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ORIFICE

HOP / HOR / HOF / HRO Series



ISO 9001 ISO 14001 ASME

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HITROL CO., LTD.

Orifice Plate
Model : HOP

개요

Orifice Plate는 다른 차압식 유량계들 보다 큰 압력 손실의 단점을 갖고 있지만 높은 신뢰도, 저렴한 가격, 손쉬운 제작과 Simple한 형상 등의 이유로 일반적으로 유량 측정에 많이 사용 된다. Bore Type 으로는 Concentric, Eccentric, Segmental, Quarter Circle, Square등이 있고 Size Calculation은 ISO-5167 과 ASME MFC-3M의 Standard Code에 따라 설계 된다.

CONCENTRIC BORE TYPE

Bore의 한쪽 면은 45도의 경사면을 이루고 있는 Simple한 구조를 갖고 있다. 이 Orifice Plate는 탈, 부착이 용이하다. 압력 탭은 특성에 따라 Flange, Radius, Pipe, Vena Contracta 그리고 Corner Taps 중에서 선택 할 수 있다.

ECCENTRIC BORE TYPE

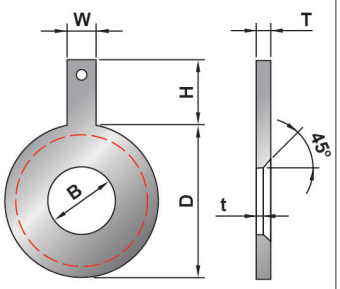
Bore를 Plate의 밑면에 위치하게 하여, 측정물의 침전물이 순조롭게 흐르도록 되어있는 Flange 또는 Vena Contracta 탭을 사용하고 Eccentric Open을 위하여 Bore 각도는 180° 또는 90°를 유지한다.

SEGMENTAL BORE TYPE

일반적으로 Segmental Bore Type은 Eccentric Orifice Plate와 같은 Service에 사용이 된다. Plate 하단부에 Bore가 위치 하여 있는 Type이다. Pipe 하부에 Bore가 요구 되는 Service에 일반적으로 사용 된다.

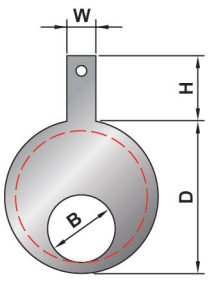
QUADRANT EDGED TYPE

이 Bore Type은 중유, 시럽, Slurries, 낮은 Reynolds Number를 갖는 고점도 유체의 유량 측정을 하고자 특별히 설계 되었다. 유입구 중앙 부위의 Bore는 둥글게 제작 된다.



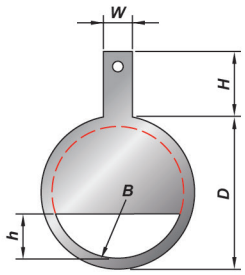
Concentric Bore Type

깨끗한 액체, 가스, 증기 등에 사용된다.
특수 조건의 Service에는 특수 자재를 선택하여야 한다.



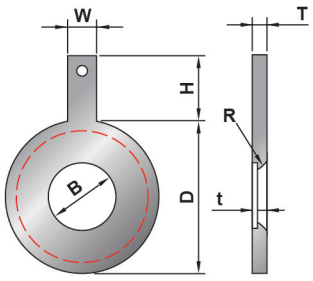
Eccentric Bore Type

Bore가 Line I.D 상부의 98% 지점에 있을때 혼합 가스는 Orifice를 통과한다.
Bore가 Pipe 하부 지점에 있을 때 침전물은 Orifice를 통과한다.



Segmental Bore Type

중량의 침전물을 지닌 유체에 적용한다.
H는 원형 부분의 높이 이다.



Quadrant Edged Type

고 점도, 낮은 Reynolds Number를 가진 유체에 적용 한다.
Plate 두께와 둥근 경사면은 Plate의 높은 내구성과 수명에 영향을 미친다.

ORIFICE PLATE의 적용

Bore Type \ Fluid Type	Fluid Type					Nominal Line Size Normally Used	
	Gas (Vapor)		Liquid				
	Clean	Dirty	Clean	Dirty	Viscous	mm	inch
Concentric Square Edge	E	X	E	O	X	40 to 1500	1-1/2 to 60
Concentric Quadrant Edge	X	X	E	O	E	40 to 250	1-1/2 to 10
Eccentric Square Edge	O	O	O	E	X	100 to 350	4 to 14
Segmental Square Edge	O	O	O	E	X	100 to 350	4 to 14

- E : Designed for this application
- O : Normally applicable for this application
- X : Not designed for this application

제품 사양

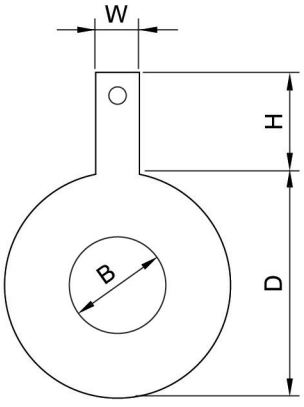
Operating Conditions	Line fluid capability	Clean liquids, gases, and low-velocity vapor(steam)flow.
	Temperature Rating	Depends on material of construction
	Pressure Rating	Maximum working pressure is per ANSI B16.5
Line Size Capabilities	Line sizes between 1/2″ through 36″	
Plate Material	304SS or 316SS Stainless steel. Monel, Hastelloy or other as required.	
Beta Ratio Capability	Custom sized and designed for Beta ratio range between 0.20 through 0.75	
Minimum Pipe Reynolds Number	Must be Greater than 10,000	
Head Loss of Differential	Varies from 50% to 70% of differential depending on application conditions and beta ratio.	
Accuracy	Between ±0.5% to ±2.0% of full scale.	

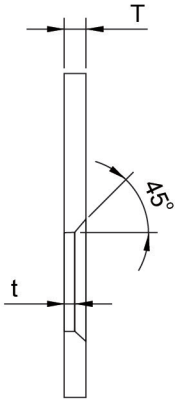
ORIFICE PLATE 치수

■ Unit : inch

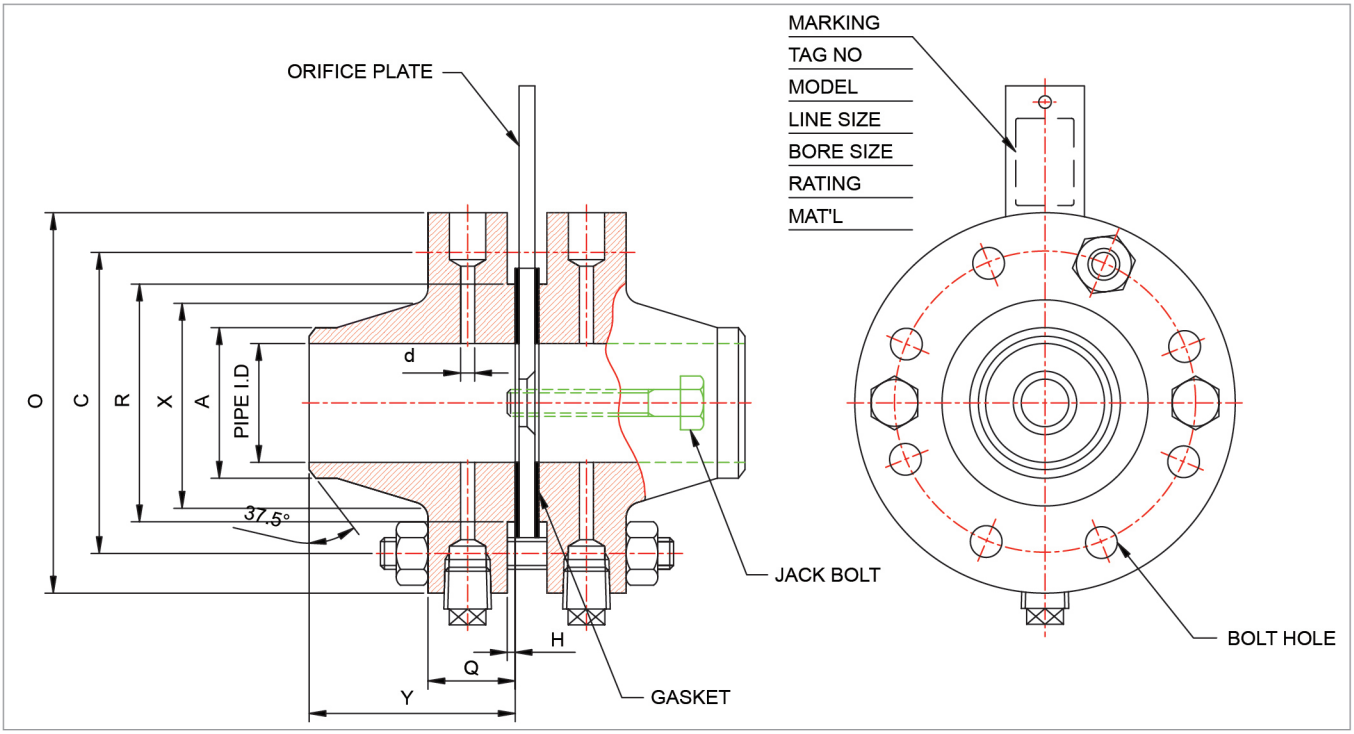
NOMINAL PIPE SIZE (inches)	ANSI 125# 150# D	ANSI 250# 300# D	ANSI 400# D	ANSI 600# D	ANSI 900# D	ANSI 1500# D	ANSI 2500# D	FOR ALL PRESSURE RATINGS					
								H	W	(AGA) T	t	Blank Weight (lbs)	(ISA) t
1/2″	1.875	2.125	2.125	2.125	2.500	2.500	2.750	4	1	.125	.015	1	.125
3/4″	2.250	2.625	2.625	2.625	2.750	2.750	3.000	4	1	.125	.015	1	.125
1″	2.625	2.875	2.875	2.875	3.125	3.125	3.375	4	1	.125	.020	1	.125
1-1/4″	3.000	3.250	3.250	3.250	3.500	3.500	4.125	4	1	.125	.020	1	.125
1-1/2″	3.375	3.750	3.750	3.750	3.875	3.875	4.625	4	1	.125	.030	1	.125
2″	4.125	4.375	4.375	4.375	5.625	5.625	5.750	4	1	.125	.030	1	.125
2-1/2″	4.875	5.125	5.125	5.125	6.500	6.500	6.625	4	1	.125	.030	1	.125
3″	5.375	5.875	5.875	5.875	6.625	6.875	7.750	4	1	.125	.030	1	.125
4″	6.875	7.125	7.000	7.625	8.125	8.250	9.250	4	1	.125	.060	2	.125
5″	7.750	8.500	8.375	9.500	9.750	10.000	11.000	4	1	.125	.060	2	.125
6″	8.750	9.875	9.750	10.500	11.375	11.125	12.125	6	1-1/2	.125	.060	3	.125
8″	11.000	12.125	12.000	12.625	14.125	13.875	15.250	6	1-1/2	.125	.125	5	.125
10″	13.375	14.250	14.125	15.750	17.125	17.125	18.750	6	1-1/2	.125	.125	7	.125
12″	16.125	16.250	16.500	18.000	19.625	20.500	21.625	6	1-1/2	.250	.250	18	.125
14″	17.750	19.125	19.000	19.375	20.500	22.750		6	1-1/2	.250	.250	24	.125
16″	20.250	21.250	21.125	22.250	22.625	25.250		6	1-1/2	.375	.375	40	.250
18″	21.500	23.375	23.250	24.000	25.000	27.625		6	1-1/2	.375	.375	50	.250
20″	23.750	25.625	25.375	26.750	27.375	29.625		6	1-1/2	.375	.375	65	.250
22″	26.000	27.750	27.500	28.875				6	1-1/2	.375	.375	72	.250
24″	28.125	30.375	30.125	31.000	32.875	35.500		6	1-1/2	.375	.375	90	.250
30″	34.625	37.375	37.250	38.125				6	1-1/2	.500	.500	160	.250
36″	41.125	43.875	43.875	44.375				6	1-1/2	.500	.500	220	.375







ORIFICE ASSEMBLY 치수



FOR ANSI 300 FLANGES

■ Unit : mm

Nominal Pipe Size	Diam of Flange O	Thickness of Flange Q	D.of Hub at of Weld'g A	Diam of Hub X	Length Through Hub Y	O.D of Raised Face R	Depth of Groove H	Diam of Tab Holes d	Diam of Bolts Circle C	Number of Bolt	Bolt Size& Length
1/2″	95.3	38.1	21.3	38.1	76.2	35.1	1.5	6.4	66.5	4	1/2″x140
3/4″	117.3	38.1	26.7	47.8	79.5	42.9	1.5	6.4	82.6	4	5/8″x150
1″	124	38.1	33.5	53.8	82.6	50.8	1.5	6.4	88.9	4	5/8″x150
1-1/2″	155.4	38.1	48.3	69.9	85.9	73.2	1.5	6.4	114.3	4	3/4″x165
2″	165.1	38.1	60.5	84.1	85.9	91.9	1.5	6.4	127	8	5/8″x150
2-1/2″	190.5	38.1	73.2	100.1	88.9	104.6	1.5	6.4	149.4	8	3/4″x165
3″	209.6	38.1	88.9	117.3	88.9	127	1.5	9.5	168.1	8	3/4″x165
4″	254	38.1	114.3	146.1	91.9	157.2	1.5	12.7	200.2	8	3/4″x165
6″	317.5	38.1	168.4	206.2	100.1	215.9	1.5	12.7	269.7	12	3/4″x165
8″	381	41.2	219.2	260.4	111.3	269.7	1.5	12.7	330.2	12	7/8″x185
10″	444.5	47.8	273.1	320.5	117.3	323.9	1.5	12.7	387.4	16	1″x210
12″	520.7	50.8	323.9	374.7	130	381	1.5	12.7	450.9	16	1-1/8″x230
14″	584.2	53.8	355.6	425.5	142.7	412.8	1.5	12.7	514.4	20	1-1/8″x235
16″	647.2	57.2	406.4	482.6	146.1	469.9	1.5	12.7	571.5	20	1-1/4″x260
18″	711.2	60.5	457.2	533.4	158.8	533.4	1.5	12.7	628.7	24	1-1/4″x265
20″	774.7	63.5	508	587.2	162.1	584.2	1.5	12.7	585.8	24	1-1/4″x270
24″	914.4	69.9	609.6	701.5	168.1	692.2	1.5	12.7	812.8	24	1-1/2″x310

FOR ANSI 600 FLANGES

■ Unit : mm

Nominal Pipe Size	Diam of Flange O	Thickness of Flange Q	D.of Hub at of Weld'g A	Diam of Hub X	Length Through Hub Y	O.D of Raised Face R	Depth of Groove H	Diam of Tab Holes d	Diam of Bolts Circle C	Number of Bolt	Bolt Size& Length
1/2″	95.3	38.1	21.3	38.1	76.2	35.1	1.5	6.4	66.5	4	1/2″x140
3/4″	117.3	38.1	26.7	47.8	79.5	42.9	1.5	6.4	82.6	4	5/8″x150
1″	124	38.1	33.5	53.8	82.6	50.8	1.5	6.4	88.9	4	5/8″x150
1-1/2″	155.4	38.1	48.3	69.9	85.9	73.2	1.5	6.4	114.3	4	3/4″x165
2″	165.1	38.1	60.5	84.1	85.9	91.9	1.5	6.4	127	8	5/8″x150
2-1/2″	190.5	38.1	73.2	100.1	88.9	104.6	1.5	6.4	149.4	8	3/4″x165
3″	209.6	38.1	88.9	117.3	88.9	127	1.5	9.5	168.1	8	3/4″x165
4″	273.1	44.5	114.3	152.4	108	157.2	6.4	12.7	216	8	7/8″x190
6″	355.6	54.2	168.4	222.3	123.7	215.9	6.4	12.7	292.1	12	1″x220
8″	419.1	62	219.2	273.1	139.8	269.7	6.4	12.7	349.3	12	1-1/8″x250
10″	508	69.9	273.1	342.9	158.8	323.9	6.4	12.7	431.8	16	1-1/4″x280
12″	558.8	72.9	323.9	400.1	161.8	381	6.4	12.7	489	20	1-1/4″x285
14″	603.3	76.3	355.6	431.8	171.5	412.8	6.4	12.7	527.1	20	1-3/8″x305
16″	685.8	82.6	406.4	495.3	184.2	469.9	6.4	12.7	603.3	20	1-1/2″x335
18″	743	89	457.2	546.1	190.6	533.4	6.4	12.7	654.1	20	1-5/8″x360
20″	812.8	95.3	508	609.6	196.9	584.2	6.4	12.7	723.9	24	1-5/8″x375
24″	939.8	108	609.6	717.6	209.6	692.2	6.4	12.7	838.2	24	1-7/8″x425

FOR ANSI 900 FLANGES

■ Unit : mm

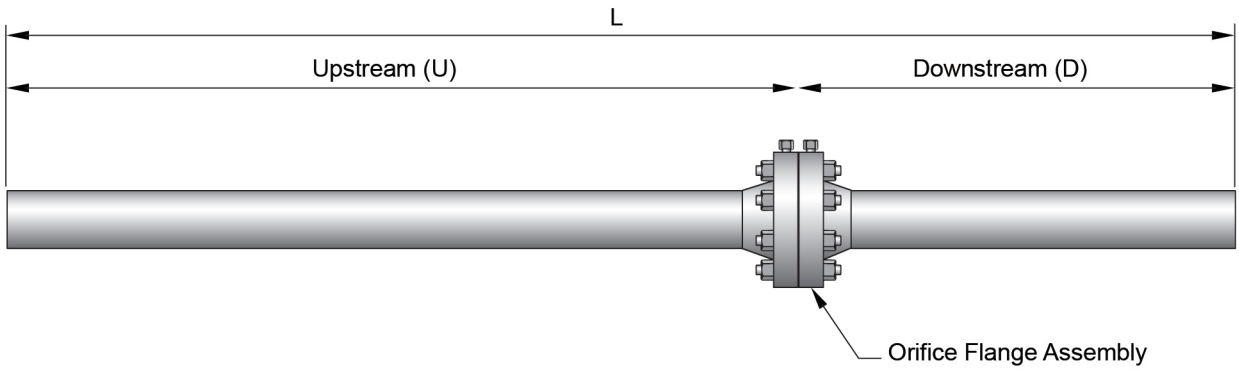
Nominal Pipe Size	Diam of Flange O	Thickness of Flange Q	D.of Hub at of Weld'g A	Diam of Hub X	Length Through Hub Y	O.D of Raised Face R	Depth of Groove H	Diam of Tab Holes d	Diam of Bolts Circle C	Number of Bolt	Bolt Size& Length
1/2″	120.7	44.5	21.3	38.1	82.6	35.1	6.4	6.4	82.6	4	3/4″x175
3/4″	130	44.5	26.7	44.5	89	42.9	6.4	6.4	88.9	4	3/4″x175
1″	149.4	44.5	33.5	52.3	89	50.8	6.4	6.4	101.6	4	7/8″x190
1-1/2″	177.8	44.5	48.3	69.9	95.3	73.2	6.4	6.4	124	4	1″x200
2″	215.9	44.5	60.5	104.6	108	91.9	6.4	6.4	165.1	8	7/8″x190
2-1/2″	244.3	47.5	73.2	124	111	104.6	6.4	6.4	190.5	8	1″x205
3″	241.3	44.5	88.9	127	108	127	6.4	9.5	190.5	8	7/8″x190
4″	292.1	50.9	114.3	158.8	120.7	157.2	6.4	12.7	235	8	1-1/8″x225
6″	381	62	168.4	235	146.1	215.9	6.4	12.7	317.5	12	1-1/8″x250
8″	469.9	69.9	219.2	298.5	168.5	269.7	6.4	12.7	393.7	12	1-3/8″x290
10″	546.1	76.3	273.1	368.3	190.6	323.9	6.4	12.7	469.9	16	1-3/8″x305
12″	609.6	85.6	323.9	419.1	206.6	381	6.4	12.7	533.4	20	1-3/8″x325
14″	641.4	92.3	355.6	450.9	219.3	412.8	6.4	12.7	558.8	20	1-1/2″x350
16″	704.9	95.3	406.4	508	222.3	469.9	6.4	12.7	616	20	1-5/8″x370
18″	787.4	108	457.2	565.2	235	533.4	6.4	12.7	685.8	20	1-7/8″x425
20″	857.3	114.4	508	622.3	254.1	584.2	6.4	12.7	749.3	20	2″x450
24″	1041.4	146.1	609.6	749.3	298.5	692.2	6.4	12.7	901.7	20	2-1/2″x560

FOR ANSI 1500 FLANGES

■ Unit : mm

Nominal Pipe Size	Diam of Flange O	Thickness of Flange Q	D.of Hub at of Weld'g A	Diam of Hub X	Length Through Hub Y	O.D of Raised Face R	Depth of Groove H	Diam of Tab Holes d	Diam of Bolts Circle C	Number of Bolt	Bolt Size& Length
1/2″	120.7	44.5	21.3	38.1	82.6	35.1	6.4	6.4	82.6	4	3/4″x175
3/4″	130	44.5	26.7	44.5	89	42.9	6.4	6.4	88.9	4	3/4″x175
1″	149.4	44.5	33.5	52.3	89	50.8	6.4	6.4	101.6	4	7/8″x190
1-1/2″	177.8	44.5	48.3	69.9	95.3	73.2	6.4	6.4	124	4	1″x200
2″	215.9	44.5	60.5	104.6	108	91.9	6.4	6.4	165.1	8	7/8″x190
2-1/2″	244.3	47.5	73.2	124	111	104.6	6.4	6.4	190.5	8	1″x205
3″	266.7	54.2	88.9	133.4	123.7	127	6.4	9.5	203.2	8	1-1/8″x235
4″	311.2	60.2	114.3	162.1	130.4	157.2	6.4	12.7	241.3	8	1-1/4″x260
6″	393.7	89	168.4	228.6	177.9	215.9	6.4	12.7	317.5	12	1-3/8″x330
8″	482.6	98.3	219.2	292.1	219.3	269.7	6.4	12.7	393.7	12	1-5/8″x375
10″	584.2	114.4	273.1	368.3	260.4	323.9	6.4	12.7	482.6	12	1-7/8″x435
12″	673.1	130.4	323.9	450.9	288.8	381	6.4	12.7	571.5	16	2″x480
14″	749.3	139.8	355.6	495.3	304.9	412.8	6.4	12.7	635	16	2-1/4″x525
16″	825.5	152.5	406.4	552.5	317.6	469.9	6.4	12.7	704.9	16	2-1/2″x580
18″	914.4	168.5	457.2	596.9	333.6	533.4	6.4	12.7	774.7	16	2-3/4″x635
20″	984.3	184.2	508	641.4	362	584.2	6.4	12.7	831.9	16	3″x695
24″	1168.4	209.6	609.6	762	412.8	692.2	6.4	12.7	990.6	16	3-1/2″x795

직관부 조건



	Straight Unobstructed Meter Tube Length from the Upstream Side of the Orifice Plate		Overall Laying Length	Pipe I.D (inches)	
Pipe Size	U	D	L	Sch. 40	Sch. 80
2″	5′-0″	3′-0″	8′-0″	2.067″	1.939″
3″	6′-0″	4′-0″	10′-0″	3.068″	2.900″
4″	8′-0″	4′-0″	12′-0″	4.026″	3.826″
6″	12′-0″	5′-0″	17′-0″	6.065″	5.761″
8″	15′-0″	5′-0″	20′-0″	7.981″	7.625″
10″	19′-0″	6′-0″	25′-0″	10.020″	9.564″
12″	21′-0″	7′-0″	28′-0″	11.938″	11.376″

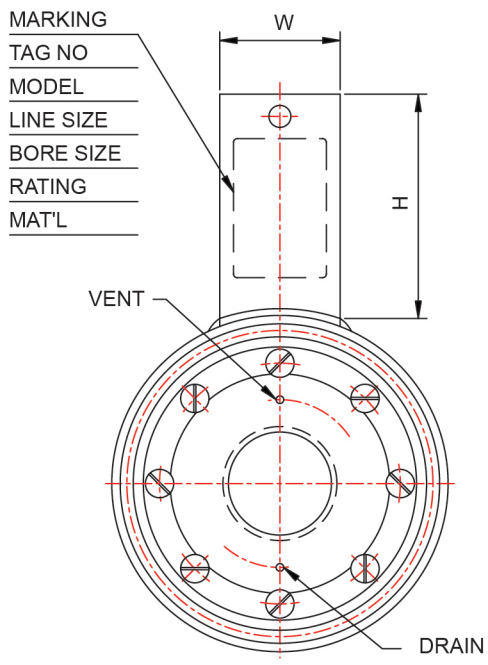
Orifice Plate with Holder Ring
Model : HOP-RJ

개 요

Holder Ring Assembly는 Holder Ring 과 RTJ(Ring Type Joint) Flange를 위해 설계된 Orifice Plate와 조합 된다. Holder Ring은 Orifice Plate의 Holding 및 누수 방지를 위한 Gasket 기능을 한다. Metallic Sealing System은 고온, 고압에 적용이 용이 하다. 일반적으로 Flange Tap을 사용 한다.

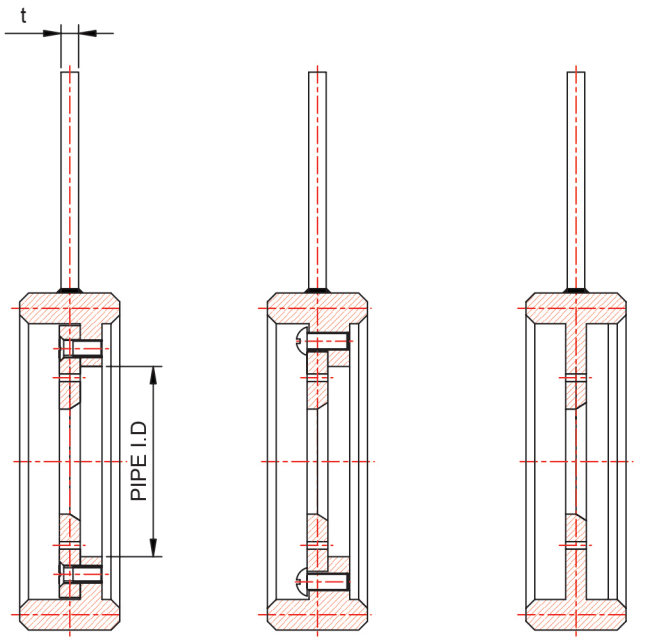
제품 사양

Line Size Capabilities End Arrangement	Line sizes between 1/2" through 24" Octagonal Ring Type, Oval Formed Type
Material	304SS or 316SS Stainless steel. Monel, Hastelloy or other as required.
Flange Rating	ANSI 300#, 600#, 900#, and 1500# Ring Type Joint(RTJ)
Pressure Tap	Flange Taps
Drain and Vent Hole	Per ASME recommendations. Not drilled for orifice bores smaller than 25.4mm



ORIFICE HANDLE (W & H)

1/2"~3" : W =25, H=100
4"~8" : W =38, H=120
10"~14" : W =38, H=140
16"~18" : W =38, H=160
20"~24" : W =38, H=190



(1/2"-2-1/2") (3"-24") INTEGRAL TYPE

RING TYPE : OCTAGONAL or OVAL FORMED

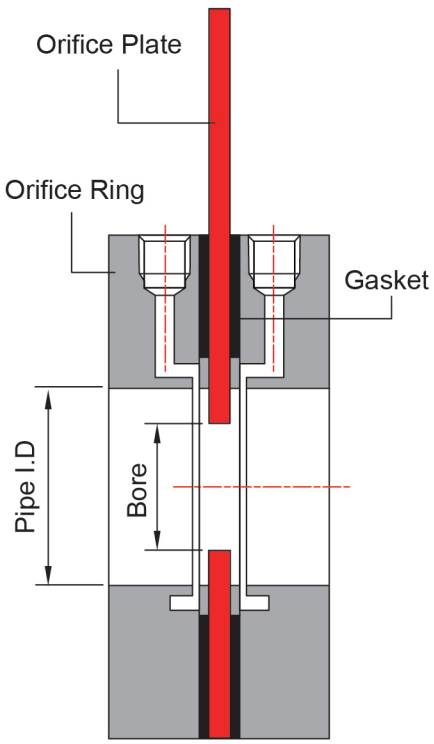
Orifice Ring Assembly
Model : HOR

개 요

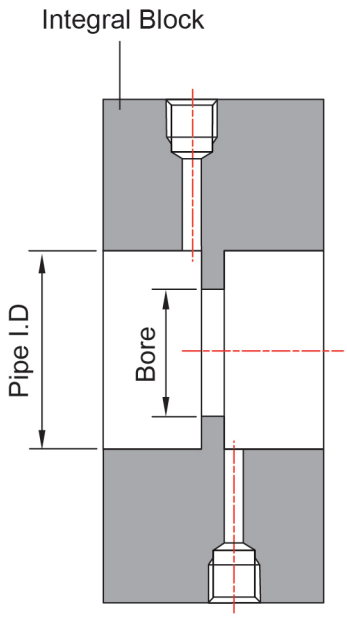
Orifice Ring Assembly는 압력이 높지 않은 소구경 파이프의 유량 측정에 사용을 한다. 한 개의 Orifice Plate와 2개의 Orifice Ring으로 구성 되어 있다. 압력 탭은 Corner Tap을 사용 한다.

제품 사양

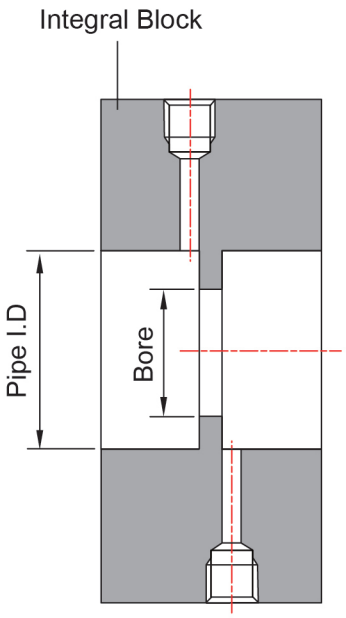
Line Size Capabilities / End Arrangement	Line sizes between 1/2" through 24"
Material	304SS or 316SS Stainless steel. Monel, Hastelloy or other as required.
Gasket Material / Thickness	Asbestos, Non-Asbestos, Teflon / 1.5mm, 2.0mm, 3.0mm
Pressure Tap / Size	Corner Taps / PT 1/2", NPT 1/2" or other as required.
Flange Rating	ANSI 150#, 300#



ORIFICE RING ASSEMBLIES



ORIFICE BLOCKS

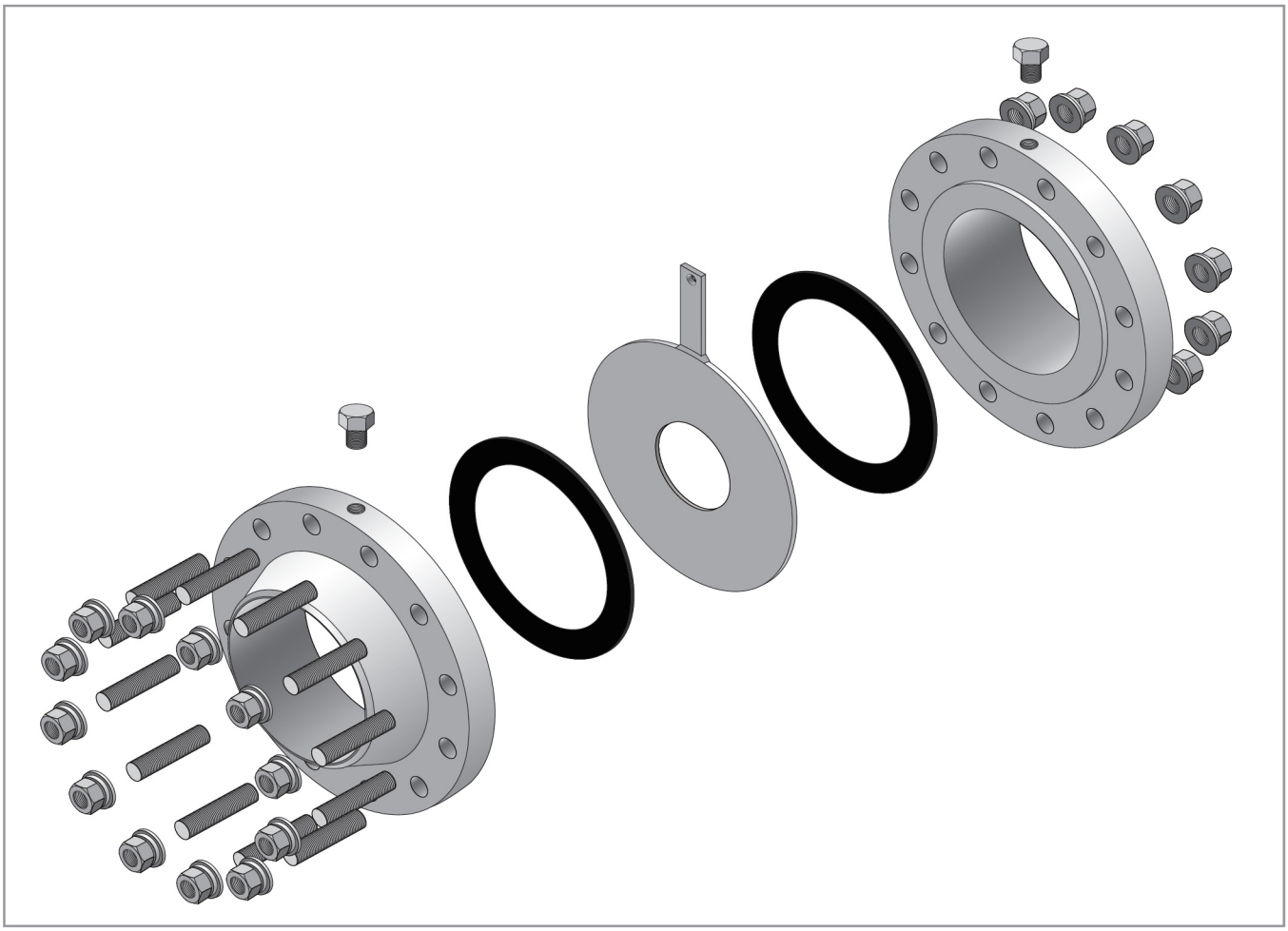


RING TYPE ORIFICE BLOCKS

Orifice Flange Assembly
Model : HOF

개 요

Orifice Plate는 Bore Diameter를 정밀 가공하여 현장에 설치하기 위해서 Flange Assembly가 필요하다.
Orifice Plate는 가스켓과 함께 플렌지와 플렌지 사이에 조립이 되고 특히 플렌지에는 정확한 차압 측정을 위한 압력탭이 가공 된다.



제품 사양

Line Size Capabilities End Arrangement	Line sizes between 1” through 24” Welding neck Type, Slip on, Socket Weld, Ring joint WN
Material	304SS or 316SS Stainless steel. Monel, Hastelloy or other as required.
Flange Rating	ANSI 300#, 600#, 900# and 1500#
Pressure Tap / Size	Flange Taps / PT 1/2”, NPT 1/2” or other as required.
Gasket Material / Thickness	Non-Asbestos, Sprial wound / 1.5mm, 4.5mm

Restriction Orifice
Model : HRO

개 요

HRO Series는 Pipe Line의 유체 압력을 낮추기 위해 사용하는 Element이며, 모든 액체, 가스, 스팀 등에 적용할 수 있다. 고압을 저압으로 급격하게 줄일 경우에 Cavitation 현상이 발생하여 소음과 진동으로 인하여 배관과 다른 장치에 손상을 줄 수가 있다. HRO Series는 Cavitation 현상없이 배관내의 압력을 줄일 수 있다.
HRO Series는 원자력 발전소 Q Class에 적용하기 위해 한국수력원자력과 함께 기술 개발된 우선 품목이다. 내진 해석, 차압, Beta Ratio, 홀의 수, 공정 조건에 따라 Orifice를 설계, 제작 한다. HRO Series는 Flat, Conical 두 종류가 있으며, Flat Type은 Muliple과 Single 두 종류가 있다. HRO Series는 하이트롤의 엄격한 품질 보증 시스템과 자체 개발한 Software를 사용하여 제작한다.

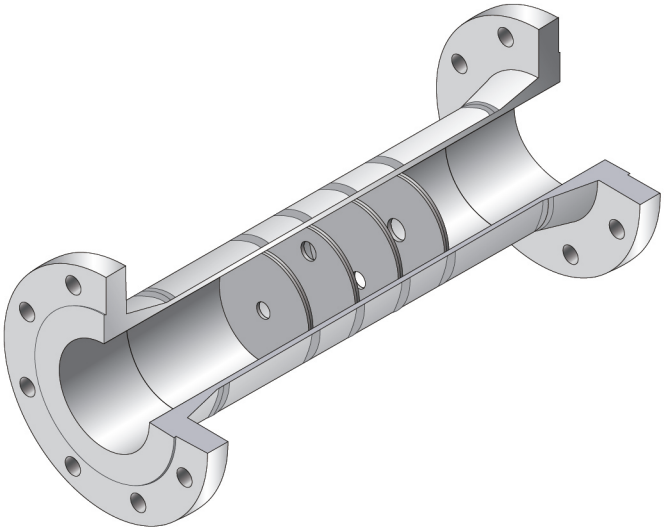




Flat Type



Conical Type



Multi Stage Type



Orifice

HOP/HRO/HOF Series는 아래 테이블에 있는 유량 정보가 있어야만 차압을 계산하고 제품을 디자인 할 수 있습니다.

Flow Data \ Tag No.			
Fluid Name / Fluid State			
Max. / Nor. Flow Rate (m^3/hr)			
Max. / Nor. Temperature (℃)			
Max. / Nor. Pressure (psia)			
Pipe Inside Diameter (mm)			
Density at Base (kg/m^3)			
Density at Operating (kg/m^3)			
Operating Viscosity (cP)			