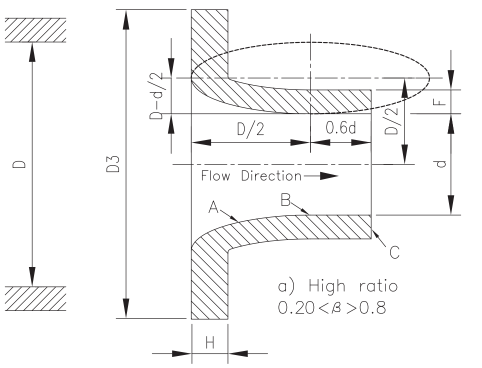
Flow nozzle
Model : F600

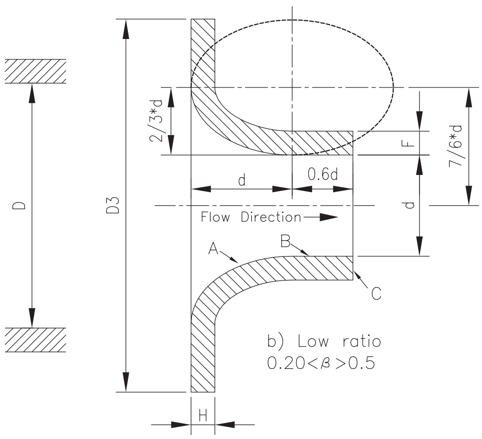
Spec. sheet no. FD06-01

Description

The flow nozzles, more costly than other orifice due to their structure, 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 percent great volume of a fluid, and can measure the 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 supply not only single flow nozzles, but also flow nozzles having welded short pipes on both their upstream and downstream sides.

Specification





Nozzle mounting types

Flange type
Weld-in type
Holding ring type

Flow calculation standards

- Long-radius flow nozzle
  JIS Z 8762, IS0 5167-3, ASME MFC-3M
- ISA 1932, flow nozzle
  ISO 5167-3 JIS Z 8762

Pressure taps

1D and ½D tap, throat tap

Nominal pipe sizes available

50 ~ 630 mm
2" ~ 25"

β Limit

0.2 < β < 0.8
(Low - beta) long - Radius nozzle 0.2 ≤ β ≤ 0.5
(High - beta) long - Radius nozzle 0.2 ≤ β ≤ 0.8
β : Ratio of throat to pipe diameter = d/D0
(d: Throat diameter)

Nozzle thicknesses

Maker standards

Material

A182-F11, F22, F91
A182-F304
A182-F316 / F316L

1. Base model

F600	Flow nozzle

2. Type

W	Weld in
H	Holding ring
F	Flanged

3. Line size

JIS	**mm**	**ANSI**	**inch**	**DIN**	**mm**
J015	15A	**A001**	½B	**D015**	15A
J020	20A	**A002**	¾B	**D020**	20A
J025	25A	**A003**	1B	**D025**	25A
J040	40A	**A004**	1½B	**D040**	40A
J050	50A	**A005**	2B	**D050**	50A
J065	65A	**A006**	2½B	**D065**	65A
J080	80A	**A007**	3B	**D080**	80A
J100	100A	**A008**	4B	**D100**	100A
J125	125A	**A009**	5B	**D125**	125A
J150	150A	**A010**	6B	**D150**	150A
J200	200A	**A011**	8B	**D200**	200A
J250	250A	**A012**	10B	**D250**	250A
J300	300A	**A013**	12B	**D300**	300A
J350	350A	**A014**	14B	**D350**	350A
J400	400A	**A015**	16B	**D400**	400A
J450	450A	**A016**	18B	**D450**	450A
J500	500A	**A017**	20B	**D500**	500A
J600	600A	**A018**	24B	**D600**	600A
J700	700A	**A019**	28B	**D700**	700A
J800	800A	**A020**	32B	**D800**	800A
J000	1,000A	**A021**	40B	**D000**	1,000A
XXXX	Other				

4. Tap type

R	Radius tap
T	Throat tap

5. End connection

F	Flanged
W	Welded on

6. Nozzle material

4	A182 F304
5	A182 F316
6	A182 F316L
7	A182 F91
Z	Other

7. Pipe material

C1	A106 Gr.B
C2	A106 Gr.C
A1	A335 P11
A2	A335 P22
A3	A335 P91
XX	Other

8. Holding ring material

A1	A182 F11
A2	A182 F22
A3	A182 F91
C1	A105
H4	A182 F304
H5	A182 F316
ZZ	Other
NO	None

9. Boss size

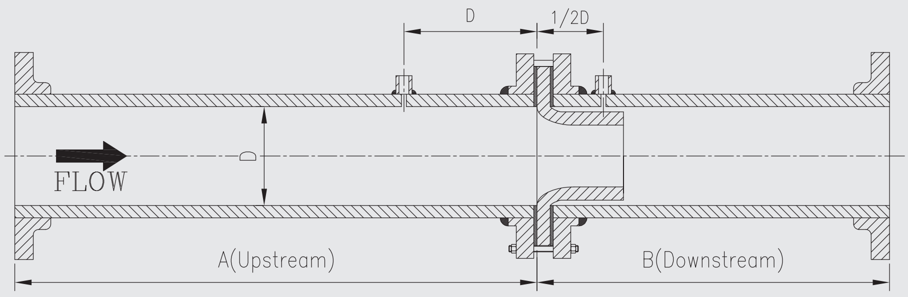
2S	½" S.W
3S	¾" S.W
4S	1" S.W
OH	Other

10. Option

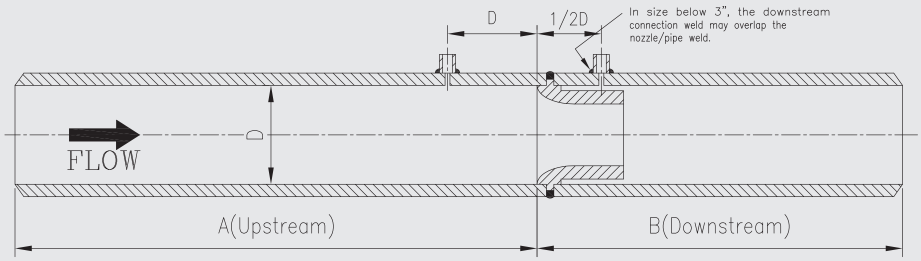
I	Inspection pot
N	None
O	Other

1	2	3	4	5	6	7	8	9	10	
F600	**W**	**A014**	**R**	**W**	**5**	**C1**	**N0**	**3S**	**N**	**Sample ordering code**

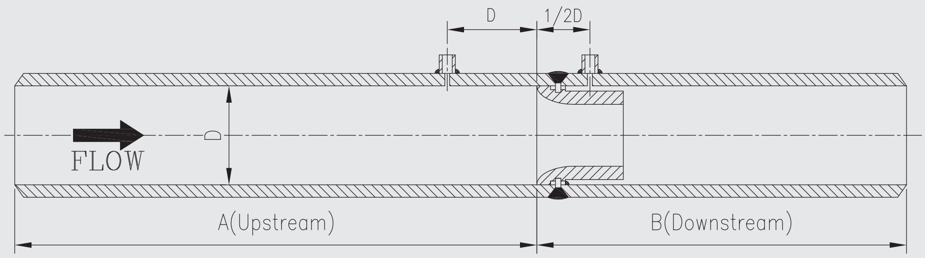
Dimension



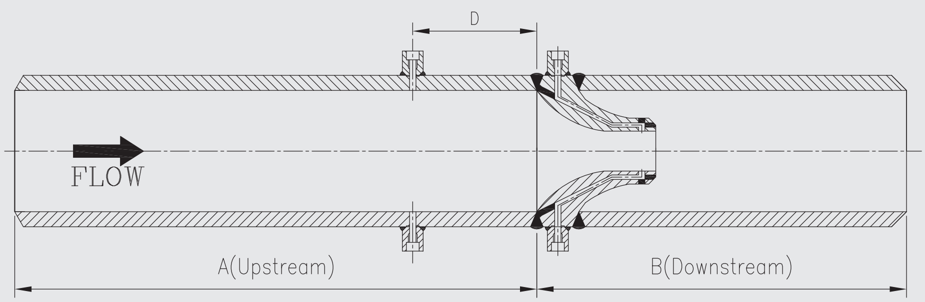
— Flange type —



— Weld in type —



— Holding ring type —



— Throat tap type —

Differential pressure and pressure loss

When a throttle element is interposed in a closed passage of fluid in piping, a difference is produced between the pressures upstream and downstream the throttle element as illustrated in Fig.1. This difference (ΔP=p1-p2) is called differential pressure. The fluid passing through the section 2 gradually regains its pressure as it flows downstream, but the downstream pressure cannot be recovered up to the upstream pressure, part of the pressure being lost. This loss is called a pressure loss (permanent pressure loss = p3). The extent of this pressure loss depends on the type of throttle elements and their open area ratio, as shown in Fig.2 The relation between the flow rate and the differential pressure is given by:

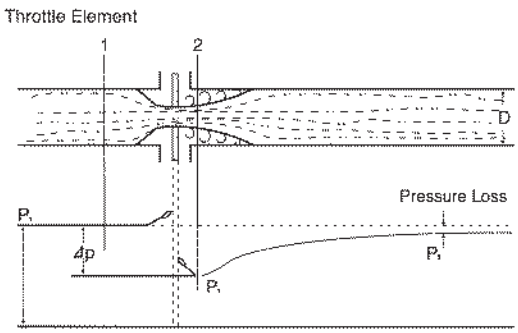


Fig.1

$$Q = C\sqrt{\Delta P/\rho}$$

$$Qn = C\sqrt{\Delta P * \rho/\rho n}$$

$$W = C\sqrt{\Delta P * \rho}$$

Table 1 : Relation between Flow Rate and Differential Pressure

Flow rate (%)	100	90	80	70	60	50	40	30	20	10	0
Differential pressure	100	81	64	49	36	25	16	9	4	1	0

Q (m³/h) : Volume rate of flow at density operating conditions
Qn (Nm³/h) : Volume rate of flow at density bass conditions
W (kg/h) : Weight rate of flow
ρ (kg/m³) : Density in operating conditions
ρn (kg/Nm³) : Density in base conditions
C : Constant coefficient

From the above, the relation between the flow rate and the differential pressure where the density is constant but the flow rate is variable is as listed in table 1. In other words, the flow rate is obtainable by measuring the differential pressure. When the density is variable (When the pressure and temperature are variable), the true flow rate can be given by compensating the variate of the density by the above equation (This however, is not applicable when the density varies to a great extent.)

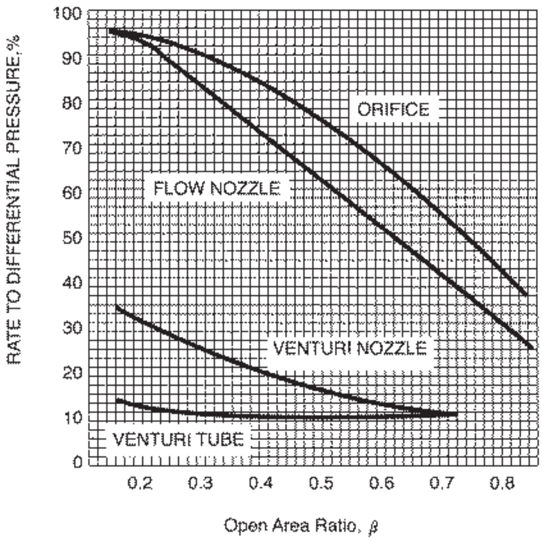


Fig.2

Venturi tube
Model : F700

Spec. sheet no. FD07-01

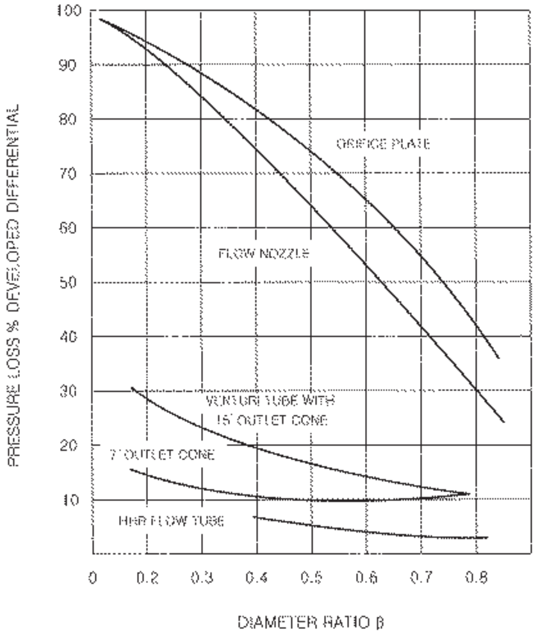
Description

The venturi tube is characterized by its tapered inlet and diverging outlet. This design greatly reduces head loss to the system when compared to an orifice plate, in fact, the venturi can handle 25 ~ 50% more flow, than an orifice for comparable larger line size and lower head loss. The venturi is well suited for dirty fluids. There are no places for dirt to build up in the tube. Traditionally, the venturi tube has been used on low pressure gas flow, water and waste applications. Venturi tubes are generally constructed with the system of pressure taps which project radially into the pipe and feed into a common camber known as a piazometer ring. This multiple tap arrangement provides an average pressure reading over the entire circumference of the element. As a result, the need for a long pipe runs is eliminated. A general rule is that a venturi tube requires only half the upstream and downstream runs of an orifice plate. The discharge coefficient of the venturi is constant and predictable to ±1% for pipe reynolds numbers greater than 100,000. Venturi elements are not as reliable at lower reynolds numbers (Figure 10). The venturi tube is a relatively high cost device. However, low pumping costs and reduced piping requirements can make it cost effective.

Specification

Venturi type

Fabricated flange type
Fabricated weld-on type
Machined flange type
Machined weld on type



Flow calculation standards

ISO 5167-4

Flange ratings

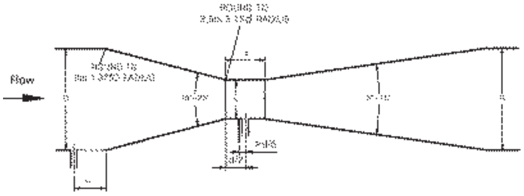
JIS 10, 16, 20, 30, 40 and 63K
ANSI class 150, 300, 600 and 900 Lb

Nominal pipe sizes available

50 ~ 1,200 mm
2" ~ 48"

Material

Carbon steel
304SS, 316SS and 316L SS



The Critical Dimension of the Classical Venturi Tube

WISE®

1. Base model

F700	Venturi tube

2. Type

FF	Fabricated flanged
FW	Fabricated weld-on
MF	Machined flanged
MW	Machined weld-on

3. Line size

JIS	**mm**	**ANSI**	**inch**	**DIN**	**mm**
J015	15A	**A001**	½B	**D015**	15A
J020	20A	**A002**	¾B	**D020**	20A
J025	25A	**A003**	1B	**D025**	25A
J040	40A	**A004**	1½B	**D040**	40A
J050	50A	**A005**	2B	**D050**	50A
J065	65A	**A006**	2½B	**D065**	65A
J080	80A	**A007**	3B	**D080**	80A
J100	100A	**A008**	4B	**D100**	100A
J125	125A	**A009**	5B	**D125**	125A
J150	150A	**A010**	6B	**D150**	150A
J200	200A	**A011**	8B	**D200**	200A
J250	250A	**A012**	10B	**D250**	250A
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J600	600A	**A018**	24B	**D600**	600A
J700	700A	**A019**	28B	**D700**	700A
J800	800A	**A020**	32B	**D800**	800A
J000	1,000A	**A021**	40B	**D000**	1,000A
XXXX	Other				

4. Body material

C	Carbon steel
4	304SS
5	316SS
6	316L SS
O	Other

5. Flange rating

JIS		**ANSI**		**DIN**	
J010	JIS 10K	**A010**	ANSI 150 Lb	**P010**	PN 10
J016	JIS 16K	**A020**	ANSI 300 Lb	**P016**	PN 16
J020	JIS 20K	**A030**	ANSI 600 Lb	**P025**	PN 25
J030	JIS 30K	**A040**	ANSI 900 Lb	**P040**	PN 40
J040	JIS 40K	**A050**	ANSI 1,500 Lb		
J063	JIS 63K	**A060**	ANSI 2,500 Lb		

6. Flange material

A	A105
S	304SS
O	Other
N	None

7. Boss material

CS	A105
S4	304SS
OH	Other
NO	None

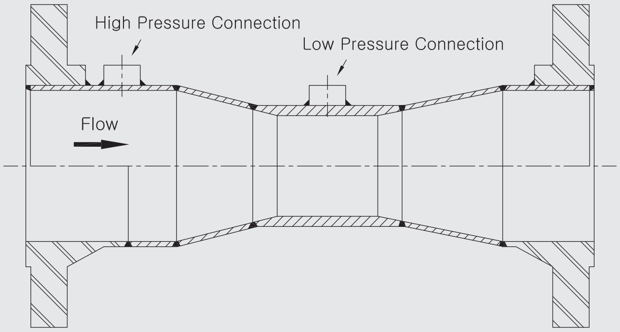
8. Option

O	Other
N	None

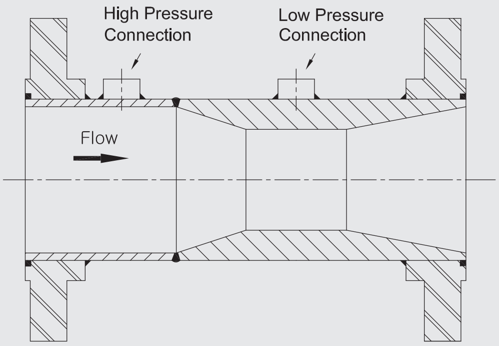
1	2	3	4	5	6	7	8	
F700	**FF**	**A016**	**4**	**A020**	**S**	**S4**	**N**	**Sample ordering code**

Dimension

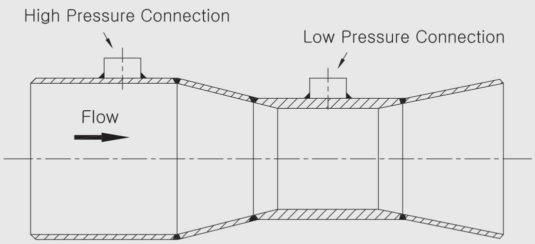
Fabricated flange type
Available in size 6" and larger
Model : F700-FF



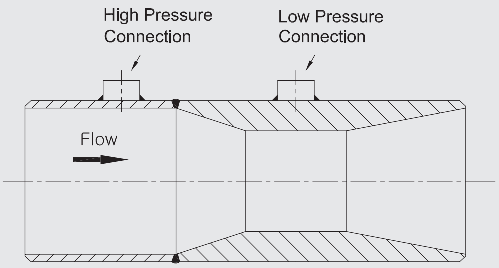
Machined flange type
Available in size 6" and smaller
Model : F700-MF



Fabricated weld-on type
Available in size 6" and larger
Model : F700-FW



Machined weld-on type
Model : F700-MW



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