

Hydroseal Series 1500, Part Number Codes & Engineering Data

15 X X X X X X X X/XX

Orifice Area (in.²)
 C • 0.058 E • 0.230 G • 0.590
 D • 0.129 F • 0.366

Inlet x Outlet
Size/Available Orifice (Connection)
 D • 3/8" x 3/4" (C Orifice Only) 5 • 1" x 1 1/2" (D, E, F Orifice Only)
 E • 1/2" x 3/4" (C Orifice Only) 6 • 1 1/2" x 1 1/2" (D, E, F Orifice Only)
 F • 3/4" x 3/4" (C, D Orifice Only) J • 1" x 2" (E, F Orifice Only)
 H • 3/8" x 1" (C Orifice Only) 7 • 1 1/2" x 2" (E, F, G Orifice Only)
 1 • 1/2" x 1" (C, D Orifice Only) 8 • 2" x 2" (E, F, G Orifice Only)
 2 • 3/4" x 1" (C, D Orifice Only) 9 • 1 1/2" x 2 1/2" (G Orifice Only)
 3 • 1" x 1" (C, D Orifice Only) 0 • 2" x 2 1/2" (G Orifice Only)
 4 • 3/4" x 1 1/2" (D, E Orifice Only)

Connection
Gender M • M x F J • M x M
 F • F x F K • F x M
Flanged A • 150 x 150 C • 600 x 150 E • 1500 x 300
 B • 300 x 150 D • 600 x 300 G • 2500 x 300
Flange x Thread X • Special

Facing
 0 • NPT 4 • MNPT x RF 8 • NPT x Socket/Nipple
 1 • RF x RF 5 • Sanitary Flange X • Special
 2 • RTJ x RF 6 • Socket/Nipple x Socket/Nipple
 3 • RF x FNPT 7 • Socket/Nipple x NPT

Seat Type
 C • Neoprene N • Nitrile W • Steam (Metal Seals)
 E • EPDM S • Silicone X • Special
 K • Kalrez® T • Teflon® Y • Steam (Soft Seat) w/Viton® Seals
 M • Metal V • Fluorocarbon Z • Kalrez® Seat w/Viton® Seals

Material
Body/Spring/Trim
 0 • WCB/CS/316SS 3 • CF8M/316SS/316SS
 1 • WCB/316SS/316SS 4 • CF8M (NACE)/Inconel®/316SS
 2 • WCB (NACE)/Inconel®/316SS X • Special

Cap Type
 O • Closed L • Open Lever P • Packed Lever
 G • Closed w/Gag M • Lever w/Gag S • Packed w/Gag

Spring Code
Consult Factory for Spring Chart.
 Max. set pressure for steam is 600 psig.
 C Orifice is available in soft seat only.
 Lift lever is required for ASME code service for steam, air or water over 140°F.
 3/8" NPT inlet valves are non ASME Code for liquid.
 Call for market price on Kalrez® seat material.
 Flanged option not available in sizes 1/4" and 3/8".

Temperature Limits

Temperature	Seat Material					
	Nitrile	EPDM	Viton®	Neoprene	Kalrez®	Teflon®
Lower °F	-65	-70	-15	-45	30	-300
Upper °F	225	300	400	300	550	400

Sizing Equations

US Units

Air/Gas

$$W = CK_d AP_1 \sqrt{\frac{M}{TZ}}$$

Liquid

$$Q = 38K_d K_v A \sqrt{\frac{P_1 - P_d}{G}}$$

Where

$$P_1 = 1.1 P_{set} + 14.7 \text{ over } 30 \text{ psi or}$$

$$P_1 = P_{set} + 17.7 \text{ under } 30 \text{ psi}$$

$$C = 520 \sqrt{k \left(\frac{2}{k+1} \right)^{\frac{k+1}{k-1}}}$$

W = Capacity in lbm/hr

P_{set} = Set Pressure in psig

P_d = Discharge Pressure

A = Orifice Area

K_d = .870 for Air/Gas/Steam

K_d = .672 for Liquid

K_v = Viscosity Correction Factor

Q = Capacity in GPM

Z = Compressibility Factor

T = Temperature in °R

k = Ratio of Specific Heats

M = Molecular Weight

G = Specific Gravity

SI Units

Air/Gas

$$W = 13160 CK_d AP_1 \sqrt{\frac{M}{TZ}}$$

Liquid

$$Q = \frac{K_d K_v A}{11.78} \sqrt{\frac{P_1 - P_d}{G}}$$

Where

$$P_1 = 1.1 P_{set} + 101.3 \text{ over } 207 \text{ kPa or}$$

$$P_1 = P_{set} + 122 \text{ under } 207 \text{ kPa}$$

$$C = 520 \sqrt{k \left(\frac{2}{k+1} \right)^{\frac{k+1}{k-1}}}$$

W = Capacity in kg/hr

P_{set} = Set Pressure in kPa

P_d = Discharge Pressure

A = Orifice Area

K_d = .870 for Air/Gas/Steam

K_d = .672 for Liquid

K_v = Viscosity Correction Factor

Q = Capacity in liter/min

Z = Compressibility Factor

T = Temperature in °K

k = Ratio of Specific Heats

M = Molecular Weight

G = Specific Gravity

Contact Factory in order to receive sizing program and/or capacity charts.



Hydroseal Series 1500, Parts List & Material Selection

Index	Description	Materials, Codes & Temperature Ranges				
		-20°F to +450°F (-29°C to +232°C) 0	-20°F to +650°F (-29°C to +343°C) 1	NACE MR0175 -20°F to +750°F (-29°C to +399°C) 2	-425°F to +800°F (-254°C to +426°C) 3	NACE MR0175 -425°F to +800°F (-254°C to +426°C) 4
1	Cap	Carbon Steel	Carbon Steel	Carbon Steel	316 Stainless Steel	316 Stainless Steel
2	Adjusting Screw	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
3	Adjusting Nut	Carbon Steel	Carbon Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
4	O-Ring	Specify	Specify	Specify	Specify	Specify
5	Spring Plate	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
6	Stem	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
7	Spring	316 Stainless Steel ⁽²⁾	316 Stainless Steel ⁽²⁾	Inconel® X750	316 Stainless Steel ⁽²⁾	Inconel® X750
8	Stem Head	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
9	Disc Holder	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
10	Disc Retainer	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
11	Disc	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
12	Body	WCB	WCB	WCB	CF8M	CF8M
13	Guide	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
14	Nozzle	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
15	Lap Joint Flange (Outlet)	Carbon Steel	Carbon Steel	Carbon Steel	316 Stainless Steel	316 Stainless Steel
16	Lap Joint Stub End (Outlet)	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
17	Lap Joint Flange (Inlet)	Carbon Steel	Carbon Steel	Carbon Steel	316 Stainless Steel	316 Stainless Steel
18	Lap Joint Stub End (Inlet)	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
Open Lift Lever						
19	Cap	WCB	WCB	WCB	CF8M	CF8M
20	Release Washer	Carbon Steel	Carbon Steel	Carbon Steel	316 Stainless Steel	316 Stainless Steel
21	Release Nut	Carbon Steel	Carbon Steel	Carbon Steel	316 Stainless Steel	316 Stainless Steel
22	Lever Pin	Carbon Steel	Carbon Steel	Carbon Steel	316 Stainless Steel	316 Stainless Steel
23	Lever	Carbon Steel	Carbon Steel	Carbon Steel	316 Stainless Steel	316 Stainless Steel
Packed Lift Lever						
24	Cap	WCB	WCB	WCB	CF8M	CF8M
25	Release Nut	Carbon Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
26	Release Washer	Carbon Steel	Carbon Steel	Carbon Steel	316 Stainless Steel	316 Stainless Steel
27	Lever Shaft	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
28	Gland O-Ring	Same as Item 4	Same as Item 4	Same as Item 4	Same as Item 4	Same as Item 4
29	Lock Nut	Carbon Steel	Carbon Steel	Carbon Steel	316 Stainless Steel	316 Stainless Steel
30	Lever Pin	Carbon Steel	Carbon Steel	Carbon Steel	302 Stainless Steel	302 Stainless Steel
31	Shaft O-Ring	Same as Item 4	Same as Item 4	Same as Item 4	Same as Item 4	Same as Item 4
32	Gland Nut	Carbon Steel	316 Stainless Steel	Carbon Steel	316 Stainless Steel	316 Stainless Steel
33	Lever	Carbon Steel	Carbon Steel	Carbon Steel	316 Stainless Steel	316 Stainless Steel
Soft Seat Option						
34	Disc	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
35	Disc Retainer Screw	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
36	O-Ring ⁽¹⁾	Specify	Specify	Specify	Specify	Specify

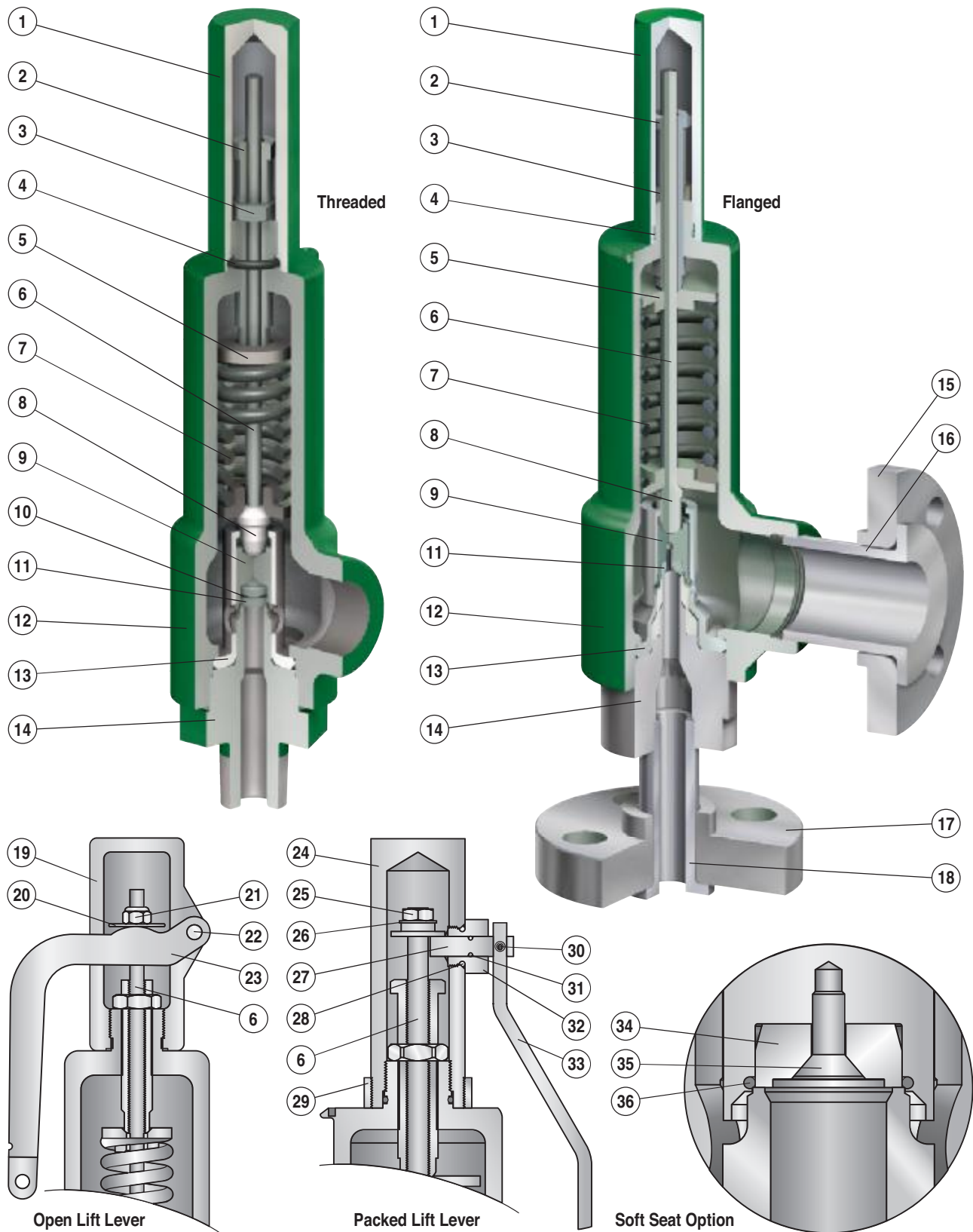
(1) Soft Seat Valve Only

(2) Hydroseal reserves the right to substitute Inconel® X750 in lieu of 316SS for higher pressure springs.

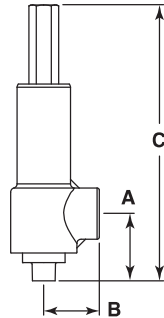
Materials: WCB-ASME SA216, CF8M-ASME SA351



Hydroseal Series 1500, Component Parts



Hydroseal Series 1500 Threaded & Flanged, Dim. Data & Weights



Series 1500 Threaded

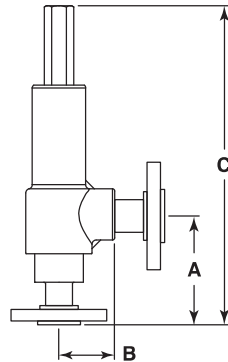
Orifice	Inlet x Outlet	FNPT x FNPT MNPT x FNPT	Max Set (psig)	Dimension (in.)			Wt. (lbs.)
C	3/8 x 3/4	MNPT x FNPT	1350	3 1/4	13/4	12 1/4	8
		FNPT x FNPT	3800	3 1/4	13/4	12 1/4	8
	1/2 x 3/4	MNPT x FNPT	3000	3 1/4	13/4	12 1/4	8
		FNPT x FNPT	6150	3 1/4	13/4	12 1/4	8
	3/4 x 3/4	MNPT x FNPT	6150	3 1/4	13/4	12 1/4	8
		FNPT x FNPT	6150	3 1/4	13/4	12 1/4	8
	3/8 x 1	MNPT x FNPT	1350	3 1/4	13/4	12 1/4	8
		FNPT x FNPT	3800	3 1/4	13/4	12 1/4	8
	1/2 x 1	MNPT x FNPT	3000	3 1/4	13/4	12 1/4	8
		FNPT x FNPT	6150	3 1/4	13/4	12 1/4	8
	3/4 x 1	MNPT x FNPT	6150	3 1/4	13/4	12 1/4	8
		FNPT x FNPT	6150	3 1/4	13/4	12 1/4	8
D	3/4 x 3/4	MNPT x FNPT	2600	3 1/4	13/4	12 1/4	8
		FNPT x FNPT	3150	3 1/4	13/4	12 1/4	8
	1/2 x 1	MNPT x FNPT	900	3 1/4	13/4	12 1/4	8
		FNPT x FNPT	3150	3 1/4	13/4	12 1/4	8
	3/4 x 1	MNPT x FNPT	2600	3 1/4	13/4	12 1/4	8
		FNPT x FNPT	3150	3 1/4	13/4	12 1/4	8
	1 x 1	MNPT x FNPT	3150	3 1/4	13/4	12 1/4	8
		FNPT x FNPT	3150	3 1/4	13/4	12 1/4	8

Note: Weights are approximate.

Overall height with lever: Add 1" to outlet C & D valves. Add 1 1/2" to outlet E, F & G valves.

Orifice	Inlet x Outlet	FNPT x FNPT MNPT x FNPT	Max Set (psig)	Dimension (in.)			Wt. (lbs.)
D	3/4 x 1 1/2	MNPT x FNPT	2700	3 11/16	2 9/16	13 5/8	12
	1 1/2	FNPT x FNPT	3950	3 11/16	2 9/16	13 5/8	12
	1 x 1 1/2	MNPT x FNPT	3950	3 11/16	2 9/16	13 5/8	12
		FNPT x FNPT	3950	3 11/16	2 9/16	13 5/8	12
	1 1/2 x 1 1/2	MNPT x FNPT	3950	3 11/16	2 9/16	13 5/8	12
		FNPT x FNPT	3600	3 11/16	2 9/16	13 5/8	12
E	3/4 x 1 1/2	MNPT x FNPT	800	3 11/16	2 9/16	13 5/8	31
	1 1/2	FNPT x FNPT	2500	3 11/16	2 9/16	13 5/8	31
	1 x 1 1/2	MNPT x FNPT	2400	3 11/16	2 9/16	13 5/8	31
		FNPT x FNPT	2500	3 11/16	2 9/16	13 5/8	31
	1 1/2 x 1 1/2	MNPT x FNPT	2500	3 11/16	2 9/16	13 5/8	31
		FNPT x FNPT	2500	3 11/16	2 9/16	13 5/8	31
	1 x 2	MNPT x FNPT	2400	4	3 1/4	16 1/2	31
		FNPT x FNPT	2500	4	3 1/4	16 1/2	31
	1 1/2 x 2	MNPT x FNPT	3850	4	3 1/4	16 1/2	31
		FNPT x FNPT	3850	4	3 1/4	16 1/2	31
	2 x 2	MNPT x FNPT	3850	4	3 1/4	16 1/2	31
		FNPT x FNPT	3600	4	3 1/4	16 1/2	31
F	1 x 1 1/2	MNPT x FNPT	900	4	3 1/4	16 1/2	31
		FNPT x FNPT	1550	4	3 1/4	16 1/2	31
	1 1/2 x 1 1/2	MNPT x FNPT	1550	4	3 1/4	16 1/2	31
		FNPT x FNPT	1550	4	3 1/4	16 1/2	31
	1 x 2	MNPT x FNPT	900	4	3 1/4	16 1/2	31
		FNPT x FNPT	1550	4	3 1/4	16 1/2	31
	1 1/2 x 2	MNPT x FNPT	1550	4	3 1/4	16 1/2	31
		FNPT x FNPT	1550	4	3 1/4	16 1/2	31
	2 x 2	MNPT x FNPT	1550	4	3 1/4	16 1/2	31
		FNPT x FNPT	1550	4	3 1/4	16 1/2	31
G	1 1/2 x 2	MNPT x FNPT	1650	4 3/8	3 3/4	19 3/8	34
		FNPT x FNPT	1650	4 3/8	3 3/4	19 3/8	34
	2 x 2	MNPT x FNPT	1650	4 3/8	3 3/4	19 3/8	34
		FNPT x FNPT	1650	4 3/8	3 3/4	19 3/8	34
	1 1/2 x 2 1/2	MNPT x FNPT	1650	4 3/8	3 3/4	19 3/8	34
		FNPT x FNPT	1650	4 3/8	3 3/4	19 3/8	34
	2 x 2 1/2	MNPT x FNPT	1650	4 3/8	3 3/4	19 3/8	34
		FNPT x FNPT	1650	4 3/8	3 3/4	19 3/8	34

Series 1500 Flanged



Orifice	Inlet x Outlet	Flange Inlet x Outlet	Max Set (psig)	Dimension (in.)			Wt. (lbs.)
C	1/2 x 3/4	150 x 150	285	6	4	14 13/16	11
		300 x 150	740	6	4	14 13/16	12
		600 x 150	1480	6	4	14 13/16	12
		600 x 300	1480	6	4	14 13/16	13
		1500 x 300	3400	7 1/2	5	16 5/16	16
	1/2 x 1	150 x 150	285	6	4	14 13/16	11
		300 x 150	740	6	4	14 13/16	12
		600 x 150	1480	6	4	14 13/16	12
		600 x 300	1480	6	4	14 13/16	13
		1500 x 300	3400	7 1/2	5	16 5/16	16
	3/4 x 3/4	150 x 150	285	6 1/4	4	15 1/16	13
		300 x 150	740	6 1/4	4	15 1/16	14
		600 x 150	1480	6 1/4	4	15 1/16	14
		600 x 300	1480	6 1/4	5	15 1/16	15
		1500 x 300	3705	6 1/4	5	15 1/16	18



Series 1500 Flanged, Continued

Orifice	Inlet x Outlet	Flange Inlet x Outlet	Max Set (psig)	Dimension (in.)			Wt. (lbs.)
C Actual Area .058 in. ²	3/4 x 1	150 x 150	285	6 1/4	4	15 1/16	13
		300 x 150	740	6 1/4	4	15 1/16	14
		600 x 150	1480	6 1/4	4	15 1/16	14
		600 x 300	1480	6 1/4	5	15 1/16	15
		1500 x 300	3705	6 3/16	5	15 1/16	18
	1 x 1	150 x 150	285	6 1/2	4 1/4	15 5/16	14
		300 x 150	740	6 1/2	4 1/4	15 5/16	15
		600 x 150	1480	6 1/2	4 1/4	15 5/16	15
		600 x 300	1480	7 1/2	5	16 1/4	16
		1500 x 300	3705	7 1/2	5	16 1/4	21
2500 x 300	6170	7 1/2	5	16 1/4	24		
D API Area .110 in. ² Actual Area .129 in. ²	1/2 x 1	150 x 150	285	6	4	13 3/4	12
		300 x 150	740	6	4	13 3/4	13
	3/4 x 1	150 x 150	285	6 1/4	4	14	13
		300 x 150	740	6 1/4	4	14	14
		600 x 150	1480	6 1/4	4	14	14
		600 x 300	1480	6 1/4	5	14	15
		1500 x 300	1750	6 1/4	5	14	18
	1 x 1	150 x 150	285	6 1/2	4 1/4	14 1/4	14
		300 x 150	740	6 1/2	4 1/4	14 1/4	15
		600 x 150	1480	6 1/2	4 1/4	14 1/4	15
		600 x 300	1480	7 1/2	5	15 3/8	16
		1500 x 300	2000	7 1/2	5	15 3/8	20
	3/4 x 1 1/2	2500 x 300	2000	7 1/2	5	15 3/8	25
		150 x 150	285	6 1/4	5	15 3/8	14
		300 x 150	740	6 1/4	5	15 3/8	15
		600 x 150	1480	6 1/4	5	15 3/8	16
		600 x 300	1480	6 1/4	5 3/4	15 1/8	19
	1 x 1 1/2	1500 x 300	1750	6 1/2	5 3/4	15 3/8	22
		150 x 150	285	6 1/4	5	15 1/8	15
		300 x 150	740	6 1/4	5	15 1/8	16
		600 x 150	1480	6 1/4	5	15 1/8	17
		600 x 300	1480	6 1/4	5 3/4	15 1/8	20
	1 1/2 x 1 1/2	1500 x 300	3500	6 1/4	5 3/4	15 1/8	24
		2500 x 300	3500	7 1/4	5 3/4	16 1/8	29
		150 x 150	285	7 1/8	5	16	17
		300 x 150	740	7 1/8	5	16	20
		600 x 150	1480	7 1/8	5	16	20
E API Area .196 in. ² Actual Area .230 in. ²	3/4 x 1 1/2	600 x 300	1480	7 1/8	5 3/4	16	23
		1500 x 300	3500	7 1/4	5 3/4	16 1/8	32
		2500 x 300	3500	7 1/4	5 3/4	16 1/8	42
		150 x 150	285	6 1/4	5	15 1/8	18
		300 x 150	640	6 1/4	5	15 1/8	19
	1 x 1 1/2	600 x 150	640	6 1/4	5	15 1/8	20
		600 x 300	640	6 1/4	5 3/4	15 1/8	23
		1500 x 300	640	6 1/4	5 3/4	15 1/8	26
		150 x 150	285	6 1/4	5	15 1/8	19
		300 x 150	740	6 1/4	5	15 1/8	20
		600 x 150	1480	6 1/4	5	15 1/8	20
		600 x 300	1480	6 1/4	5 3/4	15 1/8	24
	1 1/2 x 1 1/2	1500 x 300	1750	7 1/4	5 3/4	16 1/8	28
		150 x 150	285	6 1/4	5	15 1/8	24
		300 x 150	740	6 1/4	5	15 1/8	24
		600 x 150	1480	6 1/4	5	15 1/8	24
		600 x 300	1480	6 1/4	5 3/4	15 1/8	23
	1500 x 300	2000	7 1/4	5 3/4	16 1/8	36	
2500 x 300	2000	7 1/4	5 3/4	16 1/8	46		

Orifice	Inlet x Outlet	Flange Inlet x Outlet	Max Set (psig)	Dimension (in.)			WL (lbs.)	
E	1 x 2	150 x 150	285	6 1/2	6	18 13/16	29	
		300 x 150	740	6 1/2	6	18 13/16	31	
		600 x 150	1480	6 1/2	6	18 13/16	31	
		600 x 300	1480	6 1/2	6	18 13/16	33	
	300 x 150	740	6 1/2	6	18 1/8	26		
	600 x 150	1480	6 1/2	6	18 1/8	26		
	600 x 300	1480	6 1/2	6	18 1/8	27		
	2500 x 300	3500	8 1/4	6	19 7/8	47		
	300 x 150	740	6 3/4	6	18 3/8	26		
	600 x 150	1480	6 3/4	6	18 3/8	28		
	600 x 300	1480	6 3/4	6	18 3/8	30		
	1500 x 300	3500	8 1/4	6	19 7/8	44		
	2500 x 300	3500	8 1/4	6	19 7/8	60		
	F	1 x 1 1/2	150 x 150	285	6 1/4	5	18	38
			300 x 150	740	6 1/4	5	18	39
			600 x 150	740	5 1/8	5	17	37
600 x 300			740	5 1/8	5 3/4	17	40	
300 x 150		740	7 1/8	5	18 3/4	43		
600 x 150		1480	7 1/8	5	18 3/4	43		
600 x 300		1480	7 1/8	5 3/4	18 3/4	46		
300 x 150		740	6 1/2	6	18 13/16	32		
600 x 150		1200	6 1/2	6	18 13/16	32		
600 x 300		1200	6 1/2	6	18 13/16	34		
300 x 150		740	6 1/2	6	18 1/8	45		
600 x 150		1480	6 1/2	6	18 1/8	45		
600 x 300		1480	6 1/2	6	18 1/8	46		
150 x 150		285	6 3/4	6	18 3/8	44		
300 x 150		740	6 3/4	6	18 3/8	46		
600 x 150		1480	6 3/4	6	18 3/8	47		
600 x 300	1480	6 3/4	6	18 3/8	49			
1500 x 300	1500	8 1/4	6	19 7/8	63			
G	1 1/2 x 2	150 x 150	285	7 1/8	6 1/2	21	45	
		300 x 150	740	7 1/8	6 1/2	21	48	
		600 x 150	1480	7 1/8	6 1/2	21	50	
		600 x 300	1480	7 1/8	6 1/2	21	51	
	300 x 150	740	7 1/8	6 1/2	21	51		
	600 x 150	1480	7 1/8	6 1/2	21	51		
	600 x 300	1480	7 1/8	6 1/2	21	54		
	300 x 150	740	7 1/8	6 1/2	21	55		
	600 x 150	1480	7 1/8	6 1/2	21	53		
	600 x 300	1480	7 1/8	6 1/2	21	56		
	150 x 150	285	7 1/8	6 1/2	21	54		
	300 x 150	740	7 1/8	6 1/2	21	55		
	600 x 150	1480	7 1/8	6 1/2	21	56		
	API Area .503 in. ²	2 x 2 1/2	600 x 300	1480	7 1/8	6 1/2	21	58
			1500 x 300	1500	8 1/4	6 1/2	22	72

Note: Weights are approximate.

Overall height with lever: Add 1" to outlet C, D & E valves. Add 1 1/2" to outlet F & G valves.

