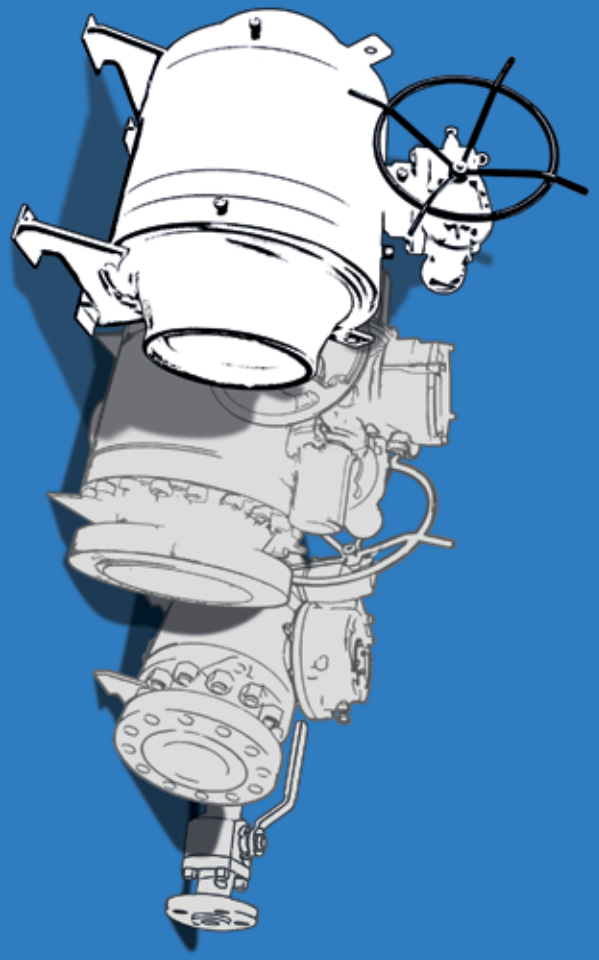
PISHGAM

BALL VALVE MANUFACTURER

کارخانـه : تهران، شـهرک صنعتی شـمس آباد، بلوار بهارسـتان،
بلـوار نارنجسـتان، انتهـای گلبـرگ۴
تلفـن : ۵۶۲۳۰۱۲۵-۰۲۱ ۵۶۲۳۳۶۴۱-۲-۰۲۱
نمابـر : ۵۶۲۳۰۱۲۶-۰۲۱
info@pishgam.co www.pishgam.co

Factory: Golbarg-e-4 St. ,Narenjestan Blvd., Baharestan Blvd.,Shamsabad Industrial City, Tehran ,Iran
Tel : (+98 - 21) 562 30 126
(+98 - 21) 562 33 641-2
Fax : (+98 - 21) 562 30 125



- All Welded

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Company Profile

PISHGAM Industrial Designers Company named "PISHGAM" hereafter is a privately held company led by board of directors consisting of graduates of reputable Iranian universities with high level of educations.

Directors have been chosen and employed among the best educated people holding recognized academic degrees who are experienced and professional in their field of work.

Since 2002 this company has started performing professional activities through experienced staff who have undergone necessary trainings concentrating on design and production of oil and gas equipment through cooperation with top rated companies abroad and intelligent technology transfer.

PISHGAM is emphasizing on production of premium quality products in accordance with national and international standards. For all productions supply, production, and test processes are performed under supervision of quality control department which monitors all processes by accurate instrumentation and records the information as per parts recognition procedures. Good reputation in oil and gas industry obliges the company to implement quality standards.

PISHGAM is set and implemented all organizational and information flow procedures in all organizational levels with regard to quality management system. Process improvement is an integral responsibility assigned to all departments which are all monitored by quality assurance department.

Having about 4000 sqm workshop, storage and office; PISHGAM conforms with all necessary standards for work environment; creating a suitable area for business.

Benefiting from highly qualified technical and engineering team and holding

production license from ministry of mines, industry and commerce, is now serving as a reliable reference in field of globe valves used in oil and gas industry.

PISHGAM is the first company in Iran who has achieved design and production of all fully welded Ball valves which are currently produced in sized from 2 inches to 36 inches and in 150, 300 and 600 classes.

2-piece and 3-piece Ball valves sized from ½ inches to 36 inches in 150, 300 and 600 classes as well as valves required in 900, 1500 and 2500 pressures are amongst other products of this company.

Our major clients include National Iranian Oil Company, National Iranian Gas Company, National Iranian Petrochemical Company, National Iranian Oil Production and Distribution Company and affiliates such as Oil Supplies Company, Pars Oil and Gas Company, Iranian Gas Engineering and Development Company as well as Petrochemical Kala Company.

می باشد وتمامی واحدهای سازمان تحت نظارت واحد تضمین کیفیت مشغول فعالیت می باشد.
شرکت پیشگام با بهره گیری از نزدیک به ۴۰۰۰ متر فضای کارگاهی ، اداری و انبار در تمام بخشها استانداردهای لازم را در محیط کار رعایت نموده و فضاهای متناسب با نیاز کسب و کار را ایجاد نموده است .

شرکت پیشگام با بهره گیری ازتیم فنی و مهندسی قوی علاوه بر دارا بودن پروانه بهره برداری درتولید شیرآلات از وزارت صنعت ومعدن وتجارت، مجوز تأسیس واحد تحقیق و توسعه را اخذ نموده است و به عنوان یک مرجع در حوزه شیرآلات توپی کاربردی در صنعت نفت، گاز و پتروشیمی در ایران مطرح می باشد .

شرکت پیشگام اولین شرکت در بین تولید کنندگان شیرهای توپی در ایران می باشد که موفق به طراحی و ساخت شیرهای تمام جوشی در ایران گردید و امروز این شیرها از سایز ۲اینچ الی ۳۶ اینچ در کلاسهای ۱۵۰ ، ۳۰۰ و ۶۰۰ تولید می شوند .

ازدیگرتولیدات شرکت می توان به شیرهای توپی دو یا سه تکه از سایز $\frac{1}{2}$ اینچ الی ۳۶ اینچ در کلاس های ۱۵۰ ،۳۰۰ و ۶۰۰ وهمچنین شیرهای مورد نیاز در فشارهای ۹۰۰، ۱۵۰۰و ۲۵۰۰ اشاره کرد.

از مشتریان اصلی ما می توان به شرکت های ملی گاز،ملی نفت ، ملی پتروشیمی ، ملی پالایش وپخش فرآورده های نفتی وکلیه شرکت های تابعه ایشان همچون شرکت کالای نفت ، شرکت نفت وگاز پارس ، شرکت مهندسی وتوسعه گاز وکالای پتروشیمی اشاره نمود.


MOODY INTERNATIONAL

Certificate Of Registration

PISHGAM
Industrial Equipment Designers Co.

ISO/TS 29001:2007


Certificate of Registration

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Certificate of Registration

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معرفی شرکت

شرکت طراحان تجهیزات صنعتی پیشگام که در این کاتالوگ به نام «پیشگام» شناخته می شود، یک شرکت سهامی خاص است که در رأس آن هیئت مدیره قرار دارد . اعضاء هیئت مدیره از فارغ التحصیلان دانشگاههای معتبر ایران با مدارک عالی می باشند و رهبری شرکت را به عهده دارند.

مدیران اجرایی شرکت از بین بهترین افراد تحصیل کرده با مدارک علمی معتبر که دارای تجربه و تخصص در رشته مرتبط با فعالیت خود هستند انتخاب و به خدمت گرفته شده اند.

این شرکت در فعالیتهای تخصصی خود از پرسنل مجرب و کارآزموده که آموزشهای لازم را برای انجام فعالیتهای خود گذرانده اند ، بهره گرفته است . وبا تمرکزبرطراحی وتولید تجهیزات مورد نیاز صنایع نفت وگاز وپتروشیمی کشوراز طریق همکاری با شرکت های برتر خارجی وانتقال هوشمندانه دانش فنی از سال ۱۳۸۱ فعالیت خود را شروع کرده است.

شرکت پیشگام در تولید محصول با کیفیت عالی که در انطباق با استانداردهای ملی وبین المللی باشداصرارمی ورزد و برای تولید یک محصول با کیفیت بر اساس مستندات تدوین شده ، کلیه فرآیندهای تأمین ، تولید وتست را تحت نظر واحد کنترل کیفیت انجام میدهد . واحدکنترل کیفیت با بهره گیری از ابزارهای لازم و دقیق که در اختیار دارد کلیه فرآیندهای تولید محصول را زیر نظر دارد واقدام به ثبت اطلاعات طبق رویه های شناسایی قطعات می نماید. بهره مندی از شهرت خوب در عرصه صنعت نفت وگاز وپتروشیمی به سبب التزام شرکت در بکارگیری استانداردهای کیفیت می باشد.

شرکت پیشگام با پیاده سازی نظام مدیریت کیفیت ، کلیه فرآیندهای سازمانی و گردش اطلاعات خود را تدوین ودر تمام لایه های سازمان پیاده سازی کرده است . بهبود فرآیندها توسط همه واحدها امری ضروری


Certificate of Registration

MOODY


Certificate of Registration

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PISHGAM
Industrial Equipment Designers Co.

ISO 9001:2008


MOODY INTERNATIONAL

Certificate of Capability

PISHGAM
Industrial Equipment Designers Co.

"Manufacturer to API Standard Q1 and Specification 6D"

Company Overview

Engineering Expertise

The PISHGAM's expertise in ball valve engineering covers most of the processes in oil, gas and petrochemical industries. Extensive experience gained over the past years from the design, development, and manufacture of custom-engineered solutions serves as the basis for mastering new challenges.

The wide range of products proven in practice can be customized in close cooperation with the customer to provide a commercially acceptable solution to meet the requirements of even the most complex applications.

Quality Assurance Programme

The PISHGAM is sincerely committed to supplying Quality Assured products throughout the petrochemical and process industries. The fine reputation and position in the industry enjoyed by this company is wholly attributed to a rigid adherence to all aspects of Quality Control and Assurance.

It is the intent of PISHGAM to provide our customers with products of genuine quality. These products will be manufactured in strict compliance with all Code requirements and standards of quality and all customer specifications which are accepted by PISHGAM as a part of the customer Purchase Order.

Effective Logistics

In order to remain a valve manufacturer even under the changing conditions The PISHGAM has built a logistics system to ensure that the company is able to react quickly, flexibly, and in line with demand on a long-term basis. This logistics system increases the availability of PISHGAM products.

The purchase of raw materials, semi-finished parts, and services for use in our product will be in accordance with Material Specifications. In addition, foresighted production of components and peripheral devices as well as the quick final assembly according to customer specifications take place on short routes under the watchful eye of an ISO 9001-2008 certified quality assurance system and API specification Q1.

Advanced Manufacturing

The PISHGAM is using a combination of technologies, processes and education to produce ball valves. The production system employs numerical control automatic and semi-automatic machines. Both using these machines and qualified technicians PISHGAM continuously strives to reach the excellent of the quality in its products both for the technical characteristics and the reliability in their use. The entire manufacturing process follows procedures as laid down in the Company Quality Assurance Manual.

Well- Equipped Testing

Production testing is necessary to ensure that the product being shipped to the customer will offer the rated performance and meet the requirements of various regulator codes.
The PISHGAM . conducts his own test and inspection of the assembled ball valve in the presence of the customer's inspector. The first step is a hydrostatic shell test of production ball valves. Valves are closed off and the ball placed in partially open position during the test.
The second production qualification is a hydrostatic seat of production ball valves.
This gives a qualification of 1.1 times the pressure rating of body at 100°F.
The optional production qualification is a bi-directional 80 psi air test in which the valve is submerged in air and pressurized. This qualifies the seat and the stem seal, for zero bubble leaks. Fire testing of PISHGAM ball valve is according to the API 6FA.

Superior Service

The PISHGAM provides a superior product with superior service at competitive pricing. PISHGAM's sales force provides professional service to each customer and will discuss individual applications to provide the proper valve solution. After the sale, PISHGAM continues to add value for our customers. PISHGAM offers 24-hour emergency service as well as commissioning assistance to ensure valve integrity during installation and testing.

Applicable Standards

Ball valve standards are design to ensure interchangeability and reasonable functioning of the valve. The adaption of standards guarantees not only the performance of the product but also the continuity of supply, conformance to quality norms, and the incorporation of all product improvements.

PISHGAM ball valves conform to the latest edition of the following standard specifications as to face–to–face dimensions, pressure ratings, materials of construction, design dimensions for some valve components to ensure adequate strength and procedures for the testing of ball valves.

American Petroleum Institute	API-6D	Specification for pipeline valve
	API-6FA	Fire test for valve
	API-598	Valve inspection and testing
	API-608	Metal ball valve – flanged, threaded and welding end
American Society of Mechanical Engineers	ASME- B 16.5	Pipe flanges and flanged fittings
	ASME- B 16.25	Butt welding ends
	ASME- B 16.10	Face–to–face and end–to–end dimension of valve
	ASME- B 16.34	Valve–flanged, threaded and welding end
	ASME- Section VIII, div.1	Rules for construction of pressure vessels
	ASME- Section VIII, div.2	Alternative rules for construction of pressure vessels
	ASME- Section V	Nondestructive Examination
British Standards Institution	BSI-BS 4504	Circular flanges for pipes, valve and fittings
	BSI-BS 5146	Inspection and test of valves
	BSI-BS 5351	Specification for steel ball valves
	BSI-BS EN 558	Industrial valves
Iranian Gas Standards	IGS-M–PL–010–1	Ball valves, class 150
	IGS-M–PL–010–2	Ball valves, class 300
	IGS-M–PL–010–3	Ball valves, class 600
	IGS-M–PL–007	Valve actuator, gas–over–oil type
	IGS-M-PL-009	Hand wheel Operated Gear Box For Ball , Plug and Batterfly Valves
Manufacturers Standardization Society	MSS-SP-6	.Standard finishes for contact face of pipe flanges
	MSS-SP-55	Quality standard for steel casting for valves, flanges and fitting s and other piping components.
National Association of Corrosion Engineers	NACE-MR 0175	Sulfide Stress Cracking Resistant Metallic Material for Oilfield Equipment
International Organization for Standardization	ISO-14313	Petroleum and natural gas industries-pipeline transportation systems-pipeline valves
	ISO-5208	Industrial valves-pressure testing of valves
	ISO-5211	Industrial valves-part turn actuator attachment
	ISO-7121	Flanged steel ball valve

Trunnion – Mounted Ball Valve												
Size		ASME Class			End Connection			Bore		Operating Device		
NPS	DN	150	300	600	Flanged RF	Butt Welding	Flanged RTJ	Full	Reduced	Wrench	Gearbox	Actuator
2"	50	√	√	√	√	√	√	√	√	√	-	√
3"	80	√	√	√	√	√	√	√	√	√	-	√
4"	100	√	√	√	√	√	√	√	√	√	-	√
6"	150	√	√	√	√	√	√	√	√	-	√*	√
8"	200	√	√	√	√	√	√	√	√	-	√	√
10"	250	√	√	√	√	√	√	√	√	-	√	√
12"	300	√	√	√	√	√	√	√	√	-	√	√
14"	350	√	√	√	√	√	√	√	√	-	√	√
16"	400	√	√	√	√	√	√	√	√	-	√	√
18"	450	√	√	√	√	√	√	√	√	-	√	√
20"	500	√	√	√	√	√	√	√	√	-	√	√
22"	550	√	√	√	√	√	√	√	√	-	√	√
24"	600	√	√	√	√	√	√	√	√	-	√	√
26"	650	√	√	√	√	√	√	√	√	-	√	√
28"	700	√	√	√	√	√	√	√	√	-	√	√
30"	750	√	√	√	√	√	√	√	√	-	√	√
32"	800	√	√	√	√	√	√	√	√	-	√	√
34"	850	√	√	√	√	√	√	√	√	-	√	√
36"	900	√	√	√	√	√	√	√	√	-	√	√

* ASME Class 600

Design Features

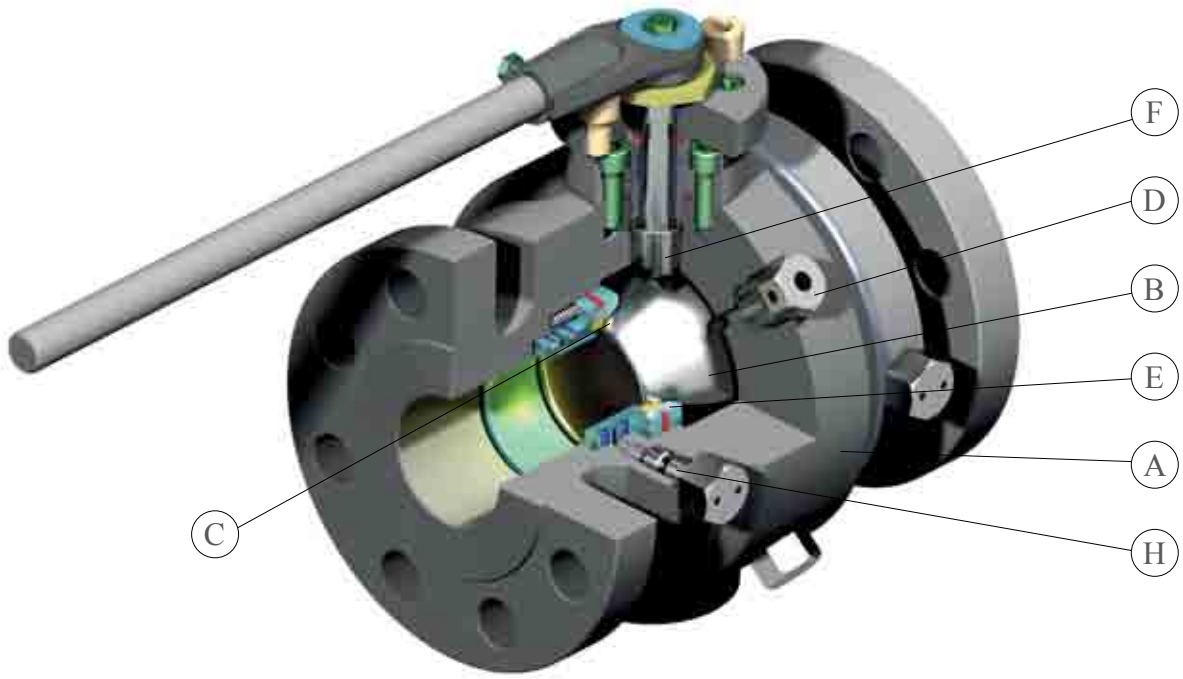
Type: PBT-21A

2-Piece body

Side entry design

Size: { 2″ , 3″ , 4″ , 6″
2″x1$\frac{1}{2}$, 3″x2″, 4″x3″, 6″x4″

ASME Class: 150, 300, 600



A	Valve Body
B	Smooth electroless nickel plated ball for bubble tight sealing and low operating torque
C	Standard insert materials include reinforced PTFE
D	Vent valve for block and bleed function and seat integrity verification
E	Secondary metal to metal Sealing accomplishes fire safe requirements
F	Blow - out proof stem
G	Anti - static device (not shown)
H	Seat injection fitting with internal check valve for emergency sealing

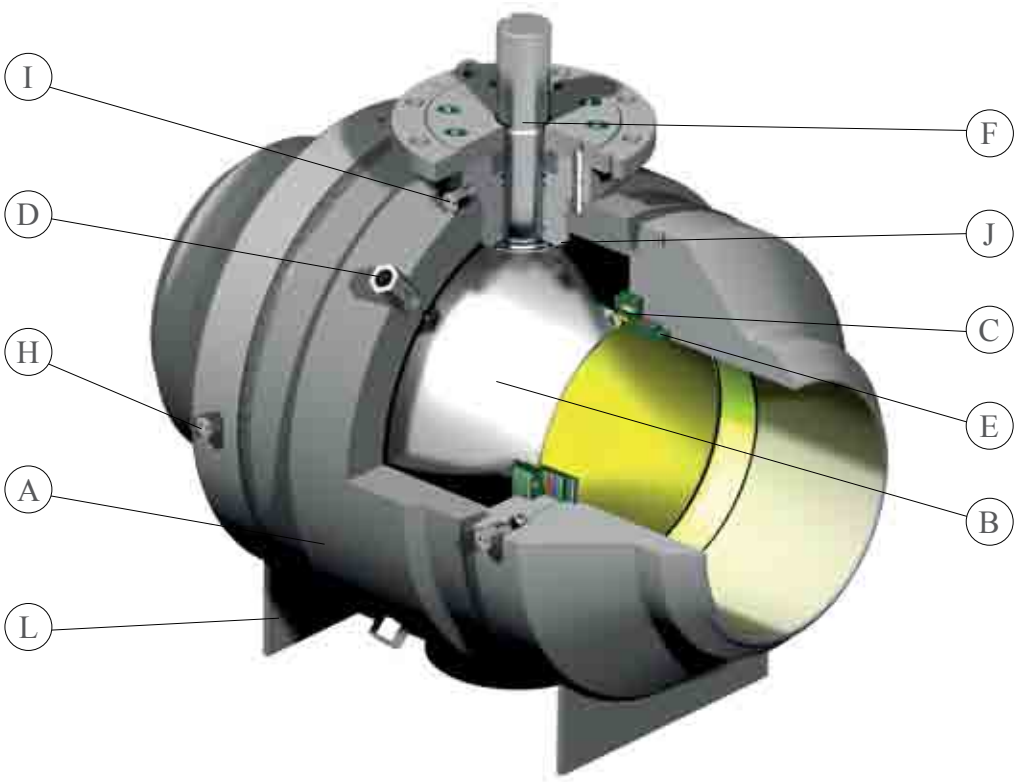
Type: PBT-31A

3-Piece body

Side entry design

Sizes: 6″ , 8″ , 10″ , 12″ , 14″ , 16″
8″x6″, 10″x8″, 12″x10″, 14″x10″ , 14″x12″ , 16″x12″ , 16″x14″ , 18″x16″ , 20″x16″

ASME Class: 150, 300, 600

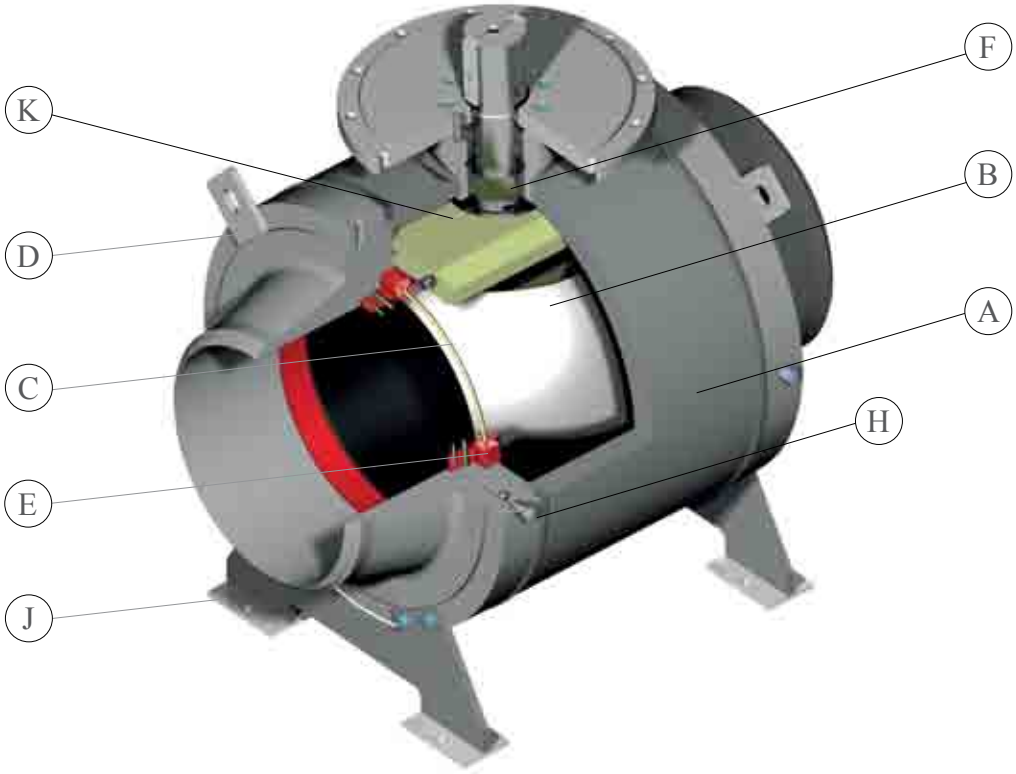


A	Valve Body
B	Smooth electroless nickel plated ball for bubble tight sealing and low operating torque
C	Standard insert materials include reinforced PTFE
D	Vent valve for block and bleed function and seat integrity verification
E	Secondary metal to metal Sealing accomplishes fire safe requirements
F	Blow - out proof stem
G	Anti - static device (not shown)
H	Seat injection fitting with internal check valve for emergency sealing
I	Stem injection fitting for secondary sealing
J	Self - lubrication steel trunnion bearing for smooth operation
K	Lifting lugs (on 8” and larger) (not shown)
L	Support lugs (on 8” and larger)

Design Features

Type: PBT-32A

3-Piece body
Side entry design
Sizes: { 20″ , 22″ , 24″ , 26″ , 28″ , 30″ , 32″ , 34″ , 36″
24″x20″, 30″x24″, 36″x30″
ASME Class: 150, 300, 600



A	Valve Body
B	Smooth electroless nickel plated ball for bubble tight sealing and low operating torque
C	Standard insert materials include reinforced PTFE
D	Lifting lugs (on 8” and larger)
E	Secondary metal to metal Sealing accomplishes fire safe requirements
F	Blow - out proof stem
G	Anti - static device (not shown)
H	Seat injection fitting with internal check valve for emergency sealing
I	Stem injection fitting for secondary sealing (not shown)
J	Support lugs (on 8” and larger)
K	Beaning Retainer

General

PISHGAM ball valves are quarter–turn, straight–through flow valves that use a spherical ball as the opening (or closing) mechanism to control fluid flow.

The ball is rotated 90 degrees from full open to full close; therefore, it is well-suited for applications which require quick or frequent opening and closing. The ball seals by fitting tightly against resilient seats located on each side of the ball.

PISHGAM ball valves are generally selected for on-off service and are in sizes 36 inches or less.

PISHGAM ball valves are available in full and reduced port sizes. Full port has the same opening size as the connecting pipe.Thus, PISHGAM ball valves have very low fluid resistance and consequently very high C.V. values.

PISHGAM ball valves can be used as an isolating valve that is fitted to systems for a variety of reasons. Equipment which is supported by installed standbys will have ball valves to permit maintenance and inspection without shutting down the process and loss of production.

Long instrument impulse lines may be fitted with primary ball valves so that in the unlikely event of pipe failure the fluid source can be sealed to prevent further loss of product. Ball valves are also often fitted at the blank end of lines of manifolds to allow future connection of additional equipment without shutting down operating processes.

PISHGAM ball valves commonly selected for a number of applications, including:

- Gas transmission
- Gas separation systems
- Compressor stations
- Products pipeline
- Natural gas storage
- Dryer Service
- NGL plants and pipelines

Some service conditions require the valve housings to be of welded construction, as well as being welded into the piping system.

A typical service condition requiring such structure is when the valve is controlling the flow of high pressure steam. PISHGAM all welded ball valve housing includes a valve body containing the valve chamber and closures welded to the opposite ends of the valve body.

Principal Features

Body Construction

All welded body design which reduces the number of potential leak paths and is fully compliant with ISO 14313/API 6D, is produced recently by PISHGAM for a high integrity application.

The design assumes its “high-integrity” qualifications come from the fact that body is welded and has no seals to leak. The compact shape of the body allows for the easy absorption of bending loads coming from the pipeline and its all welded construction has fewer leak paths than spilt body ball valves.PISHGAM welded body fabricated ball valve has a cylindrical central body section made from performed tubes of steel or wrought metal. The body is made from two or three forged parts in accordance with ASTM A105 or ASTM A350 - LF2. Forged steel bodies have been proposed for improving the strength to weight ratio.

Ball valves can be produced with two–piece or three–piece bodies in accordance with the pressure and temperature requirements and severity of the application.

The three–piece body construction is very versatile and allows many variations in detail design. The basic design concept of ball valves with three–piece bodies is a ball mounted in a central portion, with two identical end connectors clamping the seats in position. The highest pressure ratings required can be accommodated using this construction. Three–piece bodies up to 36 inches are available for ASME class 600 pressure rating in accordance with ASTM A105 or ASTM A350 - LF2. Process connections can be flanged directly to studded machined facings. For high integrity pip line duties, where the valve is permanently installed, the process connection can be butt weld. Heating, during welding, can create distortion problems for precision components. To avoid this problem, the contractor welds a short section of pipe to the valve body prior to final machining.

Principal Features

Ball Configuration

PISHGAM ball valves offer a precision machined solid carbon steel or stainless steel ball that is mirror finished for bubble–tight shut–off and reduced operating torque. The critical ball edge has beveled curvatures to reduce seat wear and provide a high cycle life.

The ball arrangement involves a trunnion mounted ball in which the ball is fixed at two pivot points, and the process pressure pushes the upstream seat against the ball sealing surface. These types of valves have spring–loaded or elastically–mounted seats to ensure good sealing contact. At the trunnion mounted ball valve lower torque figures are obtained. These can be as low as one half to two thirds of the torque figures for conventional floating ball valve.

PISHGAM trunnion mounted ball valves have an exclusive triple–sealing seat system to give you years of bubble–tight, trouble–free service. A distinguishing characteristic of this design is its provision for metal–to–metal sealing contact between the seat and ball, with an elastomeric insert, as an added feature, to enhance the bubble–tightness to the seal. And both of these are backed–up by a fully contained sealant injection system that provides a renewable seal if there is damage to the other elements.Trunnion–mounted ball valves allows upstream sealing of the valve, so that block and bleed operations can be carried out, it also means the forces exerted against the ball by pipe line pressure are absorbed through trunnion and body, rather than the sealing elements and assures dependable, predictable operating torque.

Stem Design

From a valve mechanical design view point the stem should have a large diameter to be able to:

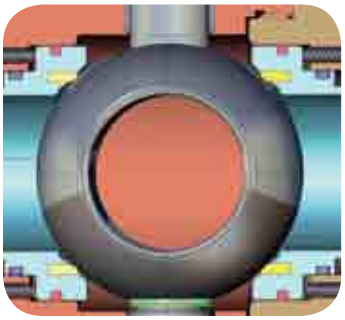
- resists bending forces
- has low stresses due to actuating forces/ torques
- has a very high natural frequency

From a valve sealing view point the stem should be as small as possible to:

- reduce the area of potential leak paths
- utilize the smallest seal site
- saves material around the packing box

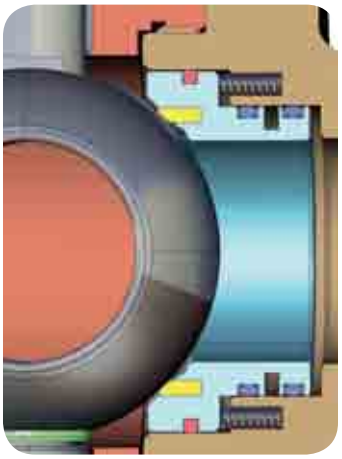
The two sets of objectives are in direct conflict and the final design is a compromise to achieve satisfactory performance at a market price level. All the stem designs are blow-out proof to replace packing and o-ring easily while the valve is in service and under line pressure with body bleed open. The adaptor flange of ball valve with anti blow-out stem is removed to facilitate upper packing change. The gland flange is independent and remains secured to the body. The bottom diameter of the stem is larger than the bore of the gland flange and therefore will prevent the stem from blowing out. Friction is reduced by means of stem bearing washers, which also provide back up to the stem seal. The polymeric seats and packing used in ball valve can electrically insulate the ball and the stem from the valve body. Anti–static devices earth the ball to the stem and the stem to the body thus eliminating the risk of electrostatic sparks. PISHGAM ball valves are provided with an anti–static device which achieves electrical continuity between the ball, stem and the valve body.

Principal Features



Double Block and Bleed (DBB)

The ball and the seats meet the requirements for DBB design, which means that the ball valve has two seats (double block) – an upstream seat and a downstream seat.
The inner space between the ball and the body cavity can be vented (bleed) by means of a venting valve (or plug).
In this way it is possible to check the closure tightness in CLOSED position or in OPEN position.



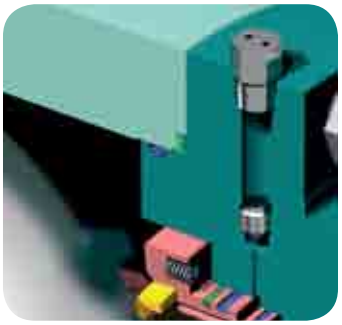
Seat Design

bubble-tight sealing

In PISHGAM Floating Ball Valves bubble-tight sealing is achieved by the use of two rigid seats firmly secured in the valve body on either side of the ball. Media flow is cut off on the downstream side by upstream pressure pushing against the ball.

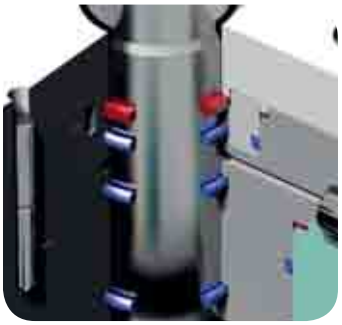
Seat design (PMSS)

Two independent floating seat rings ensure the required bidirectional tightness of the valve. The seat rings are spring loaded to achieve the required tightness even at very low pressure.On soft seated ball valves a resilient seat seal is inserted into the seat ring to provide a secondary soft seating in addition to the primary metal to metal seating between the ball and the seat.The sealing between the seat and the closures is achieved by the means of O-rings and graphite gaskets.



Emergency Sealant Injection - Seat

The design and the built-in quality of PISHGAAM Trunnion Mounted Ball Valves do not require the use of sealant injection to grant the perfect tightness and therefore the provision for emergency grease injection in the seat sealing area is considered as an option available for sizes 2″ up to 4″ on customer requests and a standard feature for other trunnion mounted valves.
These systems are made available for the sole purpose of providing a temporary seal to a damaged area.



Replace Stem Seal

The stem seal is achieved by the use of two O-rings and a graphite gasket retained by the gland plate. Valve sizes 4″ and larger have a provision for an emergency sealant injection facility between the upper O-ring and the graphite gasket. The graphite gasket can be replaced with the valve in line and the ball in any position by removing the gland plate, after having released through the grease injection fitting hole, the possible pressure existing in the space between the upper O-ring and the graphite gasket.
The stem seals can be replaced with the valve in line, providing that the ball is in the fully closed or fully open position and the pressure in the body cavity has been completely released.

Part Materials

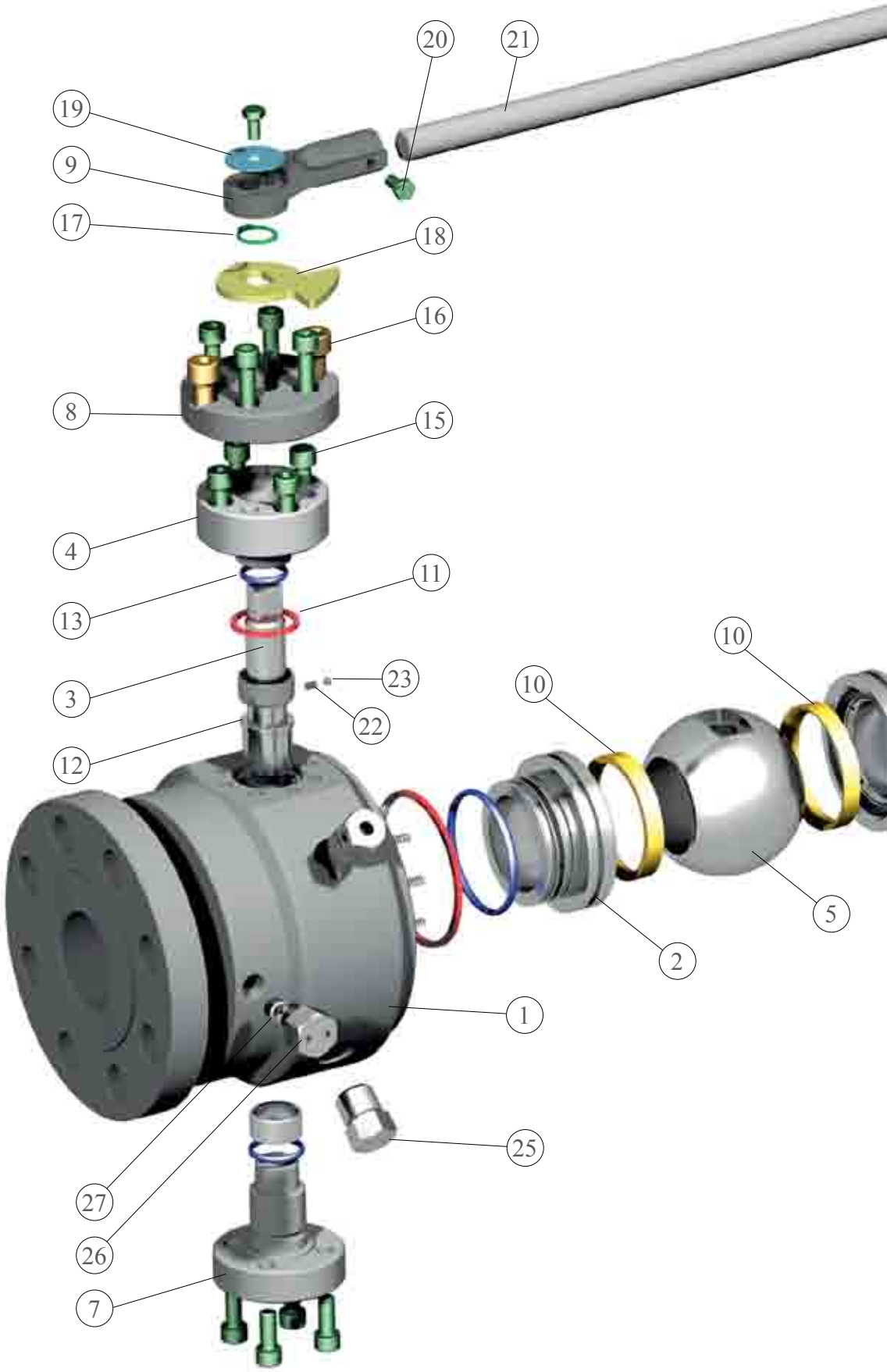
The PISHGAM produce Trunnion ball valves using a full range of carbon, alloy and stainless steel materials.
All the materials are supplied by the best available steel mills, forged by well experienced forgeries with the most up to data equipment and can be certified in the chemical composition and the mechanical characteristic.

Parts	Carbon Steel	Low Temp. Steel	Sour Service NACE MR-01-75	Stainless Steel
Body and Closure	ASTM A105 ASTM A216 Gr-WCB	ASTM A350-LCB ASTM A350 Gr LF2	ASTM A105 ASTM A216-WCB ASTM A350 LF2	ASTM A182-F316 ASTM A351-CF8M
Ball	ASTM A105	ASTM A350 LF2 ASTM A182-F316	A564 Gr630 ASTM A350LF2 ASTM A105	ASTM A350-LF2
Seat Seals	PTFE RPTFE DEVLON VITON	PTFE RPTFE DEVLON VITON	PTFE RPTFE DEVLON VITON	PTFE RPTFE DEVLON VITON
Stem	ASTM A184-F304 ASTM A105 AISI 4140	ASTM A184-F304 ASTM A350 LF2-M ASTM A182 F316 AISI 4140	ASTM A350 LF2 ASTM A564 Gr630 ASTM A182-F6a	ASTM A184-F304 ASTM A184-F316
Body Nuts	ASTM A194-2H	ASTM A194 -7M	ASTM A194-2HM	ASTM A194 -8
Stud Bolts	ASTM A193-B7	ASTM A320-17M	ASTM A193-B7M	ASTM A193-B8
Body Gasket	316SS+ Graphite	316SS+ Graphite	316SS+ Graphite	316SS+ Graphite
Packing	PTFE Graphite	PTFE Graphite	PTFE Graphite	PTFE Graphite

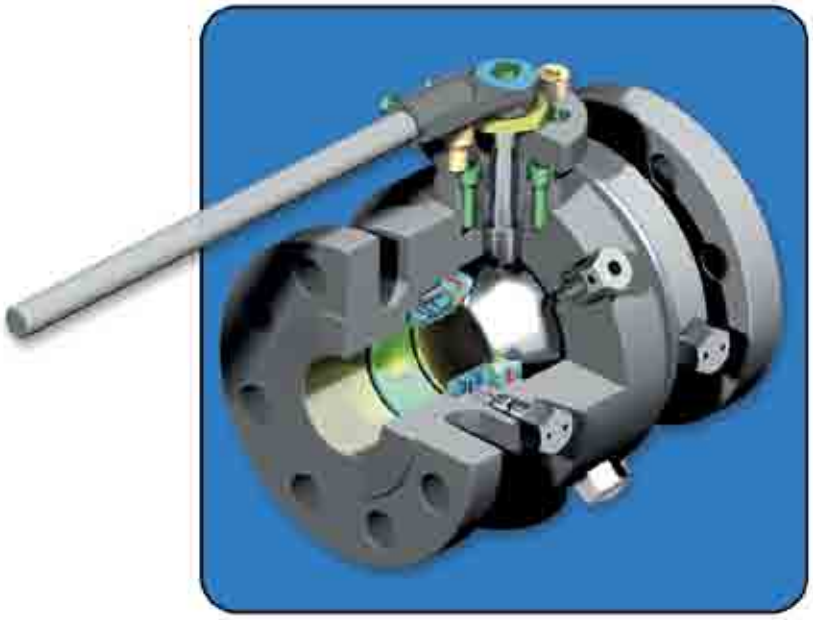
NACE Construction Valves for Sour Gas Applications

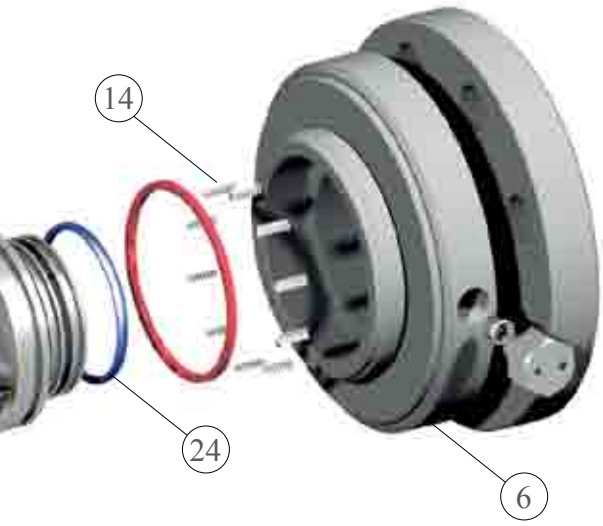
NACE, the National Association of Corrosion Engineers, has published a report outlining acceptable materials for valves for sour service. The current outline is Publication MR0175-2009, and is a guide to the manufacturers and users of valves based on the latest metallurgical knowledge. The basic problem is that whenever even a small amount of hydrogen sulfide (H2S) is encountered in natural gas or under oil pressure, a corrosion phenomenon may occur, known as hydrogen sulfide embrittlement or sulfide stress cracking. Actually, the steel part is absorbing hydrogen. This causes ductility, and when other stresses are added, may result in failure of the part.
The PISHGAM Ball Valves can be supplied in conformance to standards enumerated in the NACE governing documentation sour gas application. In some cases, a more sophisticated construction may be required because of other corrosive elements in the flow stream. All major components are heat-treated to a controlled hardness of 22 or lower on the Rockwell C scale.

Parts List



Type: PBT-21A

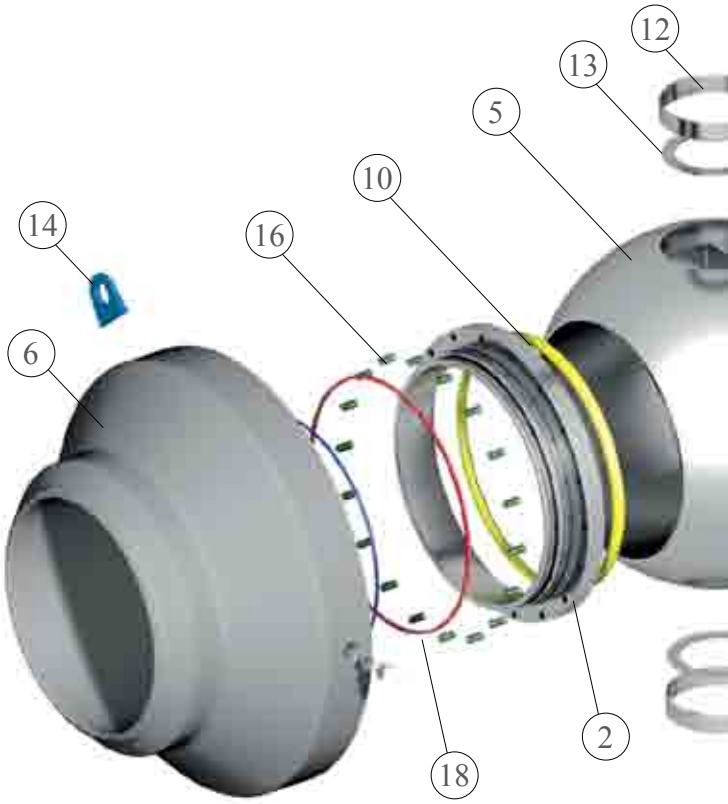




NO.	Part Name
01	Body
02	Seat Holder
03	Stem
04	Gland Flange
05	Ball
06	Closure
07	Trunnion
08	Adaptor Flange
09	Wrench
10	Seat Insert
11	Stem Packing
12	Stem Bearing
13	Stem O-Ring
14	Seat Spring
15	Gland Flange Screw
16	Adaptor Flange Screw
17	Circlip
18	Stop Plate
19	Indicator Washer
20	Wrench Set Screw
21	Wrench Pipe
22	Antistatic Spring
23	Antistatic Ball
24	Seat O-Ring
25	Vent
26	Ball Sealant Injection
27	Check Valve

Parts List

NO.	Part Name
01	Body
02	Seat Holder
03	Stem
04	Gland Flange
05	Ball
06	Closure
07	Trunnion
08	Adaptor Flange
09	Retaining Ring
10	Seat Insert
11	Packing
12	Bush
13	Washer
14	Lifting Lug
15	Support Lug
16	Seat Spring
17	Gasket
18	O-Ring
19	Parallel Pin
20	Parallel Key
21	Vent
22	Gland Flang Screw
23	Adaptor Flang Screw



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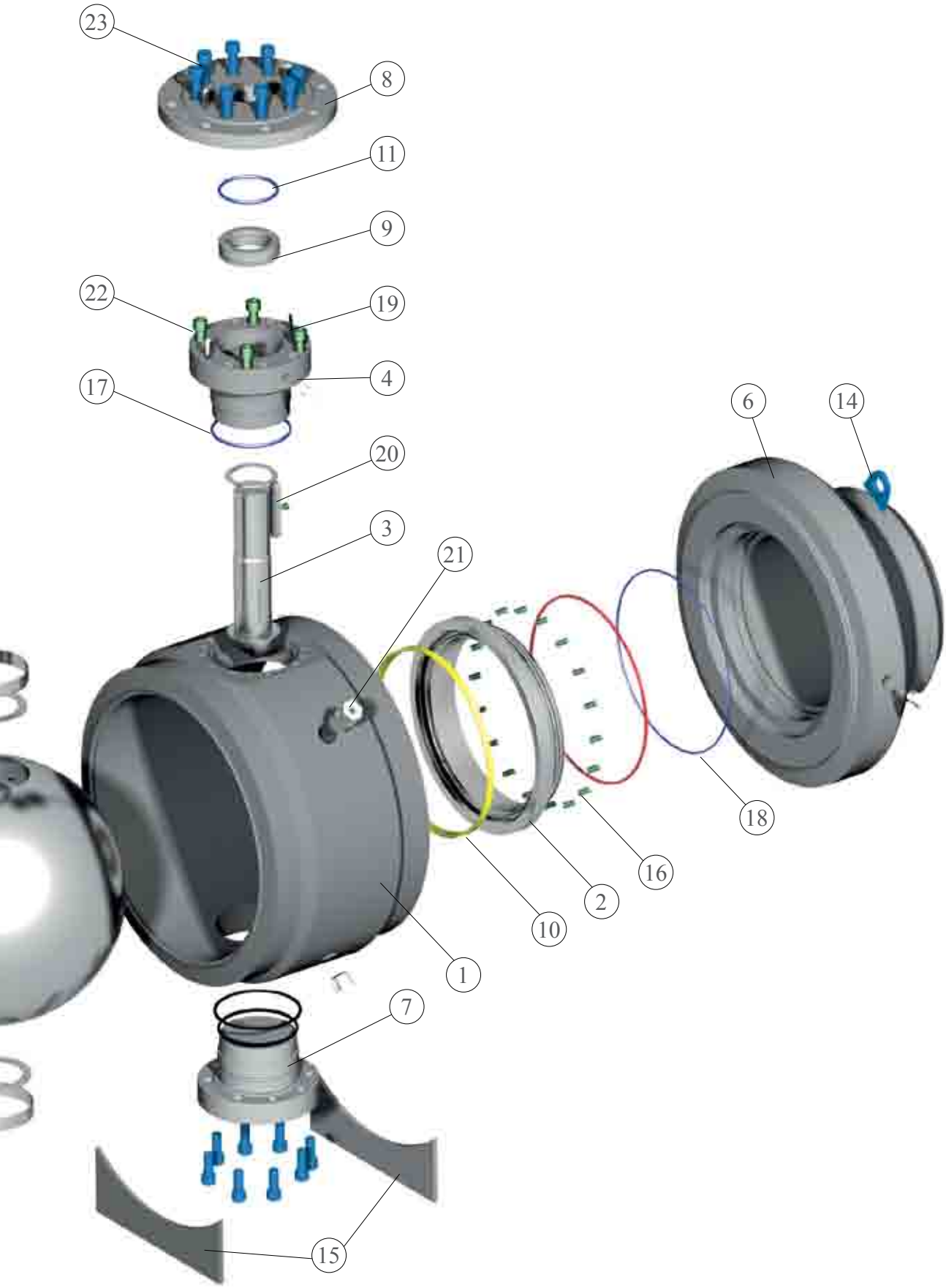
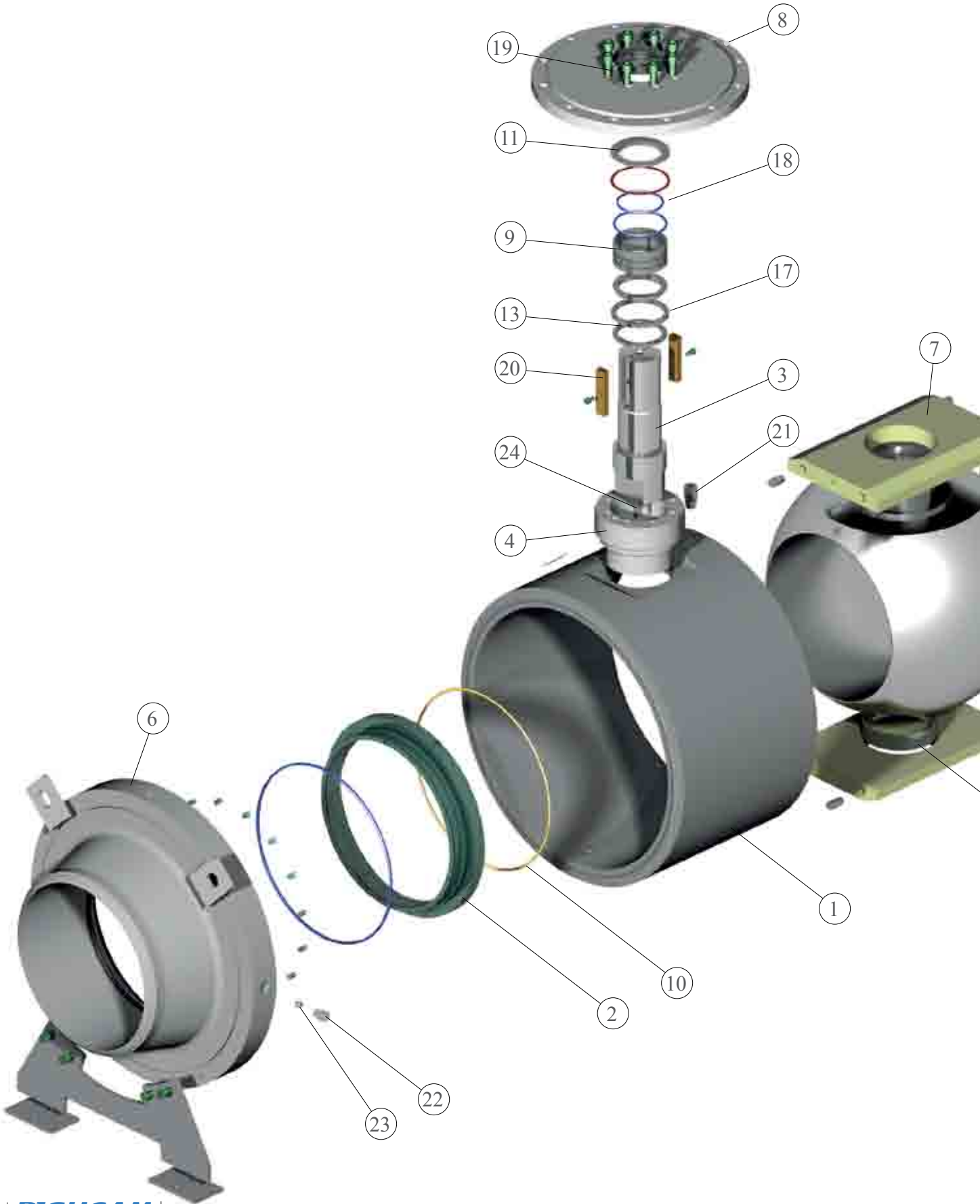
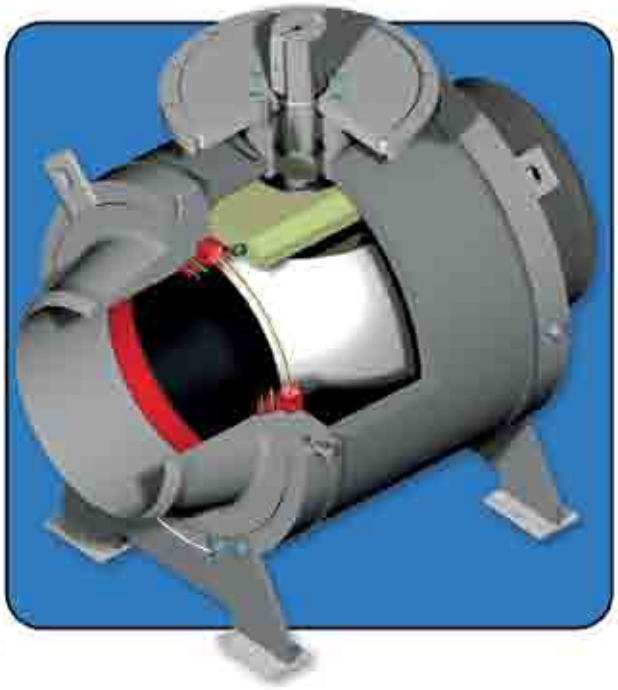
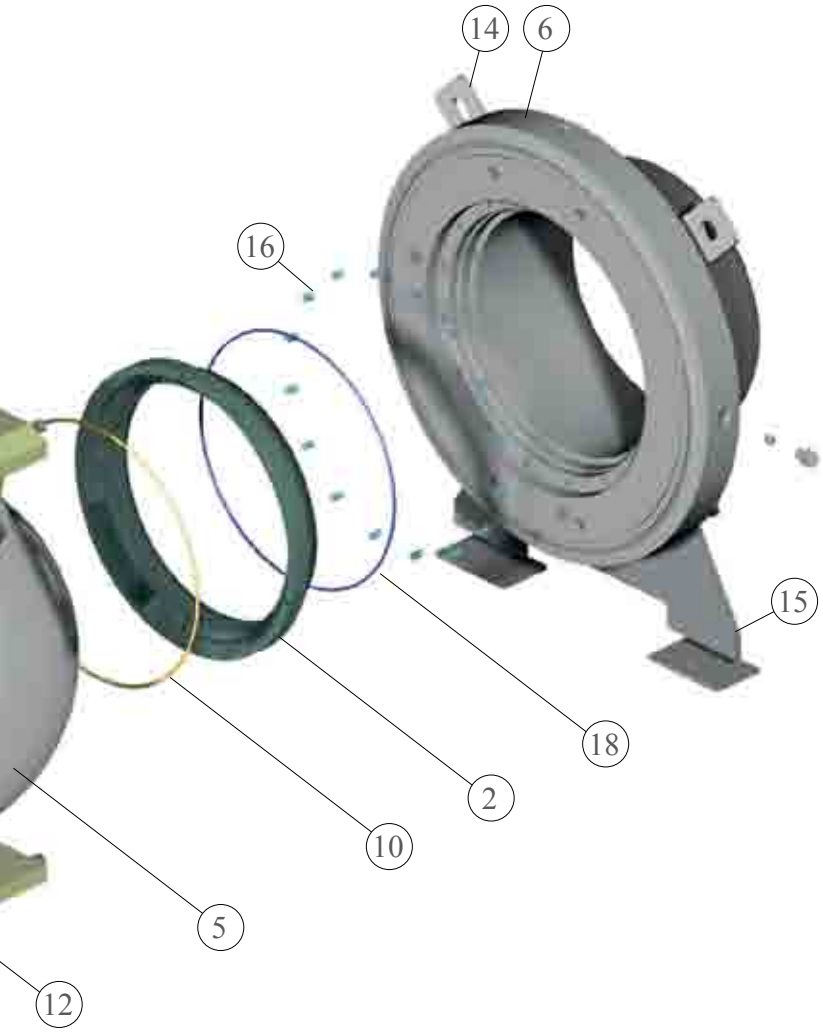


Parts List



Type: PBT-32A





NO.	Part Name
01	Body
02	Seat Holder
03	Stem
04	Gland Flange
05	Ball
06	Closure
07	Bearing Retouner
08	Adaptor Flange
09	Retaining Ring
10	Seat Insert
11	Packing
12	Bush
13	Washer
14	Lifting Lug
15	Support Lug
16	Seat Spring
17	Gasket
18	O-Ring
19	Parallel Pin
20	Parallel Key
21	Vent
22	Ball Sealant Injector
23	Check Valve
24	Antistatic Spring

Design Qualifications

Design of ball valve is based on flow passage sizing and material selection. Generally, flow passage sizing is based on the standard thermodynamic laws of fluid flow. The application of these laws is affected by the particular function of the valve plus the type and severity of the service. With ball valves, the valve is expected to pass full flow. If the valve's internal flow passage is sized smaller then the up stream piping, flow will be restricted from that point forward. This will cause the valve to take a pressure drop and pass less flow, defeating the major purpose of the ball valve. On the other hand, the choice of material is usually based upon requirements for pressure, temperature, resistance to corrosion, abrasion and method of manufacture.

Some fluids necessitate the use of special, costly materials or materials which pose manufacturing difficulties in order to prevent sever corrosion damage to the valve. To minimize

material costs and optimize the valve design for the thermal/mechanical loadings, the design by analysis approach was taken. It is possible to compute the stresses and deflections for various shaft diameters, body thickness, and various disk shapes over the pressure range of the product. The mathematical model can be used to develop a family of curves that can later be verified through actual laboratory testing to compare the computer models performance to actual stress valve from the instrumented valve. Matrix methods of structural

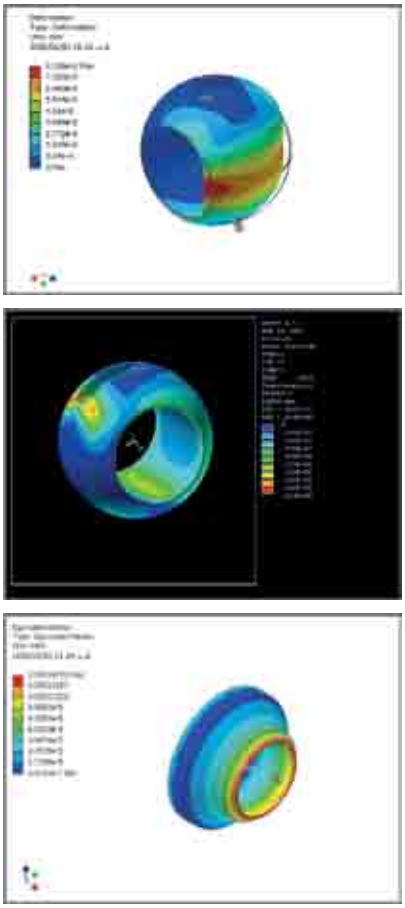
analysis based on the discipline of finite element techniques are

becoming increasingly popular as an important tool for the design/analysis of valves and valve components to specified stress and

deformation limits. The use of design by analysis gave detailed stress and deformation data that would not be available with standard design methods.

For correct ball valve sizing the following conditions are needed:

- the upstream pressure
- he maximum and minimum temperatures
- the type of process fluid
- the maximum and minimum flow rate
- pipeline size
- schedule and material



PISHGAM ball valve materials are examined to verify that the material in question is indeed the material specified by the customer.

Four examinations are used to verify a material and to test its integrity and ability to perform as required: visual, magnetic particle, radiography and ultrasonic. The visual examination involves looking closely at the part for any defects such as cracks, surface porosity etc.

The magnetic particle examination is a quick method to determine small cracks or porosity in the surface of the metal that cannot be seen with a visual examination.

Radiography is to an x-ray procedure and is used to check for any cracks or voids under the surface of the part. PISHGAM produces a certified material test report for body material, which traces the history of the metal back to its heat number and batch number from the foundry.

Production Procedure

The machining process in PISHGAM factory starts after material testing and ensuring the quality of parts. Depending on the required precision, each part is machined by a special engine lathe. The body and closure casting are set true to the original bore and turned to achieve the required precision that marked and specified in drawings.

Balls on PISHGAM ball valves are turned and polished to achieve a mirror–liked surface finish. Surface finishing of the ball reduced torque, leakage, friction and sealing damage. Thus the manufacture of the ball to precise degree of roundness guarantees low pressure shut–off and low consistent operating torque. The ball surface is coated with electroless nickel plated to increases anti–friction and anti–erosion property. In case the machined part requires more surface smoothness it must undergo a grinding process. Stem on PISHGAM ball valves are turned and coated with electroless nickel plated to achieve a surface finishing of 4 to 6.3 Rz and to increases anti-friction and anti–erosion property. Surface fishing of the stem reduced torque, friction and packing installed above the body.

PISHGAM all welded ball valves have a valve body containing the valve chamber and closures welded to the opposite ends of the valve body. Since the valve ball and the valve seats must be in place when the closures are welded to the opposite ends of the body appreciable difficulty has been encountered in preventing distortion or damage of the valve parts when the closures are welded to the valve body, as well as when the closures are later welded into a piping system. When resilient seals are employed, it is necessary that any welding which may be necessary after the seals are in place be done far enough from the seal so that the heat of welding does not melt or otherwise deteriorate the resilient seals. All welding processes for the body are suited to the materials of construction and are qualified and performed according to ASME Section IX.

Process Q.C. inspectors perform a full supervision on production processes through executing necessary checks and using error prevention factors, the results are precisely recorded for date analysis processes.

When all valve parts are completed, they are laid out for assembly and inspected. Parts then are cleaned and assembled in an assembly line. According to assembly procedure of floating ball valve, one seat is inserted down the bore of the body. The ball is turned by a separate stem which has a tongue to engage with a groove in the top of the ball. The stem with its thrust or sealing washer is fitted next followed by the ball. Enough space is left for a seat to fit into the body next to the ball. The closure can now be bolted up to hold all the internals in place. The packing rings can then be assembled. Packing rings are the sealing elements in stuffing box .They consist of a soft material which is stuffed into the stuffing box and compressed by the gland flange to form a seal around the valve stem.Because of the corrosive nature of service, PISHGAM ball valves are painted with corrosion–resistant coating on the exterior surface of the body.

Production testing

Production testing is necessary to ensure that the product being shipped to the customer will offer the rated performance and meet the requirements of various regulator codes. PISHGAM Co. conducts his own test and inspection of the assembled ball valve in the presence of the customer's inspector. The first step is a hydrostatic shell test of production ball valves. Valves are closed off and the ball placed in partially open position during the test. This gives a qualification of 1.5 times the pressure rating of the body at 100°F and located any defects that may occur during the casting of manufacturing of the ball valve.

The second production qualification is a hydrostatic seat of production ball valves. This gives a qualification of 1.1 times the pressure rating of body at 100°F. This test is performed by applying the pressure inside the assembled ball valve with the valve closed and any packing gland tight enough to maintain the test pressure, there by, except for bellows seal valves, testing the stuffing box.

The optional production qualification is a bi-directional 80 psi air test in which the valve is submerged in water and pressurized. This qualifies the seat and the stem seal, for zero bubble leaks.

Fire testing of PISHGAM ball valve is according to the API 6FA.

The basis of fire test is that a pressurized ball valve must operate after being burned at a specified high temperature for a specified period and leakage after burning (which will destroy soft seals) must remain within specified limits.

The broad object of a fire test is to establish acceptable levels of leakage after exposure to a fire for 30 minute, time period.

This allows the user to select a valve best suited for a particular service.

Operating Devices

With larger PISHGAM ball valve sizes, the torque required for seal break out becomes some what excessive. This is caused by the larger contact surface between the ball and sealing device as well as any adverse operating conditions, such as a high process pressure, temperature extreme, corrosion deposits, etc. In this case wrenches are typically replaced with gear boxes, which reduce the torque requirement significantly. To ensure quarter–turn motion with out over or under stroking the valve, a stop–collar arrangement is used.

The stop collar is designed to allow only a 90° travel of the wrench or handweel. Electric, pneumatic, gas–over–oil or hydraulic actuators can be fitted as required for on-off service or modulating control. The function of an actuator is to adjust the position of the ball valve to ensure correct control of the process fluid. The valve position shall be only “open” or “closed”, as in the case of ball valve. To operate effectively the actuator must be sufficiently powerful to produce a position, accurate and quick response to a control signal. In the event of signal failure the actuator may be required to return the valve to a predator mined position (fail safe or line break system) or to hold its current position. It is there fore important to specify the correct type and size of actuator in order to meet the demands of the process, reliability and economy.

There for the decision for actuating a valve will be made because of one or more of the following reasons:

- control of the process system
- inaccessibility or remote valve location
- emergency shutdown/ fail–safe requirements
- excessive valve operating torque
- safety

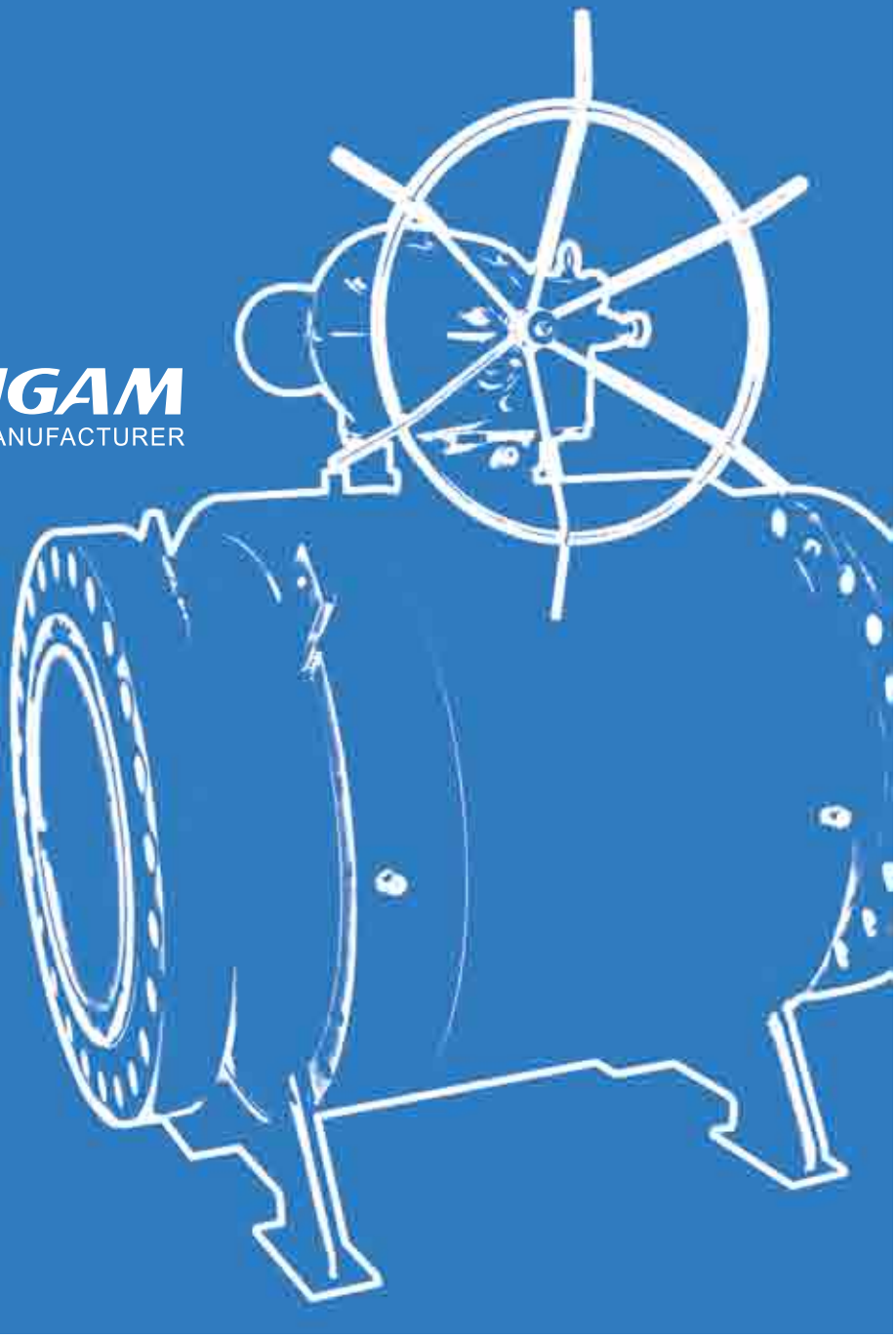
Gas–over–oil actuators are the most common type of actuator, because of their readily available power source, which is natural gas. The actuator is fed by pressurized gas which, after being filtered, flows through the control valves into the tank relevant to the operation to be performed. The hydraulic oil contained in the tank is pressurized by the gas and flows in to the relevant cylinder chamber, while the oil contained in the other chamber flows in to the second tank. The cylinder piston stroke causes the actuator operation. The oil flow from the cylinder in to the tanks is adjusted by means of two flow control valve. In this way it is possible to adjust the stroking of the actuator.

According to N.I.G.C specification for Gas–over–oil actuators, the following specification shall be considered:

- double acting type
- supplied with emergency hand pump, local push buttons, local position indicator, automatic line break system (if specified) and emergency power gas strong tank for a complete operations (one open one close stroke)
- provided with hydraulic torque limit switch where remote control is not required
- the pneumatic components shall be totally enclosed in a water proof enclosure

PISHGAM

BALL VALVE MANUFACTURER

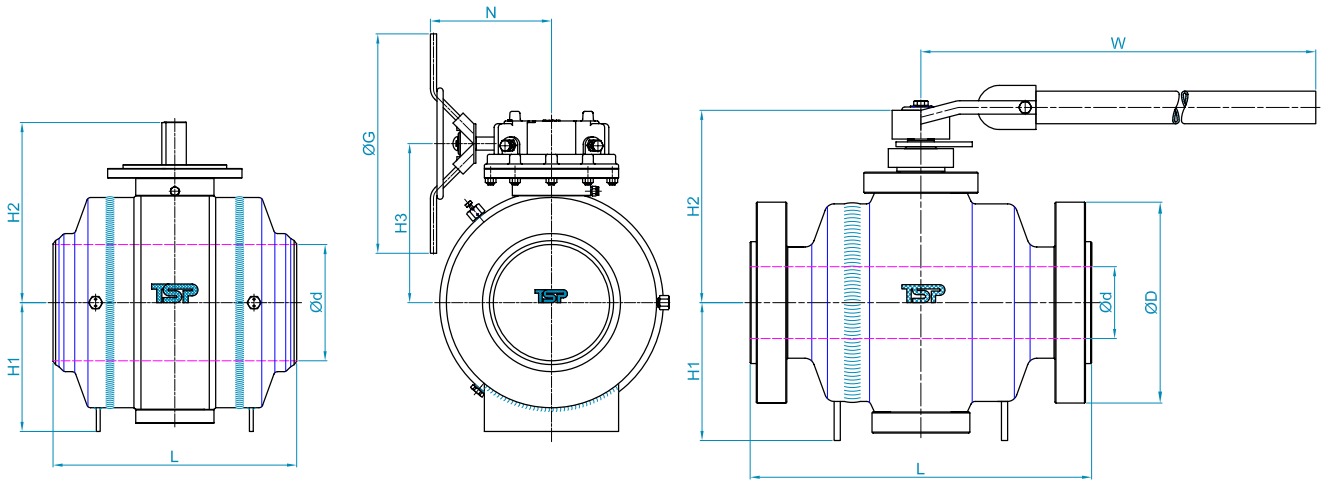


Dimensional Data

All Welded Ball Valve

Dimensional Data

ASME Class 150



Full Bore													
Valve size		End To End (L)			Body Dimensions			Lever Operated		Gear Operated			Weight*
NPS	DN	RF	RTJ	BW	ϕd	ϕD	H1	H2	W	G	H3	N	
2"	50	178	191	216	50	150	102	150	300	600	176	310	27
3"	80	203	216	283	75	190	126	210	350	600	213	310	54
4"	100	229	241	305	100	230	163	232	450	600	230	310	89
6"	150	394	406	457	150	280	187	246.7	750	600	260	310	160
8"	200	457	470	521	203	345	224			600	298	310	253
10"	250	533	546	559	252	405	278			600	350	310	387
12"	300	610	622	635	303	485	306			700	425	368	559
14"	350	686	699	762	334	535	334			700	456	368	760
16"	400	762	775	838	385	595	358			700	488	368	1020
18"	450	864	876	914	436	635	390			700	612	368	1215
20"	500	914	927	991	487	700	434			700	737	400	1793
22"	550	991	991	1092	538	747	477			700	796	400	2359
24"	600	1067	1080	1143	589	815	523			700	856	500	2803
26"	650	1143		1245	633	870	564			700	906	500	3685
28"	700	1245		1346	684	927	658			700	956	500	4490
30"	750	1295		1397	735	985	704			700	1006	500	4820
32"	800	1372		1524	779	1061	746			700	1056	500	5490
34"	850	1473		1626	830	1111	773			700	1106	500	7800
36"	900	1524		1727	874	1168.5	807			700	1156	500	7615

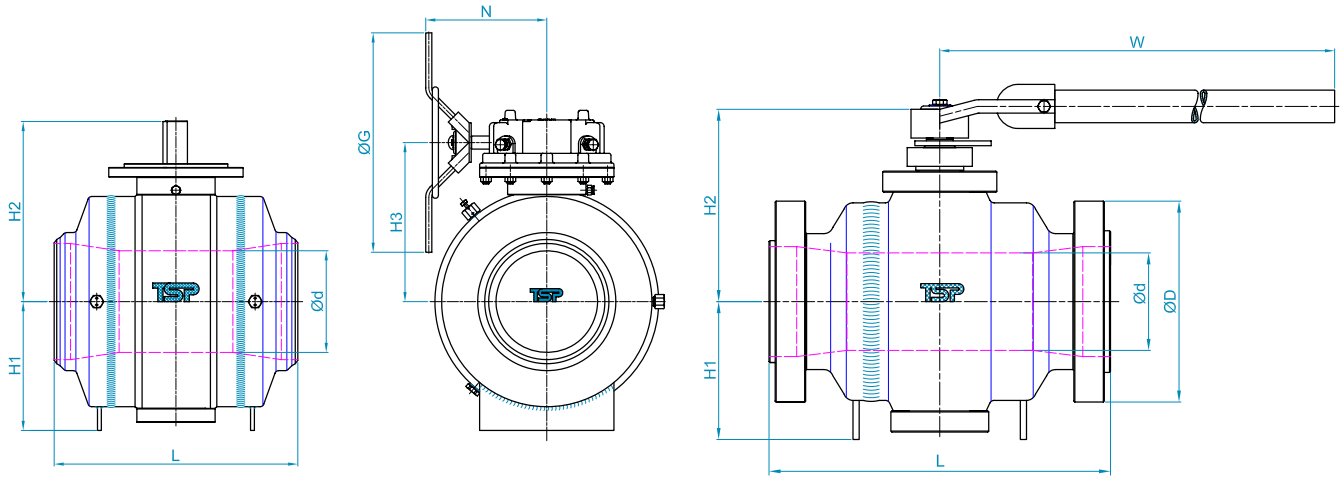
* Weight Figures are Relevant to Flanged End Valve

Note : - Dimensions In Millimeters and Weight in Kilograms

- The information provided in the table does not bring any compulsion for the manufacturer

Dimensional Data

ASME Class 150

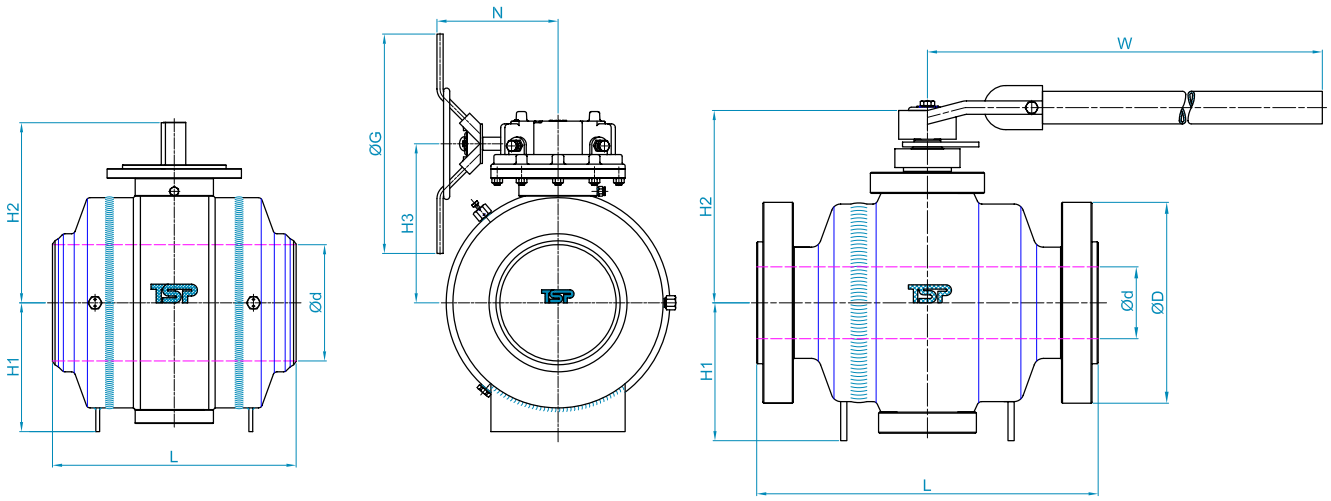


Reduced Bore													
Valve size		End To End (L)			Body Dimensions			Lever Operated		Gear Operated			Weight*
NPS	DN	RF	RTJ	BW	ϕd	ϕD	H1	H2	W	G	H3	N	
2 "×1 1/2"	50×40	178	191	216	49	150	102	150	300	600	176	310	25
3 " × 2"	80×50	203	216	283	74	190	126	210	350	600	213	310	30
4 " × 3"	100×80	229	241	305	100	230	163	232	450	600	230	310	60
6" × 4"	150×100	394	406	457	150	280	187	246.7	750	600	260	310	100
8" × 6"	200×150	457	470	521	201	345	224			600	298	310	185
10" × 8"	300×250	533	546	559	252	405	278			600	350	310	291
12" ×10"	150×100	610	622	635	303	485	306			700	425	368	462
14" × 10"	350×250	686	699	762	334	535	334			700	456	368	518
14" ×12"	350×300	686	699	762	334	535	334			700	456	368	610
16" × 12"	400×300	762	775	838	385	595	358			700	488	368	698
16" × 14"	400×350	762	775	838	385	595	358			700	488	368	820
18" × 16"	450×400	864	876	914	436	635	390			700	612	368	1060
20" × 16"	500×400	1067	1080	1143	487	700	434			700	737	400	1100
20" × 18"	500×450	1143		1245	487	700	434			700	737	400	1190
24" × 20"	600×500	1245		1346	589	815	523			700	856	500	1970
30" × 24"	750×600	1295		1397	735	985	704			700	1006	500	3250
36" × 30"	900×750	1372		1524	874	1168.5	805			700	1156	500	6314

* Weight Figures are Relevant to Flanged End Valve
Note : - Dimensions In Millimeters and Weight in Kilograms
- The information provided in the table does not bring any compulsion for the manufacturer

Dimensional Data

ASME Class 300

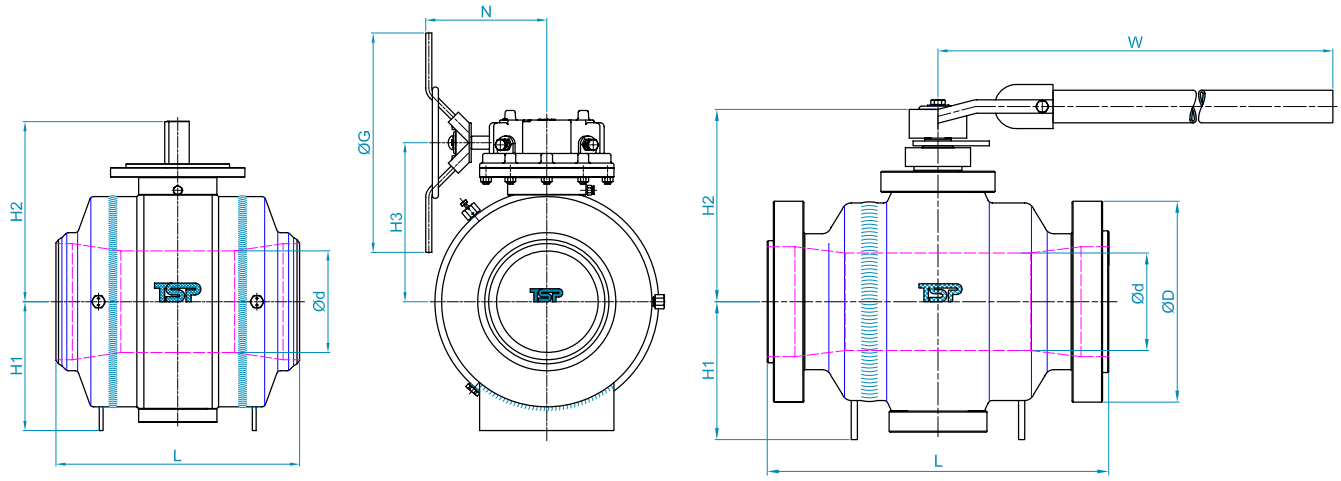


Full Bore													
Valve size		End To End (L)			Body Dimensions			Lever Operated		Gear Operated			Weight*
NPS	DN	RF	RTJ	BW	ϕd	ϕD	H1	H2	W	G	H3	N	
2"	50	216	232	216	50	165	95	133.5	334	600	178	310	27
3"	80	283	298	283	75	210	120	183.5	410	600	228	310	55
4"	100	305	321	305	100	255	160	220	524	600	265	310	92
6"	150	403	419	457	150	320	200	264.7	750	600	309	310	182
8"	200	502	518	521	203	380	230			600	408	310	278
10"	250	568	584	559	252	445	295			600	458	310	500
12"	300	648	664	635	303	520	330			700	503	368	733
14"	350	762	778	762	334	585	345			700	456	368	1029
16"	400	838	854	838	385	650	390			700	483	368	1418
18"	450	914	930	914	436	710	410			700	612	368	1592
20"	500	991	1010	991	487	775	465			700	737	400	2195
22"	550	1092	1114	1092	538	915	480			700	796	400	2788
24"	600	1143	1165	1143	589	915	545			700	856	500	3460
26"	650	1245	1270	1245	633	972	580			700	906	500	4660
28"	700	1346	1372	1346	684	1035	665			700	956	500	5770
30"	750	1397	1422	1397	735	1092	730			700	1006	500	6590
32"	800	1524	1553	1524	779	1149	765			700	1056	500	7932
34"	850	1626	1654	1626	830	1207	800			700	1106	500	9040
36"	900	1727	1756	1727	874	1270	825			700	1156	500	10093

* Weight Figures are Relevant to Flanged End Valve
Note : - Dimensions In Millimeters and Weight in Kilograms
- The information provided in the table does not bring any compulsion for the manufacturer

Dimensional Data

ASME Class 300

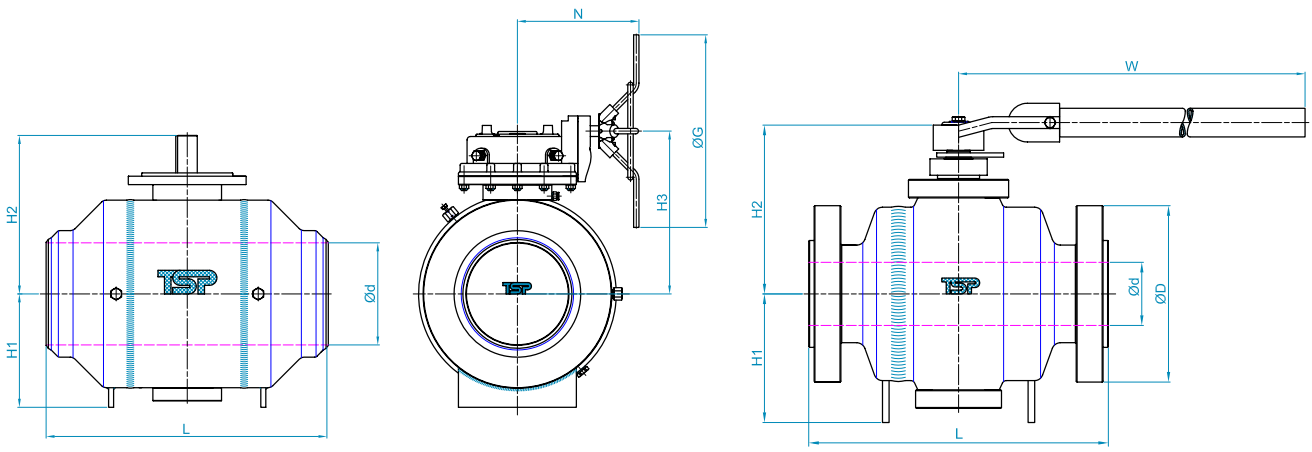


Reduced Bore													
Valve size		End To End (L)			Body Dimensions			Lever Operated		Gear Operated			Weight*
NPS	DN	RF	RTJ	BW	ϕd	ϕD	H1	H2	W	G	H3	N	
2 "×1 1/2"	50×40	216	232	216	49	165	95	-	-	600	178	310	25
3 " × 2"	80×50	283	298	283	74	210	120	133.5	334	600	228	310	32
4 " × 3"	100×80	305	321	305	100	255	160	183.5	410	600	265	310	62
6" × 4"	150×100	403	419	457	150	320	200	220	524	600	309	310	115
8" × 6"	200×150	502	518	521	201	380	230	264.7	750	600	408	310	219
10" × 8"	300×250	568	584	559	252	445	295			600	458	310	292
12" ×10"	150×100	648	664	635	303	520	330			700	503	368	594
14" × 10"	350×250	762	778	762	334	585	345			700	456	368	643
14" ×12"	350×300	762	778	762	334	585	345			700	456	368	816
16" × 12"	400×300	838	854	838	385	650	390			700	483	368	965
16" × 14"	400×350	838	854	838	385	650	390			700	483	368	1125
18" × 16"	450×400	914	930	914	436	710	410			700	612	368	1593
20" × 16"	500×400	991	1010	991	487	775	465			700	737	400	1663
20" × 18"	500×450	991	1010	991	487	775	465			700	737	400	1792
24" × 20"	600×500	1143	1165	1143	589	915	545			700	856	500	2661
30" × 24"	750×600	1397	1422	1397	735	1092	730			700	1006	500	4484
36" × 30"	900×750	1727	1756	1727	874	1270	825			700	1156	500	8183

* Weight Figures are Relevant to Flanged End Valve
Note : - Dimensions In Millimeters and Weight in Kilograms
- The information provided in the table does not bring any compulsion for the manufacturer

Dimensional Data

ASME Class 600

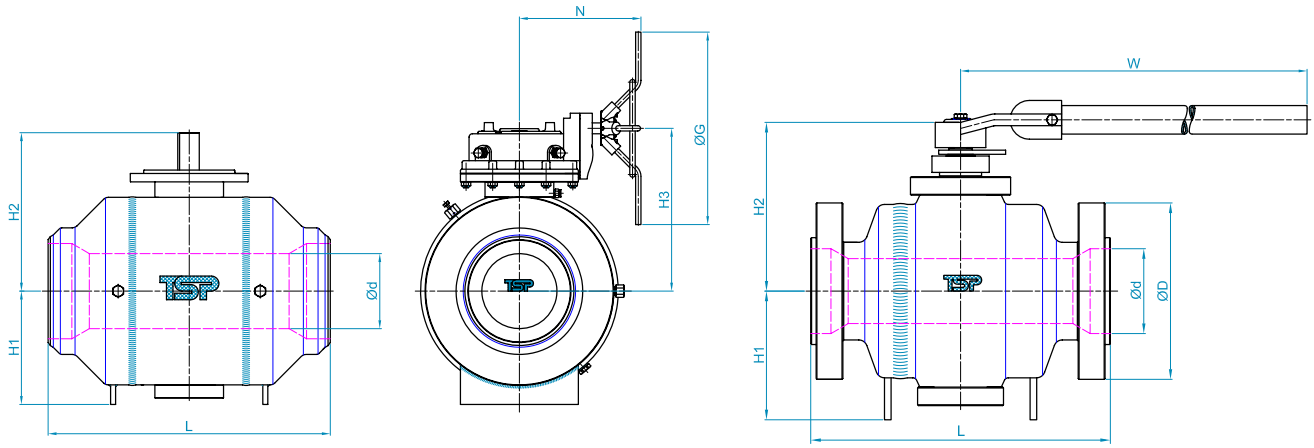


Full Bore													
Valve size		End To End (L)			Body Dimensions			Lever Operated		Gear Operated			Weight*
NPS	DN	RF	RTJ	BW	ϕd	ϕD	H1	H2	W	G	H3	N	
2"	50	292	295	292	50	165	102	164.6	400	600	178	310	31
3"	80	356	359	356	75	210	126	207.5	670	600	213	310	62
4"	100	432	435	432	100	275	163	221	750	600	230	310	113
6"	150	559	562	559	150	355	187	264.7	750	600	260	310	253
8"	200	660	664	660	201	420	224			600	298	310	485
10"	250	787	791	787	252	510	278			700	358	368	758
12"	300	838	841	838	303	560	306			700	414	368	1067
14"	350	889	892	889	334	605	334			700	464	368	1083
16"	400	991	994	991	385	685	358			700	514	400	1525
18"	450	1092	1095	1092	436	745	390			700	580	500	2095
20"	500	1194	1200	1194	487	815	434			700	646	500	2638
22"	550	1295	1305	1295	538	950	477			700	697	500	3787
24"	600	1397	1407	1397	589	1028	523			700	750	500	4736
26"	650	1448	1461	1448	633	1020	564			900	850	500	5647
28"	700	1549	1562	1549	684	1172	658			900	1080	500	6758
30"	750	1537	1664	1651	735	1290	704			900	1050	500	8377
32"	800	1778	179	1778	779	1330	746			900	1140	500	9738
34"	850	1930	1946	1930	830	1450	773			900	1250	500	11336
36"	900	2083	2099	2083	874	1546	807			900	1300	500	13298

* Weight Figures are Relevant to Flanged End Valve
Note : - Dimensions In Millimeters and Weight in Kilograms
- The information provided in the table does not bring any compulsion for the manufacturer

Dimensional Data

ASME Class 600

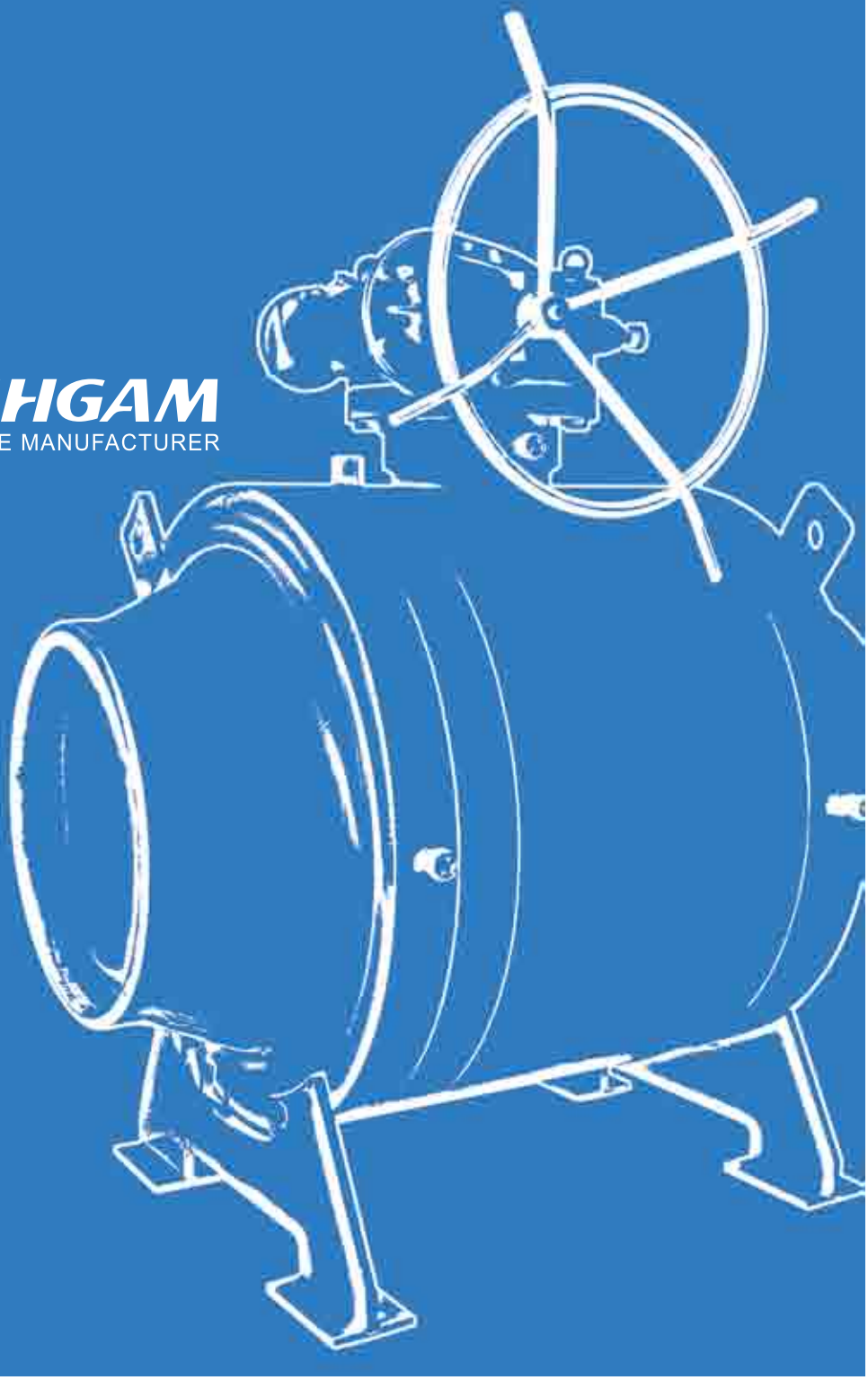


Reduced Bore													
Valve size		End To End (L)			Body Dimensions			Lever Operated		Gear Operated			Weight*
NPS	DN	RF	RTJ	BW	ϕd	ϕD	H1	H2	W	G	H3	N	
2 "×1 1/2"	50×40	292	295	292	49	165	102	-	-	600	178	310	31
3 " × 2"	80×50	356	359	356	74	210	126	164.6	400	600	213	310	39
4 " × 3"	100×80	432	436	432	100	275	163	207.5	670	600	230	310	78
6" × 4"	150×100	559	562	559	150	355	187	221	750	600	260	310	150
8" × 6"	200×150	660	664	660	201	420	224	264.7	750	600	298	310	292
10" × 8"	300×250	787	791	787	252	510	278			700	358	368	550
12" ×10"	150×100	838	841	838	303	560	306			700	414	368	811
14" × 10"	350×250	889	892	889	334	605	334			700	464	368	912
14" ×12"	350×300	889	892	889	334	605	334			700	464	368	1145
16" × 12"	400×300	991	994	991	385	685	358			700	514	400	1348
16" × 14"	400×350	991	994	889	385	685	358			700	514	400	1083
18" × 16"	450×400	1092	1095	1092	436	745	390			700	514	400	1680
20" × 16"	500×400	1194	1200	1194	487	815	434			700	646	500	2085
20" × 18"	500×450	1194	1200	1194	487	815	434			700	646	500	2375
24" × 20"	600×500	1397	1406	1397	589	1020	523			700	749	500	3248
30" × 24"	750×600	1537	1697	1684	735	1290	704			900	1050	500	5768
36" × 30"	900×750	2083	2098	2083	874	1546	807			900	1300	500	10376

* Weight Figures are Relevant to Flanged End Valve
Note : - Dimensions In Millimeters and Weight in Kilograms
- The information provided in the table does not bring any compulsion for the manufacturer

PISHGAM

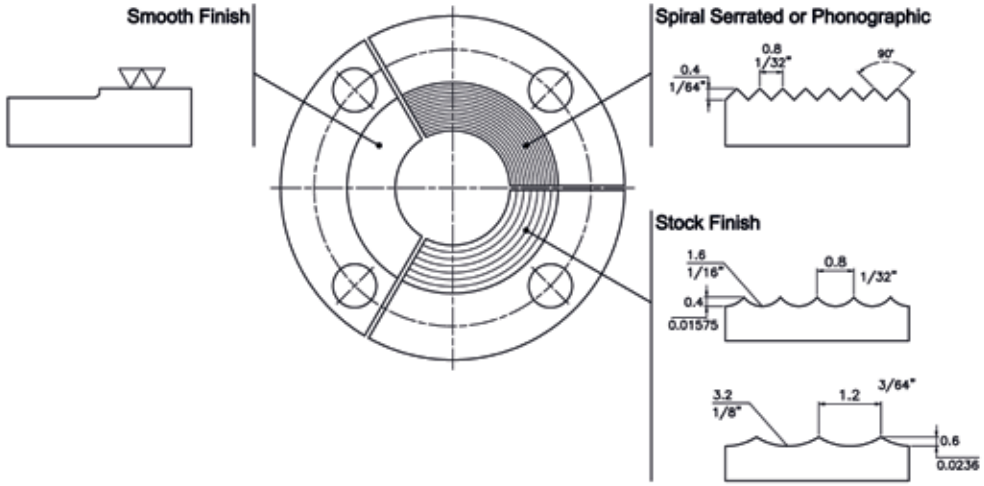
BALL VALVE MANUFACTURER



Engineering Data

Engineering Data

1 Standard Flange Finish [MSS SP-6]



2 Calculation of Flow

The flow Coefficient of a valve is the flow rate of water (gallons/minute) through a fully open valve, with a pressure drop of 1 psi across the valve. to find the flow of liquid through the valve from the Cv use the followong formulas;

Liquid Flow

QL = Flow rate of liquid (gal./min.)

ΔP = Differential pressure across the valve (psi)

G = Specific gravity of liquid (for water, G = 1)

$$QL = Cv\sqrt{\frac{\Delta P}{G}}$$

Gas Flow

Qg = Flow rate of gas (CFH at STP)

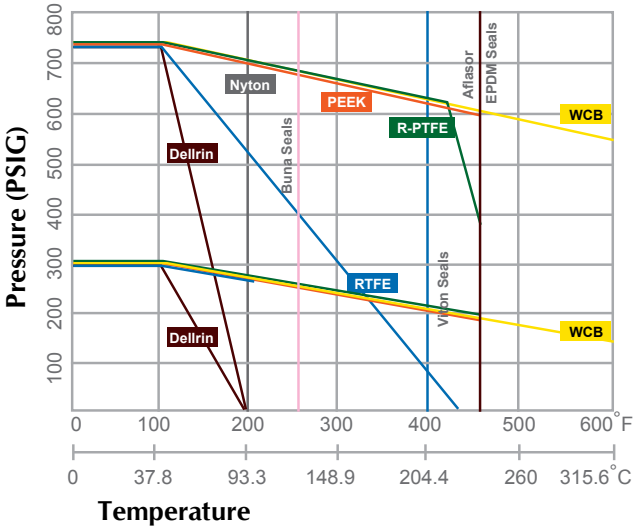
P2 = Outlet pressure (psia)

g = Specific gravity of gas (for air, g = 1.000)

$$Qg = 61Cv\sqrt{\frac{P2\,\Delta P}{g}}$$

3 Pressures-Temperatures

Pressure-temperature Chart



4 Face-to-face and end-to-end dimensions

API Specification 6D-2008																			
DN	NPS	PN 20 (Class 150)						PN 50 (Class 300)						PN64 (Class400)			PN100 (Class 600)		
		Full-bore and reduced-bore			Short-pattern , full-bore and reduced-bore			Full-bore and reduced-bore			Short-pattern, full-bore and reduced-bore			Full-bore and reduced-bore			Full-bore and reduced-bore		
		Raised face A	Welding end B	Ring Joint C	Raised face A	Welding end B	Ring Joint C	Raised face A	Welding end B	Ring Joint C	Raised face A	Welding end B	Ring Joint C	Raised face A	Welding end B	Ring Joint C	Raised face A	Welding end B	Ring Joint C
50	2	178	216	191	-	-	-	216	216	232	-	-	-	-	-	-	292	292	295
65	2 1/2	191	241	203	-	-	-	241	241	257	-	-	-	-	-	-	330	330	333
80	3	203	283	216	-	-	-	283	283	298	-	-	-	-	-	-	356	356	359
100	4	229	305	241	-	-	-	305	305	321	-	-	-	406	406	410	432	432	435
150	6	394	457	406	267	403	279	457	457	419	-	-	-	495	495	498	559	559	562
200	8	457	521	470	292	419	305	502	521	518	419	419	435	597	597	600	660	660	664
250	10	533	559	546	330	457	343	568	559	584	457	457	473	673	673	676	787	787	791
300	12	610	635	622	356	502	368	648	635	664	502	502	518	762	762	765	838	838	841
350	14	686	762	699	-	-	-	762	762	778	-	-	-	826	826	829	889	889	892
400	16	762	838	775	-	-	-	838	838	854	-	-	-	902	902	905	991	991	994
450	18	864	914	876	-	-	-	914	914	930	-	-	-	978	978	981	1092	1092	1095
500	20	914	991	927	-	-	-	991	991	1010	-	-	-	1054	1054	1060	1194	1194	1200
550	22	-	-	-	-	-	-	1092	1092	1114	-	-	-	1143	1143	1153	1295	1295	1305
600	24	1067	1143	1080	-	-	-	1143	1143	1165	-	-	-	1232	1232	1241	1397	1397	1407
650	26	1143	1245	-	-	-	-	1245	1245	1270	-	-	-	1308	1308	1321	1448	1448	1461
700	28	1245	1346	-	-	-	-	1346	1346	1372	-	-	-	1397	1397	1410	1549	1549	1562
750	30	1295	1397	-	-	-	-	1397	1397	1422	-	-	-	1524	1524	1537	1651	1651	1664
800	32	1372	1524	-	-	-	-	1524	1524	1553	-	-	-	1651	1651	1667	1778	1778	1794
850	34	1473	1626	-	-	-	-	1626	1626	1654	-	-	-	1778	1778	1794	1930	1930	1946
900	36	1524	1727	-	-	-	-	1727	1727	1756	-	-	-	1880	1880	1895	2083	2083	2099

Note: Dimensions In Millimeters

5 Minimum bore for full-opening valves

API Specification 6D-2008					
DN	NPS	Minimum bore by class mm			
		PN 20 to 100 (Class 150 to 600)	PN 150 (Class 900)	PN 250 (Class 1500)	PN 420 (Class 2500)
15	1/2	13	13	13	13
20	3/4	19	19	19	19
25	1	25	25	25	25
32	1 1/4	32	32	32	32
40	1 1/2	38	38	38	38
50	2	49	49	49	42
65	2 1/2	62	62	62	52
80	3	74	74	74	62
100	4	100	100	100	87
150	6	150	150	144	131
200	8	201	201	192	179
250	10	252	252	239	223
300	12	303	303	287	265
350	14	334	322	315	292
400	16	385	373	360	333
450	18	436	423	406	374
500	20	487	471	454	419
550	22	538	522	500	-
600	24	589	570	546	-
650	26	633	617	594	-
700	28	684	665	641	-
750	30	735	712	686	-
800	32	779	760	730	-
850	34	830	808	775	-
900	36	874	855	819	-

6 Material

Casting Material

Chemical Properties						
Classification	High-temp`steel		Low- temp`steel		Stainless Steel	
Specification	ASTM A-216		ASTM A-352		ASTM A-351	
Grade	Gr-WCA	Gr-WCB	Gr-LCB	Gr-LCC	Gr-CF8	Gr-CF8M
C % MAX	A 0.25	0.30	A 0.30	A 0.25	0.08	0.08
SI	0.60	0.60	A 0.60	0.60	2.0	1.50
Mn	A 0.70	1.00	A 1.0	A 1.20	1.5	1.50
P	0.040	0.04	0.04	0.04	0.04	0.04
S	0.045	0.045	0.045	0.045	0.04	0.04
Ni	0.50 max	0.5 max	0.5	0.50	8.0 ~ 11.0	9.0 ~ 12.0
Cr	0.50 max	0.5 max	0.50	0.50	18.0 ~ 21.0	18.0 ~ 21.0
Mo	0.20 max	0.2 max	0.20	0.20	0.50	2.0 ~ 3.0
Cu	0.30 max	0.3 max	0.30	-	-	-
V	0.03 max	0.03 max	0.30	0.30	-	-

A: For each reduction of 0.01% below the specified maximum carbon content , an increase of 0.040% manganese above the specified maximum will be permitted up to a max of 1.10% for LCA , 1.28% for LCB , and 1.4% for LCC.

Physical Properties							
Classification		WCA	WCB	LCB	LCC	CF8	CF8M
Tensile Strength	KPA	60 ~ 85	70~95	65.0 ~ 90.0	70.0 ~ 95.0	Min 70	Min 70
	Mpa	415 ~ 585	485~655	450 ~ 620	485 ~ 655	485	485
Yield Strength © min	KPA	30	36	35.0	40.0	Min 30	Min30
	MPa	205	250	240	275	205	205
Elongation 2" or 50 mm	min %	24	22	24	22	35.0	30.0
Reduction of area	min %	35	35	35	35	-	-

C: Determine by either 0.2% offset method or 0.5% extension-under load method

6 Material (continue)

Wrought Materials

Chemical Properties						
Specification	A-105	A-182	A-276			
Grade		F6a-1	304	304L	316	316L
C	0.02	0.15 max	0.08 max	0.030 max	0.08 max	0.030 max
Mn	0.04 to 0.06	1.00 max	2.00 max	2.00 max	2.00 max	2.00 max
P	0.008	0.04	0.04	0.045	0.045	0.045
S	0.010	0.030	0.030	0.030	0.030	0.030
Si	0.03	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max
Ni	0.03	0.50 max	8.0 ~ 11.0	8.0 ~ 13.0	10.0 ~ 14.0	10.0 ~ 15.0
Cr	0.041	11.5 ~ 13.5	18.0 ~ 20.0	18.0 ~ 20.0	16.0 ~ 18.0	16.0 ~ 18.0
Mo	0.01				2.00 ~ 3.00	2.00 ~ 3.00
V	0.01					

NACE Hardness: All material Maximum HB 235 (HRC 22 maximum)

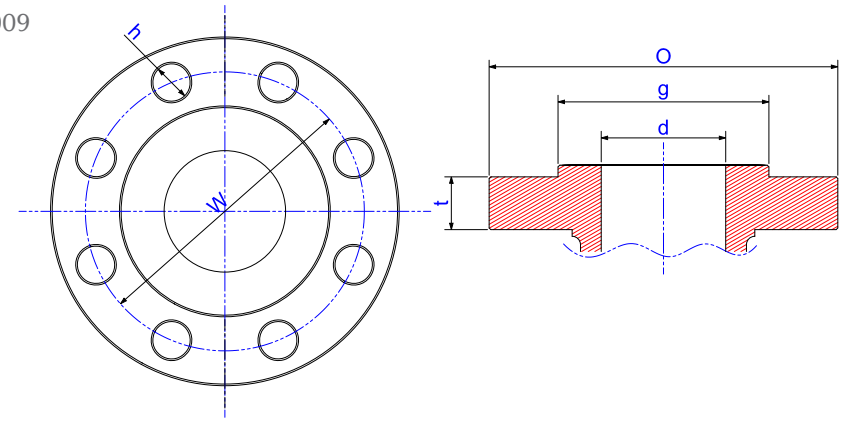
Physical Properties							
Classification		A105 ©	® F6a	® 304	® 304L	® 316	® 316L
Tensile Strength	KSi	70	70	75	70	75	70
	MPa	485	485	515	485	515	485
Yield Strength © min	KSi	36	40	30	25	30	25
	MPa	250	275	205	170	205	170
Elongation 2" or 50 mm	min %	30	18	30	30	30	30
Reduction of area	min %	22	35	50	50	50	50

©-A: Determined by either the 0.2% offset method or the 0.5% extension-under load method

© -R: Determined by the 0.2% offset method for ferritc steel only 0.5% extension
-under load method may also by used

7 Pipe Flanges and Flanged Fittings

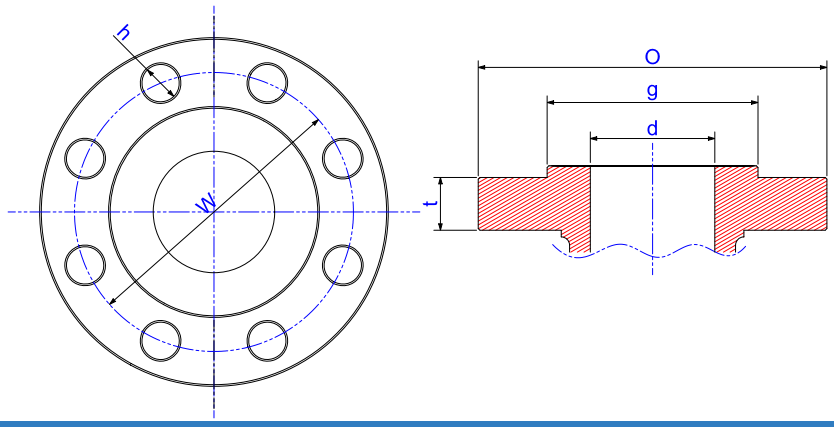
ASME B16.5-2009



Dimensions of Class 150 Flanges								
Drilling								
Nominal Pipe size,NPS	Outside Diameter of Flange O	Diameter of Boit Circle W	Diameter of Bolt Holes in. h	Number of Bolts	Diameter of Bolts in.	Thichess of Flange Min. t	Inside diameter of Fittng, d	2mm Raised Face Large Male, g
1/2	90	60.3	5/8	4	1/2	8.0	13	34.9
3/4	100	69.9	5/8	4	1/2	8.9	19	42.9
1	110	79.4	5/8	4	1/2	9.6	25	50.8
1 1/4	115	88.9	5/8	4	1/2	11.2	32	63.5
1 1/2	125	98.4	5/8	4	1/2	12.7	38	73.0
2	150	120.7	3/4	4	5/8	14.3	51	92.1
2 1/2	180	139.7	3/4	4	5/8	15.9	64	104.8
3	190	152.4	3/4	4	5/8	17.5	76	127
3 1/2	215	177.8	3/4	8	5/8	19.1	89	139.7
4	230	190.5	3/4	8	5/8	22.3	102	157.2
5	255	215.9	7/8	8	3/4	22.3	127	185.7
6	280	241.3	7/8	8	3/4	23.9	152	215.9
8	345	298.5	7/8	8	3/4	27.0	203	269.9
10	405	362.0	1	12	7/8	28.6	254	323.8
12	485	431.8	1	12	7/8	30.2	305	381.0
14	535	476.3	1 1/8	12	1	33.4	337	412.8
16	595	539.8	1 1/8	16	1	35.0	387	469.9
18	635	577.9	1 1/4	16	1 1/8	38.1	438	533.4
20	700	635.0	1 1/4	20	1 1/8	41.3	489	584.2
24	815	749.3	1 3/8	20	1 1/4	46.1	591	692.2

7 Pipe Flanges and Flanged Fittings (continue)

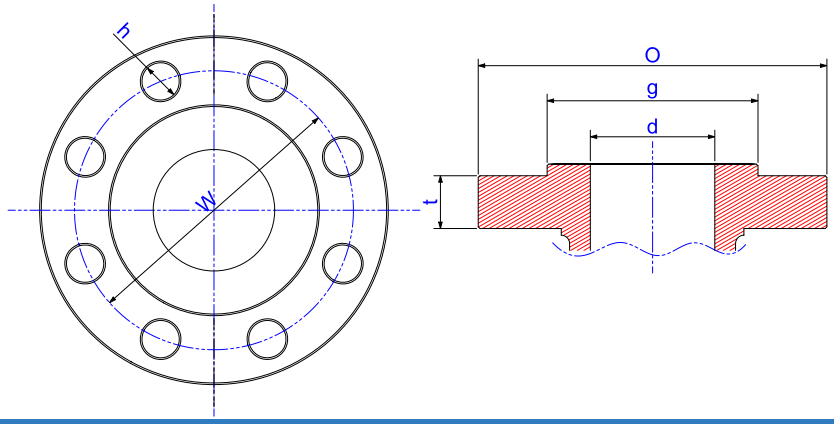
ASME B16.5-2009



Dimensions of Class 300 Flanges								
Drilling								
Nominal Pipe size,NPS	Outside Diameter of Flange O	Diameter of Boit Circle W	Diameter of Bolt Holes in. h	Number of Bolts	Diameter of Bolts in.	Thichess of Flange Min. t	Inside diameter of Fittng, d	2mm Raised Face Large Male, g
1/2	95	66.7	5/8	4	1/2			34.9
3/4	115	82.6	3/4	4	5/8			42.9
1	125	88.9	3/4	4	5/8	15.9	25	50.8
1 1/4	135	98.4	3/4	4	5/8	17.5	32	63.5
1 1/2	155	114.3	7/8	4	3/4	19.1	38	73.0
2	165	127.0	3/4	8	5/8	20.7	51	92.1
2 1/2	190	149.2	7/8	8	3/4	23.9	64	104.8
3	210	168.3	7/8	8	3/4	27.0	76	127.0
3 1/2	230	184.2	7/8	8	3/4	28.6	89	139.7
4	255	200.0	7/8	8	3/4	30.2	102	157.2
5	280	235.0	7/8	8	3/4	33.4	127	185.7
6	320	269.9	7/8	12	3/4	35.0	152	215.9
8	380	330.2	1	12	7/8	39.7	203	269.9
10	445	387.4	1 1/8	16	1	46.1	254	323.8
12	520	450.8	1 1/4	16	1 1/8	49.3	305	381.0
14	585	514.4	1 1/4	20	1 1/8	52.4	337	412.8
16	650	571.5	1 3/8	20	1 1/4	55.6	387	469.9
18	710	628.6	1 3/8	24	1 1/4	58.8	432	533.4
20	775	685.8	1 3/8	24	1 1/4	62.0	483	584.2
24	915	812.8	1 5/8	24	1 1/2	68.3	584	692.2

7 Pipe Flanges and Flanged Fittings (continue)

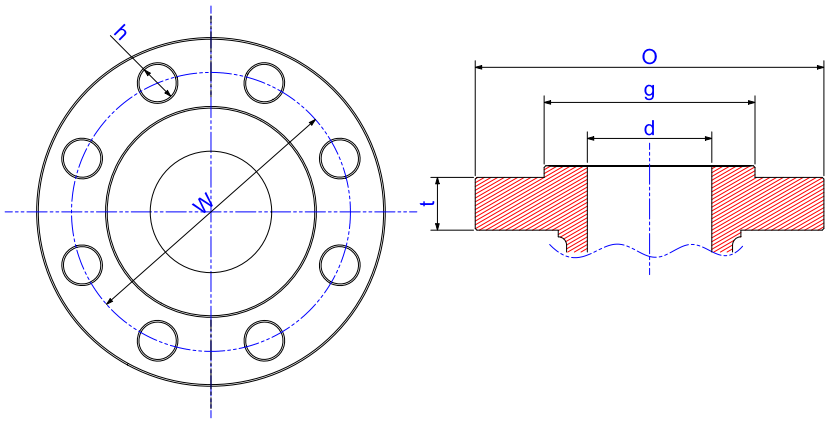
ASME B16.5-2009



Dimensions of Class 600 Flanges							
Drilling							
Nominal Pipe Size, NPS	Outside Diameter of Flange, O	Diameter of Bolt Circle, W	Diameter of Bolt Holes, h	No. of Bolts	Diameter of Bolt, in.	Thichness of flange min, t	Raised Face Large Male, g
1⁄2	95	66.7	5/8	4	1/2	14.3	34.9
3/4	115	82.6	3/4	4	5/8	15.9	42.9
1	125	88.9	3/4	4	5/8	17.5	50.8
1 1/4	135	98.4	3/4	4	5/8	27.0	63.5
1 1/2	155	114.3	7/8	4	3/4	22.3	73.0
2	165	127.0	3/4	8	5/8	25.4	92.1
2 1/2	190	149.2	7/8	8	3/4	28.6	104.8
3	210	168.3	7/8	8	3/4	31.8	127.0
3 1/2	230	184.2	1	8	7/8	35.0	139.7
4	275	215.9	1	8	7/8	38.1	157.2
5	330	266.7	1 1/8	8	1	44.5	185.7
6	355	292.1	1 1/8	12	1	47.7	215.9
8	420	394.2	1 1/4	12	1 1/8	55.6	269.9
10	510	431.8	1 3/8	16	1 1/4	63.5	323.8
12	560	489.0	1 3/8	20	1 1/4	66.7	381.0
14	605	527.0	1 1/2	20	1 3/8	69.9	412.8
16	685	603.2	1 5/8	20	1 1/2	76.2	469.9
18	745	654.0	1 3/4	20	1 5/8	82.6	533.4
20	815	723.9	1 3/4	24	1 5/8	88.9	584.2
24	940	838.2	2	24	1 7/8	101.6	692.2

7 Pipe Flanges and Flanged Fittings (continue)

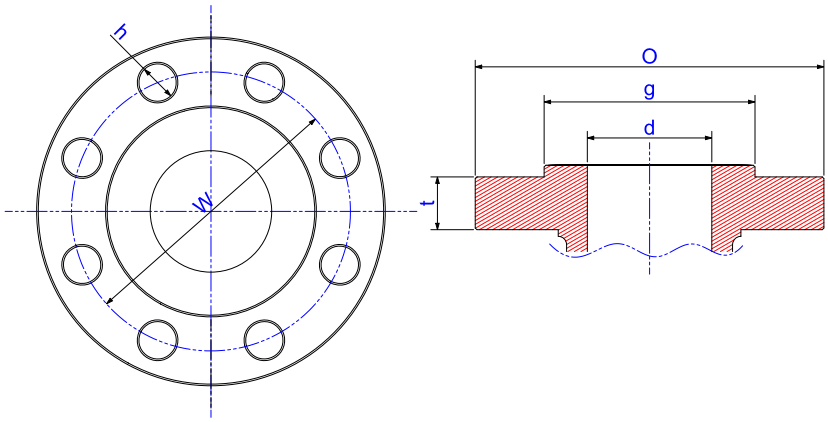
ASME B16.5-2009



Dimensions of Class 900 Flanges								
Drilling								
Nominal Pipe Size, NPS	Outside Diam-eter of Flange, O	Diameter of Bolt Circle, W	Diameter of Bolt Holes, h	No. of Bolts	Diameter of Bolt, in.	7-mm Raised Face	Ring joint	Min. Thickness of Flange
NPS	Use class 1500 dimensions in these sizes							
3/4								
1								
1 1/4								
1 1/2								
2								
2 1/2								
3	240	190.5	1	8	7/8	145	145	38.1
4	290	235	1 1/4	8	1 1/8	170	170	44.5
6	380	317.5	1 1/4	12	1 1/8	190	195	55.6
8	470	393.7	1 1/2	12	1 3/8	220	220	63.5
10	545	469.9	1 1/2	16	1 3/8	235	235	69.9
12	610	533.4	1 1/2	20	1 3/8	255	255	79.4
14	640	558.8	1 5/8	20	1 1/2	275	280	85.8
16	705	616	1 3/4	20	1 5/8	285	290	88.9
18	785	685.8	2	20	1 7/8	325	335	101.6
20	855	749.3	2 1/8	20	2	350	360	108
24	1040	901.7	2 5/8	20	2 1/2	440	455	139.7

7 Pipe Flanges and Flanged Fittings (continue)

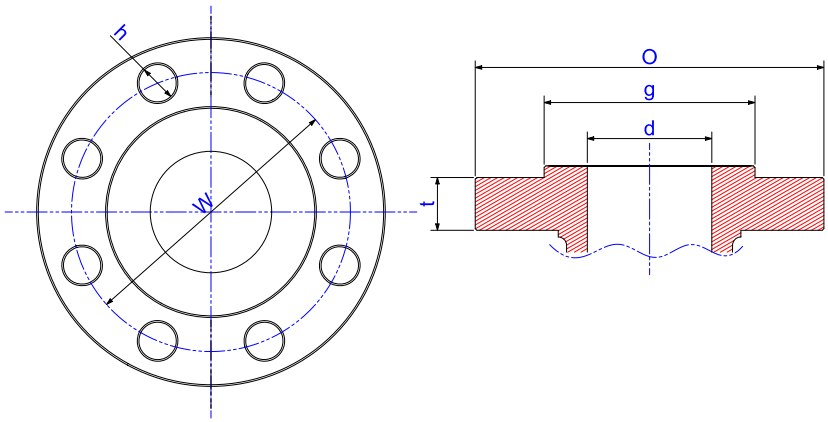
ASME B16.5-2009



Dimensions of Class 1500 Flanges								
Drilling								
Nominal Pipe Size, NPS	Outside Diameter of Flange, O	Diameter of Bolt Circle, W	Diameter of Bolt Holes, h	No. of Bolts	Diameter of Bolt, in.	7-mm Raised Face	Ring joint	Min. Thickness of Flange
1/2	120	82.6	7/8	4	3/4	110	110	22.3
3/4	130	88.9	7/8	4	3/4	115	115	25.4
1	150	101.6	1	4	7/8	125	125	28.6
1 1/4	160	111.1	1	4	7/8	125	125	28.6
1 1/2	180	123.8	1 1/8	4	1	140	140	31.8
2	215	165.1	1	8	7/8	145	145	38.1
2 1/2	245	190.5	1 1/8	8	1	160	160	41.3
3	265	203.2	1 1/4	8	1 1/8	180	180	47.7
4	310	241.3	1 3/8	8	1 1/4	195	195	54
6	395	317.5	1 1/2	12	1 3/8	260	265	82.6
8	485	393.7	1 3/4	12	1 5/8	290	300	92.1
10	585	482.6	2	12	1 7/8	335	345	108
12	675	571.5	2 1/8	16	2	375	385	123.9
14	750	635	2 3/8	16	2 1/4	405	425	133.4
16	825	704.8	2 5/8	16	2 1/2	445	470	146.1
18	915	774.7	2 7/8	16	2 3/4	495	525	162
20	985	831.8	3 1/8	16	3	540	565	177.8
24	1170	990.6	3 5/8	16	3 1/2	615	650	203.2

7 Pipe Flanges and Flanged Fittings (continue)

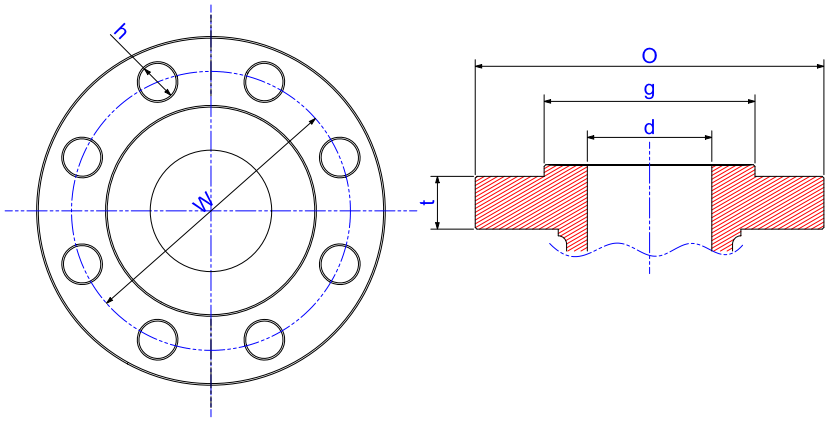
ASME B16.5-2009



Dimensions of Class 2500 Flanges								
Drilling								
Nominal pip size,NPS	Outside Diameter of flange, O	Diameter of Bolt Circle, W	Diameter of Bolt Holes, in h	No. of Bolts	Diameter of Bolt, in.	"7-mm Raised Face"	Raised Face g	Min. Thick-ness of Flange t
1/2	135	88.9	7/8	4	3/4	120	120	30.2
3/4	140	95.2	7/8	4	3/4	125	125	31.8
1	160	108	1	4	7/8	140	140	35
1 1/4	185	130.2	1 1/8	4	1	150	150	38.1
1 1/2	205	146	1 1/4	4	1 1/8	170	170	44.5
2	235	171.4	1 1/8	8	1	180	180	50.9
2 1/2	265	196.8	1 1/4	8	1 1/8	195	205	57.2
3	305	228.6	1 3/8	8	1 1/4	220	230	66.7
4	355	273	1 5/8	8	1 1/2	255	260	76.2
6	485	368.3	2 1/8	8	2	345	355	108
8	550	438.2	2 1/8	12	2	380	395	127
10	675	539.8	2 5/8	12	2 1/2	490	510	165.1
12	760	619.1	2 7/8	12	2 3/4	540	560	184.2

7 Pipe Flanges and Flanged Fittings (continue)

ASME B 16.47



Class 150 Steel Pipe Flange Dimensions

Nominal Size		O		W		g		t		h (Bolt hole)		Bolt	
inch	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	Number	Diam.
26	650	34.25	870	31.75	806.5	29.50	749	2.69	68.4	1.38	35	24	1 1⁄4
28	700	36.50	927	34.00	863.5	31.50	800	2.81	71.4	1.38	35	28	1 1⁄4
30	750	38.75	984	36.00	914.5	33.75	857	2.94	74.7	1.38	35	28	1 1⁄4
32	800	41.75	1060	38.50	978.0	36.00	914	3.18	80.8	1.62	41	28	1 1⁄2
34	850	43.75	1111	40.50	1029.0	38.00	965	3.25	82.6	1.62	41	32	1 1⁄2
36	900	46.00	1168	42.75	1086.0	40.25	1022	3.56	90.5	1.62	41	32	1 1⁄2

Height of raised face is 0.06 inch (1.6 mm) each.

Class 300 Steel Pipe Flange Dimensions

Nominal Size		O		W		g		t		h (Bolt hole)		Bolt	
inch	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	number	Diam.
26	650	38.25	972	34.50	876.5	29.50	749	3.12	79.3	1.75	45	28	1 5⁄8
28	700	40.75	1035	37.00	940.0	31.50	800	3.38	85.9	1.75	45	28	1 5⁄8
30	750	43.00	1092	39.25	997.0	33.75	857	3.62	92.0	1.88	48	28	1 3⁄4
32	800	45.25	1149	41.50	1054.0	36.00	914	3.88	98.6	2.00	51	28	1 7⁄8
34	850	47.50	1207	43.50	1105.0	38.00	965	4.00	101.6	2.00	51	28	1 7⁄8
36	900	50.00	1270	46.00	1168.5	40.25	1022	4.12	104.7	2.12	54	32	2

Height of raised face is 0.06 inch (1.6 mm) each.

Class 600 Steel Pipe Flange Dimensions

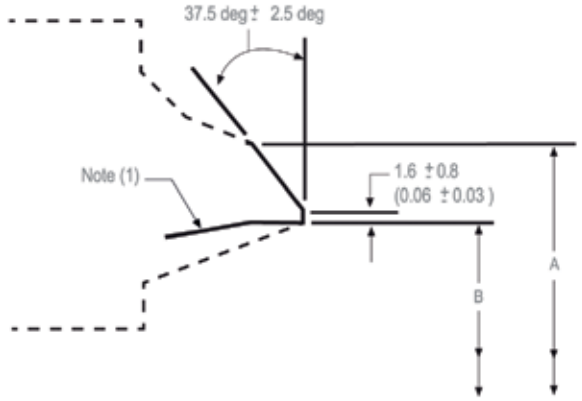
Nominal Size		O		W		g		t		h (Bolt hole)		Bolt	
inch	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	number	Diam.
26	650	40.00	1016	36.00	914.5	29.50	749	4.25	108.0	2.00	51	28	1 7⁄8
28	700	42.25	1073	38.00	965.0	31.50	800	4.38	111.3	2.12	54	28	2
30	750	44.50	1130	40.25	1022.5	33.75	857	4.50	114.3	2.12	54	28	2

Height of raised face is 0.25 inch (6.4 mm) each.

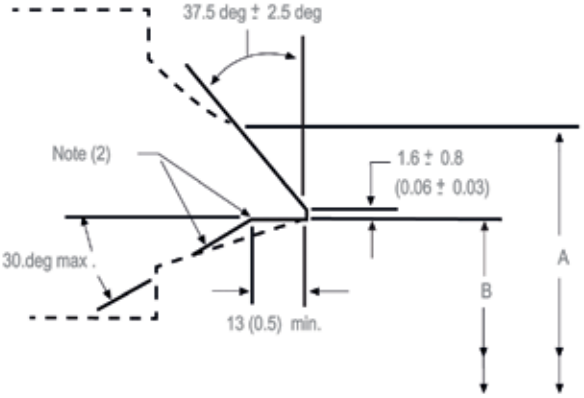
8 Butt-Welding Dimensions

Bevels for wall thickness over 3 mm (0.12 in.) to 22 mm (0.88 in.)

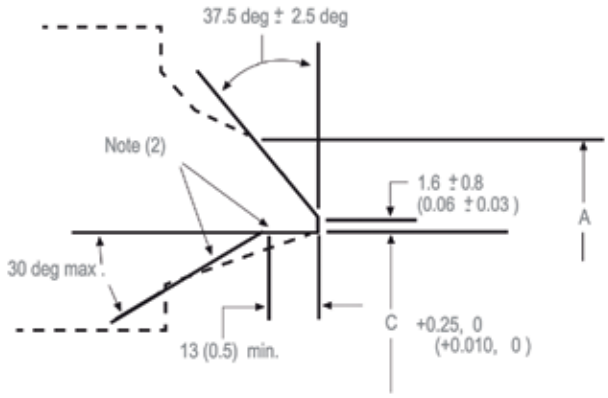
ASME B16.25-2007



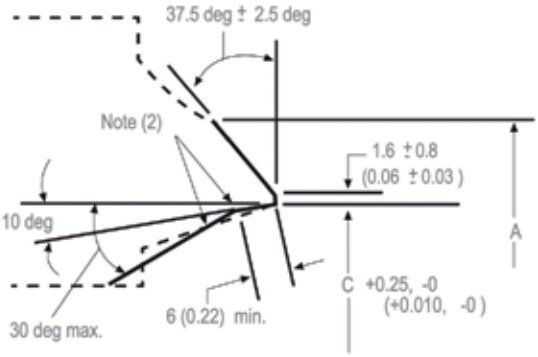
Bevels for wall thickness over 3 mm (0.12 in.) to 22 mm (0.88 in.)



(b) Welding End Detail for joint Using Split Rectangular Backing Ring



(C) Welding End Detail for joint Using Continuou Rectangular Backing Ring



(d) Welding End Detail for joint Using Continuous Tapered Backing Ring

GENERAL NOTES :
(a) Broken lines denote maximum envelope for transitions from welding bevel and root face into body of component . see fig . 1 for details .
(b) see section 5 for tolerances other than those given in these illustrations .
(c) purchase order must secify contour of any backing ring to be used.
(d) linear dimensione are in millimeters with inch values in parentheses .
NOTES:
(1) Internal surface may by as . formed or machined for dimension b at root face . contour within the envelope shall be in accordance with section 2.
(2) Intersections should be silghtly rounded .

8 Butt-Welding Dimensions (continue)

ASME B 16.25-2007

Nominal Pipe Size (NPS)	Schedule No. [Note (1)]	O.D at Welding Ends		B	C [Note (2)]	t
		Wrought or Fabricated, A [Note (1)]	Cast Components, A			
3	XXS	88.9	91	58.50	61.19	15.24
4	XXS	114.3	117	80.00	83.30	17.12
6	120	168.3	172	140.00	142.29	14.27
	160	168.3	172	132.00	135.31	18.26
	XXS	168.3	172	124.50	128.85	21.95
8	100	219.1	223	189.00	191.65	15.09
	120	219.1	223	182.50	186.11	18.26
	140	219.1	223	178.00	181.98	20.62
	XXS	219.1	223	174.50	179.16	22.23
	160	219.1	223	173.00	177.79	23.01
10	120	273.0	278	230.00	234.44	21.44
	140	273.0	278	222.00	227.51	25.40
	160	273.0	278	216.00	221.95	28.58
12	60	323.8	329	295.00	297.97	14.27
	80	323.8	329	289.00	292.17	17.48
	100	323.8	329	281.00	285.24	21.44
	120	323.8	329	273.00	278.31	25.40
	140	323.8	329	266.50	272.75	28.58
	160	323.8	329	257.00	264.45	33.32
16	60	406.4	413	373.00	376.21	16.66
	80	406.4	413	363.50	367.84	21.44
	100	406.4	413	354.00	359.53	26.19
	120	406.4	413	344.50	351.18	30.96
	140	406.4	413	333.50	341.43	36.53
	160	406.4	413	325.50	334.50	40.49
18	20	457.2	464	441.50	442.30	7.92
	30	457.2	464	435.00	436.68	11.13
	STD	457.2	464	438.00	439.48	9.53
	XS	457.2	464	432.00	433.94	12.70
	40	457.2	464	428.50	431.19	14.27
	60	457.2	464	419.00	422.82	19.05
	80	457.2	464	409.50	414.46	23.83
	100	457.2	464	398.50	404.78	29.36
	120	457.2	464	387.50	395.03	34.93
	140	457.2	464	378.00	386.77	39.67
	160	457.2	464	366.50	376.99	45.24

8 Butt-Welding Dimensions (continue)

ASME B 16.25-2007

Nominal Pipe Size (NPS)	Schedule No. [Note (1)]	O.D at Welding En ds		B	C [Note (2)]	t
		Wrought or Fabricated, A [Note (1)]	Cast Components, A			
20	STD	508.0	516	489.00	490.28	9.53
	XS	508.0	516	482.50	484.74	12.70
	40	508.0	516	478.00	480.55	15.09
24	STD	609.6	619	590.50	591.88	12.7
	XS	609.6	619	584.00	586.34	9.53
	30	609.6	619	581.00	583.59	14.27
	40	609.6	619	574.50	577.97	17.48
	60	609.6	619	560.50	565.49	24.61
	80	609.6	619	547.50	554.38	30.96
	100	609.6	619	532.00	540.49	38.89
	120	609.6	619	517.50	528.03	46.02
	140	609.6	619	505.00	516.91	52.37
	160	609.6	619	490.50	504.37	59.54
30	10	762.0	772	746.00	747.10	7.92
	STD	762.0	772	742.94	744.28	9.53
	20	762.0	772	736.50	738.74	12.70
	30	762.0	772	730.00	733.17	15.88
36	10	914.4	927	898.50	899.50	7.92
	STD	914.4	927	895.34	896.68	9.53
	20	914.4	927	889.00	891.14	12.70
	30	914.4	927	882.50	885.57	15.88
	40	914.4	927	876.5	880.02	19.05

Gtne kal nules :
(a) Dimensions are in milimeters.
(b) See Section 5 for tolerances.
NOTES:
(1) Date are from ASME B36.10M or amore precise roumding of the inch dimeasions from Table 1-1. Data in the tabale are lso applicable to ASME B36.19M when the wall thkkness contorms to ASME B 36.10m. Letter design natiors signity
(a) STD = Standard wall thickness
(b) XS = extra strong wall thickness
(c) xxs = double, extra strong wall thichness

(2) Internal machining for continuous becing rirgs for size NPS 2 and smaller is not contemplatet see para. 4.2 br c dimension for sizes not liste.

9 Pressure - Temperature Ratings for Group1. 1 Materials

ASME B16.5-2003

Nominal Designation	Forgings	Castings	Plates
C-Si	A105(1)	A216 Gr.WCB(1)	A515 Gr .70(1)
C-Mn-Si	A350Gr.LF2(1)		A516 Gr .70(1).(2)
C-Mn-Si -7	A350Gr.LF6CL.(4)		
31/2 Ni	A350Gr.LF3		A537 CL.1(3)

NOTES:
(1) Upon Prolonged exposure to temperatures a bove 425°c, the carbide phase of steel may be converted to graphsteel, Permissible but not recommended for prolonged use above 425°c
(2) Not to be used over 455°c.
(3) Not to be used over 370°c.
(4) Not to be used over 260°c.

Working Pressure by Classes , bar							
Class Temp., C	150	300	400	600	900	1500	2500
-29 to 38	19.6	51.1	68.1	102.1	153.2	255.3	425.5
50	19.2	50.1	66.8	100.2	150.4	250.6	417.7
100	17.7	46.6	62.1	93.2	139.8	233.0	388.3
150	15.8	45.1	60.1	90.2	135.2	225.4	375.6
200	13.8	43.8	58.4	87.6	131.4	219.0	365.0
250	12.1	41.9	55.9	83.9	125.8	209.7	349.5
300	10.2	39.8	53.1	79.6	119.5	199.1	331.8
325	9.3	38.7	51.6	77.4	116.1	193.6	322.6
350	8.4	37.6	50.1	75.1	112.7	187.8	313.0
375	7.4	36.4	48.5	72.7	109.1	181.8	303.1
400	6.5	34.7	46.3	69.4	104.2	173.6	289.3
425	5.5	28.8	38.4	57.5	86.3	143.8	239.7
450	4.6	23.0	30.7	46.0	69.0	115.0	191.7
475	3.7	17.4	23.2	34.9	52.3	87.2	145.3
500	2.8	11.8	15.7	23.5	35.3	58.8	97.9
538	1.4	5.9	7.9	11.8	17.7	29.5	49.2

Working Pressure by Classes , Psig							
Class Temp., F	150	300	400	600	900	1500	2500
-20 to 100	285	740	985	1480	2220	3705	6170
200	260	680	905	1360	2035	3395	5655
300	230	655	870	1310	1965	3270	5450
400	200	635	845	1265	1900	3170	5280
500	170	605	805	1205	1810	3015	5025
600	140	570	755	1135	1705	2840	4730
650	125	550	730	1100	1560	2745	4575
700	110	530	710	1060	1590	2655	4425
750	95	505	675	1015	1520	2535	4230
800	80	410	550	825	1235	2055	3430
850	65	320	425	640	955	1595	2655
900	50	230	305	460	690	1150	1915
950	35	135	185	275	410	685	1145
1000	20	85	115	170	255	430	715

How to Order

Valve figure Number Explanation

Example:

BT02RF600FGS-SE

Valve Type
B-Ball Valve

Ball Type
T-Trunnion-Mounted
F-Floating

Size
1/2-36

End Connection
BW-Butt Welding
Rf-Flaged End-RF
RJ-Flanged End-RTJ

ASME Class
Class 150
Class 300
Class 600
Class 800
Class 900
Class 1500
Class 2500

Accessories
SE-Stem Extension

Body Type
S-Split Body
A-All Welded

Operation
G-Gearbox
A-Actuator
W-wrench

Bore
F-Full-Bore
R-Rrduced-Bore

How to Read NamePlate	
1	valve serial Number
2	Nominal Valve size (Inches)
3	ASME Pressure Class
4	Seat material
5	Stem material

How to Read NamePlate	
6	Ball material
7	Body material
8	Applied design code
9	Maximum Operationg Pressure at Maximum Operating Temperature
10	Maximum Operating Pressure at Minimum Operating Temperature