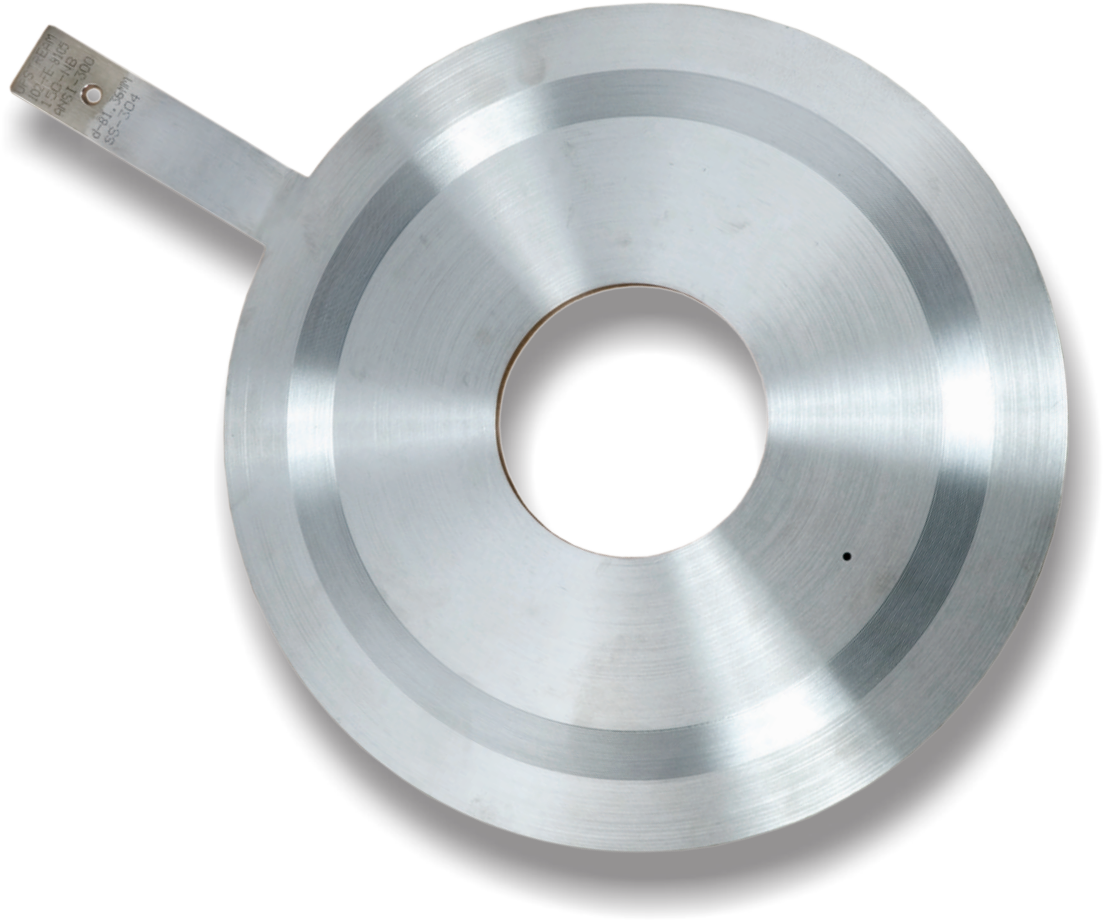
Orifice Plates

Orifice plates are most commonly used primary elements for flow measurement in pipelines based on the principle of measurement of 'differential pressure' created when an obstruction is placed in the fluid flow, due to increase in fluid velocity.

Orifice Plates cover a wide range of applications of fluid and operating conditions. They give an acceptable level of uncertainities at lowest cost and long life without regular maintenance.

We manufacture orifice plates, restriction orifice plates, with or without carrier ring, meter run assemblies, integral orifice plates to suit customer's requirements.

We have fully equipped integrated designing, manufacturing and testing facilities which are among the best in country. Over the years we have manufactured and supplied orifice plate assemblies to many prestigious projects in the domestic as well as international market.

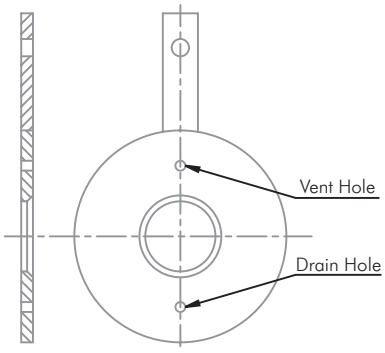


PRISMA Instruments & Gauge Bourdon France

Specifications

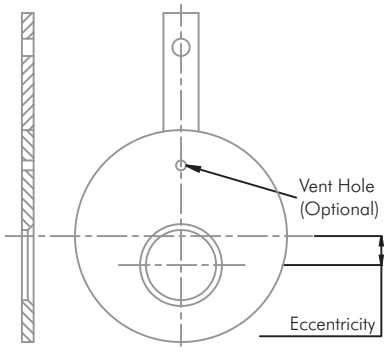
Design	:	Conforms to ISA RP 3.2 , DIN 1952 , BS 1042, ISO-5167
Types	:	Square edge concentric, Quadrant edged, Conical entrance, Eccentric, Segmental
Plate material	:	SS304 , SS316 , SS316L as standard. Hastelloy-C , Monel , PP , PVC , PTFE coated , etc. can be given on request.
Orifice Bore	:	In accordance with ISO-5167, BS-1042, ASME MFC 3M, R.W.Miller, L.K.Spink, AGA-3
Tab Plate	:	In the same material as plate & is welded to orifice plate. Tab plate integral to the Orifice plate (i.e. without welding) can also be offered as a special case.
Vent / Drain	:	Vent or Drain holes are provided as per customer's requirement. The diameter of the vent or drain holes are as per ISA RP 3.2
Flange Union	:	Weld neck, Slip on, Threaded, Socket welded with RF or RTJ facing Orifice flanges are in accordance with ANSI B16.36 with minimum flange rating of 300# for sizes up to 8" or male - female flanges in accordance with ANSI B16.5.
Pressure Tappings	:	Corner tappings are recommended for sizes upto 1 ½"; Flange taps from 2" to 16" ; D – D/2 taps for higher sizes.
Gasket	:	CAF as per IS: 2712 Gr 0/1 , SS spiral wound + CAF , SS spiral wound + Grafoil, SS spiral wound + PTFE are normally supplied as per process requirement. Other materials available on request. For RTJ flanges , the plate is fixed on the plate holder. The plate holder is in Soft Iron material & acts as a gasket .
Studs / Nuts	:	ASTM A193 Gr.B7/A-194 Gr.2H as standard, Other material on request.
Jack Screw	:	ASTM A193 Gr.B7/A-194 Gr.2H as standard, Other material on request.

Types of Orifice Plates



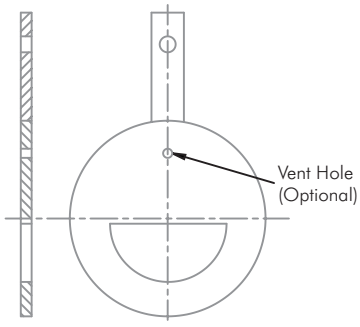
Square Edged Concentric

These are most commonly used for flow measurement. This has special features such as simple structures, high accuracy, and ease of installation & replacement. The orifice plates are correctly finished to the dimensions, surface roughness, and flatness to the applicable standard. These plates are recommended for clean liquids, gases & steam flow, when the Reynold number ranges from 10000 to 10^7.



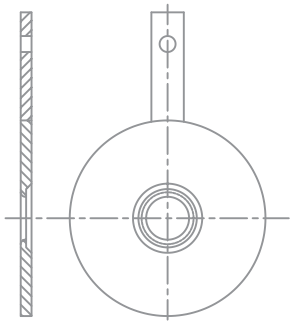
Eccentric

For liquids containing solid particles that are likely to sediment or for vapors likely to deposit water condensate, this orifice plate is used with its eccentric bore bottom flush with the bottom of the piping inside surface so that the sedimentation of such inclusions are avoided. Likewise, for gases or vapors, it may be installed with its eccentric bore top flush with the ID of the piping to avoid stay of gas or vapor in its vicinity.



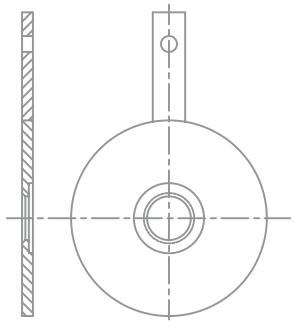
Segmental

Segmental orifice plates are most useful where there are substantial entrained water or air and also if there are suspension in the fluids. This avoids build up in front of the orifice plate. The orifice hole is placed at the bottom for gas service and top for liquids.



Quadrant Edge

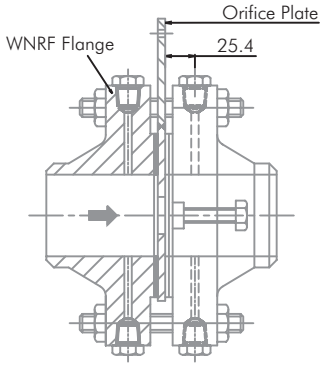
The inlet edge of the bore of this orifice plate is rounded to a quarter circle. This orifice plate is usually used for viscous fluids & Reynolds number between 2000 to 10000.



Conical Entrance

These conical entrance orifice plates are used for low Reynolds number in the range of 80 to 2000 and give more constant or predictable discharge coefficient. At lower Reynolds numbers, the discharge coefficient of square edge orifice plate may change by as much as 30%. These are more usable for viscous service.

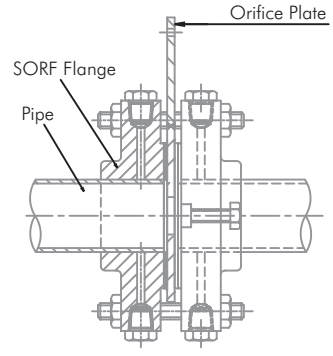
Typical assemblies



Orifice Assembly with WNRF Flange & Flange Taps

ORIFICE PLATE WITH WELD NECK FLANGE UNION

The weld neck flange is normally referred to as " high Hub" flange. It is designed to transfer stresses to the pipe, thereby reducing high stress concentrations at the base of the flange. The pressure tappings are provided through the flangewhich arte at a distance of 1" from the face of the plate (shown in the drawing attached). Weld neck flanges are prefered where radiography on welding is involved.



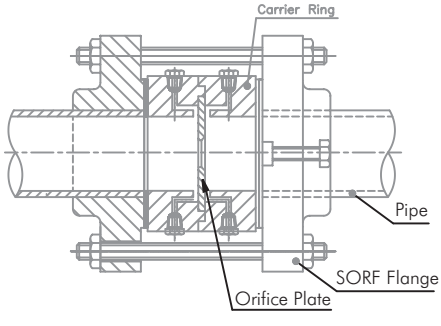
Orifice Assembly with SORF Flange & Flange Taps

ORIFICE PLATE WITH SLIP ON FLANGE UNION

The slip on flange has a low hub because the pipe slips into the flange prior to welding. It is welded both from inside and out to provide sufficient strength and prevent leakage. The slip on flanges are bored slightly larger than the OD of the matching pipe.

ORIFICE PLATE WITH MALE-FEMALE CARRIER RING AND FLANGED UNION

The construction is similar to the above except male-female carrier ring is provided to facilitate pressure tapping through it (corner tapping). This construction is generally used for lower line sizes (normally less than 2"). Carrier rings are also available for bigger sizes on request. Carrier ring machined from single block is also offered in place of male-female carrier. For better accuracy, honed meter run assemblies are recommended which employ upstream and downstream straight lengths. The end connection in such case can be plain (suitable for welding) or flanged.



Orifice Plate with Carrier Ring & Flange Union

CARRIER RING

Orifice Assembly

SIZE

SAME AS SIZE	1/4" TO 78"

PIPE SCH

SAME AS SCH	5
SAME AS SCH	10
SAME AS SCH	20
SAME AS SCH	40
SAME AS SCH	60
SAME AS SCH	80
SAME AS SCH	120
SAME AS SCH	160
SAME AS SCH	XS
SAME AS SCH	XXS

FLANGE TYPE

WNF	WNRF
SOF	SORF
SWF	SWRF
SCR	SCREWED
RTJ	WNRTJ
LTG	WNLTG
LJ	LAP JOINT

RATING

SAME AS RATING	150#
SAME AS RATING	300#
SAME AS RATING	600#
SAME AS RATING	900#
SAME AS RATING	1500#
SAME AS RATING	2500#

TAPPING TYPE

FL	FLANGE
RD	RADIUS
CO	CORNER
PI	PIPE

PROCESS CONNECTION

NP	NPT (F)
BS	BSP (F)
SW	SW

FLANGE MATERIAL

A5	ASTM A105
F6	A182 F316
F6L	A182 F316L
F4	A182 F304
F4L	A182 F304
F5	A182 F5
F11	A182 F11
F22	A182 F22
SPECIFY	OTHER

SPECIAL

CE	CE
HS	H2S
HI	HIC
NACE	NACE
IBR	IBR
H2	H2 SERVICE
O2	O2 CLEANING
WCAL	WET CALLIBRATION

STUD NUT / JACK SCREW

B7	A193 Gr. B7/ Gr.2H
B8	A193 Gr. B8/ Gr.8
B16	A193 Gr. B16/ Gr.16
B7M	A193 Gr. B7M/ Gr.2HM
B8M	A193 Gr. B8M/ Gr.8M

GASKET

6GR	SW SS316 + GRFL
6CA	SW SS316 + CAF
4GR	SW SS304 + GRFL
4CA	SW SS304 + CAF
OCT	OCTAL RING
PT	PTFE
NEO	NEOPRENE
BR	BUTYL RUBBER
SPECIFY	OTHER

PLATE MATERIAL

6/ 6L	SS316/ 316L
4/ 4L	SS304/ 304L
MO	MONEL
HC	HASTELLOY - C
PF	PTFE
PV	PVC
PP	POLY PROPYLENE
SPECIFY	OTHER

PLATE TYPE

SEC	SQUARE EDGE
QEC	QUDRANT EDGE
ECC	ECCENTRIC
SEG	SEGMENTAL
COE	CONICAL ENTRANCE
RO	RESTRICTION

PLATE THICKNESS

SAME AS THK	3.18mm
SAME AS THK	6.35mm
SAME AS THK	9.52mm
SAME AS THK	12.70mm
SPECIFY	OTHER

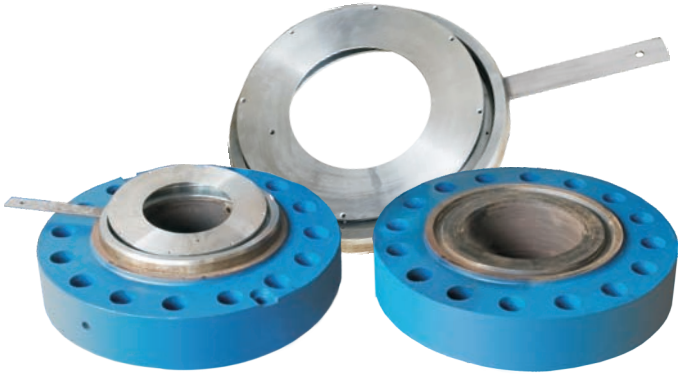
Note:
1. Upto 6" size, flanges will be used of ANSI B16.36 and from 8" & above flanges will be used of ANSI B 16.5
2. Drain hole for gas service & vent hole for liquid service will be provided as per requirement.
3. Other than above information customer has to provide process data as on page no. 32
4. Default process connection size is 1/2" other than this (e.g. 3/4" or 1"), please specify.
5. If carrier ring is required, only carrier ring material should be provided extra to the above information.

Orifice Plate Assemblies with RTJ Holder

The Plate Holder Assembly is a combination of plate holder and an orifice plate designed for ring tongue joint (RTJ) flanges. The plate holder has a function of holding the orifice plate and also a function as a gasket to prevent leakage of the process fluid. The plate holder has a oval or octagonal ring for mounting between ring tongue joint flanges. This metallic sealing system is applicable to a fluid of high temperature and high pressure. The pressure tapping system normally is of the flange tap type.

Orifice plate is screwed to the plate holder. Generally the plate holder is of soft iron material. The Orifice plate is available in standard material such as SS316, SS304, SS316L, Monel, Hastelloy-C, etc. Other materials are available on request. The plate holder along with the orifice plate can be also machined from one piece.

RTJ holder material is selected so that the RTJ holder hardness is less than that of flange hardness.



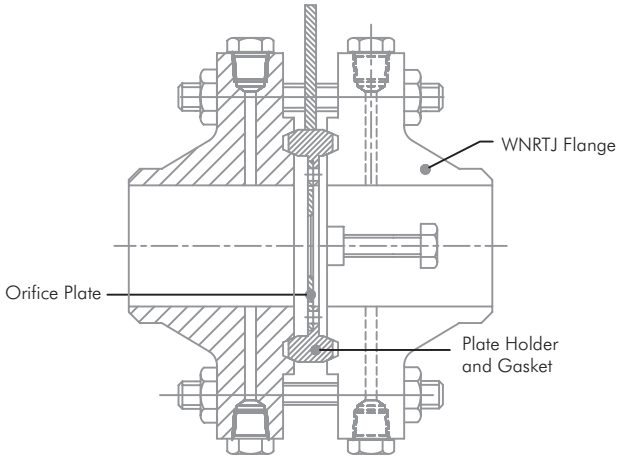
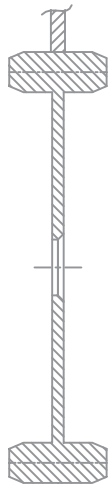
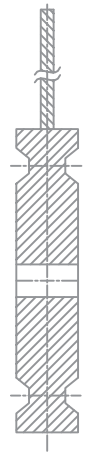


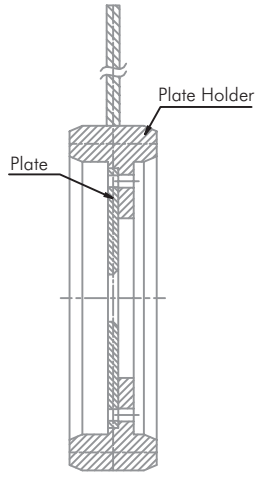
Plate with Plate Holder mounted in between RTJ Flanges



Integral RTJ

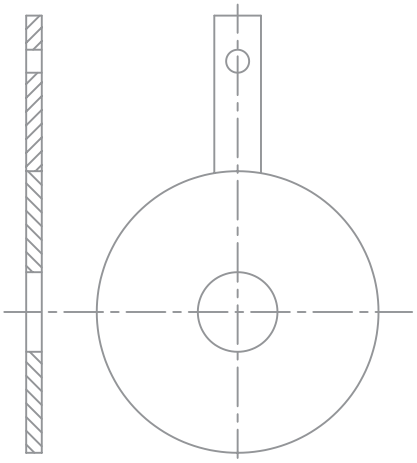


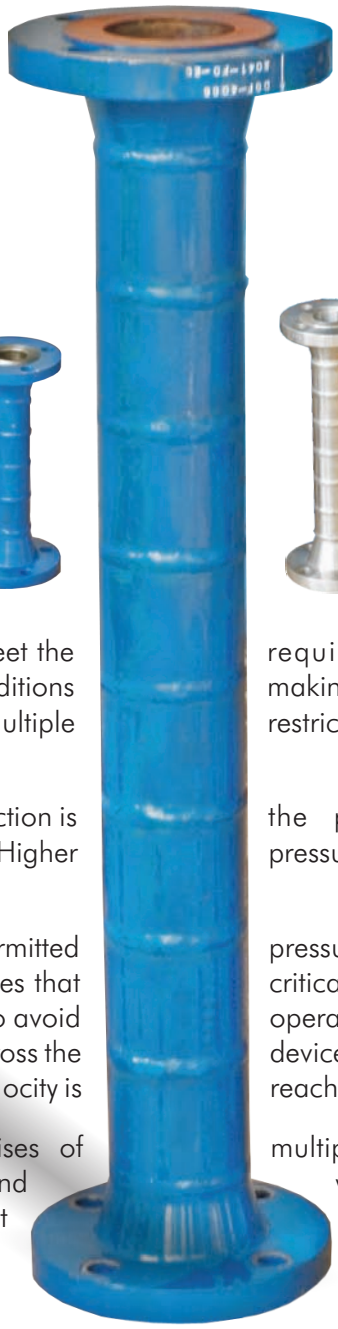
Integral RTJ with Female Groove



Orifice Plate with RTJ Holder

The restriction orifices are used for reducing fluid pressure and are designed somewhat different from the orifice plates that are used for measuring flow rates. They are designed to slip between the piping flanges.



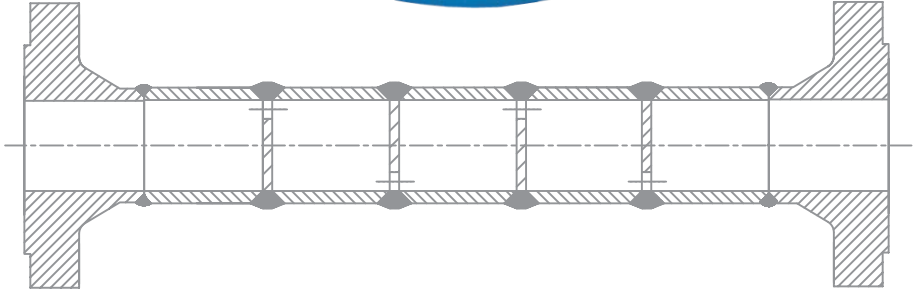


While single restriction orifices are often sufficient to meet the requirements, there are situations where limitations arise due to process conditions making the single restriction orifices unacceptable. In such situations, use of multiple restriction in series is a better solution.

The foremost consideration for the case of multiple restriction is the pressure drop. This applies whether or not the fluid is liquid or vapor/gas. Higher pressure drop implies higher velocities resulting in vibration and noise problems.

The other consideration is not just about maximum permitted pressure drop and this is particularly for gas flow. If the process condition indicates that critical flow will occur with the use of single restriction plate, care should be exercised to avoid operating well beyond the critical pressure drop. Critical implies a pressure drop across the device exceeding 50 percent of the absolute upstream pressure at which point sonic velocity is reached.

Construction of Multistage Orifice Assembly comprises of multiple restriction orifice plates separated by a distance of one pipe diameter and welded with the pipes in between them. End connection is either suitable for butt welding or with end flanges.

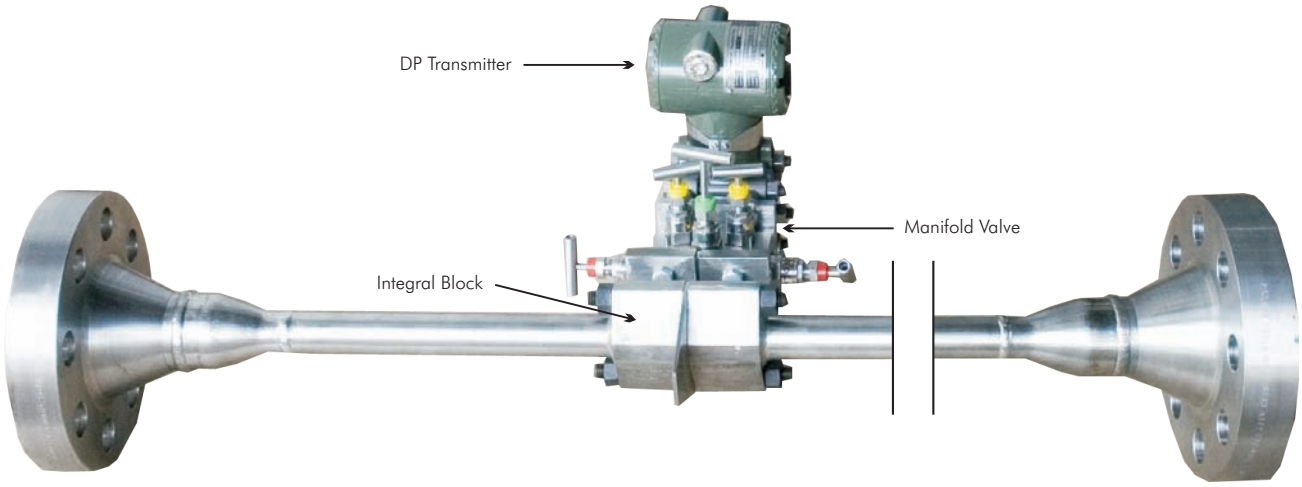


Multiple Restriction Orifice Assembly

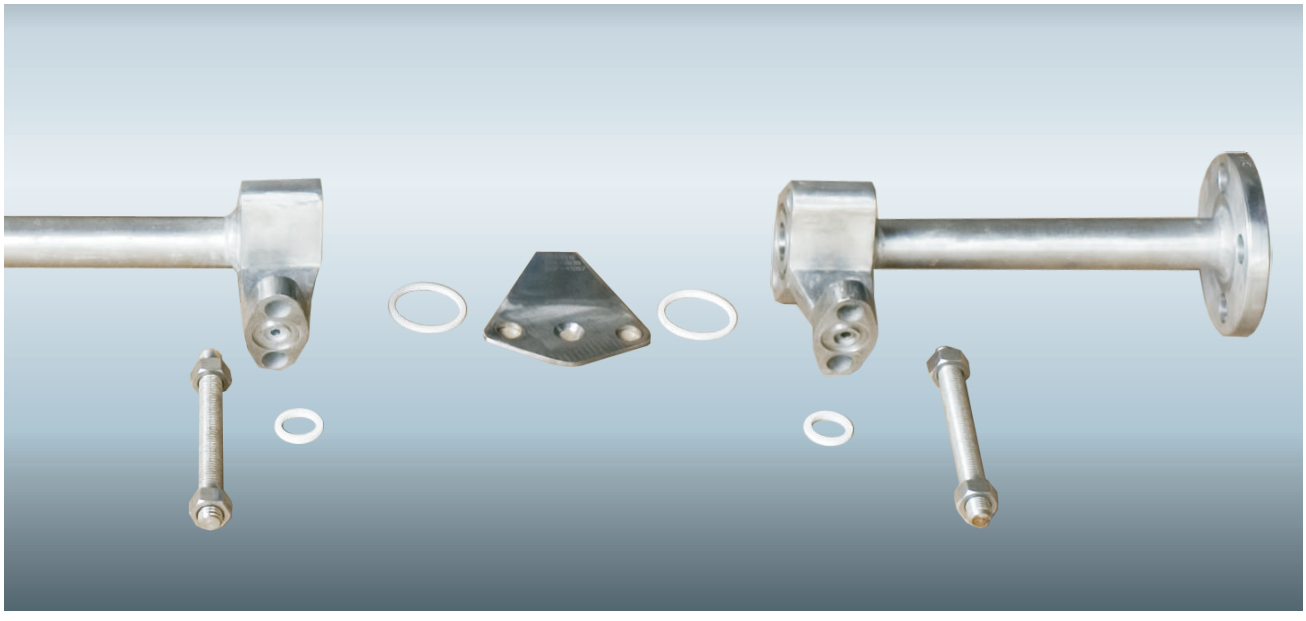
Integral Meter Run Assembly

Integral Flow Orifice Assembly is used when Differential Pressure Transmitter has to be directly mounted on the orifice assembly. This eliminates cost of installation of Differential Pressure Transmitter with impulse piping up to the orifice assembly. The transmitter is mounted on the orifice assembly through a 3/5 Valve H-type manifold. Available with line sizes of 2" & below. However due to process temperature limits of the transmitter, this assembly cannot be used for process temperatures above 120 Degrees Centigrade.

The assembly consists of a orifice plate between two integral blocks having corner taps. Generally meter run pipe is recommended with upstream length of 750mm and downstream length of 250mm. The pipes are welded to the blocks with end flanges.



Integral Orifice Assembly, Manifold valve, DP transmitter & end flanges



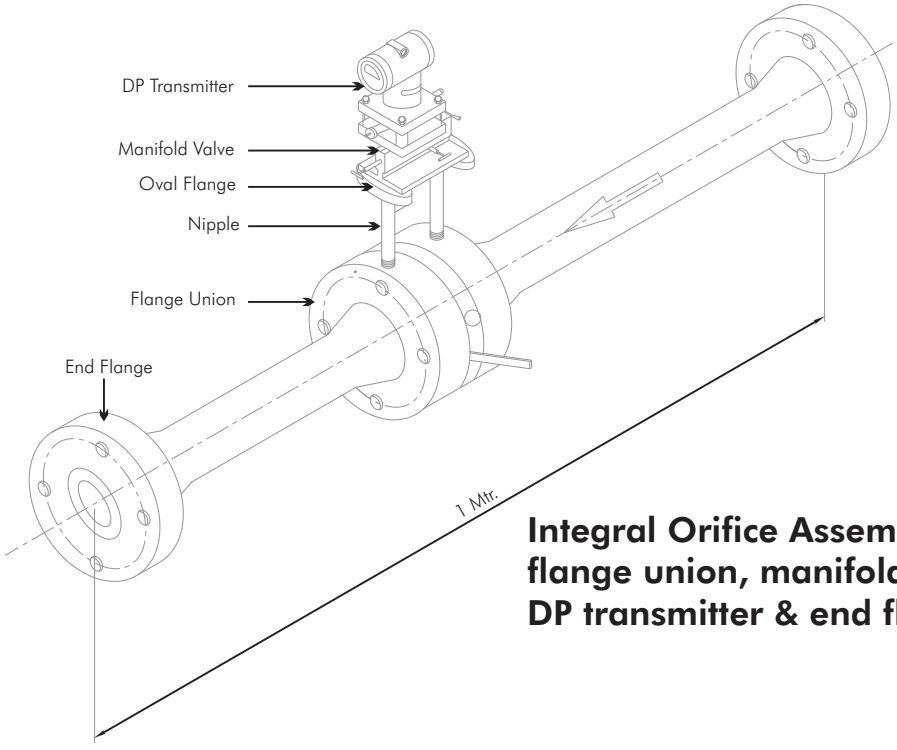
Advantages of using Integral Meter run assembly:

- Use of an integral orifice flow meter will eliminate the three measurement inaccuracies recorded in small orifice line installations.
- The Integral Orifice honed body reduces ID uncertainty
- By inserting precision bored upstream and downstream sections of pipe, the velocity profile distortion due to pipe roughness is reduced.
- The self-centering design of the Integral Orifice Plate eliminates plate misalignment.

Improves reliability and maintenance costs

The integral orifice flow meter eliminates impulse lines, reducing leak points by over 50% and decrease start-up time due to the flexibility of numerous process connection options. The direct mount design minimizes line plugging by eliminating long lines, small-bore ports, and crevices while providing consistently reliable installations.

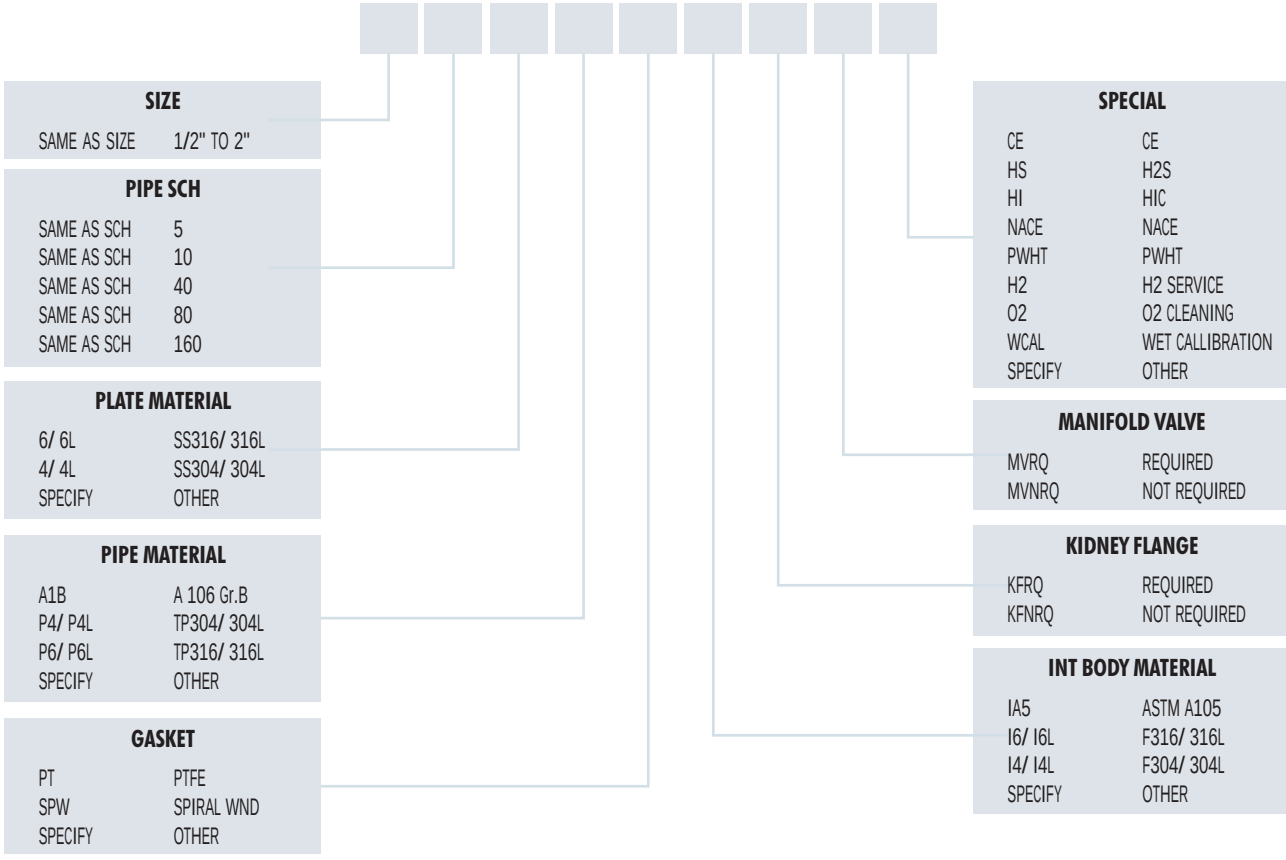
- Accuracy up to ±0. 5% of volumetric flow rate
- Integral manifold head allows direct mounting of DP transmitters
- Ideal fluid types: liquid, gas, and steam



Integral Orifice Assembly with flange union, manifold valve, DP transmitter & end flanges

Ordering Guide

Integral Meter Run Assembly



SIZE	
SAME AS SIZE	1/2" TO 2"

PIPE SCH	
SAME AS SCH	5
SAME AS SCH	10
SAME AS SCH	40
SAME AS SCH	80
SAME AS SCH	160

PLATE MATERIAL	
6/ 6L	SS316/ 316L
4/ 4L	SS304/ 304L
SPECIFY	OTHER

PIPE MATERIAL	
A1B	A 106 Gr.B
P4/ P4L	TP304/ 304L
P6/ P6L	TP316/ 316L
SPECIFY	OTHER

GASKET	
PT	PTFE
SPW	SPIRAL WND
SPECIFY	OTHER

SPECIAL	
CE	CE
HS	H2S
HI	HIC
NACE	NACE
PWHT	PWHT
H2	H2 SERVICE
O2	O2 CLEANING
WCAL	WET CALLIBRATION
SPECIFY	OTHER

MANIFOLD VALVE	
MVRQ	REQUIRED
MVNRQ	NOT REQUIRED

KIDNEY FLANGE	
KFRQ	REQUIRED
KFNRQ	NOT REQUIRED

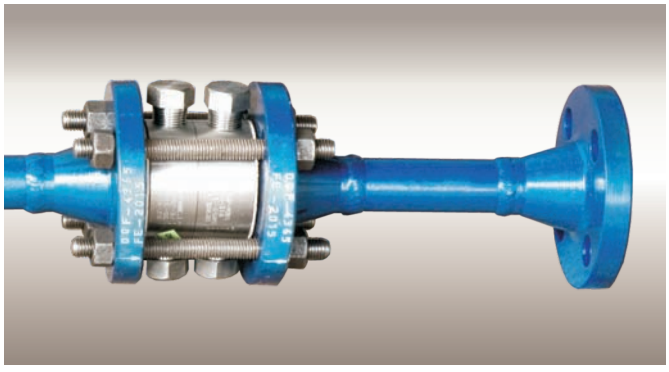
INT BODY MATERIAL	
IA5	ASTM A105
I6/ I6L	F316/ 316L
I4/ I4L	F304/ 304L
SPECIFY	OTHER

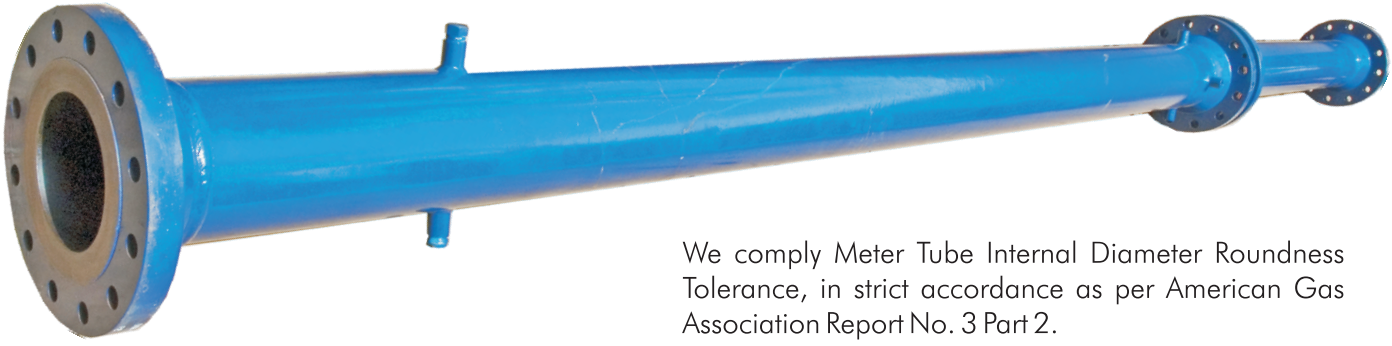
Note: 1. Use the end flange details as described in orifice ordering information.
2. Other than above information customer has to provide process data as on page no. 32
3. If manifold valve is required then please provide detail specifications for the same.

Meter runs are supplied as a complete unit of normally 1M length to ensure the necessary straight pipe length to achieve highest possible efficiency.

These are available with line sizes mostly below 50mm with corner tap.

These are used for the measurement of small flow rates precisely where high accuracy of flow rates is required.





Types of Meter Runs:

1. Orifice Flange union with Meter -run.
2. Orifice flange union with Carrier ring & Meter –run.

Generally Meter-run pipe is recommended with upstream length of 750mm and downstream length of 250mm.

Meter runs sizes above 50mm are also available as per the customers or process requirements.

MOC: Orifice Plate in SS 316, SS 304 & other on request.

End Connection: Socket Weld, Screwed and Flanged ends with meter run piping suitable to ANSI, IS & DIN flanges

We comply Meter Tube Internal Diameter Roundness Tolerance, in strict accordance as per American Gas Association Report No. 3 Part 2.

Any internal diameter measured in distance one pipe diameter will be less than the 0.25% of the mean diameter for the upstream side.

$$\left| \frac{[\text{Any diameter within one D}]-\text{Dmean}}{D} \times 100 \right| \leq 0.25\%$$

Also the percentage difference between the maximum and minimum measured internal diameter through all upstream meter tube will be less than 0.5%.

$$\frac{\text{Maximum Diameter-Minimum Diameter}}{\text{Dmean}} \times 100 \leq 0.5\%$$

For the downstream side any internal diameter measured will be less than 0.5% of the mean diameter for the downstream side.

$$\left| \frac{[\text{Any downstream diameter D}]-\text{Dmean}}{D} \times 100 \right| \leq 0.5\%$$