

Carbon Steel Valves  
Stainless Steel Valves  
Forged Steel Valves



Valves for Cryogenic Application

FIGURE NUMBER

H B F 1 - D N S - D S M W

H

H - Company

Hawks  
Technologies  
Sdn. Bhd.

B

B - Valve Type

B : Butterfly  
GA : Gate  
GL : Globe  
BA : Ball  
CH : Check  
O : Others

F

F - Connection

F : Flange  
L : Lugged  
W : Wafer  
C : Butt Weld  
S : Special  
O : Others

1

1 - Pressure Rating

1 : 10K (150#)  
2 : 20K (300#)  
3 : 30K (450#)  
4 : 40K (600#)  
6 : 60K (900#)  
9 : 90K (1500#)  
0 : Others

D

D - Size

Standard : 2" to 24"  
A : 2" B : 2.5" C : 3"  
D : 4" E : 5" F : 6"  
G : 8" H : 10" I : 12"  
J : 14" K : 16" L : 18"  
M : 20" N : 24" O : 28"  
P : 32" Q : 36" R : 40"  
S : 44" T : 48" U : Others

N

N - Temperature

1 : 100°C  
2 : 200°C  
3 : 300°C  
5 : 500°C  
7 : 700°C  
9 : 900°C  
N : 20 (Normal Temp)  
O : Others

S

S - Fluid

S : Steam  
W : Water  
O : Oil  
B : Brine  
C : Chemical  
CR : Cryogenic Service

D

D - Body Material

D : Carbon Steel  
E : High Temp Alloy Steel  
F : Low Temp Alloy Steel  
S : Stainless Steel 316, 304, 310, Hasteloy, Duplex, etc.

S

S - Disc Material

S : 304SS, 316SS  
F : A217 - CA15  
W : A216 - WCB  
O : Others

M

M - Seat Material

M : 304SS, 316SS  
H : HF Stellite  
F : Full Stellite  
O : Others

W

W - Operating System

L : Hand Wheel  
W : Worm Gear  
P : Pneumatic Actuator  
H : Hydraulic Actuator  
E : Electric Actuator  
CH : Chain Wheel  
O : Others

\* Note : Valve pressure, size, temperature, body material, disc material and seat material may be customized to suit customer requirements. Kindly consult us for additional requirements and applications.

## CONTENTS

|                                                                               |    |
|-------------------------------------------------------------------------------|----|
| GATE VALVE - BOLTED BONNET (ASME 150 - 2500 / KS(JIS) 10K - 40K) .....        | 1  |
| GLOBE VALVE - BOLTED BONNET (ASME 150 - 2500 / KS(JIS) 10K - 40K) .....       | 7  |
| SWING CHECK VALVE - BOLTED BONNET (ASME 150 - 2500 / KS(JIS) 10K - 40K) ..... | 12 |
| GATE VALVE - PRESSURE SEAL BONNET (ASME 600 - 2500) .....                     | 17 |
| GLOBE VALVE - PRESSURE SEAL BONNET (ASME 600 - 2500) .....                    | 21 |
| SWING CHECK VALVE - PRESSURE SEAL BONNET (ASME 600 - 2500) .....              | 25 |
| FORGED STEEL - GATE VALVE (ASME 150 - 2500) .....                             | 29 |
| FORGED STEEL - GLOBE VALVE (ASME 150 - 2500) .....                            | 32 |
| FORGED STEEL - CHECK VALVE (ASME 150 - 2500) .....                            | 36 |
| BUTTERFLY VALVE (ASME 150 - 300) .....                                        | 43 |
| KNIFE GATE VALVE .....                                                        | 59 |
| DUO - CHECK VALVE .....                                                       | 61 |
| STRAINER .....                                                                | 63 |
| BALL VALVE (ASME 150 - 1500) .....                                            | 67 |
| ENGINEERING DATA: CONFORMANCE STANDARDS .....                                 | 72 |
| BY-PASS & DRAIN .....                                                         | 73 |
| BODY WALL THICKNESS .....                                                     | 75 |
| MATERIAL COMPARISON .....                                                     | 76 |
| BUTT WELDED ENDS DIMENSION .....                                              | 81 |
| FLANGE DIMENSION .....                                                        | 82 |
| WORKING PRESSURE .....                                                        | 88 |
| CONVERSION TABLES .....                                                       | 89 |

## GATE VALVE - BOLTED BONNET

**YOKE SLEEVE** The upper portion of the YOKE SLEEVE is hexagonally tapered to fit the handwheel. The standard material of YOKE SLEEVE is Nodular Ni-resist D2 with over 1150°C (2100°F) dissolution point in accordance to API Std. specifications.

**BOLTING** The body-bonnet bolts are manufactured in accordance with API Std. 600 specifications. The nuts also strictly conform to with ANSI B1.1. The stud-bolt nuts, hexagonal, rigid and hot-forged, bear material notation as well as the bolt nuts are made according to ANSI B18.2.2

**BONNET** The bonnet and valve body have the same wall thickness.

The body-bonnet flange drilling is spot-faced to exactly meet stud-bolt nuts. The bonnet back seat bushing guarantees packing replacement even when the valve is fully opened. The stem packing dimensions of the stuffing box are in accordance to API Std. specifications.

**STEM** The machine forged stem comes with a T-shape head, which connects the slot of the wedge. The spherically shaped contacting surface of the head gives greater strength and durability.

The stem dimensions are in accordance to API Std. 600 specifications. The heat treated stem delivers adequate mechanical properties as well as excellent surface hardness. In addition, opening/shutting friction is minimized by accurate machining and lapping.

**SEAT RING** Bottom seated type seat rings are welded or screwed into the body.

The seating surface is finished by lapping. These are forgings that have been heat treated to deliver the best mechanical properties and required hardness. The difference in hardness between seat and wedge is in accordance to API Std. specifications.

**FLEXIBLE WEDGE** The standard disc of our valve is a one-piece flexible wedge.

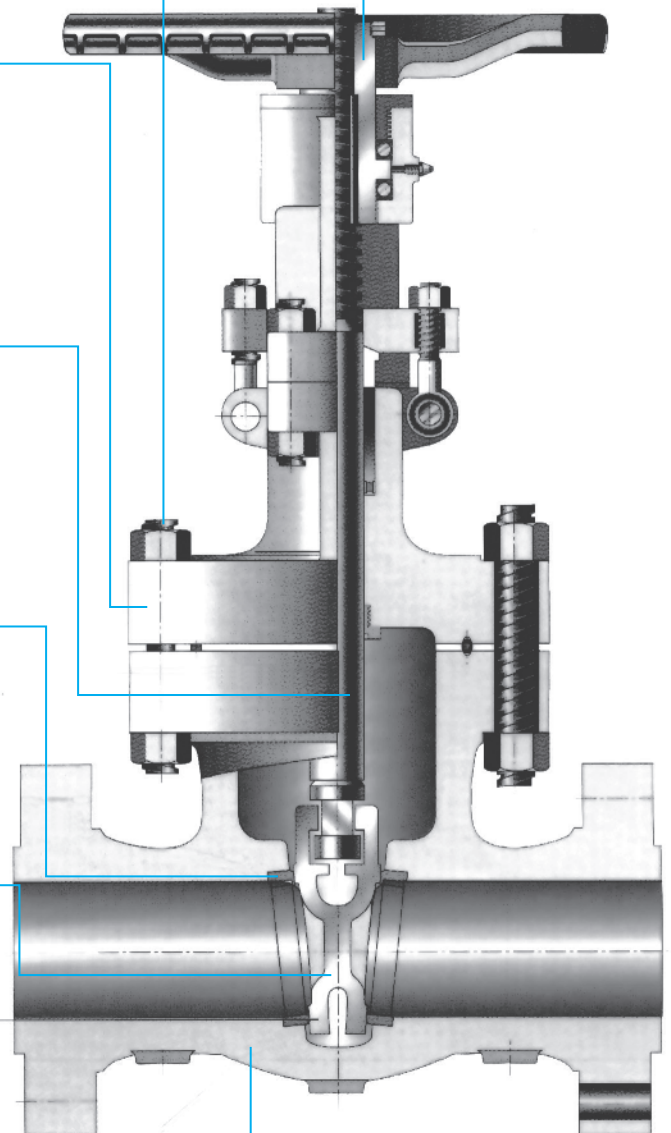
Slots are machined on both sides of the wedge to allow it to travel correctly in the integrally cast body guides.

The wedge seating surfaces have been accurately machined, grind and lapped to a mirrored finish to prevent leakage and eliminate galling.

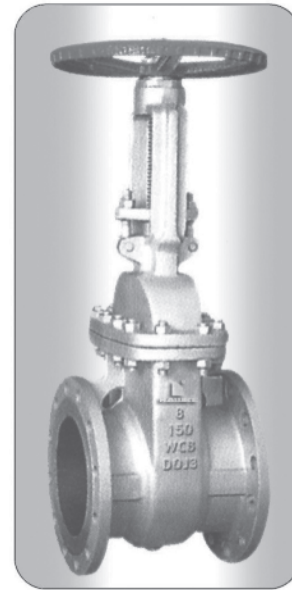
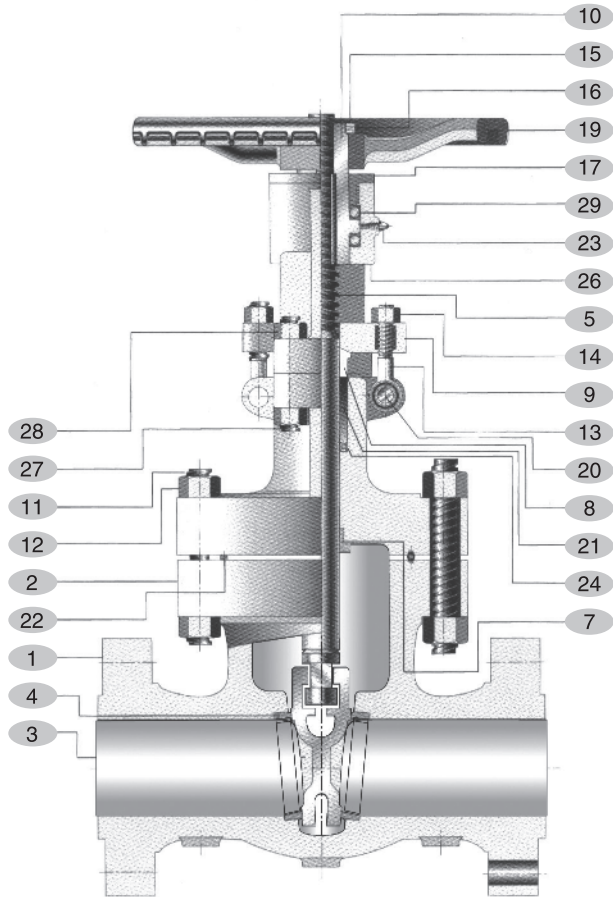
**BODY** The cast steel body is designed to ensure a wall thickness which is greater at any point than the minimum specified by API Std. 600. Special care has been taken with the design of the Class 150 valve body, that the elliptically shaped centre section is free from intensified stresses in the critical area.

The body of above Class 300 are made circular in shape as much as possible to minimize distortion even under extreme operating conditions. Inlet and outlet port dimensions conform to ANSI B16.5 Pipe Fitting.

The welded-in type seat ring is standard to ensure interchangeability. Except for Class 150, the standard body-bonnet joint is male-female.





CAST STEEL  
BOLTED BONNET

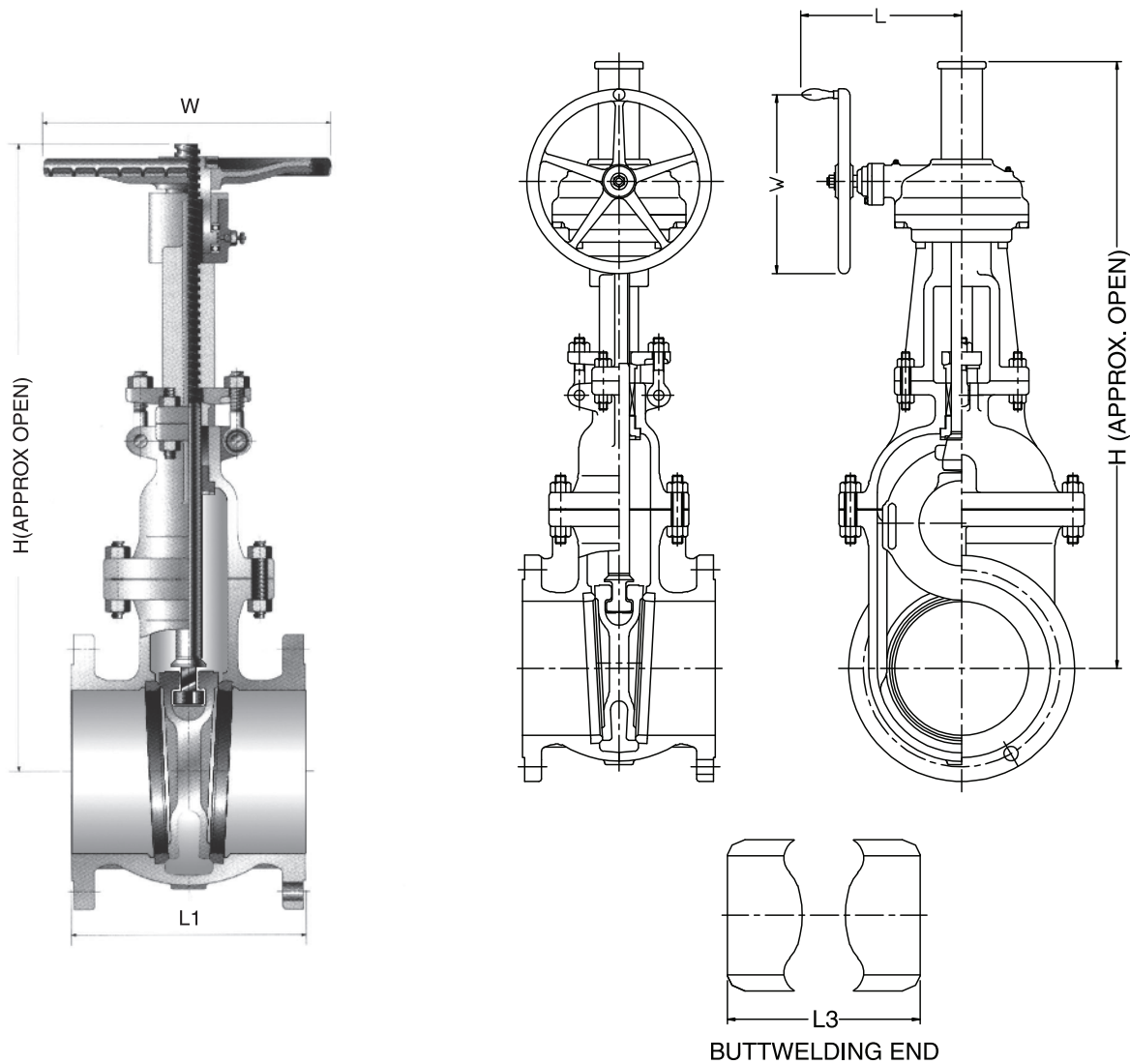
| No | NAME OF PART  | ASTM SPECIFICATION | KS SPECIFICATION |
|----|---------------|--------------------|------------------|
| 15 | HANDLE NUT    | STEEL              | STEEL            |
| 16 | SET SCREW     | STEEL              | STEEL            |
| 17 | SLEEVE GLAND  | STEEL              | STEEL            |
| 19 | HANDWHEEL     | A395               | FCD45            |
| 21 | PACKING       | COMMERCIAL         | COMMERCIAL       |
| 22 | GASKET        | COMMERCIAL         | COMMERCIAL       |
| 23 | GREASE NIPPLE | STEEL              | STEEL            |
| 29 | BEARING       | COMMERCIAL         | COMMERCIAL       |

| No | Name of Part   | ASTM SPECIFICATION |                          |                |                |                |                         | KS SPECIFICATION |
|----|----------------|--------------------|--------------------------|----------------|----------------|----------------|-------------------------|------------------|
|    |                | STANDARD           | HIGH TEMPERATURE SERVICE |                |                |                | LOW TEMPERATURE SERVICE | STANDARD         |
| 1  | BODY           | A216-WCB           | A217-WC1                 | A217-WC6       | A217-WC9       | A217-C5        | A352-LCB                | SCPH 2           |
| 2  | BONNET         | A216-WCB           | A217-WC1                 | A217-WC6       | A217-WC9       | A217-C5        | A352-LCB                | SCPH 2           |
| 3  | *DISC          | A217-CA15          | A217-WC1                 | A217-WC6       | A217-WC9       | A217-C5        | A352-LCB                | SSC 1            |
| 4  | BODY SEAT RING | A105+HARD FACE     | A105+HARD FACE           | A105+HARD FACE | A105+HARD FACE | A105+HARD FACE | A182 F304               | STEEL+13CR       |
| 5  | STEM           | A182-F6a           | A182-F6a                 | A182-F6a       | A182-F6a       | A182-F6a       | A276-304                | STS 410          |
| 7  | BONNET BUSH    | A276-410           | A276-410                 | A276-410       | A276-410       | A276-410       | A276-304                | STS 410          |
| 8  | PACKING GLAND  | A276-410           | A276-410                 | A276-410       | A276-410       | A276-410       | A276-304                | STS 410          |
| 9  | GLAND FLANGE   | A105               | A105                     | A105           | A105           | A105           | A105                    | SF 45            |
| 10 | YOKE SLEEVE    | A439-D2C           | A439-D2C                 | A439-D2C       | A439-D2C       | A439-D2C       | A439-D2C                | FCD 45           |
| 11 | BONNET BOLT    | A193-B7            | A193-B7                  | A193-B7        | A193-B7        | A193-B7        | A320-L7                 | SNB 7            |
| 12 | BONNET NUT     | A194-2H            | A194-2H                  | A194-2H        | A194-2H        | A194-2H        | A194-4                  | SM 45C           |
| 13 | GLAND BOLT     | A193-B7            | A193-B7                  | A193-B7        | A193-B7        | A193-B7        | A320-L7                 | SM 45C           |
| 14 | GLAND NUT      | A194-2H            | A194-2H                  | A194-2H        | A194-2H        | A194-2H        | A194-4                  | SM 45C           |
| 20 | HINGE PIN      | A276-410           | A276-410                 | A276-410       | A276-410       | A276-410       | A276-304                | SM 45C           |
| 24 | LANTERN        | A276-410           | A276-410                 | A276-410       | A276-410       | A276-410       | A276-304                | STS 410          |
| 26 | YOKE           | A216-WCB           | A216-WC1                 | A216-WC6       | A216-WC9       | A216-C5        | A352-LCB                | SCPH 2           |
| 27 | YOKE BOLT      | A193-B7            | A193-B7                  | A193-B7        | A193-B7        | A193-B7        | A320-L7                 | SNB 7            |
| 28 | YOKE NUT       | A194-2H            | A194-2H                  | A194-2H        | A194-2H        | A194-2H        | A194-4                  | SM 45C           |

\*Note : In the case of 8" or larger size, trim material overlayed as per tables or equivalent material of the body will be used.

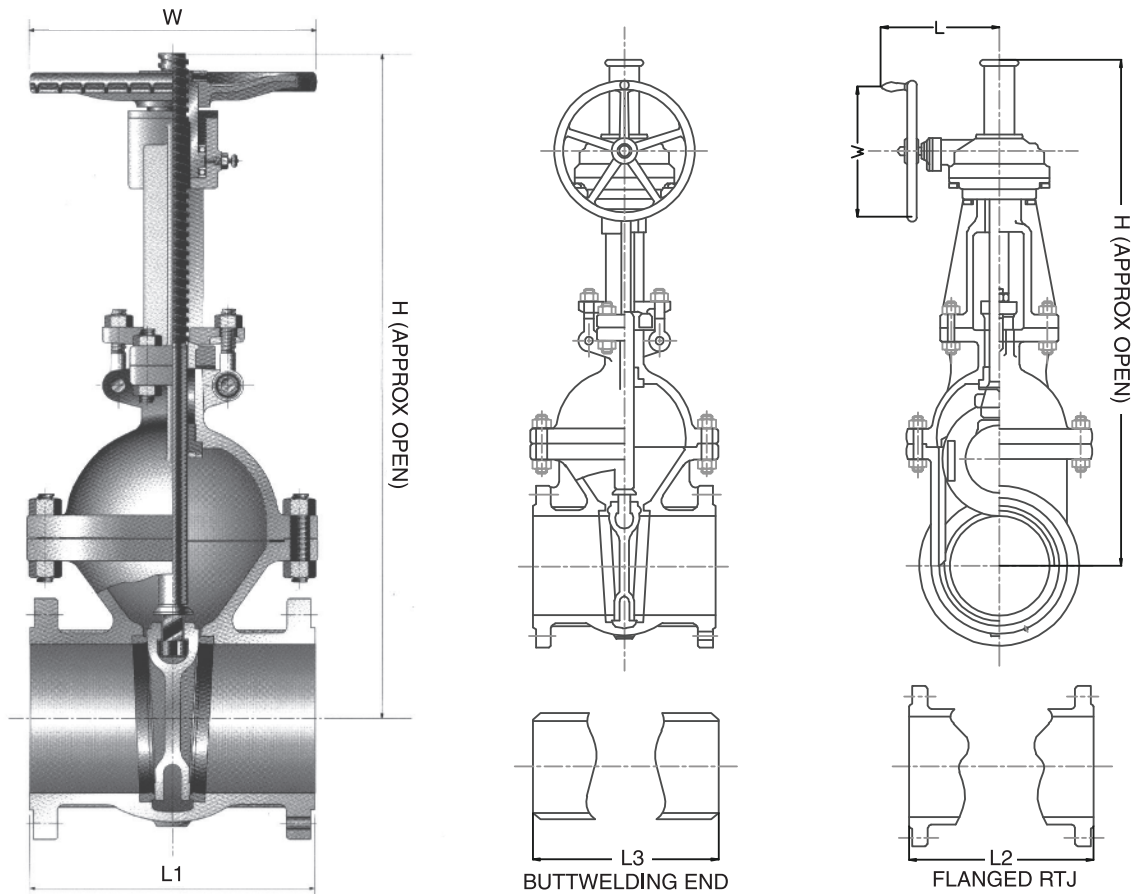
GT KS 10K / ASME 150LB

BOLTED BONNET



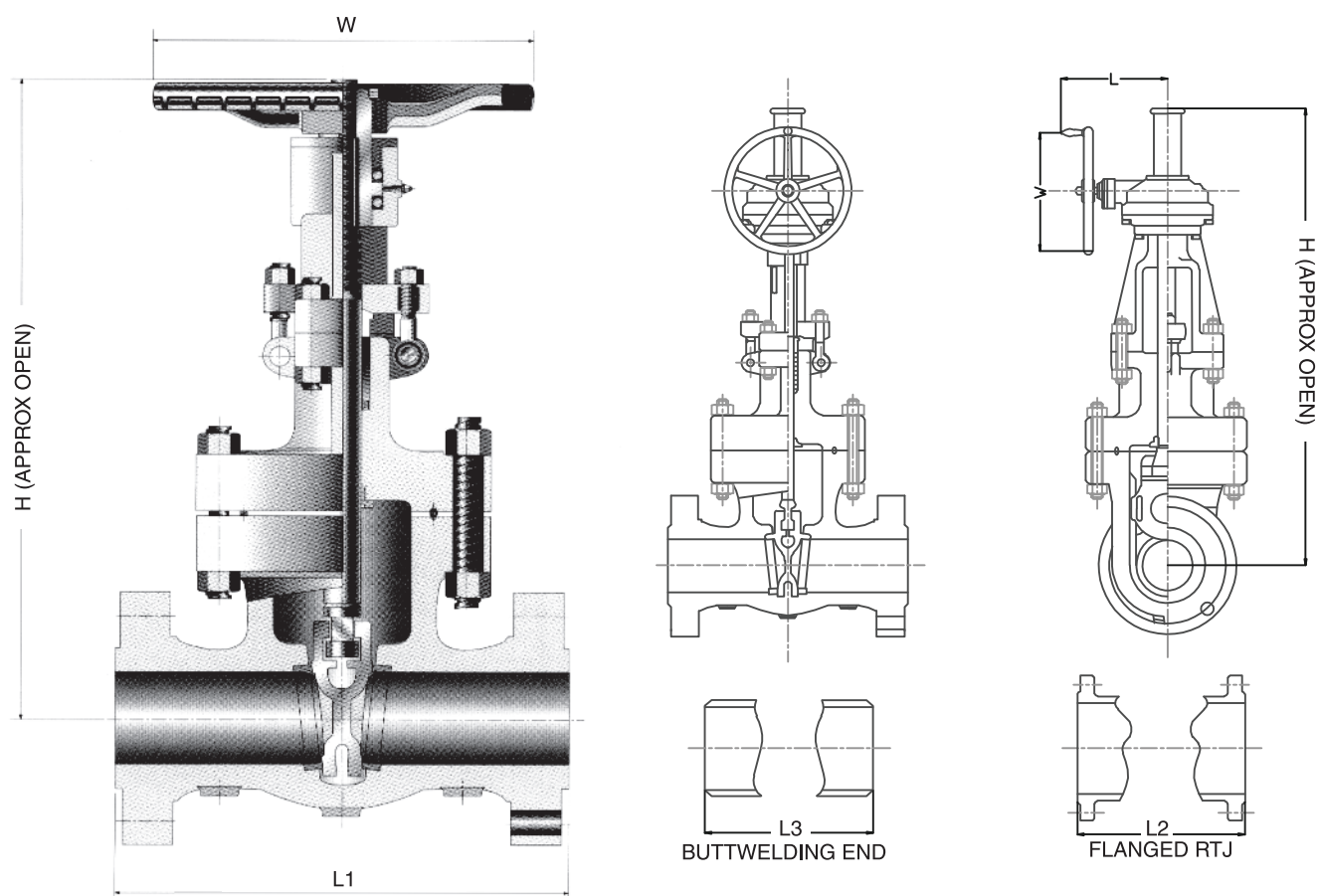
| VALVE SIZE | in | 2    | 2.5  | 3     | 4    | 6     | 8     | 10    | 12    | 14    | 16     | 18     | 20     | 24     | 28     | 30     | 36     | 40     |
|------------|----|------|------|-------|------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|
|            | mm | 50   | 60   | 80    | 100  | 150   | 200   | 250   | 300   | 350   | 400    | 450    | 500    | 600    | 700    | 750    | 900    | 1000   |
| L1         | in | 7.0  | 7.5  | 8.0   | 9.0  | 10.5  | 11.5  | 13.0  | 14.0  | 15.0  | 16.0   | 17.0   | 18.0   | 20.0   | 24.0   | 24.0   | 28.0   | 30.0   |
|            | mm | 178  | 190  | 203   | 229  | 267   | 292   | 330   | 356   | 381   | 406    | 432    | 457    | 508    | 610    | 610    | 711    | 762    |
| L3         | in | 8.5  | 9.5  | 11.12 | 12.0 | 15.87 | 16.5  | 18.0  | 19.75 | 22.5  | 24.0   | 26.0   | 28.0   | 32.0   | 36.0   | 36.0   | 40.0   | 42.0   |
|            | mm | 216  | 241  | 283   | 305  | 403   | 419   | 457   | 502   | 572   | 610    | 660    | 711    | 813    | 914    | 914    | 1016   | 1067   |
| H          | in | 14.0 | 16.3 | 18.4  | 22.2 | 30.0  | 41.9  | 50.6  | 58.3  | 60.0  | 68.7   | 79.1   | 91.7   | 109.6  | 127.4  | 134.5  | 161.8  | 183.9  |
|            | mm | 356  | 415  | 468   | 565  | 762   | 1065  | 1285  | 1480  | 1523  | 1745   | 2010   | 2330   | 2784   | 3236   | 3417   | 4109   | 4670   |
| W          | in | 7.7  | 7.7  | 8.5   | 9.4  | 11.8  | 14.0  | 15.7  | 17.7  | 13.8  | 13.8   | 13.8   | 17.7   | 17.7   | 22.0   | 22.0   | 27.9   | 31.5   |
|            | mm | 195  | 195  | 215   | 240  | 300   | 355   | 400   | 450   | 350   | 350    | 350    | 450    | 450    | 560    | 560    | 710    | 800    |
| L          | in | -    | -    | -     | -    | -     | -     | -     | -     | 13.1  | 13.1   | 13.1   | 14.3   | 14.3   | 16.3   | 16.3   | 18.4   | 20.7   |
|            | mm | -    | -    | -     | -    | -     | -     | -     | -     | 332   | 332    | 332    | 362    | 362    | 414    | 414    | 468    | 526    |
| WEIGHT     | LB | 44.1 | 55.1 | 66.2  | 97.0 | 154.4 | 233.7 | 368.2 | 526.9 | 760.7 | 1080.5 | 1274.5 | 1611.9 | 2280.0 | 3572.1 | 4057.2 | 7497.0 | 9481.5 |
|            | Kg | 20   | 25   | 30    | 44   | 70    | 106   | 167   | 239   | 345   | 490    | 578    | 731    | 1034   | 1620   | 1840   | 3400   | 4300   |

GT KS 20K / ASME 300LB  
BOLTED BONNET



| VALVE SIZE | in | 2    | 2.5   | 3     | 4     | 6     | 8     | 10    | 12     | 14     | 16     | 18     | 20     | 24     | 28     | 30     | 36      | 40      | 42      |
|------------|----|------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|
|            | mm | 50   | 65    | 80    | 100   | 150   | 200   | 250   | 300    | 350    | 400    | 450    | 500    | 600    | 700    | 750    | 900     | 1000    | 1050    |
| L1&L3      | in | 8.5  | 9.5   | 11.12 | 12.0  | 15.88 | 16.5  | 18.0  | 19.75  | 30.0   | 33.0   | 36.0   | 39.0   | 45.0   | 53.0   | 55.0   | 68.0    | 76.0    | 78.0    |
|            | mm | 216  | 241   | 283   | 305   | 403   | 419   | 457   | 502    | 762    | 838    | 914    | 991    | 1143   | 1346   | 1397   | 1727    | 1930    | 1981    |
| L2         | in | 9.12 | 10.12 | 11.75 | 12.62 | 16.5  | 17.12 | 18.62 | 20.37  | 30.62  | 33.62  | 36.62  | 39.75  | 45.88  | 54.0   | 56.0   | 69.12   | -       | -       |
|            | mm | 232  | 257   | 298   | 321   | 419   | 435   | 473   | 518    | 778    | 854    | 930    | 1010   | 1165   | 1372   | 1422   | 1756    | -       | -       |
| H          | in | 16.3 | 17.5  | 20.5  | 23.2  | 33.3  | 40.4  | 48.2  | 61.4   | 60.0   | 68.7   | 79.1   | 91.7   | 109.6  | 130.0  | 148.5  | 169.8   | 188.6   | 198.1   |
|            | mm | 415  | 445   | 520   | 590   | 845   | 1025  | 1225  | 1560   | 1523   | 1745   | 2010   | 2330   | 2784   | 3302   | 3772   | 4312    | 4791    | 5032    |
| W          | in | 7.7  | 7.7   | 8.5   | 9.4   | 14.0  | 15.7  | 17.7  | 19.7   | 17.7   | 17.7   | 22.0   | 22.0   | 27.9   | 35.4   | 35.4   | 30.0    | 30.0    | 30.0    |
|            | mm | 195  | 195   | 215   | 240   | 355   | 400   | 450   | 500    | 450    | 450    | 560    | 560    | 710    | 900    | 900    | 760     | 760     | 760     |
| L          | in | -    | -     | -     | -     | -     | -     | -     | -      | 14.3   | 14.3   | 16.3   | 16.3   | 18.4   | 21.8   | 21.8   | 21.8    | 20.2    | 20.2    |
|            | mm | -    | -     | -     | -     | -     | -     | -     | -      | 362    | 362    | 414    | 414    | 468    | 554    | 554    | 554     | 512     | 512     |
| WEIGHT     | LB | 52.9 | 75.0  | 90.4  | 143.3 | 275.9 | 401.3 | 782.8 | 1060.6 | 1528.1 | 2094.8 | 2535.8 | 3307.5 | 4691.3 | 6637.1 | 8180.6 | 11002.9 | 13582.8 | 14994.0 |
|            | Kg | 24   | 34    | 41    | 65    | 117   | 182   | 335   | 481    | 693    | 950    | 1150   | 1500   | 2250   | 3010   | 3710   | 4990    | 6160    | 6800    |

# GT KS 40K / ASME 600LB - GT KS 63K / ASME 900LB BOLTED BONNET



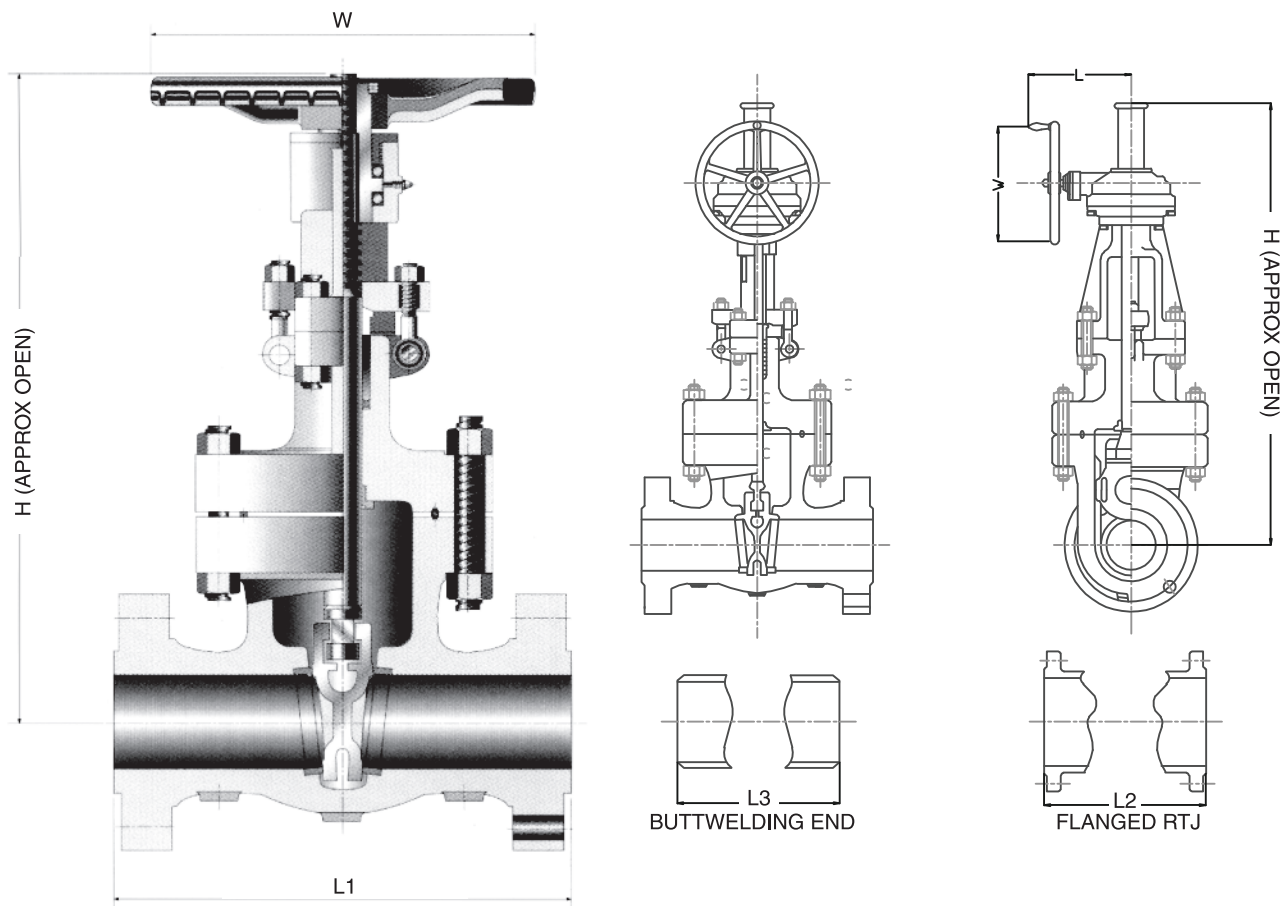
## GT KS 40K / ASME 600LB

| VALVE SIZE | in<br>mm | 2<br>50      | 2.5<br>65    | 3<br>80      | 4<br>100     | 6<br>150     | 8<br>200     | 10<br>250    | 12<br>300    | 14<br>350     | 16<br>400     | 18<br>450      | 20<br>500      | 24<br>600      |
|------------|----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|----------------|----------------|----------------|
| L1&L3      | in<br>mm | 11.5<br>292  | 13.0<br>330  | 14.0<br>356  | 17.0<br>432  | 22.0<br>556  | 26.0<br>660  | 31.0<br>787  | 33.0<br>838  | 35.0<br>889   | 39.0<br>991   | 43.0<br>1092   | 47.0<br>1194   | 55.0<br>1397   |
| L2         | in<br>mm | 11.62<br>295 | 13.12<br>333 | 14.12<br>359 | 17.12<br>435 | 22.12<br>562 | 26.12<br>664 | 31.12<br>791 | 33.12<br>841 | 35.12<br>892  | 39.12<br>994  | 43.12<br>1095  | 47.25<br>1200  | 55.38<br>1406  |
| H          | in<br>mm | 18.7<br>475  | 21.6<br>550  | 23.5<br>598  | 26.8<br>680  | 36.6<br>930  | 45.7<br>1160 | 53.1<br>1350 | 61.8<br>1570 | 72.1<br>1832  | 82.9<br>2106  | 98.0<br>2489   | 104.8<br>2662  | 116.9<br>2970  |
| W          | in<br>mm | 7.7<br>195   | 7.7<br>195   | 9.5<br>240   | 11.8<br>300  | 17.7<br>450  | 17.7<br>450  | 19.7<br>500  | 22.0<br>560  | 22.0<br>560   | 27.9<br>710   | 27.9<br>710    | 31.5<br>800    | 35.4<br>900    |
| L          | in<br>mm | -<br>-       | -<br>-       | -<br>-       | -<br>-       | -<br>-       | -<br>-       | -<br>-       | 16.3<br>414  | 16.3<br>414   | 18.4<br>468   | 18.4<br>468    | 20.7<br>526    | 26.4<br>670    |
| WEIGHT     | LB<br>Kg | 16.3<br>36   | 26.3<br>58   | 31.7<br>70   | 55.3<br>122  | 113.4<br>250 | 183.7<br>405 | 294.8<br>650 | 390.0<br>860 | 562.4<br>1240 | 639.5<br>1410 | 1005.9<br>2218 | 1274.8<br>2811 | 1780.5<br>3926 |

## GT KS 63K / ASME 900LB

| VALVE SIZE | in<br>mm | 2<br>50      | 2.5<br>65   | 3<br>80      | 4<br>100     | 6<br>150     | 8<br>200     | 10<br>250    | 12<br>300    | 14<br>350      | 16<br>400     | 18<br>450      | 20<br>500       | 24<br>600       |
|------------|----------|--------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|---------------|----------------|-----------------|-----------------|
| L1&L3      | in<br>mm | 14.5<br>368  | 16.5<br>419 | 15.0<br>381  | 18.0<br>457  | 24.0<br>610  | 29.0<br>737  | 33.0<br>838  | 38.0<br>965  | 40.5<br>1029   | 44.5<br>1130  | 48.0<br>1219   | 52.0<br>1321    | 61.0<br>1549    |
| L2         | in<br>mm | 14.62<br>371 | 16.2<br>422 | 15.12<br>384 | 18.12<br>460 | 24.12<br>612 | 29.12<br>740 | 33.12<br>841 | 38.12<br>968 | 40.88<br>1038  | 44.88<br>1140 | 48.5<br>1232   | 52.5<br>1333    | 61.75<br>1568   |
| H          | in<br>mm | 21.2<br>539  | 26.4<br>670 | 26.4<br>672  | 30.8<br>782  | 42.4<br>1076 | 55.5<br>1411 | 67.7<br>1720 | 77.4<br>1965 | 74.9<br>1902   | 80.7<br>2051  | 88.8<br>2256   | 110.2<br>2800   | 124.0<br>3150   |
| W          | in<br>mm | 11.8<br>300  | 11.8<br>300 | 14.0<br>355  | 15.4<br>400  | 22.0<br>560  | 17.7<br>450  | 22.0<br>560  | 22.0<br>560  | 24.0<br>610    | 24.0<br>610   | 30.0<br>760    | 30.0<br>760     | 24.0<br>610     |
| L          | in<br>mm | -<br>-       | -<br>-      | -<br>-       | -<br>-       | -<br>-       | 14.3<br>362  | 16.3<br>414  | 16.3<br>414  | 20.2<br>512    | 20.2<br>512   | 21.8<br>554    | 21.8<br>554     | 20.2<br>512     |
| WEIGHT     | LB<br>Kg | 181<br>82    | 342<br>155  | 364<br>165   | 384<br>174   | 999<br>453   | 1720<br>780  | 2752<br>1248 | 3400<br>1542 | 4895.1<br>2220 | 6615<br>3000  | 8533.4<br>3870 | 10716.3<br>4860 | 16096.5<br>7300 |

GT ASME 1500LB - GT ASME 2500LB  
BOLTED BONNET



ASME 1500LB

| VALVE SIZE | in mm | 2 50      | 2.5 65    | 3 80      | 4 100     | 6 150     | 8 200     | 10 250     | 12 300     | 14 350      | 16 400       |
|------------|-------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|-------------|--------------|
| L1&L3      | in mm | 14.5 368  | 16.5 419  | 18.5 470  | 21.5 546  | 27.75 705 | 32.75 832 | 39.0 991   | 44.5 1130  | 49.5 1257   | 54.5 1384    |
| L2         | in mm | 14.62 371 | 16.62 422 | 18.62 473 | 21.62 549 | 28.0 711  | 33.13 841 | 39.38 1000 | 45.12 1146 | 50.25 1276  | 55.38 1406   |
| H          | in mm | 21.2 539  | 26.4 670  | 29.1 738  | 30.8 783  | 47.1 1196 | 60.8 1546 | 66.5 1688  | 82.3 2090  | 85.1 2162   | 97.9 2486    |
| W          | in mm | 11.8 300  | 11.8 300  | 15.7 400  | 19.7 500  | 13.8 350  | 22.0 560  | 27.9 710   | 27.9 710   | 30.0 760    | 30.0 760     |
| L          | in mm | - -       | - -       | - -       | - -       | 13.1 332  | 16.3 414  | 18.4 468   | 18.4 468   | 21.8 554    | 21.8 554     |
| WEIGHT     | LB Kg | 181 82    | 341.8 155 | 401 182   | 573 260   | 1360 617  | 3175 1440 | 4412 2001  | 8414 3816  | 9073.6 4115 | 15324.8 6950 |

GT ASME 2500LB

| VALVE SIZE |    | in mm | 2 50      | 2.5 65    | 3 80      | 4 100     | 6 150     | 8 200      | 10 250     | 12 300     |
|------------|----|-------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|
| L1&L3      |    | in mm | 17.75 451 | 20.0 508  | 22.75 578 | 26.5 673  | 36.00 914 | 40.25 1022 | 50.0 1270  | 56.00 1422 |
| L2         |    | in mm | 17.87 454 | 20.25 514 | 23.0 584  | 26.88 683 | 36.5 927  | 40.87 1038 | 50.88 1292 | 56.88 1445 |
| H          |    | in mm | 24.4 619  | 31.9 809  | 31.9 809  | 42.2 1073 | 57.1 1451 | 63.0 1600  | 82.5 2096  | 90.2 2292  |
| W          |    | in mm | 11.8 300  | 17.7 450  | 17.7 450  | 24.8 630  | 24.0 610  | 24.0 610   | 24.0 610   | 30.0 760   |
| L          |    | in mm | - -       | - -       | - -       | - -       | 17.0 432  | 20.2 512   | 20.2 512   | 21.8 554   |
| WEIGHT     | RF | LB Kg | 184 84    | 298 135   | 399 181   | 1202 545  | 3255 1431 | 4841 2196  | 9076 4117  | 14246 6462 |
|            | BW | LB Kg | 115 52    | 198 90    | 260 118   | 974 442   | 2579 1170 | 3968 1800  | 7540 3420  | 11905 5400 |



## GLOBE VALVE - BOLTED BONNET

**YOKE BUSH** The standard material of Yoke Sleeve is Nodular Ni-resist D2 with over a 1150°C (2100°F) dissolution point in conformity to API Std. specifications.

**BOLTING** The body-bonnet bolts are manufactured in accordance to API Std. 600 specification. The nuts also strictly conform to ANSI B1.1. The stud-bolt nuts are made according to ANSI B18.2.2.

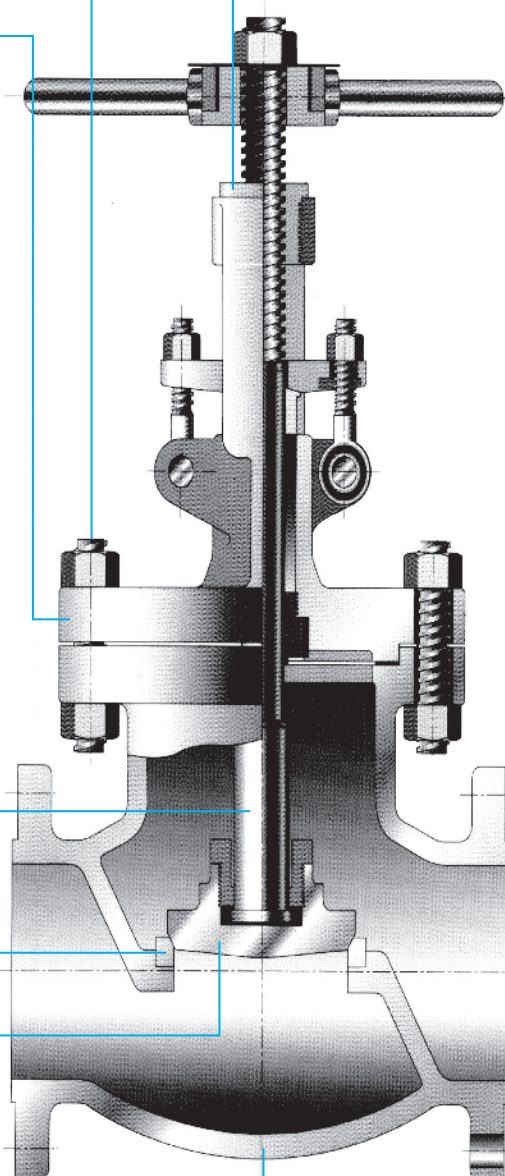
**BONNET** The bonnet is either integral, or separate from yoke, and of the same material as the body. The body-bonnet flange drilling is spot-faced to exactly meet stud-bolt nuts. The back seat bushing in the bonnet guarantees that the packing can be replaced even when the valve is fully opened. The stem packing dimensions of the stuffing box are in accordance to API Std. specifications.

**STEM** The heat-treated stem of one-piece construction is to ensure adequate mechanical properties and surface hardness. Friction at the time of opening and shutting is reduced to a minimum due to accurate machining and lapping. The round finished surface of the stem head helps to achieve point contact with the inside of the disc housing to eliminate friction.

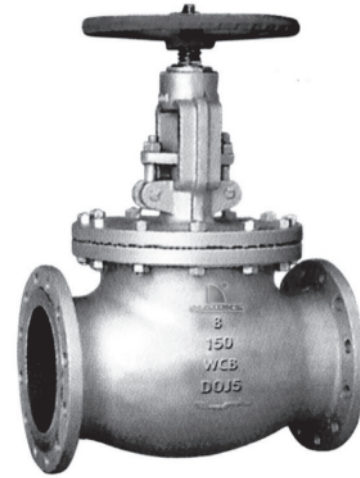
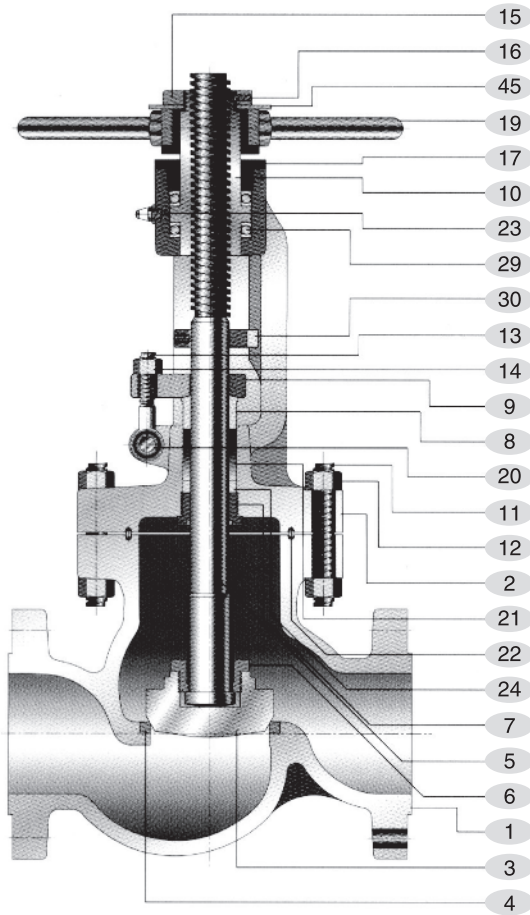
**SEAT RING** The shoulder seated type seat ring is welded or screwed into the body. The seating surface is finished by lapping. The seat ring is forged and heat-treated to deliver the best mechanical properties and required hardness. The difference in hardness between the seat and disc conforms to API Std. specifications.

**DISC** The disc of our globe valve is a loose disc and can freely revolve around the stem. This prevents friction and galling with the seating surfaces when the valve is shut. The disc is furnished with a conical seating surface that has been grounded and lapped to a mirrored finish. It is a one-piece construction, forged and heat treated to deliver the required mechanical properties and hardness.

**BODY** The cast steel body is designed to ensure a wall thickness which is greater at any point than the minimum specified by API Std. 600. Port and seat passage dimensions conform to ANSI B16.5 Pipe Fitting. The screw-in type seat ring is standard to allow interchangeability. The standard body-bonnet joint is male-female and the flange is round for all valve. Accurate machining ensure perfect coaxiality of the valve ends and seat ring in addition to exact perpendicularity of the body-bonnet flanges.



## CAST STEEL BOLTED BONNET



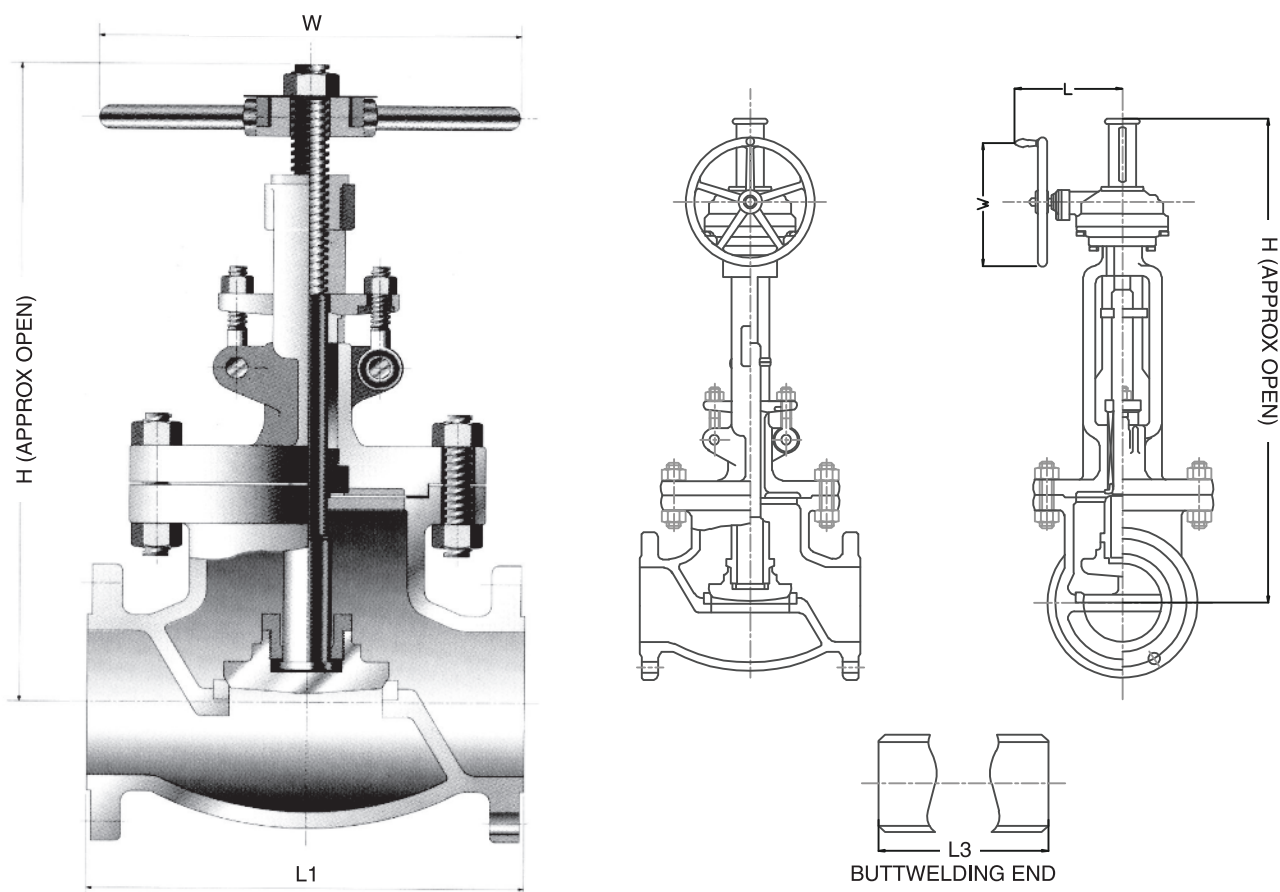
| NO | NAME OF PART  | ASTM SPECIFICATION | KS SPECIFICATION |
|----|---------------|--------------------|------------------|
| 15 | HANDLE NUT    | STEEL              | STEEL            |
| 16 | SET SCREW     | STEEL              | STEEL            |
| 17 | SLEEVE GLAND  | STEEL              | STEEL            |
| 19 | HANDLE WHEEL  | A395               | FCD45            |
| 21 | PACKING       | COMMERCIAL         | COMMERCIAL       |
| 22 | GASKET        | COMMERCIAL         | COMMERCIAL       |
| 23 | GREASE NIPPLE | STEEL              | STEEL            |
| 29 | BEARING       | COMMERCIAL         | COMMERCIAL       |
| 30 | STOPPER       | A283-D             | STEEL            |
| 45 | WASHER        | STEEL              | STEEL            |

| NO | NAME OF PART  | ASTM SPECIFICATION |                          |                |                |                         | STANDARD     |
|----|---------------|--------------------|--------------------------|----------------|----------------|-------------------------|--------------|
|    |               | STANDARD           | HIGH TEMPERATURE SERVICE |                |                | LOW TEMPERATURE SERVICE |              |
| 1  | BODY          | A216-WCB           | A217-WC1                 | A217-WC6       | A217-WC9       | A352-LCB                | SCPH 2       |
| 2  | BONNET        | A216-WCB           | A217-WC1                 | A217-WC6       | A217-WC9       | A352-LCB                | SCPH 2       |
| 3  | *DISC         | A217-CA15          | A217-WC1                 | A217-WC6       | A217-WC9       | A352-LCB                | SSC 1        |
| 4  | BODY SEAT RIG | A105+HADR FACE     | A105+HADR FACE           | A105+HADR FACE | A105+HADR FACE | A182-F304               | STEEL + 13CR |
| 5  | STEM          | A182-F6a           | A182-F6a                 | A182-F6a       | A182-F6a       | A182-F304               | STS 410      |
| 6  | DISC GLAND    | A217-CA15          | A217-CA15                | A217-CA15      | A217-CA15      | A182-F304               | SSC 1        |
| 7  | BONNET BUSH   | A276-410           | A276-410                 | A276-410       | A276-410       | A276-304                | STS 410      |
| 8  | PACKING GLAND | A276-410           | A276-410                 | A276-410       | A276-410       | A276-304                | STS 410      |
| 9  | GLAND FLANGE  | A105               | A105                     | A105           | A105           | A105                    | SF 45        |
| 10 | YOKE SLEEVE   | A439-D2C           | A439-D2C                 | A439-D2C       | A439-D2C       | A439-D2C                | FCD 45       |
| 11 | BONNET BOLT   | A193-B7            | A193-B                   | A193-B7        | A193-B         | A320-L7                 | SNB 7        |
| 12 | BONNET NUT    | A194-2H            | A194-2H                  | A194-          | A194-          | A194-                   | SM 45C       |
| 13 | GLAND BOLT    | A193-B7            | A193-B7                  | A193-B7        | A193-B7        | A320-L7                 | SM 45C       |
| 14 | GLAND NUT     | A194-2H            | A194-2H                  | A194-2H        | A194-2H        | A194-4                  | SM 45C       |
| 20 | HINGE PIN     | A276-410           | A276-410                 | A276-410       | A276-410       | A276-304                | SM 45C       |
| 24 | LANTERN       | A276-410           | A276-410                 | A276-410       | A276-410       | A279-304                | STS 410      |

\*Note : In the case of 8" or larger size, trim material overlayed as per tables or equivalent material of the body will be used.



# GL KS 10K / ASME 150LB - GL KS 20K / ASME 300LB BOLTED BONNET



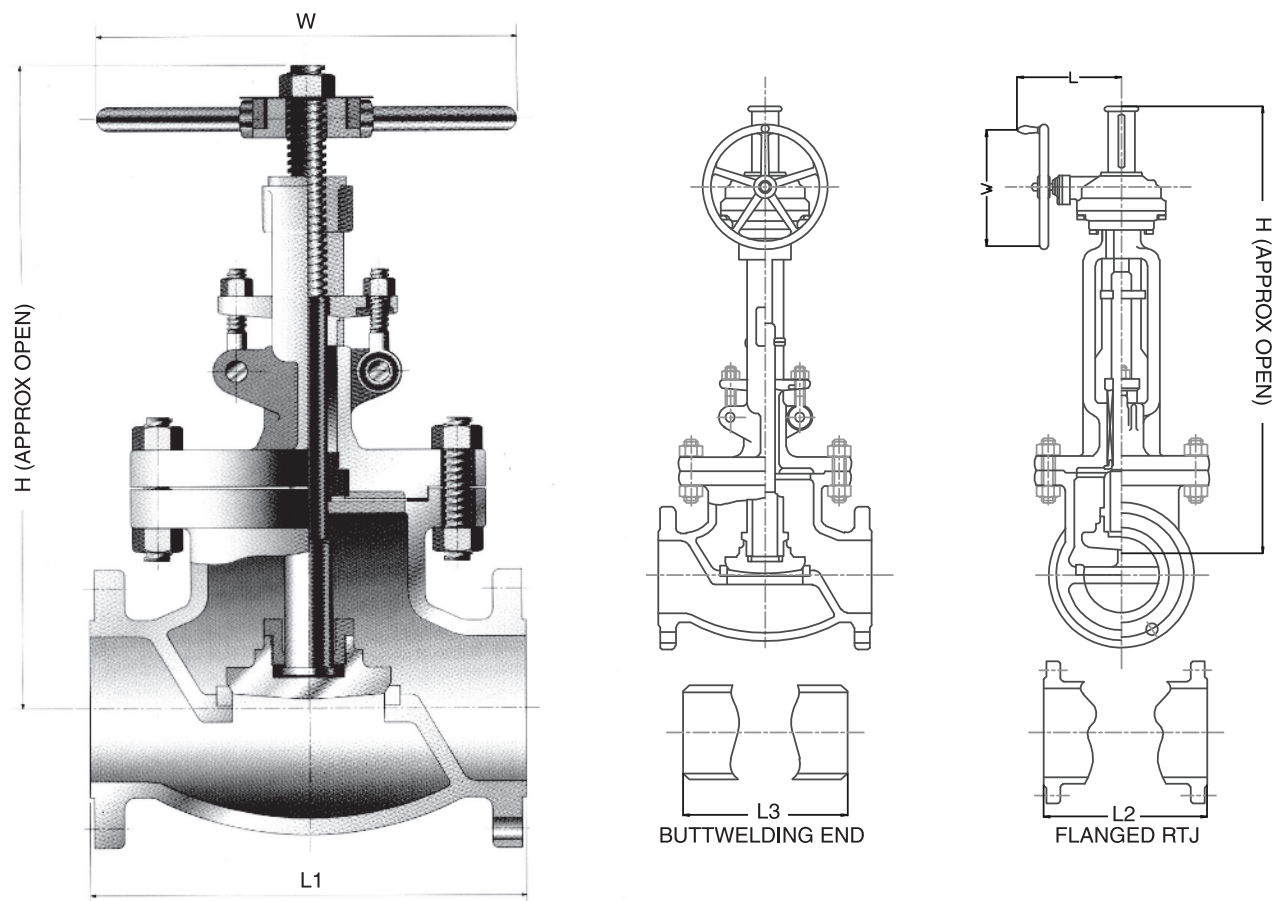
## GT KS 10K / ASME 150LB

| VALVE SIZE | in<br>mm | 2<br>50     | 2.5<br>65   | 3<br>80     | 4<br>100    | 6<br>50     | 8<br>200     | 10<br>250    | 12<br>300    | 14<br>350     | 16<br>400     | 18<br>450     | 20<br>500      | 24<br>600      |
|------------|----------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|--------------|---------------|---------------|---------------|----------------|----------------|
| L1&L3      | in<br>mm | 8.0<br>203  | 8.5<br>216  | 9.5<br>241  | 11.5<br>292 | 16.0<br>406 | 19.5<br>495  | 24.5<br>622  | 27.5<br>698  | 31.0<br>787   | 36.0<br>914   | 38.5<br>978   | 38.5<br>978    | 51.0<br>1295   |
| H          | in<br>mm | 10.8<br>275 | 11.4<br>290 | 12.5<br>320 | 13.7<br>350 | 17.3<br>440 | 22.0<br>560  | 26.4<br>670  | 29.1<br>740  | 54.7<br>1390  | 62.6<br>1590  | 71.7<br>1820  | 80.7<br>2050   | 90.6<br>2300   |
| W          | in<br>mm | 7.7<br>195  | 7.7<br>195  | 8.5<br>215  | 9.4<br>240  | 11.8<br>300 | 14.0<br>355  | 15.7<br>400  | 17.7<br>450  | 22.0<br>560   | 22.0<br>560   | 24.0<br>610   | 27.6<br>700    | 27.6<br>700    |
| L          | in<br>mm | -<br>-      | -<br>-      | -<br>-      | -<br>-      | -<br>-      | -<br>-       | -<br>-       | -<br>-       | 16.3<br>414   | 16.3<br>414   | 17.0<br>432   | 17.0<br>432    | 17.0<br>432    |
| WEIGHT     | LB<br>Kg | 46.3<br>21  | 59<br>27    | 72.8<br>33  | 116.9<br>53 | 209.5<br>95 | 410.1<br>186 | 524.8<br>238 | 804.8<br>365 | 1346.9<br>619 | 1808.1<br>820 | 2154.3<br>977 | 2712.2<br>1230 | 3472.9<br>1575 |

## GT KS 20K / ASME 300LB

| VALVE SIZE | in<br>mm | 2<br>50      | 2.5<br>65    | 3<br>80      | 4<br>100     | 6<br>150     | 8<br>200     | 10<br>250    | 12<br>300     | 14<br>350     | 16<br>400      | 16<br>450      | 20<br>500      | 24<br>600      | 32<br>800      |
|------------|----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|----------------|----------------|----------------|----------------|----------------|
| L1&L3      | in<br>mm | 10.5<br>267  | 11.5<br>292  | 12.5<br>318  | 14.0<br>356  | 17.5<br>444  | 22.0<br>559  | 24.5<br>622  | 28.0<br>711   | 33.0<br>838   | 34<br>864      | 38.5<br>978    | 40<br>1016     | 53<br>1346     | 62.75<br>1594  |
| L2         | in<br>mm | 11.12<br>283 | 12.12<br>308 | 13.12<br>333 | 14.62<br>317 | 18.12<br>460 | 22.62<br>575 | 25.12<br>638 | 28.62<br>727  | 33.6<br>854   | 34.6<br>880    | 38.8<br>986    | 40.6<br>1032   | 53.6<br>1362   | 63.4<br>1610   |
| H          | in<br>mm | 14.4<br>365  | 15.7<br>400  | 16.1<br>410  | 18.9<br>480  | 24.4<br>620  | 29.5<br>750  | 31.5<br>800  | 37.6<br>955   | 54.7<br>1390  | 62.6<br>1590   | 71.7<br>1820   | 80.7<br>2050   | 90.6<br>2300   | 122.0<br>3100  |
| W          | in<br>mm | 7.7<br>195   | 8.5<br>215   | 9.4<br>240   | 10.6<br>270  | 14.0<br>355  | 15.7<br>400  | 17.7<br>450  | 19.7<br>500   | 22.1<br>560   | 27.6<br>700    | 27.6<br>700    | 29.6<br>700    | 31.5<br>800    | 31.5<br>800    |
| L          | in<br>mm | -<br>-       | -<br>-       | -<br>-       | -<br>-       | -<br>-       | -<br>-       | -<br>-       | -<br>-        | 16.3<br>414   | 18.4<br>468    | 18.4<br>468    | 18.4<br>468    | 20.7<br>526    | 20.7<br>526    |
| WEIGHT     | LB<br>Kg | 61.7<br>28   | 86.0<br>39   | 99.2<br>45   | 189.6<br>86  | 330.8<br>150 | 621.8<br>282 | 809.2<br>367 | 1045.2<br>474 | 1907.3<br>865 | 2529.1<br>1147 | 3014.2<br>1367 | 3572.1<br>1620 | 5159.7<br>2340 | 7364.7<br>3340 |

# GL KS 40K / ASME 600LB - GL KS 63K / ASME 900LB BOLTED BONNET



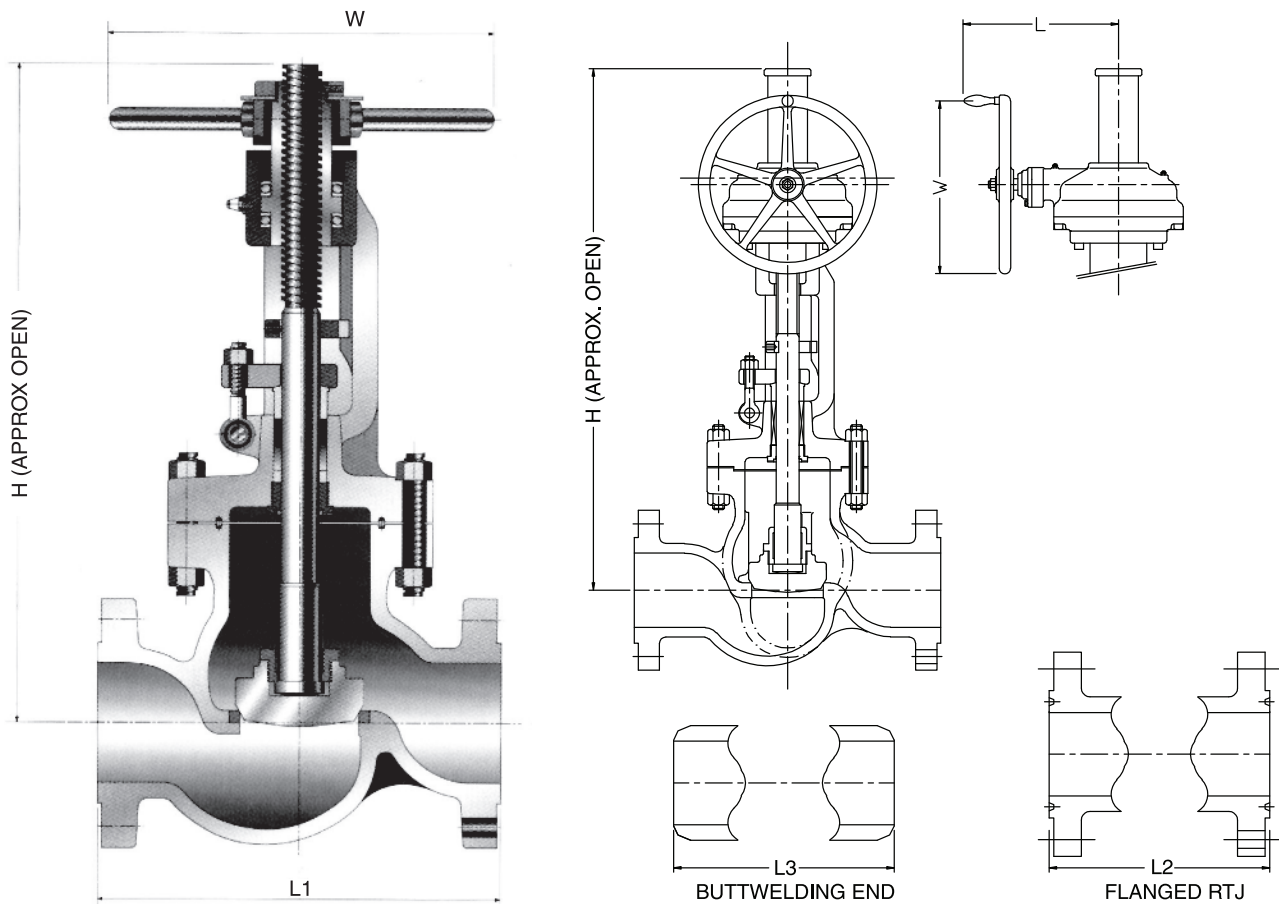
## GL KS 40K / ASME 600LB

| VALVE SIZE | in mm | 2 50      | 2.5 65    | 3 80      | 4 100     | 6 150     | 8 200      | 10 250     | 12 600      | 14 350      | 14 400      |
|------------|-------|-----------|-----------|-----------|-----------|-----------|------------|------------|-------------|-------------|-------------|
| L1&L3      | in mm | 11.5 292  | 13.0 330  | 14.0 356  | 17.0 432  | 22.0 559  | 26.0 600   | 31.0 787   | 33.0 818    | 35.0 889    | 39.0 991    |
| L2         | in mm | 11.62 259 | 13.12 333 | 14.12 359 | 17.12 435 | 22.12 562 | 26.12 664  | 31.12 792  | 33.12 841   | 35.12 892   | 39.12 994   |
| H          | in mm | 16.0 407  | 19.8 502  | 19.9 505  | 22.4 568  | 29.9 759  | 51.8 1315  | 59.5 1511  | 69.9 1775   | 70.9 1800   | 76.0 1930   |
| W          | in mm | 7.7 195   | 8.5 215   | 10.6 270  | 11.8 300  | 14.0 355  | 28.0 710   | 31.5 800   | 35.4 900    | 35.4 900    | 35.4 900    |
| L          | in mm | -         | -         | -         | -         | -         | 18.4 468   | 20.7 526   | 26.4 670    | 26.4 670    | 26.4 670    |
| WEIGHT     | LB Kg | 114.5 52  | 141.1 64  | 187.4 85  | 330.8 150 | 714.4 324 | 1234.8 560 | 1741.9 790 | 2264.5 1027 | 2932.7 1330 | 3825.7 1737 |

## GL KS 60K / ASME 900LB

| VALVE SIZE | in mm | 2 50      | 2.5 65    | 3 80      | 4 100     | 6 150      | 8 200       | 10 250      | 12 300      | 14 350      |
|------------|-------|-----------|-----------|-----------|-----------|------------|-------------|-------------|-------------|-------------|
| L1&L3      | in mm | 14.5 367  | 16.5 419  | 15.0 381  | 18.0 457  | 24.0 610   | 29.0 737    | 33.0 838    | 38.0 965    | 40.5 1029   |
| L2         | in mm | 14.62 371 | 16.62 422 | 15.12 384 | 18.12 460 | 24.12 613  | 29.12 740   | 33.12 841   | 38.12 968   | 40.88 1038  |
| H          | in mm | 27.4 695  | 27.4 695  | 30.5 775  | 33.7 855  | 50.7 1288  | 65.6 1665   | 63.0 1600   | 67.1 1705   | 87.0 2210   |
| W          | in mm | 15.7 400  | 15.7 400  | 15.7 400  | 15.7 400  | 22.0 560   | 31.5 800    | 31.5 800    | 35.4 900    | 35.4 900    |
| L          | in mm | -         | -         | -         | -         | 16.3 414   | 20.7 526    | 20.7 526    | 26.4 670    | 26.4 670    |
| WEIGHT     | LB Kg | 271.2 123 | 341.8 155 | 231.5 105 | 411 200   | 1101.5 500 | 2756.3 1250 | 4520.3 2050 | 5843.3 2650 | 8048.3 3650 |

GL ASME 1500LB - GL ASME 2500LB  
BOLTED BONNET



GL ASME 1500LB

| VALVE SIZE | in mm | 2 50      | 2.5 65    | 3 80      | 4 100     | 6 150     | 8 200       | 10 250      | 12 300      | 14 350       |
|------------|-------|-----------|-----------|-----------|-----------|-----------|-------------|-------------|-------------|--------------|
| L1&L3      | in mm | 14.5 368  | 16.5 419  | 18.5 470  | 21.5 546  | 27.75 705 | 32.75 832   | 39.0 991    | 44.5 1130   | 49.5 1257    |
| L2         | in mm | 14.62 371 | 16.62 422 | 18.62 473 | 21.62 549 | 28.0 711  | 33.13 841   | 39.68 1000  | 45.12 1146  | 50.25 1276   |
| H          | in mm | 27.4 695  | 27.4 695  | 31.5 799  | 40.0 1015 | 53.0 1345 | 77.2 196    | 91.0 2310   | 105.1 2670  | 126.0 3200   |
| W          | in mm | 15.7 400  | 15.7 400  | 19.7 500  | 19.7 500  | 28.0 710  | 28.0 710    | 30.0 760    | 30.0 760    | 30.0 760     |
| L          | in mm | -         | -         | -         | -         | 18.4 468  | 18.4 468    | 20.2 512    | 20.2 512    | 22.3 567     |
| WEIGHT     | lb Kg | 271.2 123 | 341.8 155 | 396.9 180 | 749.7 340 | 1482 627  | 4630.5 2100 | 7055.0 3200 | 9702.0 4400 | 11907.0 5400 |

GL ASME 2500LB

| VALVE SIZE | in mm  | 2 50      | 2.5 65    | 3 80      | 4 100     | 6 150     | 8 200      | 10 250     | 12 300     |
|------------|--------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|
| L1&L3      | in mm  | 15.75 451 | 20.0 508  | 22.75 578 | 26.5 673  | 36.0 914  | 40.25 1022 | 50.0 1270  | 56.0 1422  |
| L2         | in mm  | 17.87 454 | 20.25 514 | 23.0 584  | 26.88 683 | 36.5 927  | 40.87 1038 | 50.88 1292 | 56.88 1445 |
| H          | in mm  | 28.3 720  | 31.5 800  | 34.8 885  | 50.0 1260 | 75.0 1905 | 97.0 2465  | 100.2 2800 | 138.0 3505 |
| W          | in mm  | 15.7 400  | 19.7 500  | 19.7 500  | 24.0 610  | 24.0 610  | 30.0 760   | 30.0 760   | 30.0 760   |
| L          | in mm  | -         | -         | -         | 20.2 512  | 17.0 432  | 22.3 567   | 22.3 567   | 22.3 567   |
| WEIGHT     | RF     | lb 377    | 595       | 694       | 1667      | 4564      | 9524       | 13492      | 16865      |
|            |        | kg 171    | 270       | 315       | 756       | 2070      | 4320       | 6120       | 7650       |
| BW         | lb 317 | 476       | 556       | 1369      | 3968      | 8730      | 11905      | 14881      |            |
|            | kg 144 | 216       | 252       | 621       | 1800      | 3960      | 5400       | 6750       |            |

## SWING CHECK VALVE - BOLTED BONNET

**BOLTING** The body-cover bolting conforms to API B 1.1. The nuts are manufactured to conform to ANSI B18.2.2

**COVER** The cover material is identical to the body. Depending on the valve size and pressure class, either a casting or a forging will be used.

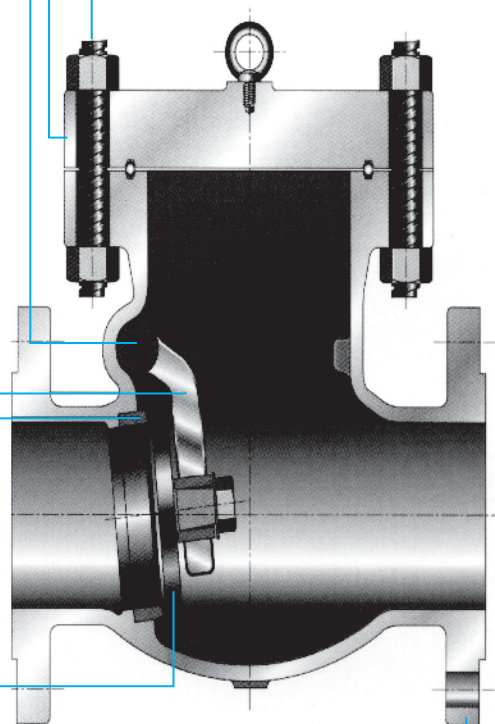
**HINGE PIN** The hinge pin is inserted into the valve and held in position by a plug. The larger size valves are provided with bolted flanges instead of plugs.

**ARM** The arm material is identical to the body. Hinge bushing is provided in the larger valve sizes to minimize friction and eliminate seizing.

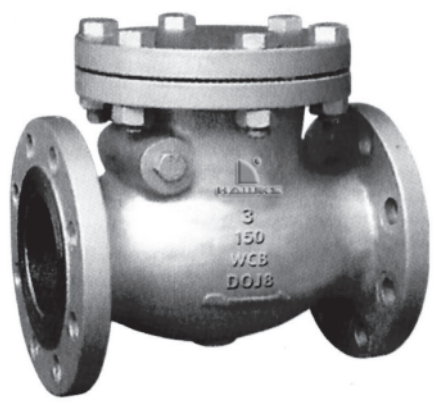
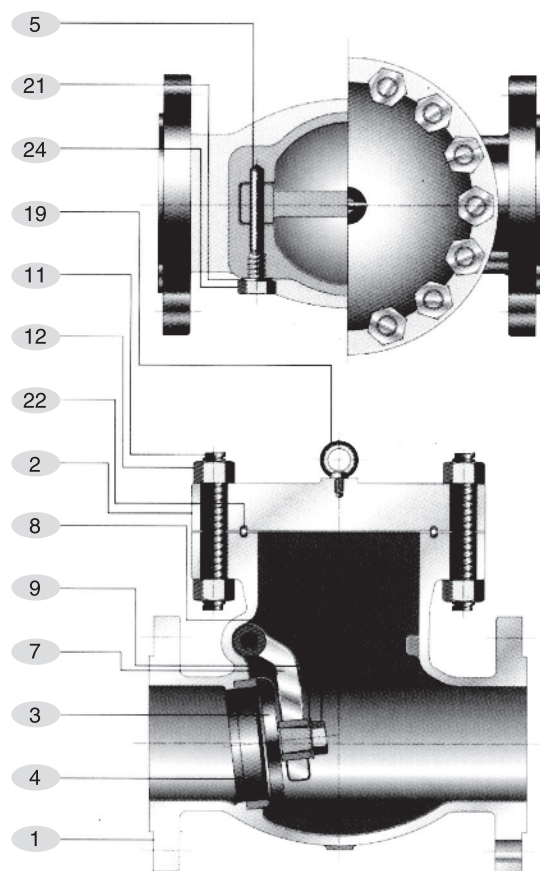
**SEAT RING** The bottom seated type seat ring is screwed into body. The seating surface is finished by lapping. The forged seat ring is heat-treated to deliver the best mechanical properties and required hardness.

**DISC** The disc has a sufficient seating surface area which is grounded and lapped to a mirrored finish. Its is a one-piece construction and is heat treated to deliver the required mechanical properties and hardness.

**BODY** The cast steel body is designed with a wall thickness which is greater at any point than the minimum requirement provided by API Std. 600 or API6D. Port and seat passage dimensions conform to ANSI B16.5 Pipe Fitting. The welded-in type seat ring is standard to allow interchangeability. The standard body-bonnet joint is male-female, and the flange is round for all valves.



CAST STEEL  
BOLTED COVER



| NO | NAME OF PART | ASME SPECIFICATION | KS SPECIFICATION |
|----|--------------|--------------------|------------------|
| 8  | DISC NUT     | AISI 304           | SM 45C           |
| 9  | DISC WASHER  | AISI 304           | STS 304          |
| 19 | EYE BOLT     | A105               | SM 25C           |
| 21 | PLUG GASKET  | COMMERCIAL         | COMMERCIAL       |
| 22 | GASKET       | COMMERCIAL         | COMMERCIAL       |
| 24 | PLUG         | A105               | SCM 440          |

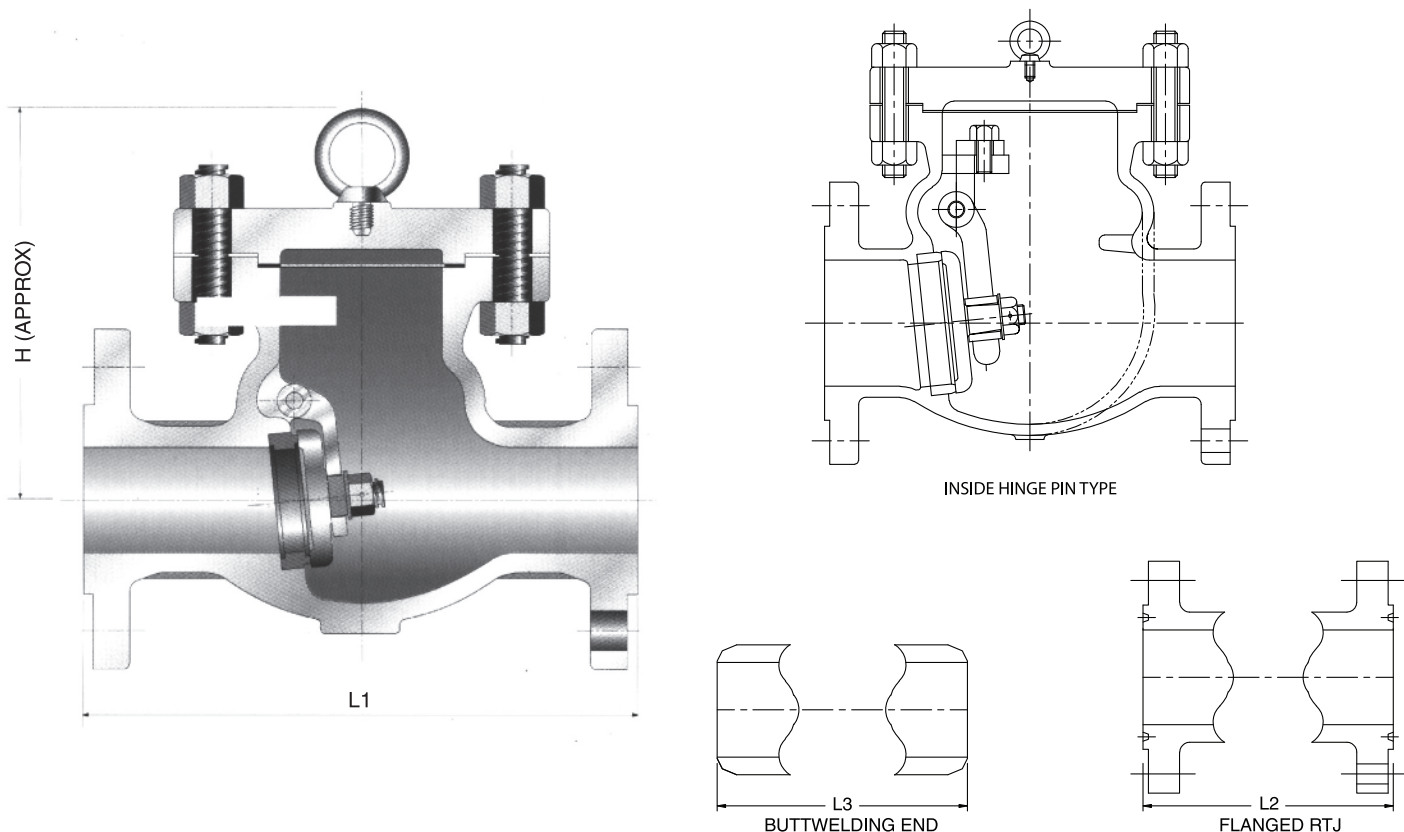
| NO | NAME OF PART   | ASME SPECIFICATION |                          |                |                         |           | KS SPECIFICATION |
|----|----------------|--------------------|--------------------------|----------------|-------------------------|-----------|------------------|
|    |                | STANDARD           | HIGH TEMPERATURE SERVICE |                | LOW TEMPERATURE SERVICE |           | STANDARD         |
| 1  | BODY           | A216-WCB           | A217-WC1                 | A217-WC6       | A217-WC9                | A352-LCB  | SCPH2            |
| 2  | COVER          | A216-WCB           | A217-WC1                 | A217-WC6       | A217-WC9                | A352-LCB  | SCPH2            |
| 3  | *DISC          | A217-CA15          | A217-WC1                 | A217-WC6       | A217-WC9                | A352-LCB  | SSC 1            |
| 4  | BODY SEAT RING | A105+HARD FACE     | A105+HARD FACE           | A105+HARD FACE | A105+HARD FACE          | A182-F304 | STEEL + 13 CR    |
| 5  | HINGE PIN      | A276-410           | A276-410                 | A276-410       | A276-410                | A276-304  | STS 410          |
| 7  | ARM            | A216-WCB           | A216-WC1                 | A216-WC6       | A216-WC9                | A352-LCB  | SCPH 2           |
| 11 | BONNET BOLT    | A193-B7            | A193-B7                  | A193-B7        | A193-B7                 | A320-L7   | SNB 7            |
| 12 | BONNET         | A194-2H            | A194-2H                  | A194-2H        | A194-2H                 | A194-4    | SM 45C           |

\*Note : In the case of 8" or larger size, trim material overlayed as per tables or equivalent material of the body will be used.



# SW / CH KS 10K / ASME 150LB - SW / CH KS 20K / ASME 300LB

## BOLTED COVER



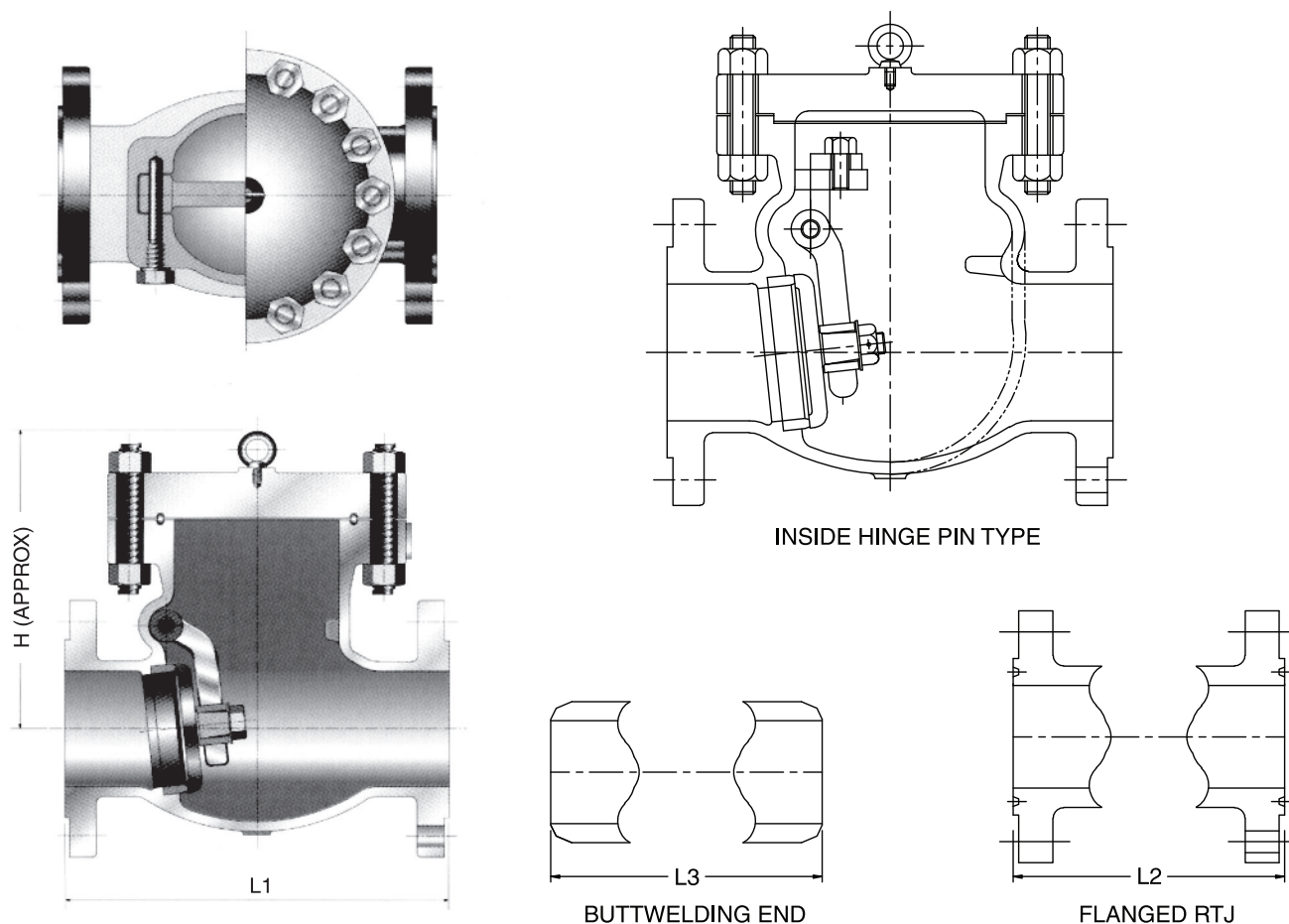
### SW / CH KS 10K / ASME 150LB

| VALVE SIZE | in<br>mm | 2<br>50    | 2.5<br>65  | 3<br>80    | 4<br>100    | 6<br>150    | 8<br>200     | 10<br>250    | 12<br>300    | 14<br>350    | 16<br>400     | 18<br>450     | 20<br>500     | 24<br>600      | 28<br>700      | 30<br>750      |
|------------|----------|------------|------------|------------|-------------|-------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|----------------|----------------|----------------|
| L1&L3      | in<br>mm | 8.0<br>203 | 8.5<br>216 | 9.5<br>241 | 11.5<br>292 | 16.0<br>356 | 19.5<br>495  | 24.5<br>622  | 27.5<br>698  | 31.0<br>787  | 36.0<br>86.4  | 38.5<br>978   | 38.5<br>978   | 51.0<br>1295   | 57.0<br>1448   | 60.0<br>1524   |
| H          | in<br>mm | 61<br>155  | 6.7<br>170 | 7.3<br>185 | 7.9<br>200  | 10.0<br>255 | 10.0<br>305  | 13.6<br>345  | 15.0<br>380  | 18.1<br>460  | 21.5<br>545   | 25.6<br>650   | 26.4<br>670   | 35.4<br>900    | 40.0<br>1016   | 45.2<br>1149   |
| WEIGHT     | LB<br>Kg | 33.1<br>15 | 48.5<br>22 | 59.5<br>27 | 90.4<br>41  | 176.4<br>80 | 313.1<br>142 | 390.3<br>177 | 639.5<br>290 | 862.2<br>391 | 1016.5<br>461 | 1411.2<br>640 | 1719.9<br>780 | 3285.5<br>1490 | 4520.3<br>2050 | 6392.3<br>2899 |

### SW / CH KS 20K / ASME 300LB

| VALVE SIZE | in<br>mm | 2<br>50      | 2.5<br>65    | 3<br>80      | 4<br>100     | 6<br>150     | 8<br>200     | 10<br>250    | 12<br>300    | 14<br>350     | 16<br>400     | 18<br>450      | 20<br>500      | 24<br>600      | 28<br>700      |
|------------|----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|----------------|----------------|----------------|----------------|
| L1&L3      | in<br>mm | 10.5<br>267  | 11.5<br>292  | 12.5<br>318  | 14.0<br>356  | 17.5<br>444  | 21.0<br>533  | 24.5<br>622  | 28.0<br>711  | 33.0<br>838   | 34.0<br>864   | 38.5<br>978    | 40.0<br>1016   | 53.0<br>1346   | 59.0<br>1499   |
| L2         | in<br>mm | 11.12<br>283 | 12.12<br>308 | 13.12<br>333 | 14.62<br>371 | 18.12<br>460 | 21.62<br>549 | 25.12<br>638 | 28.62<br>727 | 33.62<br>854  | 34.62<br>880  | 39.12<br>994   | 40.75<br>1035  | 53.88<br>1368  | 60.0<br>1524   |
| H          | in<br>mm | 6.9<br>17.5  | 7.5<br>190   | 8.1<br>205   | 8.7<br>220   | 12.8<br>326  | 14.5<br>368  | 18.6<br>473  | 20.9<br>530  | 22.8<br>580   | 27.4<br>695   | 31.4<br>797    | 30.6<br>776    | 39.6<br>1007   | 45.2<br>1149   |
| WEIGHT     | LB<br>Kg | 41.9<br>19   | 66.2<br>30   | 77.2<br>35   | 119.1<br>54  | 282.4<br>128 | 463.1<br>210 | 590.9<br>268 | 915<br>415   | 1503.8<br>682 | 1647.1<br>747 | 2756.3<br>1250 | 3307.5<br>1500 | 4917.2<br>2230 | 6504.8<br>2950 |

# SW / CH KS 40K / ASME 600LB - SW / CH KS 63K / ASME 900LB BOLTED COVER



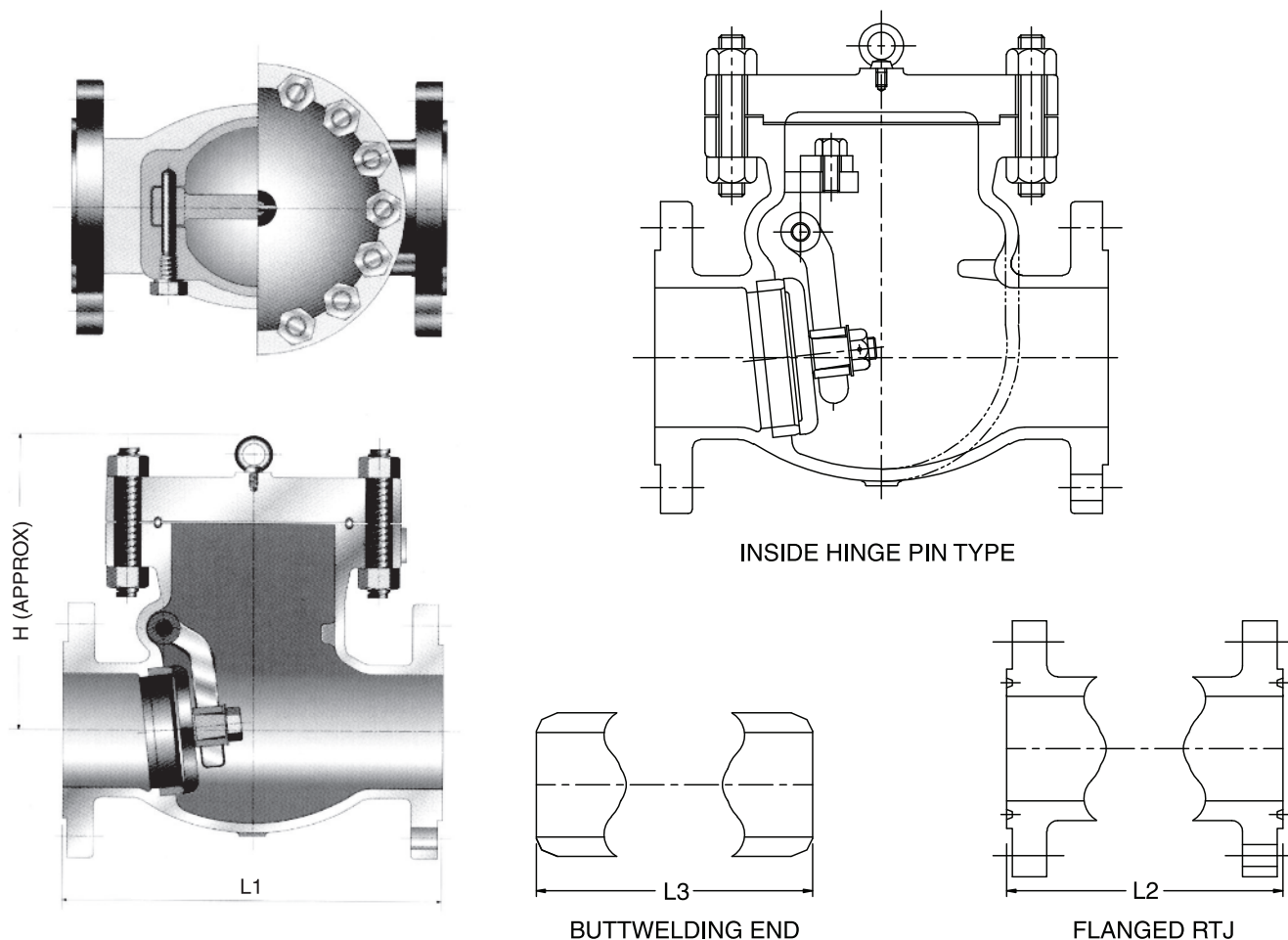
## SW / CH KS 40K / ASME 600LB

| VALVE SIZE | in<br>mm | 2<br>50      | 2.5<br>65    | 3<br>80      | 4<br>100     | 6<br>150     | 8<br>200     | 10<br>250     | 12<br>300     | 14<br>350      | 16<br>400      | 18<br>450      | 20<br>500       | 24<br>600      |
|------------|----------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|----------------|----------------|----------------|-----------------|----------------|
| L1&L3      | in<br>mm | 11.5<br>295  | 13.0<br>330  | 14.0<br>356  | 17.0<br>432  | 22.0<br>559  | 26.0<br>660  | 31.0<br>787   | 33.0<br>838   | 35.0<br>889    | 39.0<br>991    | 43.0<br>1092   | 47.0<br>1194    | 55.0<br>1397   |
| L2         | in<br>mm | 11.62<br>295 | 13.12<br>333 | 14.12<br>359 | 17.12<br>435 | 22.12<br>562 | 26.12<br>664 | 31.12<br>791  | 33.12<br>841  | 35.12<br>892   | 39.12<br>994   | 43.12<br>1095  | 47.25<br>1200   | 55.38<br>1407  |
| H          | in<br>mm | 7.5<br>190   | 8.3<br>210   | 9.6<br>235   | 11.8<br>300  | 15.7<br>400  | 16.9<br>430  | 20.7<br>525   | 24.2<br>615   | 27.6<br>700    | 32.0<br>812    | 37.8<br>960    | 40.5<br>1029    | 45.7.3<br>1202 |
| WEIGHT     | LB<br>Kg | 77.2<br>35   | 119.1<br>54  | 141.1<br>64  | 229.3<br>104 | 449.8<br>204 | 793.8<br>360 | 1367.1<br>620 | 1775.0<br>805 | 2306.4<br>1046 | 2976.8<br>1350 | 4454.1<br>2020 | 52693.9<br>2390 | 7717.5<br>3500 |

## SW / CH KS 63K / ASME 900LB

| VALVE SIZE | in<br>mm | 2<br>50      | 2.5<br>65    | 3<br>80      | 4<br>100     | 6<br>150     | 8<br>200      | 10<br>250      | 12<br>300      | 14<br>350      | 16<br>400      |
|------------|----------|--------------|--------------|--------------|--------------|--------------|---------------|----------------|----------------|----------------|----------------|
| L1&L3      | in<br>mm | 14.5<br>368  | 16.5<br>419  | 15.0<br>381  | 18.0<br>457  | 24.0<br>610  | 29.0<br>737   | 33.0<br>838    | 38.0<br>965    | 40.5<br>1029   | 44.5<br>1130   |
| L2         | in<br>mm | 14.62<br>371 | 16.62<br>422 | 15.12<br>384 | 18.12<br>460 | 21.12<br>613 | 29.12<br>740  | 33.12<br>841   | 38.12<br>968   | 40.88<br>1038  | 44.88<br>1140  |
| H          | in<br>mm | 13.1<br>333  | 13.7<br>349  | 12.6<br>321  | 16.7<br>423  | 18.9<br>479  | 22.2<br>565   | 28.3<br>721    | 30.7<br>781    | 31.8<br>807    | 33.0<br>838    |
| WEIGHT     | LB<br>Kg | 154.4<br>70  | 242.6<br>110 | 242.6<br>110 | 471.4<br>214 | 837.9<br>380 | 1375.9<br>624 | 2535.8<br>1150 | 3197.3<br>1450 | 3858.8<br>1750 | 5336.1<br>2420 |

# SW / CH ASME 1500LB - SW / CH ASME 2500LB BOLTED COVER



## SW / CH ASME 1500LB

| VALVE SIZE | in | 2     | 2.5   | 3     | 4     | 6     | 8      | 10     | 12     | 14      |
|------------|----|-------|-------|-------|-------|-------|--------|--------|--------|---------|
|            | mm | 50    | 65    | 80    | 100   | 150   | 200    | 250    | 300    | 350     |
| L1&L3      | in | 14.5  | 16.5  | 18.5  | 21.5  | 27.75 | 32.75  | 39.0   | 44.5   | 49.5    |
|            | mm | 368   | 419   | 470   | 546   | 705   | 832    | 991    | 1130   | 1257    |
| L2         | in | 14.62 | 16.62 | 18.62 | 21.62 | 28.0  | 33.13  | 39.38  | 45.12  | 50.25   |
|            | mm | 371   | 422   | 473   | 549   | 711   | 841    | 1000   | 1146   | 1276    |
| H          | in | 13.1  | 13.7  | 15.3  | 16.5  | 23.1  | 26.8   | 29.8   | 39.7   | 40.8    |
|            | mm | 333   | 349   | 389   | 419   | 587   | 680    | 750    | 1008   | 1035    |
| WEIGHT     | LB | 271.2 | 341.8 | 396.9 | 749.7 | 1482  | 4630.5 | 7055.0 | 9702.0 | 11907.0 |
|            | Kg | 123   | 155   | 180   | 340   | 627   | 2100   | 3200   | 4400   | 5400    |

## SW / CH ASME 2500LB

| VALVE SIZE | in | 2     | 2.5   | 3     | 4     | 6    | 8     | 10    | 12    | 14    | 16    |
|------------|----|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|
|            | mm | 50    | 65    | 80    | 100   | 150  | 200   | 250   | 300   | 350   | 400   |
| L1&L3      | in | 17.75 | 20.0  | 22.75 | 26.5  | 36.0 | 40.25 | 50.0  | 56.0  | 62.0  | 68.0  |
|            | mm | 451   | 508   | 573   | 673   | 914  | 1022  | 1270  | 1422  | -     | -     |
| L2         | in | 17.87 | 20.25 | 26.88 | 26.88 | 36.5 | 40.87 | 50.88 | 56.88 | -     | -     |
|            | mm | 454   | 514   | 683   | 683   | 927  | 1038  | 1292  | 1445  | -     | -     |
| H          | in | 16.4  | 16.5  | 18.9  | 18.9  | 20.1 | 28.0  | 33.5  | 39.4  | 47.2  | 51.1  |
|            | mm | 416   | 419   | 479   | 479   | 511  | 711   | 851   | 1000  | 1200  | 1299  |
| WEIGHT     | RF | LB    | 298   | 476   | 694   | 1290 | 2877  | 5060  | 7837  | 11310 | -     |
|            |    | Kg    | 135   | 216   | 315   | 585  | 1305  | 2295  | 3555  | 5130  | -     |
| WEIGHT     | BW | LB    | 238   | 387   | 556   | 1071 | 2381  | 4365  | 6250  | 9028  | 16075 |
|            |    | Kg    | 108   | 176   | 252   | 486  | 1080  | 1980  | 2835  | 4095  | 7290  |

## GATE VALVE - PRESSURE SEAL BONNET

**YOKE SLEEVE** The upper portion of the Yoke Sleeve is hexagonally tapered to fix the handwheel. The standard material of the Yoke Sleeve is Nodular Ni-resist D2 with over a 1150°C (2100°F) dissolution point in accordance to API Std. specifications.

**BONNET** The bonnet is a steel forging identical to the body to insure high reliability. The bonnet has a perfect body-bonnet seal, and both ease of dismantling and reassembling are ensured. The body and bonnet of the valve are machined by special purpose machines to achieve perfect coaxiality and eliminate any misalignment which may damage the stem.

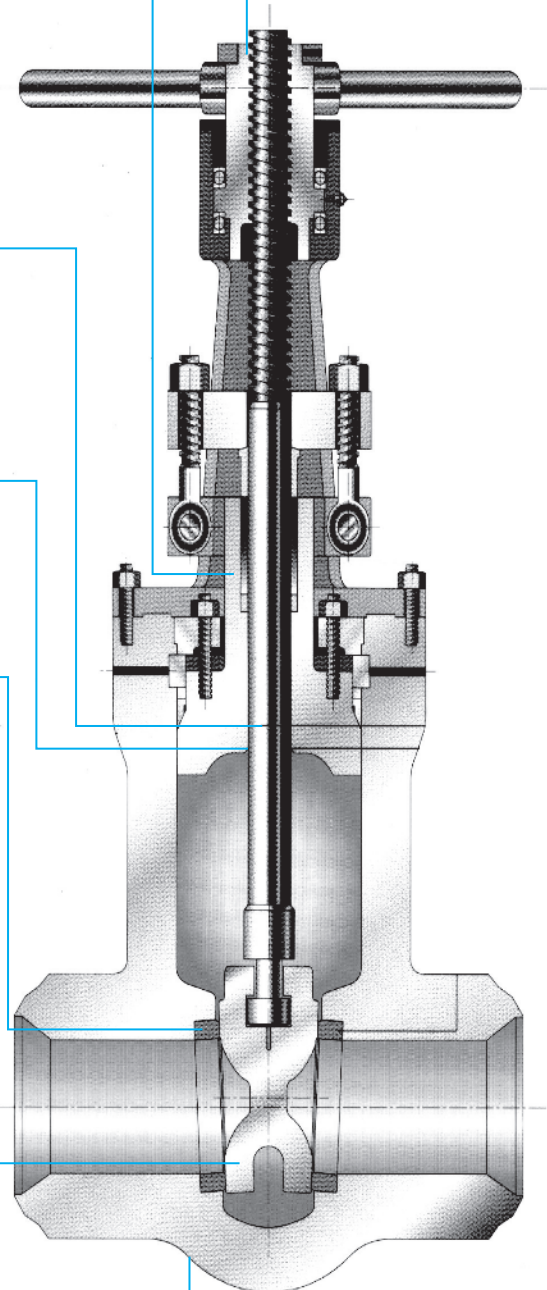
**STEM** The machined forged stem comes with a T-shape head, which connects the slot of the wedge. The contacting surface of the head is spherically shaped, thereby giving it greater strength and durability. It is heat treated to give it adequate mechanical properties and surface hardness. Accurate machining and lapping ensure minimal friction during opening and shutting of the valve.

**BACK SEAT** All our valves are provided with positive back seat, and packing replacement can be done with the valve fully open. The conical seat and the guide are integrally stellite faced.

**SEAT RING** The stellite 6 surface of the seat ring is integrally applied to the body by means of welding for all valve sizes. Lapping is applied to the seating surface and ensures perfect match with the wedge surface.

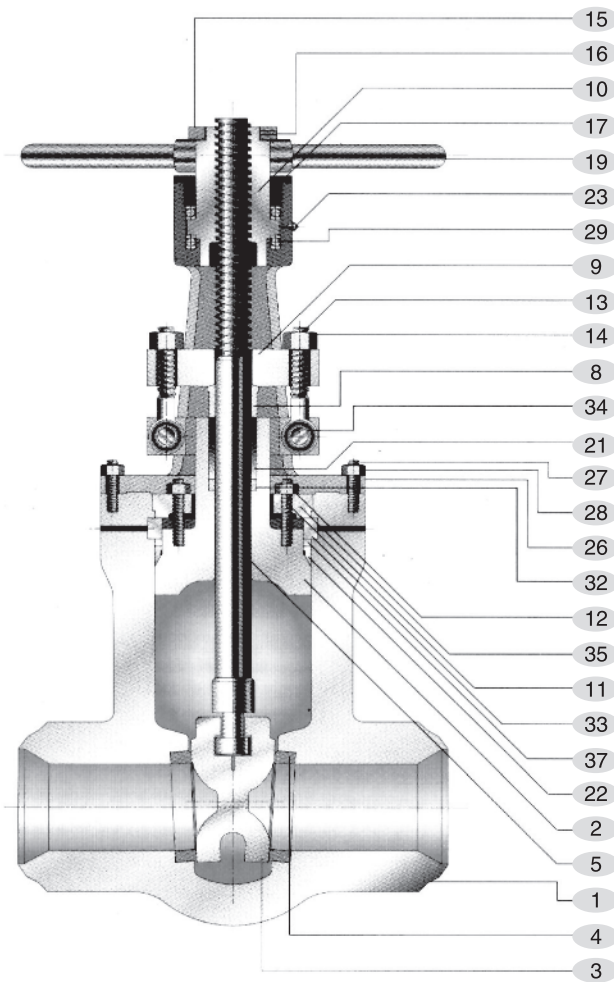
**FLEXIBLE WEDGE** The Flexible wedge is designed to absorb thermally-induced body distortion, thereby making it ideal for high temperature steam or water supply piping. A stellite 6 layer is applied to the seating surface, and this deposit is subjected to a special heat treatment to secure required hardness and soundness. The lapped finish then ensures perfect match with the seats.

**BODY** The valve body is cylindrically shaped to prevent distortion or undue stress during extreme working conditions. In addition, adequate padding helps to achieve a sound cast structure in critical area. The wall thickness is greater than, or in accordance to API, ANSI and ASME requirements. The contact surfaces ensure that a minimum specific pressure is achieved. The area in contact with the pressure seal gasket has a stainless steel 18/8 inlay to eliminate corrosion or wire drawing and to ensure easy dismantling at all times. The close tolerances of the inside diameter of this area are attained by accurate machining and honing finish.





# CAST STEEL PRESSURE SEAL BONNET



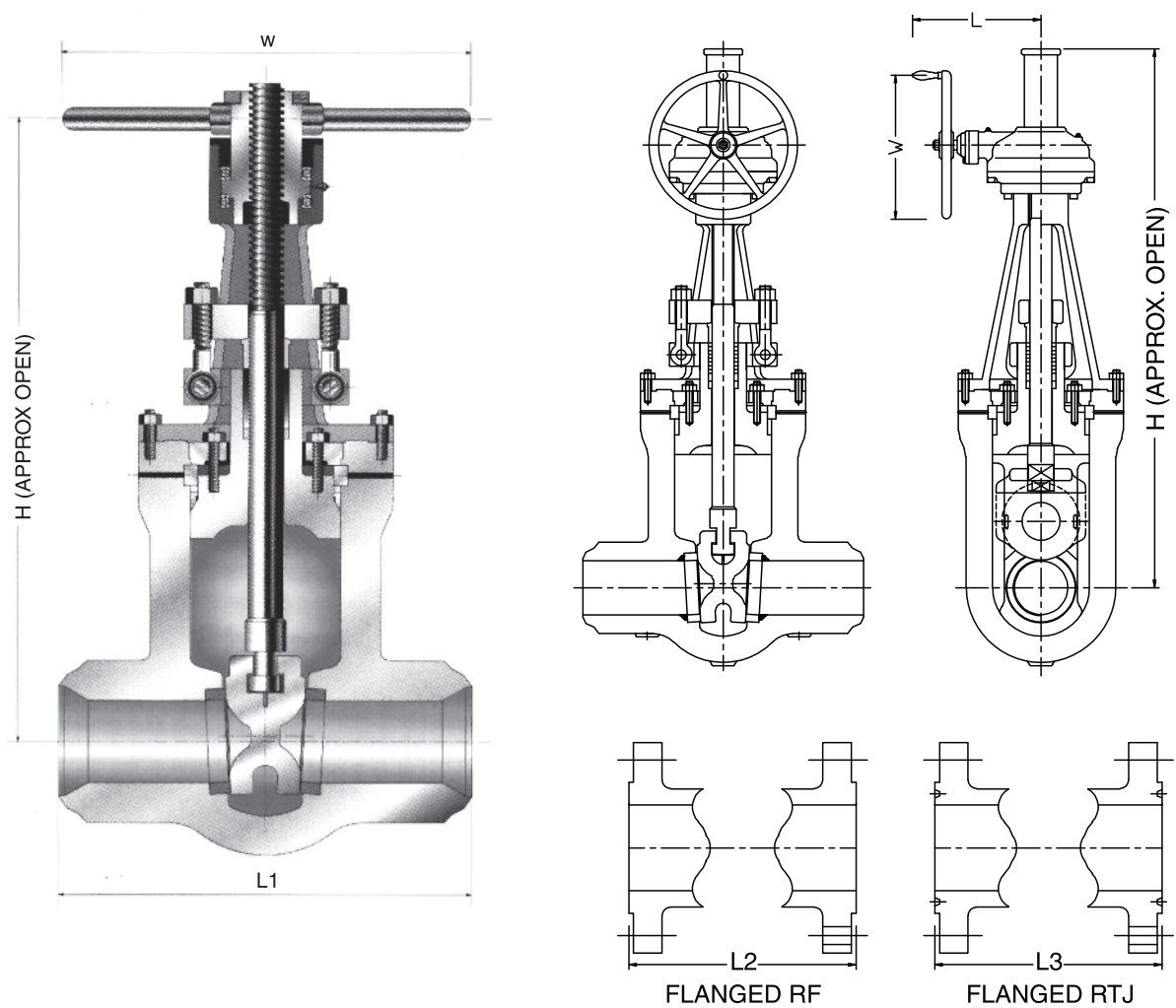
| NO | NAME OF PART  | ASTM SPECIFICATION |
|----|---------------|--------------------|
| 15 | HANDLE NUT    | STEEL              |
| 16 | SET SCREW     | STEEL              |
| 17 | SLEEVE GLAND  | STEEL              |
| 19 | HANDLE WHEEL  | A395               |
| 21 | PACKING       | COMMERCIAL         |
| 22 | GASKET        | COMMERCIAL         |
| 23 | GREASE NIPPLE | STEEL              |
| 29 | BEARING       | COMMERCIAL         |

| NO | NAME OF PART   | ASTM SPECIFICATION |                          |                |                |                |                         |                  |
|----|----------------|--------------------|--------------------------|----------------|----------------|----------------|-------------------------|------------------|
|    |                | STANDARD           | HIGH TEMPERATURE SERVICE |                |                |                | LOW TEMPERATURE SERVICE |                  |
| 1  | BODY           | A216-WCB           | A217-WC1                 | A217-WC6       | A217-WC9       | A217-C5        | A352-LCB                | A352-LC1/LC2/LC3 |
| 2  | BONNET         | A216-WCB           | A217-WC1                 | A217-WC6       | A217-WC9       | A217-C5        | A352-LCB                | A352-LC1/LC2/LC3 |
| 3  | * DISC         | A217-CA15          | A217-WC1                 | A217-WC6       | A217-WC9       | A217-C5        | A352 LCB                | A352-LC1/LC2/LC3 |
| 4  | BODY SEAT RING | A105+HARD FACE     | A105+HARD FACE           | A105+HARD FACE | A105+HARD FACE | A105+HARD FACE | A182-F304               | A182-F304        |
| 5  | STEM           | A182-F6a           | A182-F6a                 | A182-F6a       | A182-F6a       | A182-F6a       | A182-F304               | A182-F304        |
| 8  | PACKING GLAND  | A276-410           | A276-410                 | A276-410       | A276-410       | A276-410       | A276-304                | A276-304         |
| 9  | GLAND FLANGE   | A105               | A105                     | A105           | A105           | A105           | A105                    | A105             |
| 10 | YOKE SLEEVE    | A439-D2C           | A439-D2C                 | A439-D2C       | A439-D2C       | A439-D2C       | A439-D2C                | A439-D2C         |
| 11 | BONNET BOLT    | A193-B7            | A193-B7                  | A193-B7        | A193-B7        | A193-B7        | A320-L7                 | A320-L7          |
| 12 | BONNET NUT     | A194-2H            | A194-2H                  | A194-2H        | A194-2H        | A194-2H        | A194-4                  | A194-4           |
| 13 | GLAND BOLT     | A193-B7            | A193-B7                  | A194-B7        | A194-B7        | A194-B7        | A320-L7                 | A320-L7          |
| 14 | GLAND NUT      | A194-2H            | A194-2H                  | A194-2H        | A194-2H        | A194-2H        | A194-4                  | A194-4           |
| 26 | YOKE           | A216-WCB           | A216-WC1                 | A216-WC6       | A216-WC9       | A217-C5        | A352-LCB                | A352-LC1/LC2/LC3 |
| 27 | YOKE BOLT      | A193-B7            | A193-B7                  | A193-B7        | A193-B7        | A193-B7        | A320-L7                 | A320-L7          |
| 28 | YOKE NUT       | A194-2H            | A194-2H                  | A194-4         | A194-4         | A194-4         | A194-4                  | A194-4           |
| 32 | PACKING WASHER | A276-410           | A276-410                 | A276-410       | A276-410       | A276-410       | A276-304                | A276-304         |
| 33 | RETAINER       | A276-410           | A276-410                 | A276-410       | A276-410       | A276-410       | A276-304                | A276-304         |
| 34 | HINGE CLAMP    | A216-WCB           | A216-WC1                 | A216-WC6       | A216-WC9       | A216-WC5       | A352-LCB                | A352-LC1/LC2/LC3 |
| 35 | BONNET CLAMP   | A216-WCB           | A216-WC1                 | A216-WC6       | A216-WC9       | A216-WC5       | A352-LCB                | A352-LC1/LC2/LC3 |
| 37 | GASKET SPACER  | A276-410           | A276-410                 | A276-410       | A276-410       | A276-410       | A276-304                | A276-304         |

\*Note : In the case of 8" or larger size, trim material overlayed as per tables or equivalent material of the body will be used.



GT ASME 600LB - GT ASME 900LB  
PRESSURE SEAL BONNET



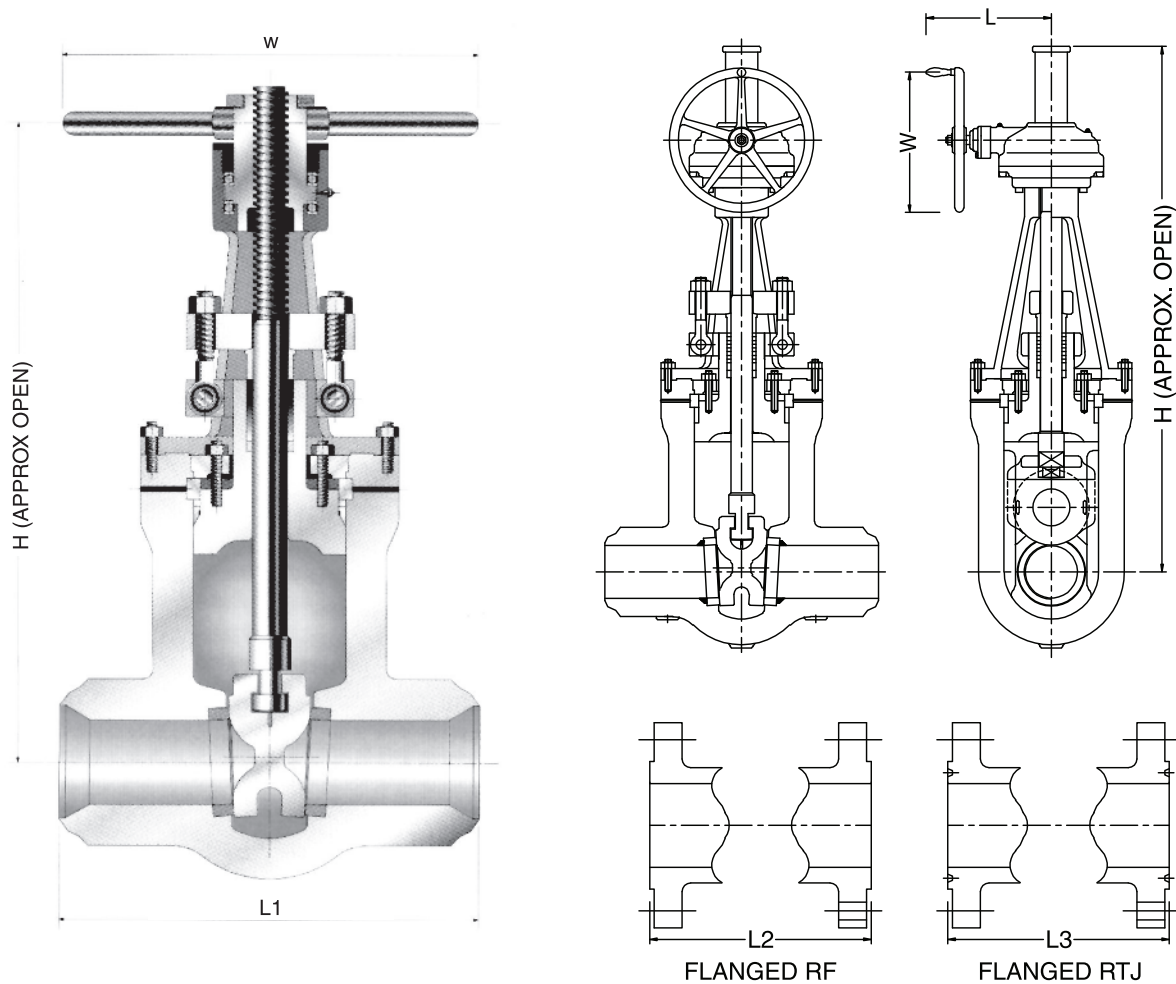
GT ASME 600LB

| VALVE SIZE | in mm | 2 50  | 2.5 65 | 3 80  | 4 100 | 6 150 | 8 200 | 10 250 | 12 300 | 14 350 | 16 400 | 18 450 | 20 500 | 24 600 |
|------------|-------|-------|--------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| L1         | in    | 7.0   | 8.5    | 10.0  | 12.0  | 18.0  | 23.0  | 28.0   | 32.0   | 35.0   | 39.0   | 43.0   | 47     | 55.0   |
|            | mm    | 178   | 216    | 254   | 305   | 457   | 584   | 711    | 813    | 889    | 991    | 1092   | 1194   | 1397   |
| L2         | in    | 11.5  | 13.0   | 14.0  | 17.0  | 22.0  | 26.0  | 31.0   | 33.0   | 35.0   | 39.0   | 43.0   | 47     | 55.0   |
|            | mm    | 292   | 330    | 356   | 432   | 556   | 660   | 787    | 838    | 889    | 991    | 1092   | 1194   | 1397   |
| L3         | in    | 11.62 | 13.12  | 14.12 | 17.12 | 22.12 | 26.12 | 31.12  | 33.12  | 35.12  | 39.12  | 43.12  | 47.25  | 55.38  |
|            | mm    | 295   | 333    | 359   | 435   | 562   | 664   | 791    | 841    | 892    | 994    | 1095   | 1200   | 1406   |
| H          | in    | 23.2  | 24.8   | 26.3  | 36.0  | 42.5  | 49.9  | 59.5   | 70.5   | 73.1   | 851    | 88.6   | 97.2   | 118.1  |
|            | mm    | 590   | 629    | 667   | 914   | 1080  | 1267  | 1511   | 1791   | 1857   | 2162   | 2251   | 2470   | 3000   |
| W          | in    | 7.9   | 9.8    | 9.8   | 11.8  | 19.7  | 22.0  | 27.2   | 35.8   | 24.0   | 24.0   | 24.0   | 24.0   | 30.0   |
|            | mm    | 200   | 250    | 250   | 300   | 500   | 560   | 690    | 610    | 610    | 610    | 610    | 610    | 760    |
| L          | in    | -     | -      | -     | -     | -     | -     | -      | 17.0   | 17.0   | 20.2   | 20.2   | 20.0   | 21.8   |
|            | mm    | -     | -      | -     | -     | -     | -     | -      | 432    | 432    | 512    | 512    | 512    | 554    |
| WEIGHT     | LB    | 16.3  | 26.3   | 31.7  | 55.3  | 113.4 | 183.7 | 294.8  | 390.0  | 562.4  | 639.5  | 1005.9 | 1274.8 | 1780.5 |
|            | Kg    | 36    | 58     | 70    | 122   | 250   | 405   | 650    | 860    | 1240   | 1410   | 2218   | 2811   | 3926   |

GT ASME 900LB

| VALVE SIZE | in mm | 2 50  | 2.5 65 | 3 80  | 4 100 | 6 150 | 8 200  | 10 250 | 12 300 | 14 350 | 16 400 | 18 450 | 20 500 | 24 600  |
|------------|-------|-------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|---------|
| L1         | in    | 8.5   | 10.0   | 12.0  | 14.0  | 20.0  | 26.0   | 31.0   | 36.0   | 39.0   | 43.0   | 46.5   | 50.5   | 59.5    |
|            | mm    | 216   | 254    | 305   | 356   | 508   | 660    | 787    | 914    | 991    | 1092   | 1181   | 1283   | 1511    |
| L2         | in    | 14.5  | 16.5   | 15.0  | 18.0  | 24.0  | 29.0   | 33.0   | 38.0   | 40.5   | 44.5   | 48.0   | 50.5   | 61.0    |
|            | mm    | 368   | 419    | 381   | 457   | 610   | 737    | 838    | 965    | 1029   | 1130   | 1219   | 1283   | 1549    |
| L3         | in    | 14.62 | 16.62  | 15.12 | 18.12 | 24.12 | 29.12  | 33.12  | 38.12  | 40.88  | 44.88  | 48.5   | 52.5   | 61.75   |
|            | mm    | 371   | 422    | 384   | 460   | 612   | 740    | 841    | 968    | 1038   | 1140   | 1232   | 1333   | 1568    |
| H          | in    | 23.4  | 29.6   | 29.8  | 34.0  | 39.9  | 50.2   | 60.7   | 70.1   | 79.8   | 89.0   | 97.2   | 108.3  | 127.6   |
|            | mm    | 594   | 753    | 756   | 864   | 1013  | 1276   | 1543   | 1781   | 2026   | 2261   | 2470   | 2750   | 3242    |
| W          | in    | 11.8  | 17.7   | 17.7  | 19.7  | 22.0  | 18.1   | 24.0   | 24.0   | 24.0   | 24.0   | 29.9   | 29.9   | 24.0    |
|            | mm    | 300   | 450    | 450   | 500   | 560   | 460    | 610    | 610    | 610    | 610    | 760    | 760    | 610     |
| L          | in    | -     | -      | -     | -     | -     | 16.8   | 17.0   | 20.0   | 20.2   | 20.2   | 21.8   | 21.8   | 20.1    |
|            | mm    | -     | -      | -     | -     | -     | 427    | 432    | 512    | 512    | 512    | 554    | 554    | 512     |
| WEIGHT     | LB    | 132.3 | 207.3  | 224.9 | 330.8 | 617.4 | 1455.3 | 2116.8 | 2976.8 | 3748.5 | 5292   | 7320.6 | 9702.0 | 14927.9 |
|            | Kg    | 60    | 94     | 102   | 150   | 280   | 660    | 960    | 1350   | 1700   | 2400   | 3320   | 4400   | 6770    |

GT ASME 1500LB - GT ASME 2500LB  
PRESSURE SEAL BONNET



GT ASME 1500LB

| VALVE SIZE | in<br>mm | 2<br>50 | 2.5<br>65 | 3<br>80 | 4<br>100 | 6<br>150 | 8<br>200 | 10<br>250 | 12<br>300 | 14<br>350 | 16<br>400 |
|------------|----------|---------|-----------|---------|----------|----------|----------|-----------|-----------|-----------|-----------|
| L1         | in       | 8.5     | 10.0      | 12.0    | 16.0     | 22.0     | 28.0     | 34.0      | 39.0      | 42.0      | 47.0      |
|            | mm       | 216     | 254       | 305     | 406      | 559      | 711      | 864       | 991       | 1067      | 1194      |
| L2         | in       | 14.5    | 16.5      | 18.5    | 21.5     | 27.75    | 32.75    | 39.0      | 44.5      | 49.5      | 54.5      |
|            | mm       | 368     | 419       | 470     | 546      | 705      | 832      | 991       | 1130      | 1257      | 1384      |
| L3         | in       | 14.62   | 16.62     | 18.62   | 21.62    | 28.0     | 33.13    | 39.38     | 45.12     | 50.25     | 55.38     |
|            | mm       | 371     | 422       | 473     | 549      | 711      | 841      | 1000      | 1146      | 1276      | 1406      |
| H          | in       | 23.4    | 29.6      | 29.6    | 34.0     | 48.0     | 51.6     | 64.8      | 77.8      | 87.2      | 91.8      |
|            | mm       | 594     | 753       | 753     | 864      | 1219     | 1311     | 1645      | 1975      | 2216      | 2331      |
| W          | in       | 11.8    | 17.7      | 17.7    | 19.7     | 24.0     | 24.0     | 24.0      | 24.0      | 29.9      | 29.9      |
|            | mm       | 300     | 450       | 450     | 500      | 610      | 610      | 610       | 610       | 760       | 760       |
| L          | in       | -       | -         | -       | -        | 17.0     | 17.0     | 20.2      | 20.0      | 21.8      | 21.8      |
|            | mm       | -       | -         | -       | -        | 432      | 432      | 512       | 512       | 554       | 554       |
| WEIGHT     | LB       | 132.3   | 207.3     | 264.6   | 458.6    | 1058.4   | 2006.6   | 3109.1    | 4586.4    | 5755.1    | 7933      |
|            | Kg       | 60      | 94        | 120     | 208      | 480      | 910      | 1410      | 2080      | 2610      | 3600      |

GT ASME 2500LB

| VALVE SIZE | in<br>mm | 2<br>50 | 2.5<br>65 | 3<br>80 | 4<br>100 | 6<br>150 | 8<br>200 | 10<br>250 | 12<br>300 | 14<br>350 | 16<br>400 | 18<br>450 |
|------------|----------|---------|-----------|---------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|
| L1         | in       | 11.0    | 13.0      | 14.5    | 18.0     | 24.0     | 30.0     | 36.0      | 41.0      | 44.0      | 49.0      | 55.0      |
|            | mm       | 279     | 330       | 368     | 457      | 610      | 762      | 914       | 1041      | 1118      | 1245      | 1397      |
| L2         | in       | 17.75   | 20.0      | 22.75   | 26.50    | 36.0     | 40.25    | 50.0      | 56.0      | -         | -         | -         |
|            | mm       | 451     | 508       | 578     | 673      | 914      | 1022     | 1270      | 1422      | -         | -         | -         |
| L3         | in       | 17.87   | 20.25     | 23.0    | 26.88    | 36.5     | 40.87    | 50.88     | 56.88     | -         | -         | -         |
|            | mm       | 454     | 514       | 584     | 683      | 927      | 1038     | 1292      | 1445      | -         | -         | -         |
| H          | in       | 23.4    | 29.6      | 29.6    | 34.3     | 47.3     | 57.1     | 63.4      | 82.5      | 90.2      | 97.2      | 116.1     |
|            | mm       | 594     | 753       | 753     | 870      | 1201     | 1451     | 1610      | 2096      | 2291      | 2470      | 2950      |
| W          | in       | 14.0    | 17.7      | 19.7    | 23.6     | 24.0     | 24.0     | 24.0      | 29.9      | 29.9      | 24.0      | 24.0      |
|            | mm       | 355     | 450       | 500     | 600      | 610      | 610      | 610       | 760       | 760       | 610       | 610       |
| W          | in       | -       | -         | -       | -        | 17.0     | 20.2     | 20.2      | 21.8      | 21.8      | 20.2      | 20.2      |
|            | mm       | -       | -         | -       | -        | 432      | 512      | 512       | 554       | 554       | 512       | 512       |
| WEIGHT     | RF       | lb      | 169       | 268     | 327      | 689      | 1607     | 2619      | 4710      | 6786      | -         | -         |
|            |          | kg      | 77        | 122     | 149      | 312      | 729      | 1188      | 2137      | 3078      | -         | -         |
|            | BW       | lb      | 99        | 179     | 188      | 377      | 1032     | 1468      | 3175      | 5952      | 6746      | 8333      |
|            |          | kg      | 45        | 81      | 86       | 171      | 468      | 666       | 1440      | 2700      | 3060      | 3780      |

## GLOBE VALVE - PRESSURE SEAL BONNET

**YOKE SLEEVE** The standard material of the Yoke Sleeve is Nodular Ni-resist D2 with over 1150°C (2100°F) dissolution point in conformity to API Std. specifications.

**BONNET** The bonnet is steel forging identical to the body to ensure high reliability. The bonnet has a perfect body-bonnet seal and ease of dismantling and reassembly for both are ensured. The body and bonnet of our valves are carefully machined to achieve perfect coaxiality and eliminate any misalignment which may cause damaged stems.

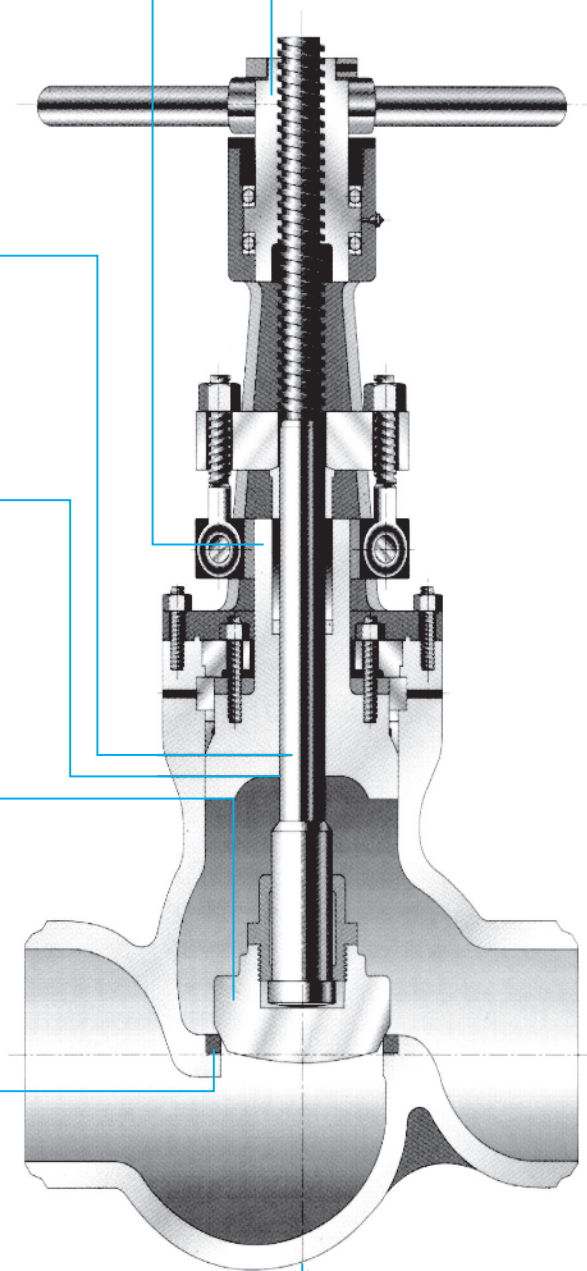
**STEM** The stem, a one-piece construction, is heat treated to secure adequate mechanical properties and surface hardness. Accurate machining and grinding ensure that there is minimum friction during valve opening/shutting. The round head of the stem gives a point contact with the inside of the disc housing, thus prevents galling.

**BACK SEAT** Our valve is equipped with a back seat to allow packing replacement when the valve is fully opened. The conical shape contact seat in the bonnet assembly is integrally stellite faced.

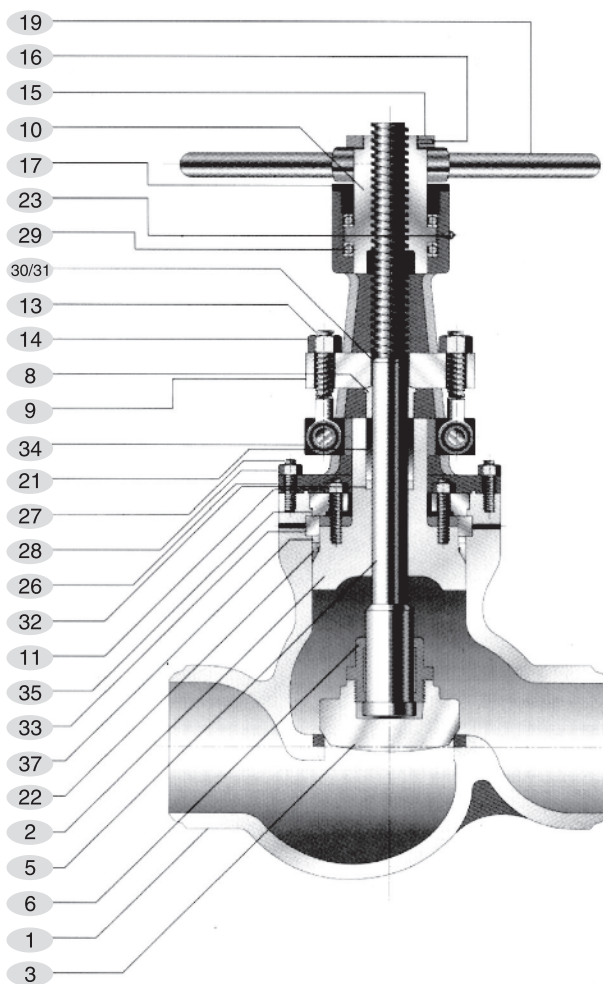
**DISC** The disc of our globe is a loose disc which freely revolves around the stem, thereby preventing friction and galling with the seating surface when the valve is shut. The outside diameter of the disc is accurately finished and cylindrical in shape to travel along the body guides. A stellite 6 layer is applied to the conical seating surface of the disc. The deposit undergoes a special heat treatment to secure the required hardness and soundness. In addition, the lapped finish ensure a perfect mating with the seat.

**SEAT** The stellite 6 seating surface is integrally applied to the body by means of welding for all valve sizes. Perfect mating of the disc surfaces is achieved by lapping applied to the seating surface.

**BODY** The cylindrically shaped valve body prevents distortion or undue stress under extreme working conditions. In additions, adequate padding ensures a sound cast structure in the critical areas. The wall thickness is greater than, or in accordance with API, ANSI and ASME requirements. The area in contact with the pressure seal gasket has a stainless steel 18/8 inlay to eliminate corrosion or wire drawing. The close tolerance of the inside diameter of this area is attained by accurate machining and honing finish.



# CAST STEEL PRESSURE SEAL BONNET



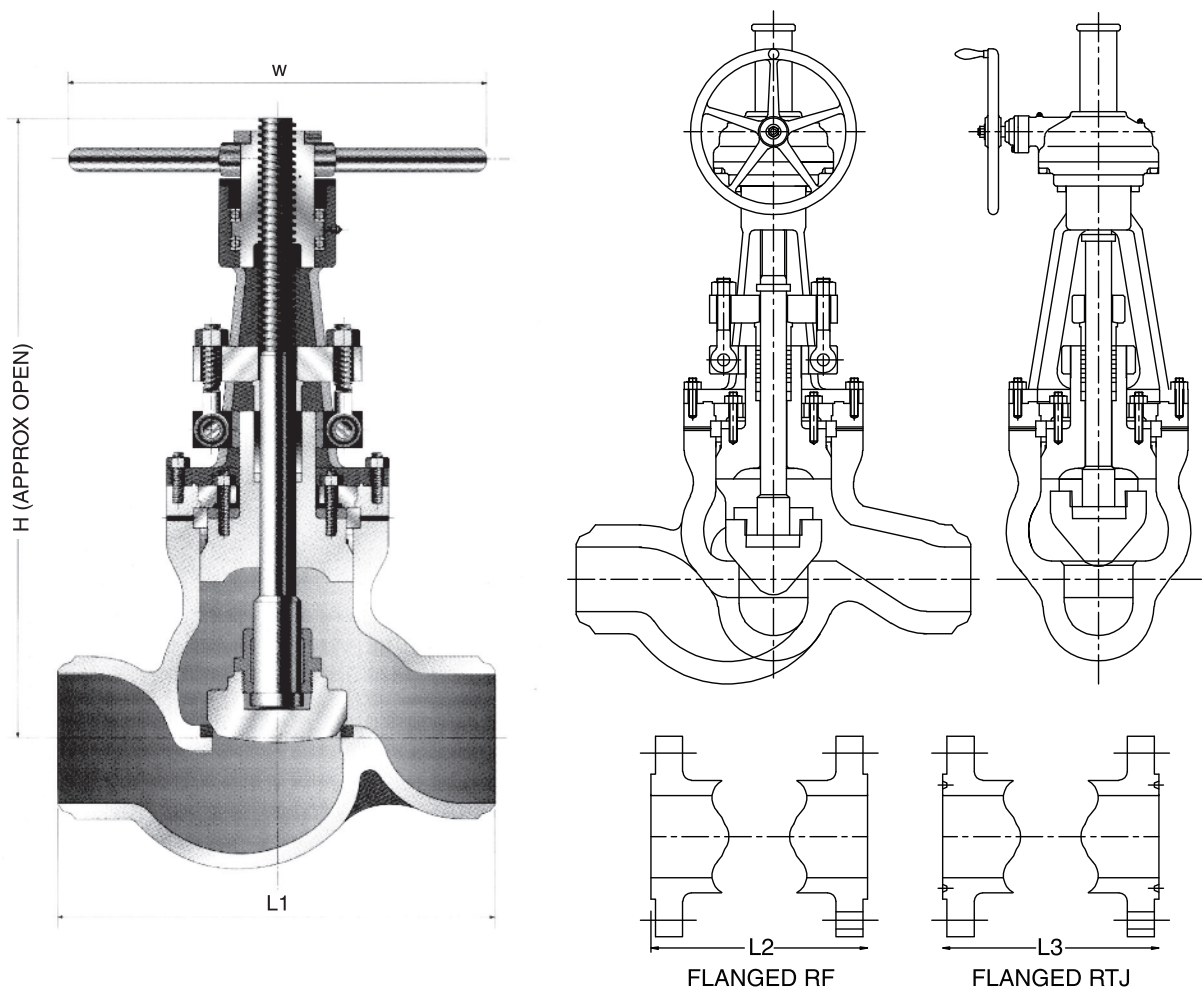
| NO | NAME OF PART | ASTM SPECIFICATION |
|----|--------------|--------------------|
| 15 | HANDLE NUT   | STEEL              |
| 16 | SET SCREW    | STEEL              |
| 19 | HANDLE WHEEL | A395               |
| 21 | PACKING      | COMMERCIAL         |
| 22 | GASKET       | COMMERCIAL         |
| 30 | STOPPER      | A283-D             |

| NO | NAME OF PART       | ASTM SPECIFICATION |                          |           |           |           |                         |                  |
|----|--------------------|--------------------|--------------------------|-----------|-----------|-----------|-------------------------|------------------|
|    |                    | STANDARD           | HIGH TEMPERATURE SERVICE |           |           |           | LOW TEMPERATURE SERVICE |                  |
| 1  | BODY               | A216-WCB           | A217-WC1                 | A217-WC6  | A217-WC9  | A217-C5   | A352-LCB                | A352-LC1/LC2/LC3 |
| 2  | BONNET             | A216-WCB           | A217-WC1                 | A217-WC6  | A217-WC9  | A217-C5   | A352-LCB                | A352-LC1/LC2/LC3 |
| 3  | *DISC              | A217-CA15          | A217-WC1                 | A217-WC6  | A217-WC9  | A217-C5   | A352-LCB                | A352-LC1/LC2/LC3 |
| 5  | STEM               | A182-F6a           | A182-F6a                 | A182-F6a  | A182-F6a  | A182-F6a  | A182-F304               | A182-F304        |
| 6  | DISC GLAND         | A217-CA15          | A217-CA15                | A217-CA15 | A217-CA15 | A217-CA15 | A182-F304               | A182-F304        |
| 8  | PACKING GLAND      | A276-410           | A276-410                 | A276-410  | A276-410  | A276-410  | A276-304                | A276-304         |
| 9  | GLAND FLANGE       | A105               | A105                     | A105      | A105      | A105      | A105                    | A105             |
| 10 | YOKE SLEEVE        | A439-D2C           | A439-D2C                 | A439-D2C  | A439-D2C  | A439-D2C  | A439-D2C                | A439-D2C         |
| 11 | BONNET FLANGE BOLT | A193-B7            | A193-B7                  | A193-B7   | A193-B7   | A193-B7   | A320-L7                 | A320-L7          |
| 13 | GLAND BOLT         | A193-B7            | A193-B7                  | A194-B7   | A194-B7   | A194-B7   | A320-L7                 | A320-L7          |
| 14 | GLAND NUT          | A194-2H            | A194-2H                  | A194-2H   | A194-2H   | A194-2H   | A194-4                  | A194-4           |
| 26 | YOKE               | A216-WCB           | A216-WC1                 | A216-WC6  | A216-WC9  | A216-C5   | A352-LCB                | A352-LC1/LC2/LC3 |
| 27 | YOKE BOLT          | A193-B7            | A193-B7                  | A193-B7   | A193-B7   | A193-B7   | A320-L7                 | A320-L7          |
| 28 | YOKE NUT           | A194-2H            | A194-2H                  | A194-2H   | A194-2H   | A194-2H   | A194-4                  | A194-4           |
| 31 | STOPPER PIN        | A276-410           | A276-410                 | A276-410  | A276-410  | A276-410  | A276-304                | A276-304         |
| 32 | PACKING WASHER     | A276-410           | A276-410                 | A276-410  | A276-410  | A276-410  | A276-304                | A276-304         |
| 33 | RETAINER           | A276-410           | A276-410                 | A276-410  | A276-410  | A276-410  | A276-304                | A276-304         |
| 34 | HINGE CLAMP        | A216-WCB           | A216-WC1                 | A216-WC6  | A216-WC9  | A217-C5   | A352-LCB                | A352-LC1/LC2/LC3 |
| 35 | BONNET CLAMP       | A216-WCB           | A216-WC1                 | A216-WC6  | A216-WC9  | A217-C5   | A352-LCB                | A352-LC1/LC2/LC3 |
| 37 | GASKET SPACER      | A276-410           | A276-410                 | A276-410  | A276-410  | A276-410  | A276-304                | A276-304         |

\*Note : In the case of 8" or larger size, trim material overlayed as per tables or equivalent material of the body will be used.



GL ASME 600LB - GL ASME 900LB  
PRESSURE SEAL BONNET



GL ASME 600LB

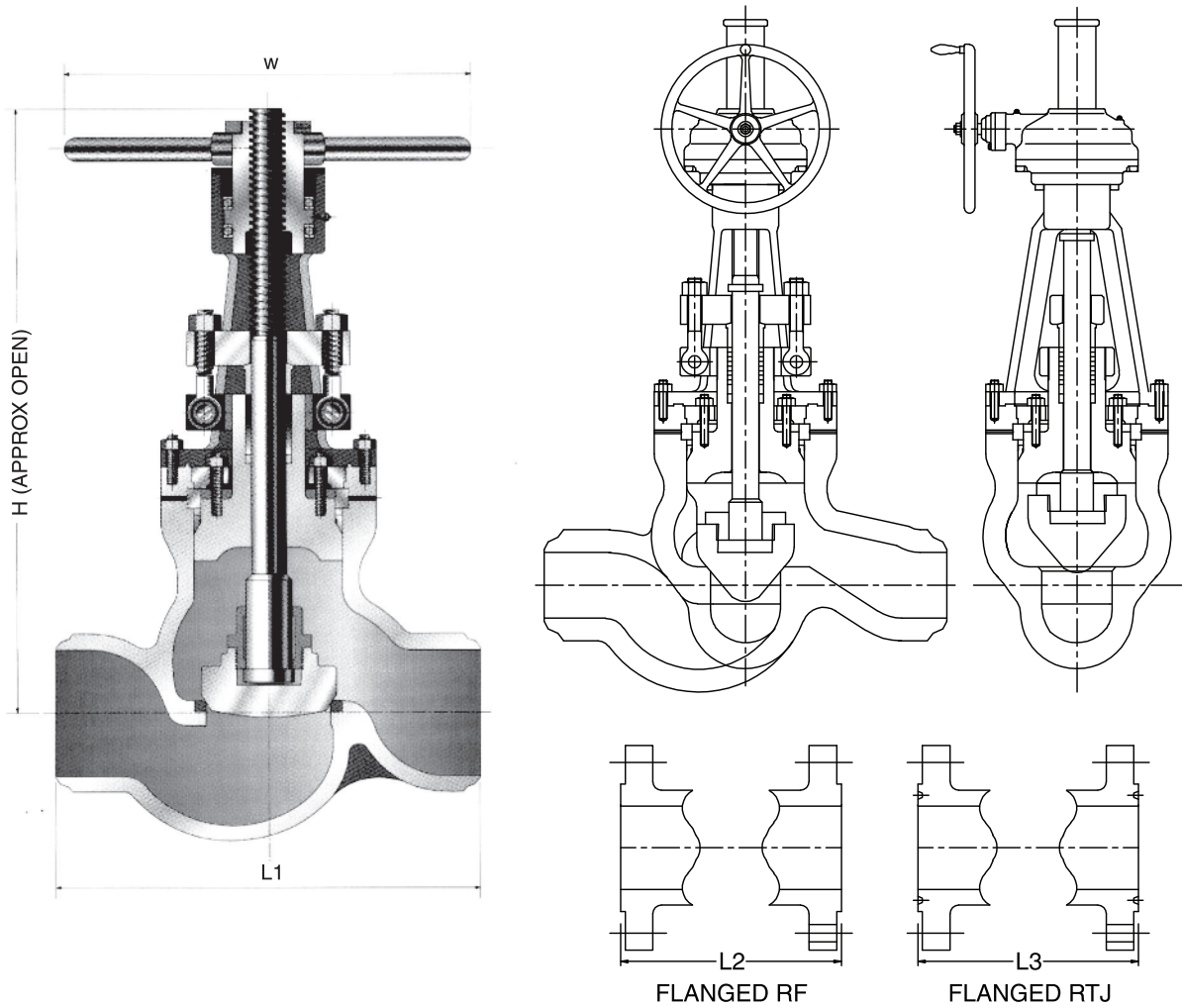
| VALVE SIZE | in mm | 2 50      | 2.5 65    | 3 80      | 4 100     | 6 150     | 8 200      | 10 250      | 12 300      | 14 350      | 16 400      |
|------------|-------|-----------|-----------|-----------|-----------|-----------|------------|-------------|-------------|-------------|-------------|
| L1         | in mm | 7.0 178   | 8.5 216   | 10.0 254  | 12.0 305  | 18.0 457  | 23.0 584   | 28.0 711    | 32.0 813    | 35.0 889    | 39.0 991    |
| L2         | in mm | 11.5 292  | 13.0 330  | 14.0 356  | 17.0 432  | 22.0 559  | 26.0 660   | 31.0 787    | 33.0 818    | 35.0 889    | 39.0 991    |
| L3         | in mm | 11.62 295 | 13.12 333 | 14.12 359 | 17.12 435 | 22.12 562 | 26.12 664  | 31.12 792   | 33.12 841   | 35.12 892   | 39.12 994   |
| H          | in mm | 21.7 550  | 24.8 630  | 26.8 680  | 29.5 750  | 45.3 1150 | 49.2 1250  | 55.1 1400   | 61.0 1550   | 70.9 1800   | 85.0 2160   |
| W          | in mm | 9.8 250   | 11.8 300  | 11.8 300  | 17.7 450  | 23.6 600  | 18.1 460   | 24.0 610    | 24.0 610    | 24.0 610    | 29.9 760    |
| L          | in mm | -         | -         | -         | -         | -         | 20.2 512   | 17.0 432    | 20.2 512    | 20.2 512    | 22.3 567    |
| WEIGHT     | LB Kg | 99.2 45   | 121.2 55  | 187.4 85  | 297.7 135 | 672.5 305 | 1367.1 620 | 2888.6 1310 | 4189.5 1900 | 5997.6 2720 | 6945.8 3150 |

GL ASME 900LB

| VALVE SIZE | in mm | 2 50      | 2.5 65    | 3 80      | 4 100     | 6 150     | 8 200       | 10 250      | 12 300      | 14 350      | 16 400      |
|------------|-------|-----------|-----------|-----------|-----------|-----------|-------------|-------------|-------------|-------------|-------------|
| L1         | in mm | 8.5 216   | 10.0 254  | 12.0 305  | 14.0 356  | 20.0 508  | 26.0 660    | 31.0 787    | 36.0 914    | 39.0 991    | 43.0 1092   |
| L2         | in mm | 14.5 368  | 16.5 419  | 15.0 381  | 18.0 457  | 24.0 610  | 29.0 737    | 33.0 838    | 38.0 965    | 40.5 1029   | 44.5 1130   |
| L3         | in mm | 14.62 371 | 16.62 422 | 15.12 384 | 18.12 460 | 24.12 613 | 29.12 740   | 33.12 841   | 38.12 968   | 40.88 1038  | 44.88 1140  |
| H          | in mm | 24.4 619  | 25.3 641  | 28.4 721  | 33.5 850  | 48.2 1225 | 53.1 1350   | 61.0 1550   | 68.9 1750   | 78.7 2000   | 90.9 2310   |
| W          | in mm | 157 400   | 15.7 400  | 15.7 400  | 19.7 500  | 24.0 610  | 24.0 610    | 24.0 610    | 24.0 610    | 29.9 760    | 29.9 760    |
| L          | in mm | -         | -         | -         | -         | 20.2 512  | 17.0 432    | 20.2 512    | 20.2 512    | 22.3 567    | 22.3 567    |
| WEIGHT     | LB Kg | 176.4 80  | 242.6 110 | 231.5 105 | 374.9 170 | 926.1 420 | 2205.0 1000 | 3792.6 1720 | 5071.5 2300 | 7386.8 3350 | 8820.0 4000 |



GL ASME 1500LB - GL ASME 2500LB  
PRESSURE SEAL BONNET



GL ASME 1500LB

| VALVE SIZE | in mm | 2 50      | 2.5 65    | 3 80      | 4 100     | 6 150      | 8 200       | 10 250      | 12 300     | 14 350      |
|------------|-------|-----------|-----------|-----------|-----------|------------|-------------|-------------|------------|-------------|
| L1         | in mm | 8.5 216   | 10.0 254  | 12.0 305  | 16.0 406  | 22.0 559   | 28.0 711    | 34.0 864    | 39.0 991   | 42.0 1067   |
| L2         | in mm | 14.5 368  | 16.5 419  | 18.5 470  | 21.5 546  | 27.75 705  | 32.75 832   | 39.0 991    | 44.5 1130  | 49.5 1257   |
| L3         | in mm | 14.62 371 | 16.62 422 | 18.62 473 | 21.62 549 | 28.0 711   | 33.13 841   | 39.38 1000  | 45.12 1146 | 50.25 1276  |
| H          | in mm | 24.4 619  | 25.2 641  | 32.9 835  | 33.7 857  | 48.4 1230  | 70.9 1800   | 78.7 2000   | 91.0 2311  | 105.9 2691  |
| W          | in mm | 15.7 400  | 15.7 400  | 19.7 500  | 19.7 500  | 24.0 610   | 24.0 610    | 29.9 760    | 29.9 760   | 29.9 760    |
| L          | in mm | -         | -         | -         | -         | 20.2 512   | 20.2 512    | 20.2 512    | 20.2 512   | 22.3 567    |
| WEIGHT     | LB Kg | 176.4 80  | 242.6 110 | 299.9 136 | 496.1 225 | 1433.3 650 | 3704.4 1680 | 5909.4 2680 | 7497 3400  | 9481.5 4300 |

GL ASME 2500LB

| VALVE SIZE | in mm | 2 50      | 2.5 65    | 3 80      | 4 100     | 6 150     | 8 200      | 10 250     | 12 300     |
|------------|-------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|
| L1         | in mm | 11.0 279  | 13.0 330  | 14.5 368  | 18.0 457  | 24.0 610  | 30.0 762   | 36.0 914   | 41.0 1041  |
| L2         | in mm | 17.75 451 | 20.0 508  | 22.75 578 | 26.50 673 | 36.0 914  | 40.25 1022 | 50.0 1270  | 56.0 1422  |
| L3         | in mm | 17.87 454 | 20.25 514 | 23.0 584  | 26.88 683 | 36.5 927  | 40.87 1038 | 50.88 1292 | 56.88 1445 |
| H          | in mm | 24.3 616  | 30.7 781  | 31.5 800  | 51.2 1300 | 53.9 1370 | 85.0 2160  | 100.0 2540 | 106.0 2692 |
| W          | in mm | 15.7 400  | 19.7 500  | 19.7 500  | 24.0 610  | 24.0 610  | 29.9 760   | 29.9 760   | 29.9 760   |
| L          | in mm | -         | -         | -         | 20.2 512  | 17.0 432  | 22.3 567   | 22.3 567   | 22.3 567   |
| WEIGHT     | RF    | lb kg     | 198 90    | 308 140   | 417 189   | 992 450   | 2480 1125  | 4762 2160  | 6548 2970  |
|            | BW    | lb kg     | 139 63    | 218 278   | 126 694   | 315 1885  | 855 3968   | 1800 4960  | 2250 6548  |

## SWING CHECK VALVE - PRESSURE SEAL BONNET

**HINGE PIN** The hinge pin is inserted into the valve body to achieve pressure seal construction.

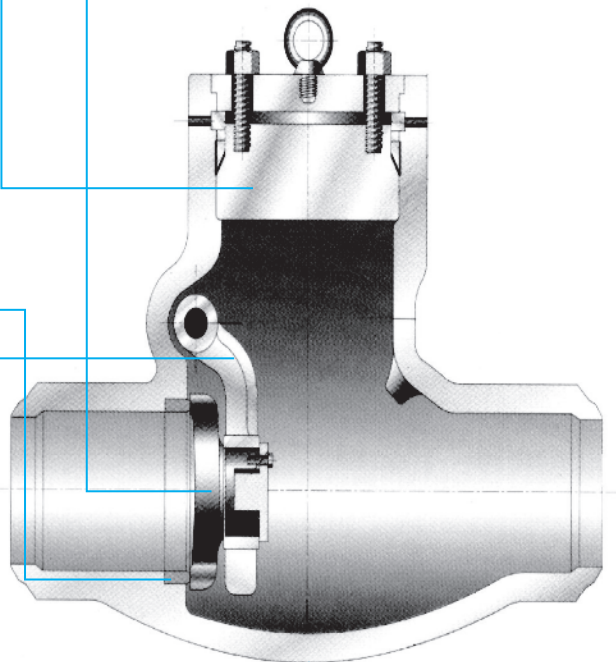
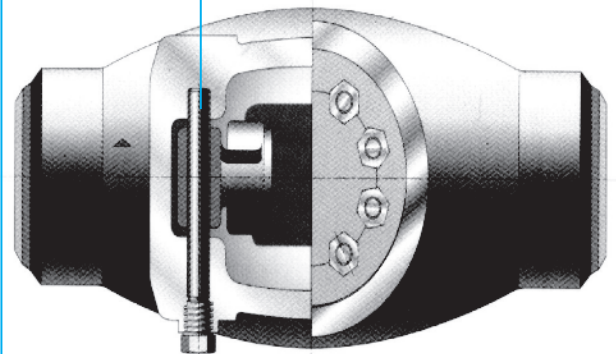
**COVER** The cover material is a steel forging identical to the body to ensure high dependability. The cover construction has a perfect body-cover tightness and ease of dismantling and reassembling are ensured.

**ARM** The arm is made of a steel material identical to the body. Larger size valves are provided with a hinge bushing to reduce friction and to prevent galling.

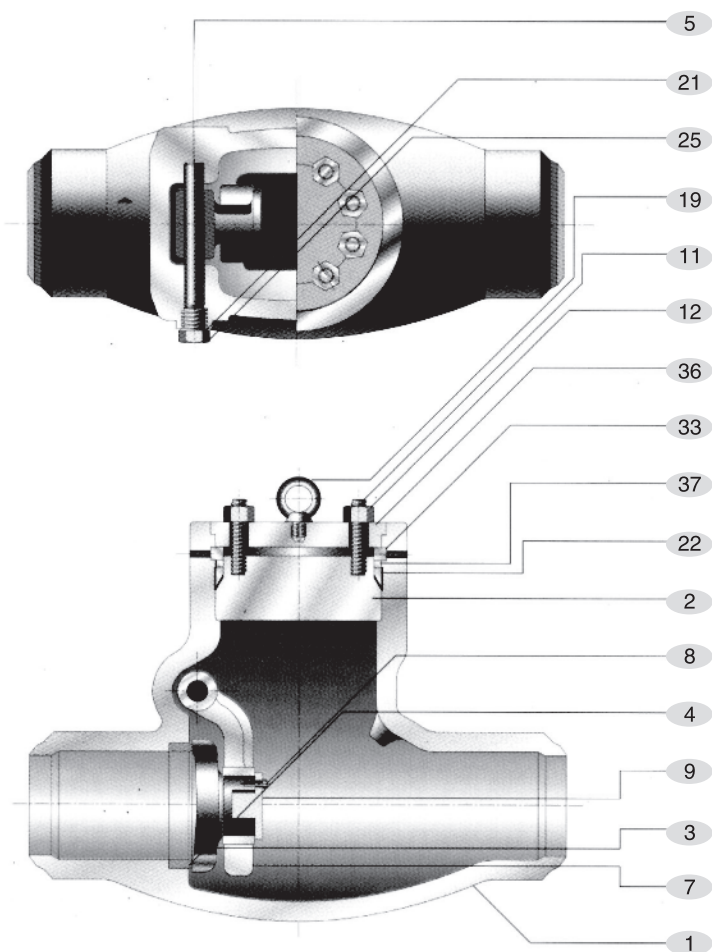
**DISC** The disc has a sufficient seating surface area which is grounded and lapped to a mirrored finish. It is a one-piece construction, and is heat treated to deliver the required mechanical properties and hardness.

**SEAT RING** The stellite 6 surface of the seat ring is integrally applied to the body by means of welding for all valve sizes. Perfect match with the disc surfaces is attained by a lapping finish applied to the seating.

**BODY** The cylindrical shaped valve body prevents distortion or undue stress under extreme working conditions. Padding is also provide to achieve a sound cast structure in the critical areas. The wall thickness is greater than, or in according to API, ANSI and ASME requirements. The area in contact with pressure seal gasket has a stainless steel 18/8 inlay to eliminate corrosion or wire drawing. The close tolerances of the inside diameter of this area are attained by accurate machining and honing finish.



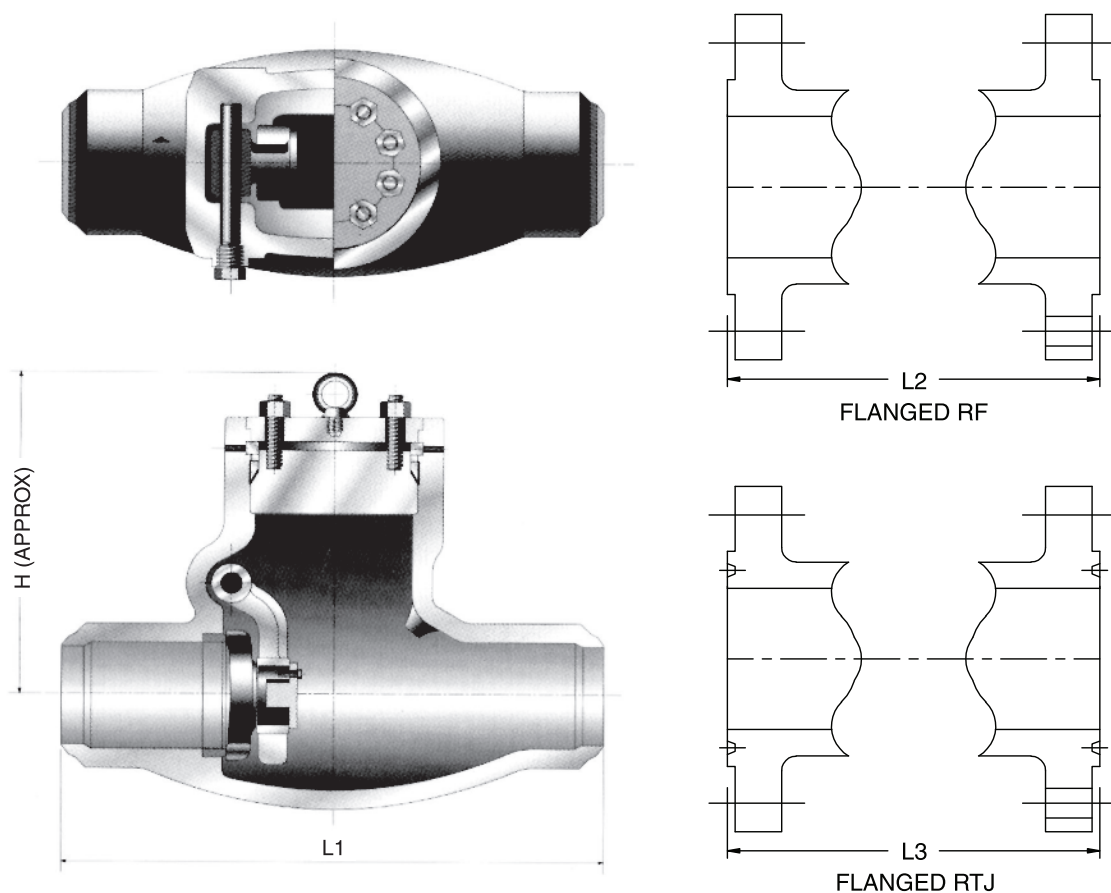
CAST STEEL  
PRESSURE SEAL COVER



| NO | NAME OF PART | ASTM SPECIFICATION |
|----|--------------|--------------------|
| 8  | SET BOLT     | AISI 304           |
| 9  | DISC COVER   | AISI 304           |
| 19 | EYE BOLT     | A105               |
| 21 | PLUG GASKET  | COMMERCIAL         |
| 22 | GASKET       | COMMERCIAL         |

| NO | NAME OF PART   | ASTM SPECIFICATION |                          |                |                |                |                         |                  |
|----|----------------|--------------------|--------------------------|----------------|----------------|----------------|-------------------------|------------------|
|    |                | STANDARD           | HIGH TEMPERATURE SERVICE |                |                |                | LOW TEMPERATURE SERVICE |                  |
| 1  | BODY           | A216-WCB           | A217-WC1                 | A217-WC6       | A217-WC9       | A217-C5        | A352-LCB                | A352-LC1/LC2/LC3 |
| 2  | COVER          | A216-WCB           | A217-WC1                 | A217-WC6       | A217-WC9       | A217-C5        | A352-LCB                | A352-LC1/LC2/LC3 |
| 3  | *DISC          | A217-CA15          | A217-WC1                 | A217-WC6       | A217-WC9       | A217-C5        | A352-LCB                | A352-LC1/LC2/LC3 |
| 4  | BODY SEAT RING | A105+HARD FACE     | A105+HARD FACE           | A105+HARD FACE | A105+HARD FACE | A105+HARD FACE | A182-F304               | A182-F304        |
| 5  | HINGE PIN      | A276-410           | A276-410                 | A276-410       | A276-410       | A276-410       | A276-304                | A276-304         |
| 7  | ARM            | A216-WCB           | A216-WC1                 | A216-WC6       | A216-WC9       | A216-WC5       | A352-LCB                | A352-LC1/LC2/LC3 |
| 11 | BONNET BOLT    | A193-B7            | A193-B7                  | A193-B7        | A193-B7        | A193-B7        | A320-L7                 | A320-L7          |
| 12 | BONNET NUT     | A194-2H            | A194-2H                  | A194-2H        | A194-2H        | A194-2H        | A194-4                  | A194-4           |
| 25 | PLUG           | A194-2H            | A194-2H                  | A194-2H        | A194-2H        | A194-2H        | A194-4                  | A194-4           |
| 33 | RETAINER       | A276-410           | A276-410                 | A276-410       | A276-410       | A276-410       | A276-304                | A276-304         |
| 36 | BONNET CLAMP   | A216-WCB           | A216-WC1                 | A216-WC6       | A216-WC9       | A217-WC5       | A352-LCB                | A352-LC1/LC2/LC3 |
| 37 | GASKET SPACER  | A276-410           | A276-410                 | A276-410       | A276-410       | A276-410       | A276-304                | A276-304         |

# SW / CH ASME 600LB - SW / CH ASME 900LB PRESSURE SEAL COVER



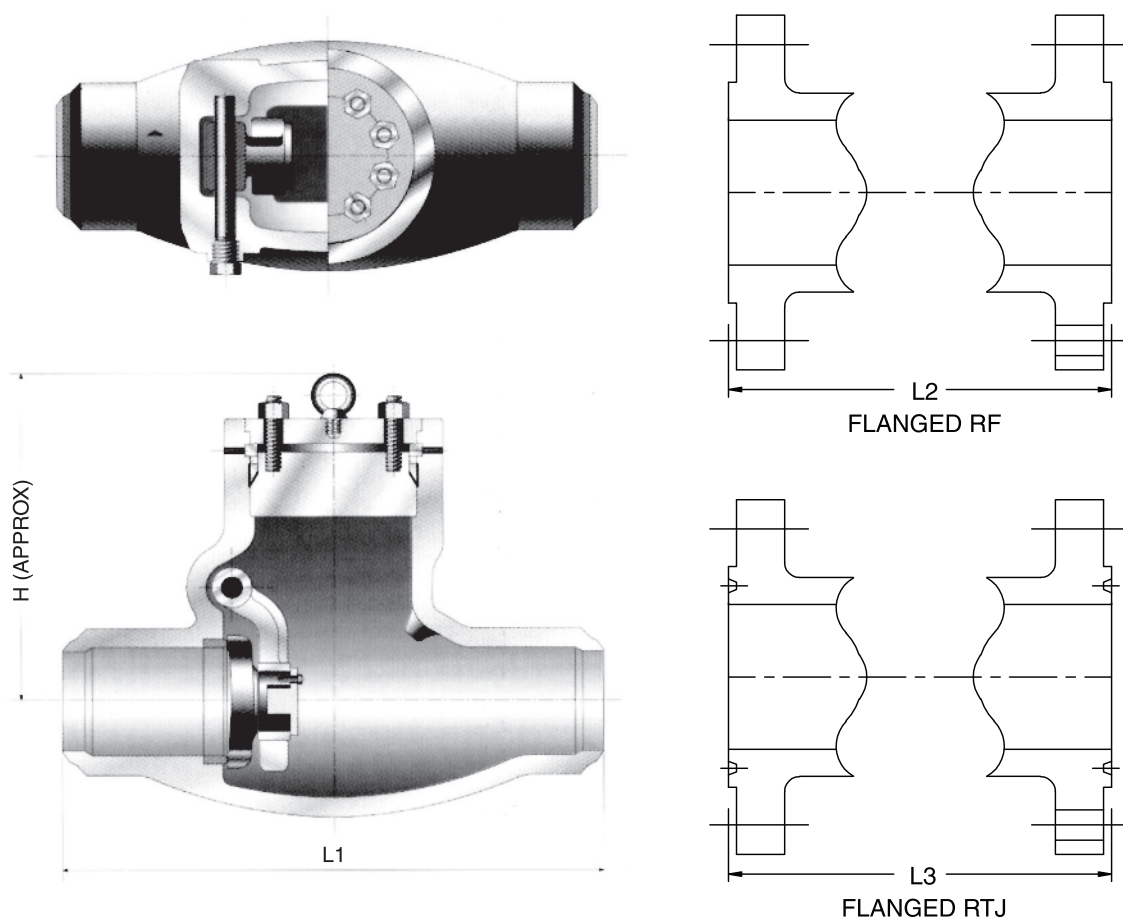
## SW / CH ASME 600LB

| VALVE SIZE | in<br>mm | 2<br>50      | 2.5<br>65    | 3<br>80      | 4<br>100     | 6<br>150     | 8<br>200     | 10<br>250     | 12<br>300     | 14<br>350     | 16<br>400      | 18<br>450      | 20<br>500      | 24<br>600     |
|------------|----------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|----------------|----------------|----------------|---------------|
| L1         | in<br>mm | 7.0<br>178   | 8.5<br>216   | 10.0<br>254  | 12.0<br>305  | 18.0<br>457  | 23.0<br>584  | 28.0<br>711   | 32.0<br>813   | 35.0<br>889   | 39.0<br>991    | 43.0<br>1092   | 47.0<br>1194   | 55.0<br>1397  |
| L2         | in<br>mm | 11.5<br>292  | 13.0<br>330  | 14.0<br>356  | 17.0<br>432  | 22.0<br>559  | 26.0<br>660  | 31.0<br>787   | 33.0<br>838   | 35.0<br>889   | 39.0<br>991    | 43.0<br>1092   | 47.0<br>1194   | 55.0<br>1397  |
| L3         | in<br>mm | 11.62<br>295 | 13.12<br>333 | 14.12<br>359 | 17.12<br>435 | 22.12<br>562 | 26.12<br>664 | 31.12<br>791  | 33.12<br>841  | 35.12<br>892  | 39.12<br>994   | 43.12<br>1095  | 47.25<br>1200  | 55.38<br>1407 |
| H          | in<br>mm | 9.5<br>241   | 10.4<br>264  | 10.6<br>270  | 12.5<br>318  | 15.7<br>400  | 23.1<br>587  | 23.9<br>606   | 27.4<br>695   | 29.5<br>749   | 28.7<br>730    | 28.7<br>730    | 32.2<br>819    | 37.4<br>949   |
| WEIGHT     | LB<br>Kg | 59.5<br>27   | 77.2<br>35   | 99.2<br>45   | 187.4<br>85  | 419.0<br>190 | 771.8<br>350 | 1102.5<br>500 | 1477.4<br>670 | 1940.4<br>880 | 2535.8<br>1150 | 3263.4<br>1480 | 4145.4<br>1880 | 5733<br>2600  |

## SW / CH ASME 900LB

| VALVE SIZE | in<br>mm | 2<br>50      | 2.5<br>65    | 3<br>80      | 4<br>100     | 6<br>150     | 8<br>200      | 10<br>250     | 12<br>300      | 14<br>350      | 16<br>400      |
|------------|----------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|----------------|----------------|----------------|
| L1         | in<br>mm | 8.5<br>216   | 10.0<br>254  | 12.0<br>305  | 14.0<br>356  | 20.0<br>508  | 26.0<br>660   | 31.0<br>787   | 36.0<br>914    | 39.0<br>991    | 43.0<br>1092   |
| L2         | in<br>mm | 14.5<br>368  | 16.5<br>419  | 15.0<br>381  | 18.0<br>457  | 24.0<br>610  | 29.0<br>737   | 33.0<br>838   | 38.0<br>965    | 40.5<br>1029   | 44.5<br>1130   |
| L3         | in<br>mm | 14.62<br>371 | 16.62<br>422 | 15.12<br>384 | 18.12<br>460 | 24.12<br>613 | 29.12<br>740  | 33.12<br>841  | 38.12<br>968   | 40.88<br>1038  | 44.88<br>1140  |
| H          | in<br>mm | 9.5<br>241   | 10.4<br>264  | 10.6<br>270  | 12.5<br>318  | 15.7<br>400  | 23.1<br>587   | 23.9<br>606   | 27.4<br>695    | 29.5<br>749    | 28.7<br>730    |
| WEIGHT     | LB<br>Kg | 88.2<br>40   | 121.3<br>55  | 114.7<br>52  | 231.5<br>105 | 507.2<br>230 | 1256.9<br>570 | 1874.3<br>880 | 2866.5<br>1300 | 3417.8<br>1550 | 3638.3<br>1650 |

# SW / CH ASME 1500LB - SW / CH ASME 2500LB PRESSURE SEAL COVER



## SW / CH ASME 1500LB

| VALVE SIZE | in<br>mm | 2<br>50      | 2.5<br>65    | 3<br>80      | 4<br>100     | 6<br>150     | 8<br>200      | 10<br>250      | 12<br>300      | 14<br>350      |
|------------|----------|--------------|--------------|--------------|--------------|--------------|---------------|----------------|----------------|----------------|
| L1         | in<br>mm | 8.5<br>216   | 10.0<br>254  | 12.0<br>305  | 16.0<br>406  | 22.0<br>559  | 28.0<br>711   | 34.0<br>864    | 39.0<br>991    | 42.0<br>1067   |
| L2         | in<br>mm | 14.5<br>368  | 16.5<br>419  | 18.5<br>470  | 21.5<br>546  | 27.75<br>705 | 32.75<br>832  | 39.0<br>991    | 44.5<br>1130   | 49.5<br>1257   |
| L3         | in<br>mm | 14.62<br>371 | 16.62<br>422 | 18.62<br>473 | 21.62<br>549 | 28.0<br>711  | 33.13<br>841  | 39.38<br>1000  | 45.12<br>1146  | 50.25<br>1276  |
| H          | in<br>mm | 9.5<br>241   | 10.4<br>264  | 10.6<br>270  | 12.5<br>318  | 15.7<br>400  | 18.9<br>479   | 23.3<br>591    | 25.4<br>645    | 28.0<br>711    |
| WEIGHT     | LB<br>Kg | 88.2<br>40   | 121.3<br>55  | 220.5<br>100 | 308.7<br>140 | 882.0<br>400 | 1345.1<br>610 | 2315.3<br>1050 | 3417.8<br>1550 | 4630.5<br>2100 |

## SW / CH ASME 2500LB

| VALVE SIZE | in<br>mm | 2<br>50      | 2.5<br>65    | 3<br>80      | 4<br>100     | 6<br>150    | 8<br>200      | 10<br>250     | 12<br>300     | 14<br>350    | 16<br>400    | 18<br>450     |
|------------|----------|--------------|--------------|--------------|--------------|-------------|---------------|---------------|---------------|--------------|--------------|---------------|
| L1         | in<br>mm | 11.0<br>279  | 13.0<br>330  | 14.5<br>368  | 18.0<br>457  | 24.0<br>610 | 30.0<br>762   | 36.0<br>964   | 41.0<br>1041  | 44.0<br>1118 | 49.0<br>1245 | 55.0<br>1397  |
| L2         | in<br>mm | 17.75<br>451 | 20.0<br>508  | 22.75<br>578 | 26.5<br>673  | 36.0<br>914 | 40.25<br>1022 | 50.0<br>1270  | 56.0<br>1422  | 62.0<br>1575 | 68.0<br>1727 | -             |
| L3         | in<br>mm | 17.87<br>454 | 20.25<br>514 | 23.0<br>584  | 26.88<br>683 | 36.5<br>927 | 40.87<br>1038 | 50.88<br>1292 | 56.88<br>1445 | -            | -            | -             |
| H          | in<br>mm | 9.6<br>245   | 10.4<br>264  | 10.6<br>270  | 12.5<br>318  | 15.7<br>400 | 22.0<br>559   | 24.8<br>629   | 27.5<br>699   | 33.9<br>860  | 35.4<br>899  | 39.4<br>1000  |
| WEIGHT     | RF       | lb<br>kg     | 169<br>77    | 234<br>106   | 308<br>140   | 565<br>257  | 1488<br>675   | 2679<br>1215  | 4266<br>1935  | 5952<br>2700 | 8294<br>3762 | 10040<br>4554 |
|            | BW       | lb<br>kg     | 99<br>45     | 139<br>63    | 169<br>77    | 327<br>149  | 913<br>414    | 1786<br>810   | 2579<br>1170  | 3571<br>1620 | 4861<br>2205 | 6349<br>2880  |



## FORGED STEEL - GATE VALVE

**DESCRIPTION** Serves as an efficient stop valve with flow in either direction. Commonly used where minimum pressure drop is required since it offers practically no resistance to flow when it is fully opened. This valve functions best in fully opened or fully closed situation where throttling is less important compared to accurate and consistent flow.

### CLASS

API 800, 1500

ANSI 150, 300, 600, 900, 1500, 2500

### SIZE

3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"

### MATERIAL

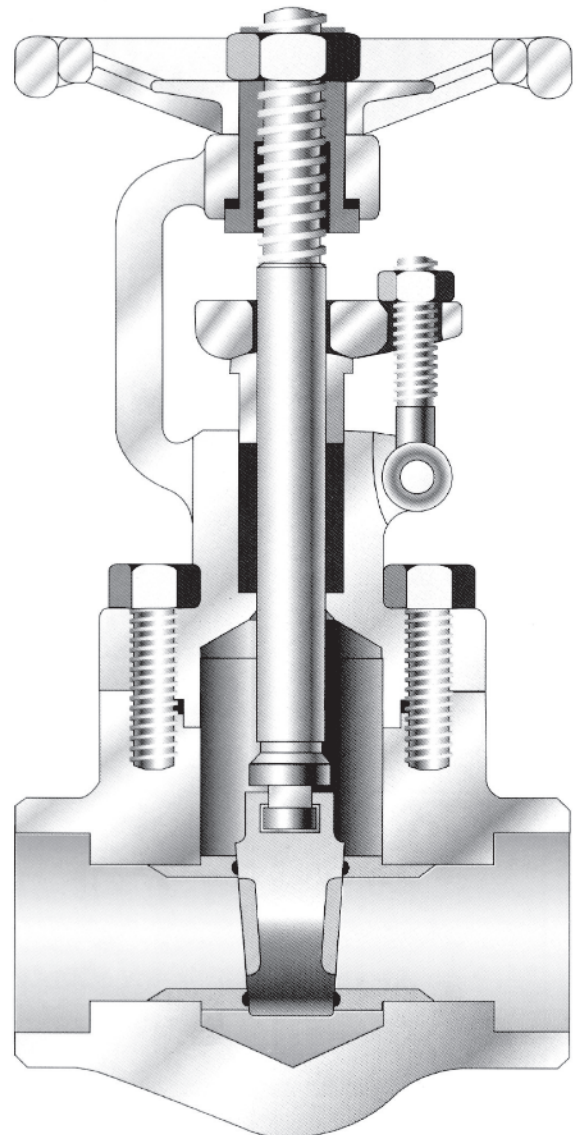
ASTM A105, A182-F5, A182-F9, A182-F11, A182-F22, A182-304, A182-F316, A182-F304L, A182-316L, A350-LF2

### END CONNETION

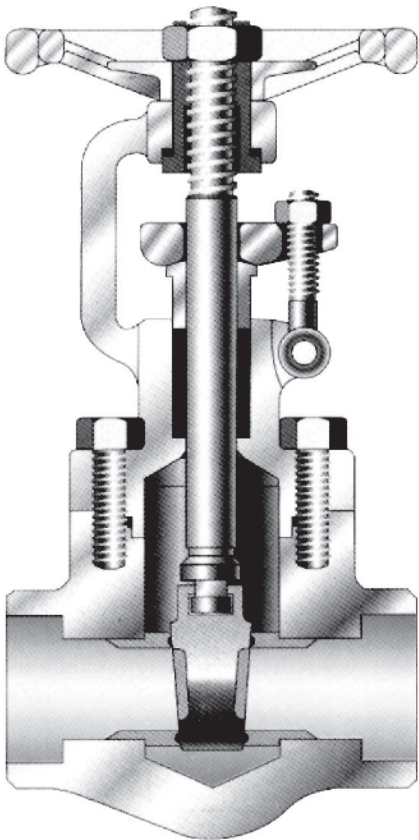
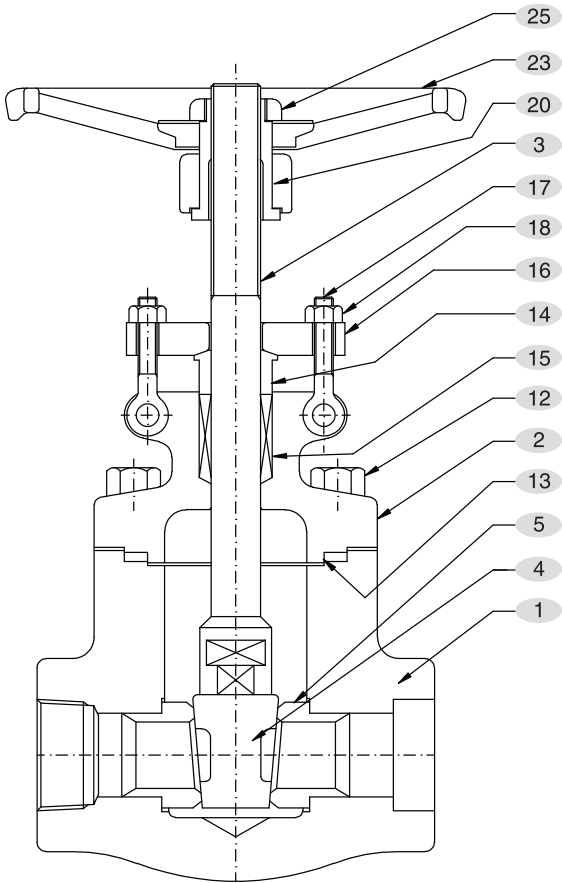
Socket welded, Threaded, Butt welded, Flanged

### FEATURE

Bolted bonnet or welded bonnet  
Outside screw & yoke  
Solid wedge disc  
Renewable seat



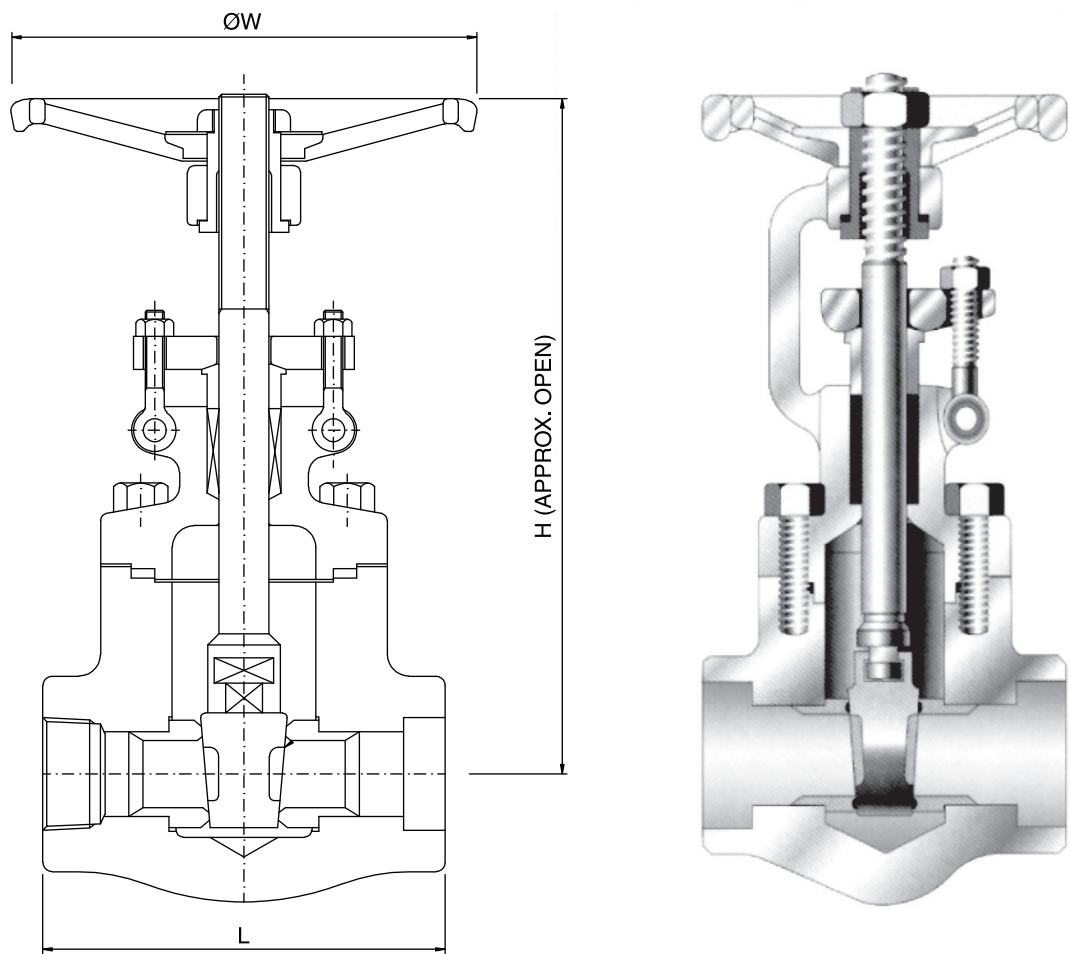
FORGED STEEL GATE VALVE  
BOLTED BONNET OS & Y



PARTS NOMENCLATURE

| PART NO. | PART NAME        | Q'ty | ASTM Specification (Specs.-Grades/Types) |           |            |                |            |         |                     |                |          |          |
|----------|------------------|------|------------------------------------------|-----------|------------|----------------|------------|---------|---------------------|----------------|----------|----------|
|          |                  |      | A105                                     | A182      |            |                |            | A182    |                     |                |          |          |
|          |                  |      |                                          | F304      | F304L      | F306           | F306L      | F1      | F5                  | F9             | F11      | F22      |
| 1        | BODY             | 1    | A105                                     | A182 F304 | A18 F304L  | A182 F316      | A182 F316L | A182 F1 | A182 F5             | A182 F9        | A182 F11 | A182 F22 |
| 2        | BONNET           | 1    | A051                                     | A182 304  | A182 F304L | A182 F316      | A182 F316L | A182 F1 | A182 F5             | A182 F9        | A182 F11 | A182 F22 |
| 3        | STEM             | 1    | A276 410                                 | A276 304  |            | A276 316       |            |         |                     | A276 410       |          |          |
| 4        | DISC             | 1    | A217 CA15                                | A351 CF6  |            | A351 CF8M      |            |         |                     | A217 CA15      |          |          |
| 5        | SEAT RING        | 2    | A276 410                                 | A276 304  |            | A276 316       |            |         |                     | A276 410       |          |          |
| 12       | BONNET BOLT      | 4    | A193 B7                                  |           |            | A193 B8        |            |         |                     | A193 B7        |          |          |
| 13       | GASKET           | 1    | SS304<br>GRAPHITE                        |           |            | SS304+GRAPHITE |            |         |                     | SS304+GRAPHITE |          |          |
| 14       | GLAND            | 1    | A276 410                                 | A276 304  |            | A276 316       |            |         | A276 410            |                |          |          |
| 15       | GLAND<br>PACKING | 1SET | GRAPHITE<br>W MONEL WIRE                 |           |            | GRAPHITE       |            |         | GRAPHITE MONEL WIRE |                |          |          |
| 16       | GLAND FLANGE     | 1    | A105                                     |           |            | A182 F304      |            |         |                     | A105           |          |          |
| 17       | GLAND BOLT       | 2    |                                          |           |            |                | A276 304   |         |                     |                |          |          |
| 18       | GLAN BOLT NUT    | 2    | A194 2H                                  |           |            | A194 8         |            |         |                     | A194 2H        |          |          |
| 19       | GLAND BOLT PIN   | 2    |                                          |           |            |                | A276 304   |         |                     |                |          |          |
| 20       | SLEEVE           | 1    |                                          |           |            |                | A276 410   |         |                     |                |          |          |
| 21       | SLEEVE WASHER    | 2    |                                          |           |            |                | A276 410   |         |                     |                |          |          |
| 22       | HANDWHEEL        | 1    |                                          |           |            |                | A197       |         |                     |                |          |          |
| 23       | NAMEPLATE        | 1    |                                          |           |            |                | ALUMINUM   |         |                     |                |          |          |
| 24       | HANDWHEELNUT     | 1    |                                          |           |            |                | A108 1020  |         |                     |                |          |          |

FORGED STEEL GATE VALVE  
BOLTED BONNET OS & Y



| CLASS 150 & 900 |    |      |      |      |      |        |        |        | (mm) |
|-----------------|----|------|------|------|------|--------|--------|--------|------|
| SIZE            | RB | 3/8" | 1/2" | 3/4" | 1"   | 1-1/4" | 1-1/2" | 2"     |      |
|                 | FB |      | 3/8" | 1/2" | 3/4" | 1"     | 1-1/4" | 1-1/2" | 2"   |
| L               |    | 79   | 79   | 92   | 111  | 120    | 120    | 140    | 170  |
| W               |    | 100  | 100  | 100  | 125  | 160    | 160    | 180    | 200  |
| H               |    | 166  | 166  | 169  | 193  | 230    | 246    | 283    | 332  |
| d               |    | 7    | 10   | 12.7 | 18   | 23     | 28.5   | 36     | 43   |

| CLASS 1500 |      |      |      |     |        |        |     | (mm) |
|------------|------|------|------|-----|--------|--------|-----|------|
| SIZE       | 3/8" | 1/2" | 3/4" | 1"  | 1-1/4" | 1-1/2" | 2"  |      |
| L          | 111  | 111  | 111  | 120 | 120    | 140    | 170 |      |
| W          | 125  | 125  | 160  | 160 | 180    | 200    | 200 |      |
| H          | 170  | 193  | 230  | 246 | 283    | 325    | 334 |      |
| d          | 10   | 12.7 | 18   | 23  | 28.5   | 36     | 43  |      |

| CLASS 2500 (Pressure Seal Bonnet) |      |      |      |     |        |        |     | (mm) |
|-----------------------------------|------|------|------|-----|--------|--------|-----|------|
| SIZE                              | 3/8" | 1/2" | 3/4" | 1"  | 1-1/4" | 1-1/2" | 2"  |      |
| L                                 | 186  | 186  | 186  | 186 | 232    | 232    | 279 |      |
| W                                 | 125  | 125  | 160  | 160 | 180    | 200    | 200 |      |
| H                                 | 321  | 321  | 321  | 321 | 375    | 406    | 496 |      |
| d                                 | 8    | 11   | 14   | 19  | 25     | 28     | 35  |      |

The dimensions are indicative only and subject to change.

## FORGED STEEL - GLOBE VALVE

**DESCRIPTION** Ideal for throttling service. Its flow characteristics permit accurate and repeatable flow control. However, caution must be exercised to avoid extremely close throttling where pressure drop exceeds 20%. This creates excessive noise, vibration and possible damage to valve and piping. When these conditions are anticipated, consult HAWKS for recommendations.

### CLASS

API 800, 1500

ANSI 150, 300, 600, 900, 2500

### SIZE

3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"

### MATERIAL

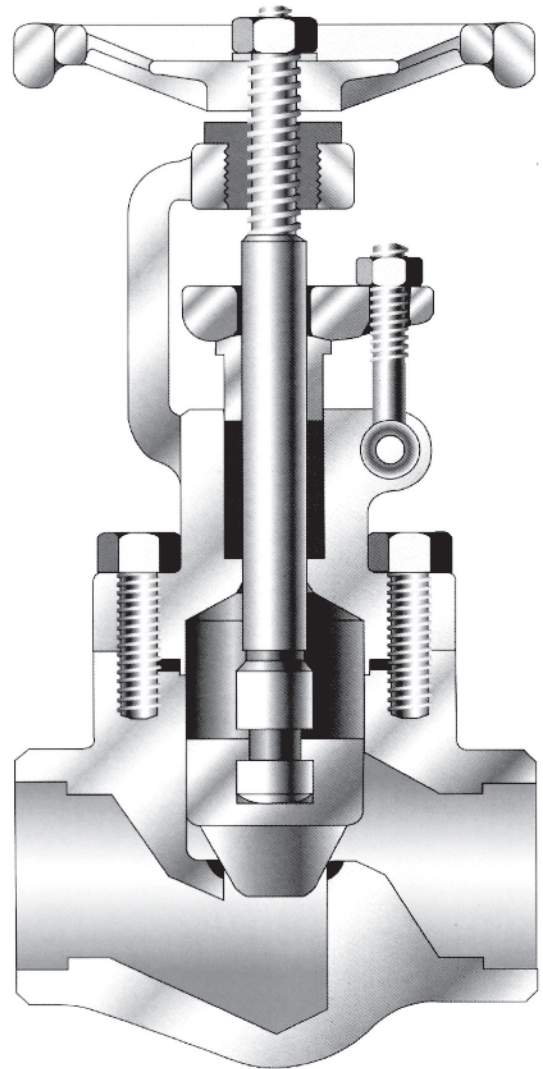
ASTM A105, A182-F5, A182-F9, A182-F11, A182-F22, A182-304, A182-F316, A182-F304L, A182-316L, A350-LF2

### END CONNETION

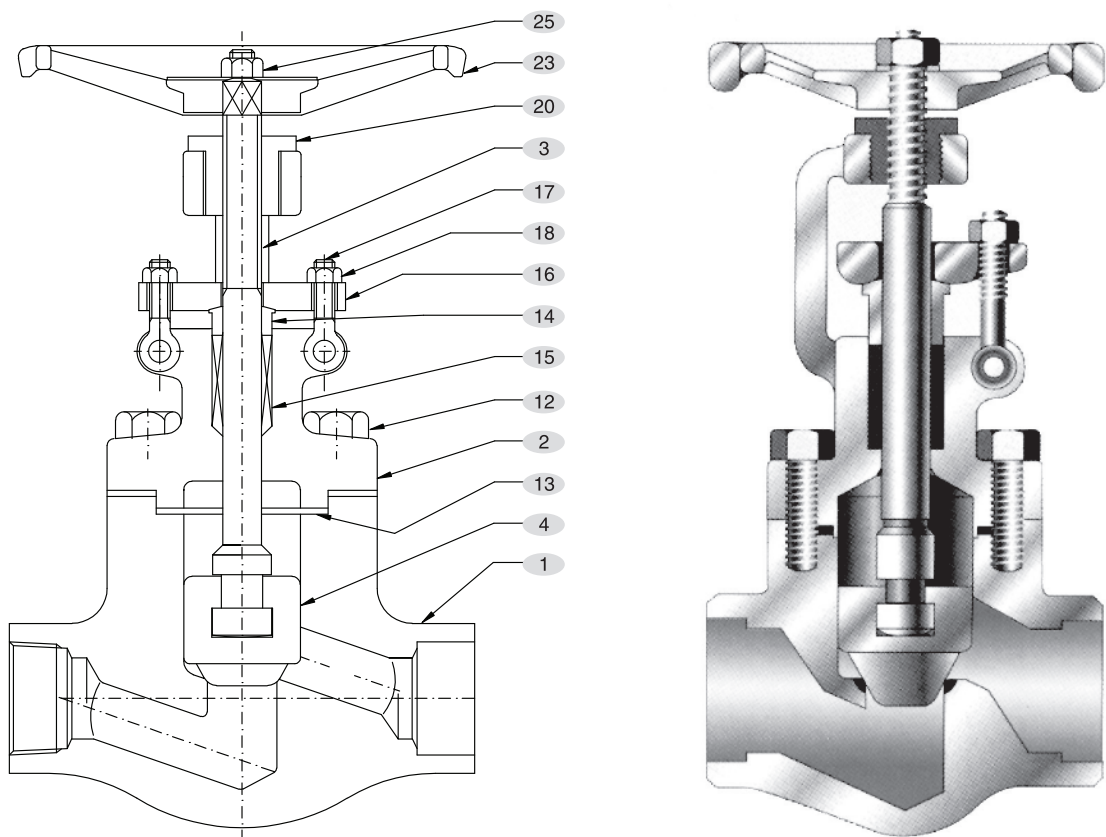
Socket welded, Threaded, Butt welded, Flanged.

### FEATURE

Bolted bonnet or welded bonnet  
Outside screw yoke  
Plug disc  
Integral seat



FORGED STEEL GLOBE VALVE  
BOLTED BONNET OS & Y

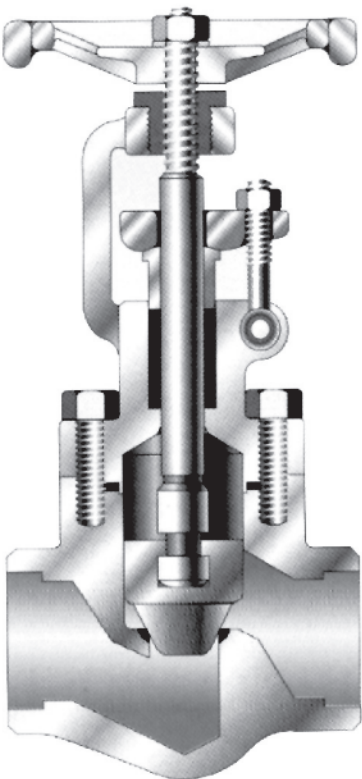
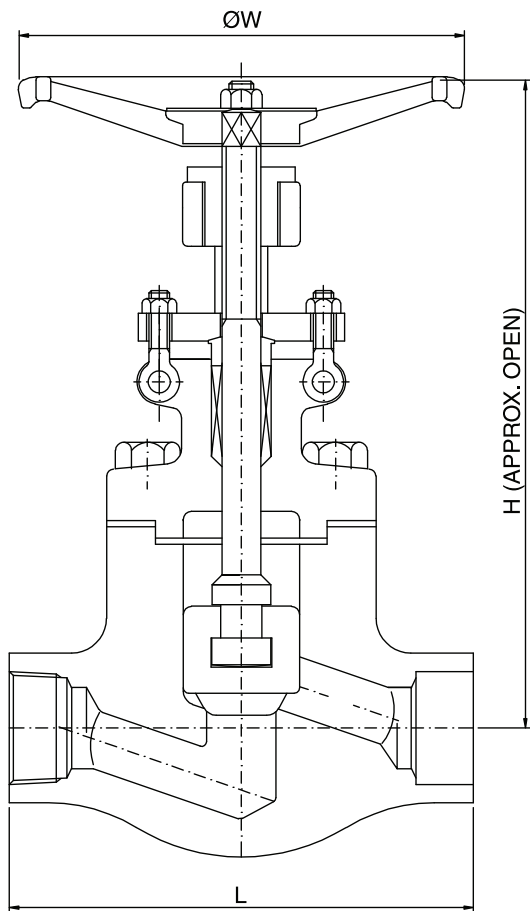


PARTS NOMENCLATURE

| PART NO. | PART NAME      | Q'ty | ASTM Specification (Specs.-Grades/Types) |           |                |           |            |                     |         |         |          |          |
|----------|----------------|------|------------------------------------------|-----------|----------------|-----------|------------|---------------------|---------|---------|----------|----------|
|          |                |      | A105                                     | A182      |                |           |            | A182                |         |         |          |          |
|          |                |      |                                          | F304      | F304L          | F306      | F306L      | F1                  | F5      | F9      | F11      | F22      |
| 1        | BODY           | 1    | A105                                     | A182 F304 | A18 F304L      | A182 F316 | A182 F316L | A182 F1             | A182 F5 | A182 F9 | A182 F11 | A182 F22 |
| 2        | BONNET         | 1    | A051                                     | A182 304  | A182 F304L     | A182 F316 | A182 F316L | A182 F1             | A182 F5 | A182 F9 | A182 F11 | A182 F22 |
| 3        | STEM           | 1    | A276 410                                 | A276 304  | A276 316       |           |            | A276 410            |         |         |          |          |
| 4        | DISC           | 1    | A217 CA15                                | A351 CF8  | A351 CF8M      |           |            | A217 CA15           |         |         |          |          |
| 5        | SEAT RING      | 2    | A276 410                                 | A276 304  | A276 316       |           |            | A276 410            |         |         |          |          |
| 12       | BONNET BOLT    | 4    | A193 B7                                  |           | A193 B8        |           |            | A193 B7             |         |         |          |          |
| 13       | GASKET         | 1    | SS304                                    |           | SS304+GRAPHITE |           |            | SS304+GRAPHITE      |         |         |          |          |
|          |                |      | GRAPHILE                                 |           |                |           |            |                     |         |         |          |          |
| 14       | GLAND          | 1    | A276 410                                 | A276 304  | A276 316       |           |            | A276 410            |         |         |          |          |
| 15       | GLAND          | 1SET | GRAPHITE                                 |           | GRAPHITE       |           |            | GRAPHITE MONEL WIRE |         |         |          |          |
|          | PACKING        |      | W MONEL WIRE                             |           |                |           |            |                     |         |         |          |          |
|          |                |      |                                          |           |                |           |            |                     |         |         |          |          |
| 16       | GLAND FLANGE   | 1    | A105                                     |           | A182 F304      |           |            | A105                |         |         |          |          |
| 17       | GLAND BOLT     | 2    |                                          |           | A276 304       |           |            |                     |         |         |          |          |
| 18       | GLAND BOLT NUT | 2    | A194 2H                                  |           | A194 8         |           |            | A194 2H             |         |         |          |          |
| 19       | GLAND BOLT PIN | 2    |                                          |           | A276 304       |           |            |                     |         |         |          |          |
| 20       | SLEEVE         | 1    |                                          |           | A276 410       |           |            |                     |         |         |          |          |
| 22       | SLEEVE WASHER  | 2    |                                          |           | A197           |           |            |                     |         |         |          |          |
| 23       | HANDWHEEL      | 1    |                                          |           | ALUMINUM       |           |            |                     |         |         |          |          |
| 24       | NAMEPLATE      | 1    |                                          |           | A108 1020      |           |            |                     |         |         |          |          |
| 25       | HANDWHEELNUT   | 1    |                                          |           | A194 2H        |           |            |                     |         |         |          |          |



FORGED STEEL GLOBE VALVE  
BOLTED BONNET OS & Y



CLASS 150 & 900

(mm)

| SIZE | RB | 3/8" | 1/2" | 3/4" | 1"   | 1-1/4" | 1-1/2" | 2"     |     |
|------|----|------|------|------|------|--------|--------|--------|-----|
|      | FB |      | 3/8" | 1/2" | 3/4" | 1"     | 1-1/4" | 1-1/2" | 2"  |
| L    |    | 79   | 79   | 92   | 111  | 120    | 152    | 172    | 220 |
| W    |    | 100  | 100  | 100  | 125  | 160    | 160    | 182    | 200 |
| H    |    | 166  | 166  | 175  | 106  | 228    | 262    | 300    | 340 |
| d    |    | 8    | 10   | 12.7 | 18   | 23     | 28.5   | 36     | 43  |

CLASS 1500

(mm)

| SIZE | 3/8" | 1/2" | 3/4" | 1"  | 1-1/4" | 1-1/2" | 2"  |
|------|------|------|------|-----|--------|--------|-----|
| L    | 111  | 111  | 111  | 120 | 152    | 172    | 220 |
| W    | 125  | 125  | 125  | 160 | 160    | 180    | 200 |
| H    | 166  | 170  | 193  | 230 | 246    | 283    | 325 |
| d    | 10   | 13   | 18   | 23  | 29     | 33     | 43  |

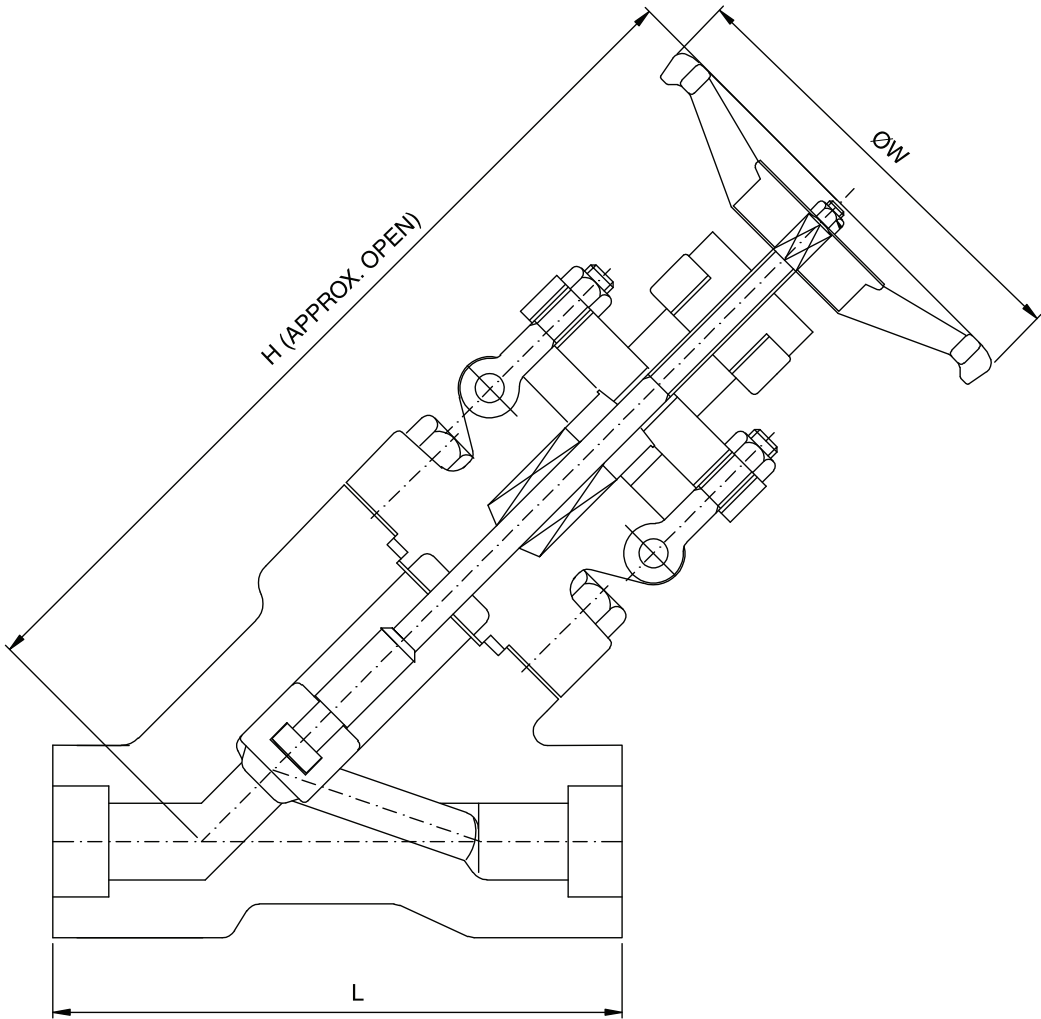
CLASS 2500 (Pressure Seal Bonnet)

(mm)

| SIZE | 3/8" | 1/2" | 3/4" | 1"  | 1-1/4" | 1-1/2" | 2"  |
|------|------|------|------|-----|--------|--------|-----|
| L    | 186  | 186  | 186  | 186 | 228    | 228    | 279 |
| W    | 125  | 125  | 160  | 160 | 180    | 200    | 200 |
| H    | 333  | 333  | 333  | 333 | 410    | 420    | 524 |
| d    | 8    | 11   | 14   | 19  | 25     | 28     | 35  |

The dimensions are indicative only and subject to change.

FORGED STEEL - Y - PATTERN GLOBE VALVE  
CLASS 150 - 1500



CLASS 150 & 900 DIMENSION & WEIGHT (mm)

| SIZE | RB | 3/8" | 1/2" | 3/4" | 1"   | 1-1/4" | 1-1/2" | 2"     |     |
|------|----|------|------|------|------|--------|--------|--------|-----|
|      | FB |      |      | 1/2" | 3/4" | 1"     | 1-1/4" | 1-1/2" | 2"  |
| L    |    | 98   | 98   | 98   | 120  | 140    | 140    | 170    | 190 |
| W    |    | 100  | 100  | 100  | 125  | 160    | 160    | 180    | 200 |
| H    |    | 240  | 240  | 240  | 290  | 302    | 368    | 368    | 370 |
| d    |    | 7    | 11   | 13   | 18   | 23.0   | 28     | 33.0   | 43  |

CLASS 1500 (mm)

| SIZE | 3/8" | 1/2" | 3/4" | 1"  | 1-1/4" | 1-1/2" | 2"  |
|------|------|------|------|-----|--------|--------|-----|
| L    | 98   | 98   | 120  | 140 | 140    | 170    | 190 |
| W    | 125  | 125  | 125  | 160 | 160    | 180    | 200 |
| H    | 240  | 240  | 290  | 302 | 368    | 368    | 410 |
| d    | 7    | 11   | 13   | 18  | 23     | 28     | 33  |

The dimensions are indicative only and subject to change.

## FORGED STEEL - CHECK VALVE

**DESCRIPTION** Lift check valve has an advantage over most other types of check valve in that it needs only a relatively short lift to obtain full valve opening. The lift check valve uses a free moving closure element that is placed above the seat. It prevents backflow and maintains pressure. The lift check valve is recommended for installation in horizontal piping lines because the disc is pushed up by flow until the flow reverses when gravity and down stream pressure seal the closure element against the seat.

### CLASS

API 800, 1500

ANSI 150, 300, 600, 900, 2500

### SIZE

3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"

### MATERIAL

ASTM A105, A182-F5, A182-F9, A182-F11, A182-F22, A182-304, A182-F316, A182-F304L, A182-316L, A350-LF2

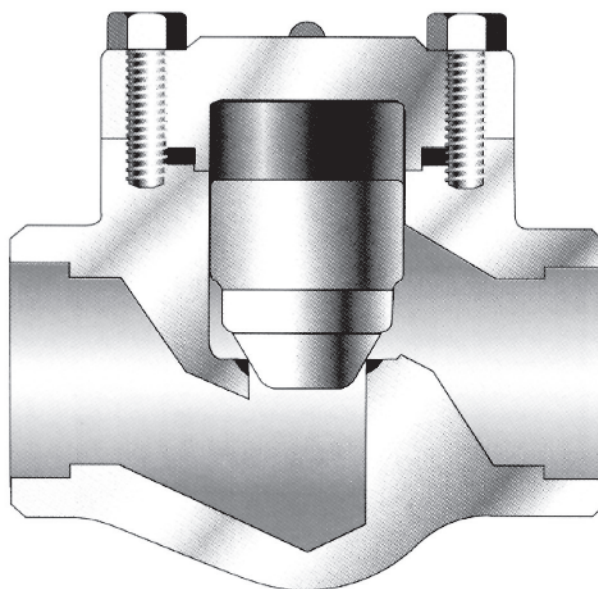
### END CONNECTION

Socket welded, Threaded, Butt welded, Flanged.

### FEATURE

Bolted bonnet or welded bonnet, Integral seat

## LIFT CHECK VALVE



**DESCRIPTION** Prevent a reversal of flow through pipeline. The swing check valve uses a hinge door to open during flow and to close against a pressure reversal. Most HAWKS swing check valves can be installed in horizontal or vertical flow piping. They offer low resistance to flow and are particularly suited to low velocity services.

### CLASS

API 800, 1500

ANSI 150, 300, 600, 900, 1500, 2500

### SIZE

3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"

### MATERIAL

ASTM A105, A182-F5, A182-F9, A182-F11, A182-316L, A182-F304, A182-F316, A182-F304F, A182-F316L, A305-LF2

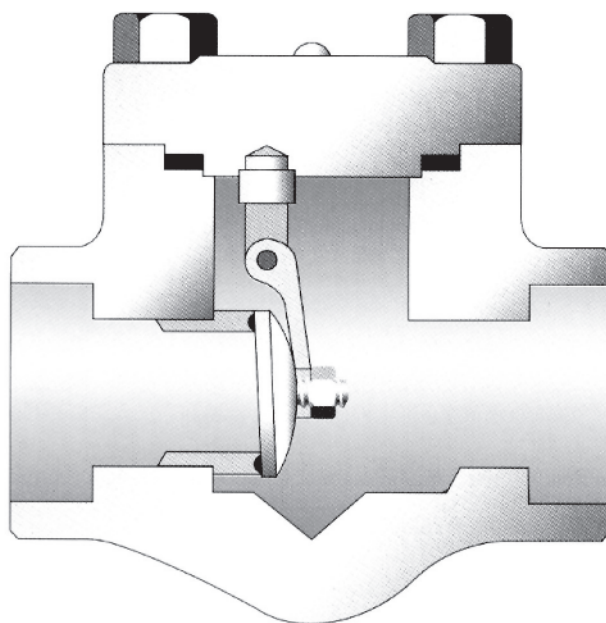
### END CONNECTION

Socket welded, Threaded, Butt welded, Flanged.

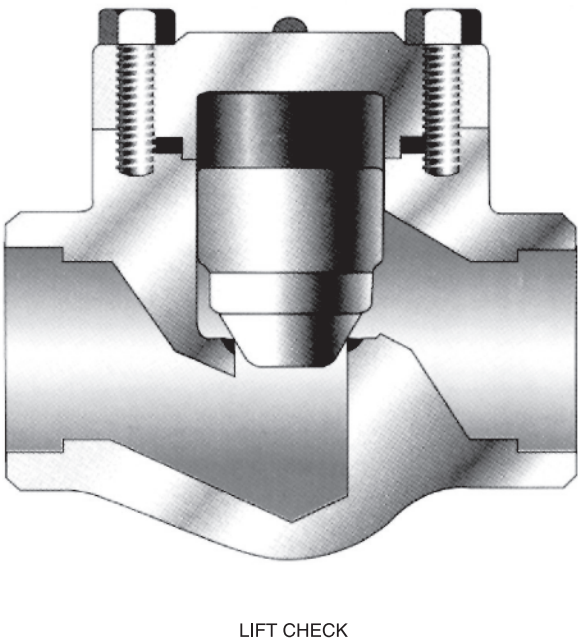
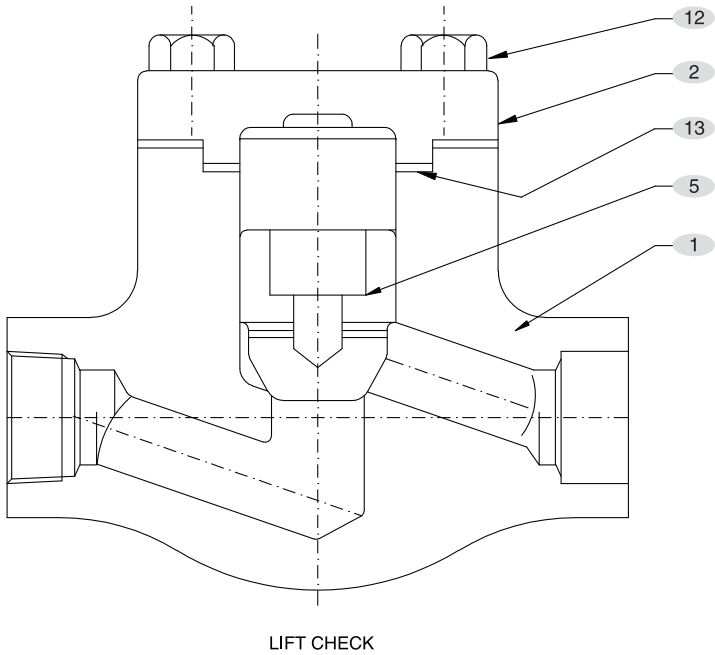
### FEATURE

Bolted bonnet or welded bonnet, Integral seat

## SWING CHECK VALVE



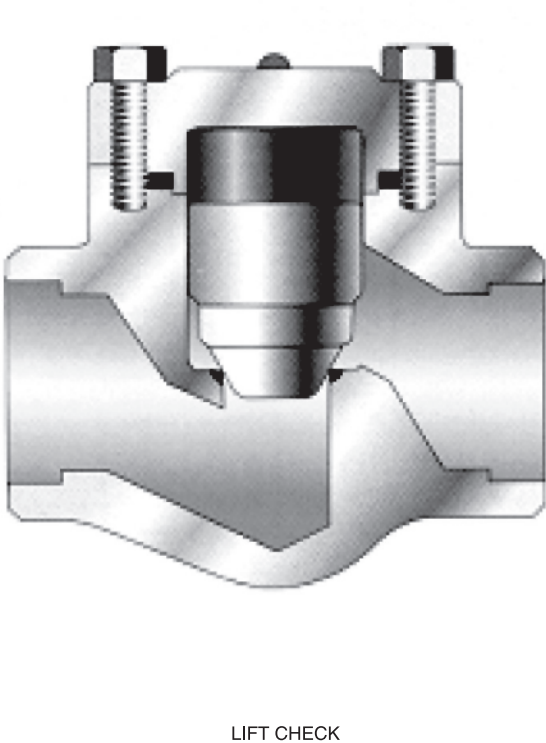
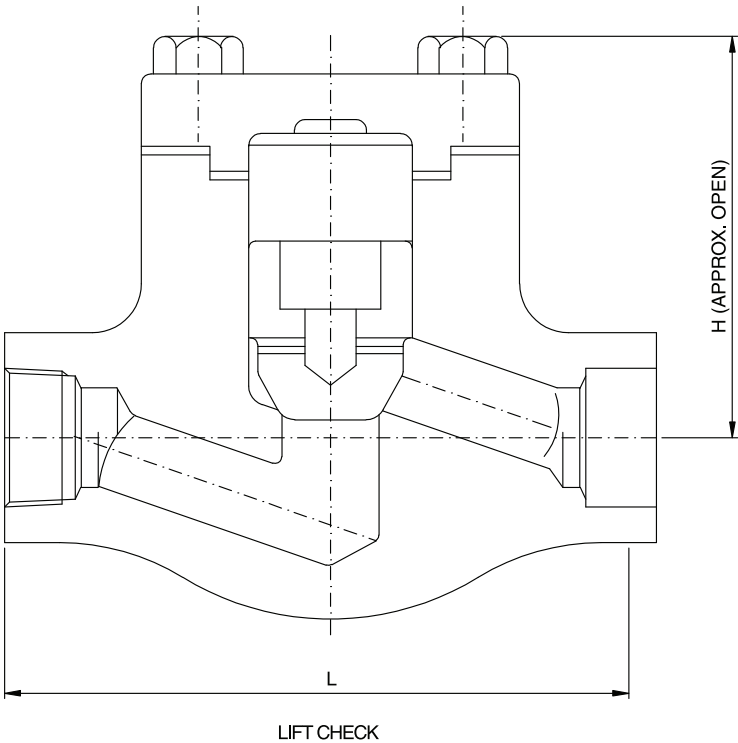
FORGED STEEL LIFT CHECK VALVE  
BOLTED COVER



PARTS NOMENCLATURE

| NO | PART NAME    | Q`ty | MATERIAL - ASTM |           |            |           |            |
|----|--------------|------|-----------------|-----------|------------|-----------|------------|
|    |              |      | A105            | F304      | F304L      | F316      | F316L      |
| 1  | BODY         | 1    | A105            | A182-F304 | A182-F304L | A182-F316 | A182-F316L |
| 3  | COVER        | 1    | A105            | A182-F304 | A182-F304L | A182-F316 | A182-F316L |
| 5  | DISC         | 1    | A217-CA15       | A182-F304 | A182-F304L | A315-CF8M | A182-F316L |
| 12 | COVER BOLTED | 4    | A193-B7         |           | A193-B8    |           |            |
| 13 | GASKET       | 1    | SS304+GRAPHITE  |           |            |           |            |

LIFT / PISTON TYPE & SWING TYPE  
CLASS 150 - 2500



CLASS 150 & 900

| SIZE | RB<br>FB | (mm) |      |      |     |        |        |     |     |
|------|----------|------|------|------|-----|--------|--------|-----|-----|
|      |          | 3/8" | 1/2" | 3/4" | 1"  | 1-1/4" | 1-1/2" | 2"  | 2"  |
| L    |          | 79   | 79   | 92   | 111 | 120    | 152    | 172 | 220 |
| H    |          | 62   | 62   | 63   | 78  | 82     | 102    | 120 | 147 |
| d    |          | 8    | 10   | 12.7 | 18  | 23     | 28.5   | 36  | 43  |

CLASS 1500

| (mm) |      |      |      |     |        |        |      |
|------|------|------|------|-----|--------|--------|------|
| SIZE | 3/8" | 1/2" | 3/4" | 1"  | 1-1/4" | 1-1/2" | 2"   |
| L    | 111  | 111  | 111  | 120 | 152    | 172    | 220  |
| H    | 62   | 63   | 78   | 82  | 102    | 120    | 147  |
| d    | 10   | 13   | 18   | 23  | 29     | 33     | 43.0 |

CLASS 2500 (Pressure Seal Bonnet)

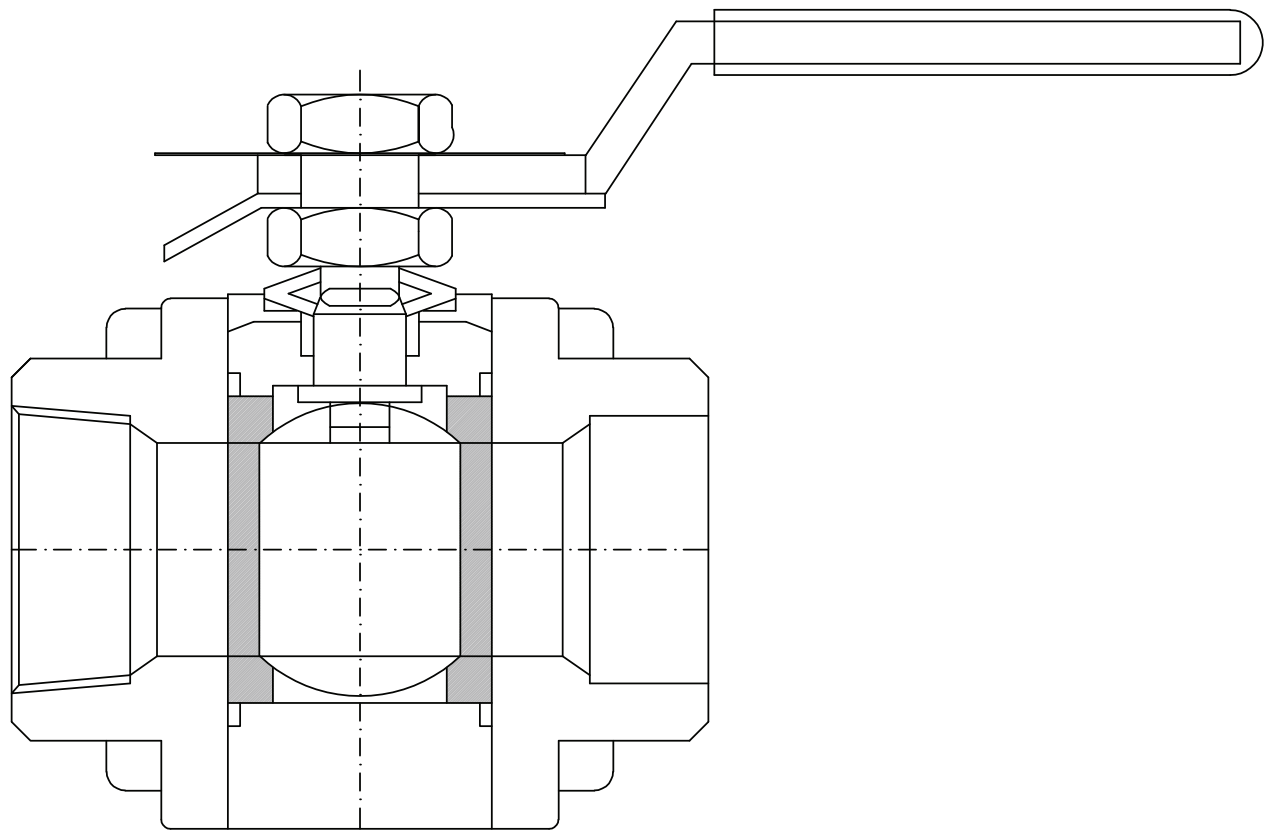
| (mm) |      |      |      |     |        |        |     |
|------|------|------|------|-----|--------|--------|-----|
| SIZE | 3/8" | 1/2" | 3/4" | 1"  | 1-1/4" | 1-1/2" | 2"  |
| L    | 186  | 186  | 186  | 186 | 228    | 228    | 279 |
| H    | 162  | 163  | 178  | 182 | 202    | 250    | 320 |
| d    | 8    | 11   | 14   | 19  | 25.0   | 28     | 35  |

The dimensions are indicative only and subject to change.



# FORGED STEEL BALL VALVE

## CLASS 150 - 1500

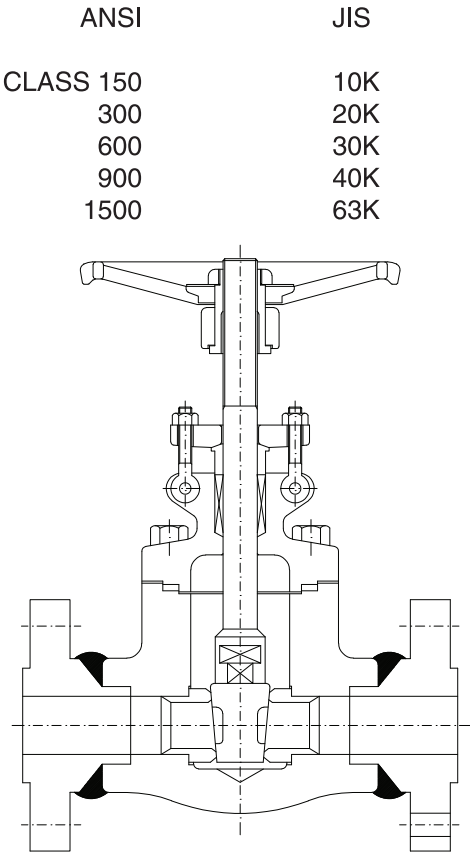


### FEATURES

- STANDARDS
- 3-PIECE CONSTRUCTION
- END CONNECTIONS: SCREWED ENDS / ANSI B 1.20.1  
SOCKET WELDED TO ASME / ANSI B 16.11
- ANTI BLOW-OUT PROOF STEM
- TRUNNION MOUNTED BALL

| PART NAME | MATERIAL  |                     |
|-----------|-----------|---------------------|
| BODY      | A105      | A182-F304/A182-F316 |
| CONNECTOR | A105      | A182-F304/A182-F316 |
| BALL      | A351-CF8M | A351-CF8M           |
| SEAT RING | RTFE      | RTFE                |
| GASKET    | PTFE      | PTFE                |
| STEM      | A276-T316 | A276-T316           |
| PACKING   | PTFE      | PTFE                |

FORGED STEEL GATE VALVE  
WELDED FLANGED ENDS. RF / FF / RTJ / SF



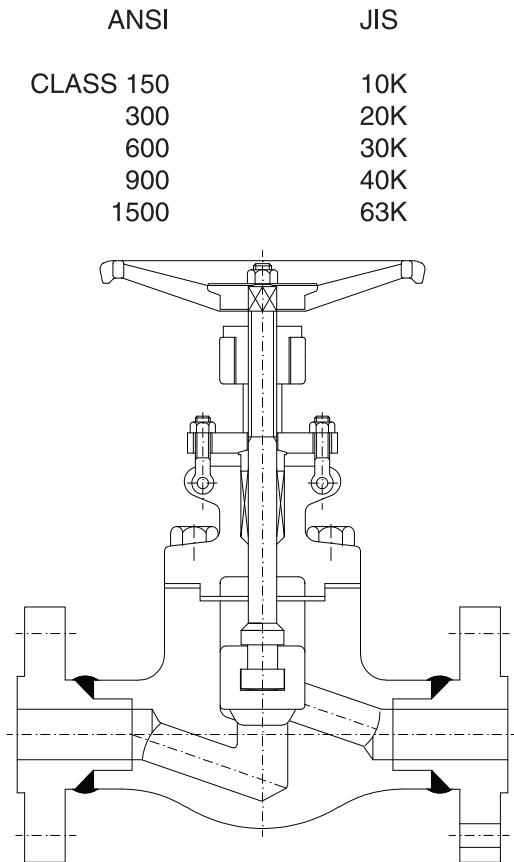
\*STANDARD  
CONSTRUCTION : API 602  
FLANGE : ANSI / ASME B16.5  
: ANSI / ASME B16.5  
: ANSI / ASME B16.10  
: JIS B 2220, JIS B 2002

\*END CONNECTIONS  
RF : RAISED FACE  
FF : FLAT FACE  
RTJ : RING JOINT  
SF : SMALL FEMALE

\*INSPECTION AND TEST  
API 598

| (mm)       |                    |      |      |      |        |        |      |
|------------|--------------------|------|------|------|--------|--------|------|
| CLASS      | DIMENSION & WEIGHT | 1/2' | 3/4' | 1"   | 1-1/4' | 1-1/2" | 2'   |
| 150        | END TO END         | 108  | 117  | 127  | 140    | 165    | 178  |
|            | WHEEL DIAMETER     | 84   | 91   | 97   | 137    | 137    | 57   |
|            | CENTRE TOP         | 138  | 147  | 174  | 217    | 217    | 256  |
|            | PORT DIAMETER      | 9.6  | 12.7 | 18.5 | 24.0   | 30.5   | 38.1 |
|            | APPROX. WEIGHT(KG) | 2.8  | 3.5  | 5.1  | 9.3    | 9.3    | 12.8 |
| 300        | END TO END         | 140  | 152  | 165  | 178    | 190    | 216  |
|            | WHEEL DIAMETER     | 84   | 97   | 97   | 137    | 137    | 57   |
|            | CENTRE TO TOP      | 138  | 147  | 174  | 217    | 217    | 256  |
|            | PORT DIAMETER      | 9.6  | 12.7 | 18.5 | 24.0   | 30.5   | 38.1 |
|            | APROX. WEIGHT (KG) | 3.1  | 3.8  | 5.4  | 9.6    | 9.6    | 13.2 |
| 600        | END TO END         | 165  | 190  | 216  | 229    | 241    | 292  |
|            | WHEEL DIAMETER     | 84   | 97   | 97   | 137    | 137    | 57   |
|            | CENTRE TOP         | 138  | 147  | 174  | 217    | 217    | 256  |
|            | PORT DIAMETER      | 9.6  | 12.7 | 18.5 | 24.0   | 30.5   | 38.1 |
|            | APPROX. WEIGHT(KG) | 3.6  | 5    | 6.8  | 12.3   | 12.5   | 16.6 |
| 900 & 1500 | END TO END         | 216  | 229  | 254  | 279    | 305    | 368  |
|            | WHEEL DIAMETER     | 97   | 97   | 137  | 157    | 157    | 157  |
|            | CENTRE TO TOP      | 147  | 156  | 207  | 246    | 246    | 303  |
|            | PORT DIAMETER      | 9.6  | 12.7 | 18.5 | 24.0   | 30.5   | 38.1 |
|            | APROX. WEIGHT (KG) | 5.0  | 7.0  | 18.7 | 29.2   | 29.2   | 34.2 |

FORGED STEEL GLOBE VALVE  
WELDED FLANGED ENDS. RF / FF / RTJ / SF



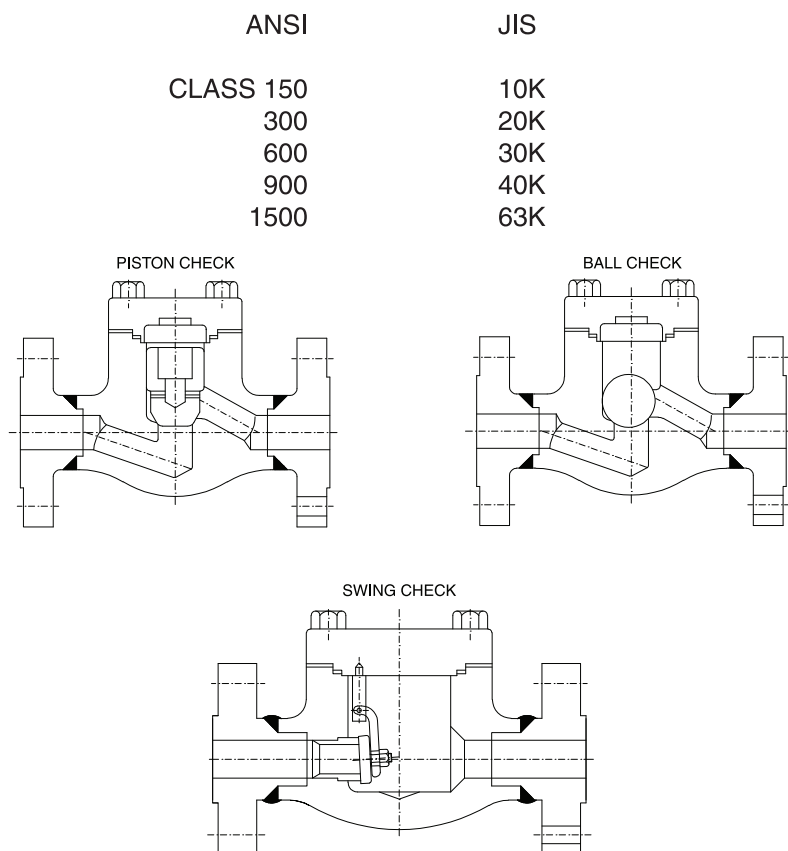
\*STANDARD  
CONSTRUCTION : API 602  
FLANGE : ANSI / ASME B16.5  
: ANSI / ASME B16.5  
: ANSI / ASME B16.10  
: JIS B 2220, JIS B 2002

\*END CONNECTIONS  
RF : RAISED FACE  
FF : FLAT FACE  
RTJ : RING JOINT  
SF : SMALL FEMALE

\*INSPECTION AND TEST  
API 598

| (mm)       |                    |      |      |      |        |        |      |
|------------|--------------------|------|------|------|--------|--------|------|
| CLASS      | DIMENSION & WEIGHT | 1/2" | 3/4" | 1"   | 1-1/4" | 1-1/2" | 2"   |
| 150        | END TO END         | 108  | 117  | 127  | 140    | 165    | 203  |
|            | WHEEL DIAMETER     | 84   | 97   | 97   | 137    | 137    | 57   |
|            | CENTRE TOP         | 144  | 154  | 177  | 225    | 225    | 254  |
|            | PORT DIAMETER      | 9.5  | 12.5 | 18.5 | 23.5   | 30.5   | 36.0 |
|            | APPROX. WEIGHT(KG) | 2.8  | 3.5  | 5.1  | 9.3    | 9.3    | 12.8 |
| 300        | END TO END         | 152  | 178  | 203  | 216    | 229    | 267  |
|            | WHEEL DIA.         | 84   | 97   | 97   | 137    | 137    | 57   |
|            | CENTRE TO TOP      | 144  | 154  | 177  | 225    | 225    | 254  |
|            | PORT DIAMETER      | 9.5  | 12.5 | 18.5 | 23.5   | 30.5   | 36.0 |
|            | APROX. WEIGHT (KG) | 3.1  | 3.8  | 5.4  | 9.6    | 9.6    | 13.2 |
| 600        | END TO END         | 165  | 190  | 216  | 229    | 241    | 292  |
|            | WHEEL DIAMETER     | 84   | 97   | 97   | 137    | 137    | 57   |
|            | CENTRE TOP         | 144  | 154  | 177  | 225    | 225    | 254  |
|            | PORT DIAMETER      | 9.5  | 12.5 | 18.5 | 23.5   | 30.5   | 36.0 |
|            | APPROX. WEIGHT(KG) | 3.6  | 5    | 6.8  | 12.3   | 12.5   | 16.6 |
| 900 & 1500 | END TO END         | 216  | 229  | 254  | 279    | 305    | 368  |
|            | WHEEL DIAMETER     | 97   | 97   | 137  | 157    | 157    | 157  |
|            | CENTRE TO TOP      | 150  | 179  | 231  | 256    | 256    | 301  |
|            | PORT DIAMETER      | 9.5  | 12.5 | 18.5 | 23.5   | 30.5   | 36.0 |
|            | APROX. WEIGHT (KG) | 5.0  | 7.0  | 18.7 | 29.2   | 29.2   | 34.2 |

# FORGED STEEL CHECK VALVE WELDED FLANGED ENDS. RF / FF / RTJ / SF



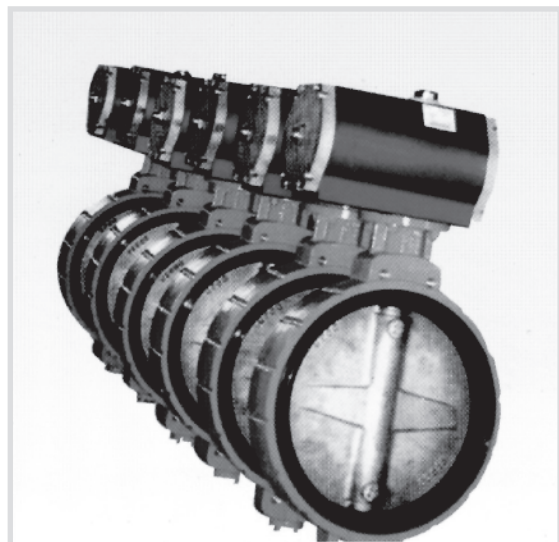
\*STANDARD  
CONSTRUCTION : API 602  
FLANGE : ANSI / ASME B16.5  
: ANSI / ASME B16.5  
: ANSI / ASME B16.10  
: JIS B 2220, JIS B 2002

\*END CONNECTIONS  
RF : RAISED FACE  
FF : FLAT FACE  
RTJ : RING JOINT  
SF : SMALL FEMALE

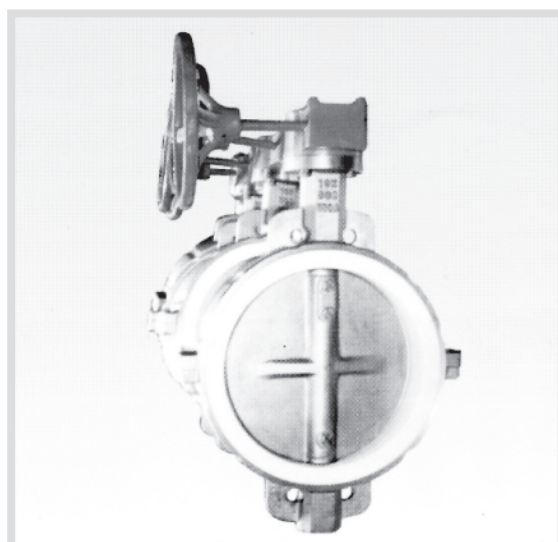
\*INSPECTION AND TEST  
API 598

| CLASS      | DIMENSION & WEIGHT | 1/2" | 3/4" | 1"   | 1-1/4" | 1-1/2" | 2"   |
|------------|--------------------|------|------|------|--------|--------|------|
| 150        | END TO END         | 108  | 117  | 127  | 140    | 165    | 203  |
|            | WHEEL DIAMETER     | 84   | 97   | 97   | 137    | 137    | 57   |
|            | CENTRE TOP         | 144  | 154  | 177  | 225    | 225    | 254  |
|            | PORT DIAMETER      | 9.5  | 12.5 | 18.5 | 23.5   | 30.5   | 36.0 |
|            | APPROX. WEIGHT(KG) | 2.8  | 3.5  | 5.1  | 9.3    | 9.3    | 12.8 |
| 300        | END TO END         | 152  | 178  | 203  | 216    | 229    | 267  |
|            | WHEEL DIAMETER     | 84   | 97   | 97   | 137    | 137    | 57   |
|            | CENTRE TO TOP      | 144  | 154  | 177  | 225    | 225    | 254  |
|            | PORT DIAMETER      | 9.5  | 12.5 | 18.5 | 23.5   | 30.5   | 36.0 |
|            | APROX. WEIGHT (KG) | 3.1  | 3.8  | 5.4  | 9.6    | 9.6    | 13.2 |
| 600        | END TO END         | 165  | 190  | 216  | 229    | 241    | 292  |
|            | WHEEL DIAMETER     | 84   | 97   | 97   | 137    | 137    | 57   |
|            | CENTRE TOP         | 144  | 154  | 177  | 225    | 225    | 254  |
|            | PORT DIAMETER      | 9.5  | 12.5 | 18.5 | 23.5   | 30.5   | 36.0 |
|            | APPROX. WEIGHT(KG) | 3.6  | 5    | 6.8  | 12.3   | 12.5   | 16.6 |
| 900 & 1500 | END TO END         | 216  | 229  | 254  | 279    | 305    | 368  |
|            | WHEEL DIAMETER     | 97   | 97   | 137  | 157    | 157    | 157  |
|            | CENTRE TO TOP      | 150  | 179  | 231  | 256    | 256    | 301  |
|            | PORT DIAMETER      | 9.5  | 12.5 | 18.5 | 23.5   | 30.5   | 36.0 |
|            | APROX. WEIGHT (KG) | 5.0  | 7.0  | 18.7 | 29.2   | 29.2   | 34.2 |

## BUTTERFLY VALVE



Series CRB with Pneumatic Actuator



Series CRB with Worm Gear



Series CRB with Lever Handle



Series CRB with Electric Actuator



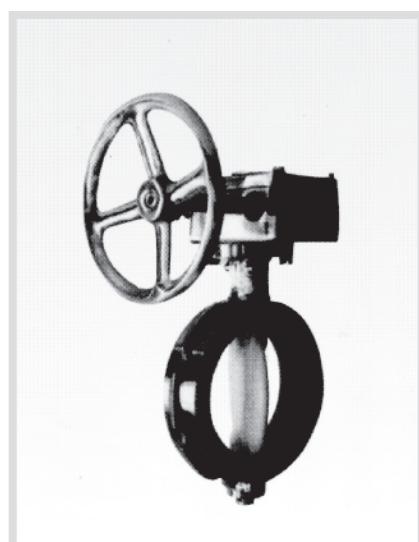
Series CHB with Centre Handle Gear



Series CHB with Worm Gear

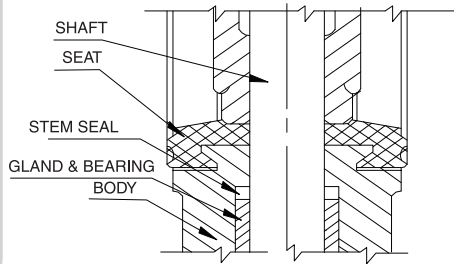


Series CTB with Lever Handle

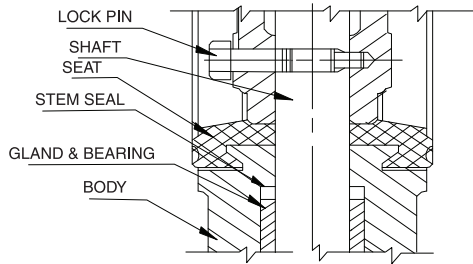


Series CTB with Worm Gear

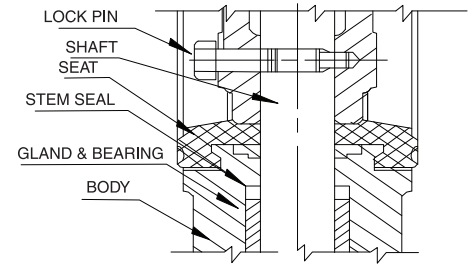




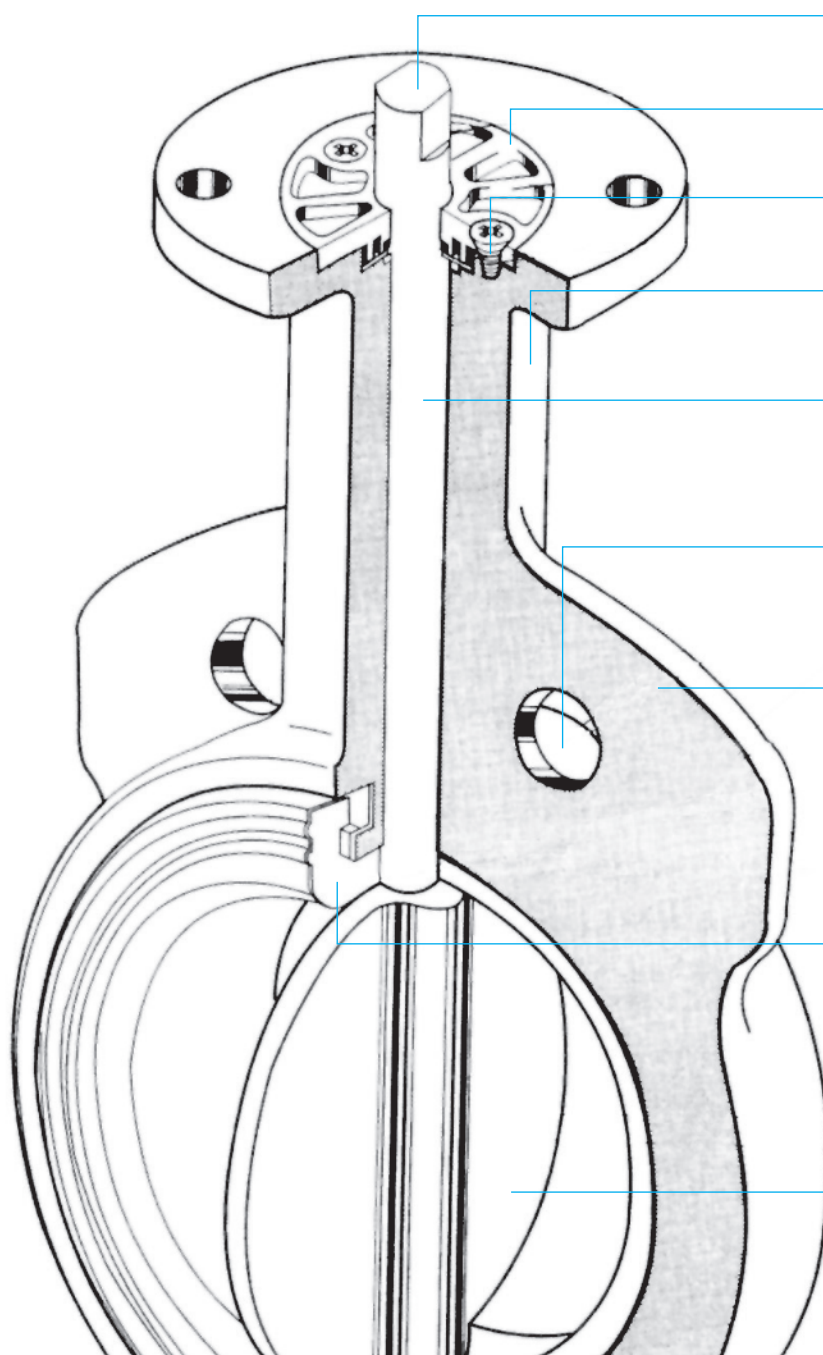
Seat Type for 1 1/2" - 12"



Seat Type for 14" - 22"



Seat Type for 24" - 40"



**PARALLEL FLATS** Ensures positive actuator connection and serves as disc position indicator.

**SAFETY RETAINER RING** Prevents shaft blowout.

**SHAFT SEAL** The O-RING is designed for positive sealing in both directions.

**EXTENDED NECK** Allows room for 2" of piping insulation.

**SHAFT** One-piece stainless steel with broached connection through 12" diameter provides positive disc drive connection and easy maintenance.

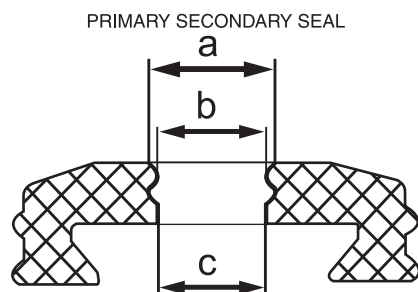
**FLANGE LOCATION HOLES** Permit quick installation and proper valve/flange alignment and prevent problems associated with improper installation.

**BODY** Single piece wafer, lug or double flanged-cast iron and coated both internally and externally for erosion/corrosion protection.

**SEAT**  
An easily replaceable one-piece seat provides tight shutoff and completely isolates the service media from the body. The molded-in double "O" rings on the liner face ensure positive sealing between all flanges and eliminate flanges gasket requirements. Designed to be used with slip on as well as weld neck ANSI, JIS, BSI, DIN, flanges seat is designed to stay flat to the body when installation between flanges resulting in exceptional seat rigidity.

**DISC** One-piece casting with wide disc edge; ground and polished for extended seat lift and shut-off.

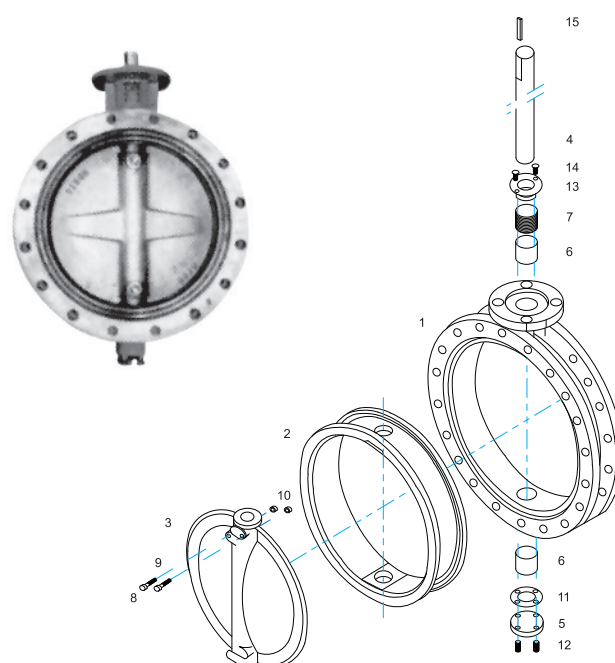
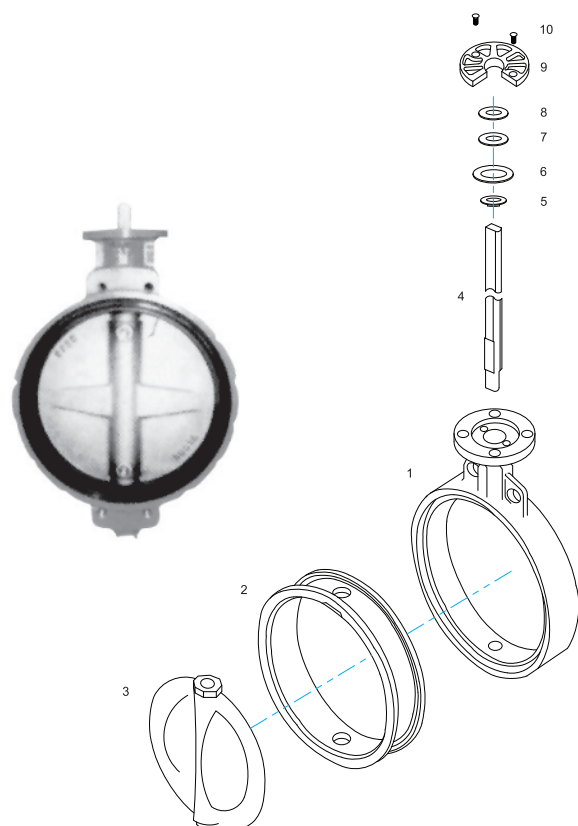
**QUARTER-TURN** Excellent flow characteristics with ease of operation and throttling. With capability through 90 degrees of operation.



Primary and Secondary Seal, and Shaft Seal provide excellent protection from stem and pipeline leakage.

\***Primary liner-Shaft Seal** is a compression fit between the disc hub and the liner.

\*\***Secondary Seal** is achieved by an interference fit created by molding the liner's shaft holes (a) smaller than the shaft diameter, and enhanced by the unique molding in the channel (b) "O" ring. (c) Secondary seal utilizes a two-point-contact design. This resulted in a triple steam seal without the need for an extra O-ring.



## PART AND MATERIALS

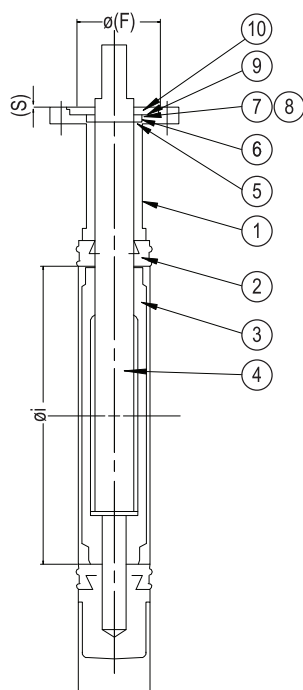
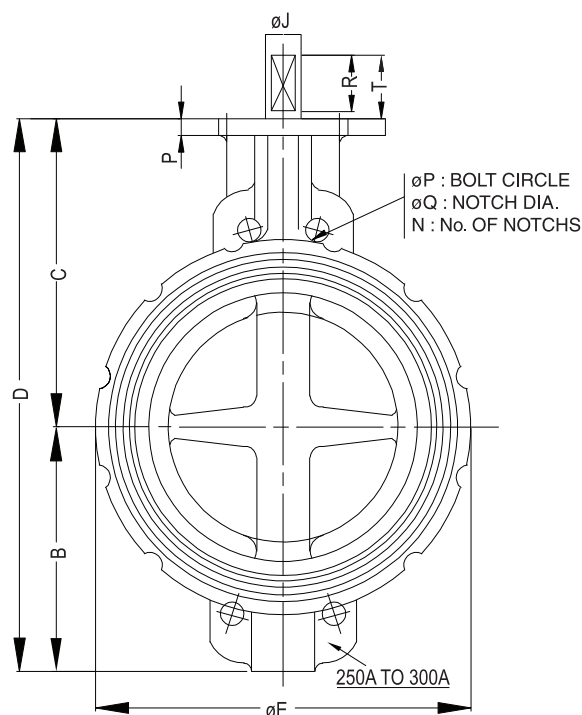
### PART AND MATERIALS FOR 1 1/2" (40A) ~ 12" (300A)

| No. | PART NAME     | MATERIALS                                              |
|-----|---------------|--------------------------------------------------------|
| 1   | BODY          | CAST IRON/DUCTILE IRON<br>CAST STEEL / STAINLESS STEEL |
| 2   | SEAT          | EPDM / NBR / VITON                                     |
| 3   | DISC          | ALUMINUM BRONZE<br>STAINLESS STEEL<br>ALLOY STEEL      |
| 4   | STEM          | STAINLESS STEEL/<br>(304. 316. 410.17-4-PH)            |
| 5   | C-CLIP        | STEEL                                                  |
| 6   | STEM RETAINER | STEEL                                                  |
| 7   | O-RING        | NBR                                                    |
| 8   | O-RING        | NBR                                                    |
| 9   | SEAL GLAND    | NYLON                                                  |
| 10  | SCREW         | PLATE STEEL                                            |

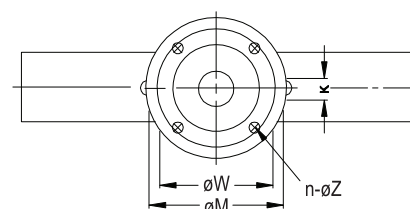
### PART AND MATERIALS FOR 14" (350A) ~ 40" (1000A)

| No. | PART NAME     | MATERIALS                                                |
|-----|---------------|----------------------------------------------------------|
| 1   | BODY          | CAST IRON / DUCTILE IRON<br>CAST STEEL / STAINLESS STEEL |
| 2   | SEAT          | EPDM / NBR / VITON                                       |
| 3   | DISC          | ALUMINUM BRONZE<br>STAINLESS STEEL<br>ALLOY STEEL        |
| 4   | STEM          | STAINLESS STEEL /<br>(304. 316. 410.17-4-PH)             |
| 5   | BOTTOM PLATE  | SAME MATERIAL AS BODY                                    |
| 6   | BEARING       | SELF-LUBRICATING                                         |
| 7   | PACKING       | NBR                                                      |
| 8   | LOCK PIN      | 17-4 PH STAINLESS STEEL                                  |
| 9   | O-RING        | NBR                                                      |
| 10  | NUT           | STAINLESS STEEL                                          |
| 11  | GASKET        | NBR                                                      |
| 12  | SCREW         | STEEL                                                    |
| 13  | PACKING GLAND | STEEL                                                    |
| 14  | SCREW         | STEEL                                                    |
| 15  | KEY           | STEEL                                                    |

# SERIES CRB WAFER TYPE



| NO | PART NAME      | QTY |
|----|----------------|-----|
| 1  | BODY           | 1   |
| 2  | SEAT           | 1   |
| 3  | DISC           | 1   |
| 4  | STEM           | 1   |
| 5  | C-CLIP         | 1   |
| 6  | STEM RETAINING | 1   |
| 7  | O-RING         | 1   |
| 8  | O-RING         | 1   |
| 9  | SEAL GLAND     | 1   |
| 10 | SCREW          | 2   |



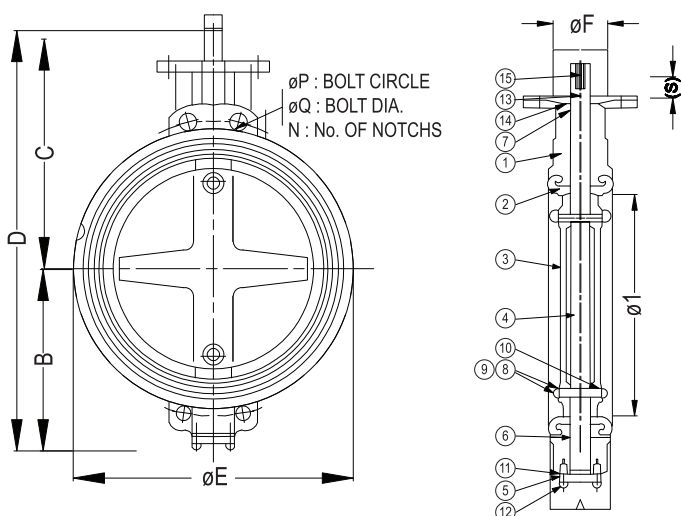
## VALVE DIMENSIONS

| Valve Size |     | ø i    A    B    C    D    øE    P |    |     |     |     |     |    | Stem |    |      |     | Top Flange to ISO 5211 |     |       |     |     |   |     | Weight |
|------------|-----|------------------------------------|----|-----|-----|-----|-----|----|------|----|------|-----|------------------------|-----|-------|-----|-----|---|-----|--------|
|            |     |                                    |    |     |     |     |     |    | T    | R  | K    | ø J | Type                   | ø M | ø (F) | (S) | ø W | n | ø Z | Kg     |
| 1½         | 40  | 40                                 | 33 | 50  | 100 | 150 | 80  | 10 | 32   | 30 | 9.5  | 14  | F07                    | 90  | 55    | 3   | 70  | 4 | 9.5 | 2.8    |
| 2          | 50  | 50                                 | 43 | 55  | 120 | 175 | 92  | 10 | 32   | 30 | 9.5  | 14  | F07                    | 90  | 55    | 3   | 70  | 4 | 9.5 | 3.2    |
| 2½         | 65  | 64                                 | 46 | 65  | 130 | 195 | 106 | 11 | 32   | 30 | 9.5  | 14  | F07                    | 90  | 55    | 3   | 70  | 4 | 9.5 | 4.1    |
| 3          | 80  | 76                                 | 46 | 75  | 140 | 215 | 122 | 11 | 32   | 30 | 9.5  | 14  | F07                    | 90  | 55    | 3   | 70  | 4 | 9.5 | 4.5    |
| 4          | 100 | 102                                | 52 | 95  | 160 | 255 | 150 | 12 | 32   | 30 | 14.5 | 19  | F07                    | 90  | 55    | 3   | 70  | 4 | 9.5 | 5.8    |
| 5          | 125 | 127                                | 54 | 115 | 180 | 295 | 178 | 12 | 32   | 30 | 14.5 | 19  | F07                    | 90  | 55    | 3   | 70  | 4 | 9.5 | 7.8    |
| 6          | 150 | 146                                | 56 | 130 | 205 | 335 | 206 | 12 | 40   | 35 | 16.0 | 22  | F07                    | 90  | 55    | 3   | 70  | 4 | 9.5 | 9.5    |
| 8          | 200 | 197                                | 60 | 160 | 230 | 390 | 264 | 14 | 40   | 35 | 16.0 | 22  | F10                    | 125 | 72    | 3   | 102 | 4 | 12  | 16.5   |
| 10         | 250 | 246                                | 68 | 215 | 278 | 465 | 324 | 14 | 40   | 35 | 22.0 | 30  | F10                    | 125 | 72    | 3   | 102 | 4 | 12  | 23.5   |
| 12         | 300 | 292                                | 78 | 245 | 323 | 520 | 370 | 16 | 40   | 35 | 22.0 | 30  | F10                    | 125 | 72    | 3   | 102 | 4 | 12  | 40.5   |

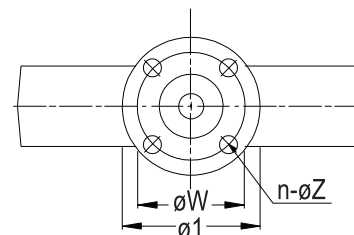
## FLANGE DIMENSIONS

| Valve Size |     | JIS 5K |    |     | JIS 10K |    |     | JIS 16K |    |     | ANSI 150LB |    |     | BS 4504 PN6 |    |     | BS 4504 PN10 |    |     | BS 4504 PN16 |    |     |
|------------|-----|--------|----|-----|---------|----|-----|---------|----|-----|------------|----|-----|-------------|----|-----|--------------|----|-----|--------------|----|-----|
| Inch       | mm  | ø P    | N  | ø Q | ø P     | N  | ø Q | ø P     | N  | ø Q | ø P        | N  | ø Q | ø P         | N  | ø Q | ø P          | N  | ø Q | ø P          | N  | ø Q |
| 1½         | 40  | 95     | 4  | 15  | 105     | 4  | 19  | 105     | 4  | 19  | 98.5       | 4  | 16  | 100         | 4  | 14  | 110          | 4  | 19  | 110          | 4  | 19  |
| 2          | 50  | 105    | 4  | 15  | 120     | 4  | 19  | 120     | 8  | 19  | 120.5      | 4  | 19  | 110         | 4  | 14  | 125          | 4  | 19  | 125          | 4  | 19  |
| 2½         | 65  | 130    | 4  | 15  | 140     | 4  | 19  | 140     | 8  | 19  | 139.5      | 4  | 19  | 130         | 4  | 14  | 145          | 4  | 19  | 145          | 4  | 19  |
| 3          | 80  | 145    | 4  | 19  | 150     | 8  | 19  | 160     | 8  | 23  | 152.5      | 4  | 19  | 150         | 4  | 19  | 160          | 8  | 19  | 160          | 8  | 19  |
| 4          | 100 | 165    | 8  | 19  | 175     | 8  | 19  | 185     | 8  | 23  | 190.5      | 8  | 19  | 170         | 4  | 19  | 180          | 8  | 19  | 180          | 8  | 19  |
| 5          | 125 | 200    | 8  | 19  | 210     | 8  | 23  | 225     | 8  | 25  | 216.0      | 8  | 22  | 200         | 8  | 19  | 210          | 8  | 19  | 210          | 8  | 19  |
| 6          | 150 | 230    | 8  | 19  | 240     | 8  | 23  | 260     | 12 | 25  | 241.5      | 8  | 22  | 225         | 8  | 19  | 240          | 8  | 23  | 240          | 8  | 23  |
| 8          | 200 | 280    | 8  | 23  | 290     | 12 | 23  | 305     | 12 | 25  | 298.5      | 8  | 22  | 280         | 8  | 19  | 295          | 8  | 23  | 295          | 12 | 23  |
| 10         | 250 | 345    | 12 | 23  | 355     | 12 | 25  | 380     | 12 | 27  | 362.0      | 12 | 25  | 335         | 12 | 19  | 350          | 12 | 23  | 355          | 12 | 28  |
| 12         | 300 | 390    | 12 | 23  | 400     | 12 | 25  | 430     | 16 | 27  | 432.0      | 12 | 25  | 395         | 12 | 23  | 400          | 12 | 23  | 410          | 12 | 28  |

## SERIES CRB WAFER TYPE



| NO | PART NAME    | QTY | NO | PART NAME     | QTY |
|----|--------------|-----|----|---------------|-----|
| 1  | BODY         | 1   | 9  | O-RING        | 2   |
| 2  | SEAT         | 1   | 10 | NUT           | 2   |
| 3  | DISC         | 1   | 11 | GASKET        | 1   |
| 4  | STEM         | 1   | 12 | SCREW         | 4   |
| 5  | BOTTOM PLATE | 1   | 13 | PACKING GLAND | 1   |
| 6  | BEARING      | 2   | 14 | SCREW         | 2   |
| 7  | PACKING      | 1   | 15 | KEY           | 1   |
| 8  | LOCK PIN     | 2   |    |               |     |



### VALVE DIMENSIONS

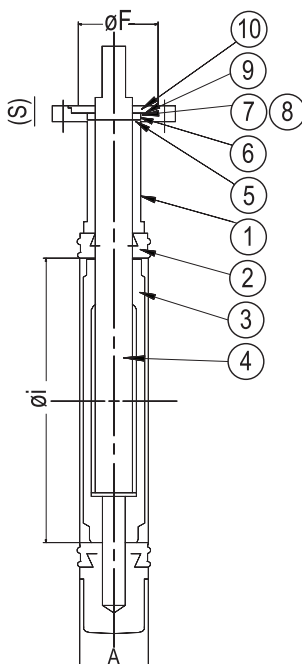
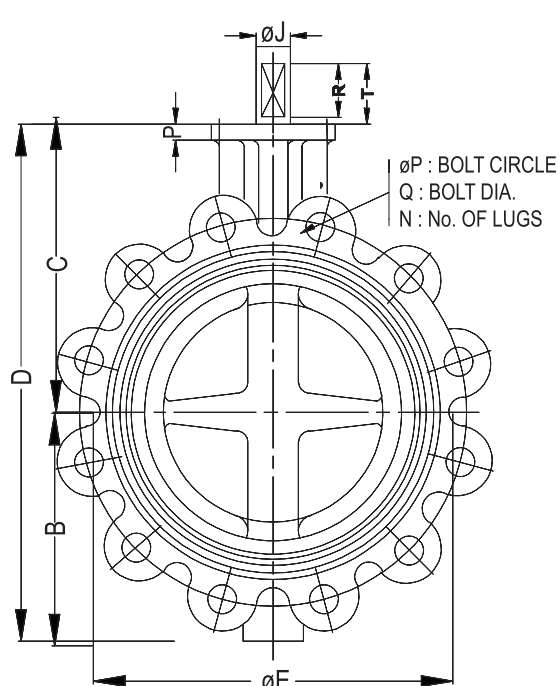
| Valve Size |      | $\phi$ i | A   | B   | C   | D    | $\phi$ E | P  | Stem |   |   |          | Top Flange to ISO 5211 |          |            |     |          |   |          | Weight<br>kg |
|------------|------|----------|-----|-----|-----|------|----------|----|------|---|---|----------|------------------------|----------|------------|-----|----------|---|----------|--------------|
| inch       | mm   |          |     |     |     |      |          |    | T    | R | K | $\phi$ J | Type                   | $\phi$ M | $\phi$ (F) | (S) | $\phi$ W | n | $\phi$ Z |              |
| 14         | 350  | 330      | 78  | 250 | 340 | 590  | 410      | 16 | 40   | - | - | 30       | F10                    | 125      | 72         | 3   | 102      | 4 | 12       | 54.5         |
| 16         | 400  | 380      | 102 | 300 | 370 | 670  | 418      | 20 | 50   | - | - | 38       | F14                    | 175      | 100        | 4   | 140      | 4 | 18       | 84.0         |
| 18         | 450  | 430      | 114 | 320 | 400 | 720  | 528      | 20 | 64   | - | - | 38       | F14                    | 175      | 100        | 4   | 140      | 4 | 18       | 97.0         |
| 20         | 500  | 482      | 127 | 360 | 440 | 800  | 578      | 20 | 64   | - | - | 55       | F16                    | 210      | 130        | 5   | 165      | 4 | 22       | 142.0        |
| 22         | 550  | 528      | 154 | 420 | 460 | 880  | 636      | 22 | 64   | - | - | 55       | F16                    | 210      | 130        | 5   | 165      | 4 | 22       | 175.0        |
| 24         | 600  | 575      | 154 | 450 | 500 | 950  | 680      | 22 | 100  | - | - | 60       | F16                    | 210      | 130        | 5   | 165      | 4 | 22       | 195.0        |
| 26         | 650  | 622      | 165 | 480 | 530 | 1010 | 750      | 24 | 100  | - | - | 60       | F25                    | 300      | 200        | 6   | 254      | 8 | 18       | 225.0        |
| 28         | 700  | 674      | 165 | 540 | 580 | 1120 | 828      | 24 | 100  | - | - | 60       | F25                    | 300      | 200        | 6   | 254      | 8 | 18       | 268.0        |
| 30         | 750  | 724      | 190 | 570 | 610 | 1180 | 880      | 28 | 100  | - | - | 75       | F25                    | 300      | 200        | 6   | 254      | 8 | 18       | 310.0        |
| 32         | 800  | 822      | 190 | 600 | 630 | 1230 | 925      | 28 | 120  | - | - | 75       | F25                    | 300      | 200        | 6   | 254      | 8 | 18       | 360.0        |
| 34         | 850  | 822      | 200 | 635 | 660 | 1295 | 970      | 28 | 120  | - | - | 85       | F25                    | 300      | 200        | 6   | 254      | 8 | 18       | 410.0        |
| 36         | 900  | 876      | 200 | 660 | 690 | 1350 | 1008     | 32 | 120  | - | - | 85       | F30                    | 350      | 230        | 6   | 298      | 8 | 22       | 480.0        |
| 40         | 1000 | 975      | 216 | 730 | 760 | 1490 | 1135     | 32 | 120  | - | - | 100      | F30                    | 350      | 230        | 6   | 298      | 8 | 22       | 610.0        |

### FLANGE DIMENSIONS

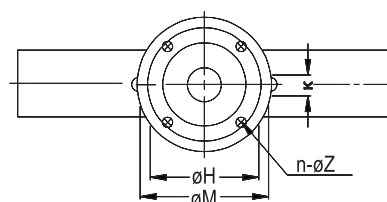
| Valve Size |      | JIS 5K   |    |          | JIS 10K  |    |          | JIS 16K  |    |          | ANSI 150LB |    |          | BS 450A PN6 |    |          | BS 4504 PN10 |    |          | BS 4504 PN16 |    |          |
|------------|------|----------|----|----------|----------|----|----------|----------|----|----------|------------|----|----------|-------------|----|----------|--------------|----|----------|--------------|----|----------|
| inch       | mm   | $\phi$ P | N  | $\phi$ Q | $\phi$ P | N  | $\phi$ Q | $\phi$ P | N  | $\phi$ Q | $\phi$ P   | N  | $\phi$ Q | $\phi$ P    | N  | $\phi$ Q | $\phi$ P     | N  | $\phi$ Q | $\phi$ P     | N  | $\phi$ Q |
| 14         | 350  | 435      | 12 | 25       | 445      | 16 | 25       | 480      | 16 | 33       | 476.0      | 12 | 28       | 445         | 12 | 23       | 460          | 16 | 23       | 470          | 16 | 28       |
| 16         | 400  | 495      | 16 | 25       | 510      | 16 | 27       | 540      | 16 | 33       | 539.5      | 16 | 28       | 495         | 16 | 23       | 515          | 16 | 28       | 525          | 16 | 32       |
| 18         | 450  | 555      | 16 | 25       | 565      | 20 | 27       | 605      | 20 | 33       | 578.0      | 16 | 32       | 550         | 16 | 23       | 565          | 20 | 28       | 585          | 20 | 32       |
| 20         | 500  | 605      | 20 | M22      | 620      | 20 | M24      | 660      | 20 | M30      | 653.5      | 20 | 11/8     | 600         | 20 | M20      | 620          | 20 | M24      | 650          | 20 | M30      |
| 22         | 550  | 665      | 20 | M24      | 680      | 20 | M30      | 720      | 20 | M36      | -          | -  | -        | -           | -  | -        | -            | -  | -        | -            | -  | -        |
| 24         | 600  | 715      | 20 | M24      | 730      | 24 | M30      | 770      | 20 | M36      | 749.5      | 20 | 11/4     | 705         | 20 | M24      | 725          | 20 | -N27     | 770          | 20 | M33      |
| 26         | 650  | 770      | 24 | M24      | 780      | 24 | M30      | 820      | 24 | M36      | -          | -  | -        | -           | -  | -        | -            | -  | -        | -            | -  | -        |
| 28         | 700  | 820      | 24 | M24      | 840      | 24 | M30      | 875      | 24 | M39      | 863.5      | 28 | 11/4     | 810         | 24 | M24      | 840          | 24 | M27      | 840          | 24 | M33      |
| 30         | 750  | 880      | 24 | M30      | 900      | 24 | M30      | 935      | 24 | M39      | 914.5      | 28 | 11/4     | -           | -  | -        | -            | -  | -        | -            | -  | -        |
| 32         | 800  | 930      | 24 | M30      | 950      | 28 | M30      | 990      | 24 | M45      | 978.0      | 28 | 11/2     | 920         | 24 | M27      | 950          | 24 | M30      | 950          | 24 | M36      |
| 34         | 850  | 980      | 24 | M30      | 1000     | 28 | M30      | 1040     | 24 | M45      | -          | -  | -        | -           | -  | -        | -            | -  | -        | -            | -  | -        |
| 36         | 900  | 1030     | 24 | M30      | 1050     | 28 | M30      | 1090     | 28 | M45      | 1086.0     | 32 | 11/2     | 1020        | 24 | M27      | 1050         | 28 | M30      | 1050         | 28 | M36      |
| 40         | 1000 | 1130     | 28 | M30      | 1060     | 28 | M36      | 1210     | 28 | M52      | 1200.0     | 36 | 11/2     | 1120        | 28 | M27      | 1160         | 28 | M33      | 1170         | 28 | M39      |



# SERIES CRB LUG TYPE



| NO | PART NAME     | QTY |
|----|---------------|-----|
| 1  | BODY          | 1   |
| 2  | SEAT          | 1   |
| 3  | DISC          | 1   |
| 4  | STEM          | 1   |
| 5  | C-CLIP        | 1   |
| 6  | STEM RETAINER | 1   |
| 7  | O-RING        | 1   |
| 8  | O-RING        | 1   |
| 9  | SEAL GLAND    | 1   |
| 10 | SCREW         | 2   |



## VALVE DIMENSIONS

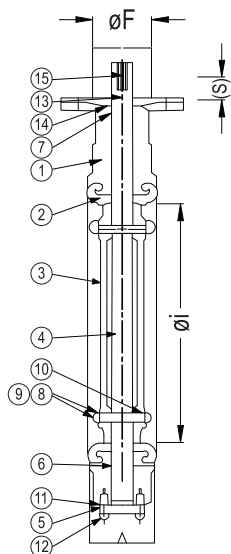
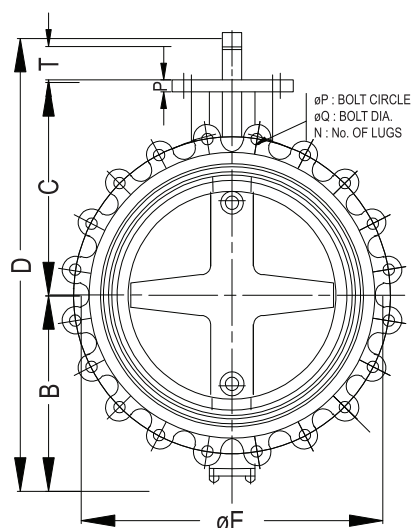
| VALVE SIZE |     | $\phi i$ | A  | B   | C   | D   | P  | Stem |    |      |          | Top Flange to ISO 5211 |          |           |     |          |   |          | Weight<br>kg |
|------------|-----|----------|----|-----|-----|-----|----|------|----|------|----------|------------------------|----------|-----------|-----|----------|---|----------|--------------|
| inch       | mm  |          |    |     |     |     |    | T    | R  | K    | $\phi J$ | TYPE                   | $\phi M$ | $\phi(F)$ | (S) | $\phi W$ | n | $\phi Z$ |              |
| 1½         | 40  | 40       | 33 | 50  | 100 | 150 | 10 | 32   | 30 | 9.5  | 14       | F07                    | 90       | 55        | 3   | 70       | 4 | 9.5      | 3.2          |
| 2          | 50  | 50       | 43 | 55  | 120 | 175 | 10 | 32   | 30 | 9.5  | 14       | F07                    | 90       | 55        | 3   | 70       | 4 | 9.5      | 3.9          |
| 2½         | 65  | 64       | 46 | 65  | 130 | 195 | 11 | 32   | 30 | 9.5  | 14       | F07                    | 90       | 55        | 3   | 70       | 4 | 9.5      | 4.8          |
| 3          | 80  | 76       | 46 | 75  | 140 | 215 | 11 | 32   | 30 | 9.5  | 14       | F07                    | 90       | 55        | 3   | 70       | 4 | 9.5      | 5.5          |
| 4          | 100 | 102      | 52 | 95  | 160 | 255 | 12 | 32   | 30 | 14.5 | 19       | F07                    | 90       | 55        | 3   | 70       | 4 | 9.5      | 8.2          |
| 5          | 125 | 127      | 56 | 115 | 180 | 295 | 12 | 32   | 30 | 14.5 | 19       | F07                    | 90       | 55        | 3   | 70       | 4 | 9.5      | 9.5          |
| 6          | 150 | 146      | 56 | 130 | 205 | 335 | 12 | 40   | 35 | 16.0 | 22       | F07                    | 90       | 55        | 3   | 70       | 4 | 9.5      | 12.5         |
| 8          | 200 | 197      | 60 | 160 | 230 | 390 | 14 | 40   | 35 | 16.0 | 22       | F10                    | 125      | 72        | 3   | 102      | 4 | 12       | 19.5         |
| 10         | 250 | 246      | 68 | 215 | 278 | 465 | 14 | 40   | 35 | 22.0 | 30       | F10                    | 125      | 72        | 3   | 102      | 4 | 12       | 28.0         |
| 12         | 300 | 292      | 78 | 245 | 323 | 520 | 16 | 40   | 35 | 22.0 | 30       | F10                    | 125      | 72        | 3   | 102      | 4 | 12       | 50.0         |

## FLANGE DIMENSIONS

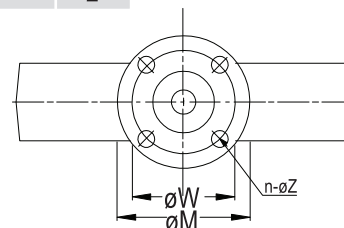
| VALVE SIZE |     | JIS 5K   |    |     | JIS 10K  |    |     | JIS 16K  |    |     | ANSI 150LB |    |      | BS 4504 PN6 |    |     | BS 4504 PN10 |    |     | BS 4504 PN16 |    |     |
|------------|-----|----------|----|-----|----------|----|-----|----------|----|-----|------------|----|------|-------------|----|-----|--------------|----|-----|--------------|----|-----|
| inch       | mm  | $\phi P$ | N  | Q   | $\phi P$ | N  | Q   | $\phi P$ | N  | Q   | $\phi P$   | N  | Q    | $\phi P$    | N  | Q   | $\phi P$     | N  | Q   | $\phi P$     | N  | Q   |
| 1½         | 40  | 95       | 4  | M12 | 105      | 4  | M16 | 105      | 4  | M16 | 98.5       | 4  | 1½"  | 100         | 4  | M12 | 110          | 4  | M16 | 110          | 4  | M16 |
| 2          | 50  | 105      | 4  | M12 | 120      | 4  | M16 | 120      | 8  | M16 | 120.5      | 4  | 5/8" | 110         | 4  | M12 | 125          | 4  | M16 | 125          | 4  | M16 |
| 2½         | 65  | 130      | 4  | M12 | 140      | 4  | M16 | 140      | 8  | M16 | 139.5      | 4  | 5/8" | 130         | 4  | M12 | 145          | 4  | M16 | 145          | 4  | M16 |
| 3          | 80  | 145      | 4  | M16 | 150      | 8  | M16 | 160      | 8  | M20 | 152.5      | 4  | 5/8" | 150         | 4  | M16 | 160          | 8  | M16 | 160          | 8  | M16 |
| 4          | 100 | 165      | 8  | M16 | 175      | 8  | M16 | 185      | 8  | M20 | 190.5      | 8  | 5/8" | 170         | 8  | M16 | 180          | 8  | M16 | 180          | 8  | M16 |
| 5          | 125 | 200      | 8  | M16 | 210      | 8  | M20 | 225      | 8  | M22 | 216.0      | 8  | 3/4" | 200         | 8  | M16 | 210          | 8  | M16 | 210          | 8  | M16 |
| 6          | 150 | 230      | 8  | M16 | 240      | 8  | M20 | 260      | 12 | M22 | 241.5      | 8  | 3/4" | 225         | 8  | M16 | 240          | 8  | M20 | 240          | 8  | M20 |
| 8          | 200 | 280      | 8  | M20 | 290      | 12 | M20 | 305      | 12 | M22 | 298.5      | 8  | 3/4" | 280         | 8  | M16 | 295          | 8  | M20 | 295          | 12 | M20 |
| 10         | 250 | 345      | 12 | M20 | 355      | 12 | M22 | 380      | 12 | M24 | 362.0      | 12 | 7/8" | 335         | 12 | M16 | 350          | 12 | M20 | 355          | 12 | M24 |
| 12         | 300 | 390      | 12 | M20 | 400      | 12 | M22 | 430      | 16 | M24 | 432.0      | 12 | 7/8" | 395         | 12 | M20 | 400          | 12 | M20 | 410          | 12 | M24 |



# SERIES CRB LUG TYPE



| NO | PART NAME    | QTY | NO | PART NAME     | QTY |
|----|--------------|-----|----|---------------|-----|
| 1  | BODY         | 1   | 9  | O-RING        | 2   |
| 2  | SEAT         | 1   | 10 | NUT           | 2   |
| 3  | DISC         | 1   | 11 | GASKET        | 1   |
| 4  | STEM         | 1   | 12 | SCREW         | 4   |
| 5  | BOTTOM PLATE | 1   | 13 | PACKING GLAND | 1   |
| 6  | BEARING      | 2   | 14 | SCREW         | 2   |
| 7  | PACKING      | 1   | 15 | KEY           | 1   |
| 8  | LOCK PIN     | 2   |    |               |     |



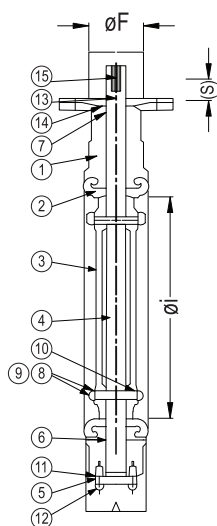
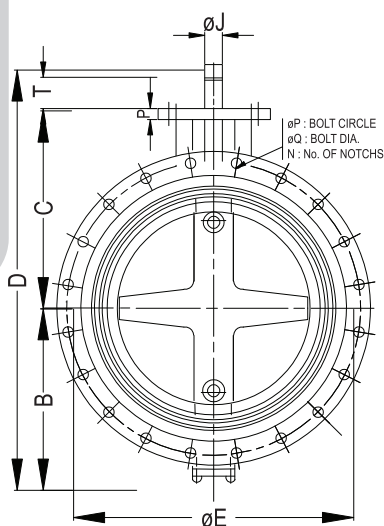
## VALVE DIMENSIONS

| VALVE SIZE |      | ø i    A    B    C    D    P |     |     |     |      |    | Stem |   |   |     | Top Flange to ISO 5211 |     |           |      |     |     |    | Weight |
|------------|------|------------------------------|-----|-----|-----|------|----|------|---|---|-----|------------------------|-----|-----------|------|-----|-----|----|--------|
| inch       | mm   |                              |     |     |     |      |    | T    | R | K | øJ  | TYPE                   | øM  | ø (F) (S) | ø(W) | n   | ø Z | kg |        |
| 14         | 350  | 330                          | 78  | 250 | 340 | 590  | 16 | 40   | - | - | 30  | F10                    | 125 | 72        | 3    | 102 | 4   | 12 | 64.0   |
| 16         | 400  | 380                          | 102 | 300 | 370 | 670  | 20 | 50   | - | - | 38  | F14                    | 175 | 100       | 4    | 140 | 4   | 18 | 107.0  |
| 18         | 450  | 430                          | 114 | 320 | 400 | 720  | 20 | 64   | - | - | 38  | F14                    | 175 | 100       | 4    | 140 | 4   | 18 | 115.0  |
| 20         | 500  | 482                          | 127 | 360 | 440 | 800  | 20 | 64   | - | - | 55  | F16                    | 210 | 130       | 5    | 165 | 4   | 22 | 160.0  |
| 22         | 550  | 528                          | 154 | 420 | 460 | 880  | 22 | 100  | - | - | 55  | F16                    | 210 | 130       | 5    | 165 | 4   | 22 | 205.0  |
| 24         | 600  | 575                          | 154 | 450 | 500 | 950  | 22 | 100  | - | - | 60  | F16                    | 210 | 130       | 5    | 165 | 4   | 22 | 270.0  |
| 26         | 650  | 622                          | 165 | 480 | 530 | 1010 | 24 | 100  | - | - | 60  | F25                    | 300 | 200       | 6    | 254 | 8   | 18 | 315.0  |
| 28         | 700  | 674                          | 165 | 540 | 580 | 1020 | 24 | 100  | - | - | 60  | F25                    | 300 | 200       | 6    | 254 | 8   | 18 | 370.0  |
| 30         | 750  | 724                          | 190 | 570 | 610 | 1180 | 28 | 100  | - | - | 75  | F25                    | 300 | 200       | 6    | 254 | 8   | 18 | 430.0  |
| 32         | 800  | 822                          | 190 | 600 | 630 | 1230 | 28 | 120  | - | - | 75  | F25                    | 300 | 200       | 6    | 254 | 8   | 18 | 480.0  |
| 34         | 850  | 822                          | 200 | 635 | 660 | 1295 | 28 | 120  | - | - | 85  | F25                    | 300 | 200       | 6    | 254 | 8   | 18 | 505.0  |
| 36         | 900  | 876                          | 200 | 660 | 690 | 1350 | 32 | 120  | - | - | 85  | F30                    | 350 | 230       | 6    | 298 | 8   | 22 | 540.0  |
| 40         | 1000 | 975                          | 216 | 730 | 760 | 1490 | 32 | 120  | - | - | 100 | F30                    | 350 | 230       | 6    | 298 | 8   | 22 | 680.0  |

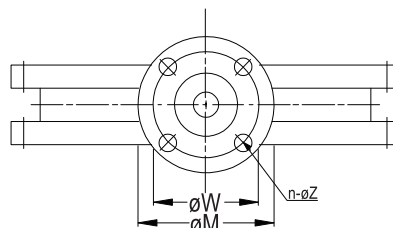
## FLANGE DIMENSIONS

| Valve Size |      | JIS 5K |    |     | JIS 10K |    |     | JIS 16K |    |     | ANSI 150 LB |    |        | BS 4504 PN6 |    |     | BS 4504 PN10 |    |     | BS 4504 PN16 |    |     |
|------------|------|--------|----|-----|---------|----|-----|---------|----|-----|-------------|----|--------|-------------|----|-----|--------------|----|-----|--------------|----|-----|
| inch       | mm   | P      | N  | Q   | P       | N  | Q   | P       | N  | Q   | P           | N  | Q      | P           | N  | Q   | P            | N  | Q   | P            | N  | Q   |
| 14         | 350  | 435    | 12 | M22 | 445     | 16 | M22 | 480     | 16 | M30 | 476.0       | 12 | 1"     | 445         | 12 | M20 | 460          | 16 | M20 | 470          | 16 | M24 |
| 16         | 400  | 495    | 16 | M22 | 510     | 16 | M24 | 540     | 16 | M30 | 539.5       | 16 | 1"     | 495         | 16 | M20 | 515          | 16 | M24 | 525          | 16 | M27 |
| 18         | 450  | 555    | 16 | M22 | 565     | 50 | M24 | 605     | 20 | M30 | 578.0       | 16 | 1 1/8" | 550         | 16 | M20 | 565          | 20 | M24 | 585          | 20 | M27 |
| 20         | 500  | 605    | 20 | M22 | 620     | 20 | M24 | 660     | 20 | M30 | 635.5       | 20 | 1 1/8" | 600         | 20 | M20 | 620          | 20 | M24 | 650          | 20 | M30 |
| 22         | 550  | 665    | 20 | M24 | 680     | 20 | M30 | 720     | 24 | M36 | -           | -  | -      | -           | -  | -   | -            | -  | -   | -            | -  | -   |
| 24         | 600  | 715    | 20 | M24 | 730     | 24 | M30 | 770     | 24 | M36 | 749.5       | 20 | 1 1/4" | 705         | 20 | M24 | 725          | 20 | M27 | 770          | 20 | M33 |
| 26         | 650  | 770    | 24 | M24 | 780     | 24 | M30 | 820     | 24 | M36 | -           | -  | -      | -           | -  | -   | -            | -  | -   | -            | -  | -   |
| 28         | 700  | 820    | 24 | M24 | 840     | 24 | M30 | 875     | 24 | M39 | 863.5       | 28 | 1 1/4" | 810         | 24 | M24 | 840          | 24 | M27 | 840          | 24 | M33 |
| 30         | 750  | 880    | 24 | M30 | 900     | 24 | M30 | 935     | 24 | M39 | 914.5       | 28 | 1 1/4" | -           | -  | -   | -            | -  | -   | -            | -  | -   |
| 32         | 800  | 930    | 24 | M30 | 950     | 28 | M30 | 990     | 24 | M45 | 978.0       | 28 | 1 1/2" | 920         | 24 | M27 | 950          | 24 | M30 | 950          | 24 | M36 |
| 34         | 850  | 980    | 24 | M30 | 1000    | 28 | M30 | 1040    | 24 | M45 | -           | -  | -      | -           | -  | -   | -            | -  | -   | -            | -  | -   |
| 36         | 900  | 1030   | 24 | M30 | 1050    | 28 | M30 | 1090    | 28 | M45 | 1086.0      | 32 | 1 1/2" | 1020        | 24 | M27 | 1050         | 28 | M30 | 1050         | 28 | M36 |
| 40         | 1000 | 1130   | 28 | M30 | 1160    | 28 | M36 | 1210    | 28 | M52 | 1200.0      | 36 | 1 1/2" | 1120        | 28 | M27 | 1160         | 28 | M33 | 1170         | 28 | M39 |

## SERIES CRB FLANGE TYPE



| NO | PART NAME    | QTY | NO | PART NAME     | QTY |
|----|--------------|-----|----|---------------|-----|
| 1  | BODY         | 1   | 9  | O-RING        | 2   |
| 2  | SEAT         | 1   | 10 | NUT           | 2   |
| 3  | DISC         | 1   | 11 | GASKET        | 1   |
| 4  | STEM         | 1   | 12 | SCREW         | 4   |
| 5  | BOTTOM PLATE | 1   | 13 | PACKING GLAND | 1   |
| 6  | BEARING      | 2   | 14 | SCREW         | 2   |
| 7  | PACKING      | 1   | 15 | KEY           | 1   |
| 8  | LOCK PIN     | 2   |    |               |     |



## VALVE DIMENSIONS

| VALVE SIZE |      |     |     |     |     |      |    | Stem |   |   |     | Top Flange to ISO 5211 |     |           |         |     |   |    |  | Weight |
|------------|------|-----|-----|-----|-----|------|----|------|---|---|-----|------------------------|-----|-----------|---------|-----|---|----|--|--------|
| inch       | mm   | Ø i | A   | B   | C   | D    | P  | T    | R | K | Ø J | TYPE                   | Ø M | Ø (F) (S) | Ø (W) n | Ø Z |   |    |  | kg     |
| 14         | 350  | 330 | 78  | 250 | 340 | 590  | 16 | 40   | - | - | 30  | F10                    | 125 | 72        | 3       | 102 | 4 | 12 |  | 70.0   |
| 16         | 400  | 380 | 102 | 300 | 370 | 670  | 20 | 50   | - | - | 38  | F14                    | 175 | 100       | 4       | 140 | 4 | 18 |  | 98.0   |
| 18         | 450  | 430 | 114 | 320 | 400 | 720  | 20 | 64   | - | - | 38  | F14                    | 175 | 100       | 4       | 140 | 4 | 18 |  | 148.0  |
| 20         | 500  | 482 | 127 | 360 | 440 | 800  | 20 | 64   | - | - | 35  | F16                    | 210 | 130       | 5       | 165 | 4 | 22 |  | 165.0  |
| 22         | 550  | 528 | 154 | 420 | 460 | 880  | 22 | 100  | - | - | 55  | F16                    | 210 | 130       | 5       | 165 | 4 | 22 |  | 205.0  |
| 24         | 600  | 575 | 154 | 450 | 500 | 950  | 22 | 100  | - | - | 60  | F16                    | 210 | 130       | 5       | 165 | 4 | 22 |  | 225.0  |
| 26         | 650  | 622 | 165 | 480 | 530 | 1010 | 24 | 100  | - | - | 60  | F25                    | 300 | 200       | 6       | 254 | 8 | 18 |  | 270.0  |
| 28         | 700  | 674 | 165 | 540 | 580 | 1020 | 24 | 100  | - | - | 60  | F25                    | 300 | 200       | 6       | 254 | 8 | 18 |  | 330.0  |
| 30         | 750  | 724 | 190 | 570 | 610 | 1180 | 28 | 100  | - | - | 75  | F25                    | 300 | 200       | 6       | 254 | 8 | 18 |  | 380.0  |
| 32         | 800  | 822 | 190 | 600 | 630 | 1230 | 28 | 120  | - | - | 75  | F25                    | 300 | 200       | 6       | 254 | 8 | 18 |  | 450.0  |
| 34         | 850  | 822 | 200 | 635 | 660 | 1295 | 28 | 120  | - | - | 85  | F25                    | 300 | 200       | 6       | 254 | 8 | 18 |  | 540.0  |
| 36         | 900  | 876 | 200 | 660 | 690 | 1350 | 32 | 120  | - | - | 85  | F30                    | 350 | 230       | 6       | 298 | 8 | 22 |  | 610.0  |
| 40         | 1000 | 975 | 216 | 730 | 760 | 1490 | 32 | 120  | - | - | 100 | F30                    | 350 | 230       | 6       | 298 | 8 | 22 |  | 980.0  |

## FLANGE DIMENSIONS

| Valve Size |      | JIS 5K |    |     | JIS 10K |    |     | JIS 16K |    |     | ANSI 150 LB |    |       | BS 4504 PN6 |    |     | BS 4504 PN10 |    |     | BS 4504 PN16 |    |     |
|------------|------|--------|----|-----|---------|----|-----|---------|----|-----|-------------|----|-------|-------------|----|-----|--------------|----|-----|--------------|----|-----|
| inch       | mm   | P      | N  | Q   | P       | N  | Q   | P       | N  | Q   | P           | N  | Q     | P           | N  | Q   | P            | N  | Q   | P            | N  | Q   |
| 14         | 350  | 435    | 12 | M22 | 445     | 16 | M22 | 480     | 16 | M30 | 476.0       | 12 | 1"    | 445         | 12 | M20 | 460          | 16 | M20 | 470          | 16 | M24 |
| 16         | 400  | 495    | 16 | M22 | 510     | 16 | M24 | 540     | 16 | M30 | 539.5       | 16 | 1"    | 495         | 16 | M20 | 515          | 16 | M24 | 525          | 16 | M27 |
| 18         | 450  | 555    | 16 | M22 | 565     | 50 | M24 | 605     | 20 | M30 | 578.0       | 16 | 1 1/8 | 550         | 16 | M20 | 565          | 20 | M24 | 585          | 20 | M27 |
| 20         | 500  | 605    | 20 | M22 | 620     | 20 | M24 | 660     | 20 | M30 | 635.5       | 20 | 1 1/8 | 600         | 20 | M20 | 620          | 20 | M24 | 650          | 20 | M30 |
| 22         | 550  | 665    | 20 | M24 | 680     | 20 | M30 | 720     | 20 | M36 | -           | -  | -     | -           | -  | -   | -            | -  | -   | -            | -  | -   |
| 24         | 600  | 715    | 20 | M24 | 730     | 24 | M30 | 770     | 24 | M36 | 749.5       | 20 | 1 1/4 | 705         | 20 | M24 | 725          | 20 | M27 | 770          | 20 | M33 |
| 26         | 650  | 770    | 24 | M24 | 780     | 24 | M30 | 820     | 24 | M36 | -           | -  | -     | -           | -  | -   | -            | -  | -   | -            | -  | -   |
| 28         | 700  | 820    | 24 | M24 | 840     | 24 | M30 | 875     | 24 | M39 | 863.5       | 28 | 1 1/4 | 810         | 24 | M24 | 840          | 24 | M27 | 840          | 24 | M33 |
| 30         | 750  | 880    | 24 | M30 | 900     | 24 | M30 | 935     | 24 | M39 | 914.5       | 28 | 1 1/4 | -           | -  | -   | -            | -  | -   | -            | -  | -   |
| 32         | 800  | 930    | 24 | M30 | 950     | 28 | M30 | 990     | 24 | M45 | 978.0       | 28 | 1 1/2 | 920         | 24 | M27 | 950          | 24 | M30 | 950          | 24 | M36 |
| 34         | 850  | 980    | 24 | M30 | 1000    | 28 | M30 | 1040    | 24 | M45 | -           | -  | -     | -           | -  | -   | -            | -  | -   | -            | -  | -   |
| 36         | 900  | 1030   | 24 | M30 | 1050    | 28 | M30 | 1090    | 28 | M45 | 1086.0      | 32 | 1 1/2 | 1020        | 24 | M27 | 1050         | 28 | M30 | 1050         | 28 | M36 |
| 40         | 1000 | 1130   | 28 | M30 | 1160    | 28 | M36 | 1210    | 30 | M52 | 1200.0      | 36 | 1 1/2 | 1120        | 28 | M27 | 1160         | 28 | M33 | 1170         | 28 | M39 |

Applications :

- Water Transmission System
- Power Plant
- Shipyard
- Industrial And Waste Water Treatment
- Fire Fighting System
- Cooling And Heating Water Process
- Oil Rigs (Offshore)

TECHNICAL DATA

|                        |                                                                  |
|------------------------|------------------------------------------------------------------|
| Size range             | 2" (50A)~24 (600A)                                               |
| Pressure rating        | 20 Bar (285 lbf/in ), 25 Bar (335/lbf/in )                       |
| Testing                | seat (305psi)=full rating x 1.1 body (415psi)= full rating x 1.5 |
| Temperature range      | -40 C PO + 200 C                                                 |
| Flange drilling        | ANSI B16.5 (CL150) PN(16, 25) JIS B2201 (16k, 20k)               |
| Face to face dimension | ISO 5752,API 609, MSS SP-67, DIN 3202 K1 BS 5155                 |
| Body style             | WAFER LUG                                                        |
| Top flange mounting    | ISO 5211                                                         |
| Operating system       | Lever handle, worm gear, Electric actuator, Pneumatic actuator   |

DESIGN FEATURES

Mounting Flange

- The mounting flange is designed for ease of fitting to any actuator with adaptor flange to ISO 5211 upon request.

Shaft Bushings

- The shaft supported in 3 positions by maintenance-free PTF / Teflon or lubricated bronze bushings. O-ring sealing provides an additional splash-proof sealing from the outside.

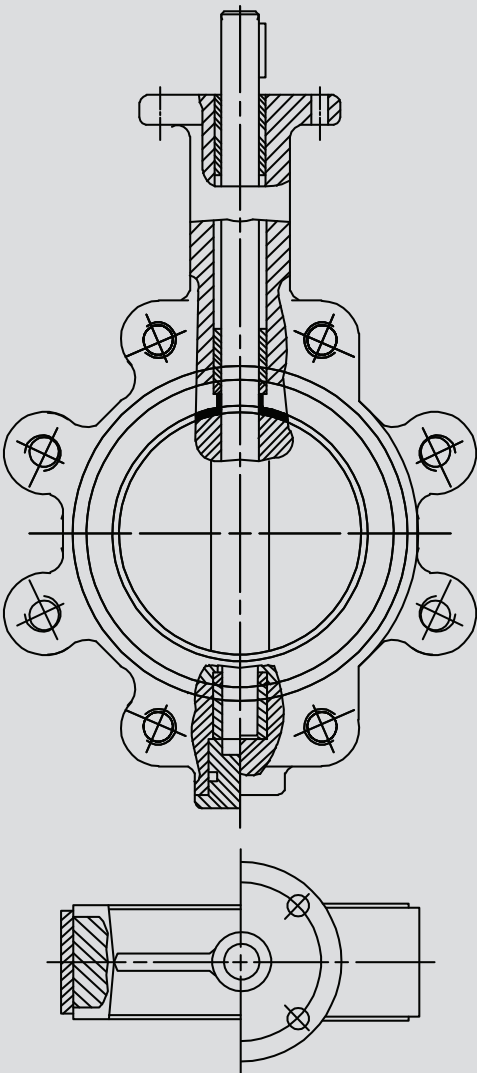
Body Neck

- Long neck to accommodate insulation according to heating facility regulations.

Flange Alignment

- Wafer type valves are provided with 4 alignment lugs with drilled holes to ensure concentricity of the valve and flanges and at the same time facilitate the assembly of the valve.

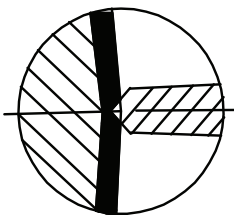
LUGGED WATER TYPE



WAFER TYPE

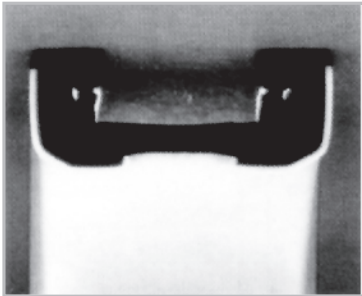
Body Liner / seat

- Rugged phenol-resin backing ring eliminates seat distortion even under maximum working pressure. The elastomeric seat is bonded to the phenolic backing ring.
- Non-collapsible blow-out proof seat bi-directional line flow. Seat serves as its own flange gasket. Dry-back seat for maximum corrosion resistance.
- Line fluid is isolated from valve body, shaft, and external parts.
- Different elastomers to suit most services conditions.
- Seat design permits valve to be bolted between weld-neck flanges and special end-of-line type on request.
- Easily replaceable end stem at site.
- Axial bearing for all sizes DN 50 -350: Mono-directional bearing through one contact point on stem end.
- DN 400-600: Double acting bearing through a specially machined split bearing.



Disc Edge Profile

The advantages of the disc are in its smooth contoured edges, and streamlined flow design with obstructions held to a minimum. The smooth precision surface ensure a bubble tight shut-off substantially; thus, lowering the closing torque of the valve, and increases the life of the disc and seat.

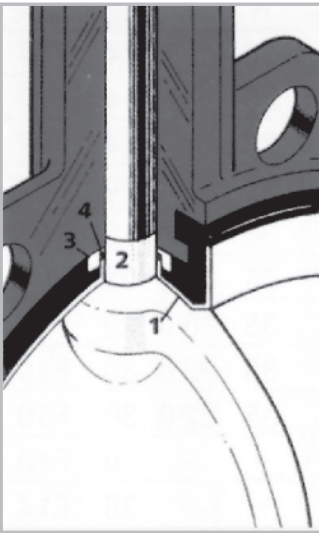
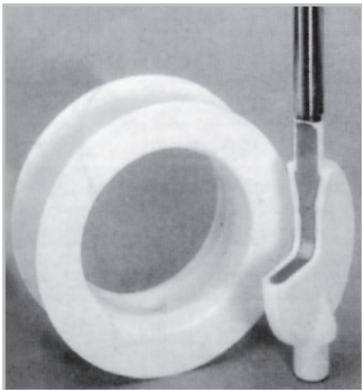
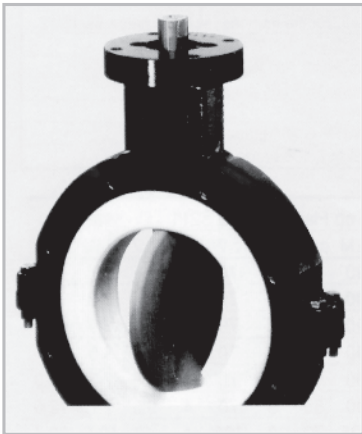


**Designed For:**

- Chemical Plant
- Pulp And Paper Mill
- Food And Beverage Industry
- Pharmaceutical Plant
- Brewery
- Processing Plant

**Technical Data**

|                        |                                                                      |
|------------------------|----------------------------------------------------------------------|
| Size range             | 2" (50A)~24 (600A)                                                   |
| Pressure rating        | 7 Bar 10 Bar                                                         |
| Temperature range      | -40 C to +200 C                                                      |
| Flange drilling        | ANSI B16.5 (CL.150) DIN 2501 (PN 10), BS 4504 (PN10), JIS B2210(10k) |
| Face to face dimension | ISO 5272, API 609, MSS SP-67, DIN 3202 K1 BS 5155                    |
| Body style             | WAFER LUG (TWO PIECE)                                                |
| Top flange mounting    | ISO 5211                                                             |
| Actuator               | Lever handle, Worm gear, Electric actuator, Pneumatic actuator       |



**UNIQUE 4-WAY SEAL**

1. The primary seal is achieved by an interference fit between the seat flat and disc hub.
2. The secondary seal is an interference fit due to the stem diameter being larger than the hole diameter of the seat stem. Teflon is molded on the stem to eliminate line media contact with the stem or body material.
3. The third seal is a Teflon compression seat ring set material. The compression seat ring is compressed against the secondary seal, therefore teflon is compressed against Teflon.
4. The final seal is a back-up Viton O-ring around the stem behind the seat. The seat's elastomer support materials are completely isolated from corrosive line media, thus valve failure is greatly reduced compared to the traditional resilient backed Teflon molded butterfly valves.

**PRESSURE RATING**

For bi-directional bubble-tight shut off, disc is in closed position:

- 316SS Disc/Stem & Teflon Molded Seat: 50mm-600mm 10 bar
- Teflon Molded Disc & Seat: 50mm 600mm &bar 2"-24" 100 psi
- Elastomer Coated Disc: 50mm-600mm 7bar. 2"-24" 100psi

**BODY**

- Cast iron ASTM A126 Class B
- 316 Stainless Steel ASTM A351 CF8M
- Aluminium ASTM B26 (Wafer only)
- Ductile Iron ASTM A536 (Lug only)

**SEAT**

- Teflon-Molded EPDM
- EPDM
- Buna-N
- Viton

**DISC/STEM**

- Teflon Molded 316 Stainless Steel ASTM A351 CF 8M / ASTM A351 CF8M
- EPDM Molded 316 Stainless Steel /316 Stainless Steel ASTM A351 CF8M / ASTM A351 CF8M
- Buna-N Molded 316 Stainless Steel/316 Stainless Steel ASTM A 351 CF8M / ASTM A351 CF8M
- Viton Molded 316 Stainless Steel / 316 Stainless Steel ASTM A 351 CF8M / ASTM A351 CF 8M
- Nylon Coated Ductile Iron/316 Stainless Steel ASTM A536/ASTM A351 CF8M





## SERIES HF - HIGH PERFORMANCE

**KEY** Square key valve-to operator connection provides an external controller failure point upon over-torquing.

**GLAND FLANGE** Applies load against packing gland to prevent external leakage. Fully adjustable.

**PACKING** Common materials are TFE for up to 230°C and graphite for up to 450°C.

**LOCK PIN** Provide positive mechanical attachment of disc to shaft.

**OVERTRAVEL STOP** Prevent disc from rotating into wrong quadrant.

**SET SCREW** Cone point screw force to seat retainer to lock in position on valve size 2" through 10" socket head cap screw are used on valve sizes 12" and larger.

**SEAT** According to your choice based on application. (See page 54: seat construction)

**SHAFT** Solid shaft provides alignment and rigid support for disc.

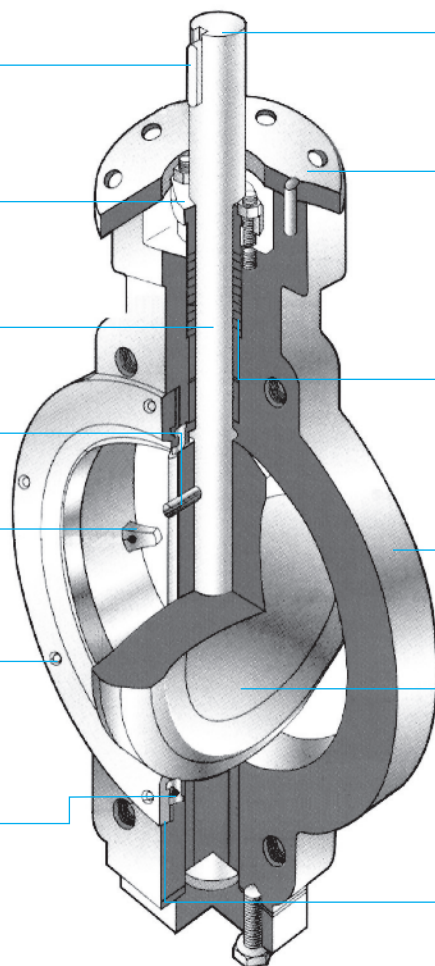
**MOUNTING FLANGE** The mounting flange is designed for ease of fitting of any actuator and guaranteed upon request. Adaptor flange compliance to ISO 5211.

**BEARINGS** Both above and below the disc, bearings maintain shaft alignment. Common materials include :  
• Glass-backed TFE for up to 230°C (Not for Stem Service.) Lubricated Bronze for up to 400°C Stainless steel for up to 450°C.

**BODY** ANSI B 16.34 is designed in either wafer or lug configuration.

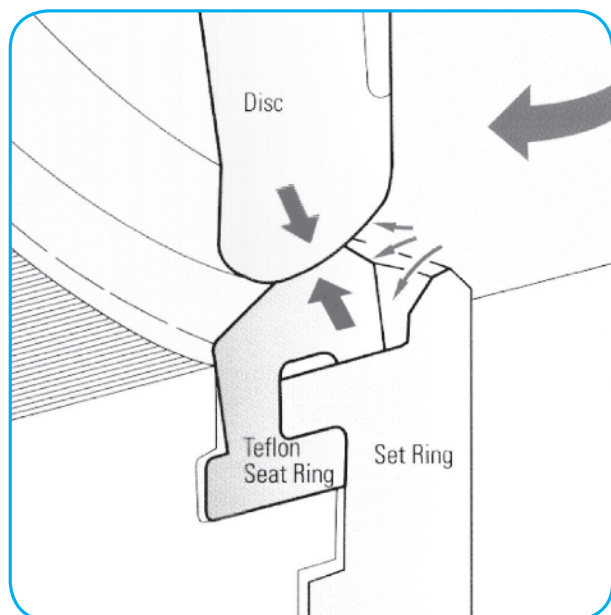
**DISC** 360° uninterrupted spherical edge for sealing. Its profile is designed for maximum flow and control. Disc seating surface is treated for enhanced temperature and abrasion resistance.

**RETAINER RING** Retains seat in valve. Standard surface finish is 125 to 200 AARH and is compatible with both standard gaskets and spiral wound gasket design. Outside diameter is recessed within gasket sealing surface to prevent external leakage.



### Self-sealing mechanism ensure tight shutoff.

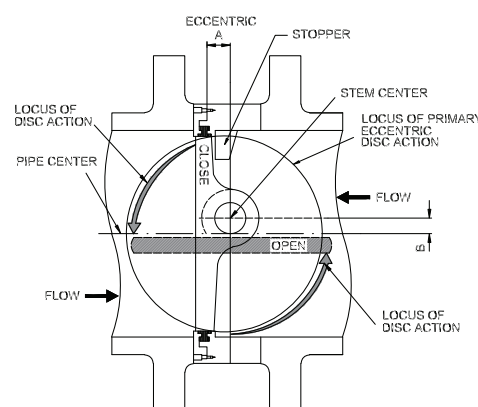
As illustrated below, fluid pressure to the disc and seat ring ensures a secured seal: in other words, the higher the pressure, the better is the sealing performance. The sealing performance remains unchanged even with the reversal of the flow direction.



### Double eccentric disc ensures longer service life, low seating torque and leak-tight shutoff.

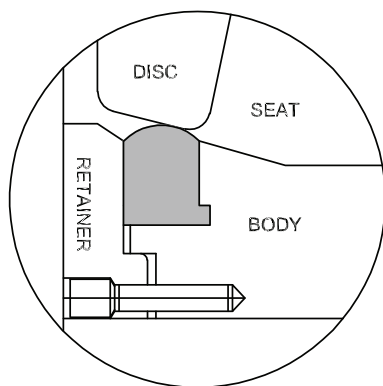
Since the stem is eccentric to the seat ring (as indicated) A and B, the disc is in contact with the seat ring only when the valve is completely closed. The benefits from the double disc design include:

- Longer service life due to hard to wear seat ring.
- When in the closed position, the force of the disc on the seat ring ensures complete sealing.
- Easy operation with less seating torque.
- The offset stem design allows easy replacement of the seat ring without removing the stem.

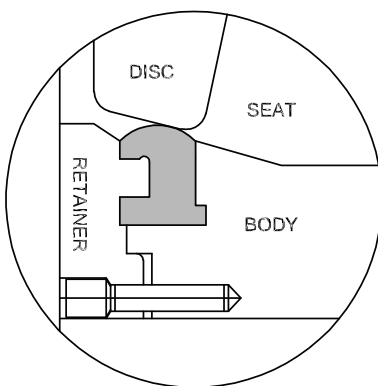




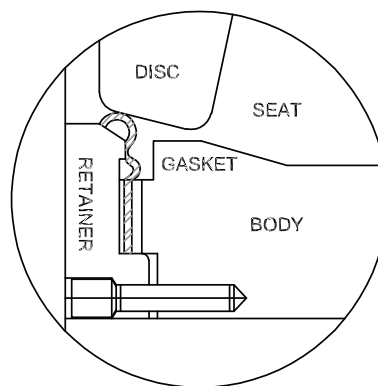
## SERIES HF - HIGH PERFORMANCE



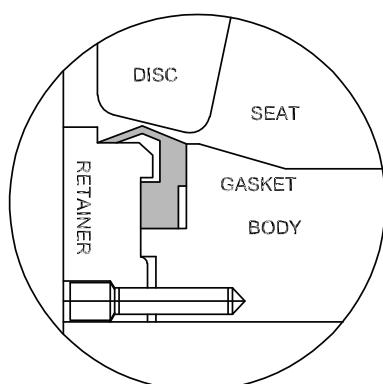
HF-R  
EPDM/NBR/VITON  
RUBBER SEAT



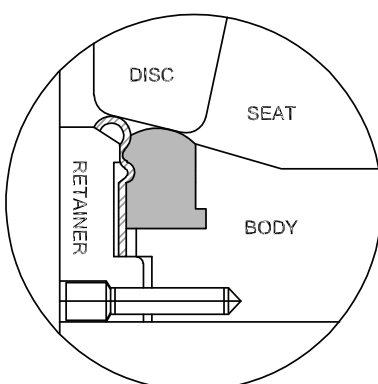
HF-T  
PTFE/RTFE  
TEFLON SEAT



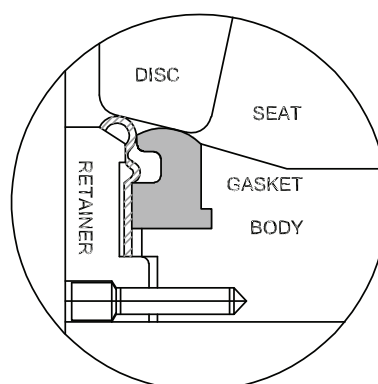
HF-FM  
INCONEL 625/ ST. STEEL 316  
FLAT METAL SEAT



HF-SM  
SF. ST. STEEL 316/MONEL  
SOLID METAL SEAT



HF-RF  
RUBBER/ ST. STEEL 316  
FIRE SAFE-RUBBER+METAL

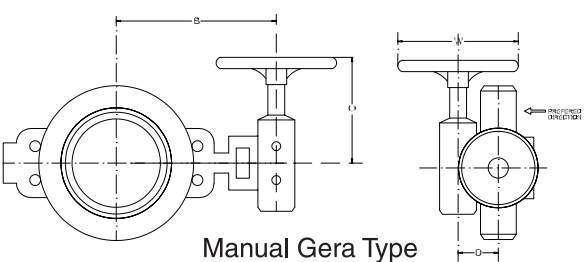


HF-TF  
TEFLON/ ST. STEEL 316  
FIRE SAFE-TEFLON+METAL

### STANDARD SPECIFICATIONS

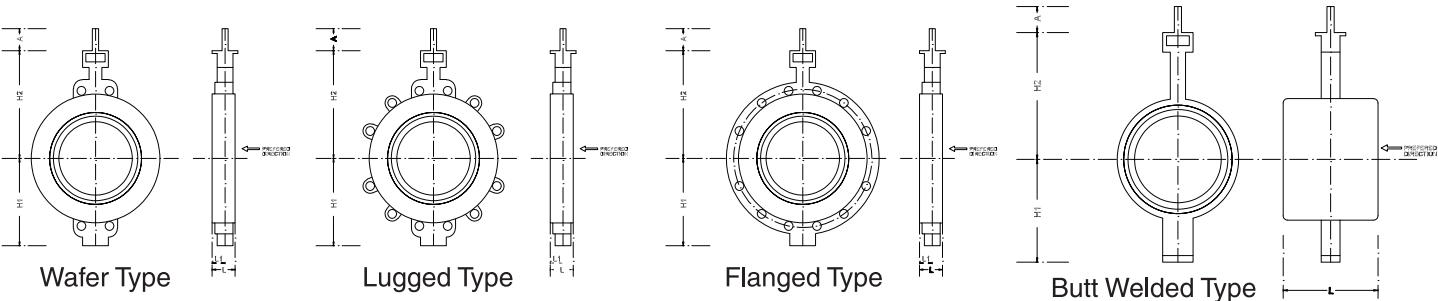
| Model Designation |           | HF-R                                                                                  | HF-T             | HF-FM                         | HF- SM           | HF-RF                       | HF-TF                  |
|-------------------|-----------|---------------------------------------------------------------------------------------|------------------|-------------------------------|------------------|-----------------------------|------------------------|
| Seat Ring         |           | RUBBER                                                                                | TEFLON           | FLAT METAL                    | SOLID METAL      | RUBBER METAL                | TEFLON+METAL           |
| Size Range        |           | DN50 to DN1200                                                                        |                  | DN50 to DN1200                |                  | DN50 to DN1200              |                        |
| Press. Rating     |           | ANSI CLASS 150 & 300                                                                  |                  | ANSI CLASS 150 & 300          |                  | ANSI CLASS 150 & 300        |                        |
| Body Connection   |           | WAFER / LUG / FLANGE / BUTT WELD END                                                  |                  |                               |                  |                             |                        |
| Applicable Flange |           | ANSI CLASS 150 & 300 / JIS 10K, 16K, 20K, / ISO / BS / DIN PN 10, PN 16, PN 25, PN 40 |                  |                               |                  |                             |                        |
| Geometry          |           | Double Offset Giving Low Unsetting and Seating Torque.                                |                  |                               |                  |                             |                        |
| Safe Feature      |           | Anti Blow Out Devices To API 609                                                      |                  |                               |                  |                             |                        |
| Face To Face      |           | LUG and Wafer type : API std. 609 category B / ISO 5752 (25service)                   |                  |                               |                  |                             |                        |
| Design Base       |           | API std. 609 / BS 5155 / ANSI B 16.34 / ASME SEC VIII                                 |                  |                               |                  |                             |                        |
| Seat Leak (Water) |           | None                                                                                  | None             | Tight shut V                  | Tight shut V     | None                        | None                   |
| Working Temp.     |           | - 10 to + 120°C                                                                       | - 150 to + 200°C | - 80 to + 300° C              | - 80 to + 450° C | - 10 to + 120° C            | - 10 to + 200° C       |
| Std material      | Body/disc | STD ; ASTM 216 WCB / ASTM A351 CFBM / ASTM B148 DUPLEX STEEL.                         |                  |                               |                  |                             |                        |
|                   | Stem      | ASTM A479 Ty. 304 / 316 ASTM A564.Ty. 630, AISI 420J2 / 403 / DUPLEX St.steel         |                  |                               |                  |                             |                        |
|                   | Seat Ring | EPDM VITON                                                                            | PTFE RTFE        | 316 St St.<br>Steel / Inconel | 316 St. Steel    | EPDM / VITON<br>+316st      | EPDM / VITON<br>TEFLON |
|                   | Packing   | PTFE / GRAPHITE / GRAFOIL / ON-ASBESTOS PACKING                                       |                  |                               |                  |                             |                        |
|                   | Bearing   | RTFE + 316 st. STEEL / TFE + FIBER GLASS COMPOSITE / BRONZE / 316 St.STEEL / STEEL    |                  |                               |                  |                             |                        |
| Pressure Tests    |           | API STD 598                                                                           | API STD 598      | API STD 598 / ANSI B16.104    |                  | API STD 607 / BS 6755 Part2 |                        |
| Seat leak Test    |           | MAX 2.25 (23KG / cm2G) as per API 589. LOW pressure test is available upon request    |                  |                               |                  |                             |                        |
| Marking           |           | API std 609 / MSS SP-25                                                               |                  |                               |                  |                             |                        |
| Top               |           | ISO 5211                                                                              |                  |                               |                  |                             |                        |
| Actuator          |           | Lever / Gear / Pneumatic / Cylinder / Hydraulic Cylinder / Electric / Motor           |                  |                               |                  |                             |                        |

SERIES HF - HIGH PERFORMANCE



Manual Gera Type

| SIZE |      | B    | C   | D   | ØW  | Approx weight (kg) |
|------|------|------|-----|-----|-----|--------------------|
| mm   | inch |      |     |     |     |                    |
| 50   | 2    | 165  | 155 | 40  | 150 | 7                  |
| 65   | 2½   | 170  | 155 | 40  | 150 | 9                  |
| 80   | 3    | 190  | 155 | 40  | 150 | 12                 |
| 100  | 4    | 225  | 155 | 40  | 150 | 14                 |
| 125  | 5    | 250  | 155 | 40  | 150 | 20                 |
| 150  | 6    | 275  | 155 | 40  | 150 | 25                 |
| 200  | 8    | 325  | 185 | 52  | 205 | 40                 |
| 250  | 10   | 375  | 185 | 52  | 205 | 65                 |
| 300  | 12   | 405  | 185 | 52  | 205 | 85                 |
| 350  | 14   | 475  | 185 | 52  | 205 | 130                |
| 400  | 16   | 500  | 310 | 90  | 457 | 170                |
| 450  | 18   | 550  | 310 | 90  | 457 | 210                |
| 500  | 20   | 675  | 500 | 150 | 600 | 265                |
| 600  | 24   | 740  | 500 | 150 | 600 | 360                |
| 700  | 28   | 736  | 615 | 610 | 600 | 410                |
| 750  | 30   | 825  | 615 | 610 | 600 | 495                |
| 800  | 32   | 875  | 690 | 610 | 600 | 560                |
| 900  | 36   | 970  | 690 | 610 | 600 | 820                |
| 1000 | 40   | 995  | 750 | 750 | 600 | 1200               |
| 1050 | 42   | 1025 | 750 | 750 | 600 | 1340               |
| 1200 | 48   | 1115 | 750 | 750 | 600 | 1450               |

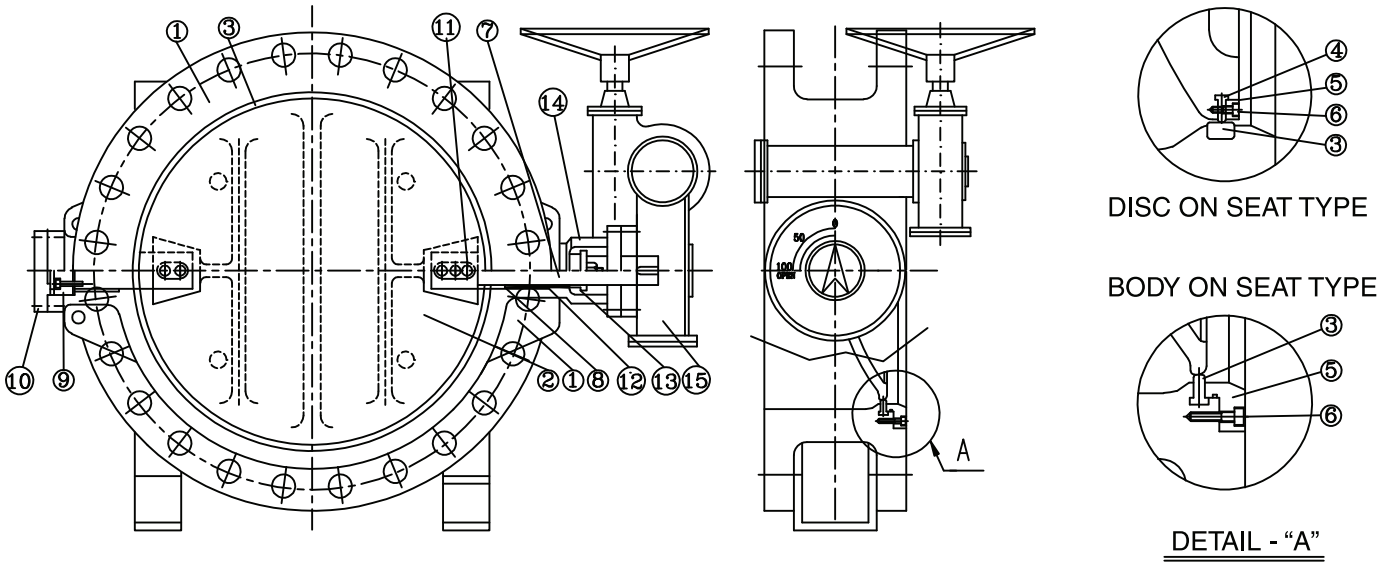


| Wafer Type |      | H1  | H2  | A   | L1  | L (API 609-B) |             |                |                | Approx. weight (kg) |             |                |                |
|------------|------|-----|-----|-----|-----|---------------|-------------|----------------|----------------|---------------------|-------------|----------------|----------------|
| mm         | inch |     |     |     |     | Wafer Type    | Lugged Type | S-flanged Type | Butt Weld Type | Wafer Type          | Lugged Type | S-flanged Type | Butt Weld Type |
| 50         | 2    | 25  | 31  | 33  | 24  | 43            | 43          | -              | -              | 5                   | 10          | 15             | -              |
| 65         | 2½   | 26  | 32  | 33  | 27  | 46            | 46          | -              | -              | 6                   | 13          | 19             | -              |
| 80         | 3    | 127 | 159 | 34  | 29  | 48            | 48          | 48             | 180            | 8                   | 19          | 24             | 15             |
| 100        | 4    | 151 | 194 | 34  | 31  | 54            | 54          | 54             | 190            | 12                  | 26          | 35             | 22             |
| 125        | 5    | 160 | 225 | 34  | 37  | 57            | 57          | 57             | 200            | 18                  | 32          | 40             | 25             |
| 150        | 6    | 177 | 242 | 34  | 37  | 57            | 57          | 57             | 210            | 21                  | 35          | 48             | 31             |
| 200        | 8    | 195 | 237 | 34  | 41  | 64            | 64          | 64             | 230            | 35                  | 40          | 56             | 48             |
| 250        | 10   | 227 | 277 | 64  | 46  | 71            | 71          | 71             | 250            | 60                  | 65          | 70             | 45             |
| 300        | 12   | 266 | 325 | 79  | 53  | 81            | 81          | 81             | 270            | 75                  | 97          | 115            | 68             |
| 350        | 14   | 293 | 352 | 79  | 61  | 92            | 92          | 92             | 290            | 110                 | 109         | 135            | 95             |
| 400        | 16   | 336 | 425 | 79  | 64  | 102           | 102         | 102            | 310            | 150                 | 159         | 165            | 145            |
| 450        | 18   | 356 | 443 | 79  | 75  | 114           | 114         | 114            | 330            | 180                 | 208         | 235            | 195            |
| 500        | 20   | 391 | 482 | 79  | 81  | 127           | 127         | 127            | 350            | 250                 | 270         | 340            | 225            |
| 600        | 24   | 463 | 550 | 109 | 97  | 154           | 154         | 154            | 390            | 330                 | 410         | 485            | 310            |
| 700        | 28   | 567 | 661 | 129 | 104 | 165           | 165         | 165            | 430            | 385                 | 510         | 520            | 450            |
| 750        | 30   | 597 | 676 | 129 | 102 | 165           | 165         | 165            | 450            | 450                 | 560         | 690            | 720            |
| 800        | 32   | 627 | 722 | 129 | 117 | 190           | 190         | 190            | 470            | 510                 | 620         | 790            | 880            |
| 900        | 36   | 687 | 795 | 175 | 125 | 200           | 200         | 200            | 510            | 775                 | 810         | 1350           | 920            |
| 1000       | 40   | 716 | 815 | 175 | 135 | 216           | 216         | 216            | 550            | 1100                | 1060        | 1420           | 1510           |
| 1050       | 42   | 746 | 850 | 175 | 153 | 251           | 251         | 251            | 590            | 1240                | 1250        | 1520           | 1650           |
| 1200       | 48   | 840 | 995 | 199 | 162 | 276           | 276         | 276            | 630            | 1350                | 1350        | 1790           | 1900           |

Intended Primarily for use with Service Water, This valve meets Specification of KS B 2333, BS 5155, AWWA C504, JIS B2064. Available in servial models, operated manually, by Motor, Cylinder, Head Stock Operation is easy and suited for heavy duty services.

SPECIFICATION

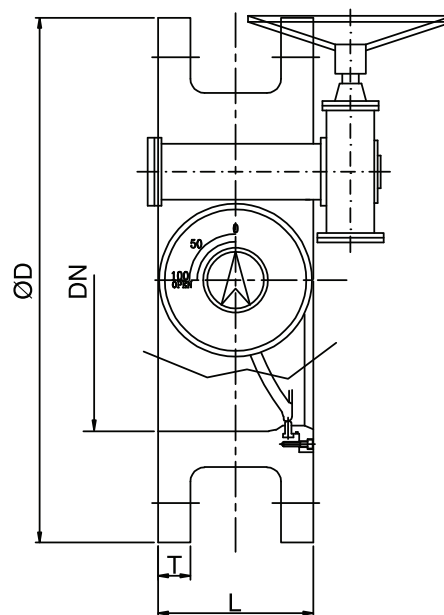
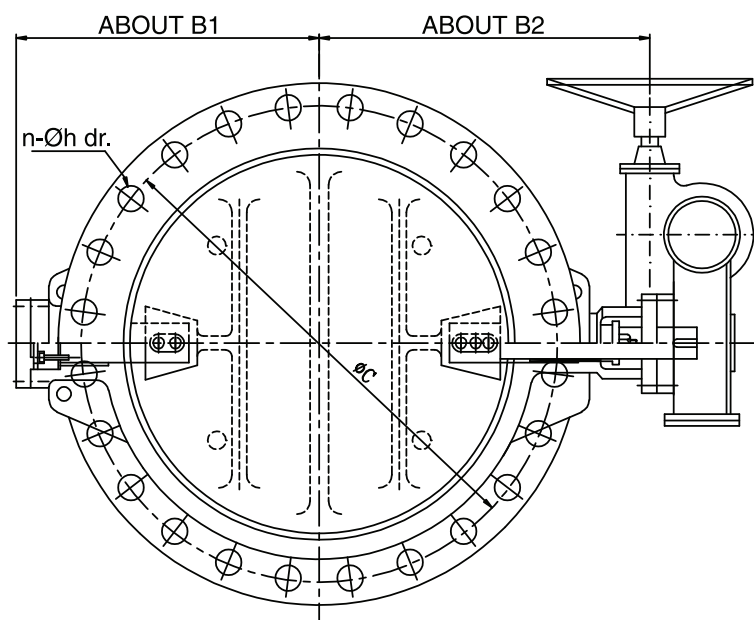
|                       |                                                                 |
|-----------------------|-----------------------------------------------------------------|
| Max. Working Pressure | AWWA CLASS 25B (Type 1-4.5kgf/cm2)                              |
|                       | AWWA CLASS 75B (Type 2-7.5kgf/cm2)                              |
|                       | AWWA CLASS 150B (Type 3-10kgf/cm2)                              |
| Norminal Diameter     | 200-3,000mm (8" - 120")                                         |
| Flange Dimension      | AWWA C207 (KS D 4309). Other Standard are available on request. |
| Installation          | Horizontal, Vertical or Floor                                   |
| Operation             | Manual (Worm Gear), Electric, Cylinder (Oil, Air)               |



MATERIALS (STANDARD)

| NO | NAME            | MATERIALS        | CODE   |          | QTY |
|----|-----------------|------------------|--------|----------|-----|
|    |                 |                  | KS     | ASTM     |     |
| 1  | BODY            | Cast Iron        | GC200  | A126CLB  | 1   |
|    |                 | Ductile Iron     | GCD450 | A536     |     |
|    |                 | Carbon Steel     | SC480  | A216WCB  |     |
|    |                 | Steel Plate      | SS400  | A36      |     |
| 2  | DISC            | Ductile Iron     | GCD450 | A536     | 1   |
|    |                 | Carbon Steel     | SC480  | A216WCB  |     |
|    |                 | Stainless Steel  | SCS13  | A351CF8  |     |
|    |                 | Steel Plate      | SS400  | A36      |     |
| 3  | BODY SEAT       | Bronze Casting   | ALBC2  | B148C954 | 1   |
|    |                 | Stainless Steel  | STS304 | A276T304 |     |
|    |                 | Rubber           | BUNA-N | BUNA-A   |     |
|    |                 |                  |        |          |     |
| 4  | DISC SEAT       | Stainless Steel  | STS304 | A276T304 | 1   |
|    |                 | Bronze Casting   | ALBC2  | B148C954 |     |
|    |                 | Rubber           | BUNA-N | BUNA-A   |     |
|    |                 |                  |        |          |     |
| 5  | SEAT GLAND      | Ductile Iron     | GCD450 | A536     | 1   |
|    |                 | Stainless Steel  | SCS13  | A351CF8  |     |
|    |                 | Bronze Casting   | ALBC2  | B148C954 |     |
|    |                 | Stainless Steel  | STS304 | A276T304 |     |
| 6  | GLAND BOLT, NUT | Stainless Steel  | STS304 | A276T304 | 1   |
| 7  | SHAFT           | Stainless Steel  | STS304 | A276T304 | 2   |
|    |                 |                  | STS316 | A276T316 |     |
| 8  | SHAFT BEARING   | Bronze Casting   | ALBC2  | B148C954 | 2   |
|    |                 | Oilless Bearing  |        | #500SP   |     |
| 9  | BOTTOM COLLAR   | Stainless Steel  | STS304 | A276T304 | 1   |
| 10 | BOTTOM COVER    | Cast Iron        | GC200  | A126CLB  | 1   |
|    |                 | Steel Plate      | SS400  | A36      |     |
| 11 | LOCK PIN        | Stainless Steel  | STS304 | A276T304 | 1   |
| 12 | PACKING         | Asbestos, O-Ring | BUNA-N |          |     |
|    |                 | Split V-Packing  | Teflon |          |     |
| 13 | PACKING GLAND   | Ductile Iron     | GCD450 | A536     | 1   |
|    |                 | Steel Plate      | SS400  | A36      |     |
|    |                 |                  |        |          |     |
| 14 | BRACKET         | Ductile Iron     | GCD450 | A536     | 1   |
|    |                 | Steel Plate      | SS400  | A36      |     |
| 15 | GEAR REDUCER    | Ass'y            |        |          | 1   |
| 16 | HAND WHEEL, CAP | Cast Iron        | GC200  | A126CLB  | 1   |

## WATERWORKS APPLICATION



Unit : mm

| DN   | KS B 2333<br>Short Type | BS 5155<br>Short Type | AWWA C 504<br>Short Type | Flange |           |       |        | B1   | B2   | Approx<br>Weight (kg) |
|------|-------------------------|-----------------------|--------------------------|--------|-----------|-------|--------|------|------|-----------------------|
|      | L                       | L                     | L                        | ØD     | Bolt Hole |       | TXf    |      |      |                       |
|      |                         |                       |                          |        | ØC        | n-Øh  |        |      |      |                       |
| 200  | 152                     | 152                   | 152                      | 340    | 295       | 8-23  | 27 X 3 | 213  | 425  | 96                    |
| 250  | 165                     | 165                   | 203                      | 395    | 350       | 12-23 | 29 X 3 | 244  | 465  | 120                   |
| 300  | 178                     | 178                   | 203                      | 445    | 400       | 12-23 | 31 X 4 | 276  | 495  | 145                   |
| 350  | 190                     | 190                   | 203                      | 505    | 460       | 16-23 | 32 X 4 | 310  | 538  | 195                   |
| 400  | 216                     | 216                   | 203                      | 565    | 515       | 16-28 | 34 X 4 | 343  | 578  | 256                   |
| 450  | 222                     | 222                   | 203                      | 615    | 565       | 20-28 | 35 X 4 | 367  | 606  | 288                   |
| 500  | 229                     | 229                   | 203                      | 670    | 620       | 20-28 | 36 X 4 | 400  | 638  | 353                   |
| 600  | 267                     | 267                   | 203                      | 780    | 725       | 20-31 | 40 X 4 | 453  | 680  | 454                   |
| 700  | 292                     | 292                   | 305                      | 895    | 840       | 24-31 | 45 X 4 | 525  | 815  | 582                   |
| 800  | 318                     | 318                   | 305                      | 1015   | 950       | 24-34 | 49 X 5 | 596  | 842  | 686                   |
| 900  | 330                     | 330                   | 305                      | 1115   | 1050      | 28-34 | 51 X 5 | 853  | 964  | 1052                  |
| 1000 | 410                     | 410                   | 305                      | 1230   | 1160      | 28-37 | 55 X 5 | 730  | 1035 | 1280                  |
| 1100 | 450                     | 450                   | 343                      | 1368   | 1270      | 32-37 | 61 X 5 | 770  | 1153 | 1720                  |
| 1200 | 470                     | 470                   | 381                      | 1470   | 1387      | 32-37 | 63 X 5 | 860  | 1211 | 2210                  |
| 1350 | 530                     | 530                   | 381                      | 1642   | 1552      | 36-38 | 68 X 6 | 955  | 1442 | 2780                  |
| 1500 | 530                     | 530                   | 381                      | 1800   | 1710      | 36-38 | 74 X 6 | 1055 | 1530 | 3480                  |
| 1650 | 530                     | 530                   | 457                      | 1950   | 1860      | 40-48 | 48 X 5 | 1325 | 1550 | 4280                  |
| 1800 | 550                     | 550                   | 457                      | 2115   | 2020      | 44-48 | 50 X 5 | 1425 | 1790 | 5250                  |
| 2000 | 550                     | 550                   | 550                      | 2325   | 2230      | 48-48 | 54 X 5 | 1525 | 1895 | 5920                  |
| 2200 | 550                     | 550                   | 550                      | 2550   | 2440      | 52-56 | 58 X 6 | 1870 | 2050 | 7140                  |
| 2400 | 550                     | 550                   | 550                      | 2760   | 2650      | 56-56 | 62 X 6 | 1830 | 2155 | 8105                  |
| 2500 | 580                     | 580                   | 580                      | 2860   | 2750      | 56-56 | 64 X 6 | 1890 | 2190 | 9320                  |
| 2600 | 580                     | 580                   | 580                      | 2960   | 2850      | 60-56 | 66 X 6 | 1990 | 2320 | 10250                 |
| 2800 | 600                     | 600                   | 600                      | 3180   | 3070      | 64-56 | 70 X 6 | 2100 | 2420 | 10975                 |
| 3000 | 600                     | 600                   | 800                      | 3405   | 3290      | 68-62 | 75 X 6 | 2150 | 2470 | 11600                 |

Flange Raring is Marker Standard. But other standards are available on request.

Lay length of valve is the domension of Marker Standard. But other standards are available on request.

# RUBBER LINED TYPE

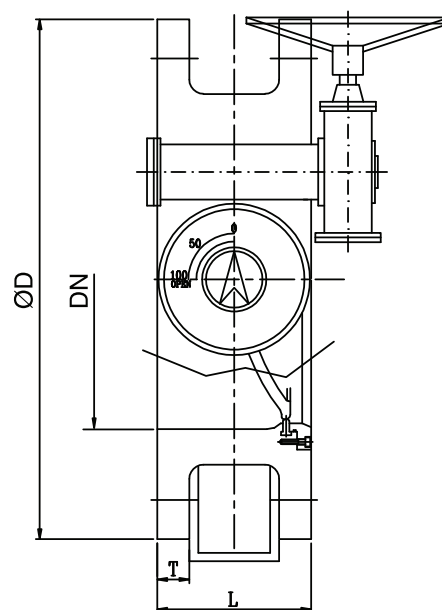
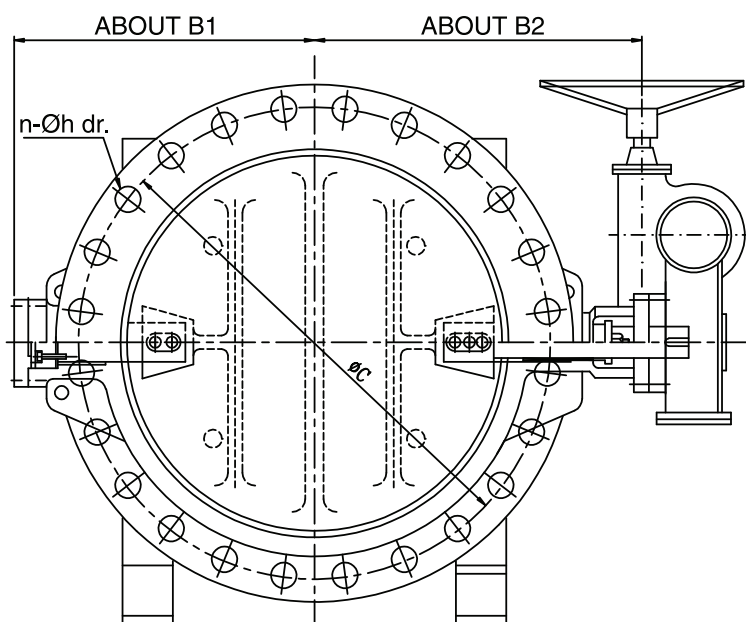
Employs an advanced lining procedure, this valves be designed and manufactured in accordance with AWWA C 504, BS 5155 for use in corrosive service, that is circulating water service, condenser partiton and condenser isolation for the Electric Utilities, Seawater Applications, Desalination plants, Chemical Processes, and so on. Operation is easy and suited for heavy duty services.

\* Rubber Lining Should be classified Two types :

- A. Fully Rubber Lined Finish
- B. With Rubber Lined Body

## SPECIFICATION

|                  |                                                                        |                              |  |
|------------------|------------------------------------------------------------------------|------------------------------|--|
| Normal Diameter  | 200-3,000mm (8" - 120")                                                |                              |  |
| Type of Fluid    | Seawater and Corrosive Fluid                                           |                              |  |
| Flange Dimension | AWWA C207, BS 4504, ISO 2084. Other Standard are available on request. |                              |  |
| Installation     | Horizontal, Vertical                                                   |                              |  |
| Hydraulic Test   | Body Pressure                                                          | 1.5 time of Working Pressure |  |
|                  | Seat Leakage                                                           | The same as Working Pressure |  |
| Lining           | Natural Rubber (N.R)                                                   |                              |  |
|                  | Nitrile Rubber (NBR)                                                   |                              |  |
|                  | Ethylene-Propylenr (EPDM)                                              |                              |  |
| Operation        | Manual (Worm Gear), Electric, Cylinder (Oil, Air)                      |                              |  |

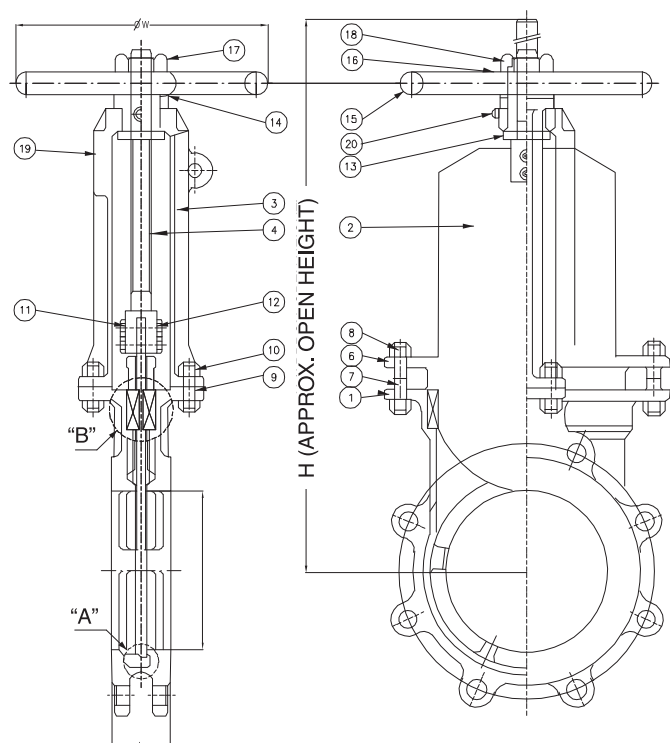


| DN   | KS B 2333<br>Short Type | BS 5155<br>Short Type | AWWA C 504<br>Short Type | Flange |           |       |      | B1   | B2   | Approx Weight (kg) |
|------|-------------------------|-----------------------|--------------------------|--------|-----------|-------|------|------|------|--------------------|
|      | L                       | L                     | L                        | ØD     | Bolt Hole |       | TXI  |      |      |                    |
|      |                         |                       |                          |        | ØC        | n-Øh  |      |      |      |                    |
| 1100 | 450                     | 450                   | 343                      | 1366   | 1270      | 32-37 | 61X5 | 770  | 1153 | 1750               |
| 1200 | 470                     | 470                   | 381                      | 1470   | 1387      | 32-37 | 63X5 | 860  | 1211 | 2260               |
| 1350 | 530                     | 530                   | 381                      | 1642   | 1552      | 36-38 | 68X6 | 955  | 1442 | 2810               |
| 1500 | 530                     | 530                   | 381                      | 1800   | 1710      | 36-38 | 74X6 | 1055 | 1530 | 3560               |
| 1650 | 530                     | 530                   | 457                      | 1950   | 1860      | 40-48 | 48X5 | 1325 | 1550 | 4350               |
| 1800 | 550                     | 550                   | 457                      | 2115   | 2020      | 44-48 | 50X5 | 1425 | 1790 | 5720               |
| 2000 | 550                     | 550                   | 550                      | 2325   | 2230      | 48-48 | 54X5 | 1525 | 1895 | 5990               |
| 2200 | 550                     | 550                   | 550                      | 2550   | 2440      | 52-56 | 58X6 | 1670 | 2050 | 7230               |
| 2400 | 550                     | 550                   | 550                      | 2760   | 2650      | 56-56 | 62X6 | 1830 | 2155 | 8195               |
| 2500 | 580                     | 580                   | 580                      | 2860   | 2750      | 56-56 | 64X6 | 1890 | 2190 | 9420               |
| 2600 | 580                     | 580                   | 580                      | 2960   | 2850      | 60-56 | 66X6 | 1990 | 2320 | 10350              |
| 2800 | 600                     | 600                   | 600                      | 3180   | 3070      | 64-56 | 70X6 | 2100 | 2420 | 11400              |
| 3000 | 600                     | 600                   | 600                      | 3405   | 3290      | 68-62 | 75X6 | 2150 | 2470 | 11800              |

1. Body & Disc Internal : RUBBER LINED
2. Material of Rubber Lining : NR (Hard Rubber)
3. Hardness of Rubber Lining : SHORE "A"95
4. Thickness of Rubber Lining : MIN. 5 mm
5. Hardness of Disc Seat : SHORE "A"70
6. Flange Raring is Marker Standard. But other standards are available on request.
7. Lay Length of valve is the dimension of Maker Standard. But other standards are available on request.



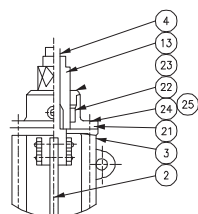
# METAL TO METAL TOUCH TYPE



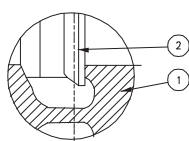
- Designed to handle heavy slurry, pulp stock and corrosive fluids in process industries.
- Meet TAPPI standard TIS 405-8 and MSS SP-81 for wafer type knife gate valves.
- These high quality metal seated knife valves with ground knife gates and lapped seat surface have maximum leakage, rated 4 to 10 times less than the permissible rates shown in TAPPI 405-8 & MSS SP-81.
- Needle bearings on 14" to 36" valves.
- Available with lever, chain, gear, electric, air or hydraulic actuation.
- Flange dimension :  
24", and smaller valves conform to ANSI B-16.5  
26", and larger valves conform to API 605 MSS-SP 44 (ANSI B 16.47 series A or series B).

## MATERIAL SPECIFICATIONS

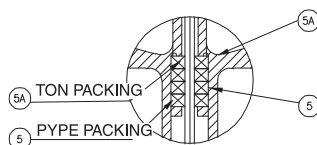
| NO | PART NAME       | MATERIAL                  |
|----|-----------------|---------------------------|
| 1  | Body            | ASTM A351 Gr CF8M         |
| 2  | Disc            | ASTM A240 Gr 316          |
| 3  | Yoke            | ASTM A351 Gr. CF8         |
| 4  | Stem            | ASTM A240 Gr. 304         |
| 5  | Packing         | Palmetto/#1347-af(Teflon) |
| 6  | Packing Gland   | ASTM A351 Gr CF 8         |
| 7  | Gland Bolt      | ASTM A194 Gr B8           |
| 8  | Gland Nut       | ASTM A194 Gr.8            |
| 9  | Yoke Bolt       | ASTM A193 Gr B8           |
| 10 | Yoke Nut        | ASTM A194 Gr 8            |
| 11 | Disc Bolt       | ASTM A193 Gr B8           |
| 12 | Disc Nut        | ASTM A194 Gr 8            |
| 13 | Yoke Sleeve     | ASTM A439 Gr D2C          |
| 14 | Thrust Washer   | ASTM A240 Gr 410          |
| 15 | Hand Wheel      | ASTM A536                 |
| 16 | Washer          | ASTM A240 Gr.304          |
| 17 | Set Screw       | 18Cr-18Ni S.Steel         |
| 18 | Wheel Nut       | ASTM A351 Gr.CF8          |
| 19 | Name Plate      | ASTM A240 Gr.304          |
| 20 | Grease Nipple   | 18Cr-18Ni S.Steel         |
| 21 | Bearing Housing | ASTM A351 GrCF8           |
| 22 | Thrust Bearing  | ANSI 4130                 |
| 23 | Sleeve Gland    | ASTM A351 Gr.CF8          |
| 24 | Housing Bolt    | ASTM A194 Gr.B8           |
| 25 | Housing Nut     | ASTM A194 Gr.8            |



SHAPE FOR SIZE 14" AND LARGE



DETAIL A

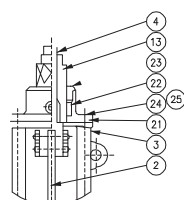
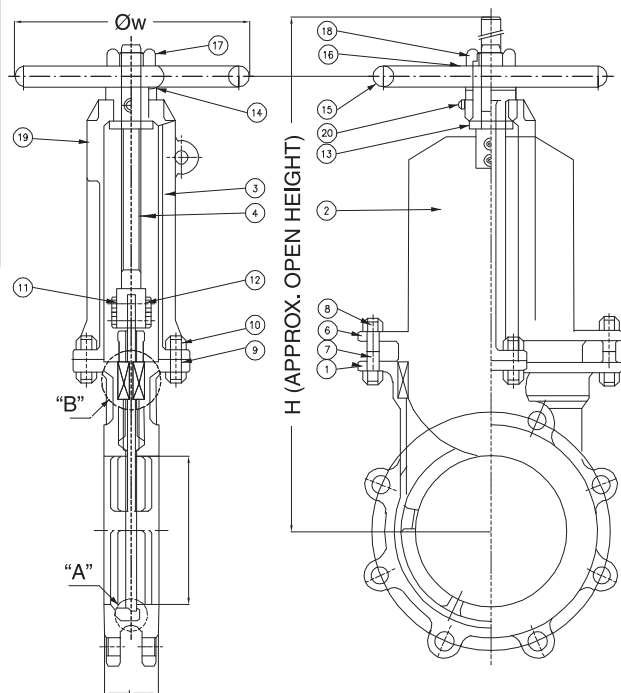


DETAIL B

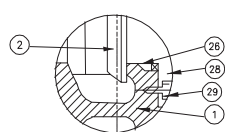
## DIMENSIONS (in/mm)

| Nom Size | mm  | 50    | 65    | 80    | 100   | 125   | 50    | 200   | 250   | 300   | 350   | 400   | 450   | 500   | 550   | 600   | 650   | 700   | 750    |
|----------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
|          | in  | 2     | 2 1/2 | 3     | 4     | 5     | 6     | 8     | 10    | 12    | 14    | 16    | 18    | 20    | 22    | 24    | 26    | 28    | 30     |
| d        | mm  | 51    | 64    | 76    | 102   | 127   | 152   | 203   | 254   | 305   | 337   | 387   | 438   | 489   | 540   | 591   | 641   | 682   | 743    |
|          | in  | 2.00  | 2.50  | 3.00  | 4.00  | 5.00  | 6.00  | 8.00  | 10.00 | 12.00 | 13.25 | 15.25 | 17.25 | 19.25 | 21.25 | 23.25 | 25.25 | 27.25 | 29.25  |
| L        | mm  | 47.6  | 51    | 51    | 51    | 57    | 57    | 70    | 70    | 76    | 76    | 89    | 89    | 114   | 114   | 114   | 114   | 121   | 121    |
|          | in  | 1.88  | 2.00  | 2.00  | 2.00  | 2.25  | 2.25  | 2.75  | 2.75  | 3.00  | 3.00  | 3.50  | 3.50  | 4.50  | 4.50  | 4.50  | 4.50  | 4.75  | 4.75   |
| K        | mm  | 16    | 20    | 20    | 20    | 20    | 20    | 20    | 28    | 28    | 28    | 32    | 32    | 38    | 38    | 38    | 38    | 50    | 50     |
|          | in  | 0.63  | 0.79  | 0.79  | 0.79  | .079  | 0.79  | 0.79  | 1.10  | 1.10  | 1.10  | 1.26  | 1.26  | 1.50  | 1.50  | 1.50  |       | 0.50  | 1.97   |
| N        |     | 8     | 6     | 6     | 6     | 6     | 6     | 6     | 5     | 5     | 5     | 4     | 4     | 3.5   | 3.5   | 3.5   | 3.5   | 3     | 3      |
| W        | mm  | 195   | 215   | 215   | 215   | 240   | 240   | 300   | 400   | 400   | 400   | 450   | 450   | 500   | 500   | 500   | 500   | 630   | 630    |
|          | in  | 7.68  | 8.46  | 8.46  | 8.46  | 9.45  | 9.45  | 11.81 | 15.75 | 15.75 | 15.74 | 17.72 | 17.72 | 19.68 | 19.68 | 19.68 | 19.69 | 24.80 | 24.80  |
| H        | mm  | 350   | 409   | 435   | 520   | 597   | 655   | 865   | 1020  | 1180  | 1350  | 1530  | 1710  | 1910  | 2018  | 2170  | 2356  | 2500  | 2656   |
|          | in  | 13.78 | 16.10 | 17.13 | 20.47 | 23.50 | 25.79 | 34.06 | 40.16 | 46.46 | 53.15 | 60.24 | 67.32 | 75.20 | 79.45 | 85.43 | 92.76 | 98.43 | 104.57 |
| Weight   | kg  | 8.1   | 10.9  | 12.2  | 15.6  | 18.7  | 22.0  | 34.2  | 53.7  | 67.4  | 88.1  | 131.9 | 165.1 | 242.2 | 268.2 | 290.8 | 345.5 | 421.9 | 502.7  |
|          | lbs | 17.8  | 24.0  | 26.8  | 36.3  | 41.1  | 48.4  | 75.2  | 118.1 | 148.3 | 193.8 | 290.2 | 363.2 | 532.4 | 590.0 | 639.8 | 760.1 | 928.2 | 1104.4 |

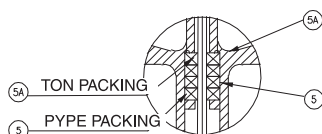
## METAL TO TEFLON TOUCH TYPE



SHAPE FOR SIZE 14" AND LARGE



DETAIL A



DETAIL B

- Meets API standard TIS 405-8 and MSS SP-81 for wafer type knife gate valves.
- Designed to handle heavy slurry, pulp stock and corrosive fluids process industries.
- Needle bearings on 14"~36" valves.
- Available with lever, chain, gear, electric, air or hydraulic actuation.
- Flange dimension :  
14" and smaller valves conform to ANSI B16.5  
26" and larger valves conform to API 605 MSS-44 (ANSI B 16.47 series A or series B).

## MATERIAL SPECIFICATIONS

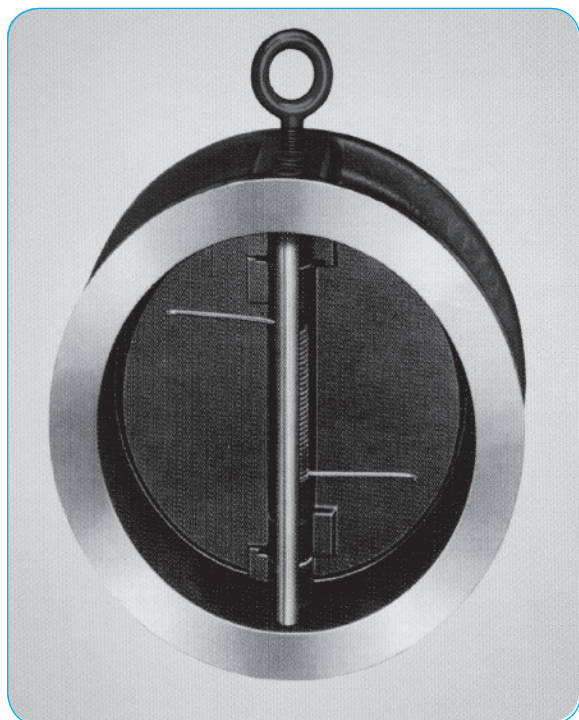
| NO | PART NAME       | MATERIAL                 |
|----|-----------------|--------------------------|
| 1  | Body            | ASTM A351 Gr CF8M        |
| 2  | Disc            | ASTM A240 Gr. 316        |
| 3  | Yoke            | ASTM A351 Gr CF8         |
| 4  | Stem            | ASTM A240 Gr. 304        |
| 5  | Packing         | Palemto/#1347-af(Teflon) |
| 6  | Packing Gland   | ASTM A351 Gr. CF8        |
| 7  | Gland Bolt      | ASTM A193 Gr. B8         |
| 8  | Gland Nut       | ASTM A194 Gr 8           |
| 9  | Yoke Bolt       | ASTM A193 Gr B8          |
| 10 | Yoke Nut        | ASTM A194 Gr. 8          |
| 11 | Disc Bolt       | ASTM A193 Gr B8          |
| 12 | Disc Nut        | ASTM A194 Gr 8           |
| 13 | Yoke Sleeve     | ASTM A439 Gr. D2C        |
| 14 | Thrust Washer   | ASTM A240 Gr. 410        |
| 15 | Hand Wheel      | ASTM A536                |
| 16 | Washer          | ASTM A240 Gr 304         |
| 17 | Set Screw       | 18Cr-18Ni S.Steel        |
| 18 | Wheel Nut       | ASTM A351 Gr. CF8        |
| 19 | Name Plate      | ASTM A240 Gr. 304        |
| 20 | Grease Nipple   | 18Cr.-18Ni S. Steel      |
| 21 | Bearing Housing | ASTM A351 Gr. CF8        |
| 22 | Thrust Bearing  | ANSI 4130                |
| 23 | Sleeve Gland    | ASTM A351 Gr. CF8        |
| 24 | Housing Bolt    | ASTM A194 Gr.B8          |
| 25 | Housing Nut     | ASTM A194 Gr8            |
| 26 | Seat Ring       | PTFE                     |
| 27 | O-Ring          | NBR                      |
| 28 | Retainer        | ASTM A351 Gr CF8         |
| 29 | Wrench Bolt     | ASTM A276 Gr 304         |

## DIMENSIONS (in/mm)

| Nom Size | mm in  | 50 2      | 65 2 1/2  | 80 3      | 100 4     | 125 5     | 150 6     | 200 8     | 250 10     | 300 12     | 350 14     | 400 16      | 450 18      | 500 20      | 550 22      | 600 24      | 650 26      | 700 28      | 750 30       |
|----------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| d        | mm in  | 40 1.57   | 47 1.85   | 61 2.40   | 94 3.70   | 119 4.68  | 144 5.67  | 193 7.60  | 241 9.49   | 291 11.46  | 329 12.95  | 370 14.57   | 425 16.73   | 457 18.70   | 526 20.70   | 575 22.64   | 627 24.68   | 682 27.25   | 730 28.74    |
| L        | mm in  | 47.6 1.88 | 51 2.00   | 51 2.00   | 51 2.00   | 57 2.25   | 57 2.25   | 70 2.75   | 70 2.75    | 76 3.00    | 76 3.00    | 89 3.50     | 89 3.50     | 114 4.50    | 114 4.50    | 114 4.50    | 114 4.50    | 121 4.75    | 121 4.75     |
| K        | mm in  | 16 0.63   | 20 0.79   | 20 0.79   | 20 0.79   | 20 0.79   | 20 0.79   | 20 0.79   | 28 1.10    | 28 1.10    | 28 1.10    | 32 1.26     | 32 1.26     | 38 1.50     | 38 1.50     | 38 1.50     | 38 1.50     | 50 0.50     | 50 1.97      |
| N        |        | 8         | 6         | 6         | 6         | 6         | 6         | 6         | 5          | 5          | 5          | 4           | 4           | 3.5         | 3.5         | 3.5         | 3.5         | 3           | 3            |
| W        | mm in  | 1.95 7.68 | 215 8.46  | 215 8.46  | 215 8.46  | 240 9.45  | 240 9.45  | 300 11.81 | 400 15.75  | 400 15.75  | 400 15.74  | 450 17.72   | 450 17.72   | 500 19.68   | 500 19.68   | 500 19.68   | 500 19.69   | 630 24.80   | 630 24.80    |
| H        | mm in  | 350 13.78 | 409 16.10 | 435 17.16 | 520 20.47 | 597 23.50 | 655 25.79 | 865 34.06 | 1020 40.16 | 1180 46.46 | 1350 53.15 | 1530 60.24  | 1710 67.32  | 1910 75.20  | 2018 79.45  | 2170 85.43  | 2356 92.76  | 2500 98.43  | 2650 104.33  |
| Weight   | kg lbs | 8.2 18.0  | 11.0 24.2 | 12.4 27.3 | 15.8 34.8 | 19.1 42.0 | 22.2 48.8 | 34.8 75.6 | 54.8 120.6 | 68.6 150.9 | 89.5 196.9 | 134.2 295.2 | 166.7 366.7 | 244.5 537.9 | 272.8 600.1 | 293.7 646.1 | 351.8 774.0 | 429.6 945.1 | 512.2 1126.8 |

## DUO - CHECK VALVE

The DUO-CHECK valve is designed to comply to ANSI flanges up to class 600 and conform to API1594 and API 6D. The valve is manufactured in a wide range of materials and is offered in sizes from 2" (50mm) to 36" (900mm).

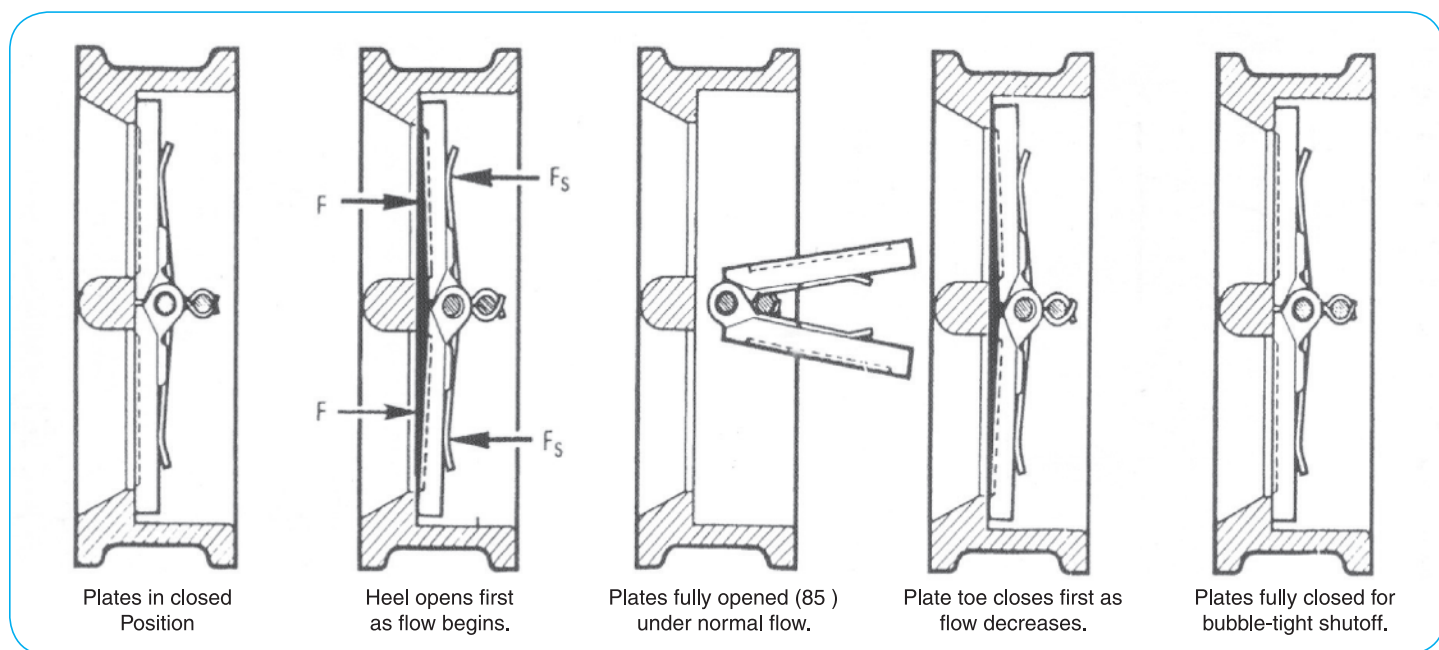


### DUO-CHECK, FLAT-SEAT DESIGN

The valve employs two spring-loaded plates (half disc) suspended on a centre vertical hinge pin. This DUO-CHECK design offers several advantages over one-piece disc design. When the flow decreases, the plates close rapidly by torsion spring action without requiring reverse flow. After extensive endurance and performance test, the spring action and hinge design have been perfected to prevent the plate heel from dragging and causing seal wear.

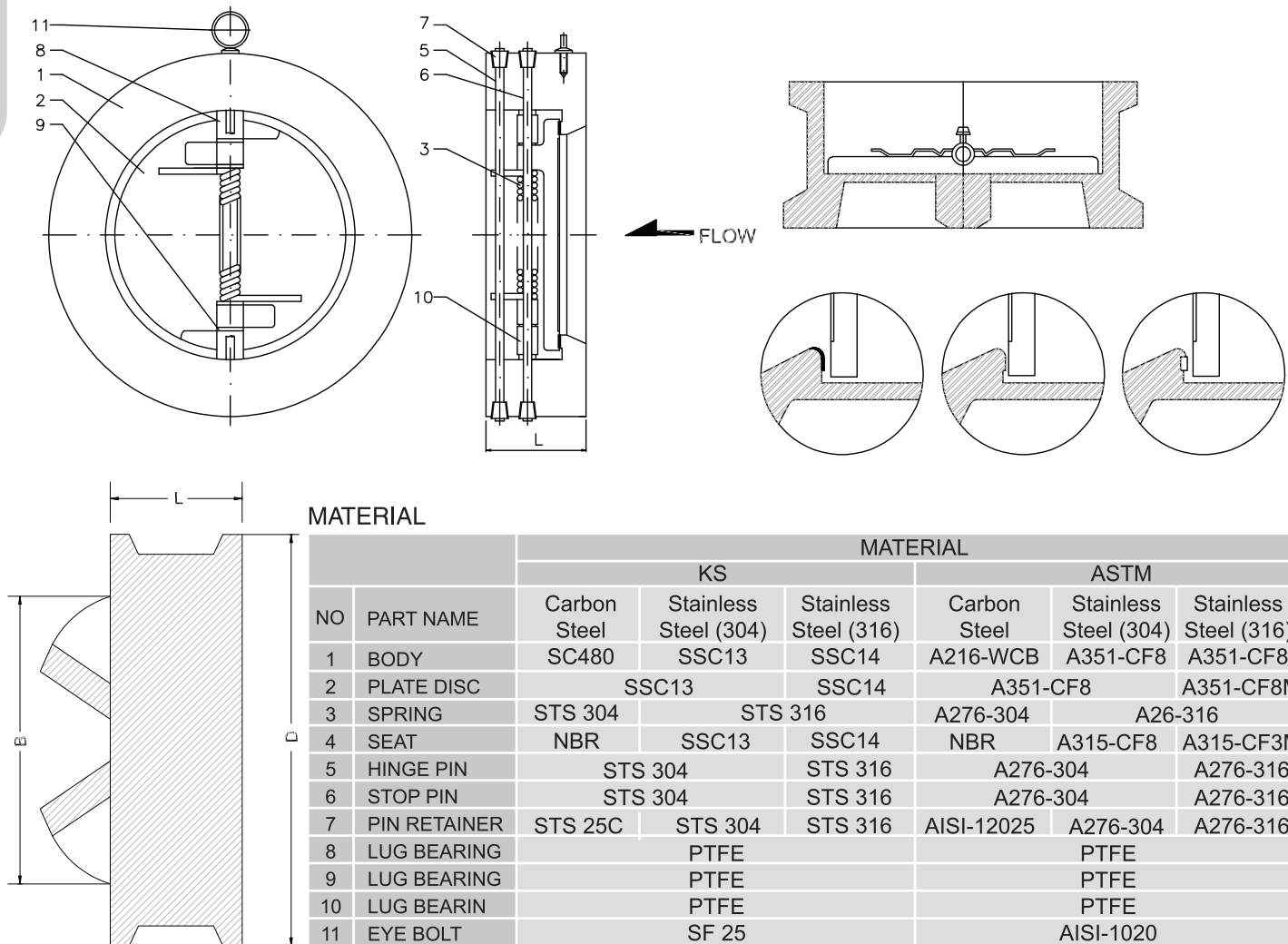
### INDEPENDENT SPRING ACTION

The valve (6-inch and larger) employs a unique new spring design for significant improvement in valves response. Each of the DUO-CHECK has its own spring, which provides independent closing action. This design overcomes the problems of earlier DUO-CHECK valve.



The fluid develops a resultant Force ( $F$ ) which acts at the centre of the area of sealed surface (0.424 radius). The point of spring force ( $f_s$ ) acts beyond the centre of area of each plate (1/2 to 3/4 radius). This acts as a fulcrum for the heel to open first, preventing the rubbing of the seal surface prior to the normal plate opening. At closing, when the fluid flow decreases, the point of spring force causes the plate to close first.

- Face to face dimensions are in accordance to [API 594 & API 6D](#)
- Dimensions shown are for valves designed as per ANSI flanges.

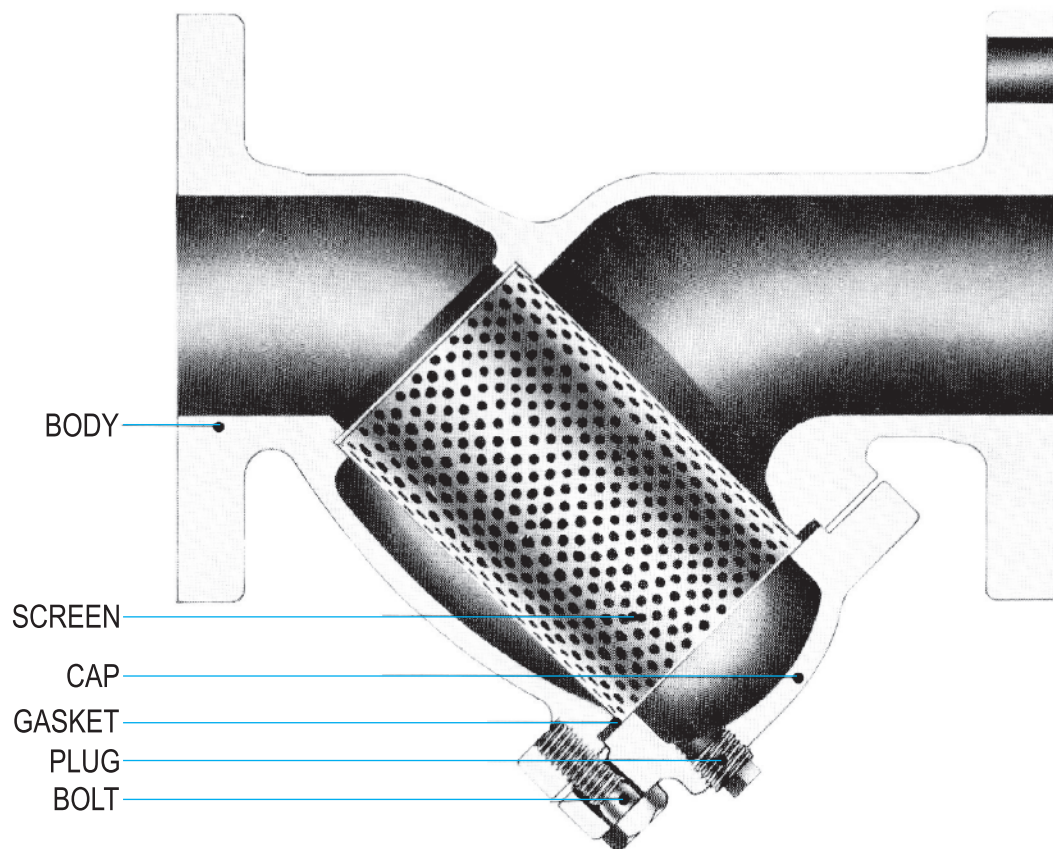


#### DIMENSIONS (in/mm) & WEIGHT

| CLASS | SIZE   | 50    | 65    | 80    | 100   | 125   | 105   | 200   | 250   | 300   | 350    | 400   | 450    | 500    | 600    | 700    | 900    |
|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|--------|--------|--------|--------|--------|
|       |        | 2     | 2 1/2 | 3     | 4     | 5     | 6     | 8     | 10    | 12    | 14     | 16    | 18     | 20     | 24     | 30     | 36     |
| 150   | L      | 60    | 67    | 73    | 73    | 86    | 98    | 127   | 146   | 181   | 184    | 191   | 203    | 219    | 222    | 305    | 368    |
|       |        | 2 3/8 | 2 5/8 | 2 7/8 | 2 7/8 | 3 3/8 | 3 7/8 | 5     | 5 1/4 | 7 1/8 | 7 1/4  | 7 1/2 | 8      | 8 3/4  | 8 3/4  | 13     | 15 1/4 |
|       | D      | 105   | 124   | 137   | 175   | 197   | 222   | 279   | 340   | 410   | 451    | 514   | 549    | 600    | 718    | 883    | 1048   |
|       |        | 4.13  | 4.88  | 5.39  | 6.89  | 7.76  | 8.74  | 10.98 | 13.37 | 16.14 | 17.76  | 20.24 | 21.61  | 23.62  | 28.27  | 34.76  | 41.26  |
|       | B      | 43    | 45    | 66    | 87    | 103   | 131   | 173   | 216   | 257   | 284    | 325   | 366    | 408    | 490    | 730    | 889    |
|       |        | 1.69  | 1.77  | 2.60  | 3.43  | 4.05  | 5.16  | 6.81  | 8.50  | 10.12 | 11.18  | 12.79 | 14.40  | 16.06  | 19.29  | 28.74  | 35.00  |
| 300   | weight | kg    | 2.5   | 3.5   | 4.0   | 8.0   | 11    | 12    | 25    | 39    | 73     | 82    | 107    | 137    | 168    | 258    | 467    |
|       |        | pound | 5     | 8     | 9     | 17    | 23    | 26    | 54    | 85    | 160    | 180   | 235    | 300    | 370    | 570    | 1030   |
|       | L      | 60    | 67    | 73    | 73    | 86    | 98    | 127   | 146   | 181   | 184    | 232   | 263    | 292    | 318    | 368    | 483    |
|       |        | 2 3/8 | 2 5/8 | 2 7/8 | 2 7/8 | 3 3/8 | 3 7/8 | 5     | 5 1/4 | 7 1/8 | 8 3/4  | 9 3/8 | 10 3/8 | 11 1/2 | 12 1/2 | 15 3/4 | 19 1/4 |
|       | D      | 111   | 130   | 149   | 181   | 216   | 251   | 308   | 362   | 422   | 486    | 540   | 597    | 654    | 775    | 953    | 1118   |
|       |        | 4.39  | 5.12  | 5.87  | 7.13  | 8.50  | 9.88  | 12.13 | 14.25 | 16.61 | 19.13  | 21.26 | 23.50  | 25.75  | 30.51  | 37.52  | 44.02  |
| 600   | B      | 43    | 45    | 66    | 87    | 103   | 124   | 173   | 216   | 257   | 284    | 325   | 366    | 408    | 490    | 730    | 889    |
|       |        | 1.69  | 1.77  | 2.60  | 3.4   | 4.05  | 4.88  | 6.81  | 8.50  | 10.12 | 11.18  | 12.79 | 14.41  | 16.06  | 19.29  | 28.74  | 35.00  |
|       | weight | kg    | 3.0   | 5.0   | 6.0   | 8.0   | 14    | 20    | 26    | 61    | 86     | 120   | 152    | 211    | 272    | 417    | 696    |
|       |        | pound | 6     | 11    | 12    | 18    | 30    | 44    | 58    | 135   | 190    | 265   | 335    | 465    | 600    | 920    | 1535   |
|       | L      | 60    | 67    | 73    | 79    | 105   | 136   | 165   | 213   | 229   | 222    | 305   | 363    | 368    | 438    | -      | -      |
|       |        | 2 3/8 | 2 5/8 | 2 7/8 | 3 1/8 | 4 1/8 | 5 3/8 | 6 1/2 | 8 3/8 | 9     | 10 3/4 | 12    | 14 1/4 | 14 1/2 | 17 1/4 | -      | -      |
| 600   | D      | 111   | 130   | 149   | 193   | 241   | 267   | 320   | 400   | 457   | 492    | 565   | 613    | 795    | 972    | -      | -      |
|       |        | 4.37  | 5.12  | 5.86  | 7.60  | 9.49  | 10.51 | 12.50 | 15.75 | 17.99 | 19.37  | 22.24 | 24.13  | 31.30  | 38.27  | -      | -      |
|       | B      | 43    | 45    | 66    | 80    | 103   | 124   | 173   | 216   | 257   | 284    | 325   | 366    | 408    | 490    | -      | -      |
|       |        | 1.69  | 1.77  | 2.60  | 3.15  | 4.05  | 4.88  | 6.81  | 8.50  | 10.12 | 11.18  | 12.79 | 14.41  | 16.06  | 19.29  | -      | -      |
|       | weight | kg    | 3.0   | 5.0   | 6.0   | 10    | 25    | 32    | 36    | 87    | 143    | 204   | 281    | 376    | 501    | 786    | -      |
|       |        | pound | 6     | 11    | 12    | 21    | 54    | 70    | 80    | 192   | 315    | 450   | 620    | 830    | 1105   | 1735   | -      |

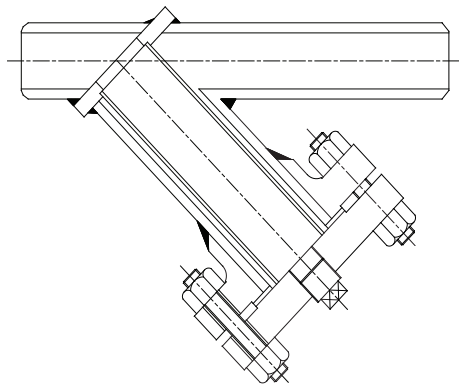
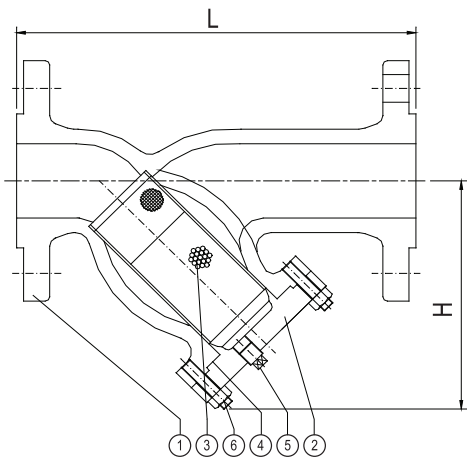
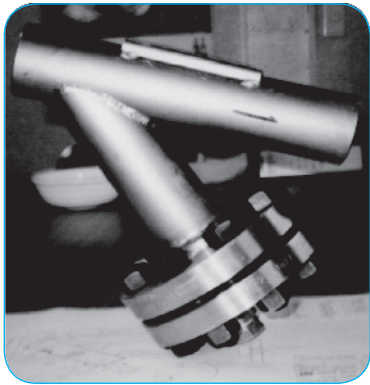


## Y - STRAINER - CONSTRUCTION



HAWKS strainers can be used to remove scale & impurity in pipeline and other plant applications. Our products are designed for use on air, water, gas and other fluids. The Screen & Mesh specifications can be changed to suit user requirements.





DESCRIPTION

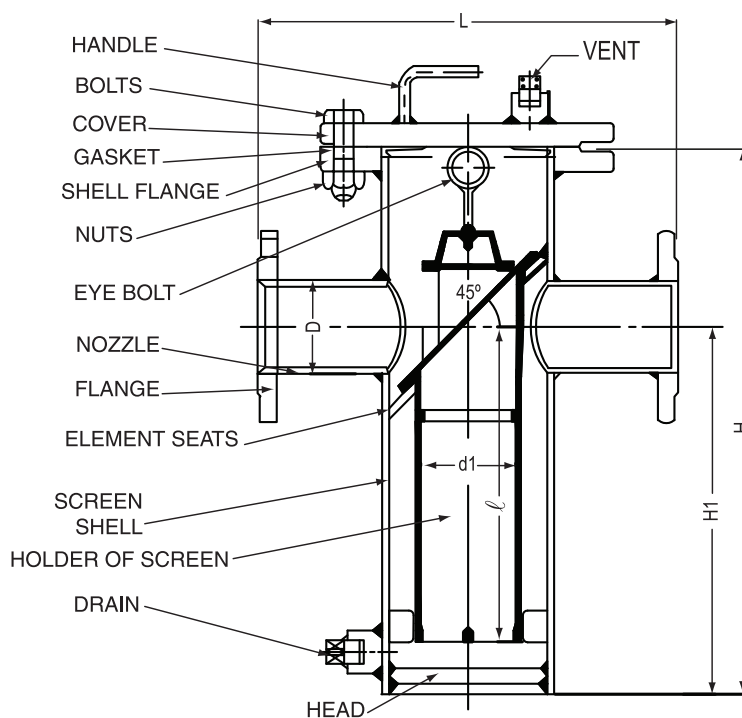
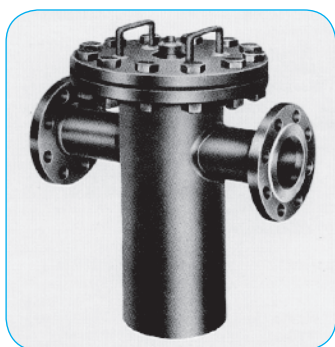
| NO.                    | NAME    | MATERIAL                   |
|------------------------|---------|----------------------------|
| 1                      | Body    | Carbon Steel               |
| 2                      | Cap     | Carbon Steel               |
| 3                      | Cscreen | Stainless Steel            |
| 4                      | Gasket  | Spiral Wound CS+Graphite   |
| 5                      | Plug    | Carbon Steel               |
| 6                      | Bolt    | Carbon Steel               |
| 1. Working Pressure    |         | Max. 20kgf/cm <sup>2</sup> |
| 2. Working Temperature |         | Max. 300 <sup>0</sup> C    |
| 3. Working Fluid       |         | A. S. W. G. NF             |
| 4. Connection          |         | RF FLANGE (ANSI 150 & 300) |

Fluid Symbol  
1. A : Air  
2. S : Steam  
3. W : Water  
4. G : Gas  
5. NF : Non-corrosive fluid

|   | 2   | 2.5 | 3   | 4   | 5   | 6   | 8   | 10  | 12  |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| L | 220 | 270 | 295 | 325 | 340 | 380 | 480 | 640 | 720 |
| H | 160 | 175 | 190 | 230 | 300 | 345 | 405 | 490 | 580 |

Dimensions and data are indicative only and subject to change.  
Please provide a job drawing for an accurate and up-to-date information.

## BASKET STRAINER



Suitable for high density fluids and for pump suctions of large capacity.  
The Screen & Mesh specifications can be changed to suit user requirements.

\* Material: Carbon Steel, Stainless Steel, Cast Carbon Steel, Cast Stainless Steel.

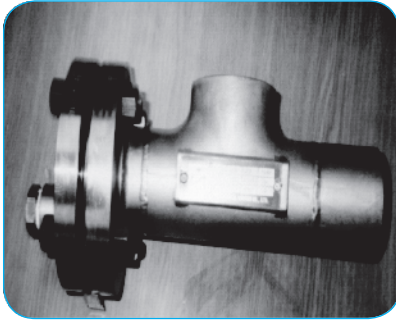
\* Flange Dimension: ANSI, KS & JIS

### DIMENSION

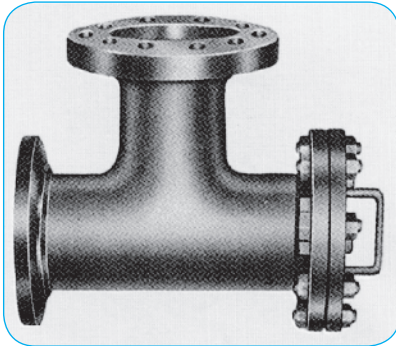
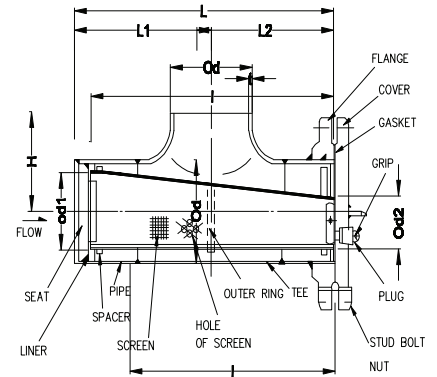
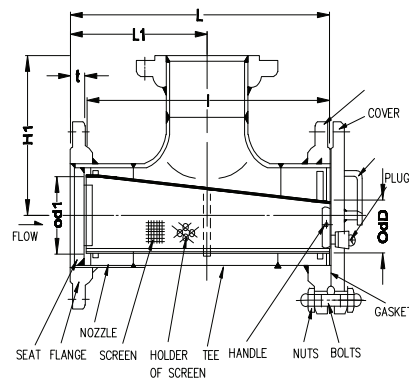
| SIZE      | D     | L    | H    | H1   | Element |      | Plug<br>(PT) |
|-----------|-------|------|------|------|---------|------|--------------|
|           |       |      |      |      | d1      | ℓ    |              |
| 50A(2B)   | 60.5  | 350  | 340  | 190  | 70      | 140  | 3/4"         |
| 80A(3B)   | 89.1  | 400  | 400  | 220  | 100     | 170  | 3/4"         |
| 100A (4B) | 114.3 | 500  | 480  | 280  | 130     | 220  | 3/4"         |
| 150A(6B)  | 165.2 | 580  | 650  | 400  | 180     | 330  | 3/4"         |
| 200A(8B)  | 216.3 | 650  | 840  | 560  | 220     | 480  | 3/4"         |
| 250A(10B) | 267.4 | 800  | 1050 | 700  | 280     | 600  | 3/4"         |
| 250A(12b) | 318.5 | 850  | 1250 | 850  | 310     | 740  | 3/4"         |
| 350A(14B) | 355.6 | 950  | 1430 | 980  | 340     | 870  | 3/4"         |
| 400A(16B) | 406.4 | 1000 | 1650 | 1150 | 420     | 1000 | 3/4"         |
| 450A(18B) | 457.2 | 1100 | 1850 | 1300 | 460     | 1150 | 3/4"         |
| 500A(20B) | 508.0 | 1100 | 2000 | 1400 | 520     | 1250 | 3/4"         |
| 600A(24B) | 609.6 | 1400 | 2450 | 1750 | 620     | 1550 | 3/4"         |

Dimensions and data are indicative only and subject to change.

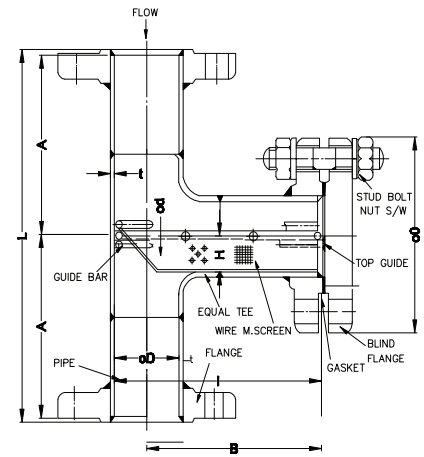
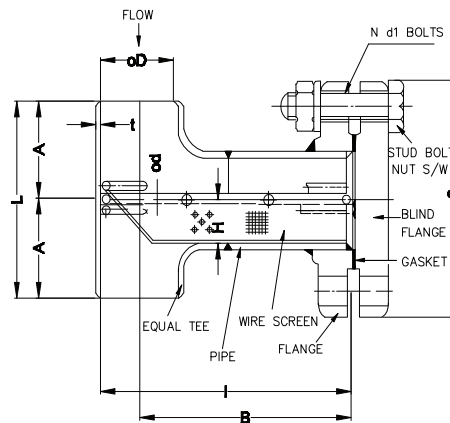
Please provide job drawing for an accurate and up-to-date information.



ANGLE FLOW TYPE



STRAIGHT TYPE



ANGLE FLOW TYPE (FLANGE TYPE)

| SIZE        | L    | L1  | H1  | Element |     |        | PLUG (PT) |
|-------------|------|-----|-----|---------|-----|--------|-----------|
|             |      |     |     | d0      | d1  | $\phi$ |           |
| 25A(1B)     | 200  | 100 | 100 | 22      | 14  | 170    | 3/4"      |
| 40A(1 1/2B) | 252  | 126 | 126 | 32      | 21  | 212    | 3/4"      |
| 50A(2B)     | 268  | 134 | 136 | 40      | 28  | 229    | 3/4"      |
| 65A(2 1/2B) | 306  | 153 | 153 | 55      | 37  | 257    | 3/4"      |
| 80A(3B)     | 332  | 166 | 166 | 63      | 43  | 286    | 3/4"      |
| 100A(4B)    | 382  | 191 | 191 | 85      | 50  | 333    | 3/4"      |
| 125A(5B)    | 446  | 223 | 223 | 110     | 70  | 381    | 3/4"      |
| 105A(6B)    | 484  | 242 | 242 | 130     | 82  | 428    | 3/4"      |
| 200A(8B)    | 578  | 289 | 289 | 175     | 112 | 513    | 3/4"      |
| 250A(10B)   | 668  | 334 | 334 | 225     | 151 | 602    | 3/4"      |
| 300A(12B)   | 770  | 385 | 385 | 270     | 185 | 692    | 3/4"      |
| 350A(14B)   | 846  | 423 | 423 | 300     | 206 | 765    | 3/4"      |
| 400A(16B)   | 1460 | 730 | 730 | 340     | 225 | 1400   | 3/4"      |
| 450A(18B)   | 1500 | 750 | 750 | 390     | 260 | 1440   | 3/4"      |
| 500A(20B)   | 1650 | 825 | 825 | 440     | 290 | 1590   | 3/4"      |
| 600A(24B)   | 1980 | 990 | 990 | 530     | 350 | 1920   | 3/4"      |

STRAIGHT TYPE (FLANGE TYPE)

Unit : mm

| SIZE        | L    | A   | B   | D     | Element |     |
|-------------|------|-----|-----|-------|---------|-----|
|             |      |     |     |       | $\phi$  | H   |
| 50A(2B)     | 268  | 134 | 134 | 52.5  | 158     | 30  |
| 65A(2 1/2B) | 306  | 153 | 153 | 62.7  | 183     | 35  |
| 80A(3B)     | 332  | 166 | 166 | 77.9  | 203     | 40  |
| 100A(4B)    | 382  | 191 | 191 | 102.3 | 240     | 50  |
| 150A(6B)    | 484  | 242 | 242 | 154   | 315     | 75  |
| 200A(8B)    | 578  | 289 | 289 | 202.7 | 386     | 95  |
| 250A(10B)   | 668  | 334 | 334 | 238.2 | 456     | 115 |
| 300A(12B)   | 770  | 385 | 385 | 303.3 | 531     | 135 |
| 350A(14B)   | 846  | 423 | 423 | 333.4 | 587     | 150 |
| 400A(16B)   | 974  | 487 | 487 | 381   | 673     | 200 |
| 450A(18B)   | 1080 | 540 | 540 | 428.6 | 751     | 225 |
| 500A(20B)   | 1166 | 583 | 583 | 477.8 | 819     | 250 |

Dimensions and data are indicative only and subject to change.

Please provide a job drawing for an accurate and up-to-date information.

# BALL VALVE

## CONSTRUCTION & DESIGN

Designed to have blowout proof function by itself by

### Stem Design

- Anti-static Device

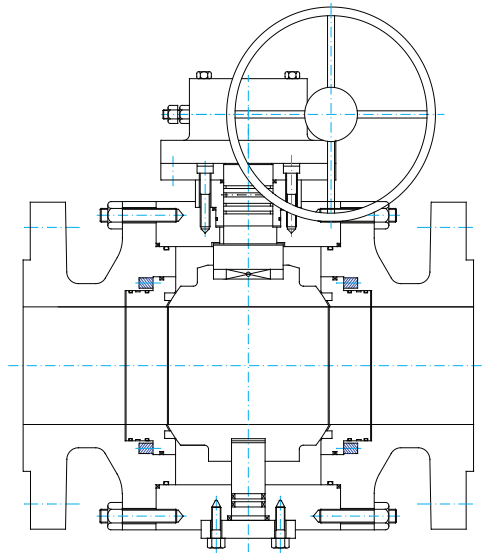
Anti-static Device is formed through metal to metal contact caused by the ball safely sustained by built-in spring inside the stem of the valve.

- Blowout Proof

HAWKS stem is designed to have a self-blowout proof function by means of inner shoulder and thrust ring without the necessity of a separate holding mechanism.

### Ball Construction

The ball is the most important part of the ball valve which determines the valve quality and life expectancy, and therefore it should be precise. HAWKS selects seat support ball or a trunnion mounted ball depending on size and specification. The types of ball are solid ball, sealed cavity ball, cored cavity ball, and hollow ball.



### Double Block & Bleed With Body Drain

When closing the valve completely and opening the drain valve at the bottom of the valve while working with pipeline, the liquid inside the body cavity together with the sludge can be drained out.

### Sealing Construction

Double O-Ring is used for the stem sealing, and the graphite and TFE are added to enhance the fire safety function.

The ball rotates around its vertical axis between the stem and the bottom trunnion.

Sealing can be done with backup spring by tightly fastening the metal with insert seat (VITON/PTFE/NYLON) to the correctly rounded ball surface. Backup spring can be adjusted to the variation of pressure or at the constant pressure of up-stream and down-stream of the fluid.

### Trunnion mounting

Trunnion mounted stems absorb the thrust from line pressure, preventing excess friction between the ball and seats, so even at full rated working pressure, opening torque stays low.

### Seat Design Features

1. The valve seat used in smaller sizes than 4" is made from Plastic Polymer Seat Sealing which is highly abrasive and corrosion resistant, this self-lubricating property reduces friction thus minimizing torque requirements. Emergency sealant fitting is only for the stem.
2. Double seat is applicable for 3" or larger sizes which is designed with primary metal to metal seals and secondary protected synthetic insert ring seats.

### Fire Safety

To prevent the valve from full leakage when expose to flame in oil and chemical industry plants, HAWKS has designed and tested Fire Safety in accordance to various international standards such as BS 6755, API RF 6FA, API 607.

When the valve is filled with water in the closed position during the 30 minute flame period with a minimum average temperature of 1200°F (650°C), the maximum seat leakage (not bonnet joint, stem, or body joint) is limited below 400 milliliters per NPS valve size per minute during the fire burning test.

### Sealant System & Lubricant

For valve size of 4", 6" and larger; an emergency seat sealant injection system can be provided.

The lubricant and sealant injection points are located at the valve's body seat and stem seat.

An injection fitting is used for this maintenance work. Lubricant is to lubricate seat ring and stem o-ring.

Sealant is to repair faces of the seal.

Lubricant lowers the valve's torque and sealant seals any leakage. This process is for temporary measures only.

Please consult HAWKS for this activity or request for the procedures.

## END ENTRY CLASS 150 DIMENSIONS

| SIZE     | D<br>(mm) | L(mm) |     |     | H<br>(mm) | H1<br>(mm) | L1<br>(mm) | D1<br>(mm) | Weigh(kg) |     |
|----------|-----------|-------|-----|-----|-----------|------------|------------|------------|-----------|-----|
|          |           | RF    | RJ  | BW  |           |            |            |            | RF        | BW  |
| 2"       | 51        | 178   | 191 | 216 | 175       | 120        | 400        | 210        | 30        | 28  |
| 3"x2"x3" | 50        | 203   | 216 | 283 | 175       | 120        | 400        | 210        | 33        | 30  |
| 3"       | 76        | 203   | 216 | 283 | 210       | 150        | 800        | 260        | 60        | 52  |
| 4"x3"x4" | 75        | 229   | 241 | 305 | 210       | 150        | 800        | 260        | 64        | 59  |
| 4"       | 102       | 229   | 241 | 305 | 255       | 168        | 800        | 330        | 103       | 90  |
| 6"x4"x6" | 100       | 394   | 406 | 457 | 255       | 168        | 800        | 330        | 110       | 105 |

## END ENTRY CLASS 300 DIMENSIONS

| SIZE     | D<br>(mm) | L(mm) |     |     | H<br>(mm) | H1<br>(mm) | L1<br>(mm) | D1<br>(mm) | Weigh(kg) |     |
|----------|-----------|-------|-----|-----|-----------|------------|------------|------------|-----------|-----|
|          |           | RF    | RJ  | BW  |           |            |            |            | RF        | BW  |
| 2"       | 51        | 216   | 232 | 216 | 175       | 120        | 400        | 210        | 33        | 30  |
| 3"x2"x3" | 50        | 283   | 298 | 283 | 175       | 120        | 400        | 210        | 36        | 33  |
| 3"       | 76        | 283   | 298 | 283 | 210       | 150        | 800        | 260        | 63        | 60  |
| 4"x3"x4" | 75        | 305   | 321 | 305 | 210       | 150        | 800        | 260        | 93        | 70  |
| 4"       | 102       | 305   | 321 | 305 | 255       | 168        | 800        | 330        | 110       | 96  |
| 6"x4"x6" | 100       | 403   | 419 | 457 | 295       | 168        | 800        | 330        | 140       | 110 |

## END ENTRY CLASS 600 DIMENSIONS

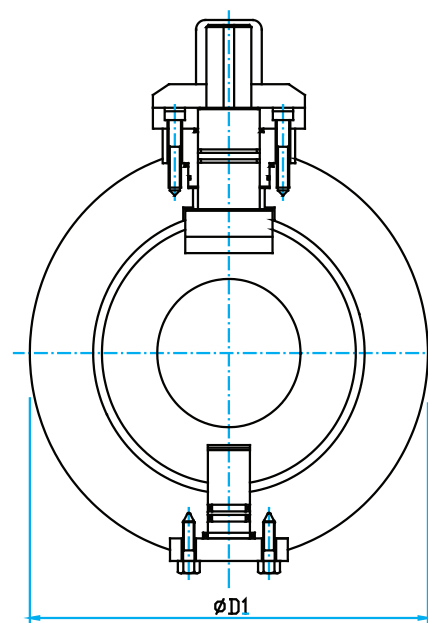
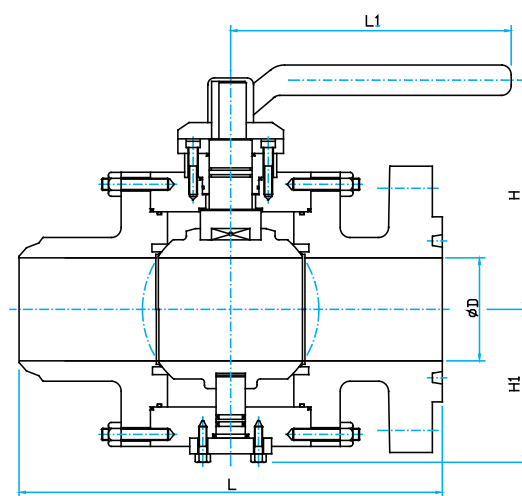
| SIZE     | D<br>(mm) | L(mm) |     |     | H<br>(mm) | H1<br>(mm) | L1<br>(mm) | D1<br>(mm) | Weigh(kg) |     |
|----------|-----------|-------|-----|-----|-----------|------------|------------|------------|-----------|-----|
|          |           | RF    | RJ  | BW  |           |            |            |            | RF        | BW  |
| 2"       | 51        | 292   | 295 | 292 | 180       | 125        | 450        | 215        | 41        | 32  |
| 3"x2"x3" | 50        | 356   | 359 | 356 | 180       | 125        | 450        | 215        | 45        | 34  |
| 3"       | 76        | 356   | 359 | 356 | 220       | 160        | 850        | 265        | 77        | 68  |
| 4"x3"x4" | 75        | 432   | 435 | 432 | 220       | 160        | 850        | 265        | 100       | 77  |
| 4"       | 102       | 432   | 435 | 432 | 260       | 170        | 850        | 335        | 139       | 112 |
| 6"x4"x6" | 100       | 559   | 562 | 559 | 260       | 170        | 850        | 335        | 190       | 142 |

## END ENTRY CLASS 900 DIMENSIONS

| SIZE     | D<br>(mm) | L(mm) |     |     | H<br>(mm) | H1<br>(mm) | L1<br>(mm) | D1<br>(mm) | Weigh(kg) |     |
|----------|-----------|-------|-----|-----|-----------|------------|------------|------------|-----------|-----|
|          |           | RF    | RJ  | BW  |           |            |            |            | RF        | BW  |
| 2"       | 51        | 368   | 372 | 368 | 185       | 130        | 500        | 220        | 53        | 37  |
| 3"x2"x3" | 50        | 381   | 384 | 381 | 185       | 130        | 500        | 220        | 57        | 50  |
| 3"       | 76        | 381   | 384 | 381 | 225       | 165        | 900        | 270        | 92        | 71  |
| 4"x3"x4" | 75        | 457   | 460 | 457 | 225       | 165        | 900        | 270        | 100       | 77  |
| 4"       | 102       | 457   | 460 | 457 | 265       | 175        | 900        | 340        | 166       | 116 |
| 6"x4"x6" | 100       | 610   | 613 | 610 | 265       | 175        | 900        | 340        | 225       | 180 |

## END ENTRY CLASS 1500 DIMENSIONS

| SIZE     | D<br>(mm) | L(mm) |       |       | H<br>(mm) | H1<br>(mm) | L1<br>(mm) | D1<br>(mm) | Weigh(kg) |     |
|----------|-----------|-------|-------|-------|-----------|------------|------------|------------|-----------|-----|
|          |           | RF    | RJ    | BW    |           |            |            |            | RF        | BW  |
| 2"       | 51        | 368.3 | 371.5 | 368.3 | 210       | 190        | 600        | 210        | 59        | 39  |
| 3"x2"x3" | 50        | 469.9 | 473.1 | 469.9 | 210       | 190        | 600        | 210        | 85        | 76  |
| 3"       | 76        | 469.9 | 473.1 | 469.9 | 270       | 230        | 900        | 260        | 120       | 84  |
| 4"x3"x4" | 75        | 546.1 | 549.3 | 546.1 | 270       | 230        | 900        | 260        | 150       | 125 |
| 4"       | 102       | 546.1 | 549.3 | 546.1 | 320       | 240        | 1200       | 340        | 195       | 132 |
| 6"x4"x6" | 100       | 704.9 | 711.2 | 704.9 | 320       | 240        | 1200       | 340        | 300       | 262 |

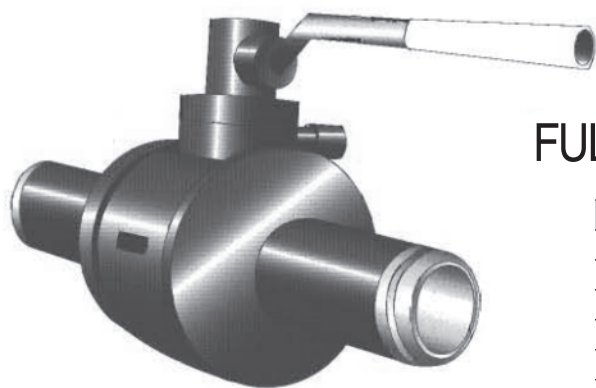


## NOTE:

- \* Valves are in inches, dimensions are in mm.
- \* Face to face dimensions in accordance to API 6D & ANSI B16.10.
- \* Flanged ends in accordance to ANSI B16.5
- \* Butt weld ends in accordance to ANSI B16.25



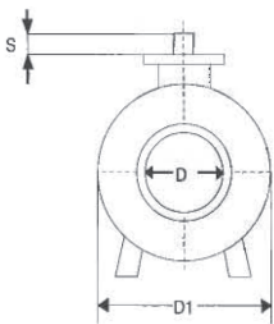
FULLY WELDED BALL VALVE



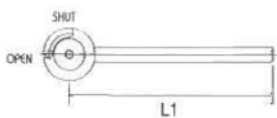
FULLY WELDED CLASS 150 DIMENSIONS

| SIZE     | D   | L   | H <sub>1</sub> | H   | D <sub>1</sub> | S  | L <sub>1</sub> | Weight |
|----------|-----|-----|----------------|-----|----------------|----|----------------|--------|
| 2"       | 51  | 216 | 82             | 106 | 160            | 43 | 305            | 19     |
| 3"x2"x3" | 51  | 283 | 82             | 106 | 160            | 43 | 305            | 22     |
| 3"       | 76  | 283 | 116            | 133 | 218            | 50 | 450            | 33     |
| 4"x2"x4" | 76  | 305 | 116            | 133 | 218            | 50 | 450            | 36     |
| 4"       | 102 | 305 | 141            | 159 | 243            | 61 | 915            | 52     |
| 6"x4"x6" | 102 | 457 | 141            | 159 | 243            | 61 | 915            | 66     |

FULLY WELDED CLASS 300 DIMENSIONS

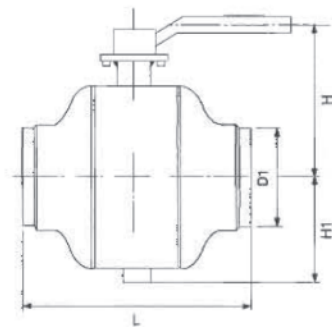


| SIZE     | D   | L   | H <sub>1</sub> | H   | D <sub>1</sub> | S  | L <sub>1</sub> | Weight |
|----------|-----|-----|----------------|-----|----------------|----|----------------|--------|
| 2"       | 51  | 216 | 82             | 106 | 162            | 43 | 450            | 21     |
| 3"x2"x3" | 51  | 283 | 82             | 106 | 162            | 43 | 450            | 24     |
| 3"       | 76  | 283 | 116            | 133 | 221            | 50 | 915            | 35     |
| 4"x2"x4" | 76  | 305 | 116            | 133 | 221            | 50 | 915            | 47     |
| 4"       | 102 | 305 | 141            | 159 | 245            | 61 | 915            | 68     |
| 6"x4"x6" | 102 | 457 | 141            | 159 | 245            | 61 | 915            | 85     |



FULLY WELDED CLASS 600 DIMENSIONS

| SIZE     | D   | L   | H <sub>1</sub> | H   | D <sub>1</sub> | S  | L <sub>1</sub> | Weight |
|----------|-----|-----|----------------|-----|----------------|----|----------------|--------|
| 2"       | 51  | 292 | 85             | 106 | 165            | 43 | 610            | 23     |
| 3"x2"x3" | 51  | 356 | 85             | 106 | 165            | 43 | 610            | 30     |
| 3"       | 76  | 356 | 120            | 155 | 225            | 61 | 900            | 49     |
| 4"x2"x4" | 76  | 432 | 120            | 155 | 225            | 61 | 900            | 70     |
| 4"       | 102 | 432 | 145            | 190 | 250            | 61 | 1200           | 96     |
| 6"x4"x6" | 102 | 559 | 145            | 190 | 250            | 61 | 1200           | 110    |



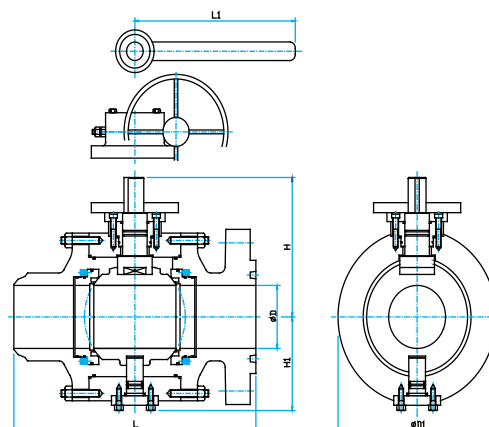
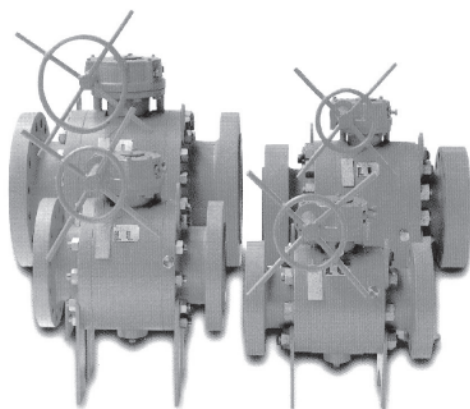
FULLY WELDED CLASS 900 DIMENSIONS

| SIZE     | D   | L   | H <sub>1</sub> | H   | D <sub>1</sub> | S  | L <sub>1</sub> | Weight |
|----------|-----|-----|----------------|-----|----------------|----|----------------|--------|
| 2"       | 51  | 368 | 88             | 119 | 175            | 61 | 610            | 40     |
| 3"x2"x3" | 51  | 381 | 88             | 119 | 175            | 61 | 610            | 47     |
| 3"       | 76  | 381 | 125            | 155 | 239            | 61 | 900            | 62     |
| 4"x2"x4" | 76  | 457 | 125            | 155 | 239            | 61 | 900            | 78     |
| 4"       | 102 | 457 | 151            | 190 | 265            | 61 | 1200           | 105    |
| 6"x4"x6" | 102 | 610 | 151            | 190 | 265            | 61 | 1200           | 155    |

FULLY WELDED CLASS 1500 DIMENSIONS

| SIZE     | D   | L   | H <sub>1</sub> | H   | D <sub>1</sub> | S  | L <sub>1</sub> | Weight |
|----------|-----|-----|----------------|-----|----------------|----|----------------|--------|
| 2"       | 51  | 368 | 109            | 119 | 221            | 61 | 600            | 44     |
| 3"x2"x3" | 51  | 470 | 109            | 119 | 221            | 61 | 600            | 60     |
| 3"       | 76  | 470 | 154            | 155 | 302            | 61 | 900            | 89     |
| 4"x2"x4" | 76  | 546 | 154            | 155 | 302            | 61 | 900            | 100    |
| 4"       | 102 | 546 | 186            | 190 | 335            | 61 | 1200           | 150    |
| 6"x4"x6" | 102 | 705 | 186            | 190 | 335            | 61 | 1200           | 229    |

NOTE : • Valves are in Inch, Dimensions are in mm,  
• Face to face dimensions In accordance with  
API 6D & ANSI B 16.10,  
• Butt Weld Ends in accordance with ANSI B 16.25,  
• The contents of this cataiogue including approximate  
weight are changeable without notice.



## ANSI CLASS 150

| SIZE            | D    | L(mm) |      |      | H    | H1   | L1   | D1   | Weigth(kg) |      |
|-----------------|------|-------|------|------|------|------|------|------|------------|------|
|                 | (mm) | RF    | RJ   | BW   | (mm) | (mm) | (mm) | (mm) | RF         | BW   |
| 6"              | 152  | 394   | 406  | 457  | 280  | 180  | 800  | 335  | 210        | 202  |
| 8" x 6 x 8"     | 150  | 457   | 470  | 521  | 280  | 180  | 800  | 335  | 225        | 210  |
| 8"              | 203  | 457   | 470  | 521  | 320  | 220  | 800  | 420  | 355        | 331  |
| 10" x 8" x 10"  | 200  | 533   | 546  | 559  | 320  | 220  | 800  | 420  | 375        | 345  |
| 10"             | 254  | 533   | 546  | 559  | 360  | 265  | Gear | 510  | 502        | 492  |
| 12" x 10" x 12" | 250  | 610   | 622  | 635  | 360  | 265  | Gear | 510  | 538        | 505  |
| 12"             | 305  | 610   | 622  | 635  | 360  | 290  | Gear | 590  | 705        | 660  |
| 16" x 12" x 16" | 300  | 762   | 775  | 838  | 420  | 350  | Gear | 705  | 730        | 670  |
| 14"             | 337  | 686   | 699  | 762  | 390  | 310  | Gear | 630  | 865        | 815  |
| 16" x 14" x 16" | 337  | 762   | 775  | 838  | 390  | 310  | Gear | 630  | 890        | 870  |
| 16"             | 387  | 762   | 775  | 838  | 420  | 350  | Gear | 705  | 1020       | 975  |
| 18" x 16" x 18" | 387  | 864   | 876  | 914  | 420  | 350  | Gear | 705  | 1120       | 1050 |
| 18"             | 438  | 864   | 876  | 914  | 620  | 430  | Gear | 800  | 1469       | 1360 |
| 20" x 18" x 20" | 438  | 914   | 927  | 991  | 620  | 430  | Gear | 800  | 1550       | 1450 |
| 20"             | 489  | 914   | 927  | 991  | 635  | 475  | Gear | 870  | 1935       | 1840 |
| 24" x 20" x 24" | 490  | 1067  | 1080 | 1143 | 635  | 475  | Gear | 870  | 2050       | 1970 |
| 24"             | 591  | 1067  | 1080 | 1143 | 810  | 500  | Gear | 1040 | 2857       | 2685 |
| 30" x 24" x 30" | 590  | 1295  |      | 1397 | 810  | 500  | Gear | 1040 | 2910       | 2820 |
| 26"             | 635  | 1143  |      | 1245 | 710  | 550  | Gear | 1060 | 3525       | 3442 |
| 28"             | 686  | 1245  |      | 1346 | 880  | 620  | Gear | 1160 | 4052       | 3950 |
| 30"             | 737  | 1295  |      | 1397 | 930  | 669  | Gear | 1245 | 4815       | 4730 |
| 36" x 30" x 36" | 735  | 1524  |      | 1727 | 930  | 669  | Gear | 1245 | 5000       | 4850 |
| 32"             | 781  | 1372  |      | 1524 | 950  | 751  | Gear | 1305 | 5500       | 5392 |
| 34"             | 832  | 1473  |      | 1626 | 1018 | 777  | Gear | 1384 | 6720       | 6590 |

## NOTE:

- \* Valves are in inches, dimensions are in mm.
- \* Face to face dimensions in accordance to API 6D & ANSI B16.10.
- \* Flanged ends in accordance to ANSI B16.5
- \* Butt weld ends in accordance to ANSI B16.25

## ANSI CLASS 300

| SIZE            | D    | L (mm) |      |      | H    | H1   | L1   | D1   | Weigth(kg) |      |
|-----------------|------|--------|------|------|------|------|------|------|------------|------|
|                 | (mm) | RF     | RJ   | BW   | (mm) | (mm) | (mm) | (mm) | RF         | BW   |
| 6"              | 152  | 403    | 419  | 457  | 283  | 183  | 800  | 335  | 226        | 195  |
| 8" x 6 x 8"     | 150  | 502    | 518  | 521  | 283  | 183  | 800  | 335  | 225        | 220  |
| 8"              | 203  | 502    | 518  | 521  | 323  | 223  | Gear | 420  | 371        | 325  |
| 10" x 8" x 10"  | 200  | 568    | 584  | 559  | 323  | 223  | Gear | 420  | 420        | 370  |
| 10"             | 254  | 568    | 584  | 559  | 365  | 270  | Gear | 510  | 562        | 475  |
| 12" x 10" x 12" | 250  | 648    | 664  | 635  | 365  | 270  | Gear | 510  | 585        | 520  |
| 12"             | 305  | 648    | 664  | 635  | 370  | 290  | Gear | 590  | 760        | 682  |
| 16" x 12" x 16" | 300  | 838    | 854  | 838  | 370  | 290  | Gear | 590  | 835        | 745  |
| 14"             | 337  | 762    | 778  | 762  | 390  | 310  | Gear | 630  | 895        | 815  |
| 16" x 14" x 16" | 337  | 838    | 854  | 838  | 400  | 342  | Gear | 630  | 920        | 865  |
| 16"             | 387  | 838    | 854  | 838  | 420  | 350  | Gear | 705  | 1295       | 1065 |
| 18" x 16" x 18" | 387  | 914    | 930  | 914  | 430  | 350  | Gear | 705  | 1380       | 1290 |
| 18"             | 438  | 914    | 930  | 914  | 495  | 395  | Gear | 800  | 1685       | 1500 |
| 20" x 18" x 20" | 438  | 991    | 1010 | 991  | 495  | 395  | Gear | 800  | 1790       | 1850 |
| 20"             | 489  | 991    | 1010 | 991  | 530  | 430  | Gear | 870  | 2038       | 1800 |
| 24" x 20" x 24" | 490  | 1143   | 1165 | 1143 | 530  | 430  | Gear | 870  | 2215       | 1980 |
| 24"             | 591  | 1143   | 1165 | 1143 | 630  | 515  | Gear | 1040 | 3045       | 2702 |
| 30" x 24" x 30" | 590  | 1397   |      | 1397 | 630  | 515  | Gear | 1040 | 3200       | 2900 |
| 26"             | 635  | 1245   |      | 1245 | 710  | 550  | Gear | 1100 | 3870       | 3460 |
| 28"             | 686  | 1346   |      | 1346 | 880  | 620  | Gear | 1200 | 4550       | 3890 |
| 30"             | 737  | 1397   |      | 1397 | 930  | 670  | Gear | 1250 | 5580       | 4958 |
| 36" x 30" x 36" | 740  | 1727   |      | 1727 | 930  | 670  | Gear | 1250 | 6100       | 5500 |
| 32"             | 781  | 1524   |      | 1524 | 950  | 760  | Gear | 1350 | 6245       | 5612 |
| 34"             | 832  | 1626   |      | 1626 | 1020 | 780  | Gear | 1400 | 7348       | 6572 |

## ANSI CLASS 600

| SIZE            | D<br>(mm) | L (mm) |      |      | H<br>(mm) | H1<br>(mm) | L1<br>(mm) | D1<br>(mm) | Weight (kg) |      |
|-----------------|-----------|--------|------|------|-----------|------------|------------|------------|-------------|------|
|                 |           | RF     | RJ   | BW   |           |            |            |            | RF          | BW   |
| 6"              | 152       | 559    | 562  | 559  | 285       | 185        | 800        | 355        | 258         | 213  |
| 8" x 6" x 8"    | 150       | 660    | 664  | 660  | 285       | 185        | Gear       | 355        | 315         | 260  |
| 8"              | 203       | 660    | 664  | 660  | 325       | 225        | Gear       | 430        | 445         | 381  |
| 10" x 8" x 10"  | 200       | 787    | 791  | 787  | 325       | 225        | Gear       | 430        | 570         | 440  |
| 10"             | 254       | 787    | 791  | 787  | 370       | 375        | Gear       | 520        | 715         | 577  |
| 12" x 10" x 12" | 250       | 838    | 841  | 838  | 370       | 375        | Gear       | 520        | 850         | 730  |
| 12"             | 305       | 838    | 841  | 838  | 395       | 300        | Gear       | 600        | 910         | 760  |
| 16" x 12" x 16" | 300       | 991    | 994  | 991  | 395       | 300        | Gear       | 600        | 1300        | 1120 |
| 14"             | 337       | 889    | 892  | 889  | 410       | 315        | Gear       | 640        | 1220        | 1070 |
| 16" x 14" x 16" | 337       | 991    | 994  | 991  | 485       | 355        | Gear       | 715        | 1380        | 1200 |
| 16"             | 387       | 991    | 994  | 991  | 485       | 355        | Gear       | 715        | 1695        | 1280 |
| 18" x 16" x 18" | 387       | 1092   | 1095 | 1092 | 540       | 405        | Gear       | 820        | 1790        | 1710 |
| 18"             | 438       | 1092   | 1095 | 1092 | 540       | 405        | Gear       | 820        | 1850        | 1800 |
| 20" x 18" x 20" | 438       | 1194   | 1200 | 1194 | 575       | 440        | Gear       | 890        | 1960        | 1710 |
| 20"             | 489       | 1194   | 1200 | 1194 | 575       | 440        | Gear       | 890        | 2710        | 2370 |
| 24" x 20" x 24" | 490       | 1397   | 1407 | 1397 | 575       | 440        | Gear       | 890        | 3430        | 3100 |
| 24"             | 291       | 1397   | 1407 | 1397 | 720       | 520        | Gear       | 1040       | 3844        | 3620 |
| 30" x 24" x 30" | 590       | 1651   | 1664 | 1651 | 720       | 520        | Gear       | 1040       | 4700        | 4420 |
| 26"             | 635       | 1448   | 1461 | 1448 | 738       | 650        | Gear       | 1100       | 5000        | 4380 |
| 28"             | 686       | 1549   | 1562 | 1549 | 780       | 690        | Gear       | 1175       | 6110        | 5510 |
| 30"             | 737       | 1651   | 1664 | 1651 | 820       | 730        | Gear       | 1270       | 6700        | 6000 |
| 36" x 30" x 36" | 740       | 2083   | 2099 | 2083 | 820       | 730        | Gear       | 1270       | 7400        | 6730 |
| 32"             | 781       | 1778   | 1794 | 1778 | 860       | 767        | Gear       | 1335       | 7799        | 7290 |
| 34"             | 832       | 1930   | 1946 | 1930 | 896       | 805        | Gear       | 1400       | 8500        | 7550 |

## ANSI CLASS 900

| SIZE            | D<br>(mm) | L (mm) |      |      | H<br>(mm) | H1<br>(mm) | L1<br>(mm) | D1<br>(mm) | Weight (kg) |       |
|-----------------|-----------|--------|------|------|-----------|------------|------------|------------|-------------|-------|
|                 |           | RF     | RJ   | BW   |           |            |            |            | RF          | BW    |
| 6"              | 152       | 610    | 613  | 610  | 290       | 190        | 900        | 360        | 390         | 301   |
| 8" x 6" x 8"    | 150       | 737    | 740  | 737  | 290       | 190        | 900        | 360        | 475         | 330   |
| 8"              | 203       | 737    | 740  | 737  | 330       | 230        | Gear       | 435        | 568         | 442   |
| 10" x 8" x 10"  | 200       | 838    | 841  | 838  | 330       | 230        | Gear       | 435        | 690         | 575   |
| 10"             | 254       | 838    | 841  | 838  | 375       | 280        | Gear       | 530        | 820         | 640   |
| 12" x 10" x 12" | 250       | 965    | 968  | 965  | 375       | 280        | Gear       | 530        | 945         | 765   |
| 12"             | 305       | 965    | 968  | 965  | 420       | 305        | Gear       | 610        | 1210        | 1015  |
| 16" x 12" x 16" | 300       | 1130   | 1140 | 1130 | 420       | 305        | Gear       | 610        | 1920        | 1700  |
| 14"             | 324       | 1029   | 1038 | 1029 | 460       | 320        | Gear       | 645        | 1655        | 1302  |
| 16" x 14" x 16" | 324       | 1130   | 1140 | 1130 | 460       | 320        | Gear       | 645        | 1950        | 1720  |
| 16"             | 375       | 1130   | 1140 | 1130 | 500       | 360        | Gear       | 720        | 2060        | 1605  |
| 18" x 16" x 18" | 375       | 1219   | 1232 | 1219 | 500       | 360        | Gear       | 720        | 2200        | 1820  |
| 18"             | 425       | 1219   | 1232 | 1219 | 510       | 410        | Gear       | 820        | 2870        | 2275  |
| 20" x 18" x 20" | 425       | 1321   | 1334 | 1321 | 510       | 410        | Gear       | 820        | 2900        | 2350  |
| 20"             | 473       | 1321   | 1334 | 1321 | 620       | 450        | Gear       | 910        | 3475        | 2765  |
| 24" x 20" x 24" | 475       | 1549   | 1569 | 1549 | 620       | 450        | Gear       | 910        | 4500        | 3160  |
| 24"             | 572       | 1549   | 1569 | 1549 | 700       | 540        | Gear       | 1090       | 5570        | 4150  |
| 30" x 24" x 30" | 570       | 1880   | 1902 | 1880 | 700       | 540        | Gear       | 1090       | 6550        | 4760  |
| 26"             | 620       | 1651   | 1673 | 1651 | 740       | 650        | Gear       | 1180       | 7100        | 5900  |
| 28"             | 667       | 1753   | 1775 | 1753 | 780       | 680        | Gear       | 1270       | 5990        | 7500  |
| 30"             | 714       | 1880   | 1902 | 1877 | 870       | 790        | Gear       | 1380       | 9500        | 7450  |
| 36" x 30" x 36" | 725       | 2286   | 2315 | 2286 | 870       | 790        | Gear       | 1380       | 10900       | 8050  |
| 32"             | 762       | 2032   | 2054 | 2032 | 920       | 820        | Gear       | 1450       | 12100       | 10200 |
| 34"             | 80        | 2159   | 2188 | 2159 | 960       | 860        | Gear       | 1520       | 17500       | 14400 |

## ANSI CLASS 1500

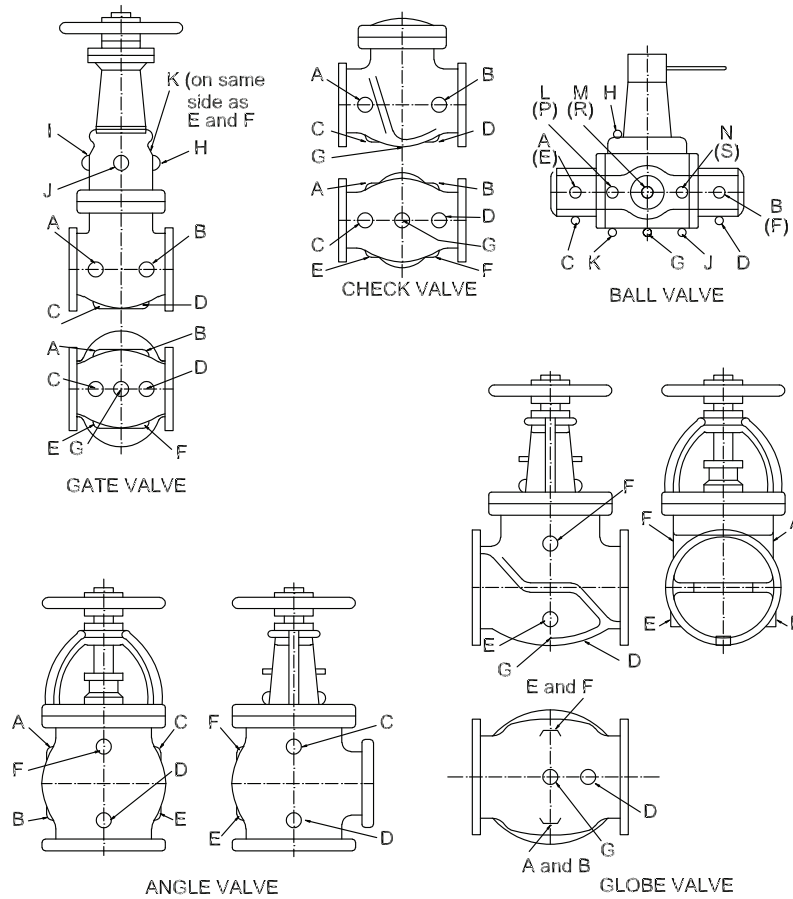
| SIZE            | D<br>(mm) | L(mm)  |        |        | H<br>(mm) | H1<br>(mm) | L1<br>(mm) | D1<br>(mm) | Weight (kg) |      |
|-----------------|-----------|--------|--------|--------|-----------|------------|------------|------------|-------------|------|
|                 |           | RF     | RJ     | BW     |           |            |            |            | RF          | BW   |
| 6"              | 147       | 704.9  | 711.2  | 704.9  | 210       | 260        | Gear       | 440        | 580         | 435  |
| 8" x 6" x 8"    | 150       | 831.9  | 841.4  | 831.9  | 210       | 260        | Gear       | 440        | 700         | 480  |
| 8"              | 194       | 831.9  | 841.4  | 831.9  | 260       | 330        | Gear       | 530        | 755         | 548  |
| 10" x 8" x 10"  | 200       | 990.6  | 1000.1 | 990.6  | 260       | 330        | Gear       | 530        | 930         | 575  |
| 10"             | 242       | 990.6  | 1000.1 | 990.6  | 310       | 390        | Gear       | 640        | 1200        | 840  |
| 12" x 10" x 12" | 240       | 1130.3 | 1146.2 | 1130.3 | 310       | 390        | Gear       | 640        | 1320        | 890  |
| 12"             | 289       | 1130.3 | 1146.2 | 1130.3 | 350       | 490        | Gear       | 710        | 1659        | 1209 |
| 14" x 12" x 14" | 290       | 1257.3 | 1276.4 | 1257.3 | 350       | 490        | Gear       | 710        | 1920        | 1230 |
| 16" x 12" x 16" | 290       | 1384.3 | 1406.5 | 1384.3 | 350       | 490        | Gear       | 710        | 2150        | 1300 |
| 14"             | 318       | 1257.3 | 1276.4 | 1257.3 | 395       | 490        | Gear       | 800        | 2800        | 2059 |
| 16"             | 362       | 1384.3 | 1406.5 | 1384.3 | 445       | 530        | Gear       | 905        | 4120        | 3120 |

## ENGINEERING DATA

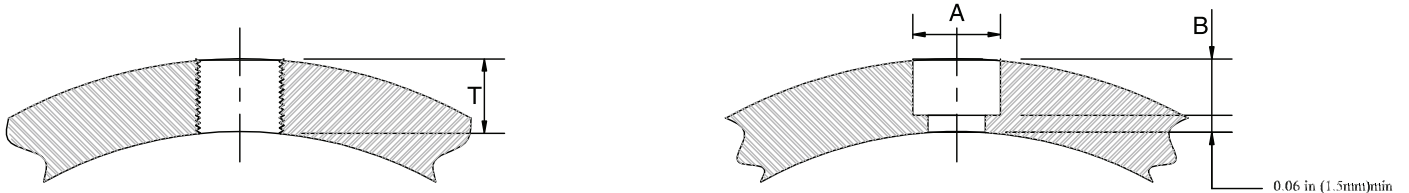
### CONFORMANCE STANDARDS

HAWKS COMPLY TO THE FOLLOWING STANDARDS AS APPLICABLE TO CUSTOMER REQUIREMENTS.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| API Spec 6D Latest Edition<br>API Standard 598 Latest Edition<br>API Standard 600 Latest Edition<br>API Standard 603 Latest Edition<br>API Standard 605 Latest Edition                                                                                                                                                                                                                                                                                           | : API Specification Pipeline Valve<br>: Valves Inspection Test<br>: Steel Gate, Flange and Butt – Welding Ends<br>: Class 150, Cast Corrosion – Resistant Flanged Ends Gate Valve<br>: Large Diameter Carbon Steel Flanges                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| ANSI B16.5 Latest Edition<br>ANSI B16.10 Latest Edition<br>ANSI B16.25 Latest Edition<br>ANSI B16.4 Latest Edition<br>MSS STANDARD Practice SP-6 Latest Edition<br><br>MSS Standard Practice SP-25 Latest Edition<br>MSS Standard Practice SP-44 Latest Edition<br>MSS Standard Practice SP-45 Latest Edition                                                                                                                                                    | : Steel Pipe Flanges and Flanged Fittings<br>: Face –To –Face and End –To –End Dimensions Of Ferrous Valves<br>: Butt- Welding Ends.<br>: Valves – Flanged, Threaded, and Welling Ends<br>: Standard Finishes For Contact Faces Of Pipe Flange And Connecting-<br>end Flanges of Valve and Fittings<br>: Standard Marking System for Valves, Fittings, Flanges and Unions<br>: Steel Pipe Line Flanges<br>: By-Pass and Drain Connection Standard                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| BS 1414 Latest Edition<br>BS 1868 Latest Edition<br>BS 1873 Latest Edition<br><br>BS 5352 Latest Edition<br>BS 6364 Latest Edition                                                                                                                                                                                                                                                                                                                               | : Steel Wedge Gate Valve (Flange and Butt-Welding Ends)<br>: Steel Check Valves (Flange and Butt-Welding Ends)<br>: Steel Globe and Globe Stop and Check Valve (Flange and Butt-<br>Welding Ends)<br>: Steel Wedge Gate, Globe and Check Valves (50mm and Smaller)<br>: Valve for Cryogenic Service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| JIS B2003 Latest Edition<br>JIS B2201 Latest Edition<br>JIS B2203 Latest Edition<br>JIS B2210 Latest Edition<br>JIS B2017 Latest Edition<br>JIS B2073 Latest Edition<br>JIS B2074 Latest Edition<br>JIS B2081 Latest Edition<br>JIS B2083 Latest Edition<br>JIS B2084 Latest Edition<br>JPI 7S-15 Latest Edition<br>JPI 7S-23 Latest Edition<br>JPI 7S-24 Latest Edition<br>JPI 7S-39 Latest Edition<br>JPI 7S-46 Latest Edition<br><br>JPI 7S-47 Latest Edition | : General Rules for Inspection of Valves<br>: Pressure Rating for Ferrous Material Pipe Flanges<br>: Tolerance for Pipe Flanges<br>: Basic Dimensions of Ferrous Material Pipe Flanges<br>: 10kgf/cm Cast Steel Flanged Globe Valves<br>: 10kgf/cm Cast Steel Flanged Gate Valves (Outside Screw Type)<br>: 10kgf/cm Cast Steel Flanged Swing Check Valves<br>: 20kgf/cm Cast Steel Flanged Globe Valves<br>: 20kgf/cm Cast Steel Flanged Gate Valves (Outside Screw Type)<br>: 20kgf/cm Cast Steel Flanged Swing Check Valves<br>: Steel Pipe Flanges for The Petroleum Industry<br>: Ring Join Gasket and Grooves for Petroleum Industry<br>: Standard Markin System for Valves<br>: Valve Inspection and Test<br>: Cast Steel Flanged Valves for The Petroleum Industry (Class 150,<br>300)<br>: Cast Steel for The Petroleum Industry, Flanged or Butt-Welding Ends.<br>(Class 600 to 2500) |
| API<br>ANSI<br>ASTM<br>ASME<br>ASS<br><br>BS<br>JIS<br>JPI<br>NACE<br>AWS                                                                                                                                                                                                                                                                                                                                                                                        | : American Petroleum Institute<br>: American National Standard Institute<br>: American Society for Testing and Materials<br>: American Society of Mechanical Engineers<br>: Manufacturers Standardization Society of the Valves and Fitting<br>Industry<br>: British Standard Institute<br>: Japanese Industrial Standrds<br>: Japan Petroleum Institute<br>: National Association of Corrosion Engineers<br>: American Welding Society                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**GENERAL NOTE**

The above sketches represent valves with symmetrical shapes. Sketches are illustrative only and do not imply actual design.

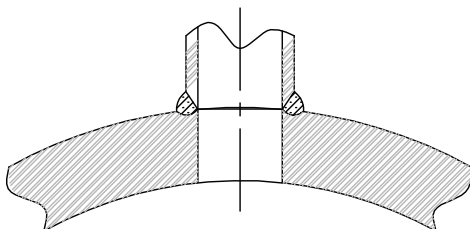
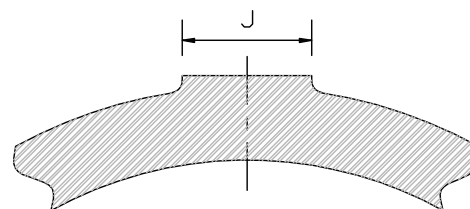
**METHOD OF DESIGNATING LOCATION OF AUXILIARY CONNECTIONS WHEN SPECIFIED**

| Conn. Size NPS          | 3/8  | 1/2  | 3/4  | 1    | 1 1/4 | 1 1/2 | 2    |
|-------------------------|------|------|------|------|-------|-------|------|
| Length of Thread, T(13) |      |      |      |      |       |       |      |
| in                      | 0.41 | 0.53 | 0.55 | 0.68 | 0.71  | 0.72  | 0.76 |
| mm                      | 11   | 14   | 14   | 18   | 18    | 19    | 20   |

Note:

(1) In case shall the effective length of thread, T be less than shown in table above. These lengths are equal to the effective thread lengths of American National Standard External Pipe Threads (ANS2.1)

| Conn. Size NPS        | 3/8   | 1/2   | 3/4   | 1     | 1 1/4 | 1 1/2 | 2     |
|-----------------------|-------|-------|-------|-------|-------|-------|-------|
| Min. Dia. of Socket A |       |       |       |       |       |       |       |
| in                    | 0.690 | 0.855 | 1.065 | 1.330 | 1.675 | 1.915 | 2.406 |
| mm                    | 17.5  | 22    | 27    | 34    | 43    | 49    | 61    |
| Min. Dia. of Socket A |       |       |       |       |       |       |       |
| in                    | 0.690 | 0.855 | 1.065 | 1.330 | 1.675 | 1.915 | 2.406 |
| mm                    | 17.5  | 22    | 27    | 34    | 43    | 49    | 61    |

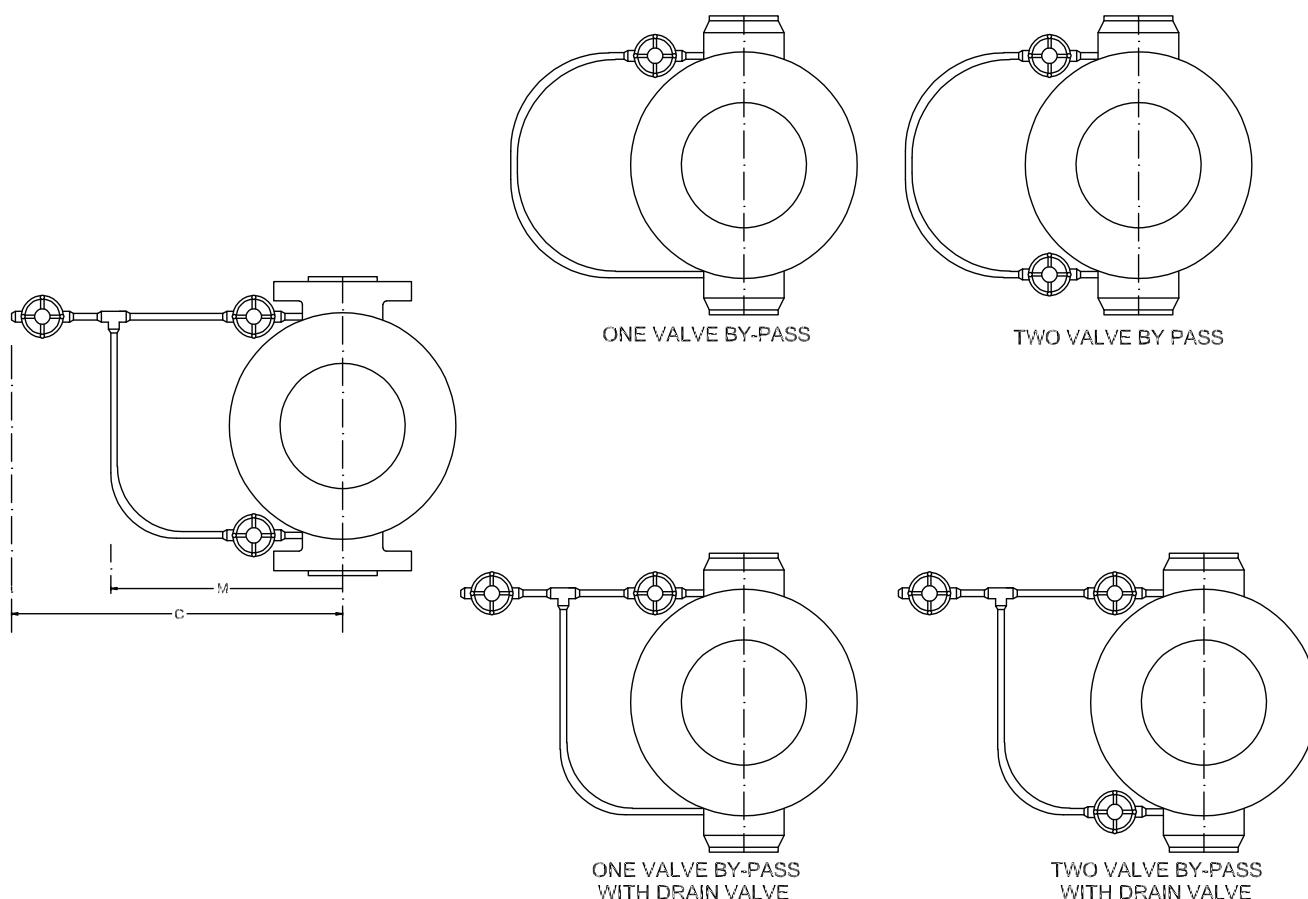
**Thread Length for auxilliary connections****Socket welding for auxilliary connections**

| Conn. Size NPS          | 3/8  | 1/2  | 3/4  | 1    | 1 1/4 | 1 1/2 | 2    |
|-------------------------|------|------|------|------|-------|-------|------|
| Length of Thread, T(13) |      |      |      |      |       |       |      |
| in                      | 1.25 | 1.50 | 1.75 | 2.12 | 2.50  | 2.75  | 3.38 |
| mm                      | 32   | 38   | 44   | 54   | 64    | 70    | 86   |

**Buttwelding for auxilliary connections****Bosses for auxilliary connections**



# BY - PASS & DRAINS TO ANSI B16.34



BY - PASS SIZES AND CLEARANCE DIMENSION - BOLTED BONNET (Inches)

| Size of Valve   |            |        | 4      | 6      | 8        | 10       | 12       | 14     | 16      | 18       | 20     | 24     |
|-----------------|------------|--------|--------|--------|----------|----------|----------|--------|---------|----------|--------|--------|
| Size of By-Pass |            |        | 1/2    | 3/4    | 3/4      | 1        | 1        | 1      | 1       | 1        | 1      | 1      |
| Built-up        | 150 Class  | M-F.E. | -      | -      | 17 1/2   | 19 13/16 | 21 1/8   | 23 1/8 | 23 3/4  | 25 1/8   | 25 1/2 | 28 3/4 |
|                 |            | M-W.E. | -      | -      | 18 7/8   | 20 7/8   | 21 13/16 | 24 1/2 | 25 9/16 | 25 13/16 | 26 7/8 | 30     |
| By-Pass         |            | C-F.E. | -      | -      | 23 3/8   | 26 11/16 | 28       | 30     | 30 5/8  | 32       | 32 3/8 | 35 5/8 |
|                 |            | C-W.E. | -      | -      | 24 3/4   | 27 3/4   | 28 11/16 | 31 3/8 | 32 7/16 | 32 11/16 | 33 3/4 | 36 7/8 |
| for use with    |            |        |        |        |          |          |          |        |         |          |        |        |
| Main valves     | 300 Class  | M      | -      | -      | 18 13/16 | 20 13/16 | 22 1/8   | 24 3/4 | 25 3/4  | 27 1/4   | 28 1/2 | 31 1/8 |
|                 |            | C      | -      | -      | 24 11/16 | 27 11/16 | 29       | 31 5/8 | 32 5/8  | 34 1/8   | 35 3/8 | 38     |
| Approximate     | 600 Class  | M      | 16 7/8 | 19 3/8 | 20 1/2   | 24 1/4   | 25 1/4   | 26     | 26 7/8  | 30 3/4   | 30 3/4 | -      |
|                 |            | C      | 22     | 25 3/8 | 26 1/2   | 31       | 32       | 32 3/4 | 33 5/8  | 37 1/2   | 37 1/2 | -      |
| Clearance       |            |        |        |        |          |          |          |        |         |          |        |        |
|                 |            |        |        |        |          |          |          |        |         |          |        |        |
| Inches          | 900 Class  | M      | 16 7/8 | 19 1/2 | 20 5/8   | 24 1/4   | 25 1/8   | 26 1/8 | 27 1/4  | 30 1/8   | -      | -      |
|                 |            | C      | 22 1/8 | 25 1/2 | 26 5/8   | 31       | 32 1/8   | 32 7/8 | 34      | 36 7/8   | -      | -      |
|                 | 1500 Class | M      | 17     | 19 5/8 | 20 3/4   | 24 1/4   | 25 3/8   | -      | -       | -        | -      | -      |
|                 |            | C      | 22 3/8 | 25 3/4 | 26 7/8   | 31 1/8   | 32 3/8   | -      | -       | -        | -      | -      |

BY - PASS SIZES AND CLEARANCE DIMENSION - BOLTED BONNET (Inches)

| Size of Valve                                                                            |            |   | 4                      | 6      | 8      | 10     | 12     | 14     | 16     | 18     | 20     | 24     |  |
|------------------------------------------------------------------------------------------|------------|---|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--|
| Size of By-Pass                                                                          |            |   | 1/2                    | 3/4    | 3/4    | 1      | 1      | 1      | 1      | 1      | 1      | 1      |  |
| Built-up<br>By-Pass<br>for use with<br>Main valves<br>Approximate<br>Clearance<br>Inches | 300 Class  | M | 17                     | 24 5/8 | 25 1/2 | 27 5/8 | 29 1/8 | 30 1/8 | 29 1/2 | 29 3/4 | 31     | 33 1/4 |  |
|                                                                                          |            | C | 23 1/2                 | 32 5/8 | 33 1/2 | 35 7/8 | 37 1/4 | 38 1/4 | 37 5/8 | 37 7/8 | 39 1/8 | 41 3/8 |  |
|                                                                                          | 600 Class  | M | 17                     | 24 1/2 | 25 1/8 | 27 1/2 | 28 1/2 | 29 5/8 | 29     | 30 1/2 | 31 1/2 | 33 3/4 |  |
|                                                                                          |            | C | 23 1/2                 | 32 1/2 | 33 1/4 | 35 5/8 | 36 5/8 | 37 3/4 | 37 1/8 | 38 5/8 | 39 5/8 | 41 7/8 |  |
|                                                                                          | 900 Class  | M | 17                     | 24 1/2 | 25 5/8 | 28 1/4 | 28     | 28 3/4 | 29 7/8 | -      | -      | -      |  |
|                                                                                          |            | C | 23 1/2                 | 32 1/2 | 33 3/4 | 36 3/8 | 36 1/8 | 36 7/8 | 68     | -      | -      | -      |  |
|                                                                                          | 1500 Class | M | } Dimension on Request |        |        |        |        |        |        |        |        |        |  |
|                                                                                          |            | C |                        |        |        |        |        |        |        |        |        |        |  |

## BODY WALL THICKNESS

**(API 603 ANSI B16.34)**  
LIGHT WALL

| NORMAL<br>SIZE |     | RATINGS |      |      |      |       |      |       |      |        |      |        |       |
|----------------|-----|---------|------|------|------|-------|------|-------|------|--------|------|--------|-------|
|                |     | 150#    |      | 300# |      | 600 # |      | 900 # |      | 1500 # |      | 2500 # |       |
|                |     | INCH    | MM   | INCH | MM   | INCH  | MM   | INCH  | MM   | INCH   | MM   | INCH   | MM    |
| ½              | 15  | 0.11    | 3.0  | 0.12 | 3.1  | 0.13  | 3.4  | 0.16  | 4.1  | 0.19   | 4.8  | 0.25   | 6.3   |
| ¾              | 20  | 0.12    | 3.1  | 0.15 | 3.8  | 0.16  | 4.1  | 0.18  | 4.6  | 0.23   | 5.8  | 0.29   | 7.4   |
| 1              | 25  | 0.16    | 4.1  | 0.19 | 4.8  | 0.19  | 4.8  | 0.22  | 5.6  | 0.26   | 6.6  | 0.35   | 8.9   |
| 1¼             | 32  | 0.19    | 4.8  | 0.19 | 4.8  | 0.19  | 4.8  | 0.25  | 6.4  | 0.31   | 7.8  | 0.44   | 11.2  |
| 1½             | 40  | 0.19    | 4.8  | 0.19 | 4.8  | 0.22  | 5.6  | 0.28  | 7.1  | 0.38   | 9.6  | 0.50   | 12.7  |
| 2              | 50  | 0.22    | 5.6  | 0.25 | 6.4  | 0.25  | 6.4  | 0.31  | 7.9  | 0.44   | 11.2 | 0.62   | 15.8  |
| 2½             | 65  | 0.22    | 5.6  | 0.25 | 6.4  | 0.28  | 7.1  | 0.34  | 8.6  | 0.50   | 12.7 | 0.75   | 19.0  |
| 3              | 80  | 0.22    | 5.6  | 0.28 | 7.1  | 0.31  | 7.9  | 0.41  | 10.4 | 0.62   | 15.7 | 0.88   | 22.4  |
| 4              | 100 | 0.25    | 6.4  | 0.31 | 7.8  | 0.38  | 9.6  | 0.50  | 12.7 | 0.75   | 19.0 | 1.09   | 27.7  |
| 5              | 125 | 0.28    | 7.1  | 0.38 | 9.6  | 0.44  | 11.2 | 0.59  | 15.0 | 0.91   | 23.1 | 1.34   | 34.0  |
| 6              | 150 | 0.28    | 7.1  | 0.38 | 9.6  | 0.50  | 12.7 | 0.72  | 18.3 | 1.09   | 27.7 | 1.59   | 40.4  |
| 8              | 200 | 0.31    | 8.1  | 0.44 | 11.2 | 0.62  | 15.8 | 0.88  | 22.4 | 1.41   | 35.8 | 2.06   | 52.3  |
| 10             | 250 | 0.34    | 8.6  | 0.50 | 12.7 | 0.75  | 19.0 | 1.06  | 26.9 | 1.72   | 43.7 | 2.59   | 65.8  |
| 12             | 300 | 0.38    | 9.6  | 0.56 | 14.2 | 0.91  | 23.1 | 1.25  | 31.8 | 2.00   | 50.8 | 3.03   | 77.0  |
| 14             | 350 | 0.41    | 10.4 | 0.62 | 15.8 | 0.97  | 24.6 | 1.38  | 35.0 | 2.19   | 55.6 | 3.34   | 84.8  |
| 16             | 400 | 0.44    | 11.2 | 0.69 | 17.5 | 1.09  | 27.7 | 1.56  | 39.6 | 2.50   | 63.5 | 3.81   | 93.8  |
| 18             | 450 | 0.47    | 11.9 | 0.75 | 19.0 | 1.22  | 31.0 | 1.75  | 44.4 | 2.81   | 41.4 | 4.27   | 108.5 |
| 20             | 500 | 0.50    | 12.7 | 0.81 | 20.6 | 1.34  | 34.0 | 1.91  | 48.5 | 3.12   | 79.2 | 4.69   | 119.1 |
| 24             | 600 | 0.57    | 14.5 | 0.94 | 23.9 | 1.59  | 40.4 | 2.28  | 57.9 | 3.72   | 94.5 | 5.72   | 145.3 |

**(API 600)**  
HEAVY WALL

| NORMAL<br>SIZE |     | RATINGS |      |      |      |       |      |       |      |        |       |        |      |
|----------------|-----|---------|------|------|------|-------|------|-------|------|--------|-------|--------|------|
|                |     | 150#    |      | 300# |      | 600 # |      | 900 # |      | 1500 # |       | 2500 # |      |
|                |     | INCH    | MM   | INCH | MM   | INCH  | MM   | INCH  | MM   | INCH   | MM    | INCH   | MM   |
| ½              | 15  | -       | -    | -    | -    | -     | -    | -     | -    | -      | -     | -      | -    |
| ¾              | 20  | -       | -    | -    | -    | -     | -    | -     | -    | -      | -     | -      | -    |
| 1              | 25  | 0.25    | 6.4  | 0.25 | 6.4  | 0.31  | 7.9  | 0.50  | 12.7 | 0.50   | 12.7  | 0.59   | 15.0 |
| 1¼             | 32  | 0.25    | 6.4  | 0.25 | 6.4  | 0.34  | 8.6  | 0.56  | 14.2 | 0.56   | 14.2  | 0.69   | 17.5 |
| 1½             | 40  | 0.25    | 6.4  | 0.31 | 7.9  | 0.37  | 9.4  | 0.59  | 15.0 | 0.59   | 15.0  | 0.75   | 19.1 |
| 2              | 50  | 0.34    | 8.6  | 0.38 | 9.7  | 0.44  | 11.2 | 0.75  | 19.1 | 0.75   | 19.1  | 0.88   | 22.4 |
| 2½             | 65  | 0.38    | 9.7  | 0.44 | 11.2 | 0.47  | 11.9 | 0.88  | 22.4 | 0.88   | 22.4  | 1.00   | 25.4 |
| 3              | 80  | 0.41    | 10.4 | 0.47 | 11.9 | 0.50  | 12.7 | 0.75  | 19.1 | 0.94   | 23.9  | 1.19   | 30.2 |
| 4              | 100 | 0.44    | 11.2 | 0.50 | 12.7 | 0.63  | 16.0 | 0.84  | 21.3 | 1.13   | 28.7  | 1.41   | 35.8 |
| 5              | 125 | -       | -    | -    | -    | -     | -    | -     | -    | -      | -     | -      | -    |
| 6              | 150 | 0.47    | 11.9 | 0.63 | 16.0 | 0.75  | 19.1 | 1.03  | 26.2 | 1.50   | 38.1  | 1.91   | 48.5 |
| 8              | 200 | 0.50    | 12.7 | 0.69 | 17.5 | 1.00  | 25.4 | 1.25  | 31.8 | 1.88   | 47.8  | 2.44   | 62.0 |
| 10             | 250 | 0.56    | 14.2 | 0.75 | 19.1 | 1.13  | 28.7 | 1.44  | 36.6 | 2.25   | 57.2  | 2.66   | 67.6 |
| 12             | 300 | 0.63    | 16.0 | 0.81 | 20.6 | 1.25  | 31.8 | 1.66  | 42.2 | 2.63   | 66.8  | 3.41   | 86.6 |
| 14             | 350 | 0.66    | 16.8 | 0.88 | 22.4 | 1.38  | 35.1 | 1.81  | 46.0 | 2.75   | 39.9  | -      | -    |
| 16             | 400 | 0.69    | 17.5 | 0.94 | 23.9 | 1.50  | 38.1 | 2.06  | 52.3 | 3.13   | 79.5  | -      | -    |
| 18             | 450 | 0.72    | 18.3 | 1.00 | 25.4 | 1.63  | 41.4 | 2.25  | 57.2 | 3.50   | 88.9  | -      | -    |
| 20             | 500 | 0.75    | 19.1 | 1.06 | 26.9 | 1.75  | 44.5 | 2.50  | 63.5 | 3.88   | 98.6  | -      | -    |
| 24             | 600 | 0.81    | 20.6 | 1.19 | 30.2 | 2.00  | 50.8 | 2.88  | 73.2 | 4.50   | 114.3 | -      | -    |

# JIS - ASTM MATERIAL COMPARISON LIST

| UNS<br>DESIGNED          | GRADE                         | BAR        |             | CASTING |                | FORGING    |               |
|--------------------------|-------------------------------|------------|-------------|---------|----------------|------------|---------------|
|                          |                               | JIS        | ASTM        | JIS     | ASTM           | JIS        | ASTM          |
|                          |                               | G 4303     | A276        | G 521   | A351           | G 3214     | A182          |
|                          | AUTENTIC STEEL                |            |             |         |                |            |               |
| S20910                   | 22Cr-12Ni5Mn-2Mo-Cb-V-N-0.04C |            | XM-19       |         | CG6MMN         |            | F XM-19       |
| S21800                   | 17Cr-8.5Mo-8Mn-4Si-N-0.08C    |            | -           |         | CF102MnN       |            |               |
| S21904                   | 20Cr-6.5Ni-9Mn-N-0.08C        |            | XM11        |         |                |            | F XM-11       |
| S24000                   | 18Cr-3Ni-13Mn-N-0.06C         |            | XM-29       |         |                |            |               |
| S24100                   | 18Cr-1.5Ni-13Mn-N-0.1C        |            | XM28        |         |                |            |               |
| JIS                      | 17Cr-7Ni-0.1C                 |            | SUS 301     |         |                |            |               |
| S30200                   | 18Cr-8Ni-0.1C                 | SUS 302    | 302         | SCS 12  | (A743-CF20)    |            | (A473-302)    |
| JIS                      | 18Cr-8Ni-0.06C                | SUS 304    |             | SCS 13  |                | SUS 304    |               |
| S30400                   | 18Cr-8Ni-0.06C                | SUS 304    | 304         | SCS A   | CF8, 8A        | SUS 304    | F304          |
| JIS                      | 18Cr-9Ni-Lo-C                 | SUS 304L   |             | SCS 19  |                | SUS 304L   |               |
| S30403                   | 18Cr-9Ni-Lo-C                 | SUS 304L   | 304L        | SC519A  | CF3, 3A        | SUS 304L   | F304L         |
| S30409                   | 18Cr-8Ni-0.07C                |            | (A479-304H) |         | CF 10          | SUS F 304H | F304H         |
| S30430                   | 18Cr-9Ni-3.5Cu-0.06C          | SUS XM7    | XM-7        |         |                |            |               |
| S30451                   | 18Cr-8Ni-0.15N-0.06C          | SUS 304N1  | 304N        |         |                |            | F304N         |
| S30452                   | 18Cr-8Ni-0.25N-0.06C          | SUS 304N2  | XM-21       |         |                |            |               |
| S30453                   | 18Cr-9Ni-0.15N-0Lo,C          | SUS 304NL  | 304LN       |         |                |            | F304LN        |
| -                        | 18Cr-13Ni-0.06C               | SUS 305J1  |             |         |                |            |               |
| S30600                   | 18Cr-15Ni-4Si-0.009C          |            |             |         |                |            | F46           |
| S30800                   | 20Cr-11Ni-0.06C               |            | 308         |         | (A743-CG12)    |            | (473 308)     |
| S30815                   | 20Cr-10Ni-1.5Si-N-Ce-0.08C    |            | -           |         |                |            | F45           |
| S30880                   | 21Cr-10Ni-2Mn-Si-0.06C        |            | ER308       |         |                |            |               |
| S30900                   | 22Cr-12Ni-0.1C                |            | 309         | SCS 17  | CH20           |            | (473 309)     |
| S30908                   | 22Cr-12Ni-0.06C               | SUS 309S   | 309S        |         | CH8            |            | (473 309S)    |
| S30909                   | 22Cr-12Ni-0.07C               |            |             |         | CH10           |            | (A336 F 309H) |
| S30940                   | 22Cr-12Ni-Cb-0.06C            |            | 309Cb       |         |                |            |               |
| S31000                   | 25Cr-20Ni-0.1C                |            | 310         | SCS 18  | CK20           | SUS F 310  | F310          |
| S31008                   | 25Cr-20Ni-0.06C               | SUS 310S   | 310S        |         |                |            | (A473 310S)   |
| S31040                   | 25Cr-20Ni-Cb-0.06C            |            | 310Cb       |         |                |            |               |
| S31254                   | 20Cr-18Ni-605Mo-N-Cu-0.01C    |            | -           |         | CK3MCuN        |            | F44           |
| S31400                   | 25Cr-20Ni-2Si-0.15C           |            | 314         |         |                |            | (A473 314)    |
| JIS                      | 18Cr-12Ni-2.5Mo-0.06C         | SUS 316    |             | SCS 14  |                | SUS F 316  |               |
| S31600                   | 18Cr-12Ni-2.5Mo-0.06C         | SUS 316    | 316         | SCS 14A | CF8M           | SUS F 316  | F316          |
| JIS                      | 18Cr-12Ni-2.5Mo-Lo, C         | SUS 316L   |             | SCS 16  |                | SUS F 316L |               |
| S31603                   | 18Cr-12Ni-2.5Mo-Lo, C         | SUS 316L   | 316L        | SCS 16A | CF3M, 3MA      | SUS F 316L | F316L         |
| S31609                   | 18Cr-12Ni-2.5Mo-0.07C         |            | (A479-306H) |         | CF10M          | SUS F 316H | F316H         |
| S31635                   | 18Cr-12Ni-2.5Mo-Ti-0.06C      |            | 316Ti       |         |                |            |               |
| S31640                   | 18Cr-13Ni-2Mo-Cb-0.06C        |            | 316Cb       | SCS 22  | CF10MC         |            |               |
| S31651                   | 18Cr-12Ni-2.5Mo-0.15N-0.06C   | SUS 316N   | 316N        |         |                |            | F316N         |
| S31653                   | 18Cr-12Ni-2.5Mo-0.15N-Lo, C   | SUS 316LN  | 316LN       |         | (A743 CF-3MN)  |            | F316LN        |
| S31654                   | 18Cr-12Ni-2.5Mo-0.2N-Lo, C    |            | -           |         | (A-743 CF-3MN) |            |               |
| JIS                      | 18Cr-12Ni-2Mo-2Cu-0.06C       | SUS 316J1  |             | BSC 15  |                |            |               |
| JIS                      | 18Cr-12Ni-2Mo-2Cu-Lo, C       | SUS 316J1L |             | SCS 20  |                |            |               |
| S31700                   | 18Cr-12Ni-3.5Mo-0.06C         | SUS 317    | 317         |         | CG8M           |            | F317          |
| S31703                   | 18Cr-12Ni-3.5Mo-Lo, C         | SUS 317L   |             |         |                |            | F317L         |
| S31725                   | 18Cr-16Ni-5Mo-Lo, C           | SUS 317L   | -           |         |                |            |               |
| S32100                   | 18Cr-9Ni-Ti-0.06C             | SUS 312    | 321         |         |                | SUS F 321  | F321          |
| S32109                   | 18Cr-9Ni-Ti-0.07C             |            | (A479-30H)  |         |                | SUS F 321H | F321H         |
| S33100                   | 8Cr-20Ni-1Si-Mn-0.15C         |            |             |         |                |            | F10           |
| S34700                   | 18Cr-9Ni-Cb-0.06C             | SUS 347    | 347         | SCS 21  | CF8C           | SUS F 347  | F347          |
| S34709                   | 18Cr-9Ni-Cb-0.07C             |            | (A479-347H) |         |                | SUS F 347H | F347H         |
| S34800                   | 18Cr-9Ni-Cb-0.06C             |            | 318         |         |                |            | F348          |
| JIS                      | 18Cr-13Ni-4Si-0.06C           | SUS XM15J1 |             |         |                |            |               |
| -                        | 20Cr-24Ni-3Mo-2Cu-3Si-0.05S   |            |             |         | (A-743CN-7MS)  |            |               |
| -                        | 20Cr-29Ni-2.5Mo-3.5Cu-0.05C   |            |             | SCS 23  | CN7M           |            |               |
| -                        | 20Cr-33Ni-Min-Si-Cb-0.01C     |            |             |         | CT15C          |            |               |
| -                        | 21Cr-24Ni-Min-Lo, C           |            |             |         | (A-743-CN-3M)  |            |               |
| -                        | 25Cr-20Ni-0.3C                |            |             |         | HK30           |            |               |
| -                        | 25Cr-20Ni-0.4C                |            |             |         | HK40           |            |               |
| FERRITIC-AUSTENTIC STEEL |                               |            |             |         |                |            |               |
| S31100                   | 25Cr-6Ni-0.04C                |            | XM-26       |         |                |            |               |
| S31200                   | 25Cr-6Ni-2Mo-N-Lo, C          |            |             |         |                |            | F50           |
| S31803                   | 23Cr-6Ni-3Mo-N-Lo, C          |            | -           | SCS 10  |                |            | F51           |
| -                        | 25Cr-5Ni-2Mo-3Cu-0.02C        |            |             |         | CD4MCu         |            |               |
| S32900                   | 25Cr-4.5Ni-2Mo-0.06C          | SUS 329J1  |             | SCS 11  |                |            |               |

| TYPE OF STEEL    | GRADE                                        | BAR             |              | CASTING      |               | FORGING |              |
|------------------|----------------------------------------------|-----------------|--------------|--------------|---------------|---------|--------------|
|                  |                                              | JIS             | ASTM         | JIS          | ASTM          | JIS     | ASTM         |
| Carpenter 20     | Cr-Ni-Fe-Mo-Cu-Cb                            |                 |              |              |               |         |              |
| Alloy 20Cb-3     | 35Ni-20Cr-2.5Mo-39Fe-35Cu-Cb-0.05C           |                 | B 473 NO8020 |              |               |         | B 462 NO8020 |
| CN7M, SCS23      | 29Ni-20Cr-2.5Mo-45Fe-35Cu-0.05C              |                 |              | G5121 SCS 23 | A 351 CN7N    |         |              |
| CN-7MS           | 24Ni-19Cr-2.5Mo-49Fe-2Cu-3Si-0.05C           |                 |              |              | A743 CM-7MS   |         |              |
| Carpenter 20 Mod | Ni-Fe-Cr-Mo                                  |                 |              |              |               |         |              |
| Aloy 20Mod       | 26Ni-22Cr-5Mo-47Fe-Ti-0.03C                  |                 | B 621 NO8320 |              |               |         | B 621 NO8320 |
| CN-3M            | 25Ni-21Cr-5Mo-49Fe-Lo, C                     |                 |              |              | A743 CM-3M    |         |              |
| Nickel           | Ni                                           |                 |              |              |               |         |              |
| Alloy 200        | 99Ni-0.1C                                    | H4562NNCB       | B 160 NO2200 |              |               |         | B 160 NO2200 |
| Alloy 201        | 99Ni-0.01C                                   | H4562 NLCB      | B 160 NO2201 |              |               |         | B 160 NO2201 |
| CZ-100           | 97Ni-0.8C                                    |                 |              |              | A494 CZ-100   |         |              |
| Duranickel 301   | 95Ni-45A1-Ti-0.2C                            | H4562 NDB       |              |              |               |         |              |
| Monel            | Ni-Cu                                        |                 |              |              |               |         |              |
| Alloy 400        | 69Ni-31Cu-0.2C (Si<0.5) (S<0.024)            | H4553 NCuB      | B 164 NO4400 |              |               |         | B 164 NO4400 |
| Alloy 405        | 69Ni-31Cu-0.2C(S<0.5) (S:0025-0.06)          |                 | B 164 NO4405 |              |               |         | B 164 NO4405 |
| M-35-1           | 70Ni-30Cu-0.25C (Si<1.25)                    |                 |              |              | A494 M-351    |         |              |
| M-35-2           | 70Ni-30Cu-0.25C (Si<2.00)                    |                 |              |              | A494 M-35-2   |         |              |
| N-30H            | 67Ni-31Cu-3Si-0.2C                           |                 |              |              | A494 M-30H    |         |              |
| M-25S            | 66Ni-30Cu-4Si-0.15C                          |                 |              |              | A494 M-25S    |         |              |
| M-30C            | 66Ni-30Cu-1.5Si-2Cb-0.2C                     |                 |              |              | A494 M-30C    |         |              |
| Inconel          | Ni-Cr-Fe(Ni-Cr-Mo-Cb)                        |                 |              |              |               |         |              |
| Alloy 600        | 77Ni-15Cr-8Fe-0.1C                           | G 4901 NCF 600  | B 166 NO6600 |              |               |         | B 564 NO6600 |
| CY 40            | 77Ni-15Cr(8Fe) -0.3C                         |                 |              |              | A494 CY-40    |         |              |
| Alloy 625        | 65Ni-22Cr-9Mo-4Cb-0.08C                      |                 | B 446 NO6625 |              |               |         | B 564 NO6625 |
| CW-6MC           | 65Ni-22Cr-9Mo-4Cb-0.04C                      |                 |              |              | A494 CW-6MC   |         |              |
| Inconel 601      | 61Ni-23Cr-14Mo-1.5A1-0.08C                   | G 4901 NCF 601  |              |              |               |         |              |
| Inconel 690      | 62Ni-23Cr-9Fe-0.03C                          | B166 NO6690     |              |              |               |         |              |
| Inconel x-750    | 73Ni-16Cr-7Fe-1Cb-2.5Ti-A1-0.06C             | G 4901 NCF 750  | B 637 NO7750 |              |               |         | B 637 NO7750 |
| Inconel 751      | 73Ni-16Cr-7Fe-1Ni-2.5Ti-A1-0.08C             | G 4901 NCF 751  |              |              |               |         |              |
| CY5SnBiM         | 76Ni-13Cr-3Mo-4Bi-4Sn-0.03C                  |                 |              |              | A494 CY5SnSim |         |              |
| Incoloy          | NiFe-Cr (Ni-Fe-Cr-Mo-Cu)                     |                 |              |              |               |         |              |
| Alloy 800        | 33Ni-21Cr-46Fe-A1-Ti-0.08C                   | G 4901 NCF 800  | B 408 NO8800 |              |               |         | B 564 NO8800 |
| Alloy 800H       | 33Ni-21Cr-46Fe-A1-Ti-0.075C                  | G 4901 NCF 800H | B 406 NO8810 |              |               |         | B 564 NO8810 |
| Alloy 825        | 42Ni-22Cr-3Mo-30Fe-2Cu-1Ti-0.03C             | G 4901 NCF 825  | B 425 NO8825 |              |               |         | B 425 NO8825 |
| Hastelloy B      | Ni-Mo                                        |                 |              |              |               |         |              |
| Alloy B          | 67Ni-28Mo-5Fe-V-0.03C                        |                 | B 335 N10001 |              |               |         | B 335 N10001 |
| A-12MV           | 67Ni-28Mo-5Fe-V-0.1C                         |                 |              |              | A494 n-12MV   |         |              |
| Alloy B-2        | 72Ni-28Mo-0.01C                              |                 | B 335 N10665 |              |               |         | B 335 N10665 |
| N-7M             | 68Ni-32Mo-0.05C                              |                 |              |              | A494 N-7M     |         |              |
| Hastelloy C      | Ni-Mo-Cr                                     |                 |              |              |               |         |              |
| Alloy C-276      | 58Ni-16Cr-16Mo-6Fe-4W-0.005C                 |                 | B 574 N10276 |              |               |         | B 335 N10276 |
| CW-12MW          | 58Ni-16Cr-16Mo-6Fe-4W-V- 0.01C               |                 |              |              | A494 CW-12MW  |         |              |
| Alloy C-4        | 68Ni-16Cr-16Mo-0.008C                        |                 | B 574 NO6455 |              |               |         | B 574 NO6455 |
| CW-2M            | 68Ni-16Cr-16Mo-0.01C                         |                 |              |              | A494 CW-2M    |         |              |
| Alloy C-22       | 58Ni-21Cr-14Mo-4Fe-3W-0.008C                 |                 | B 574 NO6022 |              |               |         | B 574 NO6022 |
| CW-6M            | 62Ni-19Cr-19Mo-0.05C                         |                 |              |              | A494 CW-6M    |         |              |
| Hastelloy G      | Ni-Cr-Fe-Mo-Cu                               |                 |              |              |               |         |              |
| Alloy G          | 46Ni-22Cr-6.5Mo-20Fe-5Mn-2Cu-0.03C           |                 | B 581 NO6007 |              |               |         | B 581 NO6007 |
| Alloy G-2        | 50Ni-25Cr-6Mo-17Fe-1Cu-1Ti-Lo, C             |                 | B 581 NO6975 |              |               |         | B 581 NO6975 |
| Alloy G-30       | 44Ni-30Cr-5Mo-15Fe-2Cu-1Cb-3W-Lo, C          |                 | B 581 NO6030 |              |               |         | B 581 NO6030 |
| Alloy G-3        | 49Ni-22Cr-7Mo -20Fe-2Cu-0.008C               |                 | B 581 NO6985 |              |               |         | B 581 NO6985 |
| Hastelloy N      | Ni-Mo-Cr-Fe                                  |                 |              |              |               |         |              |
| Alloy N          | 76Ni-7Cr-17Mo-0.06C                          |                 | B 573 N10003 |              |               |         | B 573 N10003 |
| Hastelloy X      | Ni-Cr-Mo-Fe                                  |                 |              |              |               |         |              |
| Alloy X          | 48Ni-22Cr-9Mo-19Fe-1.5Co-W-0.1C              |                 | B 572 NO6002 |              |               |         | B 572 NO6002 |
| Js 700           | Ni*-Fe-Cr-9Mo-Cb                             |                 |              |              |               |         |              |
| Alloy 700        | 25Ni-21Cr-4.5Mo-49Fe-Cb-0.02C                |                 | B 581 NO8700 |              |               |         | B 672 NO8700 |
| CN-3M            | 25Ni-21Cr-5Mo-49Fe-Lo, C                     |                 |              |              | A743 CN-3M    |         |              |
| 904L             | Ni-Fe-Cr-Mo-Cu-Lo, C                         |                 |              |              |               |         |              |
| Alloy 904L       | 26Ni-21Cr-4.5Mo-47Fe-1.5Cu-0.01C             |                 | B 649 NO8904 |              |               |         | B 649 NO8904 |
| RA-330           | Ni-Fe-Cr-Si                                  |                 |              |              |               |         |              |
| Alloy 330        | 36Ni-19Cr-44Mo-1Si-0.06C                     |                 | B 511 NO8330 |              |               |         | B 511 NO8330 |
| Nimonic 80A      | Ni-Cr                                        |                 |              |              |               |         |              |
| Nimonic 80A      | 76Ni-20Cr-2Ti-1.5A1-0.08C                    |                 | B 637 NO7080 |              |               |         | B 637 NO7080 |
| IN-102           | Ni-Cr-Fe-Cb-Mo-W                             |                 |              |              |               |         |              |
| IN-102           | 68Ni-15Cr-3Mo-7Fe-3Cb-3W-A1-Ti-Mg-B-Zr-0.06C |                 | B 518 NO6102 |              |               |         |              |
| Affcorr          | Ni-Cr-Mo-W                                   |                 |              |              |               |         |              |
| ffcorr           | 55Ni-31Cr-10.5Mo-2.5W-Cb-0.1C                |                 | B 576 NO6110 |              |               |         | B 564 NO6110 |
| RA-333           | Ni-Cr-Mo-CO-W-Fa-Si                          |                 |              |              |               |         |              |
| Alloy 333        | 46Ni-26Cr-3Mo-19Fe-3Co-3W-0.08C              |                 | B 719 NO6333 |              |               |         |              |
| AL-6X            | Cr-Ni-Mo-Fe                                  |                 |              |              |               |         |              |
| AL-6X            | 25Ni-21Cr-6.5Mo-47Fe-LO, C                   |                 | B 691 NO8366 |              |               |         |              |
| CN-3M            | 25Ni-21Cr-5Mo-49Fe-LO, C                     |                 |              |              |               |         |              |
| AL-6XN           | 25Ni-21Cr-6.5Mo-47Fe-0.2N-o, C               |                 | B 691 NO8367 |              |               |         | B 462 NO8357 |

# MATERIAL COMPARISONS FOR ASMT & JIS (CASTING & FORGING)

| General Classification |                     | ASTM symbol  |            | JIS symbol   |                 | Service Temp |
|------------------------|---------------------|--------------|------------|--------------|-----------------|--------------|
|                        |                     | Casting      | Forgings   | Casting      | Forgings        |              |
| HIGH-TEMPERATURE       | Cash iron           |              |            |              |                 |              |
|                        | Cast iron           | A126-CLASS B |            | G5501-FC20   |                 | 250°C        |
|                        | Carbon Steel        | A126-CLASS C |            | G5501-FC25   |                 | 250°C        |
|                        | Carbon steel        | A126-WCA     |            | G5151-SCPH1  |                 | 420°C        |
|                        | ½ Mo Steel          | A216-WCB     | A105       | G5151-SCPH2  | G3202-SFVC2A    | 425°C        |
|                        | 1¼ Cr-1/2Mo         | A217-WC1     | A182-F1    | G5151-SCPH11 | G3203-SFVCF1    | 455°C        |
|                        | 2¼ Cr-12Mo          | A217-WC6     | A182-F11   | G5151-SCPH21 | G3203-SFVCF11A  | 593°C        |
|                        | 5Cr-1/2Mo           | A217-WC9     | A182-F22   | G5151-SCPH32 | G3203-SFVCF22A  | 593°C        |
|                        | 9Cr-1Mo             | A217-C5      | A182-F5a   | G5151-SCPH61 | G3203-SFVCF5D   | 650°C        |
|                        | A1 Steel            | A217-C12     | A182-F9    |              | G3203-SFVCF9    | 650°C        |
| LOW-TEMPERATURE        | ½ Mo steel          | A352-LCB,LCC | A350-LF2   | G5121-SCPH1  | G3205-SFL2      | -46°C        |
|                        | 2½ Ni steel         | A352-LC1     |            | G5121-SCPH11 |                 | -59°C        |
|                        | 3½ Ni steel         | A352-LC2     |            | G5121-SCPH21 |                 | -73°C        |
|                        | 13Cr-1/2Mo          | A352-LC3     | A350-LF3   | G5121-SCPH31 | G32053-SFL3     | -101°C       |
|                        | 18Cr-8Ni(Co.03)     | A217-CA15    | A182-F6a   | G5121-SCS1   | G4303-410       | 550°C        |
| STAINLESS STEEL        | 18Cr-8Ni(Co.08)     | A351-CF3     | A182-F304L | G5121-SCS19A | G3214-SRS-F304L | 800°C        |
|                        | 18Cr-8Ni            | A351-CF8     | A182-F304  | G5121-SCS13A | G3214-SRS F304  | 800°C        |
|                        | 2Mo(Co.03)          | A351-CF3M    | A182-F316L | G5121-SCS16A | G3214-SRS F316L | 800°C        |
|                        | 18Cr-8Ni-2Mo(Co.08) | A351-CF8M    | A182-F316  | G5121-SCS14A | G3214-SRS F316  | 800°C        |
|                        | 18Cr-8Ni-Ti         |              | A182-F321  |              | G3214-SRS F321  | 800°C        |
|                        | 18Cr-8Ni-Cb         | A351-CF8C    | A182-F347  | G5121-SCS21  | G3214-SRS F347  | 800°C        |
|                        | 22Cr-12Ni           | A351-CH20    |            | G5121-SCS17  |                 | 1200°C       |
|                        | 23Cr-19Ni           | A351-CK20    |            | G5121-SCS18  |                 | 1200°C       |
|                        | 19Cr-27Ni           | A351-CN7M    |            | G5121-SCS23  |                 | 1200°C       |
|                        | 2Mo-3Cu             |              |            |              |                 |              |

| General Classification  | "ASTM" Symbols | "JIS" Symbols | Service Temp |
|-------------------------|----------------|---------------|--------------|
| HIGH TEMPERATURE (Bolt) |                |               |              |
| Mild Steel              |                | G301-SS41     | 260°C        |
| Carbon Steel            | A307-B         | G4051-S25C    | 204°C        |
| 5Cr-½Mo                 | A193-B5        | G4107-SNB5    | 600°C        |
| 1Cr-¼Mo                 | A193-B7        | G4107-SNB7    | 550°C        |
| Cr-Mo-Va                | A193-B16       | G4107-SNB18   | 600°C        |
| 18Cr-8Ni                | A193-B8        | G4303-SUS304  | 800°C        |
| 18Cr-10Ni-Cb            | A193-B8C       | G4303-SUS347  | 800°C        |
| 18Cr-10Ni-Ti            | A193-B8T       | G4303-SUS321  | 800°C        |
| 18Cr-12Ni-2Mo           | A193-B8M       | G4303-SUS316  | 800°C        |
| 15Cr-25Ni-Mo-Ti-V-B     | A453-660       |               | 540°C        |

| General Classification  | "ASTM" Symbols | "JIS" Symbols | Service Temp |
|-------------------------|----------------|---------------|--------------|
| HIGH TEMPERATURE (Bolt) |                |               |              |
| Cr-Mo                   | A320-17        |               | -101°C       |
| 18Cr-8Ni                | A320-88        | G4303-SUS304  | -196°C       |
| 18Cr-10Ni-Cb            | A320-B8C       | G4303-SUS347  | -196°C       |
| 18Cr-10Ni-Ti            | A320-B8T       | G4303-SUS321  | -196°C       |
| 18Cr-12Ni-2Mo           | A320-B8M       | G4303-SUS316  | -196°C       |
| NUT                     |                |               |              |
| Carbon steel (CO.15)    |                | G4051-S20C    | 420°C        |
| Carbon steel (CO.40)    | A194-2H        | G4051-S45C    | 550°C        |
| Carbon Mo Steel         | A194-4         |               | 600°C        |
| 18Cr-8Ni-Cb             | A194-8         | G4303-SUS304  | 800°C        |
| 18Cr-10Ni-Cb            | A194-8C        | G4303-SUS347  | 800°C        |
| 18Cr-10Ni-Ti            | A194-8T        | G4303-SUS321  | 800°C        |
| 18Cr-12NI-2MO           | A194-8M        | G4303-SUS316  | 800°C        |

## VALVE BODY BOLTING MATERIALS

| General Classification   | Temperature Degrees F. | Bolt materials specification              | Nuts            |
|--------------------------|------------------------|-------------------------------------------|-----------------|
| Carbon Steel Wcb         | -20 to 800             | ASTM A193 Gr B7                           | ASTM a194 Gr 2H |
| Carbon Steel (grade LCB) | -50 to 650             | ASTM A320 Gr L7                           | ASTM A194 Gr 4  |
| carbon moly (grade wc6)  | -20 to 850             | ASTM A193 Gr B7                           | ASTM A194 Gr 2H |
| 1¼Cr-½Mo(grade wc6)      | -20 to 1000            | ASTM A193 Gr B7                           | ASTM A194 Gr 2H |
| 2¼Cr-1Mo(grade wc9)      | -20 to 1000            | ASTM A193 Gr B7                           | ASTM A193 Gr B7 |
|                          | 1000 to 1050           | ASTM A193 Gr B16                          | ASTM A194 Gr 4  |
| 5Cr-½Mo(Grade C5)        | -20 to 1000            | ASTM A193 Gr B7                           | ASTM A194 Gr 2H |
|                          | 1000 to 1100           | ASTM A193 Gr B16                          | ASTM A194 Gr 4  |
| 9Cr-1Mo(Grade C12)       | -20 to 1000            | ASTM A193 Gr B7                           | ASTM A194 Gr 8H |
|                          | 1000 to 1100           | ASTM A193 Gr B16                          | ASTM A194 Gr 2  |
| Type 304(Grade CF8)      | -425 to 100            | ASTM A320 Gr B8                           | ASTM A194 Gr 8  |
|                          | 100 to 1500            | ASTM A193 Gr B8                           | ASTM A194 Gr 8  |
| Type 304 (Grade CF8M)    | -425 to 100            | ASTM A320 Gr B8                           | ASTM A194 Gr 8  |
|                          | 100 to 1500            | ASTM A193 Gr B8M                          | ASTM A194 Gr 8M |
| 3½ Ni(Grade LC3)         | -150 to 800            | ASTM A320 Gr B7                           | ASTM A194 Gr 8  |
|                          | -50 to 650             | With Charpy Test or 8M<br>ASTM a193 Gr B7 | ASTM A194 Gr 2H |

Alloy steel bolting A 193 Gr B7 bolts and A194 Gr 2H nuts can be used at moderate temperatures depending on the permissible differential expansion.



CHEMICAL & PHYSICAL PROPERTIES

CASTING MATERIAL  
CHEMICAL PROPERTIES

|          | Carbon Steel | CA-15     | High Temp. | High Temp. | HIGH      | TEMP       | 304-S.S   | 316-S.S   | HASTEL LOY-B | HASTEL LOY-C | 304-L.S.S | 316L-S.S  | Low Temp | NICKEL   | INCONEL | MONEL   | A-20      |
|----------|--------------|-----------|------------|------------|-----------|------------|-----------|-----------|--------------|--------------|-----------|-----------|----------|----------|---------|---------|-----------|
| ASTM Std | A-216        | A-217     | A-217      | A-217      | A-217     | A-217      | A-351     | A-351     | A-494        | A-494        | A-351     | A-351     | A-352    | A-494    | A-494   | A-494   | A-351     |
| Grade    | WCB          | CA-48     | WC6        | WC9        | C-5       | C-12       | CF8       | CF8M      | N-12M-1      | CW-12M-1     | CF3       | CF3M      | LCB      | CZ-100   | CY-40   | M-35    | CN-7M     |
| c% Max.  | 0.30         | 0.15      | 0.20       | 0.18       | 0.20      | 0.20       | 0.08      | 0.08      | 0.12         | 0.12         | 0.03      | 0.03      | 0.30     | 1.0      | 0.4     | 0.35    | 0.07      |
| Min %    | 1.00 MAX     | 1.00      | 0.05-0.08  | 0.40-0.70  | 0.40-0.70 | 0.35-0.65  | 1.50      | 1.50      | 1.00         | 1.0          | 1.50      | 1.50      | 1.00     | 1.5      | 1.5     | 1.5     | 1.5       |
| P% MAX.  | 0.04         | 0.040     | 0.04       | 0.04       | 0.040     | 0.040      | 0.04      | 0.04      | 0.040        | 0.040        | 0.04      | 0.04      | 0.05     | 0.03     | 0.03    | 0.03    | 0.04      |
| S% MAX.  | 0.045        | 0.040     | 0.045      | 0.045      | 0.045     | 0.045      | 0.04      | 0.04      | 0.030        | 0.030        | .004      | 0.04      | 0.06     | 0.03     | 0.03    | 0.03    | 0.04      |
| Ni %     | 0.50         | 1.00      | -          | -          | -         | -          | 8.00      | 9.00      | Balance      | Balance      | 8.00-12.0 | 9.00-13.0 | -        | 95.0 Min | Balance | Balance | 27.5-30.5 |
| Cr%      | 0.40         | 11.5-14.0 | 1.00-1.50  | 2.00-2.75  | 4.0-6.50  | 8.00-10.00 | 18.0-21.0 | 18.0-21.0 | 1.00         | 15.7-17.5    | 17.0-21.0 | 17.0-21.0 | -        | -        | 14-17.0 | -       | 19.22     |
| Mo%      | 0.25         | -         | 0.45-0.65  | 0.90-1.20  | 0.45-0.65 | 0.90-1.20  | -         | 2.00-3.00 | 26.00-30.0   | 16-18.0      | -         | 2.00-3.00 | -        | -        | -       | -       | 2-3       |
| Cu       | 0.0          | -         | -          | -          | -         | -          | -         | -         | -            | 0            | -         | -         | -        | 1.25     | -       | 26-33   | 3.4       |
| Si       | 0.30         | 1.50      | 0.60       | 0.60       | 0.75      | 1.00       | 2.00      | 2.00      | 1.00         | 1.0          | 2.0       | 1.50      | 0.60     | 2.0      | 3.0     | 1.25    | 1.5       |
| Fe       | -            | -         | -          | -          | -         | -          | -         | -4.0-6.0  | 4.5-6.0      | -            | -         | -         | -        | 3.0      | 11.0    | 3.5     | -         |
| V        | -            | -         | -          | -          | -         | -          | -         | -         | 0.20-0.60    | 0.2-0.4      | -         | -         | -        | -        | -       | -       | -         |

PHYSICAL PROPERTIES

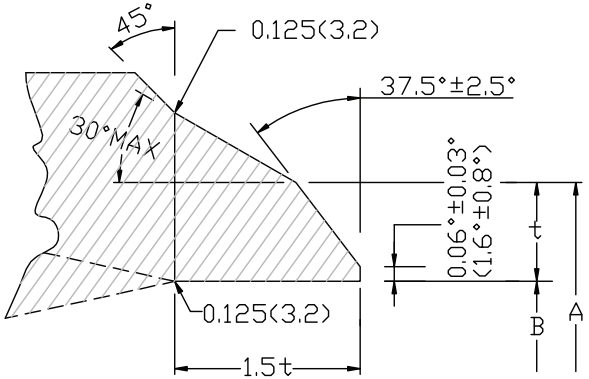
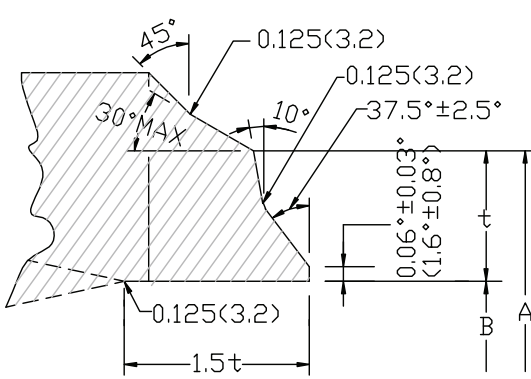
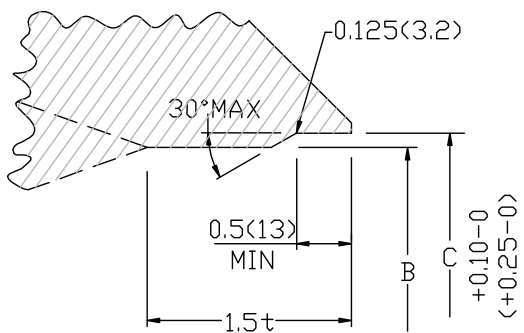
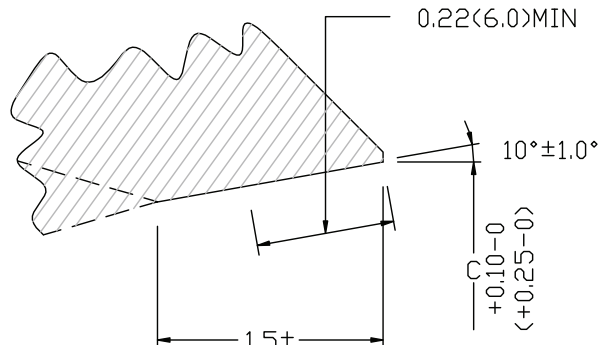
|                                  |        |                |        |        |                |                |        |        |        |        |        |        |        |        |        |        |        |
|----------------------------------|--------|----------------|--------|--------|----------------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Tensile Strength Min. Kis Mpa    | 70 485 | 90-115 621-493 | 70 485 | 70 485 | 90-115 621-793 | 90-115 621-793 | 70 485 | 70 185 | 76 525 | 70 485 | 70 485 | 65 450 | 72 495 | 50 345 | 70 485 | 65 450 | 62 425 |
| Yield Point Min. Kis Mpa         | 30 205 | 65 448         | 40 275 | 40 275 | 60 414         | 60 414         | 28 195 | 30 205 | 40 275 | 30 205 | 30 205 | 35 240 | 40 275 | 18 125 | 28 195 | 25 170 | 25 170 |
| Elongation in 2 inch (50mm) %Min | 22     | 18             | 20     | 20     | 18             | 18             | 35     | 30     | 6      | 35     | 30     | 20     | 40     | 10.0   | 30.0   | 25.0   | 35.0   |
| Reduction of Area % min          | 35     | 30             | 35     | 35     | 35             | 35             | -      | -      | -      | -      | -      | 35     | -      | -      | -      | -      | -      |

WROUGHT MATERIALS  
CHEMICAL PROPERTIES

|            | 11-13% Cr | Ductile   | Carbon Steel | B-8F        | 321-S.S    | 304L-S.S  | 316L-S.S  | 304-L-S.S   | 316L-S.S    | Hard Facing | Bolts     | Nuts |
|------------|-----------|-----------|--------------|-------------|------------|-----------|-----------|-------------|-------------|-------------|-----------|------|
| ASTM Std   | A-182     | A-439     | ASTM         | A-320       | A-182      | A-182     | A-182     | A-182       | A-182       | KLS         | A-193     | A194 |
| Grade      | F6a       | D2C       | A-105        | B-8F        | F-321      | F-304     | F-316     | F-304L      | F-316L      | HF-6R       | B7        | 2H   |
| C% Max.    | 0.15      | 0.29      | 0.22-0.35    | 0.15        | 0.08       | 0.08      | 0.08      | 0.035       | 0.035       | 11.05       | 0.38-0.48 | 0.40 |
| Si% MAX.   | 1.00      | 100.3.00  | 0.35         | 1.00        | 1.00       | 1.00      | 1.00      | 1.00        | 1.00        | 1.11        | 0.15-0.35 | -    |
| Min % MAX. | 1.00      | 1.80-2.40 | 0.60-1.05    | 2.00        | 2.00       | 2.00      | 2.00      | 2.00        | 2.00        | -           | 0.75-1.00 | -    |
| P% MAX.    | 0.04      | 0.08      | 0.04         | 0.20        | 0.030      | 0.04      | 0.04      | 0.040       | 0.040       | -           | 0.04      | 0.04 |
| S% MAX.    | 0.03      | -         | 0.05         | 0.150-0.350 | 0.030      | 0.03      | 0.03      | 0.030       | 0.030       | -           | 0.04      | 0.05 |
| Ni %       | 0.05      | 21.0-24.0 | -            | 8.00-10.00  | 9.00-12.00 | 8.0-11.0  | 10.0-14.0 | 8.00-13.00  | 10.00-15.00 | -           | -         | -    |
| Cr%        | 11.5-14.5 | 0.05      | -            | 17.00-19.00 | 17.00Min   | 18.0-20.0 | 16.0-18.0 | 18.00-20.00 | 16.00-18.00 | 28.3        | 0.80-1.10 | -    |
| Mo%        | -         | -         | -            | -           | -          | -         | 2.00-3.00 | -           | 2.00-3.00   | -           | 0.15-0.25 | -    |
| Ti%        | -         | -         | -            | -           | C%X5-0.60  | -         | -         | -           | -           | -           | -         | -    |
| F%         | Bal       | -         | -            | -           | -          | -         | -         | -           | -           | 0.30        | Bal       | Bal  |
| W%         | -         | -         | -            | -           | -          | -         | -         | -           | -           | 4.20        | -         | -    |
| Co%        | -         | -         | -            | -           | -          | -         | -         | -           | -           | Bal         | -         | -    |

PHYSICAL PROPERTIES

|                                  |        |        |        |        |        |        |        |        |        |     |         |       |
|----------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----|---------|-------|
| Tensile Strength Min. Kis Mpa    | 85 586 | 85 400 | 70 483 | 75 517 | 75 517 | 75 517 | 75 517 | 70 483 | 70 483 | - - | 125 862 | 175 - |
| Yield Point Min. Kis Mpa         | 55 379 | 28 193 | 35 248 | 30 207 | 30 207 | 30 207 | 30 207 | 25 172 | 25 172 | - - | 105 7±4 | - -   |
| Elongation in 2 inch (50mm) %Min | 18     | 20     | 22     | 35     | 45     | 30     | 30     | 30     | 30     | -   | 16      | -     |
| Reduction of Area % min          | 35     | 45     | 30     | 50     | 50     | 50     | 50     | 50     | 50     | -   | 50      | -     |

|                                                                                                                                                                         |                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>TYPE A</b></p>  <p>FOR WALL THICKNESS(t) 0.188(4.8) TO 0.875(22.2) INCLUSIVE</p> | <p><b>TYPE B</b></p>  <p>FOR WALL THICKNESS(t) GREATER THAN 0.875(22.2)</p>  |
| <p><b>TYPE C</b></p>  <p>INSIDE CONTOUR FOR USE WITH RECTANGULAR BACKING RING</p>     | <p><b>TYPE D</b></p>  <p>INSIDE CONTOUR FOR USE WITH TAPER BACKING RING</p> |

## FORMULA

Dimension C for the bore of pipe, valve, welding neck flanges and pipe fittings when using continuous rectangular or taper backing rings is determined by the following formula:

$$C = A - 0.031(0.787) - 1.75t - 0.010(0.254)$$

where

A = Nominal outside diameter of pipe

0.031(0.785) = Minus tolerance on OD of pipe (As covered by ASTM specification having the more restrictive requirements such as A106, A335, etc.)

1.75 = Minimum wall of 87½ percent of nominal wall (permitted by ASTM specification having the more restrictive requirements such as A106, A335, etc.) multiplied by two to get diameter.

t = Nominal wall thickness of pipe in inches

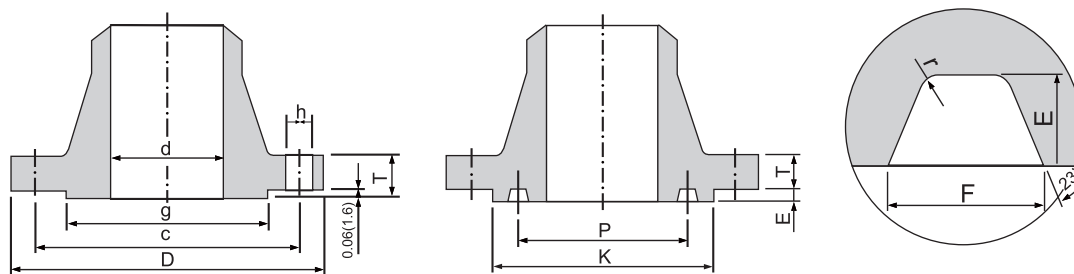
0.010(0.254) = Plus machining tolerance on Bore C.

Linear dimensions are in inches with metric values shown in millimeters in parenthesis.

DIMENSION OF BUTT - WELDED ENDS

| V/V<br>SIZE | ØA<br>CAST<br>STEEL | ØA<br>PIPE<br>O.D. | SCH.      | ØB<br>W/OUT<br>B/RING | t<br>WALL<br>TH'K |     |       |       |          |       |      |
|-------------|---------------------|--------------------|-----------|-----------------------|-------------------|-----|-------|-------|----------|-------|------|
| 2B          | 62.4                | 60.3               | 40 / STD  | 52.5                  | 3.9               | 14B | 362.0 | 355.6 | 10       | 342.9 | 6.4  |
|             |                     |                    | XS / 80   | 49.3                  | 5.5               |     |       |       | 20       | 339.8 | 7.9  |
|             |                     |                    | 160       | 42.9                  | 8.7               |     |       |       | 30 / STD | 336.5 | 9.5  |
|             |                     |                    | XXS       | 38.2                  | 11.1              |     |       |       | 40       | 333.3 | 11.1 |
| 2.5B        | 75.2                | 73.0               | 40 / STD  | 62.7                  | 5.2               | 16B | 412.8 | 406.4 | XS       | 330.2 | 12.7 |
|             |                     |                    | XS / 80   | 59.0                  | 7.0               |     |       |       | 60       | 325.4 | 15.1 |
|             |                     |                    | 160       | 54.0                  | 9.5               |     |       |       | 80       | 317.5 | 19.1 |
|             |                     |                    | XXS       | 45.0                  | 14.0              |     |       |       | 100      | 307.9 | 23.8 |
| 3B          | 91.2                | 88.9               | 40 / STD  | 77.9                  | 5.5               | 18B | 464.3 | 457.2 | 120      | 300.0 | 27.8 |
|             |                     |                    | XS / 80   | 73.7                  | 7.6               |     |       |       | 140      | 292.1 | 31.8 |
|             |                     |                    | 160       | 66.6                  | 11.1              |     |       |       | 160      | 284.2 | 35.7 |
|             |                     |                    | XXS       | 58.4                  | 15.2              |     |       |       | 10       | 393.7 | 6.4  |
| 4B          | 117.3               | 114.3              | 40 / STD  | 102.3                 | 6.0               | 20B | 515.9 | 508.0 | 20       | 390.6 | 7.9  |
|             |                     |                    | XS / 80   | 97.2                  | 8.6               |     |       |       | 30 / STD | 387.3 | 9.5  |
|             |                     |                    | 120       | 92.0                  | 11.1              |     |       |       | 40 / XS  | 381.0 | 12.7 |
|             |                     |                    | 160       | 87.3                  | 13.5              |     |       |       | 60       | 373.1 | 16.7 |
| 5B          | 144.5               | 141.3              | XXS       | 80.1                  | 17.1              | 22B | 567.4 | 558.8 | 80       | 363.5 | 21.4 |
|             |                     |                    | 40 / STD  | 128.2                 | 6.6               |     |       |       | 100      | 354.0 | 26.2 |
|             |                     |                    | XS / 80   | 122.2                 | 9.5               |     |       |       | 120      | 344.5 | 31.0 |
|             |                     |                    | 120       | 115.9                 | 12.7              |     |       |       | 140      | 333.3 | 36.5 |
| 6B          | 172.2               | 168.3              | 160       | 109.5                 | 15.9              | 24B | 619.3 | 609.6 | 160      | 325.4 | 40.5 |
|             |                     |                    | XXS       | 103.2                 | 19.1              |     |       |       | 10       | 444.5 | 6.4  |
|             |                     |                    | 40 / STD  | 154.1                 | 7.1               |     |       |       | 20       | 441.4 | 7.9  |
|             |                     |                    | XS / 80   | 146.3                 | 11.0              |     |       |       | STD      | 438.1 | 9.5  |
| 8B          | 223.0               | 219.1              | 120       | 139.7                 | 14.3              | 26B | 670.1 | 660.4 | 30       | 434.9 | 11.1 |
|             |                     |                    | 160       | 131.8                 | 18.3              |     |       |       | XS       | 431.8 | 12.7 |
|             |                     |                    | XXS       | 124.4                 | 22.0              |     |       |       | 40       | 428.7 | 14.3 |
|             |                     |                    | 20        | 206.4                 | 6.4               |     |       |       | 60       | 419.1 | 19.1 |
| 10B         | 277.9               | 273.1              | 30        | 205.0                 | 7.0               | 28B | 720.8 | 711.2 | 80       | 409.5 | 23.8 |
|             |                     |                    | 40 / STD  | 202.7                 | 8.2               |     |       |       | 100      | 398.5 | 29.4 |
|             |                     |                    | 60        | 198.5                 | 10.3              |     |       |       | 120      | 387.3 | 34.9 |
|             |                     |                    | XS / 80   | 193.7                 | 12.7              |     |       |       | 140      | 377.9 | 39.7 |
| 12B         | 329.4               | 323.9              | 100       | 188.9                 | 15.1              | 30B | 771.7 | 762.0 | 160      | 366.7 | 45.2 |
|             |                     |                    | 120       | 182.6                 | 18.3              |     |       |       | 10       | 495.3 | 6.4  |
|             |                     |                    | 140       | 177.8                 | 20.6              |     |       |       | 20 / STD | 488.9 | 9.5  |
|             |                     |                    | 160       | 173.1                 | 23.0              |     |       |       | 30 / XS  | 482.6 | 12.7 |
|             |                     |                    | XXS       | 174.6                 | 22.2              | 32B | 825.5 | 812.8 | 40       | 477.8 | 15.1 |
|             |                     |                    | 20        | 260.4                 | 6.4               |     |       |       | 60       | 466.8 | 20.6 |
|             |                     |                    | 30        | 257.5                 | 7.8               |     |       |       | 80       | 455.6 | 26.2 |
|             |                     |                    | 40 / STD  | 254.5                 | 9.3               |     |       |       | 100      | 442.9 | 32.5 |
|             |                     |                    | 60 / XS   | 247.7                 | 12.7              | 34B | 876.3 | 863.6 | 120      | 431.8 | 38.1 |
|             |                     |                    | 80        | 242.9                 | 15.1              |     |       |       | 140      | 419.1 | 44.5 |
|             |                     |                    | 100       | 236.5                 | 18.3              |     |       |       | 160      | 408.0 | 50.0 |
|             |                     |                    | 120       | 230.2                 | 21.4              |     |       |       | 10       | 546.1 | 6.4  |
|             |                     |                    | 140 / XXS | 222.3                 | 25.4              | 36B | 927.1 | 914.4 | 20 / STD | 539.7 | 9.5  |
|             |                     |                    | 160       | 215.9                 | 28.6              |     |       |       | 30 / XS  | 533.4 | 12.7 |
|             |                     |                    | 20        | 311.2                 | 6.4               |     |       |       | 60       | 514.3 | 22.2 |
|             |                     |                    | 30        | 307.1                 | 8.4               |     |       |       | 80       | 501.6 | 28.6 |
|             |                     |                    | STD       | 304.8                 | 9.5               |     |       |       | 100      | 488.9 | 34.9 |
|             |                     |                    | 40        | 303.2                 | 10.3              |     |       |       | 120      | 476.2 | 41.3 |
|             |                     |                    | XS        | 298.5                 | 12.7              |     |       |       | 140      | 463.5 | 47.6 |
|             |                     |                    | 60        | 295.3                 | 14.3              |     |       |       | 160      | 450.8 | 54.0 |
|             |                     |                    | 80        | 288.9                 | 17.5              |     |       |       | 10       | 596.9 | 6.4  |
|             |                     |                    | 100       | 281.0                 | 21.4              |     |       |       | 20 / STD | 590.5 | 9.5  |
|             |                     |                    | 120 / XXS | 273.1                 | 25.4              |     |       |       | XS       | 584.2 | 12.7 |
|             |                     |                    | 140       | 266.7                 | 28.6              |     |       |       | 30       | 581.1 | 14.3 |
|             |                     |                    | 160       | 257.2                 | 33.3              |     |       |       | 40       | 574.6 | 17.5 |
|             |                     |                    |           |                       |                   |     |       |       | 60       | 560.4 | 24.6 |
|             |                     |                    |           |                       |                   |     |       |       | 80       | 547.7 | 31.0 |
|             |                     |                    |           |                       |                   |     |       |       | 100      | 531.8 | 38.9 |
|             |                     |                    |           |                       |                   |     |       |       | 120      | 517.6 | 46.0 |
|             |                     |                    |           |                       |                   |     |       |       | 140      | 504.9 | 52.4 |
|             |                     |                    |           |                       |                   |     |       |       | 160      | 490.5 | 59.5 |
|             |                     |                    |           |                       |                   |     |       |       | 10       | 644.6 | 7.9  |
|             |                     |                    |           |                       |                   |     |       |       | STD      | 641.3 | 9.5  |
|             |                     |                    |           |                       |                   |     |       |       | 20 / XS  | 635.0 | 12.7 |
|             |                     |                    |           |                       |                   |     |       |       | 10       | 695.4 | 7.9  |
|             |                     |                    |           |                       |                   |     |       |       | STD      | 692.1 | 9.5  |
|             |                     |                    |           |                       |                   |     |       |       | 20 / XS  | 685.8 | 12.7 |
|             |                     |                    |           |                       |                   |     |       |       | 30       | 679.4 | 15.9 |
|             |                     |                    |           |                       |                   |     |       |       | 10       | 746.2 | 7.9  |
|             |                     |                    |           |                       |                   |     |       |       | STD      | 742.9 | 9.5  |
|             |                     |                    |           |                       |                   |     |       |       | 20 / XS  | 736.6 | 12.7 |
|             |                     |                    |           |                       |                   |     |       |       | 30       | 730.2 | 15.9 |
|             |                     |                    |           |                       |                   |     |       |       | 10       | 797.0 | 7.9  |
|             |                     |                    |           |                       |                   |     |       |       | STD      | 793.7 | 9.5  |
|             |                     |                    |           |                       |                   |     |       |       | 20 / XS  | 787.4 | 12.7 |
|             |                     |                    |           |                       |                   |     |       |       | 30       | 781.0 | 15.9 |
|             |                     |                    |           |                       |                   |     |       |       | 40       | 777.8 | 17.5 |
|             |                     |                    |           |                       |                   |     |       |       | 10       | 847.8 | 7.9  |
|             |                     |                    |           |                       |                   |     |       |       | STD      | 844.5 | 9.5  |
|             |                     |                    |           |                       |                   |     |       |       | 20 / XS  | 838.2 | 12.7 |
|             |                     |                    |           |                       |                   |     |       |       | 30       | 831.8 | 15.9 |
|             |                     |                    |           |                       |                   |     |       |       | 40       | 828.6 | 17.5 |
|             |                     |                    |           |                       |                   |     |       |       | 10       | 898.6 | 7.9  |
|             |                     |                    |           |                       |                   |     |       |       | STD      | 895.3 | 9.5  |
|             |                     |                    |           |                       |                   |     |       |       | 20 / XS  | 889.0 | 12.7 |
|             |                     |                    |           |                       |                   |     |       |       | 30       | 882.6 | 15.9 |
|             |                     |                    |           |                       |                   |     |       |       | 40       | 876.3 | 19.1 |
|             |                     |                    |           |                       |                   |     |       |       |          |       |      |
|             |                     |                    |           |                       |                   |     |       |       |          |       |      |
|             |                     |                    |           |                       |                   |     |       |       |          |       |      |

# FLANGE DIMENSION & TEMPLATES FOR DRILLING

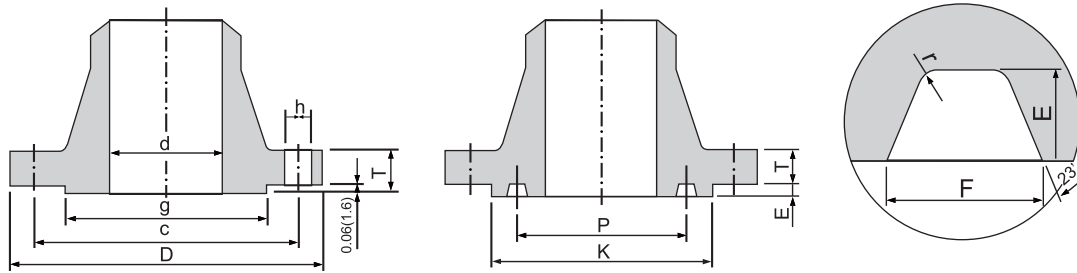


ANSI CLASS 150

ANSI B16.5 - 1988

| Nominal    | Inside<br>Diam | OD of<br>Flange | Raised<br>Face Diam | Thickness<br>of flange | Diam. of<br>Bolt Circle | Diam. of<br>Bolt Holes | No<br>of<br>Bolt | Diam<br>of<br>Bolt | Facing<br>Diam. | Pitch<br>Diam. | Ring<br>No. | Depth<br>Groove | Width of<br>Groove | Groove Fillet<br>Radius |
|------------|----------------|-----------------|---------------------|------------------------|-------------------------|------------------------|------------------|--------------------|-----------------|----------------|-------------|-----------------|--------------------|-------------------------|
| Size       | d              | D               | g                   | T                      | C                       | h                      |                  |                    | K               | P              |             | E               | F                  | F                       |
| inch<br>mm | inch<br>mm     | inch<br>mm      | inch<br>mm          | inch<br>mm             | inch<br>mm              | inch<br>mm             |                  |                    | inch<br>mm      | inch<br>mm     |             | inch<br>mm      | inch<br>mm         | inch<br>mm              |
| 1/2        | 0.50           | 3.50            | 1.38                | - 0.44                 | 2.38                    | 0.62                   | 4                | 1/2                | -               | -              | -           | -               | -                  | -                       |
| 15         | 12.7           | 88.9            | 35.1                | - 11.2                 | 60.5                    | 15.8                   | 4                | 1/2                | -               | -              | -           | -               | -                  | -                       |
| 3/4        | 0.75           | 3.88            | 1.69                | - 0.50                 | 2.75                    | 0.62                   | 4                | 1/2                | -               | -              | -           | -               | -                  | -                       |
| 20         | 19.1           | 98.6            | 42.9                | - 12.7                 | 69.9                    | 15.8                   | 4                | 1/2                | -               | -              | -           | -               | -                  | -                       |
| 1          | 1.00           | 4.25            | 2.00                | 0.44 0.56              | 3.12                    | 0.62                   | 4                | 1/2                | 2.50            | 1.875          | R15         | 0.25            | 0.344              | 0.03                    |
| 25         | 25.4           | 108             | 50.8                | 11.3 14.3              | 79.3                    | 15.8                   | 4                | 1/2                | 63.5            | 47.63          | R15         | 6.35            | 8.74               | 0.8                     |
| 1 1/4      | 1.25           | 4.62            | 2.50                | 0.50 0.62              | 3.50                    | 0.62                   | 4                | 1/2                | 2.88            | 2.250          | R17         | 0.25            | 0.344              | 0.03                    |
| 32         | 31.8           | 117.4           | 63.5                | 13. 15.8               | 88.9                    | 15.8                   | 4                | 1/2                | 73.2            | 57.15          | R17         | 6.35            | 8.74               | 0.8                     |
| 1 1/2      | 1.50           | 5.00            | 2.88                | 0.56 0.69              | 3.88                    | 0.62                   | 4                | 1/2                | 3.25            | 2.562          | R19         | 0.25            | 0.344              | 0.03                    |
| 40         | 38.1           | 127             | 73.2                | 14.5 17.5              | 98.6                    | 15.8                   | 4                | 1/2                | 82.6            | 65.08          | R19         | 6.35            | 8.74               | 0.8                     |
| 2          | 2.00           | 6.00            | 3.62                | 0.62 0.75              | 4.75                    | 0.75                   | 4                | 5/8                | 4.00            | 3.250          | R22         | 0.25            | 0.344              | 0.03                    |
| 50         | 50.8           | 152.4           | 92.0                | 15.8 19.1              | 120.7                   | 19.1                   | 4                | 5/8                | 101.6           | 82.55          | R22         | 6.35            | 8.74               | 0.8                     |
| 2 1/2      | 2.50           | 7.00            | 4.12                | 0.69 0.88              | 5.50                    | 0.75                   | 4                | 5/8                | 4.75            | 4.00           | R25         | 0.25            | 0.344              | 0.03                    |
| 65         | 63.5           | 177.8           | 104.7               | 17.5 22.4              | 139.7                   | 19.1                   | 4                | 5/8                | 120.7           | 101.60         | R25         | 6.35            | 8.74               | 0.8                     |
| 3          | 3.00           | 7.50            | 5.00                | 0.75 0.94              | 6.00                    | 0.75                   | 4                | 5/8                | 5.25            | 4.50           | R29         | 0.25            | 0.344              | 0.03                    |
| 80         | 76.2           | 190.5           | 127.0               | 19.1 23.9              | 152.4                   | 19.1                   | 4                | 5/8                | 133.4           | 114.3          | R29         | 6.35            | 8.74               | 0.8                     |
| 3 1/2      | 3.50           | 8.50            | 5.50                | 0.8 0.94               | 7.00                    | 0.75                   | 8                | 5/8                | 6.06            | 5.188          | R33         | 0.25            | 0.344              | 0.03                    |
| 90         | 88.9           | 215.9           | 139.7               | 20.3 23.9              | 177.8                   | 19.1                   | 8                | 5/8                | 153.9           | 131.78         | R33         | 6.35            | 8.74               | 0.8                     |
| 4          | 4.00           | 9.00            | 6.19                | 0.94                   | 7.50                    | 0.75                   | 8                | 5/8                | 6.75            | 5.875          | R36         | 0.25            | 0.344              | 0.03                    |
| 100        | 101.6          | 228.6           | 157.2               | 23.9                   | 190.5                   | 19.1                   | 8                | 5/8                | 171.5           | 149.23         | R36         | 6.35            | 8.74               | 0.8                     |
| 5          | 5.00           | 10.000          | 7.31                | 0.94                   | 8.50                    | 0.88                   | 8                | 3/4                | 7.62            | 6.750          | R40         | 0.25            | 0.344              | 0.03                    |
| 125        | 127            | 254.0           | 185.7               | 23.9                   | 215.9                   | 22.4                   | 8                | 3/4                | 193.6           | 171.45         | R40         | 6.35            | 8.74               | 0.8                     |
| 6          | 6.00           | 11.00           | 8.50                | 1.00                   | 9.50                    | 0.88                   | 8                | 3/4                | 8.62            | 7.625          | R43         | 0.25            | 0.344              | 0.03                    |
| 150        | 152.4          | 279.4           | 215.9               | 25.5                   | 241.3                   | 22.4                   | 8                | 3/4                | 219.0           | 193.68         | R43         | 6.35            | 8.74               | 0.8                     |
| 8          | 8.00           | 13.50           | 10.62               | 1.12                   | 11.75                   | 0.88                   | 8                | 7/8                | 10.75           | 9.750          | R48         | 0.25            | 0.344              | 0.03                    |
| 200        | 203            | 342.9           | 269.8               | 28.5                   | 298.5                   | 22.4                   | 8                | 7/8                | 273.1           | 247.65         | R48         | 6.35            | 8.74               | 0.8                     |
| 10         | 10.00          | 16.00           | 12.75               | 1.19                   | 14.25                   | 1.00                   | 12               | 7/8                | 13.00           | 12.000         | R52         | 0.25            | 0.344              | 0.03                    |
| 250        | 254            | 406.4           | 323.9               | 30.2                   | 362.0                   | 25.4                   | 12               | 7/8                | 330.2           | 304.80         | R52         | 6.35            | 8.74               | 0.8                     |
| 12         | 12.00          | 19.00           | 15.00               | 1.25                   | 17.00                   | 1.00                   | 12               | 7/8                | 16.00           | 15.000         | R56         | 0.25            | 0.344              | 0.03                    |
| 300        | 304.8          | 482.6           | 381.0               | 31.8                   | 431.8                   | 25.4                   | 12               | 7/8                | 406.4           | 381.000        | R56         | 6.35            | 8.74               | 0.8                     |
| 14         | 13.25          | 21.00           | 16.25               | 1.38                   | 18.75                   | 1.12                   | 12               | 1                  | 16.75           | 15.625         | R59         | 0.25            | 0.344              | 0.03                    |
| 350        | 336.6          | 533.4           | 412.8               | 35.1                   | 476.3                   | 28.5                   | 12               | 1                  | 425.5           | 396.88         | R59         | 6.35            | 8.74               | 0.8                     |
| 16         | 15.25          | 23.50           | 18.50               | 1.44                   | 21.25                   | 1.12                   | 16               | 1                  | 19.00           | 17.875         | R64         | 0.25            | 0.344              | 0.03                    |
| 400        | 387.4          | 596.9           | 469.9               | 36.6                   | 539.8                   | 28.5                   | 16               | 1                  | 482.6           | 454.03         | R64         | 6.35            | 8.74               | 0.8                     |
| 18         | 17.25          | 25.00           | 21.00               | 1.56                   | 22.75                   | 1.25                   | 16               | 1 1/8              | 21.50           | 20.375         | R68         | 0.25            | 0.344              | 0.03                    |
| 450        | 438.2          | 635             | 533.4               | 39.6                   | 577.9                   | 31.8                   | 16               | 1 1/8              | 546.1           | 517.53         | R68         | 6.35            | 8.74               | 0.8                     |
| 20         | 19.25          | 275.0           | 23.00               | 1.69                   | 25.00                   | 1.25                   | 20               | 1 1/8              | 23.50           | 22.000         | R72         | 0.25            | 0.344              | 0.03                    |
| 500        | 489.0          | 698.7           | 584.2               | 42.9                   | 635.0                   | 31.8                   | 20               | 1 1/8              | 596.9           | 558.80         | R72         | 6.35            | 8.74               | 0.8                     |
| 24         | 23.25          | 32.00           | 27.25               | 1.88                   | 29.50                   | 1.38                   | 20               | 1 1/4              | 28.00           | 26.500         | R76         | 0.25            | 0.344              | 0.03                    |
| 600        | 590.6          | 812.8           | 692.2               | 47.8                   | 749.3                   | 35.1                   | 20               | 1 1/4              | 711.2           | 673.10         | R76         | 6.35            | 8.74               | 0.8                     |

# FLANGE DIMENSION & TEMPLATES FOR DRILLING



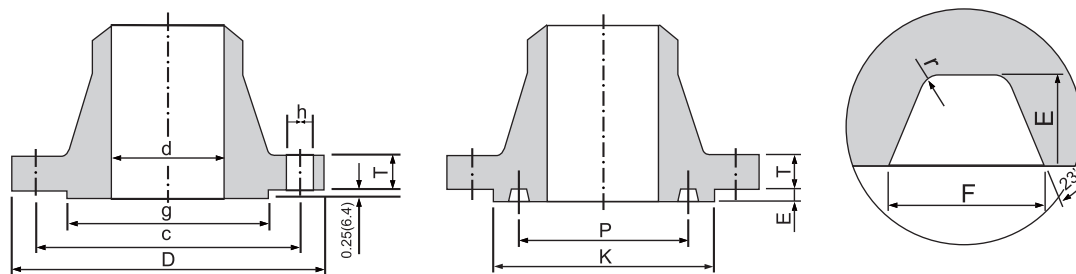
ANSI CLASS 300

ANSI B16.5 - 1988

| Nominal Size | Inside Diam<br>d | OD of Flange<br>D | Raised Face Diam<br>g | Thickness of Flange<br>T | Diam. of Bolt Circle<br>C | Diam. of Bolt Holes<br>h | No of Bolt | Diam of Bolt | Facing Diam.<br>K | Pitch Diam.<br>P | Ring No. | Depth Groove<br>E | Width OF Groove<br>F | Groove Fillet Radius<br>F |
|--------------|------------------|-------------------|-----------------------|--------------------------|---------------------------|--------------------------|------------|--------------|-------------------|------------------|----------|-------------------|----------------------|---------------------------|
| inch<br>mm   | inch<br>mm       | inch<br>mm        | inch<br>mm            | inch<br>mm               | inch<br>mm                | inch<br>mm               |            |              | inch<br>mm        | inch<br>mm       |          | inch<br>mm        | inch<br>mm           | inch<br>mm                |
| 1/2<br>15    | 0.50<br>12.7     | 3.75<br>95.3      | 1.38<br>35.1          | 0.56<br>14.2             | 2.62<br>66.6              | 0.62<br>15.8             | 4          | 1/2          | 2.00<br>50.8      | 1.344<br>34.14   | R11      | 0.219<br>5.56     | 0.281<br>7.14        | 0.03<br>0.8               |
| 3/4<br>20    | 0.75<br>19.1     | 4.62<br>117.3     | 1.69<br>42.9          | 0.62<br>15.8             | 3.25<br>82.6              | 0.75<br>19.1             | 4          | 5/8          | 2.50<br>63.5      | 1.688<br>12.88   | R13      | 0.250<br>6.35     | 0.344<br>8.74        | 0.03<br>0.8               |
| 1<br>25      | 1.00<br>25.4     | 4.88<br>124       | 2.00<br>50.8          | 0.69<br>17.5             | 3.50<br>88.9              | 0.75<br>19.1             | 4          | 5/8          | 2.75<br>69.9      | 2.000<br>50.80   | R16      | 0.750<br>6.35     | 0.344<br>8.74        | 0.03<br>0.8               |
| 1 1/4<br>32  | 1.25<br>31.8     | 5.25<br>133.4     | 2.50<br>63.5          | 0.75<br>19.1             | 3.88<br>98.6              | 0.75<br>19.1             | 4          | 3/4          | 3.12<br>79.3      | 2.375<br>60.33   | R18      | 0.250<br>6.35     | 0.344<br>8.74        | 0.03<br>0.8               |
| 1 1/2<br>40  | 1.50<br>38.1     | 6.12<br>155.5     | 2.88<br>73.2          | 0.81<br>20.6             | 4.50<br>114.3             | 0.88<br>22.4             | 4          | 3/4          | 3.56<br>90.5      | 2.688<br>68.28   | R20      | 0.250<br>6.35     | 0.344<br>8.74        | 0.03<br>0.8               |
| 2<br>50      | 2.00<br>50.8     | 6.50<br>165.1     | 3.62<br>92.0          | 0.88<br>22.4             | 5.00<br>127.0             | 0.75<br>19.1             | 8          | 3/4          | 4.25<br>108       | 3.250<br>32.55   | R23      | 0.312<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 2 1/2<br>65  | 2.50<br>63.5     | 7.50<br>190.5     | 4.12<br>104.7         | 1.00<br>25.4             | 5.88<br>149.4             | 0.88<br>22.4             | 8          | 3/4          | 5.00<br>127       | 4.000<br>101.60  | R26      | 0.321<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 3<br>80      | 3.00<br>76.2     | 8.25<br>209.6     | 5.00<br>127.0         | 1.12<br>28.5             | 6.62<br>168.2             | 0.88<br>22.4             | 8          | 3/4          | 5.75<br>146.1     | 4.875<br>123.83  | R31      | 0.321<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 3 1/2<br>90  | 3.50<br>88.9     | 9.00<br>228.6     | 5.50<br>139.7         | 1.19<br>30.2             | 7.25<br>184.2             | 0.88<br>22.4             | 8          | 3/4          | 6.25<br>158.8     | 5.188<br>131.76  | R34      | 0.312<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 4<br>100     | 4.00<br>101.6    | 10.00<br>254      | 6.19<br>157.2         | 1.25<br>31.8             | 7.88<br>200.2             | 0.88<br>22.4             | 8          | 3/4          | 6.88<br>174.8     | 5.875<br>149.23  | R37      | 0.312<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 5<br>125     | 5.00<br>127      | 11.00<br>279.4    | 7.31<br>185.7         | 1.38<br>35.1             | 9.25<br>235.0             | 0.88<br>22.4             | 8          | 3/4          | 8.25<br>209.6     | 7.125<br>180.98  | R41      | 0.312<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 6<br>150     | 6.00<br>152.4    | 12.50<br>317.5    | 8.50<br>215.9         | 1.44<br>36.6             | 10.62<br>269.8            | 0.88<br>22.4             | 12         | 3/4          | 9.50<br>241.3     | 8.312<br>211.13  | R45      | 0.312<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 8<br>200     | 8.00<br>203      | 15.00<br>381      | 10.62<br>269.8        | 1.62<br>41.2             | 13.00<br>330.2            | 1.00<br>25.4             | 12         | 7/8          | 1.88<br>301.8     | 10.625<br>269.88 | R49      | 0.312<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 10<br>250    | 10.00<br>254     | 17.50<br>444.5    | 12.75<br>323.9        | 1.88<br>47.8             | 15.25<br>387.4            | 1.12<br>28.5             | 16         | 1            | 14.00<br>355.6    | 12.750<br>323.85 | R53      | 0.312<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 12<br>300    | 12.00<br>305     | 20.50<br>521      | 15.00<br>381.0        | 2.00<br>50.8             | 17.75<br>450.9            | 1.25<br>31.8             | 16         | 1 1/8        | 16.25<br>412.8    | 15.000<br>381.00 | R57      | 0.312<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 14<br>350    | 13.25<br>337     | 23.00<br>584.2    | 16.25<br>412.8        | 2.12<br>53.8             | 20.25<br>514.4            | 1.25<br>31.8             | 20         | 1 1/8        | 18.00<br>457.2    | 16.500<br>419.10 | R61      | 0.312<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 16<br>400    | 15.25<br>387     | 25.50<br>647.7    | 18.50<br>469.9        | 2.25<br>57.2             | 22.50<br>571.5            | 1.38<br>35.1             | 20         | 1 1/4        | 20.00<br>508      | 18.500<br>469.90 | R65      | 0.312<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 18<br>450    | 17.00<br>432     | 28.00<br>711.2    | 21.00<br>533.4        | 2.38<br>60.5             | 24.75<br>628.7            | 1.38<br>35.1             | 24         | 1 1/4        | 22.62<br>574.5    | 21.000<br>533.40 | R69      | 0.312<br>7.92     | 0.469<br>11.91       | 0.03<br>0.8               |
| 20<br>500    | 19.00<br>483     | 30.50<br>774.7    | 23.00<br>584.2        | 2.50<br>63.5             | 27.00<br>685.8            | 1.38<br>35.1             | 24         | 1 1/4        | 25.00<br>635      | 23.000<br>584.20 | R73      | 0.375<br>9.52     | 0.531<br>13.49       | 0.06<br>1.5               |
| 24<br>600    | 23.00<br>584     | 36.00<br>914.4    | 27.25<br>692.2        | 2.75<br>69.9             | 32.00<br>812.8            | 1.62<br>41.2             | 24         | 1 1/2        | 29.50<br>749.3    | 27.250<br>692.15 | R77      | 0.438<br>11.13    | 0.656<br>16.66       | 0.06<br>1.5               |



# FLANGE DIMENSION & TEMPLATES FOR DRILLING

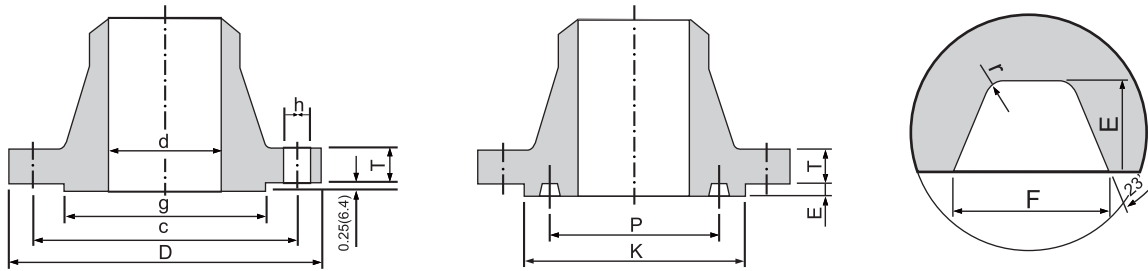


ANSI CLASS 600

ANSI 16.5 - 1988

| Nominal | Inside Diam | OD of Flange | Raised Face Diam | Thickness of flange | Daim of Bolt Circle | Daim of Bolt Holes | No of Bolt | Diam of Bolt | Facing Diam | Picth Diam | Ring No. | Depth Groove | Width of Groove | Groove Fillet Radius |
|---------|-------------|--------------|------------------|---------------------|---------------------|--------------------|------------|--------------|-------------|------------|----------|--------------|-----------------|----------------------|
| Size    | d           | D            | g                | T                   | C                   | h                  |            |              | K           | P          |          | E            | F               | F                    |
| inch    | Inch        | inch         | inch             | inch                | inch                | inch               |            |              | inch        | inch       |          | inch         | inch            | inch                 |
| mm      | mm          | mm           | mm               | mm                  | mm                  | mm                 |            |              | mm          | mm         |          | mm           | mm              | mm                   |
| 1/2     | 0.50        | 3.75         | 1.38             | 0.56                | 2.62                | 0.62               | 4          | 1/2          | 2.00        | 1.344      | R11      | 0.219        | 0.281           | 0.03                 |
| 15      | 12.7        | 95.3         | 35.01            | 14.2                | 66.6                | 15.8               |            |              | 50.8        | 34.14      |          | 5.56         | 7.14            | 0.8                  |
| 3/4     | 0.75        | 4.62         | 1.69             | 0.62                | 3.25                | 0.75               | 4          | 5/8          | 2.50        | 1.688      | R13      | 0.250        | 0.344           | 0.03                 |
| 20      | 19.1        | 117.4        | 42.9             | 15.8                | 82.6                | 19.1               |            |              | 63.5        | 42.88      |          | 6.35         | 8.74            | 0.8                  |
| 1       | 1.00        | 4.88         | 2.00             | 0.69                | 3.50                | 0.75               | 4          | 5/8          | 2.75        | 2.000      | R16      | 0.250        | 0.344           | 0.03                 |
| 25      | 25.4        | 124          | 50.8             | 17.5                | 88.9                | 19.1               |            |              | 69.9        | 50.80      |          | 6.35         | 8.74            | 0.8                  |
| 1 1/4   | 1.25        | 5.25         | 2.5              | 0.81                | 3.88                | 0.75               | 4          | 5/8          | 3.12        | 2.375      | R18      | 0.250        | 0.344           | 0.03                 |
| 32      | 31.8        | 133.4        | 63.5             | 20.6                | 98.6                | 19.1               |            |              | 79.3        | 60.33      |          | 6.35         | 8.74            | 0.8                  |
| 1 1/2   | 1.50        | 6.12         | 2.88             | 0.88                | 4.50                | 0.88               | 4          | 3/4          | 3.56        | 2.688      | R20      | 0.250        | 0.344           | 0.03                 |
| 40      | 38.1        | 155.5        | 73.2             | 22.4                | 114.3               | 22.4               |            |              | 90.4        | 68.28      |          | 6.35         | 8.74            | 0.8                  |
| 2       | 2.00        | 6.50         | 3.62             | 1.00                | 5.00                | 0.75               | 8          | 5/8          | 4.25        | 3.250      | R23      | 0.312        | 0.469           | 0.03                 |
| 50      | 50.8        | 165.1        | 92.0             | 25.4                | 127.0               | 19.1               |            |              | 108         | 82.55      |          | 7.92         | 11.91           | 0.8                  |
| 2 1/2   | 2.50        | 7.50         | 4.12             | 1.12                | 5.88                | 0.88               | 8          | 3/7          | 5.00        | 4.000      | R26      | 0.312        | 0.469           | 0.03                 |
| 65      | 63.5        | 190.5        | 104.7            | 28.5                | 149.4               | 22.4               |            |              | 127         | 101.60     |          | 7.92         | 11.91           | 0.8                  |
| 3       | 3.00        | 8.25         | 5.00             | 1.25                | 6.62                | 0.88               | 8          | 3/4          | 5.75        | 4.875      | R31      | 0.312        | 0.469           | 0.03                 |
| 80      | 76.2        | 209.6        | 127.0            | 32.18               | 168.2               | 22.4               |            |              | 146.1       | 123.83     |          | 7.92         | 11.91           | 0.8                  |
| 3 1/2   | 3.50        | 9.00         | 5.50             | 1.38                | 7.25                | 1.00               | 8          | 7/8          | 6.25        | 5.188      | R34      | 0.312        | 0.469           | 0.03                 |
| 90      | 88.9        | 228.6        | 139.7            | 35.1                | 184.1               | 25.4               |            |              | 158.8       | 131.86     |          | 7.92         | 11.91           | 0.8                  |
| 4       | 4.00        | 10.75        | 6.17             | 1.50                | 8.50                | 1.00               | 8          | 7/8          | 6.88        | 5.875      | R37      | 0.312        | 0.469           | 0.03                 |
| 100     | 101.6       | 273.1        | 157.2            | 38.1                | 215.9               | 25.4               |            |              | 174.8       | 149.23     |          | 7.92         | 11.91           | 0.8                  |
| 5       | 5.00        | 13.00        | 7.31             | 1.75                | 10.50               | 1.12               | 8          | 1            | 8.25        | 7.125      | R41      | 0.312        | 0.169           | 0.03                 |
| 125     | 127         | 330.20       | 185.7            | 44.5                | 266.7               | 28.4               |            |              | 209.6       | 180.98     |          | 7.92         | 11.91           | 0.8                  |
| 6       | 6.00        | 14.00        | 8.50             | 1.88                | 11.50               | 1.12               | 12         | 1            | 9.50        | 8.312      | R45      | 0.312        | 0.469           | 0.03                 |
| 150     | 152.4       | 355.6        | 215.9            | 47.8                | 292.1               | 28.4               |            |              | 241.3       | 211.12     |          | 7.92         | 11.91           | 0.8                  |
| 8       | 7.87        | 16.50        | 10.62            | 2.18                | 13.75               | 1.25               | 12         | 1 1/8        | 11.8        | 10.625     | R49      | 0.312        | 0.469           | 0.03                 |
| 200     | 199.9       | 419.1        | 269.8            | 55.6                | 349.3               | 31.8               |            |              | 301.8       | 269.88     |          | 7.92         | 11.91           | 0.8                  |
| 10      | 9.75        | 20.00        | 12.75            | 2.50                | 17.00               | 1.38               | 16         | 1 1/4        | 14.00       | 12.750     | R53      | 0.312        | 0.469           | 0.03                 |
| 250     | 247.7       | 508          | 323.9            | 63.5                | 431.8               | 31.8               |            |              | 355.6       | 323.85     |          | 7.92         | 11.91           | 0.8                  |
| 12      | 11.75       | 22.00        | 15.00            | 2.62                | 19.25               | 1.38               | 20         | 1 1/4        | 16.25       | 15.000     | R57      | 0.312        | 0.469           | 0.03                 |
| 300     | 298.5       | 558.8        | 381.0            | 66.5                | 489.0               | 31.8               |            |              | 412.8       | 381.00     |          | 7.92         | 11.91           | 0.8                  |
| 14      | 12.87       | 23.75        | 16.25            | 2.75                | 20.75               | 1.5                | 20         | 1 3/8        | 18.00       | 16.500     | R67      | 0.312        | 0.469           | 0.03                 |
| 150     | 326.9       | 603.3        | 412.8            | 69.9                | 527.1               | 38.1               |            |              | 457.2       | 419.10     |          | 7.92         | 11.91           | 0.8                  |
| 16      | 14.75       | 27.00        | 18.50            | 3.00                | 23.75               | 1.62               | 20         | 1 1/2        | 20.00       | 18.500     | R65      | 0.312        | 0.469           | 0.03                 |
| 400     | 374.7       | 685.8        | 469.9            | 76.2                | 603.3               | 41.1               |            |              | 508         | 469.90     |          | 7.92         | 11.91           | 0.8                  |
| 18      | 16.50       | 29.25        | 21.00            | 3.25                | 25.75               | 1.75               | 20         | 1 5/8        | 22.62       | 21.00      | R69      | 0.312        | 0.469           | 0.03                 |
| 450     | 419.1       | 743.0        | 533.4            | 82.6                | 654.0               | 44.5               |            |              | 574.5       | 533.40     |          | 7.92         | 11.91           | 0.8                  |
| 20      | 18.25       | 32.00        | 23.00            | 3.50                | 28.50               | 1.75               | 24         | 1 5/8        | 25.00       | 23.000     | R73      | 0.375        | 0.531           | 0.06                 |
| 500     | 463.6       | 812.8        | 584.2            | 88.9                | 723.9               | 44.5               |            |              | 635         | 584.20     |          | 9.52         | 13.49           | 1.5                  |
| 24      | 22.00       | 37.00        | 27.25            | 4.00                | 33.00               | 2.00               | 24         | 1 7/8        | 29.5        | 27.250     | R77      | 0.438        | 0.656           | 0.06                 |
| 600     | 885.8       | 939.8        | 692.2            | 101.6               | 838.2               | 50.8               |            |              | 749.3       | 692.15     |          | 11.13        | 16.66           | 1.5                  |

## FLANGE DIMENSION &amp; TEMPLATES FOR DRILLING



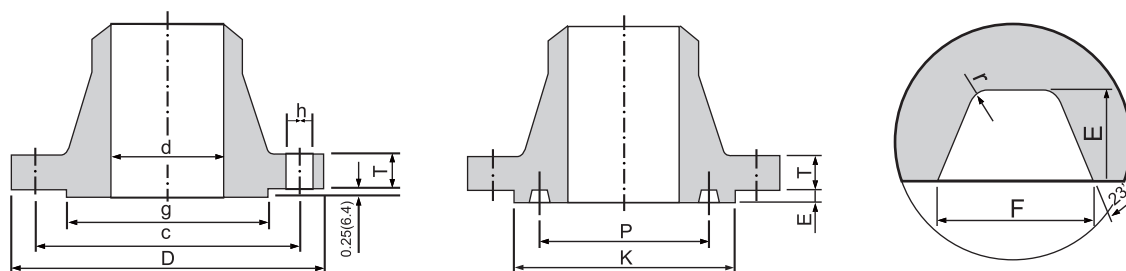
ANSI CLASS 900

ANSI B16.5 - 1988

| Nominal | Inside<br>Diam | OD of<br>Flange | Raised<br>Face Diam | Thickness<br>of flange | Daim of<br>Bolt Circle | Daim of<br>Bolt Holes | No<br>of Bolt | Diam<br>of Bolt | Facing<br>Diam | Pitch<br>Diam | Ring<br>No. | Depth<br>Groove | Width of<br>Groove | Groove Fillet<br>Radius |
|---------|----------------|-----------------|---------------------|------------------------|------------------------|-----------------------|---------------|-----------------|----------------|---------------|-------------|-----------------|--------------------|-------------------------|
| SIZE    | d              | D               | g                   | T                      | C                      | h                     |               |                 | K              | P             |             | E               | F                  | F                       |
| inch    | inch           | inch            | inch                | inch                   | inch                   | inch                  |               |                 | inch           | inch          |             | inch            | inch               | inch                    |
| mm      | mm             | mm              | mm                  | mm                     | mm                     | mm                    |               |                 | mm             | mm            |             | mm              | mm                 | mm                      |
| 1/2     |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 15      |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 3/4     |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 20      |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 1       |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 25      |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 1 1/4   |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 32      |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 1 1/2   |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 40      |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 2       |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 50      |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 2 1/2   |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 65      |                |                 |                     |                        |                        |                       |               |                 |                |               |             |                 |                    |                         |
| 3       | 2.87           | 9.50            | 5.00                | 1.50                   | 7.5                    | 1.00                  | 8             | 7/8             | 6.12           | 4.875         | R31         | 0.312           | 0.469              | 0.03                    |
| 80      | 72.29          | 241.3           | 127.0               | 38.1                   | 190.5                  | 25.4                  | 8             | 1 1/8           | 155.5          | 123.83        | R31         | 7.92            | 11.91              | 0.8                     |
| 4       | 3.87           | 11.50           | 6.19                | 1.75                   | 9.25                   | 1.25                  | 8             | 1 1/8           | 7.12           | 5.875         | R37         | 0.312           | 0.469              | 0.03                    |
| 100     | 98.3           | 292.1           | 157.2               | 44.5                   | 235.0                  | 31.8                  | 8             | 1 1/4           | 180.9          | 149.23        | R37         | 7.92            | 11.91              | 0.8                     |
| 5       | 4.75           | 13.75           | 7.31                | 2.00                   | 11.00                  | 1.38                  | 8             | 1 1/4           | 8.50           | 7.125         | R41         | 0.312           | 0.469              | 0.03                    |
| 125     | 120.7          | 349.3           | 185.7               | 50.8                   | 279.4                  | 35.1                  | 8             | 1 1/4           | 215.9          | 180.98        | R41         | 7.92            | 11.91              | 0.8                     |
| 6       | 5.75           | 15.00           | 8.50                | 2.19                   | 12.50                  | 1.25                  | 12            | 1 1/8           | 9.50           | 8.312         | R45         | 0.312           | 0.469              | 0.03                    |
| 150     | 146.1          | 381             | 215.9               | 56.7                   | 317.5                  | 31.8                  | 12            | 1 1/8           | 241.3          | 211.12        | R45         | 7.92            | 11.91              | 0.8                     |
| 8       | 7.50           | 18.50           | 10.62               | 2.50                   | 15.50                  | 1.50                  | 12            | 1 3/8           | 12.12          | 10.625        | R49         | 0.312           | 0.469              | 0.03                    |
| 200     | 190.5          | 469.9           | 269.8               | 63.5                   | 393.7                  | 38.1                  | 12            | 1 3/8           | 307.9          | 269.88        | R49         | 7.92            | 11.91              | 0.8                     |
| 10      | 9.37           | 21.50           | 12.75               | 2.75                   | 18.50                  | 1.50                  | 16            | 1 3/8           | 14.25          | 12.750        | R53         | 0.312           | 0.469              | 0.03                    |
| 250     | 238.0          | 546.1           | 323.9               | 69.9                   | 469.9                  | 38.1                  | 16            | 1 3/8           | 362.0          | 323.85        | R53         | 7.92            | 11.91              | 0.8                     |
| 12      | 11.12          | 24.00           | 15.00               | 3.12                   | 21.00                  | 1.50                  | 20            | 1 3/8           | 16.50          | 15.000        | R57         | 0.312           | 0.469              | 0.03                    |
| 300     | 282.5          | 609.6           | 381.0               | 79.3                   | 533.4                  | 38.1                  | 20            | 1 3/8           | 419.1          | 381.00        | R57         | 7.92            | 11.91              | 0.8                     |
| 14      | 12.25          | 25.25           | 16.25               | 3.38                   | 22.00                  | 1.62                  | 20            | 1 1/2           | 18.38          | 16.500        | R62         | 0.438           | 0.656              | 0.06                    |
| 350     | 311.2          | 641.4           | 412.8               | 85.9                   | 558.8                  | 41.2                  | 20            | 1 1/2           | 466.9          | 419.10        | R62         | 11.13           | 16.66              | 1.5                     |
| 16      | 14.00          | 27.75           | 18.50               | 3.50                   | 24.25                  | 1.75                  | 20            | 1 5/8           | 20.62          | 18.500        | R66         | 0.438           | 0.656              | 0.06                    |
| 400     | 355.6          | 704.9           | 469.9               | 88.9                   | 616.0                  | 44.5                  | 20            | 1 5/8           | 523.8          | 469.90        | R66         | 11.13           | 16.66              | 1.5                     |
| 18      | 25.75          | 31.00           | 21.00               | 4.00                   | 27.00                  | 2.00                  | 20            | 1 7/8           | 23.38          | 21.000        | R70         | 0.500           | 0.781              | 0.06                    |
| 450     | 400.1          | 787.4           | 533.4               | 101.6                  | 585.8                  | 50.8                  | 20            | 1 7/8           | 593.9          | 533.40        | R70         | 12.70           | 19.84              | 1.5                     |
| 20      | 17.50          | 33.75           | 23.00               | 4.25                   | 29.50                  | 2.12                  | 20            | 2               | 25.50          | 23.000        | R74         | 0.500           | 0.781              | 0.06                    |
| 500     | 444.5          | 857.3           | 584.2               | 108.0                  | 749.3                  | 53.9                  | 20            | 2               | 647.7          | 584.20        | R74         | 12.70           | 19.84              | 1.5                     |
| 24      | 21.00          | 41.00           | 27.25               | 5.50                   | 35.50                  | 2.62                  | 20            | 2 1/2           | 30.38          | 27.250        | R78         | 0.625           | 1.062              | 0.09                    |
| 600     | 533.4          | 1041.4          | 692.2               | 139.7                  | 901.7                  | 66.5                  | 20            | 2 1/2           | 771.7          | 692.15        | R78         | 15.88           | 26.97              | 2.4                     |

Use Class 1500 Dimension For These Sizes.

# FLANGE DIMENSION & TEMPLATES FOR DRILLING

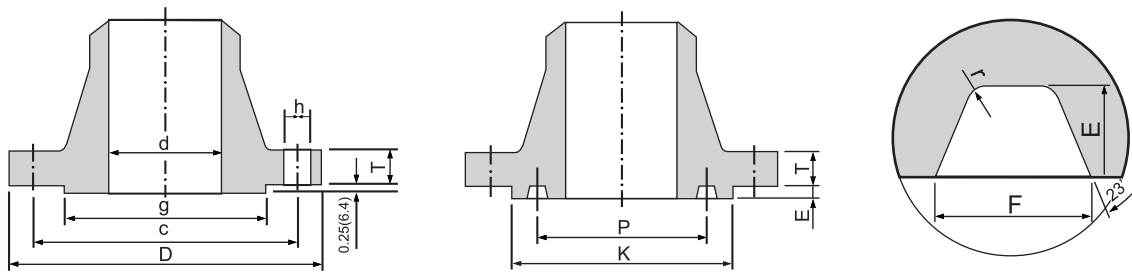


ANSI CLASS 1500

ANSI B16.5 - 1988

| Nominal | Inside Diam | OD of Flange | Raised Face Diam | Thickness of flange | Daim of Bolt Circle | Daim of Bolt Holes | No of Bolt | Diam of Bolt | Facing Diam | Pitch Diam | Ring No. | Depth Groove | Width of Groove | Groove Fillet Radius |
|---------|-------------|--------------|------------------|---------------------|---------------------|--------------------|------------|--------------|-------------|------------|----------|--------------|-----------------|----------------------|
| SIZE    | d           | D            | g                | T                   | C                   | h                  |            |              | K           | P          |          | E            | F               | F                    |
| inch    | inch        | inch         | inch             | inch                | inch                | inch               |            |              | inch        | inch       |          | inch         | inch            | inch                 |
| mm      | mm          | mm           | mm               | mm                  | mm                  | mm                 |            |              | mm          | mm         |          | mm           | mm              | mm                   |
| 1/2     | 0.50        | 4.75         | 1.38             | 0.88                | 3.25                | 0.88               | 4          | 3/4          | 2.38        | 1.562      | R12      | 0.250        | 0.344           | 0.03                 |
| 15      | 12.7        | 120.7        | 35.1             | 22.4                | 82.6                | 22.4               | 4          | 3/4          | 60.5        | 39.68      |          | 6.35         | 8.74            | 0.8                  |
| 3/4     | 0.69        | 5.12         | 1.69             | 1.00                | 3.50                | 0.88               | 4          | 3/4          | 2.62        | 1.750      | R14      | 0.250        | 0.344           | 0.03                 |
| 20      | 17.5        | 130          | 42.9             | 25.4                | 88.9                | 22.4               | 4          | 3/4          | 66.6        | 44.45      |          | 6.35         | 8.74            | 0.8                  |
| 1       | 0.88        | 5.88         | 2.00             | 1.12                | 4.00                | 1.00               | 4          | 7/8          | 2.81        | 2.000      | R16      | 0.250        | 0.344           | 0.03                 |
| 25      | 22.4        | 149.4        | 50.8             | 28.5                | 101.6               | 25.4               | 4          | 7/8          | 71.4        | 50.80      |          | 6.35         | 8.74            | 0.8                  |
| 1 1/4   | 1.12        | 6.25         | 2.50             | 1.12                | 4.38                | 1.00               | 4          | 7/8          | 3.19        | 2.375      | R18      | 0.250        | 0.344           | 0.03                 |
| 32      | 28.5        | 158.8        | 63.5             | 28.5                | 111.3               | 25.4               | 4          | 7/8          | 81.0        | 60.33      |          | 6.35         | 8.74            | 0.8                  |
| 1 1/2   | 1.38        | 7.00         | 2.88             | 1.25                | 4.88                | 1.12               | 4          | 1            | 3.62        | 2.688      | R20      | 0.250        | 0.344           | 0.03                 |
| 40      | 35.1        | 177.8        | 73.2             | 31.8                | 124                 | 28.4               | 4          | 1            | 92.0        | 68.28      |          | 6.35         | 8.74            | 0.8                  |
| 2       | 1.88        | 8.50         | 3.62             | 1.50                | 6.5                 | 1.00               | 8          | 7/8          | 4.88        | 3.750      | R24      | 0.312        | 0.469           | 0.03                 |
| 50      | 47.8        | 215.9        | 92.0             | 38.1                | 165.1               | 25.4               | 8          | 7/8          | 124         | 95.25      |          | 7.92         | 11.91           | 0.8                  |
| 2 1/2   | 2.25        | 9.62         | 4.12             | 1.62                | 7.50                | 1.12               | 8          | 1            | 5.38        | 4.250      | R27      | 0.312        | 0.469           | 0.03                 |
| 65      | 57          | 244.4        | 104.7            | 41.2                | 190.5               | 28.5               | 8          | 1            | 136.7       | 170.95     |          | 7.92         | 11.91           | 0.8                  |
| 3       | 2.75        | 10.50        | 5.00             | 1.88                | 8.00                | 1.25               | 8          | 1 7/8        | 6.62        | 5.375      | R35      | 0.312        | 0.469           | 0.03                 |
| 80      | 70          | 266.7        | 127.0            | 47.8                | 203.2               | 31.8               | 8          | 1 7/8        | 168.2       | 136.53     |          | 7.92         | 11.91           | 0.8                  |
| 4       | 3.62        | 12.25        | 6.19             | 2.12                | 9.50                | 1.38               | 8          | 1 1/4        | 7.62        | 6.375      | R39      | 0.312        | 0.469           | 0.03                 |
| 100     | 92          | 311.2        | 157.2            | 53.9                | 241.3               | 35.1               | 8          | 1 1/4        | 193.6       | 161.39     |          | 7.92         | 11.91           | 0.8                  |
| 5       | 4.37        | 14.75        | 7.31             | 2.88                | 11.5                | 1.62               | 8          | 1 1/2        | 9.00        | 7.625      | R44      | 0.312        | 0.469           | 0.03                 |
| 125     | 111         | 374.7        | 185.7            | 73.2                | 292.1               | 41.1               | 8          | 1 1/2        | 228.6       | 193.68     |          | 7.92         | 11.91           | 0.8                  |
| 6       | 5.37        | 15.50        | 8.50             | 3.25                | 12.50               | 1.50               | 12         | 1 3/8        | 9.75        | 8.312      | R46      | 0.375        | 0.531           | 0.06                 |
| 150     | 137         | 393.7        | 215.9            | 82.6                | 317.5               | 38.1               | 12         | 1 3/8        | 247.7       | 211.12     |          | 9.52         | 13.49           | 1.5                  |
| 8       | 7.00        | 19.00        | 10.62            | 3.62                | 15.50               | 1.75               | 12         | 1 5/8        | 12.50       | 10.625     | R50      | 0.438        | 0.656           | 0.06                 |
| 200     | 178         | 482.6        | 269.8            | 92.0                | 393.7               | 44.5               | 12         | 1 5/8        | 317.5       | 269.88     |          | 11.13        | 16.66           | 1.5                  |
| 10      | 8.75        | 23.00        | 12.75            | 4.25                | 19.00               | 2.00               | 12         | 1 7/8        | 14.62       | 12.750     | R54      | 0.438        | 0.656           | 0.06                 |
| 250     | 222         | 584.2        | 323.9            | 108.0               | 482.6               | 50.8               | 12         | 1 7/8        | 371.4       | 323.85     |          | 11.13        | 16.66           | 1.5                  |
| 12      | 10.37       | 26.50        | 15.00            | 4.88                | 22.50               | 2.12               | 16         | 2            | 17.25       | 15.00      | R58      | 0.562        | 0.906           | 0.06                 |
| 300     | 264         | 673.1        | 381.0            | 124.0               | 571.5               | 53.9               | 16         | 2            | 438.2       | 381.00     |          | 14.27        | 23.01           | 1.5                  |
| 14      | 11.37       | 29.50        | 16.25            | 5.25                | 25.00               | 2.38               | 16         | 1 1/4        | 19.25       | 16.500     | R63      | 0.625        | 1.062           | 0.09                 |
| 350     | 289         | 749.3        | 412.8            | 133.4               | 635.0               | 60.5               | 16         | 1 1/4        | 489         | 419.10     |          | 15.88        | 26.97           | 2.3                  |
| 16      | 13.00       | 32.50        | 18.50            | 5.75                | 27.75               | 2.62               | 16         | 2 1/2        | 21.50       | 18.500     | R67      | 0.688        | 1.188           | 0.09                 |
| 400     | 330         | 825.5        | 469.9            | 146.1               | 704.9               | 66.6               | 16         | 2 1/2        | 546.1       | 469.90     |          | 17.48        | 30.18           | 2.3                  |
| 18      | 14.62       | 36.00        | 21.00            | 6.38                | 30.50               | 2.88               | 16         | 2 3/4        | 24.12       | 21.000     | R71      | 0.688        | 1.188           | 0.09                 |
| 450     | 371         | 914.4        | 533.4            | 162.1               | 774.7               | 73.2               | 16         | 2 3/4        | 612.7       | 533.40     |          | 17.48        | 30.18           | 2.3                  |
| 20      | 16.37       | 38.75        | 23.00            | 7.00                | 32.75               | 3.12               | 16         | 3            | 26.50       | 23.000     | R75      | 0.688        | 1.312           | 0.09                 |
| 500     | 416         | 984.3        | 584.2            | 177.8               | 831.9               | 79.3               | 16         | 3            | 673.1       | 584.20     |          | 17.48        | 33.32           | 2.3                  |
| 24      | 19.62       | 46.00        | 27.25            | 8.00                | 39.00               | 3.62               | 16         | 3 1/2        | 31.25       | 27.250     | R79      | 0.812        | 1.438           | 0.09                 |
| 600     | 498         | 1168.4       | 692.2            | 203.2               | 990.6               | 92.0               | 16         | 3 1/2        | 793.8       | 692.15     |          | 20.62        | 36.53           | 2.3                  |

FLANGE DIMENSION & TEMPLATES FOR DRILLING



ANSI CLASS 2500

ANSI B16.5 - 1988

| Nominal | Inside Diam | OD of Flange | Raised Face Diam | Thick-ness of Flange | Diam. Of Bolt Circle | Diam. Of Bolt Holes | No   | Diam  | Facing Diam | Pitch Diam |      | Depth Groove | Width of Groove | Groove Fillet Radius |
|---------|-------------|--------------|------------------|----------------------|----------------------|---------------------|------|-------|-------------|------------|------|--------------|-----------------|----------------------|
| Size    | d           | D            | g                | T                    | C                    | h                   | of   | of    | K           | P          | Ring | E            | F               | F                    |
| inch    | inch        | inch         | inch             | inch                 | inch                 | inch                | Bolt | Bolt  | inch        | inch       | No.  | inch         | inch            | inch                 |
| mm      | mm          | mm           | mm               | mm                   | mm                   | mm                  |      |       | mm          | mm         |      | mm           | mm              | mm                   |
| 1/2     | 0.44        | 5.25         | 1.39             | 1.19                 | 3.50                 | 0.88                | 4    | 3/4   | 2.56        | 1.688      | R13  | 0.250        | 0.344           | 0.03                 |
| 15      | 11.2        | 133.4        | 35.3             | 30.2                 | 88.9                 | 22.4                |      |       | 65.0        | 42.88      |      | 6.35         | 8.74            | 0.8                  |
| 3/4     | 0.56        | 5.50         | 1.69             | 1.25                 | 3.75                 | 0.88                | 4    | 3/4   | 2.88        | 2.000      | R16  | 0.250        | 0.344           | 0.03                 |
| 20      | 14.2        | 139.7        | 42.9             | 31.8                 | 95.3                 | 22.4                |      |       | 73.2        | 50.80      |      | 6.35         | 8.74            | 0.8                  |
| 1       | 0.75        | 6.25         | 2.00             | 1.38                 | 4.25                 | 1.00                | 4    | 7/8   | 3.25        | 2.375      | R18  | 0.250        | 0.344           | 0.03                 |
| 25      | 19.1        | 158.8        | 50.8             | 35.1                 | 108                  | 25.4                |      |       | 82.6        | 60.33      |      | 6.35         | 8.74            | 0.8                  |
| 1 1/4   | 1.00        | 7.25         | 2.50             | 1.50                 | 5.12                 | 1.12                | 4    | 1     | 4.00        | 2.844      | R21  | 0.312        | 0.469           | 0.03                 |
| 32      | 25.4        | 184.2        | 63.5             | 38.1                 | 130.1                | 28.5                |      |       | 101.6       | 72.24      |      | 7.92         | 11.91           | 0.8                  |
| 1 1/2   | 1.12        | 8.00         | 2.88             | 1.75                 | 5.75                 | 1.25                | 4    | 1 1/8 | 4.50        | 3.250      | R23  | 0.312        | 0.469           | 0.03                 |
| 40      | 28.5        | 203.2        | 73.2             | 44.5                 | 146.1                | 31.8                |      |       | 114.3       | 82.55      |      | 7.92         | 11.91           | 0.8                  |
| 2       | 1.50        | 9.25         | 3.62             | 2.00                 | 6.75                 | 1.12                | 8    | 1     | 5.25        | 4.000      | R26  | 0.312        | 0.469           | 0.03                 |
| 50      | 38.1        | 235.0        | 92.0             | 50.8                 | 171.5                | 28.5                |      |       | 133.4       | 101.60     |      | 7.92         | 11.91           | 0.8                  |
| 2 1/2   | 1.88        | 10.50        | 4.12             | 2.25                 | 7.75                 | 1.25                | 8    | 1 1/8 | 5.88        | 4.375      | R28  | 0.375        | 0.531           | 0.06                 |
| 65      | 47.8        | 266.7        | 104.7            | 57.2                 | 196.9                | 31.8                |      |       | 149.4       | 111.13     |      | 9.52         | 13.49           | 1.5                  |
| 3       | 2.25        | 12.00        | 5.00             | 2.62                 | 9.00                 | 1.38                | 8    | 1 1/4 | 6.62        | 5.000      | R32  | 0.375        | 0.531           | 0.06                 |
| 80      | 57.2        | 304.8        | 127.0            | 66.6                 | 228.6                | 35.1                |      |       | 168.2       | 127.00     |      | 9.52         | 13.49           | 1.5                  |
| 4       | 2.88        | 14.00        | 6.19             | 3.00                 | 10.75                | 1.62                | 8    | 1 1/2 | 8.00        | 6.188      | R38  | 0.438        | 0.656           | 0.06                 |
| 100     | 73.2        | 355.6        | 157.2            | 76.2                 | 273.1                | 41.2                |      |       | 203.2       | 157.17     |      | 11.13        | 16.66           | 1.5                  |
| 5       | 3.62        | 16.50        | 7.31             | 3.62                 | 12.75                | 1.88                | 8    | 1 3/4 | 9.50        | 7.500      | R42  | 0.500        | 0.781           | 0.06                 |
| 125     | 92.0        | 419.1        | 185.7            | 92.0                 | 323.9                | 47.8                |      |       | 241.3       | 190.50     |      | 12.70        | 19.84           | 1.5                  |
| 6       | 4.38        | 19.00        | 8.50             | 4.25                 | 14.5                 | 2.12                | 8    | 2     | 11.00       | 9.000      | R47  | 0.500        | 0.781           | 0.06                 |
| 150     | 111.3       | 482.6        | 215.9            | 108.0                | 368.3                | 53.9                |      |       | 279.4       | 228.60     |      | 12.70        | 19.84           | 1.5                  |
| 8       | 5.75        | 21.75        | 10.62            | 5.00                 | 17.25                | 2.12                | 12   | 2     | 13.38       | 11.00      | R51  | 0.562        | 0.906           | 0.06                 |
| 200     | 146.1       | 552.5        | 269.8            | 127.0                | 438.2                | 53.9                |      |       | 339.9       | 279.40     |      | 14.27        | 23.01           | 1.5                  |
| 10      | 7.25        | 26.50        | 12.75            | 6.50                 | 21.25                | 2.62                | 12   | 2 1/2 | 16.75       | 13.500     | R55  | 0.688        | 1.188           | 0.09                 |
| 250     | 184.2       | 673.1        | 323.9            | 165.1                | 539.8                | 66.6                |      |       | 425.5       | 342.90     |      | 17.48        | 30.18           | 2.4                  |
| 12      | 8.62        | 30.00        | 15.00            | 7.25                 | 24.38                | 2.88                | 12   | 2 3/4 | 19.50       | 16.000     | R60  | 0.688        | 1.312           | 0.09                 |
| 300     | 219.0       | 762.0        | 381.0            | 184.2                | 619.3                | 73.2                |      |       | 495.3       | 406.40     |      | 17.48        | 33.32           | 2.4                  |

# WORKING PRESURE (ANSI B16.34) & TEST PRESSURE (API 598)

|                                                                                    |      | 150LB  |        | 300LB  |        | 600LB    |        | 900LB    |        | 1500LB   |        | 2500LB   |        |
|------------------------------------------------------------------------------------|------|--------|--------|--------|--------|----------|--------|----------|--------|----------|--------|----------|--------|
| <b>A216-WCB<br/>A105</b>                                                           | W.P  | 285PSI |        | 740PSI |        | 1480PSI  |        | 2220PSI  |        | 3705PSI  |        | 6170PSI  |        |
|                                                                                    |      | Psi    | Kg/cm2 | Psi    | Kg/cm2 | Psi      | Kg/cm2 | Psi      | Kg/cm2 | Psi      | Kg/cm2 | Psi      | Kg/cm2 |
|                                                                                    | Body | 450    | 32     | 1125   | 79     | 2225     | 156    | 3350     | 236    | 5575     | 392    | 9275     | 652    |
|                                                                                    | Seat | 315    | 22     | 815    | 57     | 1628     | 114    | 2442     | 172    | 4076     | 287    | 6787     | 477    |
| <b>A216-WCC<br/>A217-C5,C12<br/>A217-WC4,WC5,<br/>WC6,WC9<br/>A352-LCC,LC2,LC3</b> | W.P  | 290PSI |        | 750PSI |        | 1500PSI  |        | 2250PSI  |        | 3750PSI  |        | 6250PSI  |        |
|                                                                                    |      | Psi    | Kg/cm2 | Psi    | Kg/cm2 | Psi      | Kg/cm2 | Psi      | Kg/cm2 | Psi      | Kg/cm2 | Psi      | Kg/cm2 |
|                                                                                    | Body | 450    | 32     | 1125   | 79     | 2250     | 158    | 3375     | 237    | 5625     | 395    | 9375     | 659    |
|                                                                                    | Seat | 319    | 22     | 825    | 58     | 1650     | 116    | 2475     | 174    | 4125     | 290    | 6875     | 483    |
| <b>A182-F1<br/>A217-WC1<br/>A352-LCB,LC1</b>                                       | W.P  | 265PSI |        | 695PSI |        | 1390PSI  |        | 2085PSI  |        | 3470PSI  |        | 5785PSI  |        |
|                                                                                    |      | Psi    | Kg/cm2 | Psi    | Kg/cm2 | Psi      | Kg/cm2 | Psi      | Kg/cm2 | Psi      | Kg/cm2 | Psi      | Kg/cm2 |
|                                                                                    | Body | 400    | 28     | 1050   | 74     | 2100     | 148    | 3150     | 221    | 5225     | 367    | 8700     | 612    |
|                                                                                    | Seat | 292    | 21     | 765    | 54     | 1529     | 107    | 2294     | 161    | 3817     | 268    | 6364     | 447    |
| <b>A182-F304, F316<br/>A351-CF8, CF8M,<br/>CF8C,<br/>CF3, CF3M</b>                 |      | 275PSI |        | 720PSI |        | 1440 PSI |        | 2160 PSI |        | 3600 PSI |        | 6000 PSI |        |
|                                                                                    |      | Psi    | Kg/cm2 | Psi    | Kg/cm2 | Psi      | Kg/cm2 | Psi      | Kg/cm2 | Psi      | Kg/cm2 | Psi      | Kg/cm2 |
|                                                                                    | Body | 425    | 30     | 1100   | 77     | 2175     | 153    | 3250     | 228    | 5400     | 380    | 9000     | 633    |
|                                                                                    | Seat | 303    | 21     | 792    | 56     | 1584     | 111    | 2376     | 167    | 3960     | 278    | 6600     | 464    |



CONVERSION TABLES

LENGTH

| cm                | m                      | in                     | ft                     |
|-------------------|------------------------|------------------------|------------------------|
| 1                 | 1x10 <sup>-2</sup>     | 3.937x10 <sup>-1</sup> | 3.28x10 <sup>-2</sup>  |
| 1x10 <sup>2</sup> | 1                      | 3.937x10               | 3.281                  |
| 2,540             | 2.540x10 <sup>-2</sup> | 1                      | 8.333x10 <sup>-2</sup> |
| 3.048x10          | 3.048x10 <sup>-1</sup> | 12                     | 1                      |

AREA

| cm <sup>2</sup>       | m <sup>2</sup>         | in <sup>2</sup>        | ft <sup>2</sup>        |
|-----------------------|------------------------|------------------------|------------------------|
| 1                     | 1x10 <sup>-4</sup>     | 1.550x10 <sup>-1</sup> | 1.076x10 <sup>-3</sup> |
| 1x10 <sup>4</sup>     | 1                      | 1.550x10 <sup>3</sup>  | 1.076x10               |
| 6.452                 | 6.452x10 <sup>-1</sup> | 1                      | 6.944x10 <sup>-3</sup> |
| 9.290x10 <sup>2</sup> | 9.290x10 <sup>-2</sup> | 1.44x10 <sup>2</sup>   | 1                      |

VOLUME - 1

| cm <sup>3</sup>       | m <sup>3</sup>         | in <sup>3</sup>        | ft <sup>3</sup>        |
|-----------------------|------------------------|------------------------|------------------------|
| 1                     | 1x10 <sup>-6</sup>     | 6.102x10 <sup>-2</sup> | 3.531x10 <sup>-5</sup> |
| 1x10 <sup>6</sup>     | 1                      | 6.102x10 <sup>4</sup>  | 3.531x10               |
| 1.639x10              | 1.639x10 <sup>-5</sup> | 1                      | 2.787x10 <sup>-4</sup> |
| 2.832x10 <sup>4</sup> | 2.832x10 <sup>-2</sup> | 1.728x10 <sup>3</sup>  | 1                      |

VOLUME - 2

| litre             | m <sup>3</sup>         | British gal.           | U.S. gal.              |
|-------------------|------------------------|------------------------|------------------------|
| 1                 | 1x10 <sup>-3</sup>     | 2.20x10 <sup>-1</sup>  | 2.642x10 <sup>-1</sup> |
| 1x10 <sup>3</sup> | 1                      | 2.20x10 <sup>2</sup>   | 2.642x10 <sup>2</sup>  |
| 4.546             | 4.546x10 <sup>-3</sup> | 1                      | 1.201                  |
| 3.785             | 3.785x10 <sup>-3</sup> | 8.327x10 <sup>-1</sup> | 1                      |

1 U.S. gal = 231 cu. in  
1 cu. ft = 7.4805 U.S. gal

WEIGHT

| kg                     | t                      | lb                    | ton                    | Sh-tn                  |
|------------------------|------------------------|-----------------------|------------------------|------------------------|
| 1                      | 1x10 <sup>3</sup>      | 2.205                 | 9.842x10 <sup>-4</sup> | 1.102x10 <sup>-3</sup> |
| 1x10 <sup>3</sup>      | 1                      | 2.205 <sup>3</sup>    | 9.842x10 <sup>-1</sup> | 1.102                  |
| 4.536x10 <sup>-1</sup> | 4.536x10 <sup>-4</sup> | 1                     | 4.464x10 <sup>-4</sup> | 5.1x10 <sup>-4</sup>   |
| 1.016x10 <sup>3</sup>  | 1.016                  | 2.240x10 <sup>3</sup> | 1                      | 1.12                   |
| 9.072x10 <sup>2</sup>  | 9.072x10 <sup>-1</sup> | 2.000x10 <sup>3</sup> | 8.929x10 <sup>-1</sup> | 1                      |

t: ton, ton; British ton, shtn; U.S. ton

DENSITY

| g/cm                   | kg/m                   | Lb/in                  | Lb/ft                  | Lb/U.S gal.            |
|------------------------|------------------------|------------------------|------------------------|------------------------|
| 1                      | 1x10 <sup>3</sup>      | 3.613x10 <sup>-2</sup> | 6.243x10               | 8.345                  |
| 1x10 <sup>-3</sup>     | 1                      | 3.613x10 <sup>5</sup>  | 6.243x10 <sup>-2</sup> | 8.345x10 <sup>-3</sup> |
| 2.768x10               | 2.768x10 <sup>4</sup>  | 1                      | 1.728x10 <sup>3</sup>  | 231                    |
| 1.602x10 <sup>-2</sup> | 1.602x10               | 5.787x10 <sup>4</sup>  | 1                      | 1.337x10 <sup>-1</sup> |
| 1.198x10 <sup>-1</sup> | 1.198x10 <sup>-3</sup> | 4.329x10 <sup>-3</sup> | 7.481                  | 1                      |

1 g/cm<sup>3</sup> = 1.0/m<sup>3</sup>

FORCE

| kgf                      | lbf                    | N                  | dyn                     |
|--------------------------|------------------------|--------------------|-------------------------|
| 1                        | 2.205                  | 9.80665            | 9.80665x10 <sup>5</sup> |
| 4.5436x10 <sup>-1</sup>  | 1                      | 4.44822            | 4.44822x10 <sup>5</sup> |
| 1.01972x10 <sup>-1</sup> | 2.248x10 <sup>-1</sup> | 1                  | 1x10 <sup>5</sup>       |
| 1.07982x10 <sup>-5</sup> | 2.245x10 <sup>-5</sup> | 1x10 <sup>-5</sup> | 1                       |

1 dyn = 10<sup>-5</sup> N

POWER

| kw                      | Kgf.m/s                | PS                     | HP                     |
|-------------------------|------------------------|------------------------|------------------------|
| 1                       | 1.0197x10 <sup>2</sup> | 1.3596                 | 1.3405                 |
| 9.8067x10 <sup>-3</sup> | 1                      | 1.333x10 <sup>-2</sup> | 1.315x10 <sup>-2</sup> |
| 7.355x10 <sup>-3</sup>  | 7.5x10                 | 1                      | 9.859x10 <sup>-1</sup> |
| 7.46x10 <sup>-1</sup>   | 7.607x10               | 1.0143                 | 1                      |

1 W = 1 J/S, 1kgf.m/s = 9.80665W, 1PS = 0.7355kw

PRESSURE

| kg/cm <sup>2</sup>       | Psi                       | Bar                      | Pa                      | kPa                     | MPa                      |
|--------------------------|---------------------------|--------------------------|-------------------------|-------------------------|--------------------------|
| 1                        | 14.22313                  | 9.80665x10 <sup>-1</sup> | 9.80665x10 <sup>1</sup> | 9.80665x10 <sup>1</sup> | 9.80665x10 <sup>-1</sup> |
| 0.070308                 | 1                         | 6.89486x10 <sup>-2</sup> | 6.89489x10 <sup>1</sup> | 6.89486                 | 6.89486x10 <sup>-3</sup> |
| 1.01972                  | 14.50356                  | 1                        | X10 <sup>1</sup>        | X10 <sup>1</sup>        | X0.1                     |
| 1.01972x10 <sup>-5</sup> | 14.50356x10 <sup>-4</sup> | 1x10 <sup>-5</sup>       | 1                       | X10 <sup>-3</sup>       | X10 <sup>-5</sup>        |
| 1.01972x10 <sup>-2</sup> | 14.50356x10 <sup>-1</sup> | 1x10 <sup>-2</sup>       | X10 <sup>1</sup>        | 1                       | X10 <sup>-3</sup>        |
| 1.01972x10 <sup>-1</sup> | 14.50356x10 <sup>0</sup>  | X10 <sup>-1</sup>        | X10 <sup>1</sup>        | X10 <sup>1</sup>        | 1                        |

1 Pa = 1 N/m<sup>2</sup>

STRESS

| kgf/mm <sup>2</sup>      | kgf/cm <sup>2</sup>      | lbf/ft <sup>2</sup>    | Pa                      | MPa(=N/mm)               |
|--------------------------|--------------------------|------------------------|-------------------------|--------------------------|
| 1                        | 1x10 <sup>2</sup>        | 2.048x10 <sup>5</sup>  | 9.80665x10 <sup>5</sup> | 9.80665                  |
| 1x10 <sup>-2</sup>       | 1                        | 2.048x10 <sup>3</sup>  | 9.80665x10 <sup>4</sup> | 9.80665x10 <sup>-2</sup> |
| 4.882x10 <sup>6</sup>    | 4.882x10 <sup>4</sup>    | 1                      | 4.786x10                | 4.7836x10 <sup>-5</sup>  |
| 1.01972x10 <sup>-7</sup> | 1.01972x10 <sup>-5</sup> | 2.089x10 <sup>-2</sup> | 1                       | 1x10 <sup>-6</sup>       |
| 1.01972x10 <sup>-1</sup> | 1.01972x10               | 2.089x10 <sup>4</sup>  | 1x10 <sup>6</sup>       | 1                        |

1 N/mm<sup>2</sup> = 1MPa

VELOCITY

| m/s    | km/h  | kn     | Ft/s   | Mile/h |
|--------|-------|--------|--------|--------|
| 1      | 3.6   | 1.944  | 3.281  | 2.237  |
| 0.2778 | 1     | 0.544  | 0.9113 | 0.6214 |
| 0.5144 | 1.852 | 1      | 1.688  | 1.151  |
| 0.3048 | 1.097 | 0.5925 | 1      | 0.6818 |
| 0.4470 | 1.609 | 0.8690 | 1.467  | 1      |

1 kn (Knot) = 1852 m/h

VISCOSITY

| kgf.s/m <sup>2</sup>     | lbf.s/in <sup>2</sup>  | Pa.s                 | cP                      | P                    |
|--------------------------|------------------------|----------------------|-------------------------|----------------------|
| 1                        | 1.422x10 <sup>-1</sup> | 9.80665              | 9.80665x10 <sup>1</sup> | 9.80665x10           |
| 7.03x10 <sup>-1</sup>    | 1                      | 6.9x10 <sup>-1</sup> | 6.9x10 <sup>1</sup>     | 6.9x10 <sup>-1</sup> |
| 1.01973x10 <sup>-1</sup> | 1.449x10 <sup>-4</sup> | 1                    | 1x10 <sup>-3</sup>      | 1x10 <sup>-1</sup>   |
| 1.01973x10 <sup>-1</sup> | 1.449x10 <sup>-4</sup> | 1x10 <sup>-1</sup>   | 1                       | 1x10                 |
| 1.01973x10 <sup>-1</sup> | 1.449x10 <sup>-5</sup> | 1x10 <sup>-1</sup>   | 1x10 <sup>-2</sup>      | 1                    |

1 lbf.s/in<sup>2</sup> = 6.9x10<sup>1</sup>cP, 1 Pa.s. = 1 N.s/m<sup>2</sup>, 1 cP = 1mPa.s  
1 P = 1 dyn.s/cm<sup>2</sup> = 1 g/cm.s

KINEMATIC VISCOSITY

| m <sup>2</sup> /s      | Ft <sup>2</sup> /h     | cSt                    | St                    |
|------------------------|------------------------|------------------------|-----------------------|
| 1                      | 1.076x10               | 1x10 <sup>6</sup>      | 1x10 <sup>4</sup>     |
| 2.778x10 <sup>-2</sup> | 1                      | 9.2900x10 <sup>1</sup> | 9.290x10 <sup>2</sup> |
| 1x10 <sup>6</sup>      | 1.076x10 <sup>-5</sup> | 1                      | 1x10 <sup>-2</sup>    |
| 1x10 <sup>4</sup>      | 1.076x10 <sup>-3</sup> | 1x10 <sup>2</sup>      | 1                     |

1 St = 1 cm<sup>2</sup>/s

FLOW

| m <sup>3</sup> /s      | m <sup>3</sup> /h      | Ft <sup>3</sup> /h    | Ft <sup>3</sup> /s     |
|------------------------|------------------------|-----------------------|------------------------|
| 1                      | 3.600x10 <sup>3</sup>  | 1.272x10 <sup>5</sup> | 3.531x10               |
| 7.290x10 <sup>-4</sup> | 1                      | 3.531x10              | 9.807x10 <sup>-3</sup> |
| 7865x10 <sup>-6</sup>  | 2.832x10 <sup>-5</sup> | 1                     | 2.778x10 <sup>-4</sup> |
| 2.832x10 <sup>-2</sup> | 1.20x10 <sup>2</sup>   | 3.600x10 <sup>3</sup> | 1                      |

ENERGY

| kgf.m                   | lbf.ft                 | j                     | kw-h                   | kcal                   |
|-------------------------|------------------------|-----------------------|------------------------|------------------------|
| 1                       | 7.231                  | 9.801                 | 2.724x10 <sup>-6</sup> | 2.343x10 <sup>-3</sup> |
| 1.383x10 <sup>-1</sup>  | 1                      | 1.356                 | 3.766x10 <sup>-7</sup> | 3.239x10 <sup>-4</sup> |
| 1.0197x10 <sup>-1</sup> | 7.376x10 <sup>-1</sup> | 1                     | 2.778x10 <sup>-7</sup> | 2.389x10 <sup>-4</sup> |
| 3.671x10 <sup>5</sup>   | 2.655x10 <sup>6</sup>  | 3.600x10 <sup>6</sup> | 1                      | 8.600x10 <sup>2</sup>  |
| 4.269x10 <sup>2</sup>   | 3.087x10 <sup>3</sup>  | 4.186x10 <sup>3</sup> | 1.163x10 <sup>3</sup>  | 1                      |

1 J = 1W.s, W.h = 3600W.s  
1 ca = 4.18605 J