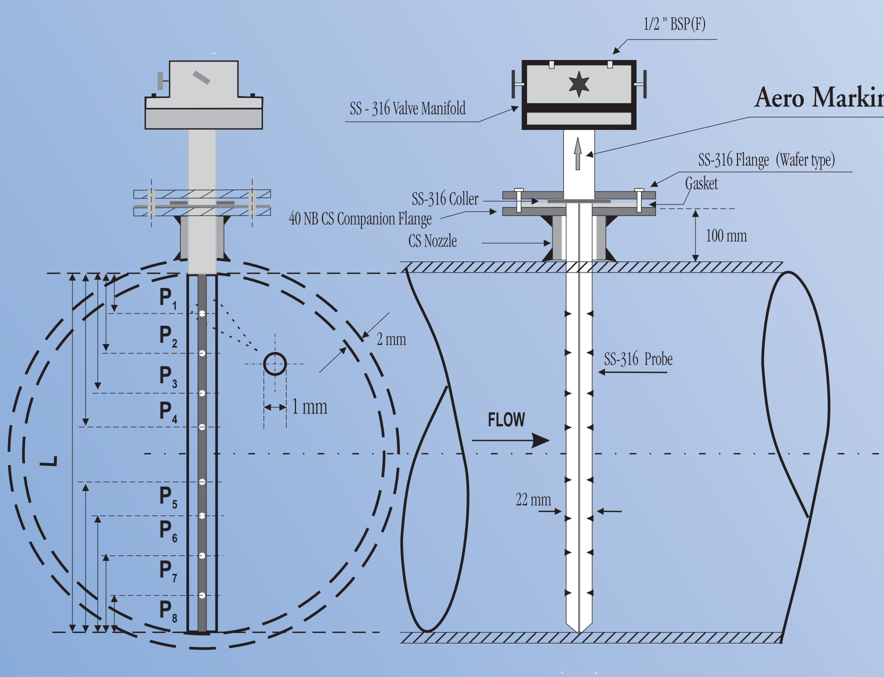
Although the Unni bars is one of the simplest flow sensors, it is used in a wide range of flow measurement applications. In industrial applications, Unni bars are used to measure air flow/gas flow in pipes, ducts, and stacks, and liquid flow in pipes etc. While accuracy and rangeability are relatively low, nn bars are simple, reliable, inexpensive, and suited for a variety of environmental conditions, including extremely high temperatures and a wide range of pressures.

The Self Averaging Bar is an inexpensive alternative to an orifice plate. Accuracy ranges from 1% to 2% FS, which is comparable to that of an orifice. Its flow rangeability of 3:1 (some operate at 4:1) is also similar to the capability of the orifice plate. The main difference is that, while an orifice measures the full flowstream, the Unni bar detects the flow velocity at only one point in the flowstream. An advantage of the device is that it can be inserted into existing and pressurized pipelines (called hot-tapping) without requiring a shutdown & offers no permanent pressure drop.

Unni bar also can be used in square, rectangular or circular air ducts. Typically, the pitot tube fits through a 25mm diameter hole in the duct. Mounting can be by a flange or gland. The tube is usually provided with an external indicator, so that its impact port can be accurately rotated to face directly into the flow. In addition, the tube can be designed for detecting the full velocity profile by making rapid and consistent traverses across the duct.

In some applications, such as EPA-mandated stack particulate sampling, it is necessary to traverse a pitot sampler across a stack or duct. In these applications, at each point , a temperature and flow measurement is made in addition to taking a gas sample, which data are then combined and taken to a laboratory for analysis. In such applications, a single probe contains a pitot tube, a thermocouple, and a sampling nozzle.

A pitot tube also can be used to measure water velocity in open channels, at drops, chutes, or over fall crests. At the low flow velocities typical of laminar conditions, pitot tubes are not recommended because it is difficult to find the insertion depth corresponding to the average velocity and because the pitot element produces such a small pressure differential. The use of a pitot venturi does improve on this situation by increasing the pressure differential, but cannot help the problem caused by the elongated velocity profile.



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