

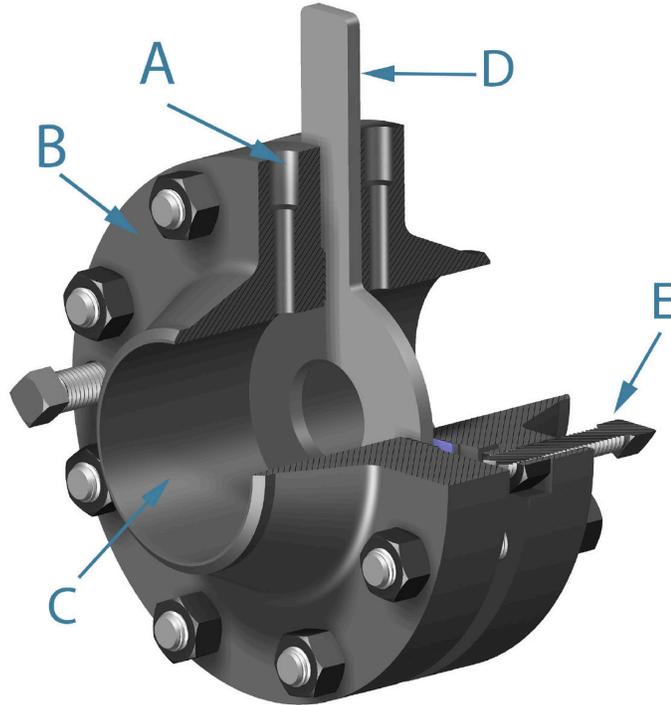
DANIEL®
ORIFICE FLANGE UNIONS
DATA SHEET

DIFFERENTIAL PRESSURE FLOW METERS



DANIEL®

Daniel Orifice Flanges Measurement



- A. Metering taps
- B. Orifice flange
- C. Flange bore
- D. Paddle style orifice plate
- E. Jack screws

Orifice flange unions are one of the most economical means of measuring flow, and Daniel Orifice Flanges are manufactured to be the most accurate. Daniel orifice flange unions meet the most stringent tolerances and recommendations for flanges as specified in ASME B16.36, *STEEL ORIFICE FLANGES*, and API's *MPMS Chapter 14, Section 3, Part 2, NATURAL GAS FLUIDS MEASUREMENT (API-14.3)*, with careful attention given to metering tap location, flange bore (ID) smoothness, bolt hole spacings and flange facings.

Daniel Orifice Flanges are made of forged steel, ASTM A-105. Optional materials are available on special order.

Features and advantages

Bore Tolerances are well within the latest recommendations of API-14.3.

Pressure Tap Hole Location is closely controlled. Tap hole centers are 0.938-in from bearing faces of raised face flanges, placing their centerline 1-in from the face of the orifice plate when 0.063-in gasket thickness is included.

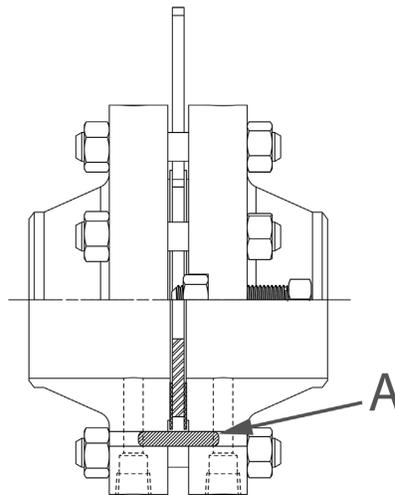
1. For 3-in and smaller flanges, tap location tolerance is ± 0.016 -in.
2. For 4-in and larger flanges, tap location tolerance is ± 0.031 -in.

Pressure Tap Holes – Tap hole edges on the flange bore surface are carefully inspected to be free from burrs. All roughness is eliminated. Sizes are shown in the following tables.

Flange Tap Connections - Standard connections are .50-in NPT. Other sizes and types are available on request.

Gaskets - Two 0.063-in thick⁽¹⁾ precision die-cut gaskets are furnished with all raised face orifice flanges. Non-asbestos gaskets are standard.

Dowel pins: Alignment dowel pins of the knock-out type are furnished as standard on all 2-in to 8-in raised face orifice flanges. These dowel pins assure correct alignment of the flange bores as well as centering the orifice plate bore to the flange bores within the tolerances of API-14.3.



A. Dowel pin

Note

Dowel pins are not required with Ring Type Joint (RTJ) Orifice Flange Unions. Alignment of these style flanges is accomplished with the use of Model 590 RTJ orifice plate holders or Model 560 integral rings and orifice plates. Information for these devices are available in separate publications.

(1) When specified gasket thickness is other than 0.063-in, flange pressure tap hole locations will change.

Standard specification

Please consult a Daniel product specialist if requirements are outside of the listed specifications. Other product and material offerings may be available depending on the application.

Mechanical ratings

Pressure ratings by Line size

- Standard: 2-in to 8-in, ANSI 600 - 2500
- Consult factory for other options

Flange face and end connections

- Standard: Raised face weldneck and ring-joint weldneck

Assembly

- Carbon Steel: furnished complete with studs (ASTM A-193 Gr.B7), nuts (ASTM A-194 GR 2H), (2) 0.0625-in non-asbestos gaskets and (2) jackscrews
- Stainless Steel: furnished complete with zinc plated studs (ASTM A-193 GR B7), nuts (ASTM A-194 GR 2H), (2) 0.0625-in non-asbestos gaskets and (2) jackscrews

Differential pressure taps

Location and number of tap holes

- Standard: 2 tap holes with orientation on top and bottom 180 deg apart, in accordance with API 14.3 (AGA3) or ISO 5167
- Consult factory for other tap location and number of tap options

Process connection

- Standard: .50-in NPT standard
- Consult factory for other options

Types of tap connections

- Standard: Threaded
- Optional: Socket weld
- Consult factory for other options

Line bore tolerances

- Standard size: Sch 40 and 80
- Consult factory for other options

Temperature range

- Standard: -20° to +250° F (-29° to +121° C)
- Standard (low temperature): -100° to +250° F (-73° to +121° C)
- Consult factory for other options

Material specifications

- Standard: A105 Carbon Steel and A350 LF-2 (low temperature applications)
- Consult factory for other options

Flow measurement code

- API 14.3
- ISO-5167

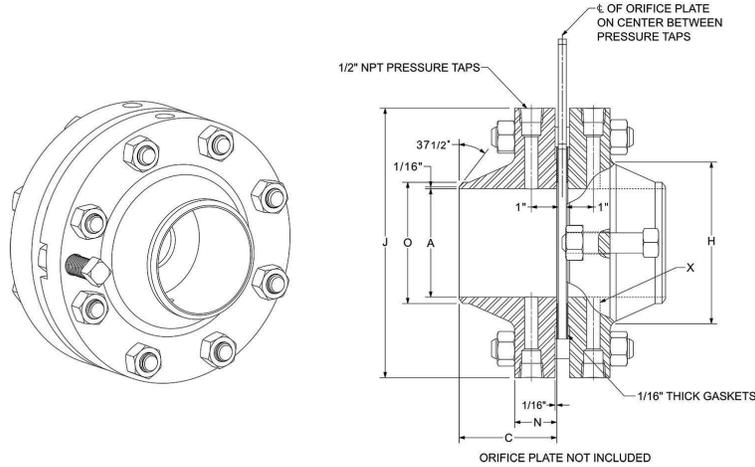
Design code

- ASME B16.36

Gaskets

- Standard gaskets for RF flanges are 0.625-in thick. (0.125-in thick gaskets are available as an option.)
 - Grafoil gasket
 - Spiral wound gasket without inner ring
 - Garlock gylon
 - Spiral wound gasket with inner ring
- RTJ Flanges use Daniel model 560 or 590 style plate holders. The plate holder is designed with an equivalent ring gasket to match the R-number based on size and pressure class.

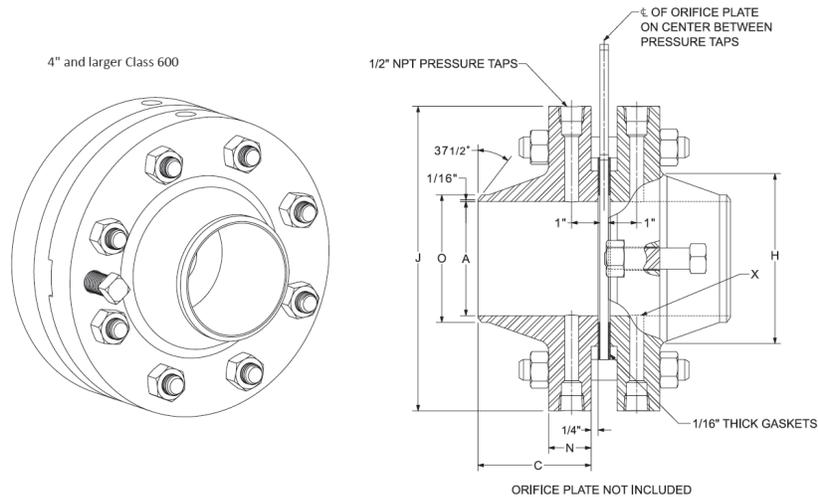
Raised Face Weldneck - ANSI Class 300



ANSI Class 300 (740 PSIG CWP)						
Size (in)		2	3	4	6	8
Diameter internal line bore and tolerance (in)	A	2.067 ± .003	3.068 ± .003	4.026 ± .004	6.065 ± .004	(1) ± .004
Diameter of flange (in)	J	6.50	8.25	10.00	12.50	15.00
Minimum flange thickness (in)	N ⁽²⁾	1.50	1.50	1.50	1.50	1.62
Diameter of raised face (in)		3.62	5.00	6.18	8.50	10.62
Length through hub (in)	C ⁽²⁾	3.38	3.50	3.62	3.93	4.38
Hub diameter at base (in)	H	3.31	4.62	5.07	8.12	10.25
Diameter of hub at point of welding (in)	O	2.38	3.50	4.50	6.63	8.63
Pressure tap hole size (in)	X	0.38	0.38	0.50	0.50	0.50
Flange drilling template	Diameter of bolt circle (in)	5.00	6.62	7.88	10.62	13.00
	Diameter of holes (in)	0.68	0.81	0.81	0.88	1.00
	Number of holes	8.00	8.00	8.00	12.00	12.00
	Size and length of stud bolts (in)	0.62 X 5.25	0.75 X 5.50	0.75 X 5.50	0.75 X 5.50	1.00 X 7.00
Jack screw size and length (in)		0.62 x 3.00	0.75 x 3.00	0.75 x 3.00	0.75 x 3.00	0.75 x 3.00
Approximate weight (lbs)		27	43	66	106	152

(1) To be specified by purchaser
 (2) Class 300 flanges C and N dimensions include .166-in raised face.

Raised Face Weldneck - ANSI Class 600

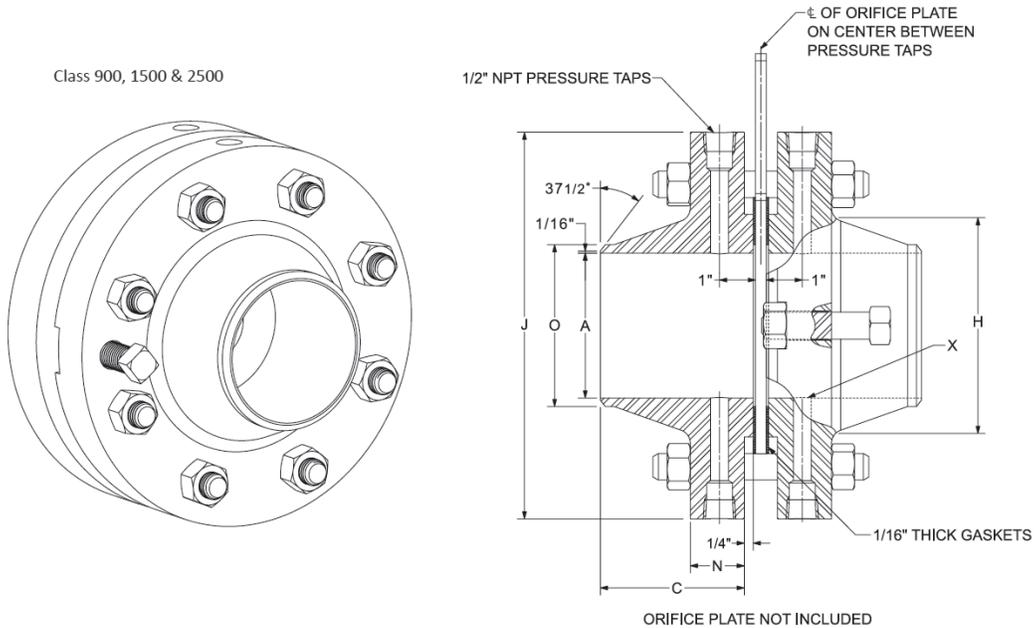


ANSI Class 600 (1480 PSIG CWP) ⁽¹⁾					
Size (in)			4	6	8
Diameter internal line bore and tolerance (in)		A	4.026 ± .004	6.065 ± .004	(2) ± .004
Diameter of flange (in)		J	10.07	14.00	16.50
Minimum flange thickness (in)		N ⁽³⁾	1.50	1.88	2.19
Diameter of raised face (in)			6.19	8.50	10.62
Length through hub (in)		C ⁽³⁾	4.00	4.62	5.25
Hub diameter at base (in)		H	6.00	8.75	10.75
Diameter of hub at point of welding (in)		O	4.50	6.63	8.63
Pressure tap hole size (in)		X	0.50	0.50	0.50
Flange drilling template	Diameter of bolt circle (in)		8.50	11.50	13.75
	Diameter of holes (in)		1.00	1.12	1.25
	Number of holes		8.00	12.00	12.00
	Size and length of stud bolts (in)		0.88 X 6.25	1.00 X 7.25	1.12 X 8.25
Jack screw size and length (in)			0.75 x 4.00	0.75 x 4.00	0.75 x 4.50
Approximate weight (lbs)			103	195	278

- (1) 3-in and smaller, same as Class 300
- (2) To be specified by purchaser
- (3) Class 600 Flanges C and N dimensions do not include .25-in raised face

Note
Model 520 Orifice Plates must be ordered separately.

Raised Face Weldneck - ANSI Class 900, 1500, 2500



ANSI Class 900 (2220 PSIG CWP) ⁽¹⁾					
Size (in)		3	4	6	8
Diameter internal line bore and tolerance (in)	A	(2) ± .003	(2) ± .004	(2) ± .004	(2) ± .004
Diameter of flange (in)	J	9.50	11.50	15.00	18.50
Minimum flange thickness (in)	N ⁽³⁾	1.50	1.75	2.18	2.50
Diameter of raised face (in)		5.00	6.18	8.50	10.62
Length through hub (in)	C ⁽³⁾	4.00	4.50	5.50	6.37
Hub diameter at base (in)	H	5.00	6.25	9.25	11.75
Diameter of hub at point of welding (in)	O	3.50	4.50	6.63	8.63
Pressure tap hole size (in)	X	0.37	0.50	0.50	0.50
Flange drilling template	Diameter of bolt circle (in)	7.50	9.50	12.50	15.50
	Diameter of holes (in)	1.00	1.25	1.25	1.50
	Number of holes	8.00	8.00	12.00	12.00
	Size and length of stud bolts (in)	0.88 X 6.25	1.12 X 7.25	1.12 X 8.25	1.38 X 9.50
Jack screw size and length (in)		0.75 x 4.00	0.75 x 4.00	0.75 x 4.50	1.00 x 5.50
Approximate weight (lbs)		79	129	263	445

(1) 1.5-in and smaller Class 900, same as Class 1500

- (2) To be specified by purchaser
 (3) Class 900-2500 flanges C and N dimensions do not .25-in include raised face.

ANSI Class 1500 (3705 PSIG CWP)						
Size (in)		2	3	4	6	8
Diameter internal line bore and tolerance (in)	A	(1) ± .003	(1) ± .003	(1) ± .004	(1) ± .004	(1) ± .004
Diameter of flange (in)	J	8.50	10.50	12.50	15.50	19.00
Minimum flange thickness (in)	N ⁽²⁾	1.50	1.88	2.12	3.25	3.62
Diameter of raised face (in)		3.62	5.00	6.18	8.50	10.62
Length through hub (in)	C ⁽²⁾	4.00	4.62	4.88	6.75	8.38
Hub diameter at base (in)	H	4.12	5.25	6.38	9.00	11.50
Diameter of hub at point of welding (in)	O	2.38	3.50	4.50	6.63	8.63
Pressure tap hole size (in)	X	0.38	0.38	0.50	0.50	0.50
Flange drilling template	Diameter of bolt circle (in)	6.50	8.00	9.50	12.50	15.50
	Diameter of holes (in)	1.00	1.25	1.38	1.50	1.75
	Number of holes	8.00	8.00	8.00	12.00	12.00
	Size and length of stud bolts (in)	0.88 X 6.25	1.12 X 7.50	1.25 X 8.25	1.37 X 11.00	1.62 X 12.25
Jack screw size and length (in)		0.62 x 4.00	0.75 x 4.00	0.75 x 4.50	0.75 x 5.50	1.00 x 7.00
Approximate weight (lbs)		65	123	182	407	675

- (1) To be specified by purchaser
 (2) Class 900-2500 flanges C and N dimensions do not include .25-in raised face.

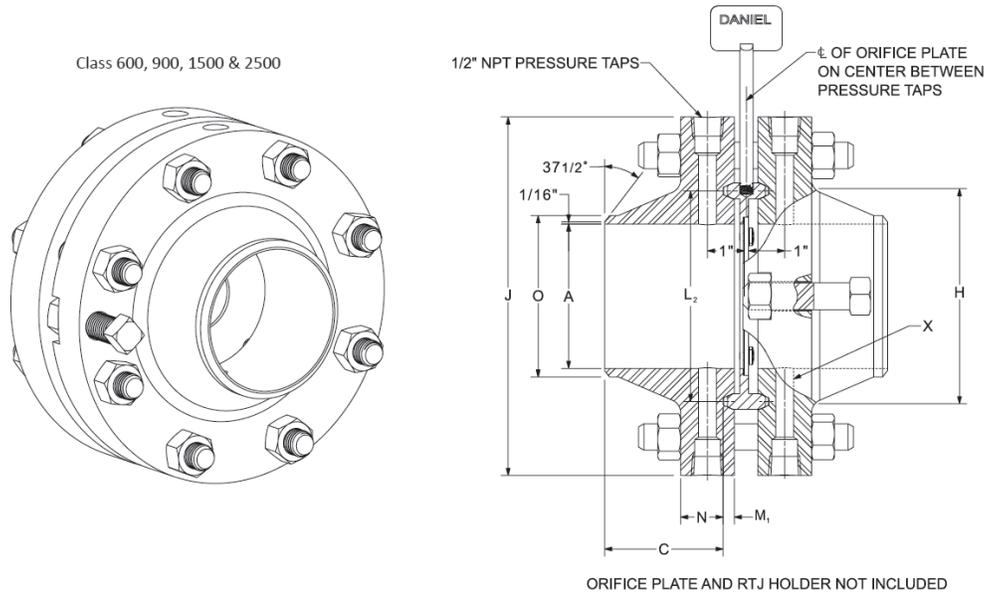
ANSI Class 2500 (6170 PSIG CWP)						
Size (in)		2	3	4	6	8
Diameter internal line bore and tolerance (in)	A	(1) ± .003	(1) ± .003	(1) ± .004	(1) ± .004	(1) ± .004
Diameter of flange (in)	J	9.25	12.00	14.00	19.00	21.07
Minimum flange thickness (in)	N ⁽²⁾	2.00	2.06	3.00	4.25	5.00
Diameter of raised face (in)		3.62	5.00	6.18	8.50	10.62
Length through hub (in)	C ⁽²⁾	5.00	6.62	7.50	10.75	12.50
Hub diameter at base (in)	H	3.75	5.25	6.50	9.25	12.00
Diameter of hub at point of welding (in)	O	2.38	3.50	4.50	6.63	8.63
Pressure tap hole size (in)	X	0.38	0.38	0.50	0.50	0.50

ANSI Class 2500 (6170 PSIG CWP)							
Size (in)			2	3	4	6	8
Flange drilling template	Diameter of bolt circle (in)		6.50	8.00	9.50	12.50	15.50
	Diameter of holes (in)		1.00	1.25	1.38	1.50	1.75
	Number of holes		8.00	8.00	8.00	12.00	12.00
	Size and length of stud bolts (in)		0.88 X 6.25	1.12 X 7.50	1.25 X 8.25	1.38 X 11.00	1.62 X 12.25
Jack screw size and length (in)			0.62 x 4.00	0.75 x 4.00	0.75 x 4.50	0.75 x 5.50	1.00 x 7.00
Approximate weight (lbs)			65	123	182	407	675

- (1) To be specified by purchaser
- (2) Class 900-2500 flanges C and N dimensions **do not** include .25-in raised face.

Note
 Model 520 Orifice Plates must be ordered separately.

Ring-Type Joint Weldneck - ANSI 600, 900, 1500 and 2500



ANSI Class 600 (1480 PSIG CWP)						
Size (in)		2	3	4	6	8
A.P.I. Ring number (in)		R-23	R-31	R-37	R-45	R-49
Diameter internal line bore and tolerance (in)	A	2.067 ± .003	3.469 ± .003	4.026 ± .004	6.065 ± .004	(1) ± .004
Diameter of flange (in)	J	6.50	8.25	10.75	14.00	16.50
Pitch diameter of ring gasket and groove (in)	L ₂	3.25	4.88	5.63	8.33	10.63
Depth of groove (in)	M ₁	0.31	0.31	0.31	0.31	0.31
Minimum flange thickness (in)	N ⁽²⁾	1.50	1.50	1.50	1.88	2.19
Length through hub (in)	C ⁽²⁾	3.38	3.50	4.00	4.63	5.25
Hub diameter at base (in)	H	3.31	4.63	6.00	8.75	10.75
Diameter of hub at point of welding (in)	O	2.38	3.50	4.50	6.63	8.63
Pressure tap hole size (in)	X	0.38	0.38	0.50	0.50	0.38
Flange drilling template	Diameter of bolt circle (in)	5.00	6.63	8.50	11.50	13.75
	Diameter of holes (in)	0.75	0.75	1.00	1.13	1.25
	Number of holes	8.00	8.00	8.00	12.00	12.00

ANSI Class 600 (1480 PSIG CWP)						
Size (in)		2	3	4	6	8
	Size and length of stud bolts (in)	0.62 X 5.50	0.75 X 5.75	0.87 X 6.75	1.00 X 7.75	1.12 X 8.75
	Jack screw size and length (in)	0.62 x 4.00	0.75 x 4.00	0.75 x 4.00	0.75 x 4.50	0.75 x 4.50
	Approximate weight (lbs)	330	56	103	197	284

- (1) To be specified by purchaser
 (2) Does not include depth of ring groove.

ANSI Class 900 (2220 PSIG CWP)					
Size (in)		3	4	6	8
A.P.I. Ring number		R-31	R-37	R-45	R-49
Diameter internal line bore and tolerance (in)		A (1) ± .003	(1) ± .004	(1) ± .004	(1) ± .004
Diameter of flange (in)		J 9.50	11.50	15.00	18.50
Pitch diameter of ring gasket and groove (in)		L ₂ 4.88	5.88	8.31	10.63
Depth of groove (in)		M ₁ 0.31	0.31	0.31	0.31
Minimum flange thickness (in)		N ⁽²⁾ 1.50	1.75	2.19	2.50
Length through hub (in)		C ⁽²⁾ 4.00	4.50	5.50	6.38
Hub diameter at base (in)		H 5.00	6.25	9.25	11.75
Diameter of hub at point of welding (in)		O 3.50	4.50	6.63	8.63
Pressure tap hole size (in)		X 0.38	0.50	0.50	0.50
Flange drilling template	Diameter of bolt circle (in)	7.50	9.25	12.50	15.50
	Diameter of holes (in)	1.00	1.25	1.25	1.50
	Number of holes	8.00	8.00	12.00	12.00
	Size and length of stud bolts (in)	0.87 X 6.75	1.12 X 7.75	1.12 X 8.75	1.37 X 10
Jack screw size and length (in)		0.75 X 4.00	0.75 X 4.5	0.75 X 4.5	1.00 X 5.50
Approximate weight (lbs)		85	140	280	475

- (1) To be specified by purchaser
 (2) Does not include depth of ring groove.

Note
 2-in and 2.50-in Class 900, same as Class 1500.

ANSI Class 1500 (3705 PSIG CWP)						
Size (in)		2	3	4	6	8 ⁽¹⁾
A.P.I. Ring number		R-24	R-35	R-39	R-46	R-50

ANSI Class 1500 (3705 PSIG CWP)						
Size (in)		2	3	4	6	8 ⁽¹⁾
Diameter internal line bore and tolerance (in)	A	⁽²⁾ ± .003	⁽²⁾ ± .003	⁽²⁾ ± .004	⁽²⁾ ± .004	⁽²⁾ ± .004
Diameter of flange (in)	J	8.50	10.50	12.25	15.50	19.00
Pitch diameter of ring gasket and groove (in)	L ₂	3.75	5.38	6.38	8.31	10.63
Depth of groove (in)	M ₁	0.31	0.31	0.31	0.38	0.44
Minimum flange thickness (in)	N ⁽³⁾	1.50	1.87	2.12	3.25	3.63
Length through hub (in)	C ⁽³⁾	4.00	4.63	4.88	6.75	8.38
Hub diameter at base (in)	H	4.13	5.25	6.38	9.00	11.50
Diameter of hub at point of welding (in)	O	2.38	3.50	4.50	6.63	8.63
Pressure tap hole size (in)	X	0.38	0.38	0.50	0.50	0.50
Flange drilling template	Diameter of bolt circle (in)	6.50	8.00	9.50	12.50	15.50
	Diameter of holes (in)	1.00	1.25	1.38	1.50	1.75
	Number of holes	8.00	8.00	8.00	12.00	12.00
	Size and length of stud bolts (in)	0.87 X 6.75	1.12 X 8.00	1.25 X 8.75	1.37 X 11.50	1.62 X 13.00
Jack screw size and length (in)		0.62 X 4.00	0.75 X 4.50	0.75 X 5.50	0.75 X 7.00	1.00 X 8.00
Approximate weight (lbs)		71	131	200	435	715

(1) Per ASME B16.36, 8-in and larger size Class 1500 RTJ require angular tap holes.

(2) To be specified by purchaser

(3) Does not include depth of ring groove.

ANSI Class 2500 (6170 PSIG CWP)						
Size (in)		2	3	4 ⁽¹⁾	6 ⁽¹⁾	8 ⁽¹⁾
A.P.I. Ring number		R-26	R-32	R-38	R-47	R-51
Diameter internal line bore and tolerance (in)	A	⁽²⁾ ± .003	⁽³⁾ ± .003	⁽³⁾ ± .004	⁽³⁾ ± .004	⁽³⁾ ± .004
Diameter of flange (in)	J	9.25	12.00	14.00	19.00	21.75
Pitch diameter of ring gasket and groove (in)	L ₂	4.00	5.00	6.19	9.00	11.00
Depth of groove (in)	M ₁	0.31	0.38	0.44	0.50	0.56
Minimum flange thickness (in)	N ⁽³⁾	2.00	2.63	3.00	4.25	5.00
Length through hub (in)	C ⁽³⁾	5.00	6.63	7.50	10.75	12.50

ANSI Class 2500 (6170 PSIG CWP)						
Size (in)		2	3	4 ⁽¹⁾	6 ⁽¹⁾	8 ⁽¹⁾
Hub diameter at base (in)	H	3.75	5.25	6.50	9.25	12.00
Diameter of hub at point of welding (in)	O	2.38	3.50	4.50	6.63	8.63
Pressure tap hole size (in)	X	0.38	0.38	0.50	0.50	0.50
Flange drilling template	Diameter of bolt circle (in)	6.75	9.00	10.75	14.50	17.25
	Diameter of holes (in)	1.13	1.38	1.63	2.13	2.13
	Number of holes	8.00	8.00	8.00	8.00	12.00
	Size and length of stud bolts (in)	1.00 X 8.00	1.25 X 10.00	1.12 X 11.25	2.00 X 15.00	2.00 X 16.50
Jack screw size and length (in)		0.75 X 4.50	0.75 X 7.00	0.75 X 7.00	0.75 X 9.00	1.00 X 10.00
Approximate weight (lbs)		84	188	292	756	1152

- (1) Per ASME B16.36, 4-in and larger size Class 2500 RTJ require angular tap holes.
- (2) To be specified by purchaser
- (3) Does not include depth of ring groove.

Note

Model 590 RTJ Plate Holders and Model 500 Universal Orifice Plates or Model 560 Integral RTJ Ring & Orifice Plate must be ordered separately.

With over 90 years of experience, Daniel is the only manufacturer that has the knowledge and experience to engineer and offer superior products that are trusted to provide the most reliable and accurate measurements in the global oil and gas industry.

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www.Daniel.com