

INTRA-AUTOMATION

MEASUREMENT AND CONTROL



Flow Nozzles



Technical Information

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FLOW NOZZLES**SFN****1. General description**

This is suitable for determining the flow rate of fluid flowing at high pressure and high temperature and is permitted approximately 60 % greater capacity than the orifice plate.

The principle of the method of measurement is based on the installation of a nozzle into a pipeline which is completely filled with a fluid. The installation of the primary device causes a static pressure difference between the upstream side and the throat. The flow rate can be determined from the measured value of this pressure difference.

The flow nozzles, more costly than other orifice due to their construction, are suited for determining the flow rates of fluids flowing at high temperature and high pressure. Under the same measuring conditions, a flow nozzle has a higher mechanical strength, can permit the flow of more than 60 % greater volume of a fluid, and can measure flow rates of fluids containing solid particles less disturbed than an orifice having the same bore. Thus, they are suited, in addition, for high-speed flowing fluids. We can offer only nozzles as well as flow nozzle assemblies having welded short pipe both on their upstream (4D) and downstream (2D) sides.



♦ Other types are available on request in full compliance with ISO-5167 (including ISA 1932 nozzles), Venturi Nozzles, ASME MFC-3M, ASME PTC-6 standards.

2. Specifications

ISO-5167 Nozzle types: Long Radius Nozzles is

1. High Ratio: $0,25 \leq \beta \leq 0,8$
2. Low Ratio: $0,5 \leq \beta \leq 0,5$

ISA 1932 Nozzle, Venturi Nozzle

ASME MFC-3M, ASME PTC-6 Nozzle types:

1. High Ratio: $0,25 \leq \beta \leq 0,8$
2. Low Ratio: $0,5 \leq \beta \leq 0,5$
3. Low Ratio, with throat tap: $0,25 \leq \beta \leq 0,5$

Pressure taps: pipe wall taps at D & D/2, throat tap

Throat Calculation codes: ISO-5167, ASME MFC-3M, L.K.SPINK., AGA NO.3

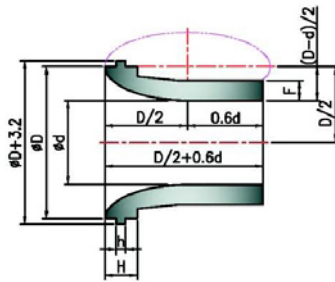
Construction types : Weld-in
: Holding ring
: Knock pin
: Flanged

End connections : Butt welds
: Flanged

3. Nozzle type: ISO 5167

We offer all flow nozzle in complete compliance with ISO-5167. There are two types of long radius nozzles, which are called:

- High ratio Nozzles and Low Ratio. For β -values between 0,25 and 0,5, either design may be used. And ISA-1932-Nozzle, Venturi Nozzle.

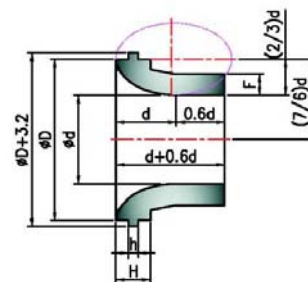


$$3 \leq H \leq 0,15 D$$

$$3 \leq F$$

[A] High ratio $0,25 \leq \beta \leq 0,8$

Flow Nozzles are suitable for determining the flow rate of fluids at high temperature and high pressure, and also can measure the flow rate of fluids containing a little amount of solid particles with less inconvenience than an orifice.



$$3 \leq H \leq 0,15 D$$

$$3 \leq F$$

[A] Low ratio $0,2 \leq \beta \leq 0,5$

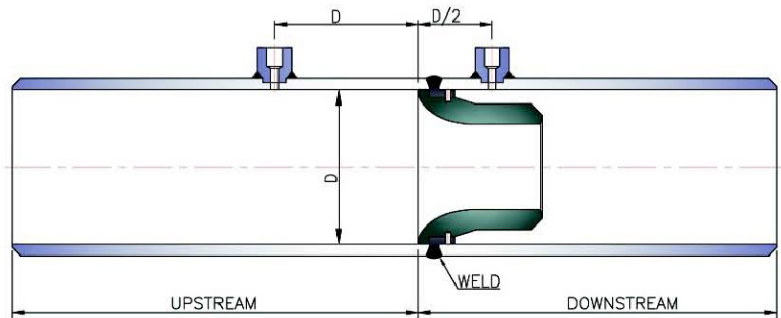
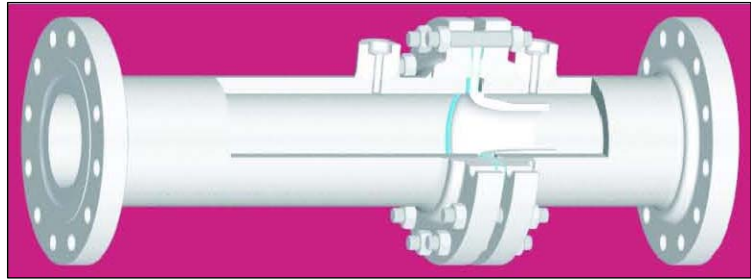
4. Nozzle type: ASME MFC-3M

We offer all flow nozzle in complete compliance with ASME MFC-3M for all below types and also ASME PTC 6 for throat tap and there are 3 types of long radius style ASME flow nozzles covered by this standard.

<p> $0,25 \leq \beta \leq 0,8$ $L1 \leq 0,6 d$ or $\leq D/3$ $r2 = (D-d)/2$ $2t \leq D-(d+6 \text{ mm})$ $3 \text{ mm} \leq t2 \leq 0,15D$ [A] High β Nozzle </p>	<p> $0,2 \leq \beta \leq 0,5$ $0,6d \leq L1 \leq 0,75d$ $0,63d \leq r2 \leq 0,67d$ $3 \text{ mm} \leq t \leq 12 \text{ mm}$ $3 \text{ mm} \leq t2 \leq 0,15D$ [B] Low β Nozzle </p>	

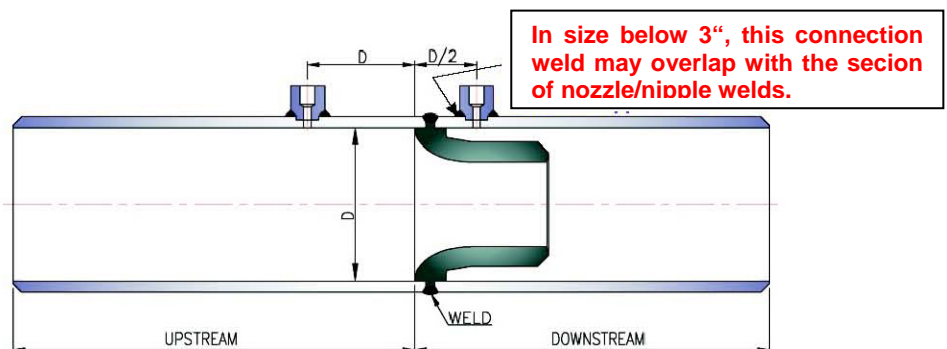
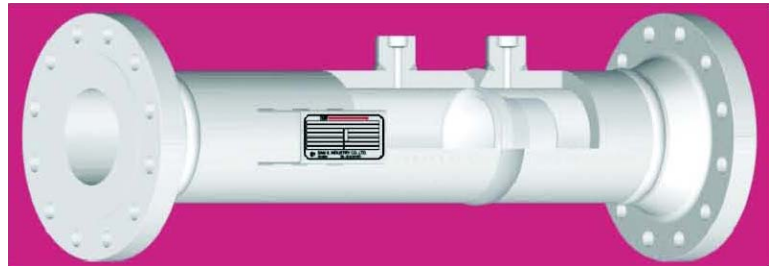
5. Flanged type flow nozzle

This is designed to be inserted between piping flanges. Flow nozzle is designed in accordance with ISO 5167 and ASME specifications



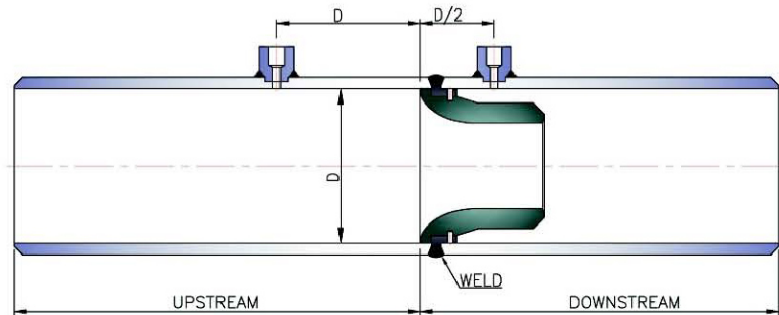
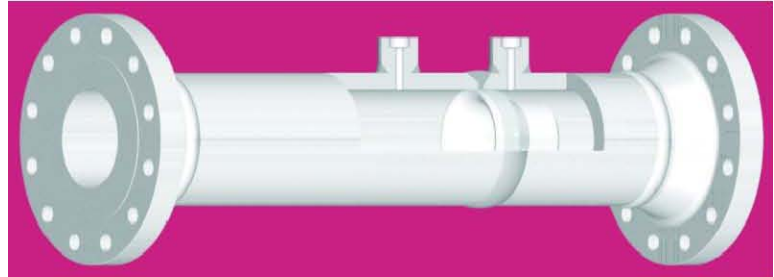
6. Weld-in type flow nozzle

This is designed to be used where flanges are not applicable (high temperature or high pressure applications).



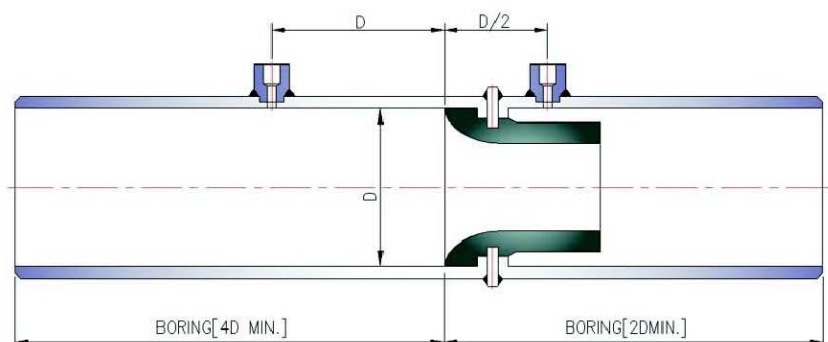
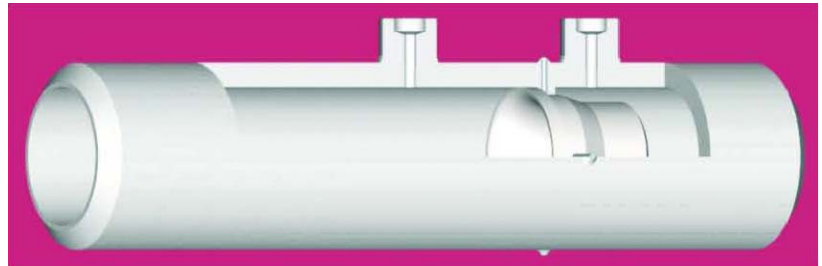
7. Holding ring type flow nozzle

This type holding ring flow nozzle eliminates the welding of dissimilar materials [=for avoiding the welding operation between two kinds of material] because the ring, pins and pipe are of compatible materials.

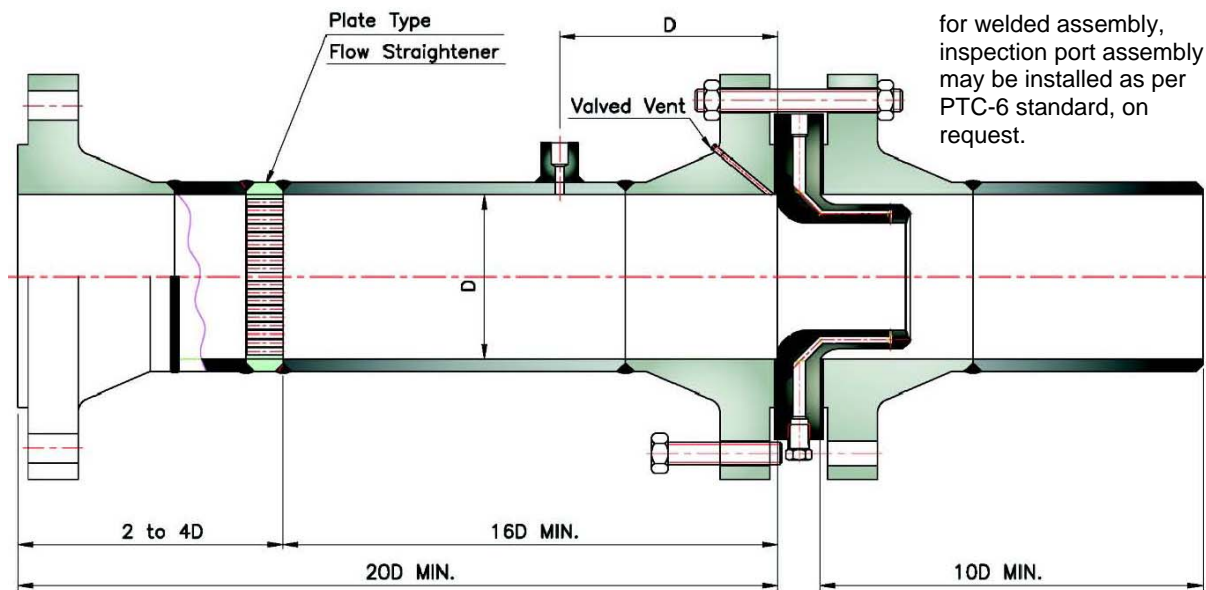


8. Knock-pin type flow nozzle


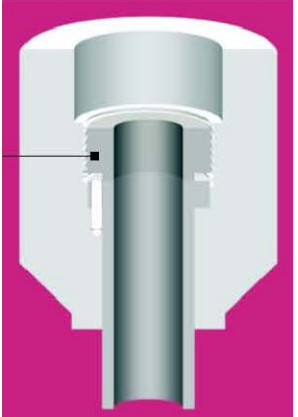
This nozzle type also avoids welding operation between dissimilar materials however, they have rather difficult to assemble the nozzle from piping. This type should basically be boring operation due to it's structure.



9. Typical construction of flow nozzle with throat tap (ASME PTC-6 standard)



10. Pressure tapping

		
Full penetration groove weld [Welding Adaptor]	Up to 800 °F [Welding Adaptor]	For temperature above 800 °F [Thermal Sleeve Welding Adaptor 2 ¼ Cr-Mo Steel]

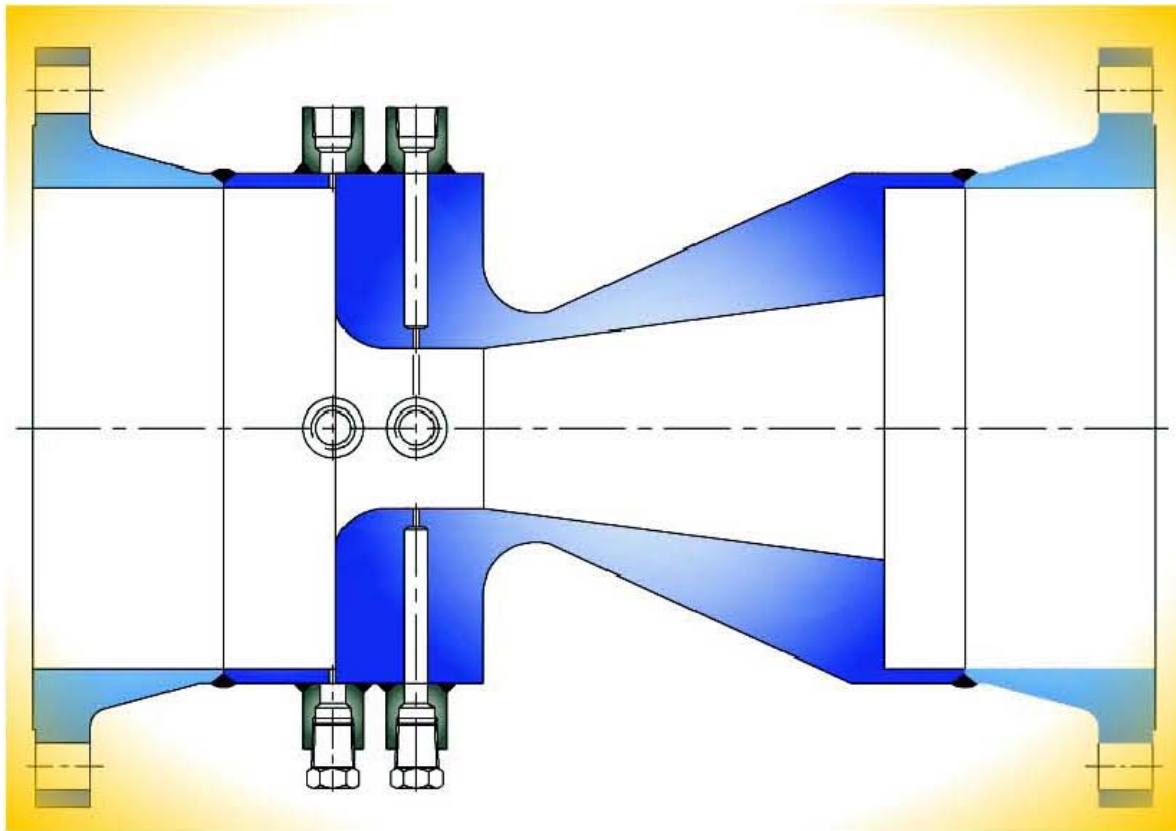
Nominal inside pipe diameter [D]	Recommended max. diameters of pressure tap holes
> 2"	¼" (6,35 mm)
2" & 3"	3/8" (9,5 mm)
4" to 8"	½" (12,7 mm)
10" and over	¾" (19,05 mm)

11. Venturi Nozzle**SVN**


The profile of a venturi nozzle is axissymmetric. It consists of a convergent section, with a rounded profile, a cylindrical throat and a divergent section. The upstream face is identical with that of an ISA 1932 nozzle.

The upstream pressure tappings shall be corner tappings (see drawing below). The tappings may be located either in the pipe or its flanges or in carrier rings.

The throad pressure tappings shall be comprise at least four (4) single pressure tappings and we will offer the piezometer ring only on request.



12. Flow Nozzle Data Sheet

 Intra-Automation GmbH	<h2 style="text-align: center;">FLOW NOZZLES</h2>				SHEET		OF		
					CONTRACT		DATE		
	NO.	BY	DATE	REVISION	REQ. P.O				
	1				BY				
	2				CHK'D				
				APPR.					
FLOW NOZZLES					FLANGES OR SPOOL[PIPE]				
1. TYPE : LONG RADIUS <input checked="" type="checkbox"/> OTHER : _____ 2. STANDARD : ISO-5167 <input type="checkbox"/> OTHER : _____ 3. BORE : MAX. RATE <input checked="" type="checkbox"/> NEAREST 1/8" <input type="checkbox"/> 4. MATERIAL : 304SS <input type="checkbox"/> 316SS <input checked="" type="checkbox"/> OTHER : _____ 5. RING MATERIAL & TYPE : _____ 6. MODEL NO. & MFR. : SEE BELOW NO. 40 & 41					7. TAPS : RADIUS <input checked="" type="checkbox"/> THROAT <input type="checkbox"/> OTHER : _____ 8. TAP SIZE : 1/2" SW <input checked="" type="checkbox"/> OTHER : _____ 9. TYPE : WELD NECK <input type="checkbox"/> SLIP ON <input type="checkbox"/> THERADED <input type="checkbox"/> 10. MATERIAL : STEEL <input checked="" type="checkbox"/> OTHER : _____ 11. FLANGE INCLUDED <input type="checkbox"/> OTHER : BY OTHER 12. FLANGE RATING : ANSI 300# RF OTHER : _____				
FLUID DATA	★ 13	Tag No.							
	14	Service							
	15	Line No.							
	★ 16	Fluid Name							
	★ 17	Fluid State							
	★ 18	Maximum Flow [m³/hr]							
	★ 19	Normar Flow [m³/hr]							
	★ 20	Press. @ Max. / Nor. [Kg/cm² g]							
	★ 21	Temp. @ Max. / Nor. [Kg/cm² g]							
	★ 22	Sp. Gr. / Density at Base							
	★ 23	Sp. Gr. / Density at Oper.							
	★ 24	Super Comp. Factor [Z]							
	★ 25	Mol. W.T. Cp / Cv							
	★ 26	Operating Viscosity [cp]							
	27	Base Press. Base Temp.							
METER	★ 28	Type of Meter							
	★ 29	Diff. Range [mmH2O]							
	30	Static Press. Range							
	★ 31	Full Scale Range [m³/hr]							
	32	Chart Multiplier							
NOZZLE & FLANGE OR PIPE	★ 33	Flange Rating							
	★ 34	Line Size Sch.							
	★ 35	Line Material							
	★ 36	Pair[s] of Tapping							
	★ 37	Flange Type							
ACCESSORY	38	Nipple							
	39	Block Valve							
MANU'ER DATA	40	Model							
	41	Manufacture							
	★ 42	Q'ty							
REMARK : "★" MARKED COLUMNS SHALL BE FILLED UP BY CUSTOMER, IF POSSIBLE. NOTE :									

Besides the products covered by this brochure, Intra-Automation GmbH also manufactures other high-quality and high precision instruments for industrial measurement tasks. For more information, please contact us (contact details on the backside of this brochure).

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