

FLOW MEASUREMENT

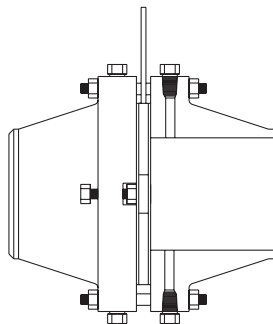
We specialize in Orifice Plates
ANY SIZE — ANY MATERIAL — ANY THICKNESS

USA Industries manufactures each Plate to meet or exceed standards by A.G.A., I.S.A., A.N.S.I., A.S.M.E. and A.P.I. recommendations.

Stocked plates include 304 & 316 Stainless Steel in 1/8" and 1/4" thicknesses. Other material and/or thicknesses are available upon request.

While typically we bore the Plates to the customer's supplied sizing calculation, we can provide sizing calculation services to you for an *additional fee*.

- Series 500 Universal Plates - For Orifice Fittings, i.e. Daniels Senior and Junior Assemblies
- Series 520 Paddle Plates - For Raised Face Flanges
- Series 560 & 590 Plates - Ring Type Joint Plates with Male or Female gasket area
- We also provide Orifice Flanges in both Carbon and Stainless Steel, as well as Orifice Plate Holder Assemblies
- Restriction Orifice Unions from 1/4" to 2" in socket-weld or Female NPT Threads and Daniels Senior Assembly repair and replacement parts



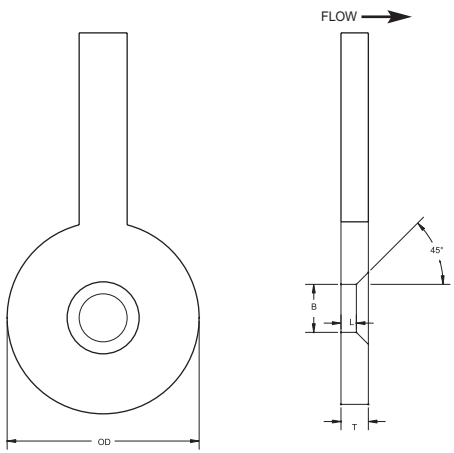
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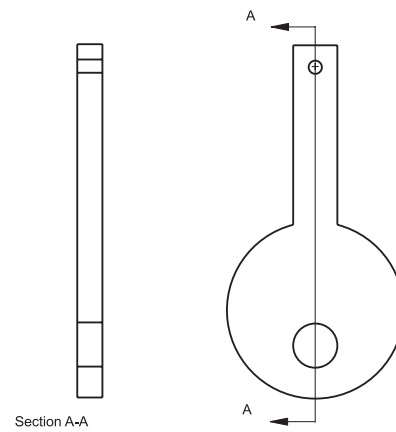
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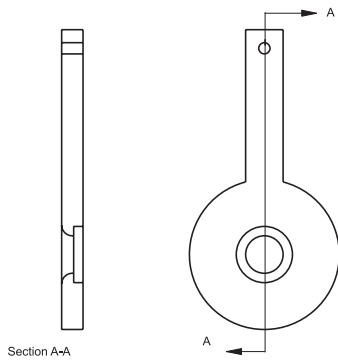
*Concentric Bore

Used primarily for clean liquids, gases, or vapors that are relatively non-viscous. When necessary, a bevel is machined at a 45 degree angle to attain the proper edge thickness. Accuracy range at +.6% for beta ratio between 0.2 to 0.75.



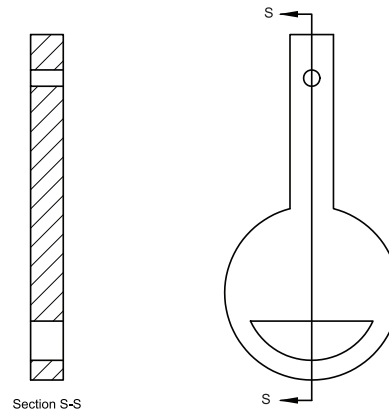
Eccentric Bore

Primarily used for measurement of entrained solids or slurries of vapors and gases where condensation is present. The eccentric bore is offset to where the bore edge is inscribed in a circle that is 98% of line I.D. Accuracy range at +1.5% to +2% for beta ratio between 0.3 to 0.75.



Quadrant Bore

This type of orifice bore is used primarily in the measurement of high viscosity flow, such as heavy crude, syrups, and slurries. The radius on the inlet side is equal to the plate thickness. The quadrant is always recommended where the Reynolds number factor is less than 100,000. Accuracy range is +2% for beta ratio between 0.24 to 0.6.



Segmental Bore

The segmental bore is located in the same way that the eccentric bore is. These bores are used primarily for slurries or extremely dirty gases where the flow may contain impurities heavier than fluid. Accuracy range at +2% for beta ratio between 0.35 to 0.75.

***Plate Bevel determined per Instrument Engineers Handbook, Edition 3: Bela Lipták. All plates thicker than 1/8" should be beveled 45 degrees on the downstream side to a 1/8" edge thickness. Any orifice bore less than 1" to be beveled to 1/16" if plate thickness is 1/8".**

Orifice Plate Installation

1. Install orifice plate and new gaskets between flanges.
2. Release the flanges by turning the two jack bolts counterclockwise.
3. Replace studs and tighten to spec.

Orifice Plate Removal

1. Loosen all studs and remove the top half of the studs.
2. Spread flanges apart by turning the jack bolts clockwise.
3. Remove orifice plate for inspection or replacement.

When Installing Orifice Plates

1. Orifice Bore must be centered within 3% of inside pipe diameter.
Note: Writing on the Orifice Plate ALWAYS faces upstream
2. Inside diameter of gaskets must not protrude beyond inside surface of pipe.*
3. Tighten flange bolts evenly to prevent plate buckling.

*Gaskets should be replaced at each orifice plate inspection.



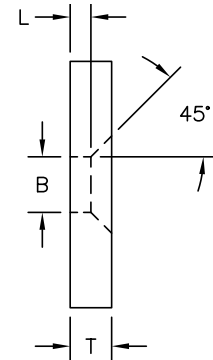
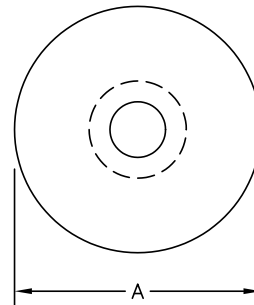
ORIFICE PLATES

Series 500 Universal Orifice Plates

Universal Orifice Plates are Manufactured for use in All Standard Orifice Fitting Assemblies or Ring Type Joint Plate Holders. Each plate is carefully manufactured to meet or exceed standards set by A.G.A., I.S.A., A.N.S.I., A.S.M.E. & A.P.I. recommendations. Stocked in 304 & 316 Stainless Steel and available in any material requested, such as Monel, Hastelloy, Copper-Nickel, etc. Coatings can also be provided.



Nominal Pipe Size (inches)	A (inches)	L (inches)	T (inches)
1	1.312	0.02	1/8
1 1/2	2	0.03	1/8
2	2.437	0.03	1/8
2 1/2	2.812	0.03	1/8
3	3.437	0.03	1/8
4	4.406	0.06	1/8
5	6	0.06	1/8
6	6.437	0.06	1/8
8	8.437	0.125	1/4
10	10.687	0.125	1/4
12	12.593	0.25	1/4
14	14	0.25	1/4
16	16	0.25	3/8
18	18	0.25	3/8
20	20	0.375	3/8
24	24	0.375	3/8



Notes:
Dimension "A" does not include seal ring.

L = Thickness for Restriction Applications

When Ordering Specify:

- Line Size
- Seal Material
- Bore Size
- Delivery Date
- Plate Thickness
- Material
- Quantity

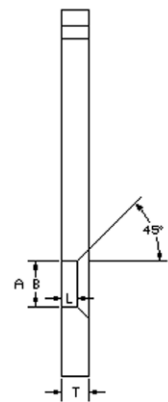
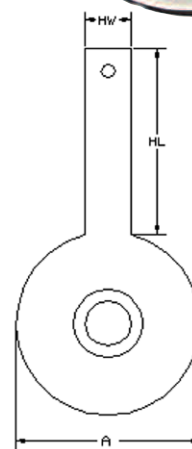
Series 520 Paddle - Type Plates

Paddle Type Orifice Plates are manufactured for use with Raised Face Orifice Flanges and Holding Blocks. Each plate is carefully manufactured to meet or exceed standards set by A.G.A., I.S.A., A.N.S.I., A.S.M.E. and A.P.I. recommendations. Stocked in 304 & 316 Stainless Steel and available in any material requested, such as Monel, Hastelloy, Copper-Nickel, etc. Coatings can also be provided.



Line Size (in)	Flange Rating A							HL (in)	HW (in)	T (in)
	150#	300#	400#	600#	900#	1500#	2500#			
1/2	1 7/8	2 1/8	2 1/8	2 1/8	2 1/2	2 1/2	2 3/4	4	1	1/8
3/4	2 1/4	2 5/8	2 5/8	2 5/8	2 3/4	2 3/4	3			
1	2 5/8	2 7/8	2 7/8	2 7/8	3 1/8	3 1/8	3 3/8			
1 1/4	3	3 1/4	3 1/4	3 1/4	3 1/2	3 1/2	4 1/8			
1 1/2	3 3/8	3 3/4	3 3/4	3 3/4	3 7/8	3 7/8	4 5/8			
2	4 1/8	4 3/8	4 3/8	4 3/8	5 5/8	5 5/8	5 3/4			
2 1/2	4 7/8	5 1/8	5 1/8	5 1/8	6 1/2	6 1/2	6 5/8			
3	5 3/8	5 7/8	5 7/8	5 7/8	6 5/8	6 7/8	7 3/4			
4	6 7/8	7 1/8	7	7 5/8	8 1/8	8 1/4	9 1/4			
5	7 3/4	8 1/2	8 3/8	9 1/2	9 3/4	10	11			
6	8 3/4	9 7/8	9 3/4	10 1/2	11 3/8	11 1/8	12 1/8			
8	11	12 1/8	12	12 5/8	14 1/8	13 7/8	15 1/4			
10	13 3/8	14 1/8	14 1/8	15 3/4	17 1/8	17 1/8	18 3/4			
12	16 1/8	16 5/8	16 1/2	18	19 5/8	20 1/2	21 5/8			
14	17 3/4	19 1/8	19	19 3/8	20 1/2	22 3/4	-			
16	20 1/4	21 1/4	21 1/8	22 1/4	22 5/8	25 1/4	-			
18	21 1/2	23 3/8	23 1/4	24	25	27 5/8	-			
20	23 3/4	25 5/8	25 3/8	26 3/4	27 3/8	29 5/8	-			
22	26	27 3/4	27 1/2	28 7/8	-	-	-			
24	28 1/8	30 3/8	30 1/8	31	32 7/8	35 1/2	-			
30	34 5/8	37 3/8	37 1/4	38 1/8	-	-	-			
36	41 1/8	43 7/8	43 7/8	44 3/8	-	-	-			

All dimensions are in inches. Additional sizes Available.



When Ordering Specify:

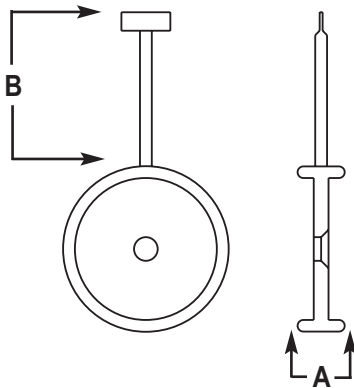
- Line Size
- Material
- Gasket Type if needed
- Delivery Date
- Plate Thickness
- Bore Size
- Quantity



Ring Type Joint Plates

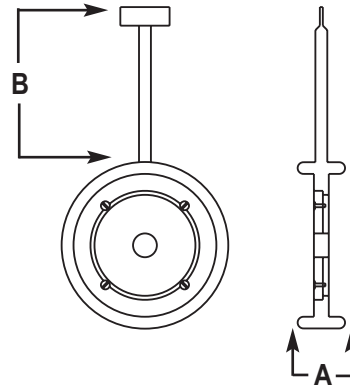
Choose from either style of plate to suit your particular needs

Series 560 Plates



Series 560 Plates are of one-piece construction. Manufactured in any material requested such as 304 or 316 SS, Monel, Hastelloy, Copper-Nickel, etc...

Series 590 Plate Holders



Series 590 Plates are manufactured with hold-down screws and use Universal Plates for the Orifice bore. The 590 Series should be used where frequent replacement or sizing changes are expected. Manufactured in any material requested such as 304 or 316 SS, Monel, Hastelloy, Copper-Nickel, etc.

When Ordering Specify:

- Line Size
- Plate Thickness
- Quantity
- Flange Rating
- Material
- Delivery Date

When Ordering Specify:

- Line Size
- Material
- API Rating
- Quantity
- Flange Rating
- Delivery Date

If Needed:

- Series 520 plate thickness
- Bore Size
- Quantity

LINE SIZE	Flange Rating													
	300 - 600 #			900 #			1500 #			2500 #				
	Ring Size	A	B	Ring Size	A	B	Ring Size	A	B	Ring Size	A	B		
1/2	R-11	29/32	4 1/4	R-12	1	4 1/4	R-12	1	6 1/2	R-13	1	6 1/2		
3/4	R-13	1		R-14			R-14			R-16			R-16	R-18
1	R-16			R-20			R-20			R-23			1 1/16	
1 1/2	R-20			R-24			R-24			R-26			1 3/16	
2	R-23	5 1/4	R-27	5 1/4	R-27	6 1/4	R-28	7 1/2	R-32	7 1/2	8 1/2			
2 1/2	R-26		R-31		R-31		R-35		1 1/16					
3	R-31	6 1/4	-	1 1/16	-	6 1/2	-	7 1/2	R-38	1 5/16	7 1/2			
3 1/2	R-34		R-37		R-37		R-39		R-42			1 7/16		
4	R-37		R-41		R-41		R-44		R-47			1 9/16		
5	R-41	6 1/2	R-45	6 1/4	R-45	7 1/2	R-46	8 1/2	R-51	1 9/16	8 1/2			
6	R-45		R-49		R-49		R-50		1 5/16					
8	R-49	7 1/2	R-53	1 3/16	R-53	7 1/2	R-54	9 1/2	R-54	1 7/16	7 1/2			
10	R-53		R-57		R-57		R-58		1 11/16					
12	R-57		R-62		R-62		R-63		1 7/8					
14	R-61		R-66		R-66		R-67		2					
16	R-65	1 1/4	R-70	1 9/16	R-70	10 1/2	R-71	11 1/2	R-75	2 1/8	10 1/2			
18	R-69		R-74		R-74		R-77		2 5/16					
20	R-73	1 7/16	R-78	1 7/8	R-78	9 1/2	R-79	11 1/2	-	-	-			
24	R-77		-		-		-		-					

NOTE: 560 Plate Holders 2" through 8" have a standard Plate thickness of 1/4".

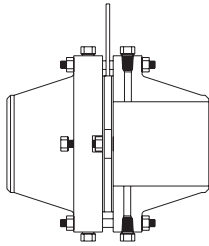
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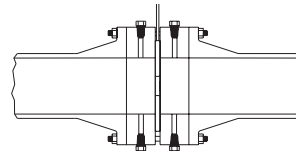
FLANGES & HOLDING BLOCKS

Orifice Flanges



Available in Carbon or Stainless Steel and manufactured to meet A.G.A., A.P.I., A.S.M.E., I.S.A. standards. In addition, available for all flange ratings and line sizes.

Orifice Holding Blocks



Meets A.G.A./A.S.M.E./I.S.A. flange tap location requirements. Available in 150# A.N.S.I. rating in all line sizes, ideal for "lined piping" in caustic service. More economical than using Orifice Flanges in particular applications. Available in Carbon, Stainless, Monel, Brass, Nickel as well as many other alloys. Coated with Teflon Or Kynar.

When Ordering Specify:

- Line Size
- Pipe Schedule
- Gasket Type
- Delivery Date
- Flange Rating
- Material
- Quantity

When Ordering Specify:

- Line Size
- Pipe Schedule
- Gasket Type
- Delivery Date
- Flange Rating
- Material
- Quantity

	Nominal Pipe Size	Diameter of Flange	Min Flange Thickness	Diameter of Raised Face	Length through Hub	Pressure Tap Hole Size	Diameter Bolt Circle	Number of Holes	Size of Holes	Size & Lgth of Studs	Size & Lgth of Jack screw	Approx. Wt. per union (LBS)
	SIZE	O	T	R	L	P	BC	#Ø	Ø	S	J	W
		*0.5	3.75	1.5	1.38	3	0.12	2.62	4	0.56	0.5 x 4.75	0.5 x 3
CLASS 300, DIMENSIONAL DATA (INCHES)	*0.75	4.62	1.5	1.69	3.12	0.12	3.25	4	0.69	0.625 x 5	0.5 x 3	11
	1	4.88	1.5	2	3.25	0.25	3.5	4	0.69	0.625 x 5	0.625 x 3	18
	*1.25	5.25	1.5	2.5	3.31	0.25	3.88	4	0.69	0.625 x 5	0.625 x 3	21
	1.5	6.12	1.5	2.88	3.38	0.25	4.5	4	0.81	0.75 x 5.25	0.625 x 3	28
	2	6.5	1.5	3.62	3.38	0.25	5	8	0.69	0.625 x 5	0.625 x 3	33
	2.5	7.5	1.5	4.12	3.5	0.25	5.88	8	0.81	0.75 x 5.25	0.625 x 3	43
	3	8.25	1.5	5	3.5	0.375	6.62	8	0.81	0.75 x 5.25	0.75 x 3	48
	4	10	1.5	6.19	3.62	0.5	7.88	8	0.81	0.75 x 5.25	0.75 x 3	68
	6	12.5	1.5	8.5	3.94	0.5	10.62	12	0.88	0.75 x 5.25	0.75 x 3	100
	8	15	1.62	10.62	4.38	0.5	13	12	1	0.875 x 5.75	0.75 x 3	155
	10	17.5	1.88	12.75	4.62	0.5	15.25	16	1.12	1 x 6.5	1 x 4.5	220
	12	20.5	2	15	5.12	0.5	17.75	16	1.25	1.125 x 7	1 x 4.5	330
	14	23	2.12	16.25	5.62	0.5	20.25	20	1.25	1.125 x 7.25	1 x 4.5	425
	16	25.5	2.25	18.5	5.75	0.5	22.25	20	1.38	1.25 x 7.75	1 x 4.5	590
	18	28	2.38	21	6.25	0.5	24.75	24	1.38	1.25 x 8	1 x 4.5	750
	20	30.5	2.5	23	6.38	0.5	27	24	1.38	1.25 x 8.5	1 x 4.5	910
	22	33	2.69	25.25	6.5	0.5	29.25	24	1.62	1.5 x 9.25	1 x 5.5	1125
	24	36	2.75	27.25	6.62	0.5	32	24	1.62	1.5 x 9.5	1 x 5.5	1350
36	50	4.18	40.25	9.5	0.5	46	32	2.12	2 x 13.25	1 x 6.5	3200	
CLASS 600, DIMENSIONAL DATA (INCHES)	1	4.88	1.5	2	3.25	0.25	3.5	4	0.75	0.625 x 5	0.625 x 3	19
	1.5	6.12	1.5	2.88	3.375	0.25	4.5	4	0.875	0.75 x 5.25	0.625 x 3	23
	2	6.5	1.5	3.625	3.375	0.25	5	8	0.75	0.625 x 5	0.625 x 3	25
	2.5	7.5	1.5	4.125	3.5	0.25	5.875	8	0.875	0.75 x 5.25	0.625 x 3	33
	3	8.25	1.5	5	3.5	0.375	6.625	8	0.875	0.75 x 5.25	0.75 x 3	45
	4	10.75	1.5	6.19	4	0.5	8.5	8	1	0.875 x 6	0.75 x 4	97
	6	14	1.88	8.5	4.62	0.5	11.5	12	1.12	1 x 7	0.75 x 4	195
	8	16.5	2.19	10.62	5.25	0.5	13.75	12	1.25	1.125 x 7.75	0.75 x 4.5	285
	10	20	2.5	12.75	6	0.5	17	16	1.38	1.25 x 8.75	1 x 5.5	450
	12	22	2.62	15	6.12	0.5	19.25	20	1.38	1.25 x 9	1 x 5.5	540
	14	23.75	2.75	16.25	6.5	0.5	20.75	20	1.5	1.375 x 9.5	1 x 4.5	820
	16	27	3	18.5	7	0.5	23.75	20	1.625	1.5 x 10.25	1 x 5.5	1110
	18	29.25	3.25	21	7.25	0.5	25.75	20	1.75	1.625 x 11	1 x 5.5	1305
	20	32	3.5	23	7.5	0.5	28.5	24	1.75	1.625 x 11.75	1 x 5.5	1624
24	37	4	27.25	8	0.5	33	24	2	1.875 x 13.25	1 x 6.5	2322	

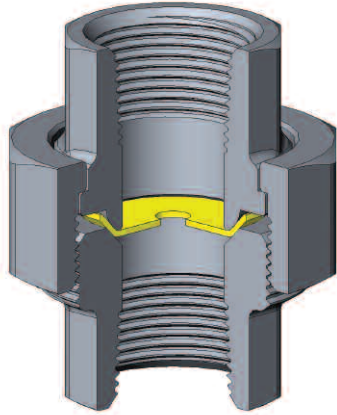
IF REQUESTED, EACH ORIFICE FLANGE ASSEMBLY COMES COMPLETE WITH:

- (2) JACKSCREWS
- (2) 1/2" PLUGS
- (2) GASKETS 1/16" THICK COMPRESSED NON-ASBESTOS BOLTS

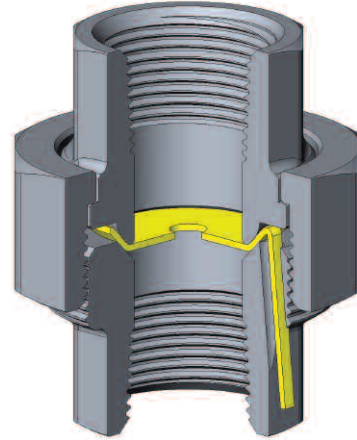


RESTRICTION ORIFICE UNIONS

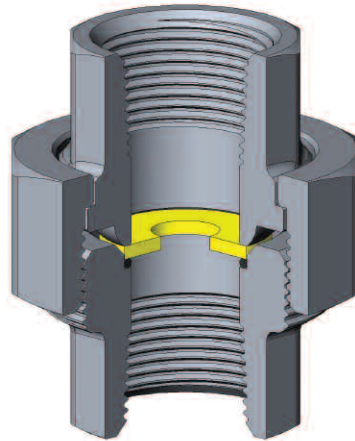
Pressed



Pressed with Tab



Recessed



Carbon & Stainless Steel bodies stocked in pressure ratings of 3,000 psig. Available in line sizes from 1/4" through 2" in both Female NPT and socket-weld connections, other sizes and materials available.

Orifices bored to your specifications. All Plates are Stainless Steel and can be ordered separately.

- Available with or without tabbed plate
- Female NPT or Socket-weld Connections
- From 1/4" through 2"



When Ordering Specify:

- Line Size
- NPT Thread Size OR Socket Weld Connection
- Plate Type - Recessed (1), Pressed (2), or Pressed with Tab (3)
- Material
- Orifice Bore
- Quantity
- Delivery Date

SIZE inch	A inch	B inch	C inch
1/4	1 3/4	1/4	1 3/8
3/8	1 7/8	3/8	1 5/8
1/2	2	1/2	1 3/4
3/4	2 1/4	3/4	2 3/16
1	2 9/16	1	2 9/16
1 1/4	2 7/8	1 1/4	3 1/16
1 1/2	3 1/8	1 1/2	3 7/16
2	3 1/2	2	4

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