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CAT-C-B31-2011

# FULLY WELDED BALL VALVE



ZHEJIANG BOTELI TECHNOLOGY CO.,LTD.

# Main Functions



BTL B31 model Fully welded ball valve is mainly used in oil and natural gas pipeline, the stations and the platform as a cut-off device, It is the most suitable to install no matter on earth, under ground and offshore. Its parts are full forged, and body structure is fully welded. Its welding and sealing technology belong to our own sole ownership. The design and manufacturing of BTL fully welded ball valve is strictly conform with International new technology standards, Taking Hard working conditions and the special function of pipeline valves it is the pipeline ball valve which has most safety and reliability of long-term use.

- Withstand the internal and external force under the safety
- Reliable seal
- Emergency Seal
- Reliable operation
- Emergency cut
- safe
- Easy to maintain online
- Weather resistance
- Sulfur corrosion resistance
- Fire safe, Anti-static
- Clean pipes
- All kinds of actuators
- types of control systems
- Maintenance-free
- The same life with pipes



## ■ Nominal Diameter

DN40~1500  
( NPS1-1/2~60 )

## ■ Nominal Pressure

PN10~420  
( ANSI 150~2500 )

## ■ Suitable temperature

-60℃~+260℃

## ■ Suitable Medium

Crew oil、Refined oil  
Natural gas  
CO<sub>2</sub> environment  
Petrification  
Seawater  
Acidic working condition  
Geothermy working condition

## ■ Application:

Pipeline Transportation  
Sea project  
Oil, gas storage  
Dehydration system  
Dry system  
Gas separation  
Compressor station

# Structure Feature

**BTL**

## ■ Design and manufacture as per API 6D/ISO14313 specification.

Each of BTL ball valve meets every detail according to clients, and can take any test that has more requirements than standard.

### ■ Stem

Stem is anti-spray design, which can prevent the spray from body caused by incorrect operation.

Stem and ball are independent with each other, and the stem is not effected by the influence caused by medium acting on the side load of ball.

The stem seal is designed with upper and lower two independent groups, the lower group consists of O-ring +V-ring, which forms three sealing, making seal durable and reliable, and the upper is the fire safety seal. It is possible to replace the upper seal under zero to max. pressure.

### ■ Stem seal grease injection port

A normal seal is not dependent on sealing grease, if it appears leakage that caused by the damage of seal, the sealing resin can be injected into it to have emergency repair.

### ■ Body

Adopt High-quality forged steel material, fully-welded body structure, advanced welding technology. The strength design meets the relevant standards, which can safely withstand the maximum line pressure and external forces, completely ruled out the possibility of leakage.

### ■ Ball

Ball is integral forged, which is fixed on the body by upper and lower two symmetry shaft seats.

The medium affects the side load of ball, and then goes to the body through bearing without affecting the stem, and the stem realize a pure torque operation.

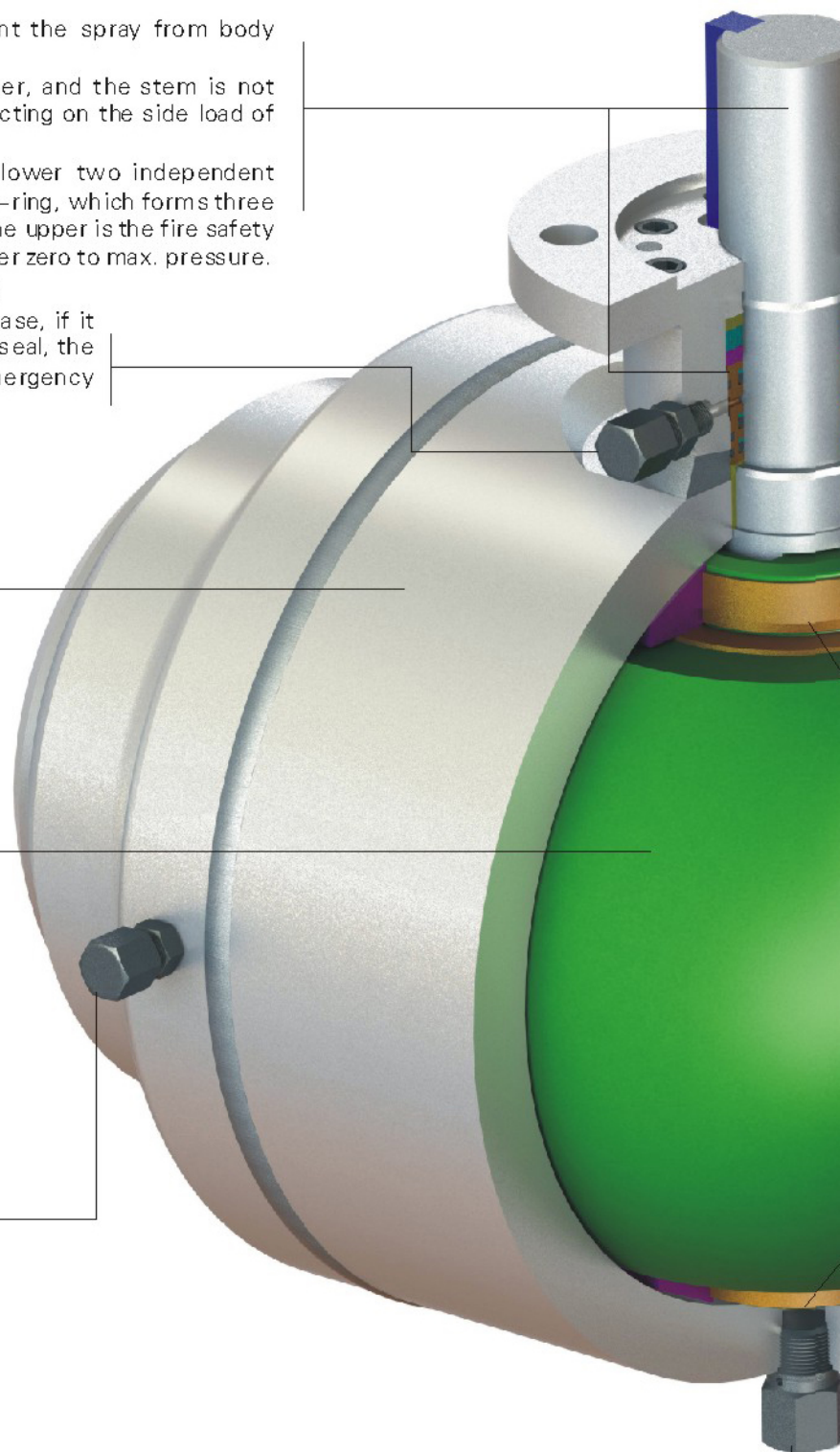
### ■ Seal grease injection port

A normal seal is not dependent on sealing grease, if it appears leakage that caused by the damage of seal, the sealing resin can be injected into it to have emergency repair.

Each grease injection port is installed with a grease injection valve and a built-in uni-direction valve. A typical grease injection valve has a safety helmet to ensure safety and reliable, and the end of the grease injection valve is the snaps which can be connected soon by the grease injection gun.

### ■ Sewage vent

In the lowest position of the valve is the sewage hole, installed with sewage valve, which can take vent and sewage for cavity. Isolation valve or vent joint can be used as sewage to ensure safety and reliable, easy for using.



# Structure Feature



## ■ Top flange able to assemble all kinds of actuators

Top flange which is for valve and actuator according to ISO5211. Easy to connect and exchange for all kinds of actuators, it can be installed both on site and factory.

## ■ Vent port

Vent valve is installed on the upper valve body where the vent hole is machined, it can vent and clean for cavity and vent valve can be isolation valve or special vent joint. Make sure safety and reliable to facilitate use.

## ■ Position adjustment

It is impossible to see the ball hole when replace or install actuators online. BTL pipeline ball valve can offer a special "positioning groove", It can easily help you to find the correct full-open and full-closed position of the ball without through watching the ball hole it is more convenient for limiting device adjustment of actuator.

## ■ Welding end

For the valve with welded end, it is able to select the valve end material (transition section) according to the user's pipe material class to ensure the suitability and weldability of the material strength. For the valve with sleeves in both two sides, the length of sleeves can ensure the welding operation at both ends on site does not effect sealing material.

## ■ Cavity overpressure release

It can release the overpressure of cavity through seat discharging or body unloading. If chose the former, the DIB-I function would be cancelled. Body unloading is finished by the pressure relief valve installed on the vent port. The pressure relief valve is installed with isolation valve, which can take regular maintenance for relief valve.

## ■ Composite Bearings

PTFE with low Friction coefficient is on the stainless steel sleeve bearing, self-lubricating, maintenance-free.

Transport or withstand the axial load from medium effecting to the ball.

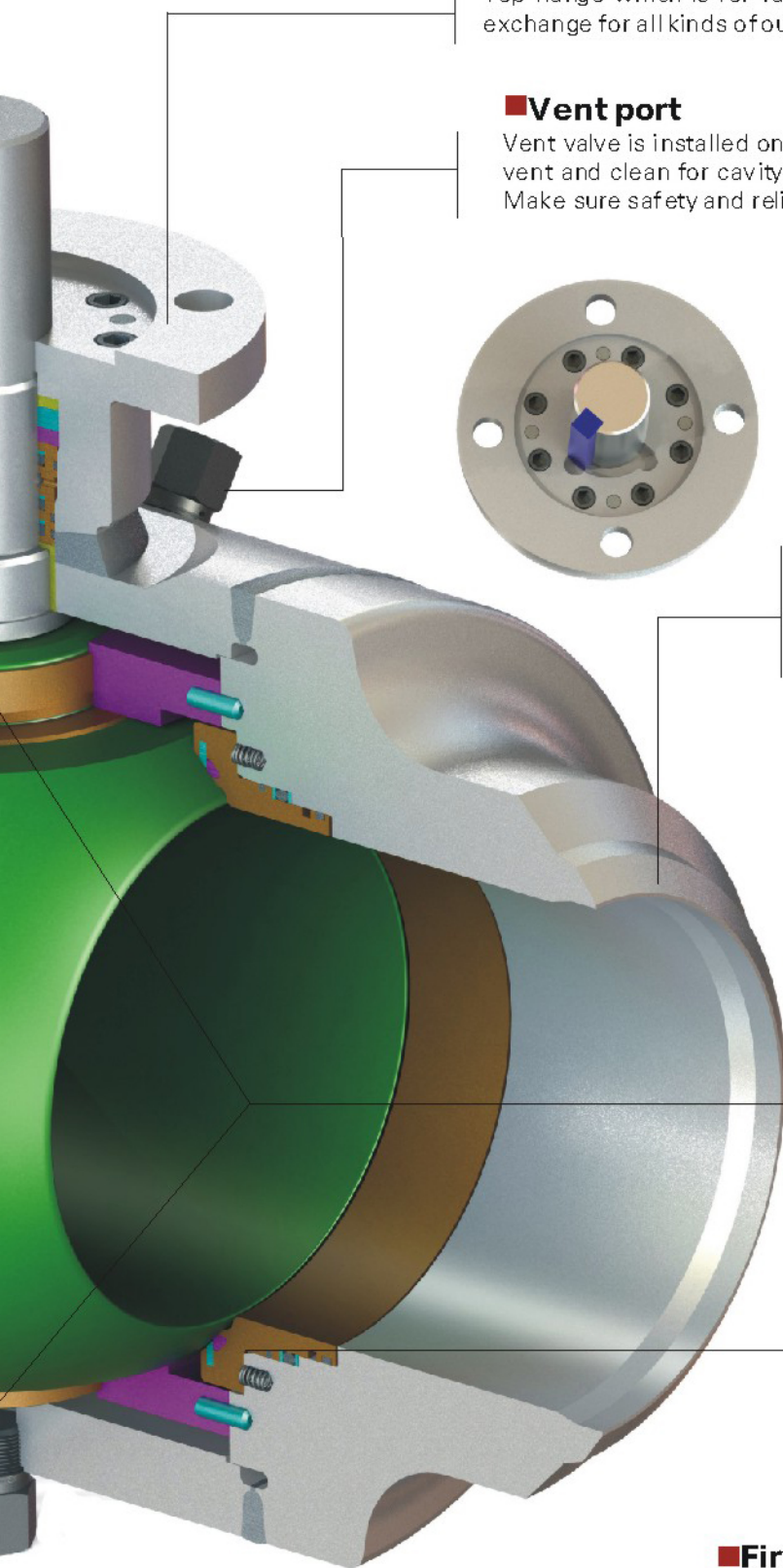
## ■ Seat

Each valve has two separate floating seat rings, make sure valve can be tightly sealed from zero to max pressure differential on bi-direction.

Seat sealing is finished by the combination of forge support ring and firm insert soft sealing support ring can both float axially and self-centering through spring preload to achieve low pressure of valve seat seal, and the piston effect realize the high-Pressure self-sealing of seat.

## ■ Fire safe and anti-static design

BTL ball valves all take fire test according to API6FA/API607 standard that issued by an independent international organization. All internal metal parts are connected with the conductive body, According to Bs5351

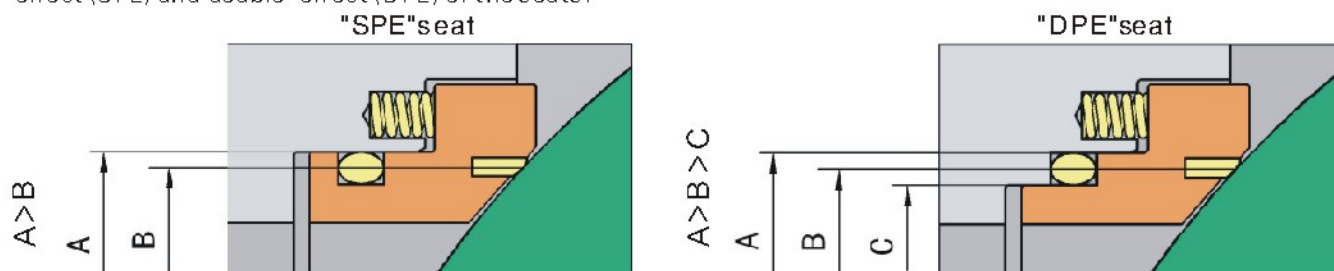


# Structure Feature



## ■Piston effect of seat

Piston effect is a sealing form of using line pressure to push the floating seat closed with ball. There is single piston effect (SPE) and double effect (DPE) of the seats:



According to the need of project, the upstream and downstream seats can be single piston effect or double piston effect, and it includes the following three combinations:

- 1 If upstream and downstream seats are single-seat piston effect, the ball valve will be upstream sealing. The valve cavity overpressure can be through automatic pressure release of downstream seat into the downstream pipe.
- 2 If upstream and downstream seats are double effect, the ball valve will be sealed in both upstream and downstream (DIB-1), that is, once the upstream seal failure, the downstream seat also can guarantee the seal, to ensure the long-term effective operation of the valve. But it lost the internal automatic pressure release function for valve cavity overpressure.
- 3 If upstream is a single-seat piston effect and downstream is double piston effect, ball valve can be sealed on both upstream and downstream valve cavity overpressure can be through automatic pressure release of upstream seat into upstream pipe (DIB-2). It not only improve the reliability of sealing but also internal automatic pressure release for valve cavity overpressure and this valve should have the requirement of main installation position.

## ■There are two kinds of design for seal structure between seat and ball:

- 1 Traditional soft seal: the embedded soft sealing is the seal of polymer to ball. It is suitable to all sizes and pressure class.
- 2 BTL assembly sealing: The soft seal made of a special plastic material is used as primary seal to ensure zero leakage according to API6D standards; adopt the metal seal between seat and ball surface, some conditions also added a RPTFE sealing to protect the primary seal, and increased the using life. This patented structure, is especially suitable for dust-containing gas and sand-containing oil conditions.

## ■Standard seat seal design of BTL ball valve (others are optional designs)

- 1, under gas working condition:  
With DIB-1 function DPE seat, BTL assembly seal structure and seal emergent replacement system.
- 2, under liquid or condensation working condition:  
With self-loading pressure function SPE seat, BTL assembly seal structure and seal emergent replacement system.

## ■Double block & bleed (DBB)

When the ball is in full open or full closed position, the medium in body cavity can be discharged through Drain or venting devices. At this moment, both sides of seats are cut at the same time, and either side can withstand the full pressure differential. B31-type fully welded ball valves all have DBB function in the fully closed position.

With DBB function, it's possible for ball to discharge water and drain on line and check valve seat seal's integrity

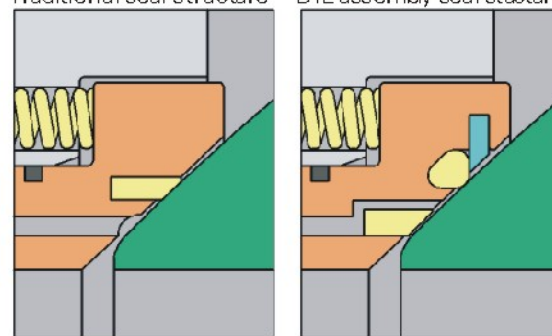
## ■Low torque design

The emergently cut-off valve on long distance pipeline is almost in full-closed position all time generally it is operated by actuator free-standing emergently auto-off, it can be returned off quickly when needed, so the low-torque design is extremely important for the safety and reliability of its use.

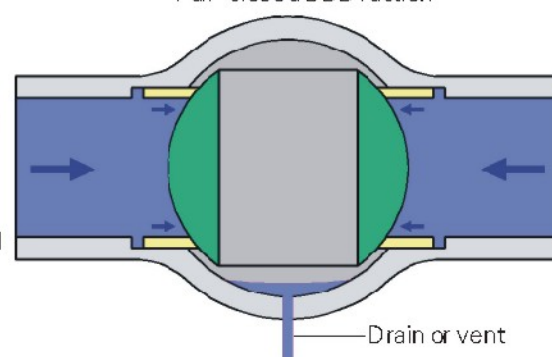
BTL Low torque ball valve design includes:

- 1 trunnion mounted ball, piston effect seat, assembly seal structure, and the necessary sealing force is small.
- 2 composite bearings with self-lubricating feature withstand the side force result from media effecting to ball, which has low friction, maintenance-free.
- 3 ball surfaces adopt enveloping line process for grinding and polishing, high precision.
- 4 hardening ball surface, to achieve non-corrosibility and reduce the friction factor to max.

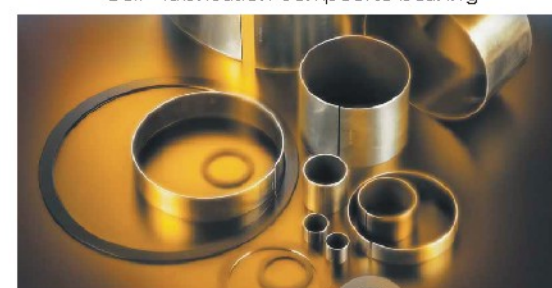
Traditional seal structure BTL assembly seal structure



Full-closed DBB function



Self-lubrication composite bearing



# Structure Feature



## ■ underground design

As to underground installation of valves, whose stem need to be extended according to project so as to make ground operation, and extend the appropriate grease, drain and vent devices to the ground through pipe as well.

1. Pipe and body welding, locking firmly.
2. There is waterproof uni-directional sealing and vent hole on external extended stem it not only can prevent the infiltration of outside water but also prevent the accumulation pressure inside.
- 3 The design of Extend stem inside and outside has high strength and tight connections, which can resist the ground load and be reliable to transfer torque and opening.
4. The pipe design has the same use life as the valve.
5. The drain and vent pipe that be extended to the upward all have isolation valves, and according to the requirements, the device can be added with isolation device.
6. The root valve in the port of pneumatic actuator and aerodynamic force also should be extended to the ground, for easy operation.

## ■ End connections

Valve end connections can be configured according to user requirements, common connections are: flange, butt welding, clamps, or any combination of the two and so on.

## ■ Face to face

Face to face according to API6D, beyond the standard range is decided by BTL company standard, which also can be accordance with user's requirements.

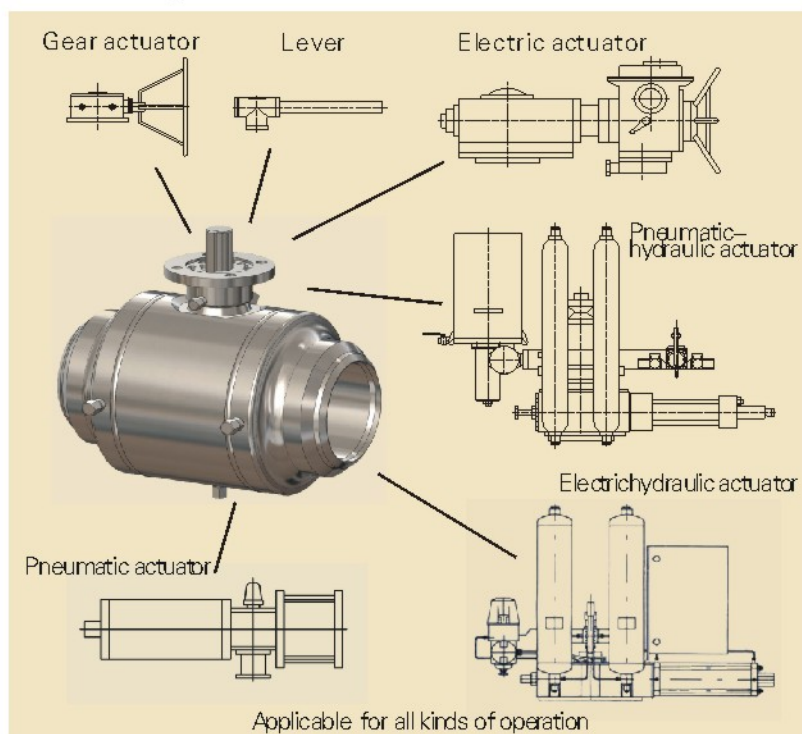
## ■ Coating

Outer coating design gives full consideration to the environment with a variety of corrosion, to ensure that the coating has 30 to 40 years of life. Part of the outer coating plant is designed to:

1. Underground parts: selection of tar epoxy or polyurethane coatings, dry film thickness at 1.5mm, other programs can be used according to project needs. Products process and test are strictly accordance with factory specifications.

(2) Above ground: according to HG/T4077, SY0043 or engineering requirements.

## ■ Valve Operation



# Technology Feature

# BTL

## ■Integral forged body

The steel ingot is formed by forging, rather than made by extending steel plate, so the structure of material is compact and whose grains keep a regular form, which makes the valve has good combination property, and longer life.

## ■Body Welding

Fully welded ball valve is a kind of special welded product; BTL Company has a proprietary sophisticated welding technique, which is the first company in the field to take PWHT free security assessment with welded joints fracture toughness CTOD values, according to international advanced standards.

BTL welding processes of different materials have to undergo an independent certification authority TUV certification, welding safety assessment by experts.

All BTL welded ball valves are certified by TUV welding engineers.

## ■Non-destructive examination

The necessary Non-destructive examination on weld joints is needed to make sure safety and reliability of our products, weld joints of BTL fully weld ball valve take 100% multi-channel ultrasonic inspection and x-ray inspection, and without blind area and inspection hazard.

## ■Ball surface treating

Ball surface treatment can fully be in accordance with the requirements of users, and there is the nickel and chrome alternatively with chemical plating method, strictly according to the technical requirements to ensure that the metal surface achieves the best hardness and corrosion resistance, so as to realize the anti-erosion, corrosion and reduce the maximum optimization of friction coefficient.

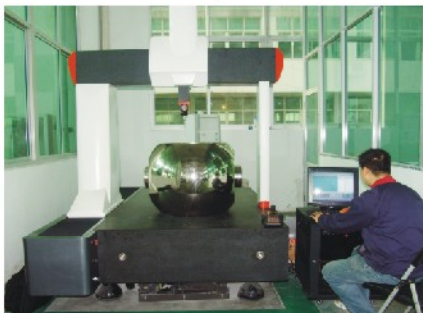
## ■Advanced processing equipment

Advanced equipment is necessary for manufacturing high-performance fully welded ball valves. The key parts of BTL ball valve are finished by machining centers and CNC, so the product can achieves 100% pass rate at one time, 100% interchangeability of parts, making a important contributions for providing high-quality products to clients.

Large machining centers and CNC Vertical Lathe CMM



dimensional measuring instrument



Mobile three-dimensional measuring instrument



Adopt the special welding equipment owned by BTL only



Ultrasonic weld testing



Weld-ray detection



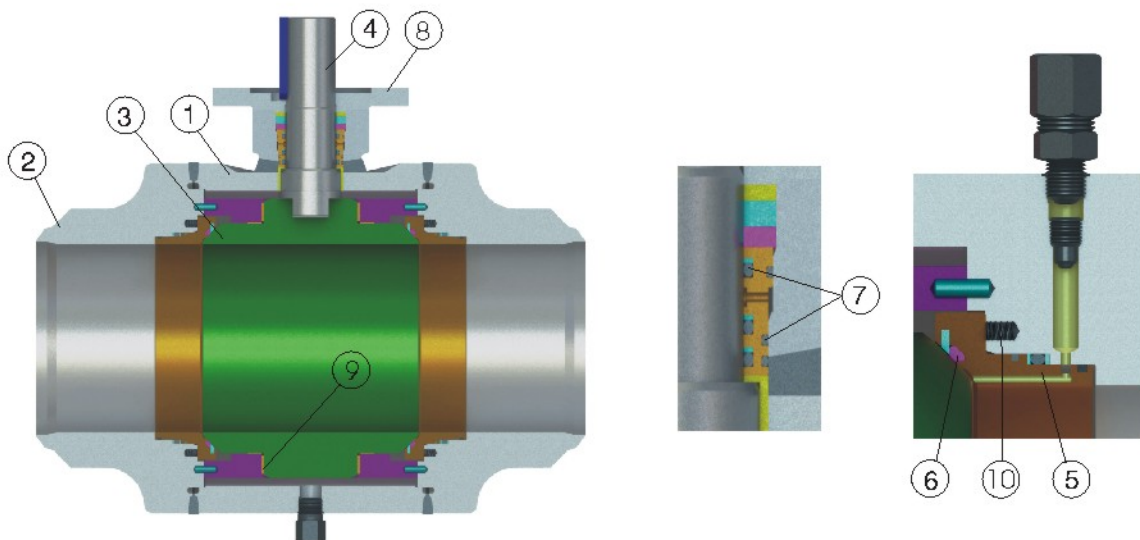
Chemical nickel plating



Large modern ball machine



# Main Material



The valves' material meets the requirement of API6D and relevant standard, which makes the valves' performance can be suit for the working situation and environment condition, and as well as to ensure their use life. The followings are the common material; it's also allowed to choose other material according to projects. BTL Company will use the most suitable material according to actual conditions, and help you to get the products with Excellent quality and competitive price.

- ①Body: ASTMA105(mod) ASTM A350 LF2(mod) ASTM A182 F316(mod)
- ②Welding end fittings: valve body ASTM A350 LF6(mod)
- ③Ball: ASTMA105+ENP ASTM A182 F316+HCr ASTM A350 LF2+ENP ASTM A182 F51
- ④Stem: ASTMA182 F6a+HCr AISI 4140+ENP ASTM A564 630+HCr ASTM A182 F51
- ⑤Seat ring: ASTMA105+ENP ASTM A350 LF2+ENP ASTM A182 F316+HCr ASTM A182 F51
- ⑥Seat insert: VTION\* VTION-GLT\* HNBR\* EPDM\* FFKM\* NYLON DEVLON RPTFE PEEK
- ⑦O-ring: VITON\* VTION-GLT\* HNBR\* EPDM\* FFKM\* PTFE+AISI 301(LIP SEAL)
- ⑧Bolt/Nut: ASTMA193 B7M/A194 2HM ASTM A193 B8M/A194 8M ASTM A320 L7M/A194 7M
- ⑨Bearing: 316+(R)PTFE 316L+(R)PTFE
- ⑩Spring: INCONEL X750 AISI 302

Note: The elastomer material with "\*" is used for pressure class  $\geq$  CL600, which should have pressure relief and anti-knock performance. As for media which contains H<sub>2</sub>S, it needs to select the material that meets to NACE MR-01-75 standard.



# Quality Control

BTL products strictly follow the ISO9001 quality management requirements; the entire production process is monitored, to ensure the provision of 100% high-quality products.

## ■ Pressure test

BTL has more than 20 units test platforms for 2"-60" CL150-CL2500 valves water pressure test and air test.

BTL will take pressure testing and function testing for every ball valves according to API 6 API598 or users requirements, and High-pressure air sealing test is also regard as a prime standard testomg..

## ■ Non-destructive inspection

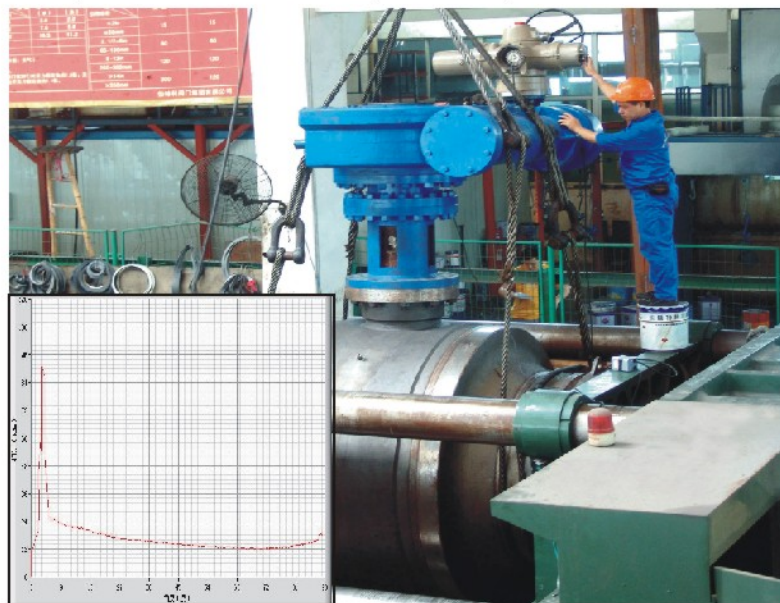
Non-destructive inspection is according to ASME, JB / T and other related specifications. BTL has our own non-destructive testing laboratory, which can take RT, UT, MT and PT tests. All qualified I personnel in laboratory have high-tech, and SNT-TC-1A certification.

## ■ Special Test

BTL also conducted a number of special tests to determine the performance of the ball. All tests were carried out according to standard or factory requirements, the main test items are as follows:

- ▲ corrosion (HIC, SCC) testing of welded joints---evaluate the joints' ability to anti-H<sub>2</sub>S;
- ▲ welded joints CTOD test evaluate the fracture toughness of joints (ability of fracture-arrest)
- ▲ connecting with drive device test---evaluate the operation performance after the valve is installed with drive device;
- ▲ Grease injection test-evaluate the grease injection result of sealing system, which should be in circlip, distributed in the sealing area;
- ▲ Gearing chain shell test;
- ▲ elastomer material anti-knock test evaluate the antiknock performance of elastomer when it losses of pressure suddenly;
- ▲ anti-static test;
- ▲ fire safe test
- ▲ whole process torque test-evaluate the operational ability of valve;
- ▲ seismic performance of buried valves numerical simulation;
- ▲ under -60 °C to +260 °C environment, valve seals and functional tests;
- ▲ 100 times full-open valve pressure test to verify the reliability of the valve seat seal design;
- ▲ bending, stretch, compress test---to evaluate valves' ability of

Valve pressure test and the whole process torque test



# BTL

Actuator installation, commissioning and linkage tests



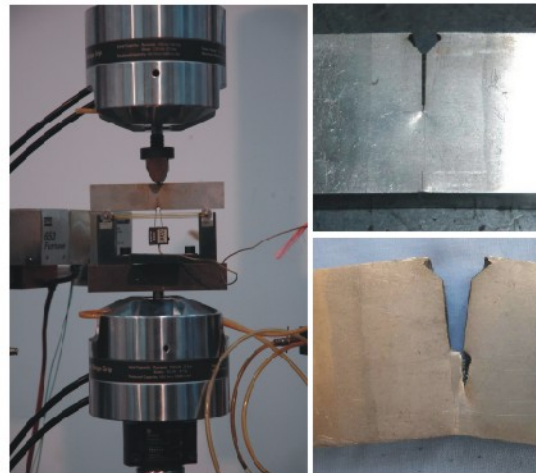
O-ring explosion-proof test



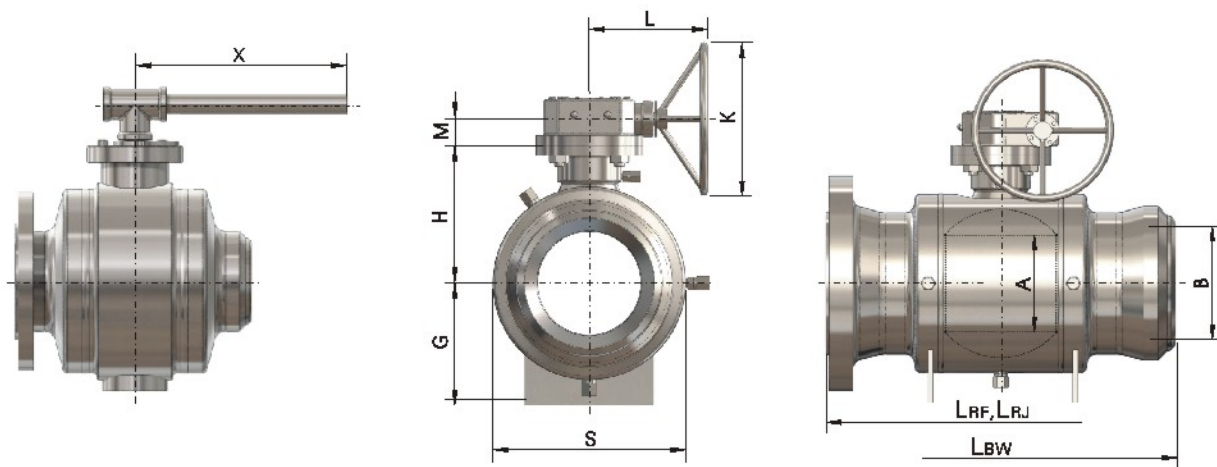
Bending test



CTOD test



# Dimension & Weight

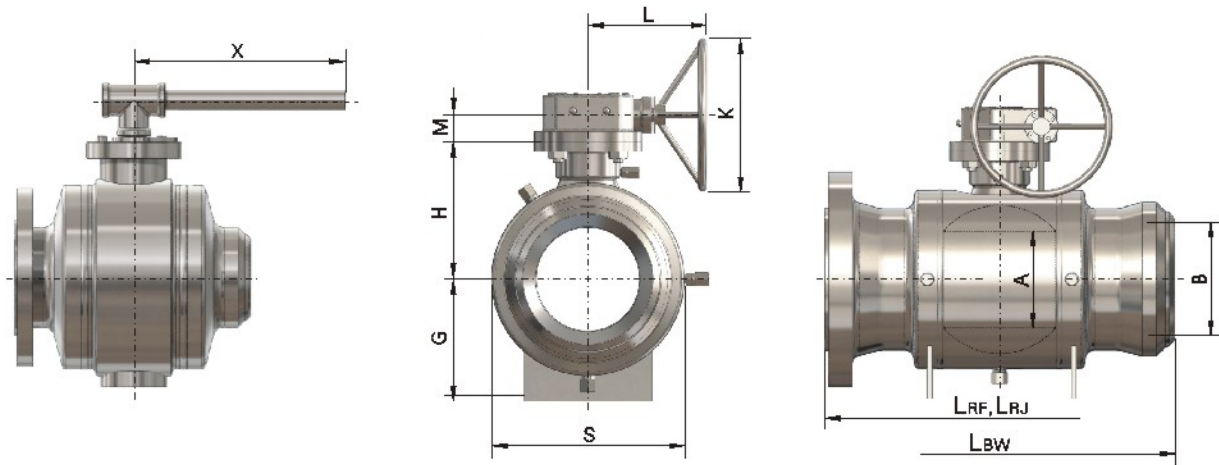


## PN16,20,25 CL 150 Full Bore

| NPS  | A    | B    | LBW  | LRF  | LRJ  | G    | H    | S    | M   | L   | K   | X   | Gear Weight | Bare Stem Weight |       |
|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-------------|------------------|-------|
|      |      |      |      |      |      |      |      |      |     |     |     |     |             | BW               | RF/RJ |
| 1.5" | 38   | 38   | 191  | 165  | 178  | 81   | 124  | 160  | 30  | 120 | 180 | 250 | 5           | 15               | 17    |
| 2"   | 49   | 49   | 216  | 178  | 191  | 91   | 139  | 175  | 30  | 120 | 180 | 250 | 5           | 20               | 21    |
| 3"   | 74   | 74   | 283  | 203  | 216  | 117  | 162  | 228  | 30  | 120 | 180 | 380 | 5           | 38               | 42    |
| 4"   | 100  | 100  | 305  | 229  | 241  | 140  | 187  | 270  | 30  | 120 | 180 | 550 | 5           | 60               | 72    |
| 6"   | 150  | 150  | 457  | 394  | 406  | 215  | 205  | 310  | 37  | 220 | 350 | -   | 9           | 142              | 168   |
| 8"   | 201  | 201  | 521  | 457  | 470  | 255  | 257  | 385  | 55  | 239 | 465 | -   | 18          | 180              | 216   |
| 10"  | 252  | 252  | 559  | 533  | 546  | 300  | 295  | 460  | 55  | 360 | 600 | -   | 21          | 297              | 345   |
| 12"  | 303  | 303  | 635  | 610  | 622  | 340  | 331  | 537  | 55  | 402 | 600 | -   | 28          | 452              | 558   |
| 14"  | 335  | 335  | 762  | 686  | 699  | 365  | 356  | 586  | 55  | 402 | 600 | -   | 38          | 680              | 802   |
| 16"  | 385  | 385  | 838  | 762  | 775  | 405  | 392  | 658  | 68  | 520 | 600 | -   | 60          | 880              | 1110  |
| 18"  | 436  | 436  | 914  | 864  | 876  | 465  | 437  | 738  | 68  | 520 | 600 | -   | 60          | 1135             | 1350  |
| 20"  | 488  | 488  | 991  | 914  | 927  | 490  | 474  | 811  | 77  | 543 | 750 | -   | 92          | 1605             | 1845  |
| 22"  | 528  | 528  | ♣    | ♣    | ♣    | 540  | 525  | 905  | 77  | 543 | 750 | -   | 92          | 2080             | 2340  |
| 24"  | 589  | 589  | 1143 | 1067 | 1080 | 565  | 552  | 968  | 77  | 543 | 750 | -   | 92          | 2570             | 3040  |
| 26"  | 633  | 633  | 1245 | 1143 | ♣    | 610  | 603  | 1050 | 87  | 604 | 750 | -   | 135         | 3220             | 3710  |
| 28"  | 684  | 684  | 1346 | 1245 | ♣    | 660  | 644  | 1134 | 87  | 604 | 750 | -   | 135         | 3880             | 4420  |
| 30"  | 735  | 735  | 1397 | 1295 | ♣    | 700  | 686  | 1217 | 87  | 604 | 750 | -   | 135         | 4420             | 5110  |
| 32"  | 779  | 779  | 1524 | 1372 | ♣    | 730  | 722  | 1288 | 87  | 642 | 750 | -   | 205         | 5370             | 6140  |
| 34"  | 830  | 830  | 1626 | 1473 | ♣    | 780  | 772  | 1372 | 87  | 642 | 750 | -   | 205         | 6350             | 7010  |
| 36"  | 874  | 874  | 1727 | 1524 | ♣    | 820  | 817  | 1445 | 87  | 660 | 750 | -   | 220         | 7430             | 8370  |
| 40"  | 976  | 976  | ♣    | ♣    | ♣    | 900  | 898  | 1605 | 87  | 660 | 750 | -   | 220         | 9990             | 10920 |
| 42"  | 1020 | 1020 | ♣    | ♣    | ♣    | 950  | 940  | 1680 | 117 | 754 | 850 | -   | 360         | 11910            | 13140 |
| 48"  | 1166 | 1166 | ♣    | ♣    | ♣    | 1060 | 1052 | 1905 | 117 | 855 | 850 | -   | 450         | 16620            | 17990 |
| 56"  | 1360 | 1360 | ♣    | ♣    | ♣    | 1240 | 1245 | 2225 | 130 | 901 | 915 | -   | 760         | 30200            | 31990 |
| 60"  | 1458 | 1458 | ♣    | ♣    | ♣    | 1320 | 1323 | 2380 | 130 | 901 | 915 | -   | 760         | 33990            | 36200 |



# Dimension & Weight

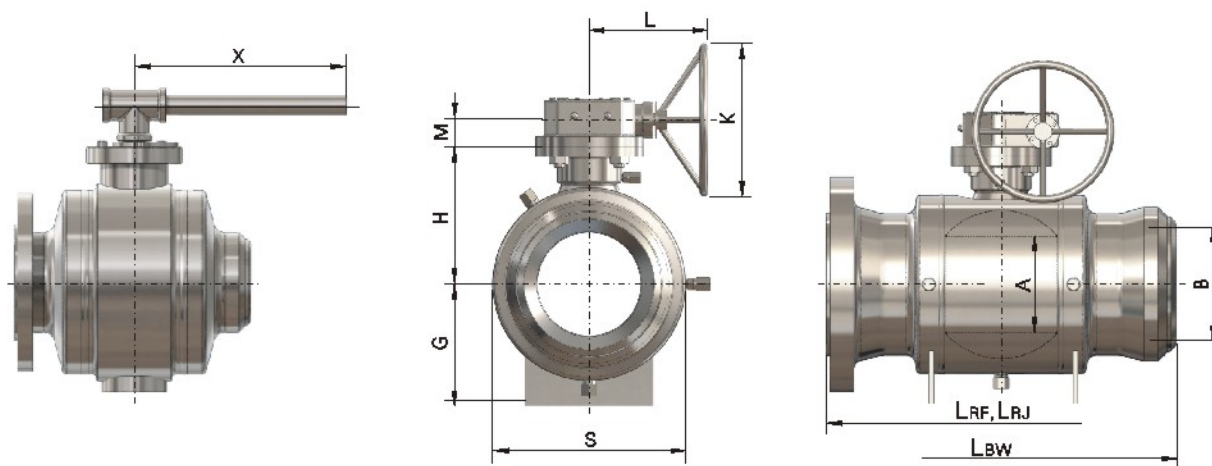


## PN16,20,25 CL 150 Reduced Bore

| NPS           | A   | B   | LBW  | LRF  | LRJ  | G   | H   | S    | M  | L   | K   | X   | Gear Weight | Bare Stem Weight |       |
|---------------|-----|-----|------|------|------|-----|-----|------|----|-----|-----|-----|-------------|------------------|-------|
|               |     |     |      |      |      |     |     |      |    |     |     |     |             | BW               | RF/RJ |
| 2"x 1.5"x 2"  | 38  | 49  | 216  | 178  | 191  | 81  | 124 | 160  | 30 | 120 | 180 | 250 | 5           | 17               | 21    |
| 3"x 2"x 3"    | 49  | 74  | 283  | 203  | 216  | 91  | 139 | 175  | 30 | 120 | 180 | 250 | 5           | 23               | 26    |
| 4"x 3"x 4"    | 74  | 100 | 305  | 229  | 241  | 117 | 162 | 228  | 30 | 120 | 180 | 380 | 5           | 42               | 49    |
| 6"x 4"x 6"    | 100 | 150 | 457  | 394  | 406  | 140 | 187 | 270  | 30 | 120 | 180 | 550 | 5           | 69               | 84    |
| 8"x 6"x 8"    | 150 | 201 | 521  | 457  | 470  | 215 | 205 | 310  | 37 | 220 | 350 | —   | 9           | 162              | 197   |
| 10"x 8"x 10"  | 201 | 252 | 559  | 533  | 546  | 255 | 257 | 385  | 55 | 239 | 465 | —   | 18          | 208              | 259   |
| 12"x 10"x 12" | 252 | 303 | 635  | 610  | 622  | 300 | 295 | 460  | 55 | 360 | 600 | —   | 21          | 332              | 402   |
| 16"x 12"x 16" | 303 | 385 | 838  | 762  | 775  | 340 | 331 | 537  | 55 | 402 | 600 | —   | 28          | 569              | 729   |
| 20"x 16"x 20" | 385 | 487 | 991  | 914  | 927  | 405 | 392 | 658  | 68 | 520 | 600 | —   | 60          | 1030             | 1320  |
| 24"x 20"x 24" | 487 | 589 | 1143 | 1067 | 1080 | 490 | 474 | 811  | 77 | 543 | 750 | —   | 92          | 1990             | 2380  |
| 30"x 24"x 30" | 589 | 735 | 1397 | 1295 | —    | 565 | 552 | 968  | 77 | 543 | 750 | —   | 92          | 3130             | 3800  |
| 36"x 30"x 36" | 735 | 874 | 1727 | 1524 | —    | 700 | 686 | 1217 | 87 | 604 | 750 | —   | 135         | 5280             | 6320  |



# Dimension & Weight

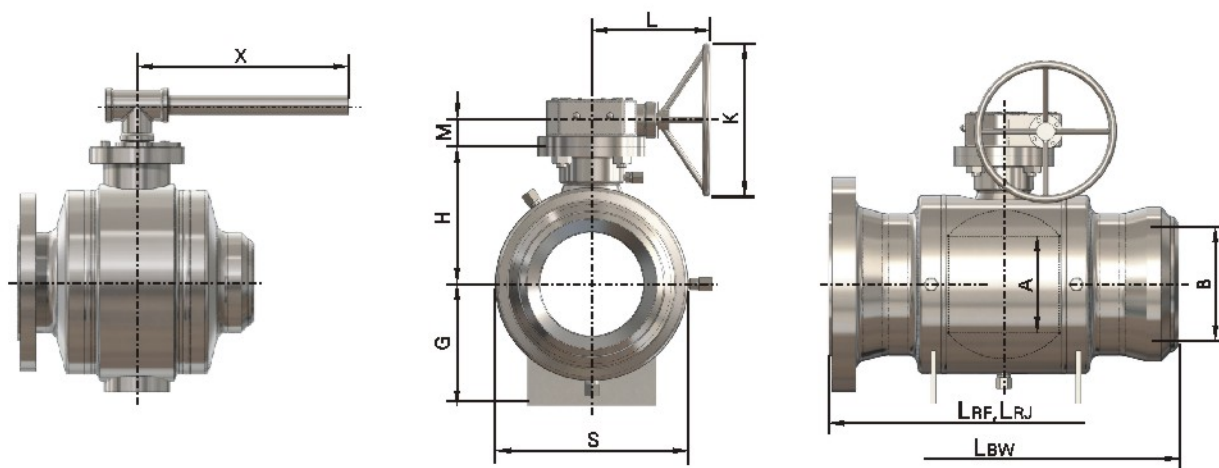


## PN 40,50 CL 300 Full Bore

| NPS  | A    | B    | LBW  | LRF  | LRJ  | G    | H    | S    | M   | L   | K   | X   | Gear Weight | Bare Stem Weight |        |
|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-------------|------------------|--------|
|      |      |      |      |      |      |      |      |      |     |     |     |     |             | BW               | RF /RJ |
| 1.5" | 38   | 38   | 191  | 191  | 203  | 81   | 124  | 160  | 30  | 120 | 180 | 250 | 5           | 15               | 21     |
| 2"   | 49   | 49   | 216  | 216  | 232  | 91   | 139  | 175  | 30  | 120 | 180 | 250 | 5           | 20               | 25     |
| 3"   | 74   | 74   | 283  | 283  | 298  | 117  | 162  | 228  | 30  | 120 | 180 | 380 | 5           | 38               | 48     |
| 4"   | 100  | 100  | 305  | 305  | 321  | 140  | 187  | 270  | 30  | 120 | 180 | 550 | 5           | 60               | 77     |
| 6"   | 150  | 150  | 457  | 403  | 419  | 215  | 205  | 310  | 40  | 239 | 350 | —   | 15          | 142              | 178    |
| 8"   | 201  | 201  | 521  | 502  | 518  | 255  | 257  | 385  | 55  | 239 | 465 | —   | 18          | 180              | 246    |
| 10"  | 252  | 252  | 559  | 568  | 584  | 300  | 295  | 460  | 55  | 402 | 600 | —   | 28          | 297              | 369    |
| 12"  | 303  | 303  | 635  | 648  | 664  | 340  | 331  | 537  | 55  | 402 | 600 | —   | 38          | 472              | 572    |
| 14"  | 334  | 334  | 762  | 762  | 778  | 365  | 356  | 586  | 68  | 520 | 600 | —   | 60          | 710              | 840    |
| 16"  | 385  | 385  | 838  | 838  | 854  | 410  | 402  | 670  | 68  | 520 | 600 | —   | 60          | 927              | 1170   |
| 18"  | 436  | 436  | 914  | 914  | 930  | 465  | 441  | 750  | 77  | 543 | 750 | —   | 92          | 1210             | 1450   |
| 20"  | 487  | 487  | 991  | 991  | 1010 | 490  | 480  | 825  | 77  | 543 | 750 | —   | 92          | 1685             | 1996   |
| 22"  | 538  | 538  | 1092 | 1092 | 1114 | 540  | 535  | 920  | 87  | 604 | 750 | —   | 135         | 2290             | 2560   |
| 24"  | 589  | 589  | 1143 | 1143 | 1165 | 575  | 570  | 990  | 87  | 604 | 750 | —   | 135         | 2710             | 3210   |
| 26"  | 633  | 633  | 1245 | 1245 | 1270 | 610  | 610  | 1065 | 87  | 642 | 750 | —   | 205         | 3380             | 3980   |
| 28"  | 684  | 684  | 1346 | 1346 | 1372 | 680  | 660  | 1146 | 87  | 642 | 750 | —   | 205         | 4120             | 4770   |
| 30"  | 735  | 735  | 1397 | 1397 | 1422 | 700  | 720  | 1235 | 87  | 660 | 750 | —   | 220         | 4650             | 5410   |
| 32"  | 779  | 779  | 1524 | 1524 | 1553 | 780  | 750  | 1310 | 87  | 660 | 750 | —   | 220         | 5610             | 6490   |
| 34"  | 830  | 830  | 1626 | 1626 | 1654 | 790  | 790  | 1390 | 117 | 754 | 850 | —   | 360         | 6750             | 7480   |
| 36"  | 874  | 874  | 1727 | 1727 | 1756 | 840  | 830  | 1465 | 117 | 754 | 850 | —   | 360         | 7830             | 8890   |
| 40"  | 976  | 976  | ♣    | ♣    | ♣    | 930  | 940  | 1630 | 117 | 855 | 850 | —   | 450         | 10540            | 11530  |
| 42"  | 1020 | 1020 | ♣    | ♣    | ♣    | 970  | 975  | 1700 | 117 | 855 | 850 | —   | 450         | 12520            | 13940  |
| 48"  | 1166 | 1166 | ♣    | ♣    | ♣    | 1100 | 1100 | 1940 | 130 | 901 | 915 | —   | 760         | 17330            | 18930  |
| 56"  | 1360 | 1360 | ♣    | ♣    | ♣    | 1270 | 1270 | 2250 | 372 | 674 | 800 | —   | 844         | 31880            | 33990  |
| 60"  | 1458 | 1458 | ♣    | ♣    | ♣    | 1370 | 1365 | 2410 | 350 | 726 | 800 | —   | 1123        | 35560            | 38200  |



# Dimension & Weight

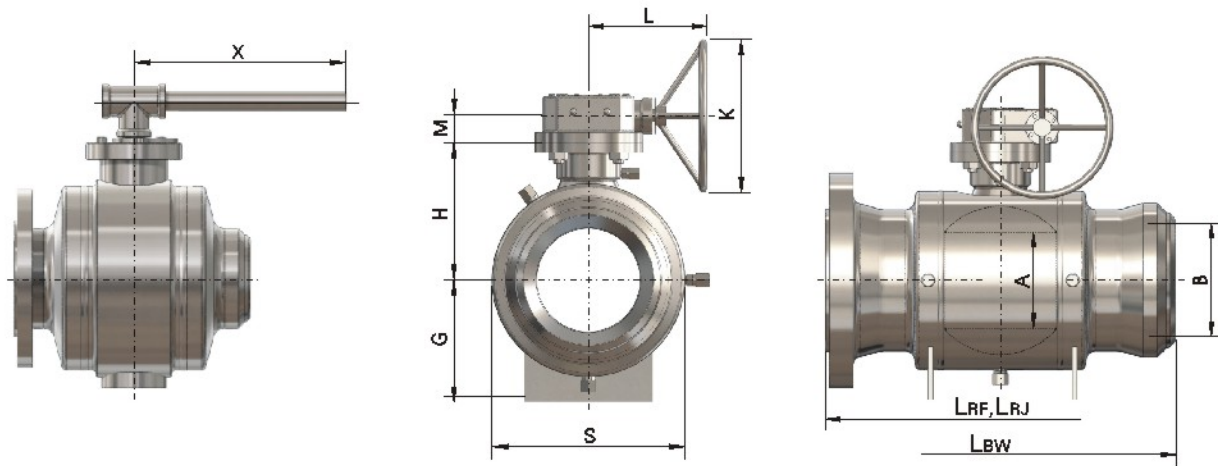


## PN 40,50 CL 300 Reduced Bore

| NPS           | A   | B   | LBW  | LRF  | LRJ  | G   | H   | S    | M  | L   | K   | X   | Gear Weight | Bare Stem Weight |       |
|---------------|-----|-----|------|------|------|-----|-----|------|----|-----|-----|-----|-------------|------------------|-------|
|               |     |     |      |      |      |     |     |      |    |     |     |     |             | BW               | RF/RJ |
| 2"x 1.5"x 2"  | 38  | 49  | 216  | 216  | 232  | 81  | 124 | 160  | 30 | 120 | 180 | 250 | 5           | 17               | 24    |
| 3"x 2"x 3"    | 49  | 74  | 283  | 283  | 298  | 91  | 139 | 175  | 30 | 120 | 180 | 250 | 5           | 25               | 32    |
| 4"x 3"x 4"    | 74  | 100 | 305  | 305  | 321  | 117 | 162 | 228  | 30 | 120 | 180 | 380 | 5           | 45               | 62    |
| 6"x 4"x 6"    | 100 | 150 | 457  | 403  | 419  | 140 | 187 | 270  | 30 | 120 | 180 | 550 | 5           | 78               | 102   |
| 8"x 6"x 8"    | 150 | 201 | 521  | 502  | 518  | 215 | 205 | 310  | 40 | 239 | 350 | —   | 15          | 162              | 201   |
| 10"x 8"x 10"  | 201 | 252 | 559  | 568  | 584  | 255 | 257 | 385  | 55 | 239 | 465 | —   | 18          | 205              | 286   |
| 12"x 10"x 12" | 252 | 303 | 635  | 648  | 664  | 300 | 295 | 460  | 55 | 402 | 600 | —   | 28          | 327              | 429   |
| 16"x 12"x 16" | 303 | 385 | 838  | 838  | 854  | 340 | 331 | 537  | 55 | 402 | 600 | —   | 38          | 590              | 692   |
| 20"x 16"x 20" | 385 | 487 | 991  | 991  | 1010 | 410 | 402 | 670  | 68 | 520 | 600 | —   | 60          | 1120             | 1430  |
| 24"x 20"x 24" | 487 | 589 | 1143 | 1143 | 1165 | 490 | 480 | 825  | 71 | 543 | 600 | —   | 92          | 2085             | 2580  |
| 30"x 24"x 30" | 589 | 735 | 1397 | 1397 | 1422 | 575 | 570 | 990  | 87 | 604 | 750 | —   | 135         | 3400             | 4100  |
| 36"x 30"x 36" | 735 | 874 | 1727 | 1727 | 1756 | 700 | 720 | 1235 | 87 | 660 | 750 | —   | 220         | 5650             | 6850  |



# Dimension & Weight

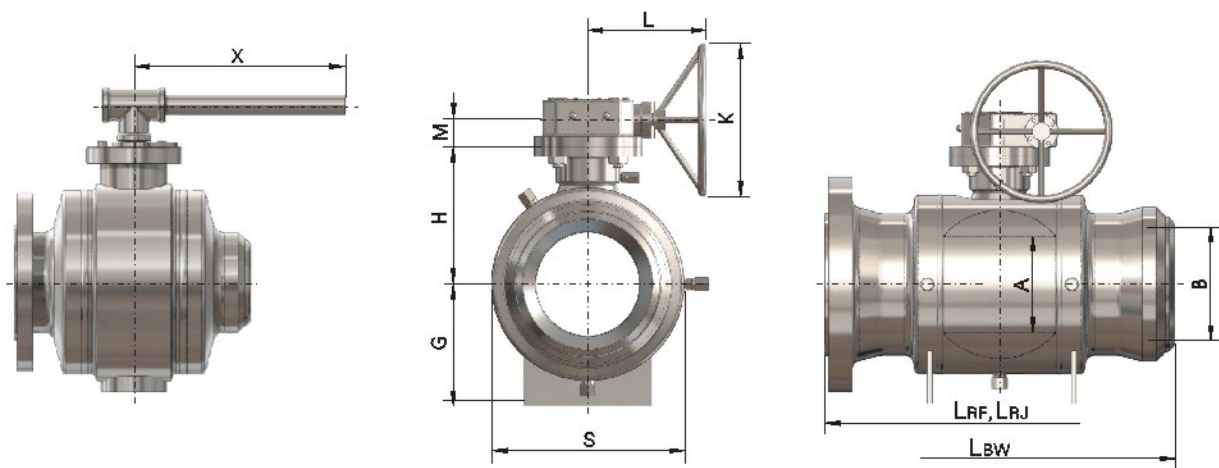


## PN 64 CL 400 FullBore

| NPS  | A    | B    | LBW  | LRF  | LRJ  | G    | H    | S    | M   | L   | K   | X   | Gear Weight | Bare Stem Weight |           |
|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-------------|------------------|-----------|
|      |      |      |      |      |      |      |      |      |     |     |     |     |             | BW               | R F / R J |
| 1.5" | 38   | 38   | 241  | 241  | 241  | 83   | 110  | 180  | 30  | 120 | 180 | 380 | 5           | 17               | 22        |
| 2"   | 49   | 49   | 292  | 292  | 295  | 88   | 117  | 155  | 30  | 120 | 180 | 380 | 5           | 22               | 30        |
| 3"   | 74   | 74   | 356  | 356  | 359  | 117  | 150  | 205  | 30  | 120 | 180 | 550 | 5           | 42               | 54        |
| 4"   | 100  | 100  | 406  | 406  | 410  | 140  | 171  | 245  | 37  | 220 | 350 | 800 | 9           | 69               | 92        |
| 6"   | 150  | 150  | 495  | 495  | 498  | 220  | 221  | 315  | 55  | 239 | 465 | —   | 18          | 153              | 198       |
| 8"   | 201  | 201  | 597  | 597  | 600  | 265  | 257  | 388  | 55  | 306 | 600 | —   | 21          | 244              | 312       |
| 10"  | 252  | 252  | 673  | 673  | 676  | 310  | 304  | 475  | 55  | 402 | 600 | —   | 38          | 437              | 508       |
| 12"  | 303  | 303  | 762  | 762  | 765  | 345  | 342  | 552  | 68  | 520 | 600 | —   | 60          | 680              | 765       |
| 14"  | 334  | 334  | 826  | 826  | 829  | 375  | 366  | 605  | 77  | 543 | 750 | —   | 92          | 875              | 993       |
| 16"  | 385  | 385  | 902  | 902  | 905  | 420  | 422  | 693  | 77  | 543 | 750 | —   | 92          | 1185             | 1388      |
| 18"  | 436  | 436  | 978  | 978  | 981  | 460  | 459  | 765  | 77  | 543 | 750 | —   | 92          | 1650             | 1810      |
| 20"  | 487  | 487  | 1054 | 1054 | 1060 | 505  | 501  | 855  | 87  | 604 | 750 | —   | 135         | 2110             | 2400      |
| 22"  | 538  | 538  | 1143 | 1143 | 1153 | 580  | 550  | 935  | 87  | 604 | 750 | —   | 135         | 2510             | 3100      |
| 24"  | 589  | 589  | 1232 | 1232 | 1241 | 590  | 594  | 1018 | 87  | 642 | 750 | —   | 205         | 3330             | 3900      |
| 26"  | 633  | 633  | 1308 | 1308 | 1321 | 655  | 630  | 1100 | 87  | 642 | 750 | —   | 205         | 4060             | 4485      |
| 28"  | 684  | 684  | 1397 | 1397 | 1410 | 700  | 685  | 1175 | 87  | 660 | 750 | —   | 220         | 4850             | 5510      |
| 30"  | 735  | 735  | 1524 | 1524 | 1537 | 750  | 725  | 1260 | 87  | 660 | 750 | —   | 220         | 5760             | 6660      |
| 32"  | 735  | 735  | 1651 | 1651 | 1667 | 800  | 780  | 1355 | 117 | 754 | 850 | —   | 360         | 6985             | 7950      |
| 34"  | 830  | 830  | 1778 | 1778 | 1794 | 840  | 825  | 1425 | 117 | 754 | 850 | —   | 360         | 8670             | 9620      |
| 36"  | 874  | 874  | 1880 | 1880 | 1895 | 930  | 870  | 1505 | 117 | 855 | 850 | —   | 450         | 9780             | 11160     |
| 40"  | 976  | 976  | •    | •    | •    | 1000 | 950  | 1665 | 117 | 855 | 850 | —   | 450         | 12230            | 13770     |
| 42"  | 1020 | 1020 | •    | •    | •    | 1050 | 1000 | 1730 | 130 | 901 | 915 | —   | 760         | 13920            | 15410     |
| 48"  | 1166 | 1166 | •    | •    | •    | 1150 | 1135 | 1990 | 372 | 674 | 800 | —   | 844         | 20970            | 22080     |
| 56"  | 1360 | 1360 | •    | •    | •    | 1350 | 1320 | 2330 | 350 | 726 | 800 | —   | 1123        | 37300            | 39590     |
| 60"  | 1458 | 1458 | •    | •    | •    | 1450 | 1420 | 2500 | 380 | 860 | 950 | —   | 2180        | 42600            | 45110     |



# Dimension & Weight

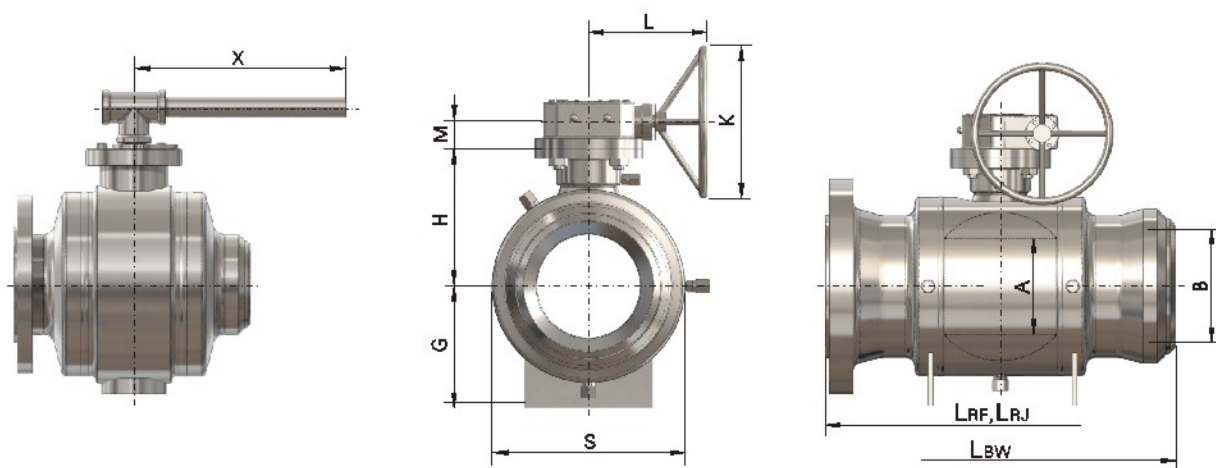


## PN 64 CL 400 Reduced Bore

| NPS           | A   | B   | LBW  | LRF  | LRJ  | G   | H   | S    | M  | L   | K   | X   | Gear Weight | Bare Stem Weight |       |
|---------------|-----|-----|------|------|------|-----|-----|------|----|-----|-----|-----|-------------|------------------|-------|
|               |     |     |      |      |      |     |     |      |    |     |     |     |             | BW               | RF/RJ |
| 2"x 1.5"x 2"  | 38  | 49  | 292  | 292  | 295  | 83  | 110 | 180  | 30 | 120 | 180 | 380 | 5           | 19               | 25    |
| 3"x 2"x 3"    | 49  | 74  | 356  | 356  | 359  | 88  | 117 | 155  | 30 | 120 | 180 | 380 | 5           | 26               | 39    |
| 4"x 3"x 4"    | 74  | 100 | 406  | 406  | 410  | 117 | 150 | 205  | 30 | 120 | 180 | 550 | 5           | 51               | 68    |
| 6"x 4"x 6"    | 100 | 150 | 495  | 495  | 498  | 140 | 171 | 245  | 37 | 220 | 350 | 800 | 9           | 85               | 115   |
| 8"x 6"x 8"    | 150 | 201 | 597  | 597  | 600  | 220 | 221 | 315  | 55 | 239 | 465 | -   | 18          | 173              | 225   |
| 10"x 8"x 10"  | 201 | 252 | 673  | 673  | 676  | 265 | 257 | 388  | 55 | 306 | 600 | -   | 21          | 279              | 377   |
| 12"x 10"x 12" | 252 | 303 | 762  | 762  | 765  | 310 | 304 | 475  | 55 | 402 | 600 | -   | 38          | 495              | 586   |
| 16"x 12"x 16" | 303 | 385 | 902  | 902  | 905  | 345 | 342 | 552  | 68 | 520 | 600 | -   | 60          | 860              | 960   |
| 20"x 16"x 20" | 385 | 487 | 1054 | 1054 | 1060 | 420 | 422 | 693  | 77 | 543 | 750 | -   | 92          | 1406             | 1680  |
| 24"x 20"x 24" | 487 | 589 | 1232 | 1232 | 1241 | 505 | 501 | 855  | 87 | 604 | 750 | -   | 135         | 2510             | 2860  |
| 30"x 24"x 30" | 589 | 735 | 1524 | 1524 | 1537 | 590 | 594 | 1018 | 87 | 642 | 750 | -   | 205         | 3850             | 4670  |
| 36"x 30"x 36" | 735 | 874 | 1880 | 1880 | 1895 | 750 | 725 | 1260 | 87 | 660 | 750 | -   | 220         | 6660             | 8120  |



# Dimension & Weight

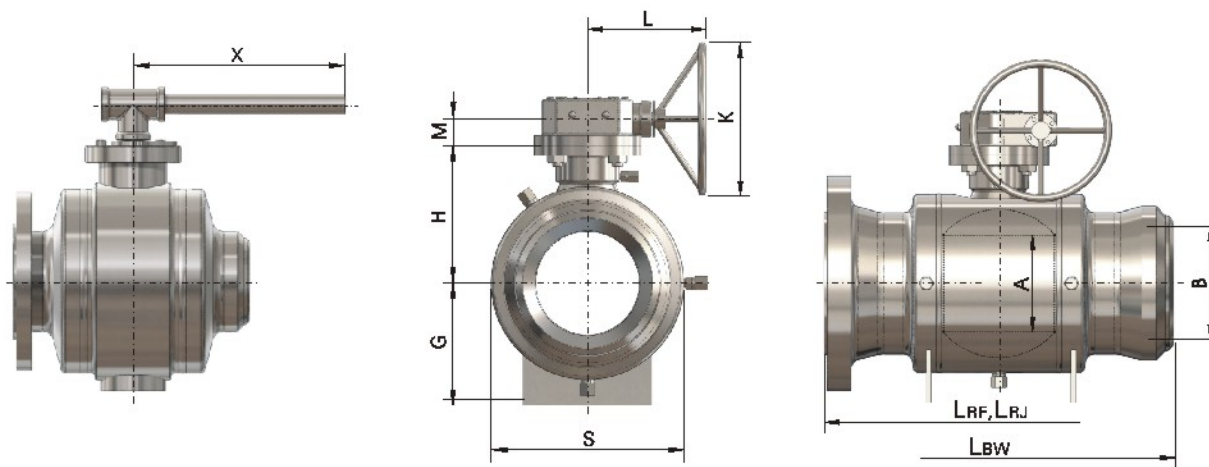


## PN 80,100 CL 600 Full Bore

| NPS  | A    | B    | LBW  | LRF  | LRJ  | G    | H    | S    | M   | L   | K   | X   | Gear Weight | Bare Stem Weight |       |
|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-------------|------------------|-------|
|      |      |      |      |      |      |      |      |      |     |     |     |     |             | BW               | RF/RJ |
| 1.5" | 38   | 38   | 241  | 241  | 241  | 83   | 110  | 180  | 30  | 120 | 180 | 380 | 5           | 17               | 24    |
| 2"   | 49   | 49   | 292  | 292  | 295  | 88   | 117  | 155  | 30  | 120 | 180 | 380 | 5           | 22               | 32    |
| 3"   | 74   | 74   | 356  | 356  | 359  | 117  | 150  | 205  | 30  | 120 | 180 | 550 | 5           | 45               | 62    |
| 4"   | 100  | 100  | 432  | 432  | 435  | 140  | 171  | 245  | 37  | 220 | 350 | 800 | 9           | 75               | 104   |
| 6"   | 150  | 150  | 559  | 559  | 562  | 220  | 221  | 315  | 55  | 239 | 465 | —   | 18          | 160              | 216   |
| 8"   | 201  | 201  | 660  | 660  | 664  | 265  | 257  | 388  | 55  | 402 | 600 | —   | 28          | 252              | 342   |
| 10"  | 252  | 252  | 787  | 787  | 791  | 310  | 304  | 475  | 55  | 402 | 600 | —   | 38          | 453              | 578   |
| 12"  | 303  | 303  | 838  | 838  | 841  | 345  | 342  | 552  | 68  | 520 | 600 | —   | 60          | 700              | 845   |
| 14"  | 334  | 334  | 889  | 889  | 892  | 375  | 366  | 605  | 77  | 543 | 750 | —   | 92          | 898              | 1055  |
| 16"  | 385  | 385  | 991  | 991  | 994  | 420  | 422  | 693  | 77  | 543 | 750 | —   | 92          | 1220             | 1500  |
| 18"  | 436  | 436  | 1092 | 1092 | 1095 | 465  | 470  | 776  | 87  | 604 | 750 | —   | 135         | 1830             | 2120  |
| 20"  | 487  | 487  | 1194 | 1194 | 1200 | 505  | 514  | 860  | 87  | 642 | 750 | —   | 205         | 2182             | 2598  |
| 22"  | 538  | 538  | 1295 | 1295 | 1305 | 580  | 565  | 945  | 87  | 642 | 750 | —   | 205         | 2780             | 3290  |
| 24"  | 589  | 589  | 1397 | 1397 | 1407 | 590  | 609  | 1024 | 87  | 660 | 750 | —   | 220         | 3450             | 4130  |
| 26"  | 633  | 633  | 1448 | 1448 | 1461 | 655  | 650  | 1105 | 87  | 660 | 750 | —   | 220         | 4460             | 5285  |
| 28"  | 684  | 684  | 1549 | 1549 | 1562 | 700  | 699  | 1185 | 117 | 754 | 850 | —   | 360         | 5110             | 6030  |
| 30"  | 735  | 735  | 1651 | 1651 | 1664 | 750  | 745  | 1275 | 117 | 855 | 850 | —   | 450         | 6110             | 7050  |
| 32"  | 779  | 779  | 1778 | 1778 | 1794 | 800  | 800  | 1365 | 117 | 855 | 850 | —   | 450         | 7580             | 9150  |
| 34"  | 830  | 830  | 1930 | 1930 | 1946 | 840  | 841  | 1438 | 117 | 855 | 850 | —   | 450         | 9140             | 11150 |
| 36"  | 874  | 874  | 2083 | 2083 | 2099 | 950  | 890  | 1520 | 130 | 901 | 915 | —   | 760         | 10820            | 12570 |
| 40"  | 976  | 976  | •    | •    | •    | 1000 | 970  | 1680 | 130 | 901 | 915 | —   | 760         | 13610            | 14560 |
| 42"  | 1020 | 1020 | •    | •    | •    | 1050 | 1020 | 1745 | 372 | 674 | 800 | —   | 844         | 15030            | 16370 |
| 48"  | 1166 | 1166 | •    | •    | •    | 1150 | 1150 | 2005 | 350 | 726 | 800 | —   | 1123        | 23100            | 24100 |
| 56"  | 1360 | 1360 | •    | •    | •    | 1360 | 1340 | 2350 | 380 | 860 | 950 | —   | 2180        | 39890            | 43210 |
| 60"  | 1458 | 1458 | •    | •    | •    | 1460 | 1440 | 2520 | 380 | 860 | 950 | —   | 2180        | 44910            | 47900 |



# Dimension & Weight

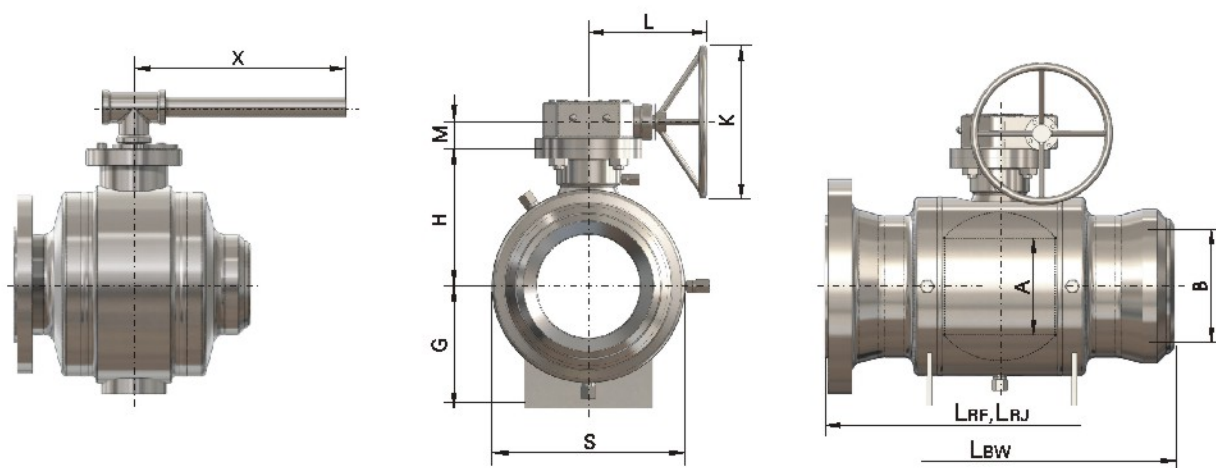


## PN 80,100 CL 600 Reduced Bore

| NPS           | A   | B   | LBW  | LRF  | LRJ  | G   | H   | S    | M   | L   | K   | X   | Gear Weight | Bare Stem Weight |       |
|---------------|-----|-----|------|------|------|-----|-----|------|-----|-----|-----|-----|-------------|------------------|-------|
|               |     |     |      |      |      |     |     |      |     |     |     |     |             | BW               | RF/RJ |
| 2"x 1.5"x 2"  | 38  | 49  | 292  | 292  | 295  | 83  | 110 | 180  | 30  | 120 | 180 | 380 | 5           | 19               | 27    |
| 3"x 2"x 3"    | 49  | 74  | 356  | 356  | 359  | 88  | 117 | 155  | 30  | 120 | 180 | 380 | 5           | 30               | 35    |
| 4"x 3"x 4"    | 74  | 100 | 432  | 432  | 435  | 117 | 150 | 205  | 30  | 120 | 180 | 550 | 5           | 62               | 85    |
| 6"x 4"x 6"    | 100 | 150 | 559  | 559  | 562  | 140 | 171 | 245  | 37  | 220 | 350 | 800 | 9           | 97               | 143   |
| 8"x 6"x 8"    | 150 | 201 | 660  | 660  | 664  | 230 | 211 | 315  | 55  | 239 | 465 | —   | 18          | 182              | 266   |
| 10"x 8"x 10"  | 201 | 252 | 787  | 787  | 791  | 275 | 257 | 388  | 55  | 402 | 600 | —   | 28          | 292              | 413   |
| 12"x 10"x 12" | 252 | 303 | 838  | 838  | 841  | 310 | 304 | 475  | 55  | 402 | 600 | —   | 38          | 501              | 760   |
| 16"x 12"x 16" | 303 | 385 | 991  | 991  | 994  | 360 | 342 | 552  | 68  | 520 | 600 | —   | 60          | 789              | 1120  |
| 20"x 16"x 20" | 385 | 487 | 1194 | 1194 | 1200 | 425 | 422 | 693  | 77  | 543 | 750 | —   | 92          | 1370             | 1780  |
| 24"x 20"x 24" | 487 | 589 | 1397 | 1397 | 1407 | 505 | 514 | 860  | 87  | 642 | 750 | —   | 205         | 2580             | 3350  |
| 30"x 24"x 30" | 589 | 735 | 1651 | 1651 | 1164 | 590 | 609 | 1024 | 87  | 660 | 750 | —   | 220         | 4040             | 5050  |
| 36"x 30"x 36" | 735 | 874 | 2083 | 2083 | 2099 | 750 | 745 | 1275 | 117 | 855 | 850 | —   | 450         | 7060             | 8650  |



# Dimension & Weight



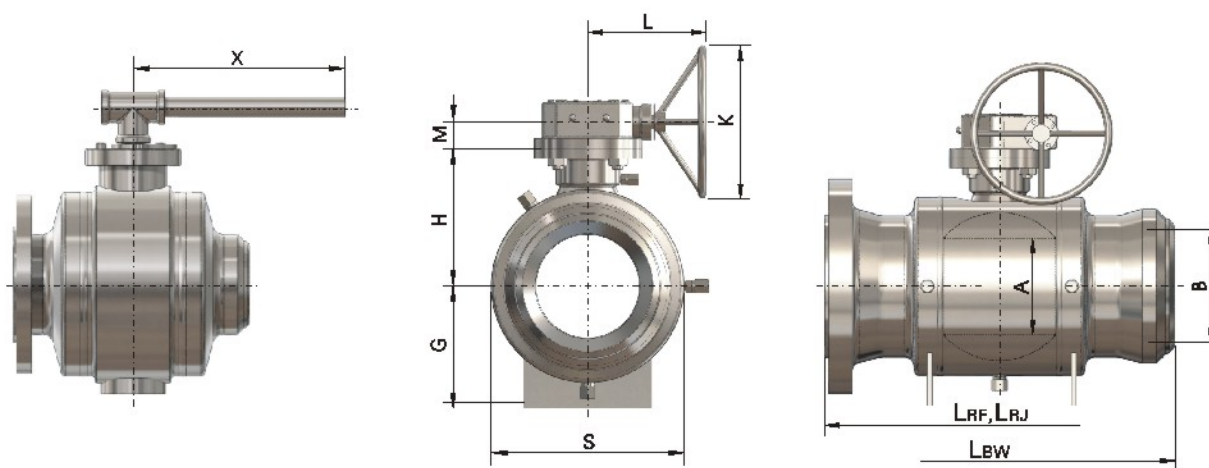
## PN150,160 CL 900 Full Bore

| NPS  | A    | B    | LBW  | LRF  | LRJ  | G    | H    | S    | M   | L   | K   | X   | Gear Weight | Bare Stem Weight |       |
|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-------------|------------------|-------|
|      |      |      |      |      |      |      |      |      |     |     |     |     |             | BW               | RF/RJ |
| 1.5" | 38   | 38   | 305  | 305  | 305  | 83   | 110  | 150  | 30  | 120 | 180 | 380 | 5           | 20               | 31    |
| 2"   | 49   | 49   | 368  | 368  | 371  | 100  | 134  | 175  | 30  | 120 | 180 | 550 | 5           | 40               | 53    |
| 3"   | 74   | 74   | 381  | 381  | 384  | 119  | 152  | 210  | 37  | 220 | 350 | 800 | 9           | 69               | 97    |
| 4"   | 100  | 100  | 457  | 457  | 460  | 141  | 189  | 255  | 55  | 465 | 350 | —   | 18          | 105              | 136   |
| 6"   | 150  | 150  | 610  | 610  | 613  | 220  | 225  | 327  | 55  | 402 | 600 | —   | 28          | 224              | 292   |
| 8"   | 201  | 201  | 737  | 737  | 740  | 270  | 272  | 414  | 55  | 402 | 600 | —   | 38          | 325              | 420   |
| 10"  | 252  | 252  | 838  | 838  | 841  | 320  | 315  | 501  | 68  | 520 | 600 | —   | 60          | 593              | 751   |
| 12"  | 303  | 303  | 965  | 965  | 968  | 370  | 368  | 589  | 77  | 543 | 750 | —   | 92          | 807              | 1027  |
| 14"  | 322  | 322  | 1029 | 1029 | 1038 | 390  | 387  | 630  | 87  | 604 | 750 | —   | 135         | 1028             | 1298  |
| 16"  | 373  | 373  | 1130 | 1130 | 1140 | 440  | 446  | 730  | 87  | 604 | 750 | —   | 135         | 1434             | 1714  |
| 18"  | 423  | 423  | 1219 | 1219 | 1232 | 485  | 500  | 818  | 87  | 652 | 750 | —   | 205         | 2123             | 2610  |
| 20"  | 471  | 471  | 1321 | 1321 | 1334 | 530  | 550  | 910  | 87  | 660 | 750 | —   | 220         | 2892             | 3515  |
| 22"  | 522  | 522  | ♣    | ♣    | ♣    | 600  | 600  | 990  | 117 | 754 | 850 | —   | 360         | 3580             | 4350  |
| 24"  | 570  | 570  | 1549 | 1549 | 1568 | 630  | 654  | 1089 | 117 | 855 | 850 | —   | 450         | 4310             | 5330  |
| 26"  | 617  | 617  | 1651 | ♣    | 1673 | 560  | 695  | 1140 | 117 | 855 | 850 | —   | 450         | 5280             | 6550  |
| 28"  | 665  | 665  | ♣    | ♣    | ♣    | 710  | 725  | 1230 | 117 | 855 | 850 | —   | 450         | 6030             | 7370  |
| 30"  | 712  | 712  | 1880 | ♣    | 1902 | 760  | 770  | 1325 | 130 | 901 | 915 | —   | 760         | 7180             | 8810  |
| 32"  | 760  | 760  | ♣    | ♣    | ♣    | 820  | 820  | 1410 | 130 | 901 | 915 | —   | 760         | 10870            | 11890 |
| 36"  | 855  | 855  | 2286 | ♣    | 2315 | 940  | 915  | 1560 | 382 | 674 | 800 | —   | 844         | 17150            | 19100 |
| 40"  | 956  | 956  | ♣    | ♣    | ♣    | 1030 | 1000 | 1740 | 350 | 726 | 800 | —   | 1123        | 25840            | 28300 |
| 42"  | 1006 | 1006 | ♣    | ♣    | ♣    | 1070 | 1030 | 1805 | 350 | 726 | 800 | —   | 1123        | 28660            | 31840 |
| 48"  | 1149 | 1149 | ♣    | ♣    | ♣    | 1200 | 1180 | 2060 | 380 | 860 | 950 | —   | 2180        | 38700            | 41800 |

## PN150,160 CL 900 Reduced Bore

| NPS           | A   | B   | LBW  | LRF  | LRJ  | G   | H   | S    | M   | L   | K   | X   | Gear Weight | Bare Stem Weight |       |
|---------------|-----|-----|------|------|------|-----|-----|------|-----|-----|-----|-----|-------------|------------------|-------|
|               |     |     |      |      |      |     |     |      |     |     |     |     |             | BW               | RF/RJ |
| 2"x 1.5"x 2"  | 38  | 49  | 368  | 368  | 371  | 83  | 110 | 150  | 30  | 120 | 180 | 380 | 5           | 22               | 43    |
| 3"x 2"x 3"    | 49  | 74  | 381  | 381  | 384  | 100 | 134 | 175  | 30  | 120 | 180 | 550 | 5           | 49               | 74    |
| 4"x 3"x 4"    | 74  | 100 | 457  | 457  | 460  | 119 | 152 | 210  | 37  | 220 | 350 | 800 | 9           | 90               | 141   |
| 6"x 4"x 6"    | 100 | 150 | 610  | 610  | 613  | 141 | 189 | 255  | 55  | 465 | 350 | —   | 18          | 143              | 206   |
| 8"x 6"x 8"    | 150 | 201 | 737  | 737  | 740  | 255 | 225 | 327  | 55  | 402 | 600 | —   | 28          | 255              | 408   |
| 10"x 8"x 10"  | 201 | 252 | 838  | 838  | 841  | 290 | 272 | 414  | 55  | 402 | 600 | —   | 38          | 403              | 605   |
| 12"x 10"x 12" | 252 | 303 | 965  | 965  | 968  | 370 | 315 | 501  | 68  | 520 | 600 | —   | 60          | 694              | 912   |
| 16"x 12"x 16" | 303 | 373 | 1130 | 1130 | 1140 | 440 | 368 | 589  | 77  | 543 | 750 | —   | 92          | 930              | 1310  |
| 20"x 16"x 20" | 373 | 471 | 1321 | 1321 | 1334 | 540 | 446 | 730  | 87  | 604 | 750 | —   | 135         | 1750             | 2380  |
| 24"x 20"x 24" | 471 | 570 | 1549 | 1549 | 1568 | 630 | 550 | 910  | 87  | 660 | 750 | —   | 220         | 3490             | 4850  |
| 30"x 24"x 30" | 570 | 712 | ♣    | 1180 | 1902 | 760 | 654 | 1089 | 117 | 855 | 850 | —   | 450         | 5280             | 6850  |
| 36"x 30"x 36" | 712 | 855 | ♣    | 2286 | 2315 | 940 | 770 | 1325 | 130 | 901 | 915 | —   | 760         | 8680             | 11910 |

# Dimension & Weight



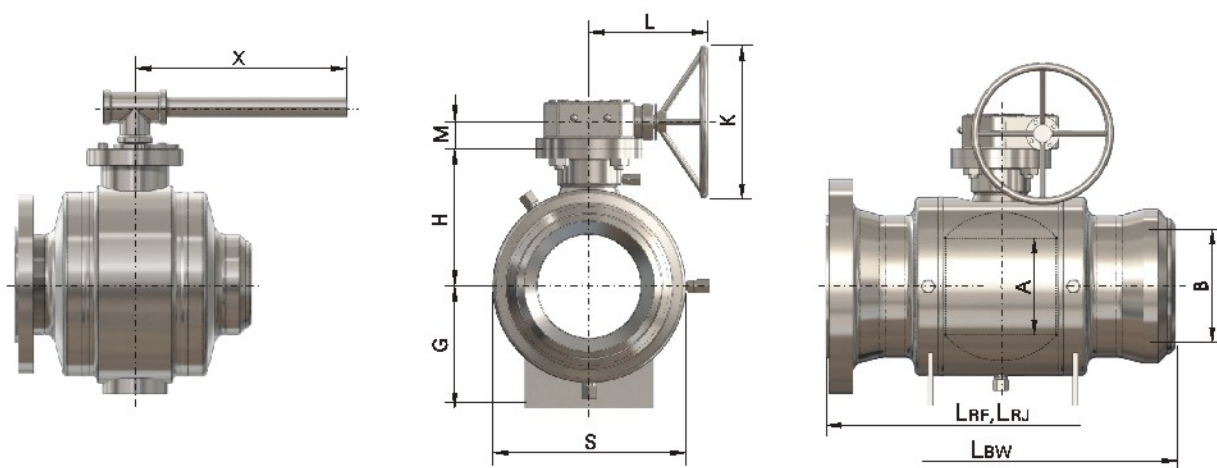
## PN 200,250 CL 1500 Full Bore

| NPS  | A   | B   | LBW  | LRF  | LRJ  | G    | H    | S    | M   | L   | K   | X   | Gear Weight | Bare Stem Weight |       |
|------|-----|-----|------|------|------|------|------|------|-----|-----|-----|-----|-------------|------------------|-------|
|      |     |     |      |      |      |      |      |      |     |     |     |     |             | BW               | RF/RJ |
| 1.5" | 38  | 38  | 305  | 305  | 305  | 83   | 110  | 150  | 30  | 120 | 180 | 250 | 5           | 20               | 31    |
| 2"   | 49  | 49  | 368  | 368  | 371  | 100  | 134  | 175  | 30  | 120 | 180 | 550 | 5           | 40               | 53    |
| 3"   | 74  | 74  | 470  | 470  | 473  | 127  | 167  | 224  | 55  | 239 | 465 | 950 | 18          | 88               | 115   |
| 4"   | 100 | 100 | 546  | 546  | 549  | 153  | 200  | 280  | 55  | 360 | 600 | —   | 21          | 141              | 177   |
| 6"   | 144 | 144 | 705  | 705  | 711  | 245  | 247  | 361  | 55  | 402 | 600 | —   | 38          | 320              | 410   |
| 8"   | 192 | 192 | 832  | 832  | 841  | 300  | 300  | 473  | 68  | 520 | 600 | —   | 60          | 658              | 778   |
| 10"  | 239 | 239 | 991  | 991  | 1000 | 360  | 363  | 570  | 77  | 543 | 750 | —   | 92          | 885              | 1080  |
| 12"  | 287 | 287 | 1130 | 1130 | 1146 | 420  | 425  | 675  | 87  | 642 | 750 | —   | 205         | 1280             | 1570  |
| 14"  | 315 | 315 | 1257 | 1257 | 1276 | 450  | 460  | 733  | 87  | 642 | 750 | —   | 205         | 1730             | 2180  |
| 16"  | 360 | 360 | 1384 | 1384 | 1407 | 510  | 520  | 816  | 87  | 660 | 750 | —   | 220         | 2220             | 2810  |
| 18"  | 406 | 406 | ♣    | 1537 | 1559 | 580  | 580  | 920  | 87  | 660 | 750 | —   | 220         | 3120             | 3850  |
| 20"  | 454 | 454 | ♣    | 1664 | 1686 | 650  | 650  | 1050 | 117 | 754 | 850 | —   | 360         | 4210             | 5050  |
| 22"  | 500 | 500 | ♣    | ♣    | ♣    | 725  | 715  | 1150 | 117 | 855 | 850 | —   | 450         | 5580             | 6580  |
| 24"  | 546 | 546 | ♣    | ♣    | 1972 | 790  | 780  | 1250 | 130 | 901 | 915 | —   | 760         | 7110             | 8230  |
| 26"  | 594 | 594 | ♣    | 1943 | ♣    | 865  | 850  | 1320 | 130 | 901 | 915 | —   | 760         | 8700             | 10130 |
| 28"  | 641 | 641 | ♣    | ♣    | ♣    | 910  | 900  | 1420 | 372 | 674 | 800 | —   | 844         | 10120            | 12450 |
| 30"  | 686 | 686 | ♣    | ♣    | ♣    | 990  | 980  | 1530 | 372 | 674 | 800 | —   | 844         | 11900            | 14190 |
| 32"  | 730 | 730 | ♣    | ♣    | ♣    | 1050 | 1050 | 1650 | 350 | 726 | 800 | —   | 1123        | 15170            | 17590 |
| 34"  | 775 | 775 | ♣    | ♣    | ♣    | 1120 | 1110 | 1740 | 380 | 860 | 950 | —   | 2180        | 19500            | 21820 |
| 36"  | 819 | 819 | ♣    | ♣    | ♣    | 1180 | 1170 | 1800 | 380 | 860 | 950 | —   | 2180        | 23100            | 26920 |

## PN 200,250 CL 1500 Reduced Bore

| NPS           | A   | B   | LBW  | LRF  | LRJ  | G   | H   | S    | M   | L   | K   | X   | Gear Weight | Bare Stem Weight |       |
|---------------|-----|-----|------|------|------|-----|-----|------|-----|-----|-----|-----|-------------|------------------|-------|
|               |     |     |      |      |      |     |     |      |     |     |     |     |             | BW               | RF/RJ |
| 2"x 1.5"x 2"  | 38  | 49  | 368  | 368  | 371  | 83  | 110 | 150  | 30  | 120 | 180 | 250 | 5           | 22               | 46    |
| 3"x 2"x 3"    | 49  | 74  | 470  | 470  | 473  | 100 | 134 | 175  | 30  | 120 | 180 | 550 | 5           | 56               | 80    |
| 4"x 3"x 4"    | 74  | 100 | 546  | 546  | 549  | 127 | 167 | 224  | 55  | 239 | 465 | 950 | 18          | 124              | 186   |
| 6"x 4"x 6"    | 100 | 144 | 705  | 705  | 711  | 153 | 200 | 280  | 55  | 360 | 600 | —   | 21          | 225              | 317   |
| 8"x 6"x 8"    | 144 | 192 | 832  | 832  | 841  | 260 | 247 | 361  | 55  | 402 | 600 | —   | 38          | 420              | 545   |
| 10"x 8"x 10"  | 192 | 239 | 911  | 911  | 1000 | 310 | 300 | 473  | 68  | 520 | 600 | —   | 60          | 805              | 958   |
| 12"x 10"x 12" | 239 | 287 | 1130 | 1130 | 1146 | 360 | 363 | 570  | 77  | 543 | 750 | —   | 92          | 1085             | 1490  |
| 16"x 12"x 16" | 287 | 360 | 1384 | 1384 | 1407 | 430 | 425 | 675  | 87  | 642 | 750 | —   | 205         | 1620             | 2090  |
| 20"x 16"x 20" | 360 | 454 | ♣    | 1664 | 1686 | 510 | 520 | 816  | 87  | 660 | 750 | —   | 220         | 2970             | 4010  |
| 24"x 20"x 24" | 454 | 546 | ♣    | 1943 | ♣    | 650 | 650 | 1050 | 117 | 754 | 850 | —   | 360         | 5290             | 6390  |
| 30"x 24"x 30" | 546 | 686 | ♣    | ♣    | ♣    | 790 | 780 | 1250 | 130 | 901 | 915 | —   | 760         | 9910             | 12100 |
| 36"x 30"x 36" | 686 | 819 | ♣    | ♣    | ♣    | 990 | 980 | 1530 | 172 | 674 | 800 | —   | 844         | 16790            | 20800 |

# Dimension & Weight



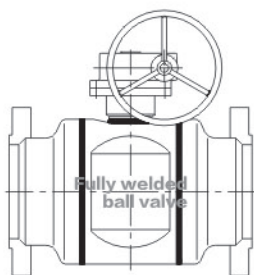
## PN 320,420 CL 2500 Full Bore

| NPS  | A   | B   | LBW  | LRF  | LRJ  | G   | H    | S    | M   | L   | K   | X   | Gear Weight | Bare Stem Weight |       |
|------|-----|-----|------|------|------|-----|------|------|-----|-----|-----|-----|-------------|------------------|-------|
|      |     |     |      |      |      |     |      |      |     |     |     |     |             | BW               | RF/RJ |
| 1.5" | 38  | 38  | ♣    | ♣    | ♣    | 97  | 131  | 172  | 37  | 220 | 350 | 800 | 9           | 41               | 64    |
| 2"   | 42  | 42  | 451  | 451  | 454  | 109 | 162  | 190  | 55  | 239 | 465 | —   | 17          | 66               | 112   |
| 3"   | 62  | 62  | 578  | 578  | 584  | 149 | 201  | 260  | 55  | 360 | 600 | —   | 23          | 162              | 231   |
| 4"   | 87  | 87  | 673  | 673  | 683  | 193 | 246  | 300  | 55  | 402 | 600 | —   | 38          | 320              | 418   |
| 6"   | 131 | 131 | 914  | 914  | 927  | 290 | 310  | 417  | 77  | 543 | 750 | —   | 92          | 696              | 840   |
| 8"   | 179 | 179 | 1022 | 1022 | 1038 | 380 | 400  | 555  | 87  | 604 | 750 | —   | 135         | 1605             | 1773  |
| 10"  | 223 | 223 | 1270 | 1270 | 1292 | 460 | 465  | 675  | 87  | 642 | 750 | —   | 205         | 2450             | 2990  |
| 12"  | 265 | 265 | 1422 | 1422 | 1445 | 520 | 540  | 778  | 117 | 754 | 850 | —   | 360         | 3470             | 4230  |
| 14"  | 292 | 292 | ♣    | ♣    | ♣    | 560 | 600  | 890  | 117 | 855 | 850 | —   | 450         | 4260             | 5090  |
| 16"  | 333 | 333 | ♣    | ♣    | ♣    | 650 | 710  | 1050 | 130 | 910 | 915 | —   | 760         | 5180             | 6320  |
| 18"  | 374 | 374 | ♣    | ♣    | ♣    | 730 | 790  | 1160 | 372 | 674 | 800 | —   | 844         | 7310             | 8770  |
| 20"  | 419 | 419 | ♣    | ♣    | ♣    | 820 | 860  | 1310 | 350 | 726 | 800 | —   | 1123        | 9930             | 11980 |
| 24"  | 502 | 502 | ♣    | ♣    | ♣    | 960 | 1020 | 1530 | 380 | 860 | 950 | —   | 2180        | 15270            | 18750 |

## PN320,420 CL 2500 Reduced Bore

| NPS           | A   | B   | LBW  | LRF  | LRJ  | G   | H   | S    | M   | L   | K   | X   | Gear Weight | Bare Stem Weight |       |
|---------------|-----|-----|------|------|------|-----|-----|------|-----|-----|-----|-----|-------------|------------------|-------|
|               |     |     |      |      |      |     |     |      |     |     |     |     |             | BW               | RF/RJ |
| 2"x 1.5"x 2"  | 38  | 42  | 451  | 451  | 454  | 97  | 131 | 172  | 37  | 220 | 350 | 800 | 9           | 46               | 85    |
| 3"x 2"x 3"    | 42  | 62  | 578  | 578  | 584  | 109 | 162 | 190  | 55  | 239 | 465 | —   | 17          | 95               | 154   |
| 4"x 3"x 4"    | 62  | 87  | 673  | 673  | 683  | 149 | 201 | 260  | 55  | 360 | 600 | —   | 23          | 208              | 316   |
| 6"x 4"x 6"    | 87  | 131 | 914  | 914  | 927  | 193 | 246 | 300  | 55  | 402 | 600 | —   | 38          | 398              | 578   |
| 8"x 6"x 8"    | 131 | 179 | 1022 | 1022 | 1038 | 290 | 310 | 417  | 77  | 543 | 750 | —   | 92          | 995              | 1340  |
| 10"x 8"x 10"  | 179 | 223 | 1270 | 1270 | 1292 | 380 | 400 | 555  | 87  | 604 | 750 | —   | 135         | 2205             | 2750  |
| 12"x 10"x 12" | 223 | 265 | 1422 | 1422 | 1445 | 460 | 465 | 675  | 87  | 642 | 750 | —   | 205         | 3225             | 3990  |
| 16"x 12"x 16" | 265 | 333 | ♣    | ♣    | ♣    | 520 | 540 | 778  | 117 | 754 | 850 | —   | 360         | 4650             | 5730  |
| 20"x 16"x 20" | 333 | 419 | ♣    | ♣    | ♣    | 650 | 710 | 1050 | 130 | 910 | 915 | —   | 760         | 6670             | 8640  |
| 24"x 20"x 24" | 419 | 502 | ♣    | ♣    | ♣    | 820 | 860 | 1310 | 350 | 726 | 800 | —   | 1123        | 11910            | 15500 |





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