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Technical Datasheet Flowseal® High Performance Butterfly Valves

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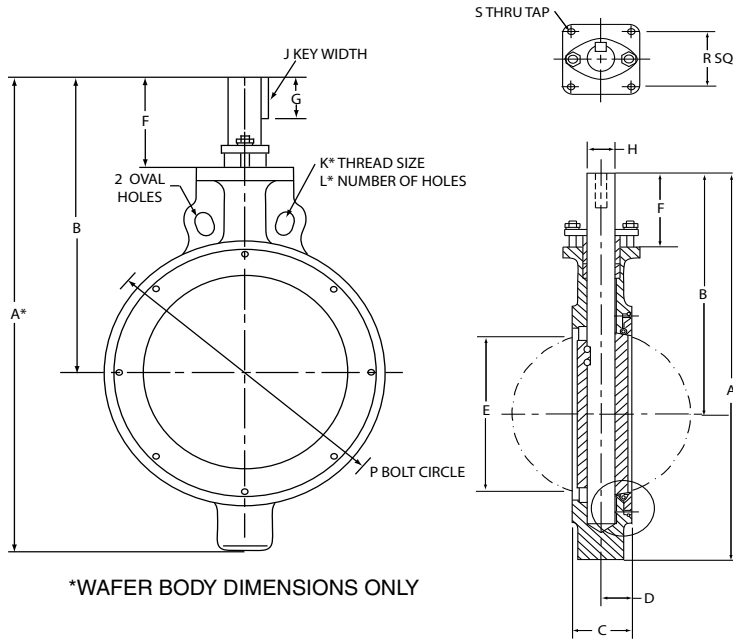


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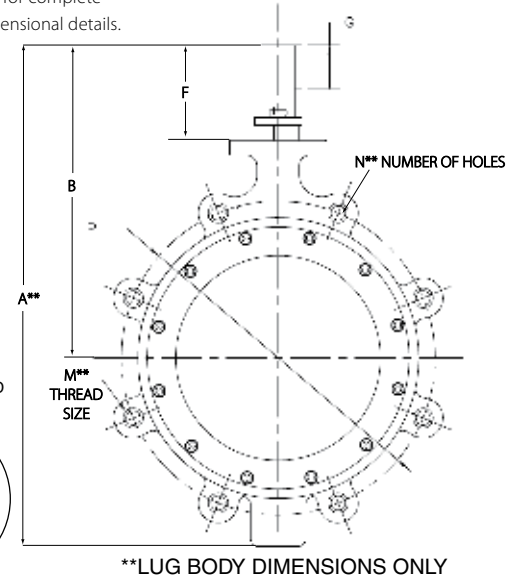
Dimensions Soft Seat

WAFER



LUG

NOTE: See page 19 for complete mounting pad dimensional details.



ASME Class 150

| Valve Size | A* | A** | B | C | D | E | F | G | H | J | K* | L* | M** | N** | P | R | S | WEIGHT (LBS) | |
|------------|-------|-------|-------|-------|------|-------|-------|------|-------|-------|---------|----|---------|-----|--------|------|--------|--------------|------|
| | WAFER | LUG | | | | | | | | | | | | | | | | WAFER | LUG |
| 2 | 10.59 | 10.59 | 7.59 | 1.75 | 1.06 | 1.72 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 5/8-11 | 4 | 4.750 | 2.25 | 3/8-16 | 8 | 11 |
| 2 1/2 | 10.30 | 10.30 | 7.59 | 1.88 | 1.09 | 2.09 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 5/8-11 | 4 | 5.500 | 2.25 | 3/8-16 | 8 | 11 |
| 3 | 11.60 | 11.60 | 8.60 | 1.92 | 1.20 | 2.75 | 3.60 | 1.19 | 0.625 | 3/16 | - | - | 5/8-11 | 4 | 6.000 | 2.25 | 3/8-16 | 11 | 13 |
| 4 | 12.92 | 13.55 | 9.42 | 2.13 | 1.26 | 3.62 | 3.67 | 1.19 | 0.625 | 3/16 | - | - | 5/8-11 | 8 | 7.500 | 2.25 | 3/8-16 | 17 | 25 |
| 5 | 14.53 | 15.16 | 10.28 | 2.25 | 1.34 | 4.55 | 3.81 | 1.25 | 0.750 | 1/4 | - | - | 3/4-10 | 8 | 8.500 | 2.25 | 3/8-16 | 20 | 30 |
| 6 | 15.69 | 15.93 | 10.81 | 2.29 | 1.38 | 5.55 | 3.81 | 1.25 | 0.750 | 1/4 | - | - | 3/4-10 | 8 | 9.500 | 2.25 | 3/8-16 | 30 | 35 |
| 8 | 17.82 | 17.95 | 11.94 | 2.50 | 1.49 | 7.28 | 3.81 | 1.25 | 1.000 | 3/8 | - | - | 3/4-10 | 8 | 11.750 | 2.25 | 3/8-16 | 44 | 48 |
| 10 | 19.85 | 20.85 | 12.97 | 2.81 | 1.70 | 9.20 | 4.09 | 1.50 | 1.250 | 3/8 | - | 2 | 7/8-9 | 12 | 14.250 | 3.25 | 3/8-16 | 71 | 91 |
| 12 | 24.97 | 24.97 | 15.47 | 3.23 | 1.86 | 11.15 | 4.84 | 2.13 | 1.500 | 3/8 | - | 2 | 7/8-9 | 12 | 17.000 | 3.25 | 3/8-16 | 110 | 127 |
| 14 | 27.09 | 27.09 | 16.09 | 3.62 | 2.19 | 12.76 | 4.84 | 2.13 | 1.500 | 3/8 | - | 4 | 1-8 | 12 | 18.750 | 3.25 | 3/8-16 | 135 | 183 |
| 16 | 31.58 | 31.53 | 19.60 | 4.00 | 2.31 | 14.58 | 6.91 | 2.50 | 1.750 | 1/2 | - | 4 | 1-8 | 16 | 21.250 | 4.25 | 1/2-13 | 182 | 250 |
| 18 | 34.48 | 34.48 | 21.36 | 4.50 | 2.45 | 16.38 | 7.36 | 3.13 | 2.000 | 1/2 | - | 4 | 1-1/8-8 | 16 | 22.750 | 4.25 | 1/2-13 | 234 | 305 |
| 20 | 36.57 | 36.57 | 22.76 | 5.00 | 2.94 | 18.38 | 7.63 | 3.00 | 2.250 | 3/4 | 1-1/8-8 | 4 | 1-1/8-8 | 20 | 25.000 | 5.00 | 3/4-10 | 320 | 414 |
| 24 | 41.05 | 41.05 | 25.13 | 6.06 | 3.12 | 21.88 | 7.88 | 3.25 | 2.500 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 20 | 29.500 | 5.00 | 3/4-10 | 505 | 702 |
| 30 | 50.24 | 50.24 | 29.36 | 6.75 | 3.53 | 28.00 | 8.73 | 4.50 | 3.000 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 28 | 36.000 | 5.00 | 3/4-10 | 925 | 1130 |
| 36 | 64.75 | 64.75 | 32.63 | 8.38 | 4.34 | 33.66 | 8.13 | 3.50 | 3.750 | 1 | 1-1/2-8 | 4 | 1-1/2-8 | 32 | 42.750 | 7.00 | 1-8 | 1630 | 1890 |
| 42 | 73.25 | 73.25 | 37.63 | 9.25 | 5.03 | 40.31 | 9.63 | 5.00 | 4.500 | 1 | 1-1/2-8 | 4 | 1-1/2-8 | 36 | 49.500 | 7.00 | 1-8 | 2475 | 2700 |
| 48 | 80.13 | 80.13 | 41.88 | 10.62 | 5.62 | 45.25 | 10.63 | 6.00 | 5.000 | 1-1/4 | 1-1/2-8 | 4 | 1-1/2-8 | 44 | 56.000 | 9.00 | 1-8 | 2815 | 3085 |

Dimensions Soft Seat

ASME Class 300

| Valve Size | A* | A** | B | C | D | E | F | G | H | J | K* | L* | M** | N** | P | R | S | WEIGHT (LBS) | |
|------------|-------|-------|-------|------|------|-------|------|------|-------|------|---------|----|---------|-----|--------|------|--------|--------------|------|
| | WAFER | LUG | | | | | | | | | | | | | | | | WAFER | LUG |
| 2 | 10.59 | 10.59 | 7.59 | 1.75 | 1.06 | 1.72 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 5/8-11 | 8 | 5.000 | 2.25 | 3/8-16 | 8 | 11 |
| 2 1/2 | 10.30 | 10.30 | 7.59 | 1.88 | 1.09 | 2.09 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 3/4-10 | 8 | 5.875 | 2.25 | 3/8-16 | 8 | 11 |
| 3 | 11.60 | 11.98 | 8.60 | 1.92 | 1.20 | 2.75 | 3.60 | 1.19 | 0.625 | 3/16 | - | - | 3/4-10 | 8 | 6.625 | 2.25 | 3/8-16 | 12 | 17 |
| 4 | 12.92 | 13.54 | 9.42 | 2.13 | 1.26 | 3.62 | 3.67 | 1.19 | 0.625 | 3/16 | - | - | 3/4-10 | 8 | 7.875 | 2.25 | 3/8-16 | 17 | 24 |
| 5 | 14.53 | 15.16 | 10.28 | 2.25 | 1.34 | 4.55 | 3.81 | 1.25 | 0.750 | 1/4 | - | - | 3/4-10 | 8 | 9.250 | 2.25 | 3/8-16 | 20 | 30 |
| 6 | 15.69 | 16.31 | 10.81 | 2.29 | 1.38 | 5.55 | 3.81 | 1.25 | 1.000 | 3/8 | - | - | 3/4-10 | 12 | 10.625 | 2.25 | 3/8-16 | 30 | 49 |
| 8 | 18.10 | 19.50 | 12.22 | 2.88 | 1.54 | 7.06 | 4.09 | 1.50 | 1.250 | 3/8 | - | - | 7/8-9 | 12 | 13.000 | 3.25 | 3/8-16 | 52 | 80 |
| 10 | 21.60 | 22.78 | 14.22 | 3.25 | 1.70 | 9.00 | 4.84 | 2.25 | 1.500 | 3/8 | 1-8 | 2 | 1-8 | 16 | 15.250 | 3.25 | 3/8-16 | 88 | 115 |
| 12 | 28.24 | 28.24 | 17.90 | 3.62 | 1.86 | 10.72 | 6.90 | 2.50 | 1.750 | 1/2 | 1-1/8-8 | 4 | 1-1/8-8 | 16 | 17.750 | 4.25 | 1/2-13 | 153 | 199 |
| 14 | 34.31 | 34.31 | 19.74 | 4.62 | 2.48 | 12.08 | 7.36 | 3.13 | 2.000 | 1/2 | 1-1/8-8 | 4 | 1-1/8-8 | 20 | 20.250 | 4.25 | 1/2-13 | 285 | 324 |
| 16 | 38.14 | 38.14 | 21.82 | 5.25 | 2.59 | 13.72 | 7.82 | 3.00 | 2.250 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 20 | 22.500 | 5.00 | 3/4-10 | 336 | 401 |
| 18 | 40.27 | 40.27 | 23.01 | 5.88 | 3.03 | 15.56 | 7.88 | 3.25 | 2.500 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 24 | 24.750 | 5.00 | 3/4-10 | 393 | 517 |
| 20 | 43.62 | 43.62 | 25.13 | 6.31 | 3.24 | 17.22 | 8.75 | 4.50 | 3.000 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 24 | 27.000 | 5.00 | 3/4-10 | 510 | 735 |
| 24 | 49.68 | 49.68 | 28.01 | 7.19 | 3.62 | 20.61 | 8.63 | 4.00 | 3.500 | 1 | 1-1/2-8 | 4 | 1-1/2-8 | 24 | 32.000 | 7.00 | 1-8 | 733 | 1020 |
| 30 | 63.00 | 63.00 | 32.50 | 8.88 | 4.39 | 27.25 | 9.62 | 5.25 | 4.500 | 1 | 1-3/4-8 | 4 | 1-3/4-8 | 28 | 39.250 | 7.00 | 1-8 | 1745 | 2145 |

ASME Class 600

| Valve Size | A* | A** | B | C | D | E | F | G | H | J | K* | L* | M** | N** | P | R | S | WEIGHT (LBS) | |
|------------|-------|-------|-------|------|------|-------|------|------|-------|------|---------|----|---------|-----|--------|------|--------|--------------|------|
| | WAFER | LUG | | | | | | | | | | | | | | | | WAFER | LUG |
| 2 | 10.59 | - | 7.59 | 1.75 | 1.06 | 1.72 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 5/8-11 | 8 | 5.000 | 2.25 | 3/8-16 | 11 | - |
| 3 | 11.60 | 12.10 | 8.60 | 2.12 | 1.20 | 2.50 | 3.60 | 1.19 | 0.625 | 3/16 | - | - | 3/4-10 | 8 | 6.625 | 2.25 | 3/8-16 | 13 | 18 |
| 4 | 14.43 | 14.93 | 9.81 | 2.50 | 1.40 | 3.43 | 3.81 | 1.25 | 0.750 | 1/4 | - | - | 7/8-9 | 8 | 8.500 | 2.25 | 3/8-16 | 30 | 52 |
| 6 | 17.27 | 18.29 | 11.71 | 3.06 | 1.67 | 5.18 | 4.09 | 1.50 | 1.250 | 3/8 | - | 2 | 1-8 | 12 | 11.500 | 3.25 | 3/8-16 | 42 | 85 |
| 8 | 21.35 | 22.00 | 13.97 | 4.00 | 1.85 | 6.28 | 4.84 | 2.25 | 1.500 | 3/8 | - | - | 1-1/8-8 | 12 | 13.750 | 3.25 | 3/8-16 | 72 | 127 |
| 10 | 31.15 | 31.15 | 17.90 | 4.62 | 1.99 | 7.95 | 6.90 | 2.50 | 1.750 | 1/2 | 1-1/4-8 | 4 | 1-1/4-8 | 16 | 17.000 | 4.25 | 1/2-13 | 170 | 233 |
| 12 | 34.80 | 34.80 | 20.13 | 5.50 | 2.53 | 9.68 | 7.50 | 3.00 | 2.250 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 20 | 19.250 | 5.00 | 3/4-10 | 245 | 379 |
| 14 | 39.60 | 39.60 | 22.80 | 6.13 | 3.14 | 10.97 | 8.25 | 3.25 | 2.500 | 3/4 | 1-3/8-8 | 4 | 1-3/8-8 | 20 | 20.750 | 5.00 | 3/4-10 | 400 | 600 |
| 16 | - | 44.25 | 25.38 | 7.00 | 3.50 | 12.60 | 9.38 | 4.50 | 3.000 | 3/4 | - | - | 1-1/2-8 | 20 | 23.750 | 5.00 | 3/4-10 | - | 1170 |

NOTES:

1. General
 - a. Standard valves tested to MSS SP-61 and ANSI/FCI 70-2, Class IV.
 - b. Dimensions shown are for reference only. Certified drawings available on application.
2. For 2" through 24" sizes
 - a. Face-to-face dimensions (C) meet, within specified tolerances, MSS SP-68 and API 609, Category B requirements.
 - b. Valves are designed for installation between ASME B16.5 flanges.
3. For 30" and 36" sizes
 - a. Valves are designed for installation between ASME B16.47, Series A flanges. (Series B on request.)



Pressure/Temperature Ratings **Soft Seat**

As temperature increases, the pressure retaining capability of materials decreases. The graph below illustrates the pressure/temperature ratings of the Flowseal ASME Class 150, Class 300, and Class 600.

The heavy lines define the ratings of the carbon steel and stainless steel valve body (or "shell") in conformance to ASME B16.34. The shaded areas define the ratings of the TFE and RTFE Seat materials.

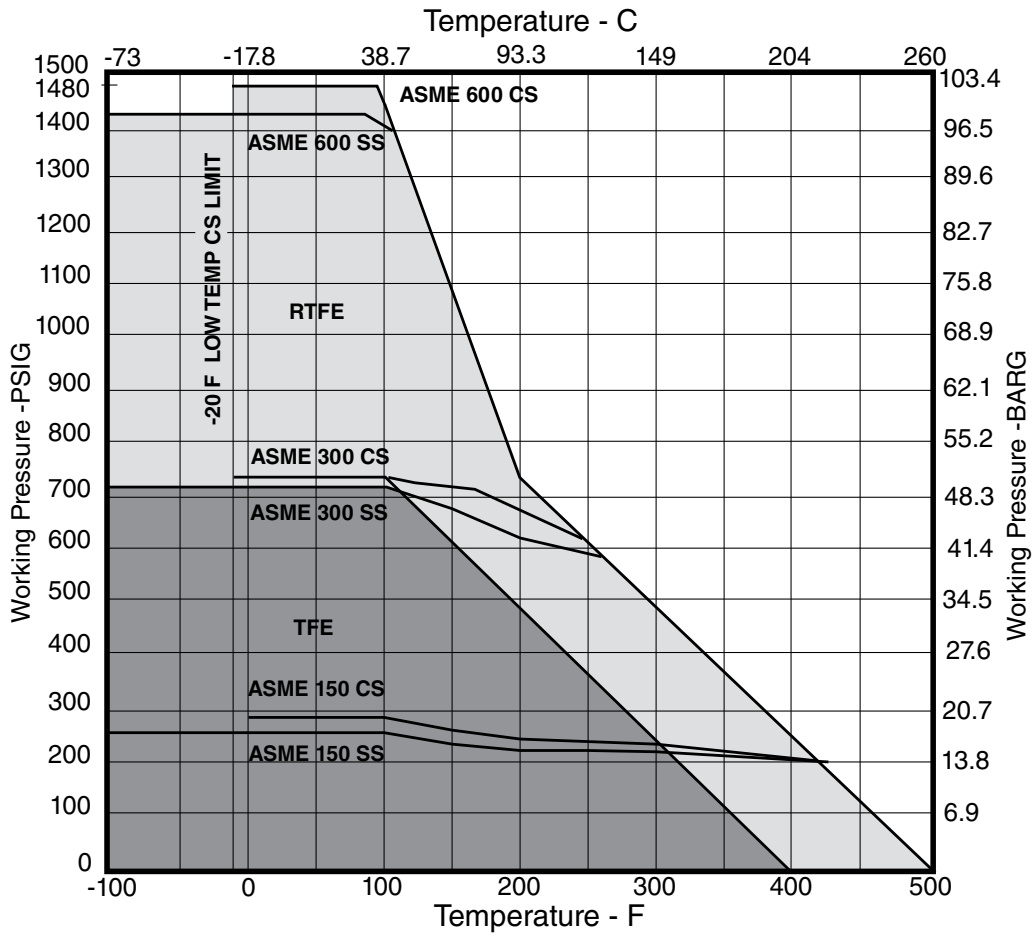
Seat ratings are based on differential pressure with the disc in the fully closed position.*

Steam Service

TFE seated valves are rated for 50 psi saturated steam.

Valves with "O" seat configuration (RTFE seat / AFLAS O-ring) are rated to 100 psi steam service.

ASME B16.34 Body and Flowseal Soft Seat Pressure - Temperature Ratings

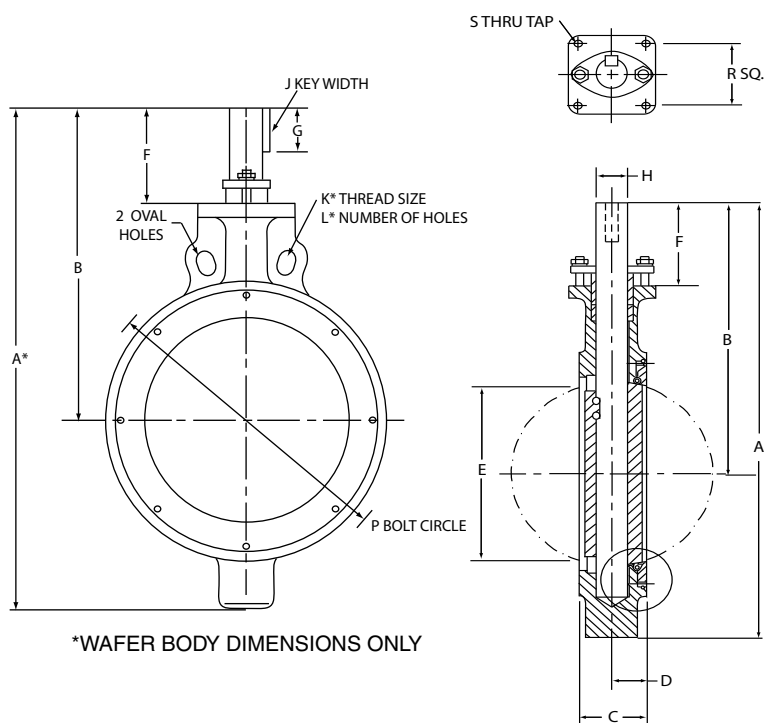


*Shaft materials other than 17-4 PH or Monel® will affect working pressure ratings. Please consult factory.

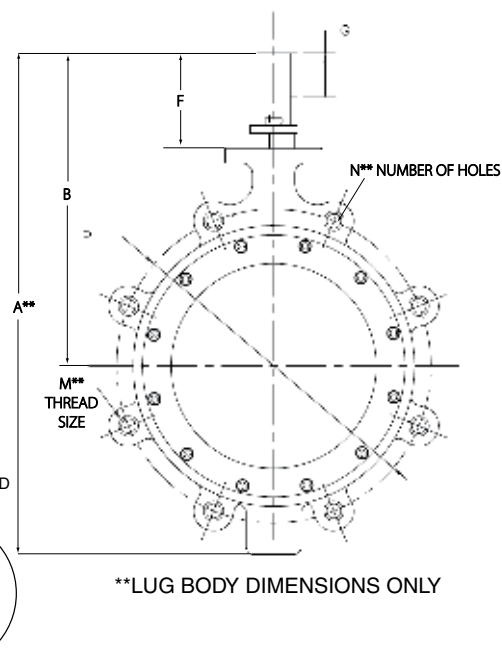
Dimensions Metal Seat

WAFER

LUG



NOTE: See page 19 for complete mounting pad dimensional details.



*WAFER BODY DIMENSIONS ONLY

**LUG BODY DIMENSIONS ONLY

ASME Class 150

| Valve Size | A* | A** | B | C | D | E | F | G | H | J | K* | L* | M** | N** | P | R | S | WEIGHT (LBS) | |
|------------|-------|-------|-------|------|------|-------|------|------|-------|------|---------|----|---------|-----|--------|------|--------|--------------|------|
| | WAFER | LUG | | | | | | | | | | | | | | | | WAFER | LUG |
| 2 | 10.59 | 10.59 | 7.59 | 1.75 | 1.06 | 1.72 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 5/8-11 | 4 | 4.750 | 2.25 | 3/8-16 | 8 | 11 |
| 2 1/2 | 10.30 | 10.30 | 7.59 | 1.88 | 1.09 | 2.09 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 5/8-11 | 4 | 5.500 | 2.25 | 3/8-16 | 8 | 11 |
| 3 | 11.60 | 11.60 | 8.60 | 1.92 | 1.20 | 2.75 | 3.60 | 1.19 | 0.625 | 3/16 | - | - | 5/8-11 | 4 | 6.000 | 2.25 | 3/8-16 | 11 | 13 |
| 4 | 12.92 | 13.55 | 9.42 | 2.13 | 1.26 | 3.62 | 3.67 | 1.19 | 0.625 | 3/16 | - | - | 5/8-11 | 8 | 7.500 | 2.25 | 3/8-16 | 17 | 25 |
| 5 | 14.53 | 15.16 | 10.28 | 2.25 | 1.34 | 4.55 | 3.81 | 1.25 | 0.750 | 1/4 | - | - | 3/4-10 | 8 | 8.500 | 2.25 | 3/8-16 | 20 | 30 |
| 6 | 15.69 | 15.93 | 10.81 | 2.29 | 1.38 | 5.55 | 3.81 | 1.25 | 0.750 | 1/4 | - | - | 3/4-10 | 8 | 9.500 | 2.25 | 3/8-16 | 30 | 35 |
| 8 | 17.82 | 17.95 | 11.94 | 2.50 | 1.49 | 7.28 | 3.81 | 1.25 | 1.000 | 3/8 | - | - | 3/4-10 | 8 | 11.750 | 2.25 | 3/8-16 | 44 | 48 |
| 10 | 19.85 | 20.85 | 12.97 | 2.81 | 1.70 | 9.20 | 4.09 | 1.50 | 1.250 | 3/8 | - | 2 | 7/8-9 | 12 | 14.250 | 3.25 | 3/8-16 | 71 | 91 |
| 12 | 24.97 | 24.97 | 15.47 | 3.23 | 1.86 | 11.15 | 4.84 | 2.13 | 1.500 | 3/8 | - | 2 | 7/8-9 | 12 | 17.000 | 3.25 | 3/8-16 | 110 | 127 |
| 14 | 27.09 | 27.09 | 16.09 | 3.62 | 2.19 | 12.76 | 4.84 | 2.13 | 1.500 | 3/8 | - | 4 | 1-8 | 12 | 18.750 | 3.25 | 3/8-16 | 135 | 183 |
| 16 | 31.58 | 31.53 | 19.60 | 4.00 | 2.31 | 14.58 | 6.91 | 2.50 | 1.750 | 1/2 | - | 4 | 1-8 | 16 | 21.250 | 4.25 | 1/2-13 | 182 | 250 |
| 18 | 34.48 | 34.48 | 21.36 | 4.50 | 2.45 | 16.38 | 7.36 | 3.13 | 2.000 | 1/2 | - | 4 | 1-1/8-8 | 16 | 22.750 | 4.25 | 1/2-13 | 234 | 305 |
| 20 | 36.57 | 36.57 | 22.76 | 5.00 | 2.94 | 18.38 | 7.63 | 3.00 | 2.250 | 3/4 | 1-1/8-8 | 4 | 1-1/8-8 | 20 | 25.000 | 5.00 | 3/4-10 | 320 | 414 |
| 24 | 41.05 | 41.05 | 25.13 | 6.06 | 3.12 | 21.88 | 7.88 | 3.25 | 2.500 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 20 | 29.500 | 5.00 | 3/4-10 | 505 | 702 |
| 30 | 50.24 | 50.24 | 29.36 | 6.75 | 3.53 | 28.00 | 8.73 | 4.50 | 3.000 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 28 | 36.000 | 5.00 | 3/4-10 | 925 | 1130 |
| 36 | 64.75 | 64.75 | 32.63 | 8.38 | 4.34 | 33.66 | 8.13 | 3.50 | 3.750 | 1 | 1-1/2-8 | 4 | 1-1/2-8 | 32 | 42.750 | 7.00 | 1-8 | 1630 | 1890 |



Dimensions Metal Seat

ASME Class 300

| Valve Size | A* | A** | B | C | D | E | F | G | H | J | K* | L* | M** | N** | P | R | S | WEIGHT (LBS) | |
|------------|-------|-------|-------|------|------|-------|------|------|-------|------|---------|----|---------|-----|--------|------|--------|--------------|------|
| | WAFER | LUG | | | | | | | | | | | | | | | | WAFER | LUG |
| 2 | 10.59 | 10.59 | 7.59 | 1.75 | 1.06 | 1.72 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 5/8-11 | 8 | 5.000 | 2.25 | 3/8-16 | 8 | 11 |
| 2 1/2 | 10.30 | 10.30 | 7.59 | 1.88 | 1.09 | 2.09 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 3/4-10 | 8 | 5.875 | 2.25 | 3/8-16 | 8 | 11 |
| 3 | 11.60 | 11.98 | 8.60 | 1.92 | 1.20 | 2.75 | 3.60 | 1.19 | 0.625 | 3/16 | - | - | 3/4-10 | 8 | 6.625 | 2.25 | 3/8-16 | 12 | 17 |
| 4 | 12.92 | 13.54 | 9.42 | 2.13 | 1.26 | 3.62 | 3.67 | 1.19 | 0.625 | 3/16 | - | - | 3/4-10 | 8 | 7.875 | 2.25 | 3/8-16 | 17 | 24 |
| 5 | 14.53 | 15.16 | 10.28 | 2.25 | 1.34 | 4.55 | 3.81 | 1.25 | 0.750 | 1/4 | - | - | 3/4-10 | 8 | 9.250 | 2.25 | 3/8-16 | 20 | 30 |
| 6 | 15.69 | 16.31 | 10.81 | 2.29 | 1.38 | 5.55 | 3.81 | 1.25 | 1.000 | 3/8 | - | - | 3/4-10 | 12 | 10.625 | 2.25 | 3/8-16 | 30 | 49 |
| 8 | 18.10 | 19.50 | 12.22 | 2.88 | 1.54 | 7.06 | 4.09 | 1.50 | 1.250 | 3/8 | - | - | 7/8-9 | 12 | 13.000 | 3.25 | 3/8-16 | 52 | 80 |
| 10 | 21.60 | 22.78 | 14.22 | 3.25 | 1.70 | 9.00 | 4.84 | 2.25 | 1.500 | 3/8 | 1-8 | 2 | 1-8 | 16 | 15.250 | 3.25 | 3/8-16 | 88 | 115 |
| 12 | 28.24 | 28.24 | 17.90 | 3.62 | 1.86 | 10.72 | 6.90 | 2.50 | 1.750 | 1/2 | 1-1/8-8 | 4 | 1-1/8-8 | 16 | 17.750 | 4.25 | 1/2-13 | 153 | 199 |
| 14 | 34.31 | 34.31 | 19.74 | 4.62 | 2.48 | 12.08 | 7.36 | 3.13 | 2.000 | 1/2 | 1-1/8-8 | 4 | 1-1/8-8 | 20 | 20.250 | 4.25 | 1/2-13 | 285 | 324 |
| 16 | 38.14 | 38.14 | 21.82 | 5.25 | 2.59 | 13.72 | 7.82 | 3.00 | 2.250 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 20 | 22.500 | 5.00 | 3/4-10 | 336 | 401 |
| 18 | 40.27 | 40.27 | 23.01 | 5.88 | 3.03 | 15.56 | 7.88 | 3.25 | 2.500 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 24 | 24.750 | 5.00 | 3/4-10 | 393 | 517 |
| 20 | 43.62 | 43.62 | 25.13 | 6.31 | 3.24 | 17.22 | 8.75 | 4.50 | 3.000 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 24 | 27.000 | 5.00 | 3/4-10 | 510 | 735 |
| 24 | 49.68 | 49.68 | 28.01 | 7.19 | 3.62 | 20.61 | 8.63 | 4.00 | 3.500 | 1 | 1-1/2-8 | 4 | 1-1/2-8 | 24 | 32.000 | 7.00 | 1-8 | 733 | 1020 |
| 30 | 63.00 | 63.00 | 32.50 | 8.88 | 4.39 | 27.25 | 9.62 | 5.25 | 4.500 | 1 | 1-3/4-8 | 4 | 1-3/4-8 | 28 | 39.250 | 7.00 | 1-8 | 1745 | 2145 |

ASME Class 600

| Valve Size | A* | A** | B | C | D | E | F | G | H | J | K* | L* | M** | N** | P | R | S | WEIGHT (LBS) | |
|------------|-------|-------|-------|------|------|------|------|------|-------|------|---------|----|---------|-----|--------|------|--------|--------------|-----|
| | WAFER | LUG | | | | | | | | | | | | | | | | WAFER | LUG |
| 2 | 10.59 | - | 7.59 | 1.75 | 1.06 | 1.72 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 5/8-11 | 8 | 5.000 | 2.25 | 3/8-16 | 11 | - |
| 3 | 11.60 | 12.10 | 8.60 | 2.12 | 1.20 | 2.50 | 3.60 | 1.19 | 0.625 | 3/16 | - | - | 3/4-10 | 8 | 6.625 | 2.25 | 3/8-16 | 13 | 18 |
| 4 | 14.43 | 14.93 | 9.81 | 2.50 | 1.40 | 3.43 | 3.81 | 1.25 | 0.750 | 1/4 | - | - | 7/8-9 | 8 | 8.500 | 2.25 | 3/8-16 | 30 | 52 |
| 6 | 17.27 | 18.29 | 11.71 | 3.06 | 1.67 | 5.18 | 4.09 | 1.50 | 1.250 | 3/8 | - | 2 | 1-8 | 12 | 11.500 | 3.25 | 3/8-16 | 42 | 85 |
| 8 | 21.35 | 22.00 | 13.97 | 4.00 | 1.85 | 6.28 | 4.84 | 2.25 | 1.500 | 3/8 | - | - | 1-1/8-8 | 12 | 13.750 | 3.25 | 3/8-16 | 72 | 127 |
| 10 | 31.15 | 31.15 | 17.90 | 4.62 | 1.99 | 7.95 | 6.90 | 2.50 | 1.750 | 1/2 | 1-1/4-8 | 4 | 1-1/4-8 | 16 | 17.000 | 4.25 | 1/2-13 | 170 | 233 |
| 12 | 34.80 | 34.80 | 20.13 | 5.50 | 2.53 | 9.68 | 7.50 | 3.00 | 2.250 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 20 | 19.250 | 5.00 | 3/4-10 | 245 | 379 |

NOTES:

1. General
 - a. Standard valves tested to MSS SP-61 and ANSI/FCI 70-2, Class IV.
 - b. Dimensions shown are for reference only. Certified drawings available on application.
2. For 2" through 24" sizes
 - a. Face-to-face dimensions (C) meet, within specified tolerances, MSS SP-68 and API 609, Category B requirements.
 - b. Valves are designed for installation between ASME B16.5 flanges.
3. For 30" and 36" sizes
 - a. Valves are designed for installation between ASME B16.47, Series A flanges. (Series B on request.)

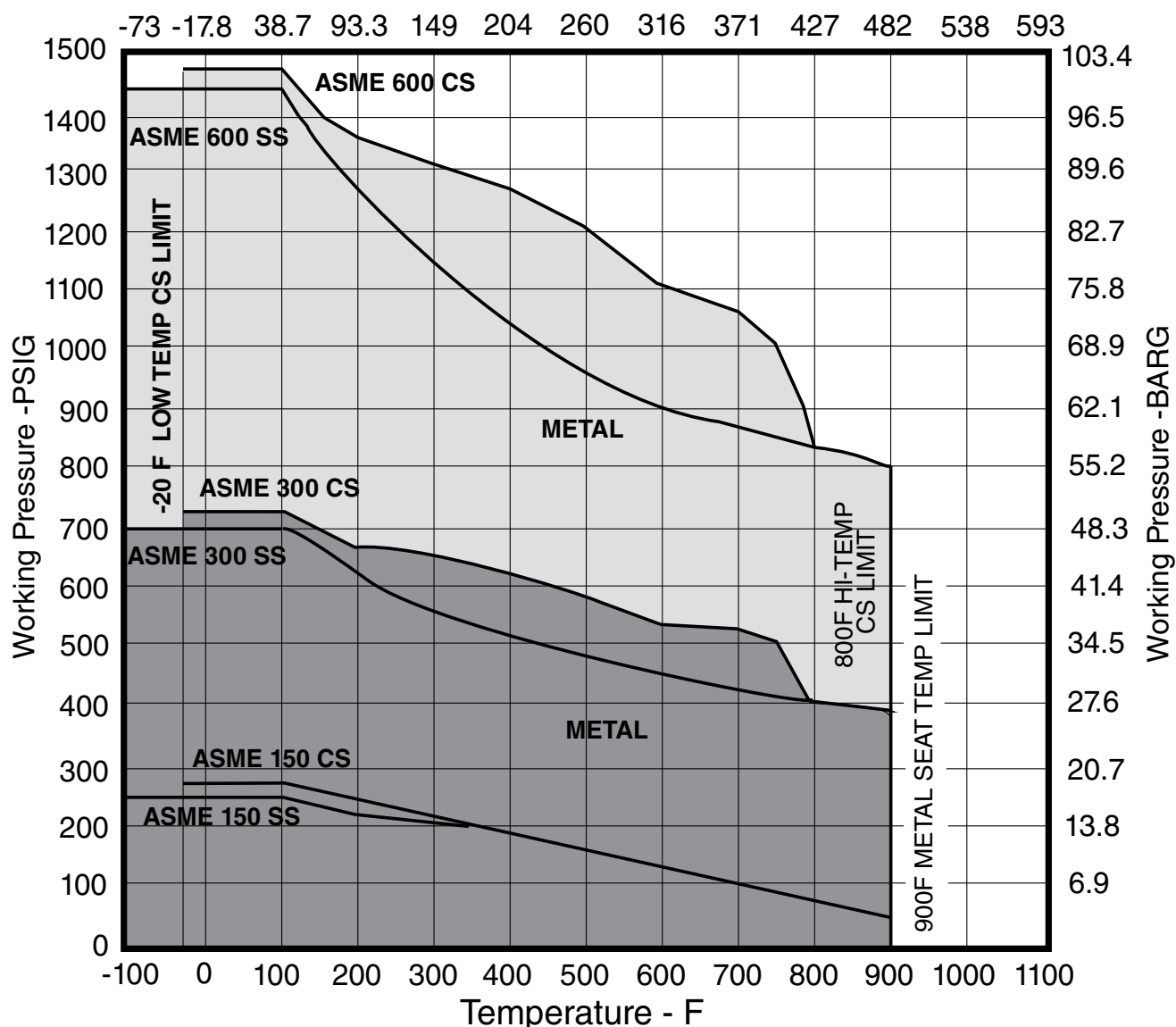
Pressure/Temperature Ratings Metal Seat

As temperature increases, the pressure retaining capability of materials decreases. The graph below illustrates the pressure/temperature ratings of the Flowseal ASME Class 150, Class 300, and Class 600.

The heavy lines define the ratings of the carbon steel and stainless steel valve body (or "shell") in conformance to ASME B16.34. The shaded areas define the ratings of the metal seat.

Seat ratings are based on differential pressure with the disc in the fully closed position.

ASME B16.34 Body and Flowseal Metal Seat Pressure - Temperature Ratings



Material & Specifications **Metal Seat**

STANDARD MATERIALS OF CONSTRUCTION

Carbon Steel Construction

| COMPONENTS | -20°F to 500°F (-28°C to 260°C) 171MTG CONSTRUCTION | 501°F to 750°F (261°C to 398°C) 171MGB CONSTRUCTION | 751°F to 800°F (399°C to 426°C) 172MGS CONSTRUCTION |
|-------------------|--|--|--|
| BODY | Carbon Steel A216 Gr WCB, or A105 | Carbon Steel A216 Gr WCB, or A105 | Carbon Steel A216 Gr WCB, or A105 |
| DISC | 316 Stainless Steel A351 CF8M, or A182 F316 Nitrided | 316 Stainless Steel A351 CF8M, or A182 F316 Nitrided | 316 Stainless Steel A351 CF8M, or A182 F316 Nitrided |
| SHAFT & PINS | 17-4 PH Stainless Steel A564 Gr 630 | 17-4 PH Stainless Steel A564 Gr 630 | 316 Stainless Steel* A479 Gr 316 |
| SEAT | Inconel® | Inconel® | Inconel® |
| PACKING | PTFE | Graphite | Graphite |
| BEARINGS | Glass-Backed PTFE | Bronze | 316 Stainless Steel Nitrided |

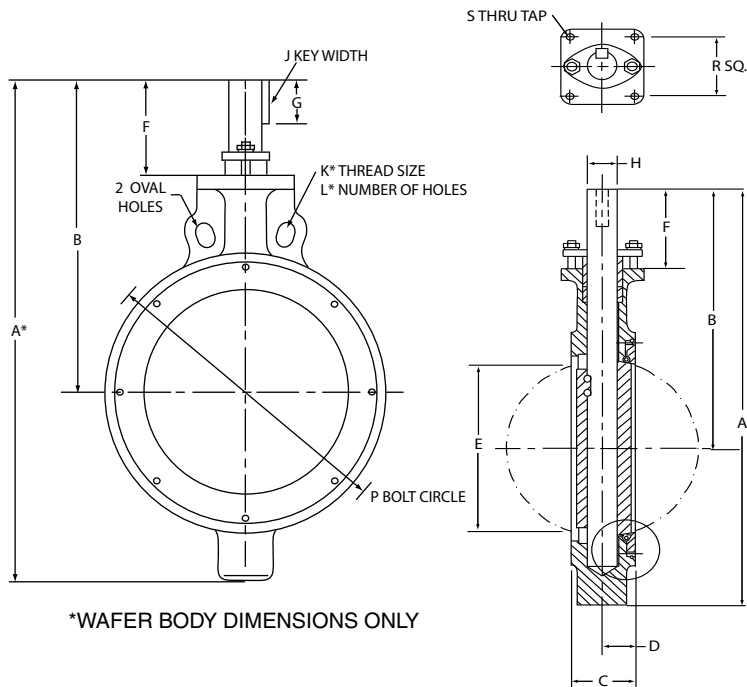
Stainless Steel Construction

| COMPONENTS | -100°F to 500°F (-73°C to 260°C) 271MTG CONSTRUCTION | 501°F to 750°F (261°C to 398°C) 271MGB CONSTRUCTION | 751°F to 900°F (399°C to 482°C) 272MGS CONSTRUCTION |
|-------------------|---|--|--|
| BODY | 316 Stainless Steel A351 CF8M, or A182 F316 | 316 Stainless Steel A351 CF8M, or A182 F316 | 316 Stainless Steel A351 CF8M, or A182 F316 |
| DISC | 316 Stainless Steel A351 CF8M, or A182 F316 Nitrided | 316 Stainless Steel A351 CF8M, or A182 F316 Nitrided | 316 Stainless Steel A351 CF8M, or A182 F316 Nitrided |
| SHAFT & PINS | 17-4 PH Stainless Steel A564 Gr 630 | 17-4 PH Stainless Steel A564 Gr 630 | 316 Stainless Steel* A479 Gr 316 |
| SEAT | Inconel® | Inconel® | Inconel® |
| PACKING | PTFE | Graphite | Graphite |
| BEARINGS | Glass-Backed PTFE | Bronze | 316 Stainless Steel Nitrided |

* Shaft materials other than 17-4 PH or Monel® will affect working pressure ratings. Please consult factory.

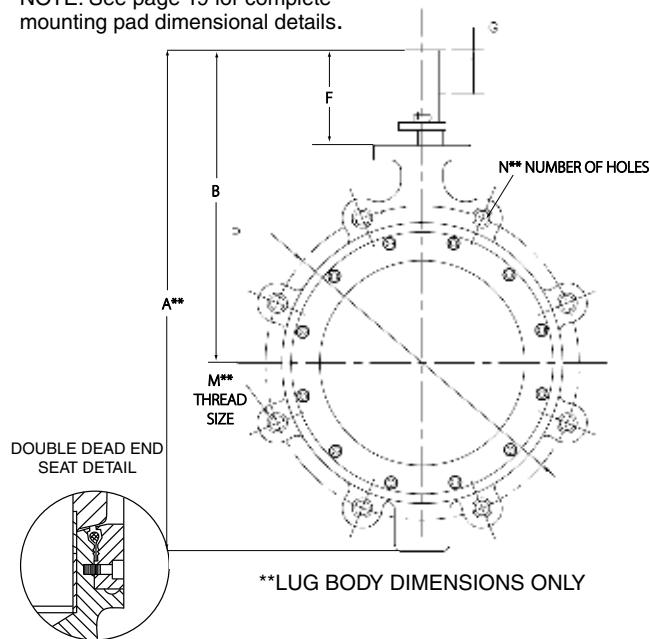
Dimensions Fire Flow

WAFER



LUG

NOTE: See page 19 for complete mounting pad dimensional details.



ASME Class 150

| Valve Size | A* | A** | B | C | D | E | F | G | H | J | K* | L* | M** | N** | P | R | S | WEIGHT (LBS) | |
|------------|-------|-------|-------|------|------|-------|------|------|-------|------|---------|----|---------|-----|--------|------|--------|--------------|------|
| | WAFER | LUG | | | | | | | | | | | | | | | | WAFER | LUG |
| 2 | 10.59 | 10.59 | 7.59 | 1.75 | 1.06 | 1.72 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 5/8-11 | 4 | 4.750 | 2.25 | 3/8-16 | 8 | 11 |
| 2 1/2 | 10.30 | 10.30 | 7.59 | 1.88 | 1.09 | 2.09 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 5/8-11 | 4 | 5.500 | 2.25 | 3/8-16 | 8 | 11 |
| 3 | 11.60 | 11.60 | 8.60 | 1.92 | 1.20 | 2.75 | 3.60 | 1.19 | 0.625 | 3/16 | - | - | 5/8-11 | 4 | 6.000 | 2.25 | 3/8-16 | 11 | 13 |
| 4 | 12.92 | 13.55 | 9.42 | 2.13 | 1.26 | 3.62 | 3.67 | 1.19 | 0.625 | 3/16 | - | - | 5/8-11 | 8 | 7.500 | 2.25 | 3/8-16 | 17 | 25 |
| 5 | 14.53 | 15.16 | 10.28 | 2.25 | 1.34 | 4.55 | 3.81 | 1.25 | 0.750 | 1/4 | - | - | 3/4-10 | 8 | 8.500 | 2.25 | 3/8-16 | 20 | 30 |
| 6 | 15.69 | 15.93 | 10.81 | 2.29 | 1.38 | 5.55 | 3.81 | 1.25 | 0.750 | 1/4 | - | - | 3/4-10 | 8 | 9.500 | 2.25 | 3/8-16 | 30 | 35 |
| 8 | 17.82 | 17.95 | 11.94 | 2.50 | 1.49 | 7.28 | 3.81 | 1.25 | 1.000 | 3/8 | - | - | 3/4-10 | 8 | 11.750 | 2.25 | 3/8-16 | 44 | 48 |
| 10 | 19.85 | 20.85 | 12.97 | 2.81 | 1.70 | 9.20 | 4.09 | 1.50 | 1.250 | 3/8 | - | 2 | 7/8-9 | 12 | 14.250 | 3.25 | 3/8-16 | 71 | 91 |
| 12 | 24.97 | 24.97 | 15.47 | 3.23 | 1.86 | 11.15 | 4.84 | 2.13 | 1.500 | 3/8 | - | 2 | 7/8-9 | 12 | 17.000 | 3.25 | 3/8-16 | 110 | 127 |
| 14 | 27.09 | 27.09 | 16.09 | 3.62 | 2.19 | 12.76 | 4.84 | 2.13 | 1.500 | 3/8 | - | 4 | 1-8 | 12 | 18.750 | 3.25 | 3/8-16 | 135 | 183 |
| 16 | 31.58 | 31.53 | 19.60 | 4.00 | 2.31 | 14.58 | 6.91 | 2.50 | 1.750 | 1/2 | - | 4 | 1-8 | 16 | 21.250 | 4.25 | 1/2-13 | 182 | 250 |
| 18 | 34.48 | 34.48 | 21.36 | 4.50 | 2.45 | 16.38 | 7.36 | 3.13 | 2.000 | 1/2 | - | 4 | 1-1/8-8 | 16 | 22.750 | 4.25 | 1/2-13 | 234 | 305 |
| 20 | 36.57 | 36.57 | 22.76 | 5.00 | 2.94 | 18.38 | 7.63 | 3.00 | 2.250 | 3/4 | 1-1/8-8 | 4 | 1-1/8-8 | 20 | 25.000 | 5.00 | 3/4-10 | 320 | 414 |
| 24 | 41.05 | 41.05 | 25.13 | 6.06 | 3.12 | 21.88 | 7.88 | 3.25 | 2.500 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 20 | 29.500 | 5.00 | 3/4-10 | 505 | 702 |
| 30 | 50.24 | 50.24 | 29.36 | 6.75 | 3.53 | 28.00 | 8.73 | 4.50 | 3.000 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 28 | 36.000 | 5.00 | 3/4-10 | 925 | 1130 |
| 36 | 64.75 | 64.75 | 32.63 | 8.38 | 4.34 | 33.66 | 8.13 | 3.50 | 3.750 | 1 | 1-1/2-8 | 4 | 1-1/2-8 | 32 | 42.750 | 7.00 | 1-8 | 1630 | 1890 |



Dimensions Fire Flow

ASME Class 300

| Valve Size | A* | A** | B | C | D | E | F | G | H | J | K* | L* | M** | N** | P | R | S | WEIGHT (LBS) | |
|------------|-------|-------|-------|------|------|-------|------|------|-------|------|---------|----|---------|-----|--------|------|--------|--------------|------|
| | WAFER | LUG | | | | | | | | | | | | | | | | WAFER | LUG |
| 2 | 10.59 | 10.59 | 7.59 | 1.75 | 1.06 | 1.72 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 5/8-11 | 8 | 5.000 | 2.25 | 3/8-16 | 8 | 11 |
| 2 1/2 | 10.30 | 10.30 | 7.59 | 1.88 | 1.09 | 2.09 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 3/4-10 | 8 | 5.875 | 2.25 | 3/8-16 | 8 | 11 |
| 3 | 11.60 | 11.98 | 8.60 | 1.92 | 1.20 | 2.75 | 3.60 | 1.19 | 0.625 | 3/16 | - | - | 3/4-10 | 8 | 6.625 | 2.25 | 3/8-16 | 12 | 17 |
| 4 | 12.92 | 13.54 | 9.42 | 2.13 | 1.26 | 3.62 | 3.67 | 1.19 | 0.625 | 3/16 | - | - | 3/4-10 | 8 | 7.875 | 2.25 | 3/8-16 | 17 | 24 |
| 5 | 14.53 | 15.16 | 10.28 | 2.25 | 1.34 | 4.55 | 3.81 | 1.25 | 0.750 | 1/4 | - | - | 3/4-10 | 8 | 9.250 | 2.25 | 3/8-16 | 20 | 30 |
| 6 | 15.69 | 16.31 | 10.81 | 2.29 | 1.38 | 5.55 | 3.81 | 1.25 | 1.000 | 3/8 | - | - | 3/4-10 | 12 | 10.625 | 2.25 | 3/8-16 | 30 | 49 |
| 8 | 18.10 | 19.50 | 12.22 | 2.88 | 1.54 | 7.06 | 4.09 | 1.50 | 1.250 | 3/8 | - | - | 7/8-9 | 12 | 13.000 | 3.25 | 3/8-16 | 52 | 80 |
| 10 | 21.60 | 22.78 | 14.22 | 3.25 | 1.70 | 9.00 | 4.84 | 2.25 | 1.500 | 3/8 | 1-8 | 2 | 1-8 | 16 | 15.250 | 3.25 | 3/8-16 | 88 | 115 |
| 12 | 28.24 | 28.24 | 17.90 | 3.62 | 1.86 | 10.72 | 6.90 | 2.50 | 1.750 | 1/2 | 1-1/8-8 | 4 | 1-1/8-8 | 16 | 17.750 | 4.25 | 1/2-13 | 153 | 199 |
| 14 | 34.31 | 34.31 | 19.74 | 4.62 | 2.48 | 12.08 | 7.36 | 3.13 | 2.000 | 1/2 | 1-1/8-8 | 4 | 1-1/8-8 | 20 | 20.250 | 4.25 | 1/2-13 | 285 | 324 |
| 16 | 38.14 | 38.14 | 21.82 | 5.25 | 2.59 | 13.72 | 7.82 | 3.00 | 2.250 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 20 | 22.500 | 5.00 | 3/4-10 | 336 | 401 |
| 18 | 40.27 | 40.27 | 23.01 | 5.88 | 3.03 | 15.56 | 7.88 | 3.25 | 2.500 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 24 | 24.750 | 5.00 | 3/4-10 | 393 | 517 |
| 20 | 43.62 | 43.62 | 25.13 | 6.31 | 3.24 | 17.22 | 8.75 | 4.50 | 3.000 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 24 | 27.000 | 5.00 | 3/4-10 | 510 | 735 |
| 24 | 49.68 | 49.68 | 28.01 | 7.19 | 3.62 | 20.61 | 8.63 | 4.00 | 3.500 | 1 | 1-1/2-8 | 4 | 1-1/2-8 | 24 | 32.000 | 7.00 | 1-8 | 733 | 1020 |
| 30 | 63.00 | 63.00 | 32.50 | 8.88 | 4.39 | 27.25 | 9.62 | 5.25 | 4.500 | 1 | 1-3/4-8 | 4 | 1-3/4-8 | 28 | 39.250 | 7.00 | 1-8 | 1745 | 2145 |

ASME Class 600

| Valve Size | A* | A** | B | C | D | E | F | G | H | J | K* | L* | M** | N** | P | R | S | WEIGHT (LBS) | |
|------------|-------|-------|-------|------|------|------|------|------|-------|------|---------|----|---------|-----|--------|------|--------|--------------|-----|
| | WAFER | LUG | | | | | | | | | | | | | | | | WAFER | LUG |
| 2 | 10.59 | - | 7.59 | 1.75 | 1.06 | 1.72 | 3.34 | 0.88 | 0.500 | 3/16 | - | - | 5/8-11 | 8 | 5.000 | 2.25 | 3/8-16 | 11 | - |
| 3 | 11.60 | 12.10 | 8.60 | 2.12 | 1.20 | 2.50 | 3.60 | 1.19 | 0.625 | 3/16 | - | - | 3/4-10 | 8 | 6.625 | 2.25 | 3/8-16 | 13 | 18 |
| 4 | 14.43 | 14.93 | 9.81 | 2.50 | 1.40 | 3.43 | 3.81 | 1.25 | 0.750 | 1/4 | - | - | 7/8-9 | 8 | 8.500 | 2.25 | 3/8-16 | 30 | 52 |
| 6 | 17.27 | 18.29 | 11.71 | 3.06 | 1.67 | 5.18 | 4.09 | 1.50 | 1.250 | 3/8 | - | 2 | 1-8 | 12 | 11.500 | 3.25 | 3/8-16 | 42 | 85 |
| 8 | 21.35 | 22.00 | 13.97 | 4.00 | 1.85 | 6.28 | 4.84 | 2.25 | 1.500 | 3/8 | - | - | 1-1/8-8 | 12 | 13.750 | 3.25 | 3/8-16 | 72 | 127 |
| 10 | 31.15 | 31.15 | 17.90 | 4.62 | 1.99 | 7.95 | 6.90 | 2.50 | 1.750 | 1/2 | 1-1/4-8 | 4 | 1-1/4-8 | 16 | 17.000 | 4.25 | 1/2-13 | 170 | 233 |
| 12 | 34.80 | 34.80 | 20.13 | 5.50 | 2.53 | 9.68 | 7.50 | 3.00 | 2.250 | 3/4 | 1-1/4-8 | 4 | 1-1/4-8 | 20 | 19.250 | 5.00 | 3/4-10 | 245 | 379 |

NOTES:

1. General
 - a. Standard valves tested to MSS SP-61 and ANSI/FCI 70-2, Class IV.
 - b. Dimensions shown are for reference only. Certified drawings available on application.
2. For 2" through 24" sizes
 - a. Face-to-face dimensions (C) meet, within specified tolerances, MSS SP-68 and API 609, Category B requirements.
 - b. Valves are designed for installation between ASME B16.5 flanges.
3. For 30" and 36" sizes
 - a. Valves are designed for installation between ASME B16.47, Series A flanges. (Series B on request.)

Pressure/Temperature Ratings Fire Flow

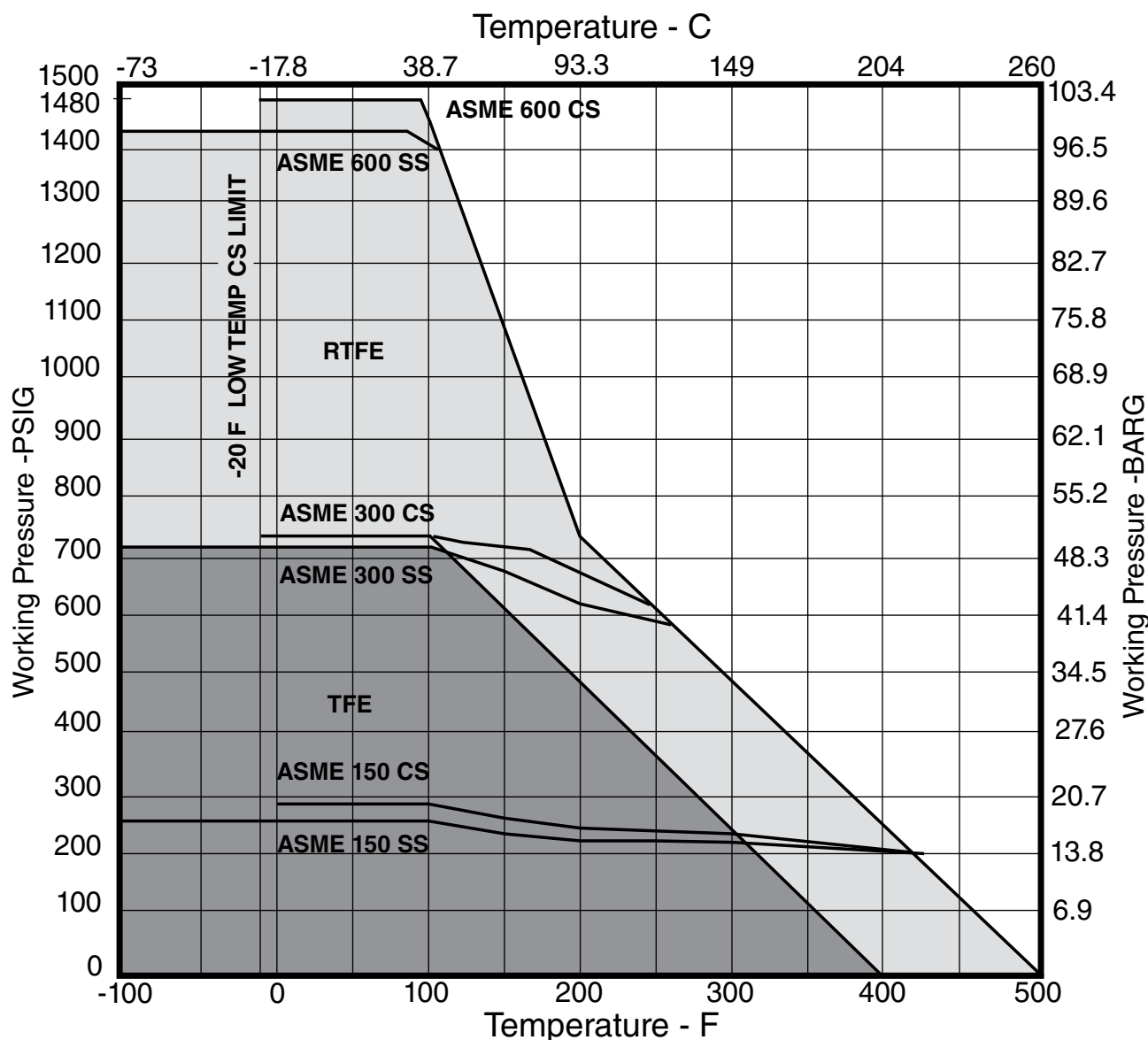
PRESSURE/TEMPERATURE RATINGS

As temperature increases, the pressure retaining capability of materials decreases. The graph below illustrates the pressure/temperature ratings of the Flowseal ASME Class 150, Class 300, and Class 600.

The heavy lines define the ratings of the carbon steel and stainless steel valve body (or "shell") in conformance to ASME B16.34. The shaded areas define the ratings of the soft seat.

Seat ratings are based on differential pressure with the disc in the fully closed position.

ASME B16.34 Body and Flowseal Soft Seat Pressure - Temperature Ratings



Valve Flow Coefficients

Cv (Coefficient of Volume) is the number of U.S. gallons per minute of water required to pass through a valve with a pressure drop of 1 psi. The chart below records this Cv factor for the Flowseal valve classes and sizes at ten degree increments between open and closed. The values shown are for the valve installed in the seat upstream ("SUS") position.

SERIES H AND J VALVES

| Degree Open % Full Cv | 10° 1.5% | 20° 6% | 30° 14% | 40° 25.2% | 50° 38% | 60° 55% | 70° 75% | 80° 97% | 90° 100% | |
|--------------------------|-------------|-----------|------------|--------------|------------|------------|------------|------------|-------------|-------|
| 2" | 150 | 1.5 | 6 | 14 | 25 | 39 | 56 | 76 | 99 | 102 |
| | 300 | 1.4 | 6 | 13 | 24 | 36 | 52 | 71 | 95 | 100 |
| | 600 | 1.4 | 5 | 13 | 23 | 35 | 51 | 70 | 90 | 93 |
| 2½" | 150 | 2.2 | 9 | 21 | 37 | 56 | 80 | 110 | 142 | 146 |
| | 300 | 2.1 | 8 | 19 | 34 | 52 | 75 | 102 | 136 | 143 |
| | 150 | 3.4 | 14 | 32 | 57 | 87 | 125 | 171 | 221 | 228 |
| 3" | 300 | 3.2 | 13 | 30 | 53 | 81 | 117 | 159 | 212 | 223 |
| | 600 | 3.1 | 12 | 29 | 52 | 79 | 114 | 156 | 202 | 208 |
| | 150 | 6.8 | 27 | 63 | 114 | 171 | 248 | 338 | 437 | 451 |
| 4" | 300 | 6.2 | 25 | 58 | 104 | 157 | 228 | 310 | 414 | 435 |
| | 600 | 5.8 | 23 | 54 | 98 | 147 | 213 | 290 | 375 | 387 |
| | 150 | 10.8 | 43 | 100 | 180 | 271 | 392 | 535 | 692 | 714 |
| 5" | 300 | 9.8 | 40 | 92 | 165 | 248 | 361 | 491 | 655 | 688 |
| | 150 | 16.5 | 66 | 154 | 278 | 419 | 607 | 827 | 1070 | 1103 |
| | 300 | 14.9 | 60 | 139 | 250 | 377 | 546 | 744 | 992 | 1041 |
| 6" | 600 | 14.7 | 59 | 137 | 247 | 372 | 538 | 734 | 950 | 979 |
| | 150 | 30.9 | 124 | 289 | 520 | 784 | 1135 | 1584 | 2002 | 2064 |
| | 300 | 27.3 | 109 | 255 | 459 | 692 | 1001 | 1365 | 1820 | 1911 |
| 8" | 600 | 26.8 | 107 | 250 | 451 | 679 | 983 | 1341 | 1734 | 1788 |
| | 150 | 52.8 | 211 | 492 | 886 | 1336 | 1934 | 2638 | 3411 | 3517 |
| | 300 | 45.6 | 183 | 426 | 767 | 1156 | 1673 | 2282 | 3042 | 3194 |
| 10" | 600 | 41.2 | 165 | 384 | 692 | 1044 | 1511 | 2060 | 2665 | 2747 |
| | 150 | 72.6 | 290 | 677 | 1219 | 1838 | 2660 | 3628 | 4690 | 4837 |
| | 300 | 63.3 | 253 | 590 | 1063 | 1602 | 2319 | 3163 | 4217 | 4428 |
| 12" | 600 | 58.4 | 233 | 545 | 981 | 1479 | 2140 | 2918 | 3774 | 3891 |
| | 150 | 90 | 392 | 914 | 1646 | 2481 | 3592 | 4898 | 6530 | 6857 |
| | 300 | 81 | 326 | 760 | 1368 | 2063 | 2986 | 4072 | 5430 | 5702 |
| 14" | 600 | 73 | 292 | 682 | 1228 | 1838 | 2680 | 3655 | 4727 | 4873 |
| | 150 | 132 | 531 | 1230 | 2229 | 3361 | 4865 | 6634 | 8845 | 9287 |
| | 300 | 109 | 435 | 1015 | 1827 | 2755 | 3988 | 5438 | 7850 | 8243 |
| 16" | 600 | 96 | 385 | 899 | 1619 | 2423 | 3533 | 4818 | 6231 | 6424 |
| | 150 | 171 | 684 | 1596 | 3873 | 4332 | 6270 | 8550 | 11270 | 11400 |
| | 300 | 139 | 555 | 1295 | 2331 | 3515 | 5088 | 6938 | 9250 | 9712 |
| 20" | 150 | 207 | 828 | 1932 | 3478 | 5244 | 7590 | 10350 | 13800 | 14420 |
| | 300 | 158 | 630 | 1470 | 2646 | 3990 | 5775 | 7875 | 10150 | 10658 |
| | 150 | 315 | 1260 | 2940 | 5292 | 7890 | 11550 | 15750 | 21000 | 22050 |
| 24" | 300 | 242 | 966 | 2254 | 4057 | 6118 | 8855 | 12075 | 16100 | 16205 |
| | 150 | 491 | 1965 | 4585 | 8253 | 12445 | 18012 | 24563 | 32750 | 34388 |
| | 300 | 404 | 1614 | 3766 | 6779 | 10222 | 14795 | 20175 | 26900 | 28245 |
| 36" | 150 | 707 | 2830 | 6602 | 11884 | 17920 | 25938 | 35370 | 45745 | 47160 |
| | 42" | 150 | 963 | 3851 | 8987 | 16176 | 24392 | 35304 | 48143 | 62264 |
| 48" | 150 | 1258 | 5030 | 11738 | 21128 | 31859 | 46111 | 62881 | 81324 | 83840 |

SERIES K VALVES

| Degree Open % Full Cv | 10° 1.5% | 20° 6% | 30° 14% | 40° 25.2% | 50° 38% | 60° 55% | 70° 75% | 80° 97% | 90° 100% | |
|--------------------------|-------------|-----------|------------|--------------|------------|------------|------------|------------|-------------|------|
| 3 | 150 | 6.5 | 17 | 36 | 59 | 92 | 138 | 176 | 236 | 262 |
| 4 | 150 | 12.9 | 32 | 70 | 119 | 181 | 273 | 348 | 468 | 519 |
| 6 | 150 | 31.4 | 79 | 171 | 290 | 443 | 667 | 849 | 1150 | 1267 |
| 8 | 150 | 58.7 | 149 | 321 | 541 | 831 | 1249 | 1632 | 2142 | 2374 |
| 10 | 150 | 100.0 | 253 | 546 | 921 | 1416 | 2127 | 2717 | 3650 | 4045 |
| 12 | 150 | 138.0 | 348 | 751 | 1268 | 1948 | 2926 | 3737 | 5018 | 5563 |

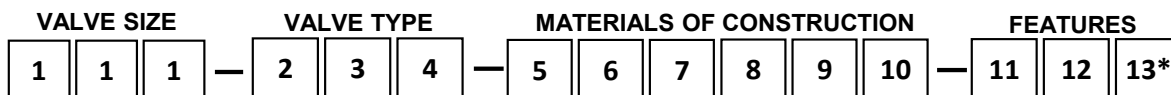
DISK DEGREE OPENING

| Disc degree opening | 15° | 20° | 25° | 30° | 35° | 40° | 45° | 50° | 55° | 60° | 65° | 70° | 75° | 80° | 85° | 90° |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Seat upstream | .95 | .91 | .84 | .81 | .78 | .80 | .77 | .74 | .74 | .73 | .70 | .66 | .63 | .60 | .57 | .53 |
| Seat downstream | .94 | .89 | .84 | .82 | .80 | .77 | .75 | .72 | .69 | .66 | .63 | .60 | .58 | .55 | .54 | .53 |

Cf FACTORS

The critical flow factor, Cf, expresses the valve pressure recovery ratio. It is equivalent to FL in ISA nomenclature.

Ordering Information



Example: 12 - 1WA - 17DMTG - 30J

12" Wafer Style Class 150 Carbon Body, Straight 17-4PH DHT SS Stem, 316 SS Nitrided Disc, Inconel Seat, TFE Pkg, Glass Backed TFE Bearings, Gear Operated

| 1. Size Code |
|--|
| 02 = 2" 025 = 2½" 03 = 3" 04 = 4" to 48 = 48" |

| 2. Body Class Code |
|--|
| 0 = 150 PSI Max Diff. Pressure 1 = ASME 150 3 = ASME 300 6 = ASME 600 |

| 3. Body Type Code |
|---|
| W = Wafer L = Lugged D = DDES Lugged ⁽²⁾ |

| 4. Shaft Design Code |
|---|
| A = Straight 2" - 12" ASME 150 36" - 48" ASME 150 2" - 12" & 30" ASME 300 2" - 8" ASME 600 C = Balanced 14" - 30" ASME 150 36" - 48" De-rated 150** 14" - 24" ASME 300 10" - 16" ASME 600 ** 150 psig maximum |

| 5. Body Material Code |
|--|
| 1 = Carbon Steel 2 = 316 SS 5 = Alum Bronze MIL-B-24480 8 = Alum Bronze B148 ASTM C958 B = 2205 Duplex ASTM A890 Gr 4A |

| 6. Disc Material Code |
|--|
| 0 = Alum Bronze/ENP B148 C958 2 = 316 SS 3 = Monel 5 = Alum Bronze MIL-B-24480 7 = 316 SS Nitrided 8 = Alum Bronze B148 ASTM C958 9 = 316 SS/ENP B = 2205 Duplex ASTM A890 Gr.4A M = Monel/ENP |

| 7. Shaft Material Code |
|---|
| D = 17-4PH DHT SS 1 = 17-4PH SS 2 = 316 SS ⁽¹⁾ 3 = Monel® 6 = Inconel® 718/750 A = ASTM B472 AL-6XN |

| 8. Seat Material Code/O-Ring |
|--|
| T = TFE/Viton ⁽⁴⁾ R = RTFE/Silicone ⁽⁶⁾ P = PTFE/Viton ⁽⁴⁾ L = Polyethylene (UHMWPE)/Viton ⁽⁴⁾ F = Fire-Flow (TFE & Inconel®)/Viton ⁽⁴⁾ A = Fire-Flow (RTFE & Inconel®)/Viton ⁽⁴⁾ B = Fire-Flow (RTFE & Inconel®)/Silicone M = Inconel® |

| 9. Packing Material Code |
|---|
| T = TFE G = Graphite F = Fire-Flow A = Live Load Packing/TFE B = Live-Load Packing/Graphite C = Live-Load Packing/Fire Flow D = EF Seal (Viton O-Rings)/TFE |

| 10. Bearing Material Code |
|---|
| G = Glass Backed TFE H = 316 SS Backed TFE F = Fire-Flow (Garfil & 316 SS) S = Stainless Steel Nitrided B = Bronze K = Monel |

| 12. Special Feature Code |
|---|
| 0 = None A = Oxygen Service B = Bi-directional C = Chlorine Service PN = CE Marked Non-Impact tested ⁽³⁾ PI = CE Marked Impact tested ⁽³⁾ VN = CE Marked NON-Impact tested w/ Vacuum Service ⁽³⁾ VI = CE Marked Impact tested w/ Vacuum Service ⁽³⁾ E = EF Seal (Low Emissions) EV = EF Seal Vacuum Service (Low Emissions) F = Flat Face G = Silicone Free H = Epoxy Coated Body J = Chainwheel K = Stem Extension L1 = Limit switch w/ SS bolting L2 = Limit switch w/ Monel bolting L = Lockable Gear MS = Gear with Memory stop N = NACE Construction ⁽⁵⁾ NN = NACE Construction w/CE Marked NON-Impact tested ⁽³⁾⁽⁵⁾ NI = NACE Construction w/CE Marked Impact tested ⁽³⁾⁽⁵⁾ R = Buried Service T = Drill Through Lugs TN = Drill Through Lugs & NACE Construction V = Vacuum Service Only select ONE special feature code per part number. |

| 11. Actuator Type Code |
|--|
| B = Bare Shaft D = Worm Gear w/2" Sq. Nut & Handwheel H = Ratchet Handle L = Ratchet Handle w/Lock T = Throttle 3 = Worm Gear 9 = Worm Gear (4-way keyed) 4 = Pneumatic Double Acting 5 = Pneumatic SR Fail Close 6 = Pneumatic SR Fail Open 7 = Hydraulic 8 = Electric |

| 13. Series Code |
|---|
| J = *Factory Assigned K = *Factory Assigned (This pertains to 3", 4", 6", 8", 10", & 12" Class 150 Soft Seat Valves) |

FLOWSEAL ACTUATOR OPTIONS:

Lever: Not recommended for Metal Seat High Performance Butterfly Valve

Worm Gear Operators: Five types available:

- High temperature service
- Buried service
- Submersible service
- Marine service
- Standard aluminum handwheel

Optional:

- Chain wheel
- Output shaft extension
- Input shaft extension
- Military special operator

Hydraulic Actuator: Customer specified hydraulic actuator

Pneumatic Actuators:

- Crane Revo® spring return pneumatic actuator
- Crane Revo® double acting pneumatic actuator
- Customer specified pneumatic actuator

Electric Actuators:

- Series 44000 electric actuator
- Customer specified electric actuator

Note(1): Shaft materials other than 17-4 PH or Monel will affect working pressure ratings. Please consult factory

Note(2): DDES = Double Dead End Service.

Note(3): For CE marked valves, see body rating chart on page 28 of the Flowseal catalog, as temp ranges can vary per material

Note(4): Viton O-Ring is recommended for use in Hydrocarbon and NACE service.

Note(5): RTFE/Silicone combination is not to be used with "NACE" valves

IMPORTANT: CRANE Co. and its subsidiaries are not responsible for the accuracy, compliance, and legality of material contained in this price list offered in print, on the company websites, or via any external links, or third party sites. Please contact your local CRANE Energy

Valve Torque Tables Engineering Data

DESCRIPTION OF TORQUE

What is TORQUE?

Torque is any (man or machine) effort which tends to cause rotation or turning. In engineering terms, torque is defined as force acting at some distance from the center of rotation. More correctly, torque equals force times the perpendicular distance from the center of rotation. The perpendicular distance from the center of turning is sometimes called a "moment arm".

Torque is measured in units of distance and force; for example, inch pounds, or foot pounds. The equation for torque is:

$$T = F \times A$$

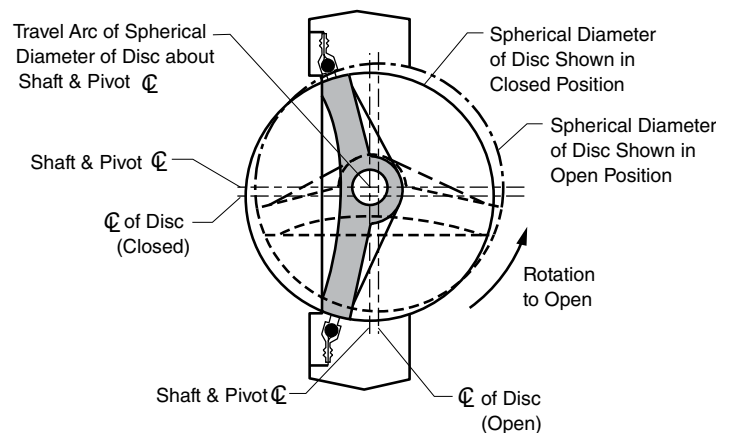
(Torque equals Force times Moment Arm)

HIGH-PERFORMANCE BUTTERFLY VALVE TORQUE

The High-Performance Butterfly Valve (HPBFV) is a "Quarter-Turn" valve design; that is, it rotates one-quarter of a full 360° turn to move from open to closed or from closed to open.

Seating torque is created by contact between the disc and seat as the disc rotates closed. Unseating torque is created by the disc breaking away from the seat as the disc rotates open. The Flowseal seat creates a seal at no-to-low pressure conditions by means of a mechanical "preload" between the disc and the seat; this pre-loading allows the seat seal to be self-energized. When line pressure is introduced, the Flowseal seat is designed to use the line pressure to create an even tighter seal between the disc and the seat (the higher the pressure, the tighter the seal); this dynamic sealing causes the Flowseal seat to be pressure energized. The valve seating and unseating torque increases as the seat seal moves from the self-energized mode to the pressure-energized mode. (Refer to the valve torque tables for the appropriate torque.)

A difference in torque exists between the seat upstream (SUS) and seat downstream (SDS) positions because of the disc and shaft design. All Flowseal HPBVs have both off-set discs and eccentric shafts. The off-set is applicable to the disc edge seating surface relative to the shaft center line. By off-setting the seating surface from the rotational center line, a contact with the seat is possible throughout the 360° circumference. The shaft is eccentric in the body by 0.060 ins. and this enhances seat life by imparting a camming action to the disc as it rotates both in and out of the seat. Seat wear points are eliminated at the top and bottom of the disc and operating torque is reduced.



FLOWSEAL HPBV ECCENTRIC SHAFT DESIGN

In the SUS position (preferred pipeline flow direction), the line pressure tends to assist in opening the valve disc. In the SDS position, the line pressure tends to assist in keeping the valve disc closed; also, line pressure acting on the surface of the disc creates more mechanical pre-load between the disc and seat. Therefore, SDS torque values are higher than SUS values.

Valve Torque Tables Engineering Data

ASME Class 150

I. SEATING and UNSEATING TORQUE VALUES

(All torque values are in inch-pounds)

| VALVE SIZE | SOFT SEAT | | | |
|------------|---------------------|----------|-----------------------|----------|
| | SEAT UPSTREAM (SUS) | | SEAT DOWNSTREAM (SDS) | |
| | 0-150 PSID | 285 PSID | 0-150 PSID | 285 PSID |
| 2" | 155 | 175 | 155 | 210 |
| 2-1/2" | 180 | 230 | 180 | 275 |
| 3" | 200 | 270 | 200 | 320 |
| 4" | 225 | 470 | 410 | 610 |
| 5" | 390 | 590 | 655 | 970 |
| 6" | 540 | 680 | 860 | 1320 |
| 8" | 910 | 1620 | 1620 | 2580 |
| 10" | 1620 | 2530 | 2630 | 4550 |
| 12" | 2530 | 3600 | 4160 | 6350 |
| 14" | 3720 | 5970 | 6200 | 9000 |
| 16" | 5530 | 9180 | 9000 | 14700 |
| 18" | 6840 | 11900 | 14500 | 20100 |
| 20" | 10020 | 16970 | 18000 | 27200 |
| 24" | 18330 | 32290 | 28100 | 43000 |
| 30" | 32330 | 56930 | 45500 | 71800 |
| 36" | 47000 | 81000 | 66000 | 102000 |
| 42" | 65000 | 111000 | 92000 | 140000 |
| 48" | 83000 | 146000 | 115000 | 184000 |

| VALVE SIZE | FIRE FLOW SEAT | | | |
|------------|---------------------|----------|-----------------------|----------|
| | SEAT UPSTREAM (SUS) | | SEAT DOWNSTREAM (SDS) | |
| | 0-150 PSID | 285 PSID | 0-150 PSID | 285 PSID |
| 2" | 430 | 480 | 495 | 585 |
| 2-1/2" | 460 | 520 | 530 | 635 |
| 3" | 480 | 540 | 550 | 660 |
| 4" | 645 | 770 | 800 | 1050 |
| 5" | 1120 | 1320 | 1780 | 2560 |
| 6" | 1520 | 1740 | 2420 | 3380 |
| 8" | 2350 | 2950 | 4180 | 4700 |
| 10" | 4080 | 5100 | 6630 | 9200 |
| 12" | 5830 | 7500 | 9600 | 13300 |
| 14" | 9100 | 11300 | 15200 | 17000 |
| 16" | 11900 | 16400 | 19400 | 26300 |
| 18" | 17300 | 22100 | 36700 | 37400 |
| 20" | 23700 | 34300 | 42600 | 55000 |
| 24" | 36700 | 59800 | 56300 | 79600 |
| 30" | 61200 | 89800 | 86100 | 113300 |
| 36" | 90360 | 135540 | 135500 | 203310 |

| VALVE SIZE | METAL SEAT | | | |
|------------|---------------------|----------|-----------------------|----------|
| | SEAT UPSTREAM (SUS) | | SEAT DOWNSTREAM (SDS) | |
| | 0-150 PSID | 285 PSID | 0-150 PSID | 285 PSID |
| 2" | 750 | 1040 | | |
| 2-1/2" | 840 | 1160 | | |
| 3" | 900 | 1250 | | |
| 4" | 1200 | 1550 | | |
| 5" | 2100 | 2800 | | |
| 6" | 2500 | 3200 | | |
| 8" | 3800 | 4700 | | |
| 10" | 6400 | 8700 | CONSULT | CONSULT |
| 12" | 8600 | 12800 | FACTORY | FACTORY |
| 14" | 11200 | 15100 | | |
| 16" | 17800 | 24200 | | |
| 18" | 26100 | 32300 | | |
| 20" | 33500 | 47600 | | |
| 24" | 53000 | 71000 | | |
| 30" | 80500 | 115000 | | |
| 36" | 122000 | 175000 | | |

Torque values shown are for on/off applications and include a 5% actuator sizing margin for normal liquid and gas applications. For severe services, or unusual fluids or slurries, consult factory.

II. HYDRODYNAMIC TORQUE VALUES

The equal percentage flow characteristics of the Flowseal HPBV makes it well-suited for proportional control applications. Hydrodynamic valve torques develop as a result of the pipeline process conditions (media, velocity, pressure, temperature, and turbulence) and the shape and degree position of the valve disc. Under certain conditions, hydrodynamic torques can meet or exceed seating and unseating torques; when selecting actuators for throttling services, hydrodynamic torque must be considered to help ensure correct selection of actuation.

The chart below provides C_t (Torque Coefficient) factors to aid in actuator sizing. The C_t factors are based on water at ambient temperature, and do not take into account other factors, such as: cavitation, flashing, noise, vibration, etc. These considerations should be addressed prior to hydrodynamic torque sizing.

The equation for hydrodynamic torque is:

$$T_d = C_t \times \Delta P$$

where, ΔP = Pressure drop across the valve at the degree of opening, in PSID
 C_t = Torque Coefficient Factor
 T_d = Hydrodynamic Torque, in inch-pounds

| VALVE SIZE | C_t = TORQUE COEFFICIENT FACTORS | | | | | | | | |
|------------|------------------------------------|--------|---------|---------|---------|---------|---------|---------|---------|
| | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° |
| 3" | 1.23 | 1.59 | 2.56 | 4.00 | 6.25 | 9.09 | 14.29 | 12.99 | 15.87 |
| 4" | 2.38 | 3.03 | 4.76 | 7.69 | 11.49 | 16.39 | 25.00 | 24.39 | 32.26 |
| 6" | 5.00 | 7.69 | 14.29 | 24.39 | 43.48 | 71.43 | 111.11 | 100.00 | 125.00 |
| 8" | 12.99 | 19.23 | 31.25 | 55.56 | 90.91 | 158.73 | 256.41 | 217.39 | 238.10 |
| 10" | 22.73 | 34.48 | 55.56 | 100.00 | 166.67 | 277.78 | 454.55 | 384.62 | 416.67 |
| 12" | 33.33 | 52.63 | 100.00 | 166.67 | 333.33 | 467.19 | 625.00 | 588.24 | 625.00 |
| 14" | 35.71 | 55.56 | 90.91 | 158.73 | 256.41 | 454.55 | 714.29 | 625.00 | 769.23 |
| 16" | 66.67 | 106.38 | 185.19 | 322.58 | 625.00 | 613.50 | 1333.33 | 1219.51 | 1351.35 |
| 18" | 83.33 | 120.48 | 208.33 | 357.14 | 588.24 | 1000.00 | 1538.46 | 1333.33 | 1428.57 |
| 20" | 126.58 | 196.08 | 344.83 | 588.24 | 1136.36 | 1724.14 | 2500.00 | 2272.73 | 2439.02 |
| 24" | 200.00 | 322.58 | 588.24 | 1000.00 | 1960.78 | 2702.70 | 4000.00 | 3571.43 | 3846.14 |
| 30" | 333.33 | 526.32 | 1000.00 | 1694.92 | 3333.33 | 4761.90 | 6666.67 | 5882.35 | 6250.00 |



Valve Torque Tables Engineering Data

ASME Class 300

I. SEATING and UNSEATING TORQUE VALUES

(All torque values are in inch-pounds)

| VALVE SIZE | SOFT SEAT | | | | | | | | | | | |
|------------|---------------------|----------|----------|----------|----------|----------|-----------------------|----------|----------|----------|----------|----------|
| | SEAT UPSTREAM (SUS) | | | | | | SEAT DOWNSTREAM (SDS) | | | | | |
| | 0-150 PSID | 285 PSID | 400 PSID | 500 PSID | 600 PSID | 700 PSID | 0-150 PSID | 285 PSID | 400 PSID | 500 PSID | 600 PSID | 700 PSID |
| 2" | 170 | 195 | 290 | 350 | 400 | 470 | 170 | 235 | 350 | 410 | 460 | 480 |
| 2-1/2" | 200 | 255 | 375 | 440 | 510 | 610 | 210 | 305 | 450 | 520 | 590 | 620 |
| 3" | 220 | 300 | 440 | 520 | 595 | 700 | 220 | 350 | 520 | 600 | 675 | 700 |
| 4" | 250 | 520 | 610 | 670 | 790 | 970 | 460 | 675 | 850 | 1000 | 1150 | 1300 |
| 5" | 430 | 660 | 830 | 990 | 1180 | 1450 | 735 | 1080 | 1310 | 1570 | 1730 | 2070 |
| 6" | 600 | 750 | 940 | 1120 | 1330 | 1630 | 950 | 1450 | 1750 | 2100 | 2300 | 2750 |
| 8" | 1000 | 1800 | 1950 | 2440 | 2810 | 3390 | 1800 | 2850 | 3400 | 4000 | 4500 | 5250 |
| 10" | 1800 | 2790 | 3840 | 4640 | 5370 | 6510 | 2900 | 5000 | 5700 | 6700 | 7600 | 8750 |
| 12" | 2790 | 4000 | 6140 | 7480 | 8590 | 11390 | 4600 | 7000 | 8000 | 9500 | 11000 | 12850 |
| 14" | 4130 | 6640 | 8630 | 10200 | 12100 | 14940 | 8200 | 11500 | 14500 | 17000 | 18000 | 22000 |
| 16" | 6140 | 10200 | 14000 | 17070 | 19640 | 24440 | 14000 | 17000 | 23500 | 26500 | 30000 | 35100 |
| 18" | 7600 | 13220 | 17100 | 20400 | 23990 | 29460 | 17500 | 24000 | 30000 | 34000 | 38000 | 44500 |
| 20" | 11140 | 18860 | 25010 | 31530 | 36310 | 42990 | 23500 | 32000 | 40000 | 44500 | 51500 | 59400 |
| 24" | 20370 | 35870 | 48260 | 58820 | 71330 | 85080 | 38000 | 52000 | 61500 | 70000 | 79500 | 90000 |
| 30" | 35920 | 63260 | 88430 | 109620 | 125290 | 156780 | 80000 | 110000 | 135000 | 155000 | 182000 | 200000 |

| VALVE SIZE | FIRE FLOW SEAT | | | | | | | | | | | |
|------------|---------------------|----------|----------|----------|----------|----------|-----------------------|----------|----------|----------|----------|----------|
| | SEAT UPSTREAM (SUS) | | | | | | SEAT DOWNSTREAM (SDS) | | | | | |
| | 0-150 PSID | 285 PSID | 400 PSID | 500 PSID | 600 PSID | 700 PSID | 0-150 PSID | 285 PSID | 400 PSID | 500 PSID | 600 PSID | 700 PSID |
| 2" | 500 | 550 | 620 | 670 | 720 | 820 | 620 | 715 | 810 | 880 | 940 | 1070 |
| 2-1/2" | 530 | 600 | 675 | 725 | 770 | 880 | 660 | 775 | 875 | 940 | 1000 | 1140 |
| 3" | 550 | 620 | 700 | 750 | 800 | 910 | 688 | 806 | 910 | 975 | 1040 | 1183 |
| 4" | 800 | 880 | 1040 | 1230 | 1420 | 1510 | 1000 | 1144 | 1352 | 1599 | 1846 | 1963 |
| 5" | 1290 | 1520 | 1670 | 1800 | 1960 | 2310 | 2225 | 3020 | 3290 | 3560 | 3870 | 4550 |
| 6" | 1750 | 2000 | 2180 | 2350 | 2550 | 3000 | 2975 | 3400 | 3700 | 4000 | 4335 | 5100 |
| 8" | 2700 | 3300 | 3900 | 4700 | 5100 | 5800 | 4590 | 5610 | 6630 | 8000 | 8670 | 9860 |
| 10" | 4700 | 5600 | 6600 | 7400 | 8600 | 9300 | 7990 | 9520 | 11220 | 12600 | 14620 | 15810 |
| 12" | 6700 | 8300 | 10800 | 12000 | 14160 | 17420 | 11390 | 14110 | 18360 | 20400 | 24070 | 29615 |
| 14" | 9100 | 11300 | 13110 | 17280 | 20500 | 25320 | 14570 | 19210 | 22290 | 29380 | 34850 | 43040 |
| 16" | 11900 | 16400 | 22580 | 27530 | 31670 | 39420 | 20230 | 27880 | 38390 | 46800 | 53840 | 67000 |
| 18" | 17300 | 22100 | 28500 | 34000 | 40000 | 49100 | 29410 | 37570 | 48450 | 57800 | 68000 | 83470 |
| 20" | 23700 | 34300 | 45470 | 57320 | 66020 | 78160 | 40290 | 58310 | 77300 | 97450 | 112230 | 132870 |
| 24" | 36700 | 59800 | 80430 | 98030 | 118800 | 141800 | 55050 | 83720 | 112600 | 137250 | 166300 | 198500 |
| 30" | 61200 | 89800 | 126320 | 156600 | 179000 | 224000 | 91800 | 125720 | 176850 | 219250 | 250600 | 313600 |

| VALVE SIZE | METAL SEAT | | | | | | | | | | | |
|------------|---------------------|----------|----------|----------|----------|----------|-----------------------|----------|----------|----------|----------|----------|
| | SEAT UPSTREAM (SUS) | | | | | | SEAT DOWNSTREAM (SDS) | | | | | |
| | 0-150 PSID | 285 PSID | 400 PSID | 500 PSID | 600 PSID | 700 PSID | 0-150 PSID | 285 PSID | 400 PSID | 500 PSID | 600 PSID | 700 PSID |
| 2" | 750 | 1040 | 1170 | 1300 | | | | | | | | |
| 2-1/2" | 840 | 1160 | 1300 | 1440 | | | | | | | | |
| 3" | 900 | 1250 | 1400 | 1550 | | | | | | | | |
| 4" | 1200 | 1550 | 1700 | 1850 | | | | | | | | |
| 5" | 2350 | 2975 | 3770 | 5000 | | | | | | | | |
| 6" | 2800 | 3400 | 4300 | 5700 | | | | | | | | |
| 8" | 4100 | 5300 | 6600 | 8100 | | | | | | | | |
| 10" | 6800 | 9200 | 11300 | 14500 | | | | | | | | |
| 12" | 9100 | 13500 | 17400 | 23600 | | | | | | | | |
| 14" | 12100 | 17900 | 22600 | 29800 | | | | | | | | |
| 16" | 19100 | 26700 | 31400 | 38800 | | | | | | | | |
| 18" | 28700 | 37300 | 46400 | 53200 | | | | | | | | |
| 20" | 39200 | 53400 | 65100 | 81000 | | | | | | | | |
| 24" | 67000 | 83200 | 97600 | 109200 | | | | | | | | |
| 30" | 112000 | 131000 | 164000 | 193000 | | | | | | | | |

Torque values shown are for on/off applications and include a 5% actuator sizing margin for normal liquid and gas applications.

For severe services, or unusual fluids or slurries, consult factory.

II. HYDRODYNAMIC TORQUE VALUES

The chart below provides C_t (Torque Coefficient) factors to aid in actuator sizing. The C_t factors are based on water at ambient temperature, and do not take into account other factors, such as: cavitation, flashing, noise, vibration, etc. These considerations should be addressed prior to hydrodynamic torque sizing.

The equation for hydrodynamic torque is:

$$T_d = C_t \times \Delta P$$

where, ΔP = Pressure drop across the valve at the degree of opening, in PSID

C_t = Torque Coefficient Factor

T_d = Hydrodynamic Torque, in inch-pounds

| VALVE SIZE | C_t = TORQUE COEFFICIENT FACTORS | | | | | | | | |
|------------|------------------------------------|--------|---------|---------|---------|---------|---------|---------|---------|
| | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° |
| 3" | 0.94 | 1.23 | 2.00 | 3.13 | 4.76 | 7.14 | 10.64 | 12.99 | 12.66 |
| 4" | 1.75 | 2.22 | 3.57 | 5.56 | 8.33 | 12.05 | 18.52 | 22.73 | 23.26 |
| 6" | 3.70 | 5.88 | 10.42 | 17.54 | 30.30 | 52.63 | 78.74 | 76.92 | 83.33 |
| 8" | 9.09 | 13.70 | 22.22 | 38.46 | 66.67 | 109.89 | 185.44 | 169.49 | 163.93 |
| 10" | 15.15 | 23.26 | 38.46 | 66.67 | 112.36 | 185.19 | 303.03 | 263.16 | 270.27 |
| 12" | 23.81 | 38.46 | 71.43 | 117.65 | 232.56 | 333.33 | 454.55 | 434.78 | 444.44 |
| 14" | 33.33 | 50.00 | 83.33 | 144.93 | 238.10 | 400.00 | 625.00 | 588.24 | 666.67 |
| 16" | 62.50 | 100.00 | 163.93 | 277.78 | 500.00 | 769.23 | 1162.79 | 1098.90 | 1176.47 |
| 18" | 66.67 | 102.04 | 175.44 | 285.71 | 454.78 | 769.23 | 1204.82 | 1190.48 | 1234.57 |
| 20" | 102.04 | 163.93 | 277.78 | 476.19 | 909.09 | 1315.79 | 1923.08 | 1785.71 | 2040.82 |
| 24" | 158.73 | 250.00 | 454.55 | 769.23 | 1369.86 | 2083.33 | 3125.00 | 2777.78 | 2941.18 |
| 30" | 357.14 | 500.00 | 1010.10 | 1694.92 | 3125.00 | 4545.45 | 6250.00 | 5882.35 | 6060.61 |

Valve Torque Tables Engineering Data

ASME Class 600

I. SEATING and UNSEATING TORQUE VALUES

(All torque values are in inch-pounds)

| VALVE SIZE | SOFT SEAT | | | | | | | | | | | |
|------------|---------------------|----------|----------|------------|------------|------------|-----------------------|----------|----------|------------|------------|------------|
| | SEAT UPSTREAM (SUS) | | | | | | SEAT DOWNSTREAM (SDS) | | | | | |
| | 0-150 PSID | 500 PSID | 800 PSID | 1,000 PSID | 1,200 PSID | 1,480 PSID | 0-150 PSID | 500 PSID | 800 PSID | 1,000 PSID | 1,200 PSID | 1,480 PSID |
| 2" | 195 | 290 | 400 | 470 | 540 | 640 | 230 | 500 | 605 | 750 | 840 | 1020 |
| 3" | 240 | 620 | 720 | 749 | 878 | 1034 | 290 | 629 | 760 | 943 | 1061 | 1250 |
| 4" | 341 | 690 | 893 | 1063 | 1248 | 1473 | 477 | 1035 | 1431 | 1550 | 1746 | 2061 |
| 6" | 710 | 1330 | 1861 | 2215 | 2601 | 3065 | 994 | 2196 | 2850 | 3101 | 3640 | 4291 |
| 8" | 1423 | 3079 | 4498 | 5444 | 6476 | 7714 | 1992 | 4310 | 6297 | 7622 | 9066 | 10800 |
| 10" | 2371 | 5469 | 8124 | 9894 | 11825 | 14142 | 3319 | 7657 | 11374 | 13852 | 16555 | 19800 |
| 12" | 3795 | 9357 | 14124 | 17302 | 20758 | 24929 | 5313 | 13100 | 19774 | 24223 | 29075 | 34900 |
| 14" | 4860 | 12312 | 18699 | 22957 | 27600 | 33176 | 6804 | 17237 | 26180 | 32140 | 38640 | 46440 |
| 16" | 6820 | 17278 | 26241 | 32216 | 38732 | 46558 | 9549 | 24190 | 36740 | 45104 | 54226 | 65180 |

| VALVE SIZE | FIRE FLOW SEAT | | | | | | | | | | | |
|------------|---------------------|----------|----------|------------|------------|------------|-----------------------|----------|----------|------------|------------|------------|
| | SEAT UPSTREAM (SUS) | | | | | | SEAT DOWNSTREAM (SDS) | | | | | |
| | 0-150 PSID | 500 PSID | 800 PSID | 1,000 PSID | 1,200 PSID | 1,480 PSID | 0-150 PSID | 500 PSID | 800 PSID | 1,000 PSID | 1,200 PSID | 1,480 PSID |
| 2" | 650 | 1400 | 2050 | 2480 | | | | | | | | |
| 3" | 740 | 1600 | 2330 | 2820 | | | | | | | | |
| 4" | 1270 | 2800 | 4130 | 5010 | | | | | | | | |
| 6" | 2670 | 7000 | 10700 | 13170 | CONSULT | | | CONSULT | | | | |
| 8" | 4600 | 12680 | 19500 | 24050 | FACTORY | | | FACTORY | | | | |
| 10" | 5600 | 13190 | 22530 | 28720 | | | | | | | | |
| 12" | 8687 | 21100 | 31560 | 38510 | | | | | | | | |
| 14" | 12090 | 28910 | 43060 | 52430 | | | | | | | | |
| 16" | 19740 | 47880 | 71600 | 87330 | | | | | | | | |

| VALVE SIZE | METAL SEAT | | | | | | | | | | | |
|------------|---------------------|----------|----------|------------|------------|------------|-----------------------|----------|----------|------------|------------|------------|
| | SEAT UPSTREAM (SUS) | | | | | | SEAT DOWNSTREAM (SDS) | | | | | |
| | 0-150 PSID | 500 PSID | 800 PSID | 1,000 PSID | 1,200 PSID | 1,480 PSID | 0-150 PSID | 500 PSID | 800 PSID | 1,000 PSID | 1,200 PSID | 1,480 PSID |
| 2" | 760 | 1325 | 1970 | 2310 | | | | | | | | |
| 3" | 950 | 1600 | 2330 | 2820 | | | | | | | | |
| 4" | 1270 | 2800 | 4130 | 5010 | | | | | | | | |
| 6" | 2670 | 7000 | 10700 | 13170 | CONSULT | | | CONSULT | | | | |
| 8" | 4600 | 12680 | 19500 | 24050 | FACTORY | | | FACTORY | | | | |
| 10" | 8210 | 21810 | 33460 | 41230 | | | | | | | | |
| 12" | 13970 | 36920 | 56600 | 69700 | | | | | | | | |
| 14" | 17900 | 47650 | 73160 | 90167 | | | | | | | | |
| 16" | 21520 | 56540 | 86550 | 106570 | | | | | | | | |

Torque values shown are for on/off applications and include a 5% actuator sizing margin for normal liquid and gas applications.

For severe services, or unusual fluids or slurries, consult factory.

II. HYDRODYNAMIC TORQUE VALUES: CONSULT FACTORY

MATERIAL DESCRIPTIONS

| MATERIAL FORM | DESCRIPTION | GENERIC NAME | SPECIFICATION | GRADE OR TYPE | CONDITIONS / COMMENTS |
|---------------|------------------|-----------------------|---------------|---------------|----------------------------------|
| CASTING | A216 WCB | CARBON STEEL | ASTM A216 | WCB | NORMALIZED AND TEMPERED |
| | A351 CF8M | STAINLESS STEEL, 316 | ASTM A351 | CF8M | SOLUTION ANNEALED |
| | A351 CN7M | ALLOY 20 | ASTM A351 | CN7M | SOLUTION ANNEALED |
| | A352 LCB | CARBON STEEL TO -50°F | ASTM A352 | LCB | QUENCHED AND TEMPERED |
| | B148 C958 | ALUMINUM - BRONZE | ASTM B148 | C95800 | ANNEALED |
| A494 M35-1 | MONEL | ASTM A494 | M35-1 | ANNEALED | |
| BARSTOCK | NITR 50 | NITRONIC 50 | ASTM A479 | XM19 | - |
| | A479 316 | STAINLESS STEEL, 316 | ASTM A479 | 316 | - |
| | 17-4 H1150 | 17-4PH | ASTM A564 | 630 | CONDITION H1150 |
| | 17-4 H1150+H1150 | 17-4PH | ASTM A564 | 630 | CONDITION H1150D |
| | B473 20CB | ALLOY 20 | ASTM B473 | - | - |
| | B164 N400 | MONEL 400 | ASTM B164 | - | STRESS RELIEVED |
| | B865 N500 | K-MONEL 500 | ASTM B865 | - | AGE HARDENED |
| | INC 718 | INCONEL 718 | ASTM B637 | 718 | AGE HARDENED |
| | C.S. | CARBON STEEL | AS AVAILABLE | VARIOUS | LOW CARBON (C1018), GENERIC |
| | 18-8 S.S. | STAINLESS STEEL | AS AVAILABLE | VARIOUS | 300 SERIES (304 SS), GENERIC |
| BOLTING | A193-B7 | ALLOY STEEL | ASTM A193 | B7 | - |
| | A193-B8 | STAINLESS STEEL, 304 | ASTM A193 | B8 | - |
| | A193-B8M | STAINLESS STEEL, 316 | ASTM A193 | B8M | - |
| | ALY STL | ALLOY STEEL | SAE | 5 | BRACKET & ACCESSORY BOLTING |
| | 18-8 S.S. | STAINLESS STEEL | - | - | 300 SERIES (304) STAINLESS STEEL |

Valve Torque Tables Engineering Data

MAXIMUM ALLOWABLE SHAFT TORQUE (MAST) VALUES

| SHAFT MATERIAL | FS | NOMINAL SHAFT DIAMETER | | | | | | | | | | | | | | | |
|------------------|---------------------------|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| | ID No. | 0.500" | 0.625" | 0.750" | 1.000" | 1.250" | 1.500" | 1.750" | 2.000" | 2.250" | 2.500" | 3.000" | 3.500" | 3.750" | 4.500" | 5.000" | |
| Stainless Steels | 17-4 PH, Cond. H1150 SS | 1 | 752 | 1637 | 2720 | 6119 | 13172 | 23947 | 36817 | 56842 | 74187 | 105862 | 192250 | 295445 | 370077 | 663974 | 891509 |
| | 17-4 PH, Cond. H1150-D SS | D | | | | | | | | | | | | | | | |
| | 316 SS | 2 | 215 | 467 | 777 | 1748 | 3763 | 6842 | 10519 | 16240 | 21196 | 30247 | 54929 | 84412 | 105735 | 189706 | 254714 |
| | 317 SS | F | | | | | | | | | | | | | | | |
| | Nitronic 50 SS (XM-19) | 0 | 394 | 857 | 1425 | 3205 | 6900 | 12544 | 19285 | 29775 | 38860 | 55452 | 100702 | 154755 | 193848 | 347797 | 466982 |
| | Avesta 254 SMO SS | C | 322 | 701 | 1166 | 2622 | 5645 | 10263 | 15779 | 24361 | 31795 | 45370 | 82394 | 126621 | 158603 | 284563 | 382071 |
| | Ferrallium 255 SS | 7 | 573 | 1246 | 2072 | 4662 | 10036 | 18245 | 28052 | 43309 | 56524 | 80657 | 146475 | 225103 | 281965 | 505885 | 679236 |
| | S32205 SS | B | 466 | 1013 | 1683 | 3788 | 8154 | 14824 | 22791 | 35188 | 45926 | 65534 | 119011 | 182894 | 229093 | 411032 | 551879 |
| Nickel Alloys | Alloy 20 | 4 | 251 | 545 | 906 | 2040 | 4390 | 7981 | 12272 | 18948 | 24729 | 35287 | 64082 | 98482 | 123362 | 221322 | 297170 |
| | AL-6XN | A | 322 | 701 | 1166 | 2622 | 5645 | 10263 | 15779 | 24361 | 31795 | 45370 | 82394 | 126621 | 158603 | 284563 | 382071 |
| | Monel 400 | 3 | 286 | 623 | 1036 | 2330 | 5018 | 9122 | 14026 | 21654 | 28263 | 40328 | 73237 | 112548 | 140985 | 252947 | 339628 |
| | Monel K-500 | 3X | 609 | 1324 | 2202 | 4952 | 10663 | 19386 | 29804 | 46015 | 60056 | 85697 | 155631 | 239167 | 299587 | 537501 | 721687 |
| | Inconel 718 | 6 | 1075 | 2338 | 3886 | 8742 | 18817 | 34210 | 52596 | 81203 | 105982 | 151231 | 274642 | 422061 | 528680 | 948532 | 1273570 |
| | Inconel X-750 | 6 | 825 | 1793 | 2979 | 6702 | 14427 | 26228 | 40324 | 62256 | 81253 | 115943 | 210558 | 323580 | 405322 | 727211 | 976410 |
| | Hastelloy C-276 | H | 295 | 640 | 1064 | 2393 | 5152 | 9367 | 14401 | 22235 | 29019 | 41409 | 75200 | 115563 | 144761 | 259721 | 348717 |

| SIZES | NOMINAL SHAFT DIAMETER | | | | | | | | | | | | | | | |
|-----------------------|------------------------|--------------------|----------|--------|--------|------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--|
| | 0.500" | 0.625" | 0.750" | 1.000" | 1.250" | 1.500" | 1.750" | 2.000" | 2.250" | 2.500" | 3.000" | 3.500" | 3.750" | 4.500" | 5.000" | |
| CLASS 150 VALVE SIZES | 2" 2 1/2" | 3" 3 1/2" 4" | 5" 6" | 8" | 10" | 12" 14" | 16" | 18" | 20" | 24" | 30" | - | 36" | 42" | 48" | |
| CLASS 300 VALVE SIZES | 2" 2 1/2" | 3" 3 1/2" 4" | 5" | 6" | 8" | 10" | 12" | 14" | 16" | 18" | 20" | 24" | - | 30" | - | |
| CLASS 600 VALVE SIZES | 2" 2 1/2" | 3" | 4" | - | 6" | 8" | 10" | - | 12" | - | 16" | - | - | - | - | |

*All MAST values are in inch-pounds.

Notes:

1. Torque values are calculated based on a maximum stress level equal to 56% of the yield strength of the material, with a 5% safety factor included.
2. MAST values apply to shaft materials at ambient temperature.

Body & Components Pressure/Temperature Ratings

BODY RATING

The charts below reflect the pressure/temperature ratings for carbon steel and stainless steel valves, in accordance with ASME B16.34. The hydrostatic shell test is performed on the body at 150% of the cold working pressure (C.W.P. is defined as the pressure rating between -20 to 100°F [-28°C to 37°C]) and the hydrostatic seat test is performed on the disc and seat at 110% of the cold working pressure.

| °F | Maximum Non-Shock Working Pressure-PSI | | | | | | | | |
|------------------------|--|------|------|-----------------------------|------|------|-------|------|------|
| | Carbon Steel ⁽¹⁾ | | | Carbon Steel ⁽²⁾ | | | 316SS | | |
| ASME Class | 150 | 300 | 600 | 150 | 300 | 600 | 150 | 300 | 600 |
| HYDROSTATIC SHELL TEST | 450 | 1125 | 2225 | 450 | 1125 | 2225 | 425 | 1100 | 2175 |
| HYDROSTATIC SEAT TEST | 315 | 815 | 1630 | 315 | 815 | 1630 | 305 | 800 | 1585 |
| -20 - 32 | 285 | 740 | 1480 | - | - | - | 275 | 720 | 1440 |
| 32-100 | 285 | 740 | 1480 | 285 | 740 | 1480 | 275 | 720 | 1440 |
| 200 | 260 | 675 | 1350 | 260 | 675 | 1350 | 240 | 620 | 1240 |
| 300 | 230 | 655 | 1315 | 230 | 655 | 1315 | 215 | 560 | 1120 |
| 400 | 200 | 635 | 1270 | 200 | 635 | 1270 | 195 | 515 | 1030 |
| 500 | 170 | 600 | 1200 | 170 | 600 | 1200 | 170 | 480 | 955 |
| 600 | 140 | 550 | 1095 | 140 | 550 | 1095 | 140 | 450 | 905 |
| 650 | 125 | 535 | 1075 | 125 | 535 | 1075 | 125 | 445 | 890 |
| 700 | 110 | 535 | 1065 | 110 | 535 | 1065 | 110 | 430 | 865 |
| 750 | 95 | 505 | 1010 | 95 | 505 | 1010 | 95 | 425 | 845 |
| 800 | 80 | 410 | 825 | 80 | 410 | 825 | 80 | 415 | 830 |
| 850 | | | | | | | 65 | 405 | 810 |
| 900 | | | | | | | 50 | 395 | 790 |
| 1000 | | | | | | | 20 | 365 | 725 |

| °C | Maximum Non-Shock Working Pressure-Bars | | | | | | | | |
|------------------------|---|------|-------|-----------------------------|------|-------|-------|------|-------|
| | Carbon Steel ⁽¹⁾ | | | Carbon Steel ⁽²⁾ | | | 316SS | | |
| ASME Class | 150 | 300 | 600 | 150 | 300 | 600 | 150 | 300 | 600 |
| HYDROSTATIC SHELL TEST | 30 | 77 | 153 | 30 | 77 | 153 | 29 | 75 | 150 |
| HYDROSTATIC SEAT TEST | 22 | 56.9 | 112.4 | 22 | 56.9 | 112.4 | 20.9 | 54.6 | 109.3 |
| -29 to 0 | 19.6 | 51.1 | 102.1 | - | - | - | 19.0 | 49.6 | 99.3 |
| 0 to 38 | 19.6 | 51.1 | 102.1 | 19.6 | 51.1 | 102.1 | 19.0 | 49.6 | 99.3 |
| 50 | 19.2 | 50.1 | 100.2 | 19.2 | 50.1 | 100.2 | 18.4 | 48.1 | 96.3 |
| 100 | 17.7 | 46.4 | 92.8 | 17.7 | 46.4 | 92.8 | 16.2 | 42.2 | 84.4 |
| 150 | 15.8 | 45.2 | 90.5 | 15.8 | 45.2 | 90.5 | 14.8 | 38.5 | 77.0 |
| 200 | 14.0 | 43.8 | 87.6 | 14.0 | 43.8 | 87.6 | 13.7 | 35.7 | 71.3 |
| 250 | 12.1 | 41.7 | 83.4 | 12.1 | 41.7 | 83.4 | 12.1 | 33.4 | 66.8 |
| 300 | 10.2 | 38.7 | 77.5 | 10.2 | 38.7 | 77.5 | 10.2 | 31.6 | 63.3 |
| 350 | 8.4 | 37.0 | 73.9 | 8.4 | 37.0 | 73.9 | 8.4 | 30.4 | 60.8 |
| 400 | 6.5 | 34.5 | 69.0 | 6.5 | 34.5 | 69.0 | 6.5 | 29.1 | 58.2 |
| 425 | 5.6 | 28.8 | 57.5 | 5.6 | 28.8 | 57.5 | 5.6 | 28.7 | 57.3 |
| 450 | | | | | | | 4.7 | 28.1 | 56.2 |
| 500 | | | | | | | 2.8 | 26.8 | 53.7 |
| 525 | | | | | | | 1.9 | 25.8 | 51.6 |

⁽¹⁾ CE impact tested materials and standard non-impact tested materials.

⁽²⁾ CE non-impact tested materials.

⁽¹⁾ CE impact tested materials and standard non-impact tested materials.

⁽²⁾ CE non-impact tested materials.

COMPONENTS RATING

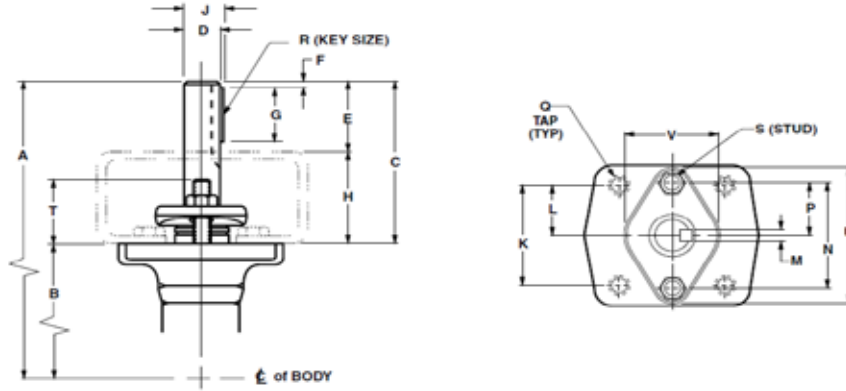
The chart at right reflects the maximum temperature ratings for individual components of the Flowseal HPBV.

Special care should be taken when specifying component materials for valves at elevated temperatures, especially metal seat valves.

Consult factory if additional information is required regarding the suitability of components for specific pressure/temperature applications.

| Description & Material | Temperature | |
|-------------------------------|--------------|------------|
| | °F | °C |
| Seat Seal (Soft Seated) | | |
| TFE | -100 to 400 | -73 to 204 |
| RTFE | -100 to 500 | -73 to 260 |
| UHMWPE | -100 to 200 | -73 to 93 |
| Seat Seal (Fire-Flow) | | |
| TFE/Inconel® | -100 to 400 | -73 to 204 |
| RTFE/Inconel® | -100 to 500 | -73 to 260 |
| Seat Seal (Metal Seats) | | |
| Inconel® 718 | -100 to 1150 | -73 to 621 |
| 316 Stainless Steel | -100 to 1000 | -73 to 538 |
| Seat O-Ring | | |
| Silicone (Standard with RTFE) | -100 to 500 | -73 to 260 |
| Viton® (Standard with TFE) | -50 to 400 | -46 to 204 |
| Stem Packing | | |
| TFE | -100 to 500 | -73 to 260 |
| Graphite | -100 to 1150 | -73 to 621 |
| Shaft | | |
| 17-4PH H1150 | -100 to 800 | -73 to 427 |
| 17-4PH H1150M | -100 to 800 | -73 to 427 |
| 316 Stainless Steel | -100 to 1150 | -73 to 621 |
| K-Monel® 500 | -100 to 1150 | -73 to 621 |
| Inconel® 718 | -100 to 1150 | -73 to 621 |
| Bearings | | |
| TFE/Fiberglass Composite | -100 to 500 | -73 to 260 |
| RTFE/316 Stainless Steel | -100 to 500 | -73 to 260 |
| Bronze | -100 to 750 | -73 to 339 |
| Steel | -100 to 1150 | -73 to 621 |
| 316 Stainless Steel | -100 to 1000 | -73 to 538 |
| Disc Treatment | | |
| Electroless Nickel Plating | -100 to 750 | -73 to 399 |
| Stellite | -100 to 1150 | -73 to 621 |
| Malcomizing | -100 to 900 | -73 to 482 |

Valve Mouting Pad Dimensions Engineering Data



| SIZE | CLASS | SERIES | A | B | C | D | E | F | G | H | J | K | L | M | N | P | Q | R | S | T | U | V |
|-------|-------|--------|-------|-------|-------|-------|------|------|------|------|-------|------|------|-------|------|------|--------|--------------|---------|------|------|------|
| 2 | 150 | J | 7.59 | 4.25 | 3.34 | 0.500 | 0.98 | 0.15 | 0.88 | 2.36 | 0.576 | 2.25 | 1.13 | 0.188 | 2.38 | 1.19 | 3/8-16 | 3/16 x 0.88 | 5/16-18 | 1.63 | 3.13 | 2.00 |
| | 300 | J | 7.59 | 4.25 | 3.34 | 0.500 | 0.98 | 0.15 | 0.88 | 2.36 | 0.576 | 2.25 | 1.13 | 0.188 | 2.38 | 1.19 | 3/8-16 | 3/16 x 0.88 | 5/16-18 | 1.63 | 3.13 | 2.00 |
| | 600 | J | 7.59 | 4.25 | 3.34 | 0.500 | 0.98 | 0.15 | 0.88 | 2.36 | 0.576 | 2.25 | 1.13 | 0.188 | 2.38 | 1.19 | 3/8-16 | 3/16 x 0.88 | 5/16-18 | 1.63 | 3.13 | 2.00 |
| 2 1/2 | 150 | J | 7.59 | 4.25 | 3.34 | 0.500 | 0.98 | 0.15 | 0.88 | 2.36 | 0.576 | 2.25 | 1.13 | 0.188 | 2.38 | 1.19 | 3/8-16 | 3/16 x 0.88 | 5/16-18 | 1.63 | 3.13 | 2.00 |
| | 300 | J | 7.59 | 4.25 | 3.34 | 0.500 | 0.98 | 0.15 | 0.88 | 2.36 | 0.576 | 2.25 | 1.13 | 0.188 | 2.38 | 1.19 | 3/8-16 | 3/16 x 0.88 | 5/16-18 | 1.63 | 3.13 | 2.00 |
| 3 | 150 | J | 8.60 | 5.00 | 3.60 | 0.625 | 1.24 | 0.15 | 1.19 | 2.36 | 0.705 | 2.25 | 1.13 | 0.188 | 2.38 | 1.19 | 3/8-16 | 3/16 x 1.19 | 5/16-18 | 1.63 | 3.13 | 2.00 |
| | 300 | J | 8.60 | 5.00 | 3.60 | 0.625 | 1.24 | 0.15 | 1.19 | 2.36 | 0.705 | 2.25 | 1.13 | 0.188 | 2.38 | 1.19 | 3/8-16 | 3/16 x 1.19 | 5/16-18 | 1.63 | 3.13 | 2.00 |
| | 600 | J | 8.60 | 5.00 | 3.60 | 0.625 | 1.24 | 0.15 | 1.19 | 2.36 | 0.705 | 2.25 | 1.13 | 0.188 | 2.38 | 1.19 | 3/8-16 | 3/16 x 1.19 | 5/16-18 | 1.63 | 3.13 | 2.00 |
| 4 | 150 | J | 9.42 | 5.75 | 3.67 | 0.625 | 1.31 | 0.15 | 1.19 | 2.36 | 0.705 | 2.25 | 1.13 | 0.188 | 2.38 | 1.19 | 3/8-16 | 3/16 x 1.19 | 5/16-18 | 1.63 | 3.13 | 2.00 |
| | 300 | J | 9.42 | 5.75 | 3.67 | 0.625 | 1.31 | 0.15 | 1.19 | 2.36 | 0.705 | 2.25 | 1.13 | 0.188 | 2.38 | 1.19 | 3/8-16 | 3/16 x 1.19 | 5/16-18 | 1.63 | 3.13 | 2.00 |
| | 600 | J | 9.81 | 6.00 | 3.81 | 0.750 | 1.45 | 0.15 | 1.25 | 2.36 | 0.854 | 2.25 | 1.13 | 0.250 | 2.38 | 1.19 | 3/8-16 | 1/4 x 1.25 | 5/16-18 | 1.88 | 3.13 | 1.76 |
| 5 | 150 | J | 10.28 | 6.47 | 3.81 | 0.750 | 1.45 | 0.15 | 1.25 | 2.36 | 0.854 | 2.25 | 1.13 | 0.250 | 2.38 | 1.19 | 3/8-16 | 1/4 x 1.25 | 5/16-18 | 1.63 | 3.13 | 1.76 |
| | 300 | J | 10.28 | 6.47 | 3.81 | 0.750 | 1.45 | 0.15 | 1.25 | 2.36 | 0.854 | 2.25 | 1.13 | 0.250 | 2.38 | 1.19 | 3/8-16 | 1/4 x 1.25 | 5/16-18 | 1.63 | 3.13 | 1.76 |
| 6 | 150 | J | 10.81 | 7.00 | 3.81 | 0.750 | 1.45 | 0.15 | 1.25 | 2.36 | 0.854 | 2.25 | 1.13 | 0.250 | 2.38 | 1.19 | 3/8-16 | 1/4 x 1.25 | 5/16-18 | 1.63 | 3.13 | 1.76 |
| | 300 | J | 10.81 | 7.00 | 3.81 | 1.000 | 1.45 | 0.15 | 1.25 | 2.36 | 1.152 | 2.25 | 1.13 | 0.375 | 2.38 | 1.19 | 3/8-16 | 3/8 x 1.25 | 5/16-18 | 1.63 | 3.13 | 2.00 |
| | 600 | J | 11.71 | 7.62 | 4.09 | 1.250 | 1.73 | 0.15 | 1.50 | 2.36 | 1.409 | 3.25 | 1.63 | 0.375 | 3.00 | 1.50 | 3/8-16 | 3/8 x 1.50 | 3/8-16 | 1.88 | 3.88 | 2.38 |
| 8 | 150 | J | 11.94 | 8.13 | 3.81 | 1.000 | 1.45 | 0.15 | 1.25 | 2.36 | 1.152 | 2.25 | 1.13 | 0.375 | 2.38 | 1.19 | 3/8-16 | 3/8 x 1.25 | 5/16-18 | 1.63 | 3.13 | 2.00 |
| | 300 | J | 12.22 | 8.13 | 4.09 | 1.250 | 1.73 | 0.15 | 1.50 | 2.36 | 1.409 | 3.25 | 1.63 | 0.375 | 3.00 | 1.50 | 3/8-16 | 3/8 x 1.50 | 3/8-16 | 1.88 | 3.88 | 2.38 |
| | 600 | J | 13.97 | 9.13 | 4.84 | 1.500 | 2.48 | 0.15 | 2.25 | 2.36 | 1.663 | 3.25 | 1.63 | 0.375 | 3.00 | 1.50 | 3/8-16 | 3/8 x 2.25 | 3/8-16 | 1.88 | 3.88 | 2.38 |
| 10 | 150 | J | 12.97 | 8.88 | 4.09 | 1.250 | 1.73 | 0.15 | 1.50 | 2.36 | 1.409 | 3.25 | 1.63 | 0.375 | 3.00 | 1.50 | 3/8-16 | 3/8 x 1.50 | 3/8-16 | 1.88 | 3.88 | 2.38 |
| | 300 | J | 14.22 | 9.38 | 4.84 | 1.500 | 2.48 | 0.15 | 2.25 | 2.36 | 1.663 | 3.25 | 1.63 | 0.375 | 3.00 | 1.50 | 3/8-16 | 3/8 x 2.25 | 3/8-16 | 1.88 | 3.88 | 2.38 |
| | 600 | H | 17.90 | 11.00 | 6.90 | 1.750 | 2.96 | 0.15 | 2.50 | 3.94 | 1.964 | 4.25 | 2.13 | 0.500 | 3.00 | 1.50 | 1/2-13 | 1/2 x 2.50 | 3/8-16 | 2.38 | 4.00 | 3.00 |
| 12 | 150 | J | 15.47 | 10.63 | 4.84 | 1.500 | 2.48 | 0.27 | 2.13 | 2.36 | 1.663 | 3.25 | 1.63 | 0.375 | 3.00 | 1.50 | 3/8-16 | 3/8 x 2.13 | 3/8-16 | 1.88 | 3.88 | 2.38 |
| | 300 | J | 17.90 | 11.00 | 6.90 | 1.750 | 2.96 | 0.15 | 2.50 | 3.94 | 1.964 | 4.25 | 2.13 | 0.500 | 3.00 | 1.50 | 1/2-13 | 1/2 x 2.50 | 3/8-16 | 2.38 | 4.00 | 3.00 |
| | 600 | H | 20.13 | 12.63 | 7.50 | 2.250 | 2.78 | 0.25 | 3.00 | 4.72 | 2.561 | 5.00 | 2.50 | 0.750 | 4.00 | 2.00 | 3/4-10 | 3/4 x 3.00 | 1/2-13 | 2.50 | 5.12 | 3.76 |
| 14 | 150 | J | 16.09 | 11.25 | 4.84 | 1.500 | 2.48 | 0.27 | 2.13 | 2.36 | 1.663 | 3.25 | 1.63 | 0.375 | 3.00 | 1.50 | 3/8-16 | 3/8 x 2.13 | 3/8-16 | 1.88 | 3.88 | 2.38 |
| | 300 | H | 19.74 | 12.38 | 7.36 | 2.000 | 3.42 | 0.15 | 3.13 | 3.94 | 2.218 | 4.25 | 2.13 | 0.500 | 4.00 | 2.00 | 1/2-13 | 1/2 x 3.13 | 1/2-13 | 2.50 | 5.12 | 3.76 |
| | 600 | H | 22.80 | 14.53 | 8.27 | 2.500 | 4.33 | 0.25 | 3.25 | 3.94 | 2.817 | 5.00 | 2.50 | 0.750 | 4.00 | 2.00 | 3/4-10 | 3/4 x 3.25 | 1/2-13 | 2.50 | 5.12 | 4.00 |
| 16 | 150 | J | 19.60 | 12.69 | 6.91 | 1.750 | 2.97 | 0.15 | 2.50 | 3.94 | 1.964 | 4.25 | 2.13 | 0.500 | 3.00 | 1.50 | 1/2-13 | 1/2 x 2.50 | 3/8-16 | 2.38 | 4.00 | 3.00 |
| | 300 | H | 21.82 | 14.00 | 7.82 | 2.250 | 3.10 | 0.25 | 3.00 | 4.72 | 2.581 | 5.00 | 2.50 | 0.750 | 4.00 | 2.00 | 3/4-10 | 3/4 x 3.00 | 1/2-13 | 2.50 | 5.12 | 3.76 |
| | 600 | H | 25.38 | 16.00 | 9.38 | 3.000 | 4.66 | 0.25 | 4.50 | 4.72 | 3.327 | 5.00 | 2.50 | 0.750 | 5.25 | 2.63 | 3/4-10 | 3/4 x 4.50 | 5/8-11 | 3.00 | 6.75 | 5.00 |
| 18 | 150 | J | 21.36 | 14.00 | 7.36 | 2.000 | 3.42 | 0.15 | 3.13 | 3.94 | 2.218 | 4.25 | 2.13 | 0.500 | 4.00 | 2.00 | 1/2-13 | 1/2 x 3.13 | 1/2-13 | 2.50 | 5.12 | 3.76 |
| | 300 | H | 23.01 | 15.13 | 7.88 | 2.500 | 3.94 | 0.25 | 3.25 | 3.94 | 2.817 | 5.00 | 2.50 | 0.750 | 4.00 | 2.00 | 3/4-10 | 3/4 x 3.25 | 1/2-13 | 3.00 | 5.12 | 4.00 |
| 20 | 150 | J | 22.76 | 15.13 | 7.63 | 2.250 | 2.91 | 0.25 | 3.00 | 4.72 | 2.561 | 5.00 | 2.50 | 0.750 | 4.00 | 2.00 | 3/4-10 | 3/4 x 3.00 | 1/2-13 | 2.50 | 5.12 | 3.76 |
| | 300 | H | 25.13 | 16.38 | 8.75 | 3.000 | 4.03 | 0.25 | 4.50 | 4.72 | 3.327 | 5.00 | 2.50 | 0.750 | 5.25 | 2.62 | 3/4-10 | 3/4 x 4.50 | 1/2-13 | 3.00 | 6.37 | 4.88 |
| 24 | 150 | J | 25.13 | 17.25 | 7.88 | 2.500 | 3.94 | 0.25 | 3.25 | 3.94 | 2.817 | 5.00 | 2.50 | 0.750 | 4.00 | 2.00 | 3/4-10 | 3/4 x 3.25 | 1/2-13 | 3.00 | 5.12 | 4.00 |
| | 300 | H | 28.01 | 19.38 | 8.63 | 3.500 | 4.69 | 0.25 | 4.00 | 3.94 | 3.927 | 7.00 | 3.50 | 1.000 | 5.25 | 2.62 | 1-8 | 1 x 4.00 | 1/2-13 | 3.00 | 6.37 | 4.88 |
| 30 | 150 | H | 29.36 | 20.63 | 8.73 | 3.000 | 4.01 | 0.25 | 4.50 | 4.72 | 3.327 | 5.00 | 2.50 | 0.750 | 5.25 | 2.62 | 3/4-10 | 3/4 x 4.50 | 1/2-13 | 3.00 | 6.37 | 4.88 |
| | 300 | H | 32.50 | 22.88 | 9.62 | 4.500 | 5.68 | 0.25 | 5.25 | 3.94 | 4.944 | 7.00 | 3.50 | 1.000 | 7.00 | 3.50 | 1-8 | 1 x 5.25 | 5/8-11 | 3.00 | 8.12 | 6.76 |
| 36 | 150 | H | 32.63 | 24.50 | 8.13 | 3.750 | 4.19 | 0.25 | 3.50 | 3.94 | 4.182 | 7.00 | 3.50 | 1.000 | 6.00 | 3.00 | 1-8 | 1 x 3.50 | 3/4-10 | 3.00 | 7.62 | 5.12 |
| 42 | 150 | H | 37.63 | 28.00 | 9.63 | 4.500 | 5.69 | 0.25 | 5.00 | 3.94 | 4.944 | 7.00 | 3.50 | 1.000 | 7.00 | 3.50 | 1-8 | 1 x 5.00 | 1/2-13 | 3.00 | 8.12 | 6.76 |
| 48 | 150 | H | 41.88 | 31.25 | 10.63 | 5.000 | 6.69 | 0.25 | 6.00 | 3.94 | 5.546 | 9.00 | 4.50 | 1.250 | 7.00 | 3.50 | 1-8 | 1-1/4 x 6.00 | 1/2-13 | 3.00 | 8.12 | 6.76 |

Installation Instructions Engineering Data

VALVE DESCRIPTION

1. The Flowseal High Performance Butterfly Valve is available in two body styles: Wafer (flangeless) and Lug (single flange).

VALVE DESIGN

1. The Flowseal High Performance Butterfly Valve features a double offset (or, double eccentric) shaft design to minimize seat abrasion and lower torque. This double offset design allows the disc to lift off and come away from the seat as it rotates open.
2. The Flowseal valve always rotates clockwise to close (when viewed from above) and counterclockwise to open.
3. The valve body has an overtravel stop which prevents the disc from over rotating into the wrong quadrant. This stop is not to be used as a disc position stop; if the disc contacts the overtravel stop, this means it has rotated beyond the seat.
4. The Flowseal valve is bi-directional, but the preferred installation position is with the seat in the upstream position (SUS). Note the arrow on the metal tag attached to the valve body.

SAFETY PRECAUTIONS

1. Be sure the line is depressurized and drained.
2. Be sure of the pipeline media. Proper care should be taken for protection against toxic and/or flammable fluids.
3. Never install the valve without an operator (manual or automatic) already attached to the valve shaft.
4. Never remove the operator from the valve while the valve is in the pipeline under pressure.
5. Always be sure that the disc is in the full-closed position before installing the valve.
6. Take care in handling the valve; if you treat it like a machine, it will operate like a machine...if you treat it like a piece of pipe, it may work like a piece of pipe.

FLANGE COMPATIBILITY

The Flowseal valve is designed to fit between flanges as follows:

| | |
|---------------------|------------|
| ASME Class 150 | 2" to 24" |
| MSS SP-44 Class 150 | 30" to 48" |
| ASME Class 300 | 2" to 24" |
| MSS SP-44 Class 300 | 30" |
| ASME Class 600 | 3" to 14" |

GASKET COMPATIBILITY

The Flowseal valve is designed to accommodate the use of standard fiber gaskets (such as non-asbestos, flexible graphite, or equivalent gasket materials) of 1/16" or less, meeting the dimensional requirements of ASME B16.21-1978. Thick elastomeric gaskets are not recommended. Metallic wound (Flexitallic) gaskets may also be used.

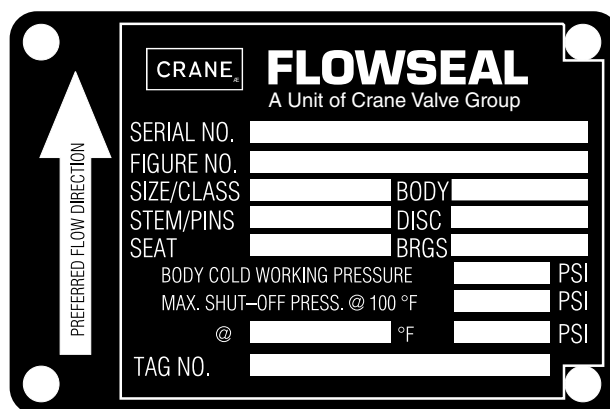
PIPE SCHEDULE COMPATIBILITY

The Flowseal valve is designed to allow the disc edge to rotate into the open position without interference with the pipeline I.D. in the following pipe schedules:

| SIZE | ASME 150 | ASME 300 | ASME 600 |
|-----------|----------|----------|----------|
| 2" – 12" | SCH 80 | SCH 80 | SCH 120 |
| 14" – 24" | SCH 40 | SCH 80 | SCH 120 |
| 30" | SCH 30 | SCH 80 | |
| 36" – 42" | STD WT | | |
| 48" | XS | | |

PRODUCT IDENTIFICATION

1. Every Flowseal valve has a metal identification tag attached to the valve body. Information includes the figure number, the size and pressure class, the materials of construction, and the operating pressures and temperatures.
2. Every Flowseal valve is hydrostatically tested before it is shipped. The metal tag also includes a serial number; this number, unique for each valve, is recorded by the Flowseal Quality Control Department along with the test results and material certification data, for individual traceability and verification of every valve produced.

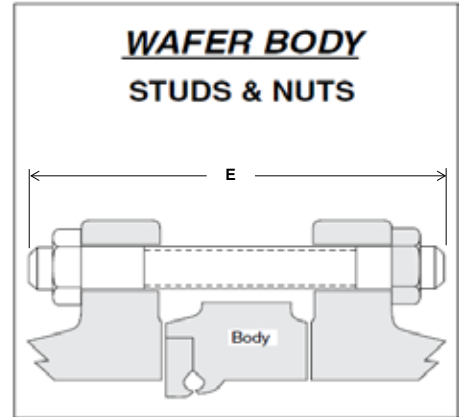
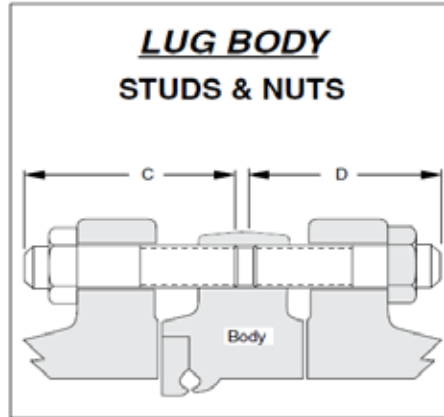
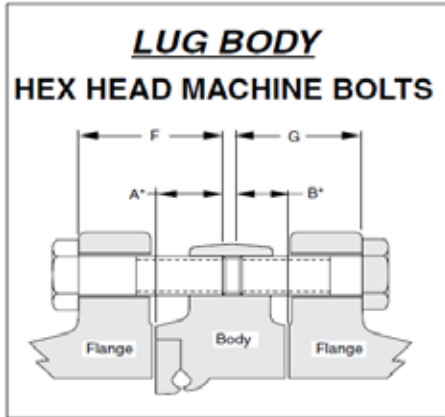


UNPACKING AND STORAGE INSTRUCTIONS

1. Check the packing list against the valve received to verify that the quantities, sizes, and materials are correct.
2. Check to make sure that the valve and operator were not damaged during shipment.
3. If the valve is to be stored before being installed, it should be protected from harsh environmental conditions.
4. Store the valve with the disc in the closed position to protect the sealing edge and the seat.
5. Keep the valve in a clean location, away from dirt, debris and corrosive materials.
6. Keep the valve in a dry area with the flange protectors attached.
7. Keep the valve in a cool location if possible, out of direct sunlight.

Installation Instructions Engineering Data

BOLTING DIMENSIONS



| ASME B16.5, CLASS 150 FLANGES: 2" - 24" | | | | | | | | | | | | | | | | |
|---|--------------|-------------|---------------------------|--------|-----|--------|--------------|--------|-----|--------|---------------|--------|-----|--------|--------------|--------|
| ASME B16.47, SERIES A (MSS SP-44), CLASS 150 FLANGES: 30" - 48" | | | | | | | | | | | | | | | | |
| | | | LUG VALVES | | | | | | | | | | | | WAFER VALVES | |
| | | | STUD ENGAGEMENT IN VALVE* | | | | STUDS & NUTS | | | | MACHINE BOLTS | | | | STUDS & NUTS | |
| VALVE SIZE | VALVE SERIES | THREAD SIZE | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH |
| | | | A | A | B | B | C | C | D | D | F | F | G | G | E | E |
| 2" | J | 5/8-11UNC | 4 | 0.940 | 4 | 0.570 | 4 | 2.50 | 4 | 2.12 | 4 | 1.75 | 4 | 1.25 | 4 | 5.00 |
| 2 1/2" | J | 5/8-11UNC | 4 | 0.960 | 4 | 0.680 | 4 | 2.62 | 4 | 2.38 | 4 | 2.00 | 4 | 1.50 | 4 | 5.25 |
| 3" | J | 5/8-11UNC | 4 | 1.139 | 4 | 0.725 | 4 | 3.00 | 4 | 2.75 | 4 | 2.00 | 4 | 1.75 | 4 | 5.50 |
| 4" | J | 5/8-11UNC | 8 | 1.071 | 8 | 0.745 | 8 | 3.00 | 8 | 2.75 | 8 | 2.00 | 8 | 1.75 | 8 | 5.75 |
| 5" | J | 3/4-10UNC | 8 | 1.220 | 8 | 0.790 | 8 | 3.25 | 8 | 2.75 | 8 | 2.25 | 8 | 1.75 | 8 | 6.00 |
| 6" | J | 3/4-10UNC | 8 | 1.401 | 8 | 0.839 | 8 | 3.50 | 8 | 2.75 | 8 | 2.25 | 8 | 1.75 | 8 | 6.25 |
| 8" | J | 3/4-10UNC | 8 | 1.492 | 8 | 0.948 | 8 | 3.75 | 8 | 3.00 | 8 | 2.50 | 8 | 2.00 | 8 | 6.75 |
| 10" | J | 7/8-9UNC | 12 | 1.752 | 12 | 1.000 | 12 | 4.50 | 12 | 3.25 | 12 | 3.00 | 12 | 2.25 | 12 | 7.25 |
| 12" | J | 7/8-9UNC | 12 | 2.147 | 12 | 1.025 | 12 | 4.75 | 12 | 3.50 | 12 | 3.25 | 12 | 2.25 | 12 | 8.00 |
| 14" | J | 1-8UNC | 12 | 2.330 | 12 | 1.210 | 12 | 5.00 | 12 | 3.75 | 12 | 3.75 | 12 | 2.50 | 12 | 9.00 |
| 16" | J | 1-8UNC | 16 | 2.648 | 16 | 1.270 | 16 | 5.25 | 16 | 4.00 | 16 | 4.00 | 16 | 2.75 | 16 | 10.00 |
| 18" | J | 1-1/8-8UN | 16 | 2.723 | 16 | 1.645 | 16 | 5.75 | 16 | 4.50 | 16 | 4.25 | 16 | 3.25 | 16 | 10.50 |
| 20" | J | 1-1/8-8UN | 16 | 3.396 | 20 | 1.434 | 16 | 6.50 | 20 | 4.50 | 16 | 5.00 | 20 | 3.25 | 16 | 11.25 |
| | J | 1-1/8-8UN | 4** | 2.325 | - | - | 4** | 5.50 | - | - | 4** | 4.00 | - | - | 8** | 5.50 |
| 24" | J | 1-1/4-8UN | 20 | 3.690 | 20 | 2.250 | 20 | 7.25 | 20 | 5.50 | 20 | 5.50 | 20 | 4.25 | 20 | 13.00 |
| 30" | H | 1-1/4-8UN | 24 | 3.471 | 24 | 3.159 | 24 | 8.00 | 24 | 7.75 | 24 | 6.25 | 24 | 6.00 | 24 | 15.75 |
| | H | 1-1/4-8UN | 4** | 1.908 | 4** | 1.592 | 4** | 6.25 | 4** | 6.00 | 4** | 4.75 | 4** | 4.50 | 8** | 6.25 |
| 36" | H | 1-1/2-8UN | 28 | 3.760 | 28 | 3.740 | 28 | 9.00 | 28 | 9.00 | 28 | 7.25 | 28 | 7.25 | 28 | 19.25 |
| | H | 1-1/2-8UN | 4** | 1.760 | 4** | 1.740 | 4** | 7.00 | 4** | 7.00 | 4** | 5.25 | 4** | 5.25 | 8** | 7.00 |
| 42" | H | 1-1/2-8UN | 32 | 4.160 | 32 | 4.090 | 32 | 9.75 | 32 | 9.50 | 32 | 8.00 | 32 | 8.00 | 32 | 20.50 |
| | H | 1-1/2-8UN | 4** | 1.782 | 4** | 1.718 | 4** | 7.25 | 4** | 7.25 | 4** | 5.50 | 4** | 5.50 | 8** | 7.25 |
| 48" | H | 1-1/2-8UN | 40 | 5.520 | 40 | 4.850 | 40 | 11.75 | 40 | 11.00 | 40 | 9.75 | 40 | 9.00 | 40 | 22.75 |
| | H | 1-1/2-8UN | 4** | 2.815 | 4** | 2.190 | 4** | 8.75 | 4** | 8.00 | 4** | 7.00 | 4** | 6.50 | 8** | 8.75 |

Length of studs and machine bolts based on:

1. Gasket thickness of 0.06 inches.
2. Minimum flange thickness of weld neck flanges per ASME B16.5 and ASME B16.47, Series A.
3. Stud lengths are based on using heavy hex nuts.

Every effort is made to provide accurate information, but no liability for claims arising from erroneous data will be accepted by Crane CP&E.

Installation Instructions Engineering Data

BOLTING DIMENSIONS

| ASME B16.5, CLASS 300 FLANGES: 2" - 24" | | | | | | | | | | | | | | | | |
|---|---|-----------|---------------------------|--------|-----|--------|--------------|--------|-----|--------|---------------|--------|-----|--------|--------------|--------|
| ASME B16.47, SERIES A (MSS SP-44), CLASS 300 FLANGES: 30" | | | | | | | | | | | | | | | | |
| VALVE SIZE VALVE SERIES THREAD SIZE | | | LUG VALVES | | | | | | | | | | | | WAFER VALVES | |
| | | | STUD ENGAGEMENT IN VALVE* | | | | STUDS & NUTS | | | | MACHINE BOLTS | | | | STUDS & NUTS | |
| | | | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH |
| A | A | B | B | C | C | D | D | F | F | G | G | E | E | | | |
| 2" | J | 5/8-11UNC | 8 | 0.940 | 8 | 0.570 | 8 | 2.75 | 8 | 2.50 | 8 | 1.75 | 8 | 1.50 | 8 | 5.25 |
| 2 1/2" | J | 3/4-10UNC | 8 | 0.970 | 8 | 0.670 | 8 | 3.00 | 8 | 2.75 | 8 | 2.00 | 8 | 1.75 | 8 | 5.75 |
| 3" | J | 3/4-10UNC | 8 | 1.034 | 8 | 0.826 | 8 | 3.25 | 8 | 3.00 | 8 | 2.25 | 8 | 2.00 | 8 | 6.00 |
| 4" | J | 3/4-10UNC | 8 | 1.196 | 8 | 0.870 | 8 | 3.50 | 8 | 3.25 | 8 | 2.50 | 8 | 2.00 | 8 | 6.50 |
| 5" | J | 3/4-10UNC | 8 | 1.220 | 8 | 0.790 | 8 | 3.75 | 8 | 3.25 | 8 | 2.50 | 8 | 2.25 | 8 | 7.00 |
| 6" | J | 3/4-10UNC | 12 | 1.301 | 12 | 0.929 | 12 | 3.75 | 12 | 3.50 | 12 | 2.75 | 12 | 2.25 | 12 | 7.00 |
| 8" | J | 7/8-9UNC | 12 | 1.702 | 12 | 1.128 | 12 | 4.50 | 12 | 4.00 | 12 | 3.25 | 12 | 2.75 | 12 | 8.25 |
| 10" | J | 1-8UNC | 16 | 1.867 | 16 | 1.300 | 16 | 5.00 | 16 | 4.50 | 16 | 3.75 | 16 | 3.25 | 14 | 9.50 |
| | J | 1-8UNC | - | - | - | - | - | - | - | - | - | - | - | - | 4** | 5.00 |
| 12" | J | 1-1/8-8UN | 16 | 2.057 | 16 | 1.475 | 16 | 5.50 | 16 | 5.00 | 16 | 4.00 | 16 | 3.50 | 12 | 10.50 |
| | J | 1-1/8-8UN | - | - | - | - | - | - | - | - | - | - | - | - | 8** | 5.25 |
| 14" | H | 1-1/8-8UN | 16 | 2.442 | 16 | 2.118 | 16 | 6.00 | 16 | 5.75 | 16 | 4.50 | 16 | 4.25 | 16 | 11.75 |
| | H | 1-1/8-8UN | 4** | 1.608 | 4** | 1.267 | 4** | 5.25 | 4** | 4.75 | 4** | 3.75 | 4** | 3.25 | 8** | 5.25 |
| 16" | H | 1-1/4-8UN | 16 | 2.562 | 16 | 2.628 | 16 | 6.50 | 16 | 6.50 | 16 | 4.75 | 16 | 4.75 | 16 | 13.00 |
| | H | 1-1/4-8UN | 4** | 1.538 | 4** | 1.588 | 4** | 5.25 | 4** | 5.25 | 4** | 3.75 | 4** | 3.75 | 8** | 5.25 |
| 18" | H | 1-1/4-8UN | 20 | 2.870 | 20 | 2.890 | 20 | 7.00 | 20 | 7.00 | 20 | 5.25 | 20 | 5.25 | 20 | 14.00 |
| | H | 1-1/4-8UN | 4** | 1.657 | 4** | 1.437 | 4** | 5.50 | 4** | 5.50 | 4** | 4.00 | 4** | 3.75 | 8** | 5.50 |
| 20" | H | 1-1/4-8UN | 20 | 3.184 | 20 | 3.006 | 20 | 7.50 | 20 | 7.25 | 20 | 5.75 | 20 | 5.50 | 20 | 14.50 |
| | H | 1-1/4-8UN | 4** | 1.681 | 4** | 1.489 | 4** | 5.75 | 4** | 5.50 | 4** | 4.00 | 4** | 4.00 | 8** | 5.75 |
| 24" | H | 1-1/2-8UN | 20 | 3.560 | 20 | 3.510 | 20 | 8.25 | 20 | 8.25 | 20 | 6.25 | 20 | 6.25 | 20 | 16.50 |
| | H | 1-1/2-8UN | 4** | 1.800 | 4** | 1.750 | 4** | 6.50 | 4** | 6.50 | 4** | 4.50 | 4** | 4.50 | 8** | 6.50 |
| 30" | H | 1-3/4-8UN | 24 | 4.331 | 24 | 4.429 | 24 | 10.25 | 24 | 10.50 | 24 | 8.00 | 24 | 8.00 | 24 | 20.50 |
| | H | 1-3/4-8UN | 4** | 2.039 | 4** | 2.071 | 4** | 8.00 | 4** | 8.00 | 4** | 5.75 | 4** | 5.75 | 8** | 8.00 |

| ASME B16.5, CLASS 600 FLANGES: 2" - 16" | | | | | | | | | | | | | | | | |
|---|---|-----------|---------------------------|--------|-----|--------|--------------|--------|-----|--------|---------------|--------|-----|--------|--------------|--------|
| VALVE SIZE VALVE SERIES THREAD SIZE | | | LUG VALVES | | | | | | | | | | | | WAFER VALVES | |
| | | | STUD ENGAGEMENT IN VALVE* | | | | STUDS & NUTS | | | | MACHINE BOLTS | | | | STUDS & NUTS | |
| | | | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH | QTY | LENGTH |
| A | A | B | B | C | C | D | D | F | F | G | G | E | E | | | |
| 2" | J | 5/8-11UNC | - | - | - | - | - | - | - | - | - | - | - | - | 8 | 6.00 |
| 3" | J | 3/4-10UNC | 8 | 1.034 | 8 | 1.026 | 8 | 3.50 | 8 | 3.50 | 8 | 2.50 | 8 | 2.50 | 8 | 7.00 |
| 4" | J | 7/8-9UNC | 8 | 1.274 | 8 | 1.165 | 8 | 4.25 | 8 | 4.00 | 8 | 3.00 | 8 | 2.75 | 8 | 8.25 |
| 6" | J | 1-8UNC | 12 | 1.274 | 12 | 1.306 | 12 | 4.75 | 12 | 4.75 | 12 | 3.25 | 12 | 3.25 | 12 | 10.00 |
| 8" | J | 1-1/8-8UN | 12 | 1.794 | 12 | 1.795 | 12 | 5.75 | 12 | 5.75 | 12 | 4.00 | 12 | 4.00 | 12 | 11.75 |
| 10" | H | 1-1/4-8UN | 12 | 2.495 | 12 | 2.000 | 12 | 6.75 | 12 | 6.25 | 12 | 5.25 | 12 | 4.75 | 12 | 13.25 |
| | H | 1-1/4-8UN | 4** | 1.372 | 4** | 1.998 | 4** | 5.75 | 4** | 6.25 | 4** | 4.00 | 4** | 4.75 | 8** | 6.25 |
| 12" | H | 1-1/4-8UN | 16 | 2.683 | 16 | 2.697 | 16 | 7.25 | 16 | 7.25 | 16 | 5.50 | 16 | 5.50 | 16 | 14.25 |
| | H | 1-1/4-8UN | 4** | 1.325 | 4** | 1.765 | 4** | 5.75 | 4** | 6.25 | 4** | 4.00 | 4** | 4.50 | 8** | 6.25 |
| 14" | H | 1-3/8-8UN | 16 | 2.994 | 16 | 2.996 | 16 | 7.75 | 16 | 7.75 | 16 | 6.00 | 16 | 6.00 | 16 | 15.50 |
| | H | 1-3/8-8UN | 4** | 1.500 | 4** | 1.560 | 4** | 6.25 | 4** | 6.25 | 4** | 4.50 | 4** | 4.50 | 8** | 6.25 |
| 16" | H | 1-1/2-8UN | 16 | 3.375 | 16 | 3.562 | 16 | 8.50 | 16 | 8.75 | 16 | 6.50 | 16 | 6.75 | 16 | 16.75 |
| | H | 1-1/2-8UN | 4** | 1.750 | 4** | 1.750 | 4** | 7.00 | 4** | 7.00 | 4** | 5.00 | 4** | 5.00 | 8** | 7.00 |

Length of studs and machine bolts based on:

1. Gasket thickness of 0.06 inches.
2. Minimum flange thickness of weld neck flanges per ASME B16.5.
3. Stud lengths are based on using heavy hex nuts.

* Stud engagement lengths "A" and "B" are measured from the face of the valve body to the minimum thread depth in the lug. Flange and gasket thickness have been added to determine the minimum bolt length.

** Special length required for tapped blind holes straddling the valve shaft at the top and bottom ends of the valve body on both sides.

Every effort is made to provide accurate information, but no liability for claims arising from erroneous data will be accepted by Crane CP&E.


Installation Instructions Engineering Data

PRE – INSTALLATION PROCEDURE

1. Remove the protective face covers from the valve.
2. Inspect the valve to be certain the waterway is free from dirt and foreign matter. Be certain the adjoining pipeline is free from any foreign material such as rust and pipe scale or welding slag that could damage the seat and disc sealing surfaces.
3. Actuators should be mounted on the valve prior to installation to facilitate proper alignment of the disc in the valve seat.
4. The valve should be in the **closed position**. Make sure the open and closed positions of the actuator correspond to the counter-clockwise to open direction of rotation of the valve.

5. Cycle the valve to the fully open position, then back to the fully closed position, checking the actuator travel stop settings for proper disc alignment.
6. Check the valve identification tag for valve class, materials, and operating pressure to be sure they are correct for the application.

WARNING! Personal injury or property damage may result if the valve is installed where service conditions could exceed the valve ratings.



7. Check the flange bolts or studs on both sides of the valve for proper size, threading, and length.

VALVE INSTALLATION PROCEDURE

The Flowseal High Performance Butterfly Valve can be installed in the pipeline with the shaft in the vertical, horizontal, or other intermediate position. Based on applications experience, however, in media with concentrations of solid or abrasive particles or media subject to solidification buildup, valve performance and service life will be enhanced by mounting the valve with the shaft in the horizontal position.

All Flowseal valves are bi-directional (in some instances, modifications may be required to operate this arrangement for dead end service) and can be mounted in the pipeline in either flow direction; however, the preferred flow direction for all seat styles and materials is with the seat retainer ring located upstream (sus) to provide maximum seat protection.

1. For Wafer style (flangeless) valves:
 - a. Loosely install the lower flange bolts to form a cradle between the flanges. See Figure 1.
 - b. Noting the flow direction arrow on the tag, place the valve and flange gaskets between the flanges, making sure the arrow on the tag points in the direction of the flow.
 - c. Install the remaining flange bolts, shifting the valve as necessary to permit the bolts to pass by or through the valve body.

2. For Lug style (single flange) valves:
 - a. Noting the flow direction arrow on the tag, place the valve between the flanges, making sure the arrow on the tag points in the direction of the flow.
 - b. Install the lower flange bolts loosely, leaving space for the flange gaskets.
 - c. After inserting the flange gaskets, install the remaining bolts.
3. Using the sequence shown in Figure 2, tighten the flange bolts evenly to assure uniform gasket compression.

- Caution:** The Flowseal valve should be centered between the flanges and gaskets to prevent damage to the disc edge and shaft as a result of the disc striking the flange, gasket, or pipe.
4. If an actuator is to be used, air hoses or electricity should be connected to the unit as specified by the actuator manufacturer.
 5. The valve is now ready for operation.

Remember: Install the valve with the disc in the full-closed position!

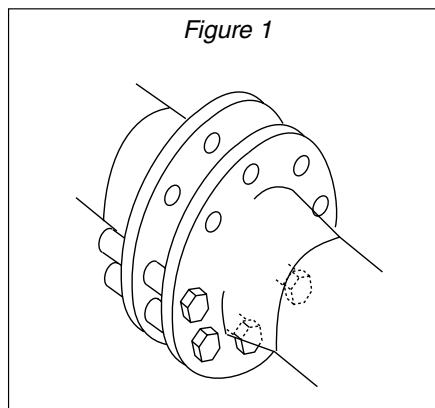


Figure 1

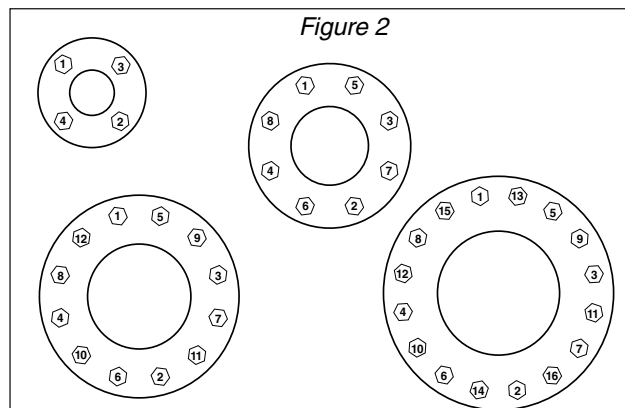


Figure 2

Typical Specifications

TYPICAL SOFT SEAT SPECIFICATION

- 1.0 Scope**
This specification covers the design and testing of high pressure offset seat butterfly valves.
- 2.0 Applicable Standards**
The following standards shall apply
- ASME B16.5: Pipe Flanges and Flanged Fittings (24" size and smaller).
- ASME B16.34: Valves—Flanged and Butt-welding End.
- MSS SP-25: Standard Marking System for Valves, Fittings, Flanges and Unions.
- MSS SP-61: Pressure Testing of Steel Valves.
- MSS SP-68: High Pressure—Offset Seat Butterfly Valves.
- API 609: Butterfly Valves, Lug-Type and Wafer-Type.
- PED Pressure Equipment Directive Section H
- 3.0 Design Requirement**
- 3.1 Valves shall be High Performance Butterfly with offset seat and eccentric shaft. They shall be capable of sealing against full differential pressure in either flow direction.
- 3.2 Valve seat shall be both self and pressure energized with an elastomeric core. The self energizing member shall be isolated from the line media.
- 3.3 Valves shall have retained top and bottom low friction bearings.
- 3.4 Shaft design shall be single or dual piece.
- 3.5 Retainer rings must be recessed in the body so that the line gasket prevents any potential external leakage.
- 3.6 Valves shall have internal stop to prevent disc over-travel.
- 3.7 Valves shall be Flowseal or approved equal.
- 4.0 Materials**
- 4.1 Valves shall be constructed of new material.
- 4.2 Carbon steel valves shall be constructed from materials below:
- 4.2.1 Body—ASTM A105 or A216 Gr. WCB.
- 4.2.2 Disc—ASTM A182 F316 or A351 Gr. CF8M.
- 4.3 Stainless steel valves shall be constructed from materials below:
- 4.3.1 Body—ASTM A182 Gr. F316 or A351 Gr. CF8M.
- 4.3.2 Disc—ASTM A182 Gr. F316 or A351 Gr. CF8M.
- 4.4 Shafts shall be ASTM A564 type 630 H 1150 or 316 SS.
- 5.0 Inspection and Test**
- 5.1 Valves shall be hydrostatically shell tested per ASME B16.34 and MSS SP-61.
- 5.2 Valves shall be seat tested per MSS SP-61. No leakage is permitted for resilient seated valves.
- 5.3 API 598 testing available upon request.

Sample Figure Number
12 – 1WA – 121TTG – 30J

TYPICAL METAL SEAT SPECIFICATION

- 1.0 Scope**
This specification covers the design and testing of high pressure offset seat butterfly valves.
- 2.0 Applicable Standards**
The following standards shall apply
- ASME B16.5: Pipe Flanges and Flanged Fittings (24" size and smaller).
- ASME B16.34: Valves—Flanged and Butt-welding End.
- MSS SP-25: Standard Marking System for Valves, Fittings, Flanges and Unions.
- ASME/FCI 70-2: Control Valve Seat Leakage
- MSS SP-68: High Pressure—Offset Seat Butterfly Valves.
- API 609: Butterfly Valves, Lug-Type and Wafer-Type.
- PED Pressure Equipment Directive Section H
- 3.0 Design Requirement**
- 3.1 Valves shall be High Performance Butterfly with offset seat and eccentric shaft. They shall be capable of Class IV sealing in either flow direction.
- 3.2 Valve seat shall be both self and pressure energized.
- 3.3 Valves shall have retained top and bottom bearings.
- 3.4 Shaft design shall be single or dual piece.
- 3.5 Retainer rings must be recessed in the body so that the line gasket prevents any potential external leakage.
- 3.6 Valves shall have internal stop to prevent disc over-travel.
- 3.7 Valves shall be Flowseal or approved equal.
- 4.0 Materials**
- 4.1 Valves shall be constructed of new material.
- 4.2 Carbon steel valves shall be constructed from materials below:
- 4.2.1 Body—ASTM A105 or A216 Gr. WCB.
- 4.2.2 Disc—ASTM A182 F316 or A351 Gr. CF8M.
- 4.3 Stainless steel valves shall be constructed from materials below:
- 4.3.1 Body—ASTM A182 Gr. F316 or A351 Gr. CF8M.
- 4.3.2 Disc—ASTM A182 Gr. F316 or A351 Gr. CF8M.
- 4.4 Shafts shall be ASTM A564 type 630 H 1150, or 316 SS.
- 5.0 Inspection and Test**
- 5.1 Valves shall be hydrostatically shell tested per ASME B16.34 and MSS SP-61.
- 5.2 Valves shall be seat tested per ASME/FCI 70-2, Class IV.

Sample Figure Number
12 – 1WA – 171MTG – 30J

TYPICAL FIRE FLOW SPECIFICATION

- 1.0 Scope**
This specification covers the design and testing of high pressure offset seat butterfly valves.
- 2.0 Applicable Standards**
The following standards shall apply
- ASME B16.5: Pipe Flanges and Flanged Fittings (24" size and smaller).
- ASME B16.34: Valves—Flanged and Butt-welding End.
- MSS SP-25: Standard Marking System for Valves, Fittings, Flanges and Unions.
- MSS SP-61: Pressure Testing of Steel Valves.
- MSS SP-68: High Pressure—Offset Seat Butterfly Valves.
- API 609: Butterfly Valves, Lug-Type and Wafer-Type.
- API 607: Fire Test for Soft-Seated Quarter Turn Valves.
- PED Pressure Equipment Directive Section H
- 3.0 Design Requirement**
- 3.1 Valves shall be High Performance Butterfly with offset seat and eccentric shaft. They shall be capable of sealing against full differential pressure in either flow direction.
- 3.2 Valve seat shall be both self and pressure energized with an elastomeric core. The self energizing member shall be isolated from the line media.
- 3.3 Valves shall have retained top and bottom low friction bearings.
- 3.4 Shaft design shall be single or dual piece.
- 3.5 Retainer rings must be recessed in the body so that the line gasket prevents any potential external leakage.
- 3.6 Valves shall have internal stop to prevent disc over-travel.
- 3.7 Valves shall be Flowseal or approved equal.
- 4.0 Materials**
- 4.1 Valves shall be constructed of new material.
- 4.2 Carbon steel valves shall be constructed from materials below:
- 4.2.1 Body—ASTM A105 or A216 Gr. WCB.
- 4.2.2 Disc—ASTM A182 F316 or A351 Gr. CF8M.
- 4.3 Stainless steel valves shall be constructed from materials below:
- 4.3.1 Body—ASTM A182 Gr. F316 or A351 Gr. CF8M.
- 4.3.2 Disc—ASTM A182 Gr. F316 or A351 Gr. CF8M.
- 5.0 Inspection and Test**
- 5.1 Valves shall be hydrostatically shell tested per ASME B16.34 and MSS SP-61.
- 5.2 Valves shall be seat tested per MSS SP-61. No leakage is permitted for resilient seated valves.
- 5.3 API 598 testing available upon request.
- 5.4 Flowseal Fire-Flow™ valves qualified to API 607 fire test standard.

Sample Figure Number
12 – 1WA – 191FFF – B0J



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