Flow Nozzles

Technical Information

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List of contents:

1. General description 2
2. Specifications 2
3. Nozzle type – ISO 5167 3
4. Nozzle type – ASME MFC-3M 3
5. Flanged type Flow Nozzle 4
6. Weld-in type Flow Nozzle 4
7. Holding Ring type Flow Nozzle 5
8. Knock-Pin type Flow Nozzle 5
9. Typical construction of Flow Nozzle with throat tap (ASME PTC6-standard) 6
10. Pressure tapping 6
11. Venturi-Nozzle 7
12. Data Sheet for Flow-Nozzles
FLOW NOZZLES

1. General description

This is suitable for determining the flow rate of fluid flowing at high pressure and high temperature and is permit 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 \( \beta \)-values between 0.25 and 0.5, either design may be used. And ISA-1932-Nozzle, Venturi Nozzle.

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.

\[
3 \leq H \leq 0.15D \\
3 \leq F
\]

[A] High ratio 0.25 \( \leq \beta \leq 0.8 

[B] 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.

\[
0.25 \leq \beta \leq 0.8 \\
L1 \leq 0.6 \text{d or } \leq \text{D/3} \\
r2 = (\text{D-d})/2 \\
2t \leq \text{D-(d+6 mm)} \\
3 \text{ mm } \leq t2 \leq 0.15\text{D}
\]

[A] High \( \beta \) Nozzle

\[
0.2 \leq \beta \leq 0.5 \\
0.6\text{d } \leq L1 \leq 0.75\text{d} \\
0.63\text{d } \leq r2 \leq 0.67\text{d} \\
3 \text{ mm } \leq t \leq 12 \text{ mm} \\
3 \text{ mm } \leq t2 \leq 0.15\text{D}
\]

[B] Low \( \beta \) Nozzle
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).

In size below 3", this connection weld may overlap with the section of nozzle/nipple welds.
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)

for welded assembly, inspection port assembly may be installed as per PTC-6 standard, on request.

10. Pressure tapping

<table>
<thead>
<tr>
<th>Nominal inside pipe diameter [D]</th>
<th>Recommended max. diameters of pressure tap holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 2&quot;</td>
<td>¼&quot; (6,35 mm)</td>
</tr>
<tr>
<td>2&quot; &amp; 3&quot;</td>
<td>3/8&quot; (9,5 mm)</td>
</tr>
<tr>
<td>4&quot; to 8&quot;</td>
<td>½&quot; (12,7 mm)</td>
</tr>
<tr>
<td>10&quot; and over</td>
<td>¾&quot; (19,05 mm)</td>
</tr>
</tbody>
</table>
11. Venturi Nozzle

The profile of a venture 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 of its flanges or in carrier rings.

The throat 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

<table>
<thead>
<tr>
<th>FLOW NOZZLES</th>
<th>FLANGES OR SPOOLPIPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. TYPE : LONG RADIUS</td>
<td>7. TAPS : RADIUS</td>
</tr>
<tr>
<td>2. STANDARD : ISO-5167</td>
<td>8. TAP SIZE : 1/2&quot; SW</td>
</tr>
<tr>
<td>3. BORE : MAX. RATE</td>
<td>9. TYPE : WELD NECK</td>
</tr>
<tr>
<td>4. MATERIAL : 304SS □ 316SS □ OTHER :</td>
<td>10. MATERIAL : STEEL</td>
</tr>
<tr>
<td>5. RING MATERIAL &amp; TYPE</td>
<td>11. FLANGE INCLUDED □ OTHER : BY OTHER</td>
</tr>
<tr>
<td>6. MODEL NO. &amp; MFR.</td>
<td>12. FLANGE RATING : ANSI 300# RF</td>
</tr>
</tbody>
</table>

#### FLUID DATA

- **13** Tag No.  
- **14** Service  
- **15** Line No.  
- **16** Fluid Name  
- **17** Fluid State  
- **18** Maximum Flow (m³/hr)  
- **19** Normal 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 (mm-H2O)  
- **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  

#### MANUFACTURER DATA

- **40** Model  
- **41** Manufacture  
- **42** Qty

Remark: **"*" MARKED COLUMNS SHALL BE FILLED UP BY CUSTOMER, IF POSSIBLE.**

Note: : 

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