Best Technology, Best Service

FORCE®

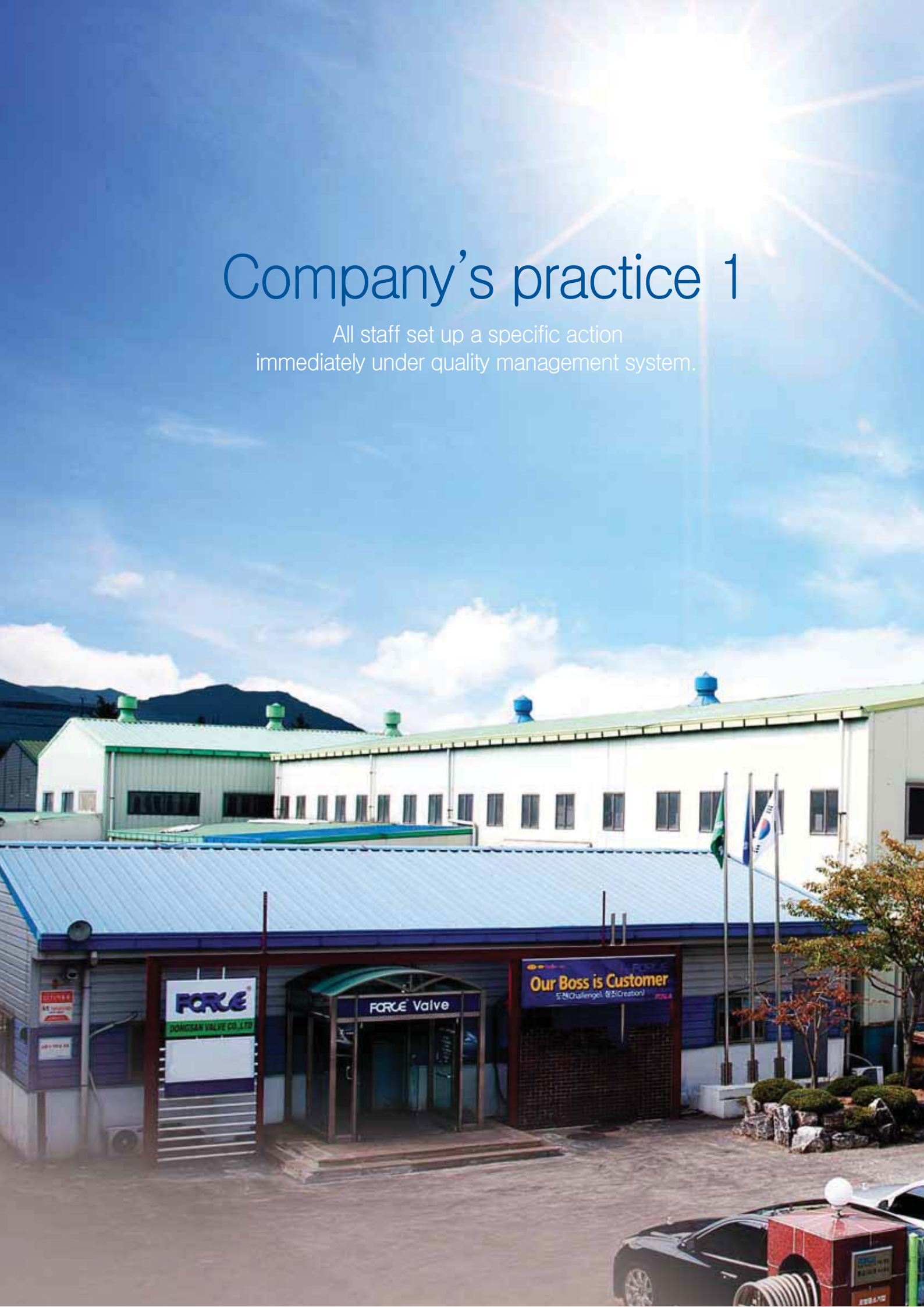
www.force-valves.com

Dongsan Valve Co., Ltd.

Best Technology, Best Service

Company's practice 1

All staff set up a specific action
immediately under quality management system.



Contents

COMPANY INTRODUCTION

Dongsan Valve (Brand : FORCE) Cast Steel and Stainless Steel Valves are utilized widely in Oil & Gas, Petrochemical Industry and Chemical processing plants both in Korea and worldwide.
The wide experience of Dongsan Valve gained from design and manufacture supply the finest casting steel valves with the best qualities to meet market requirements for industrial applications.

Quality assurance is recognized as a management function and quality control is implemented by achieving the highest degree of standardization for varied applications in production and elaborating In-house testing procedure basis on internationally recognized standards.

Dongsan Valve is being controlled by thorough quality management system and has a lot of Know-how as well as technique power.

Furthermore we received quality certificates from many customers by means of satisfying customer' requirements.

COMPANY HISTORY

Since 1980 Foundation

1983 **05** Established DONGSAN VALVE [Seokyo-Dong, Yeosu City]
11 Delivered valves and pumping products to 'YEOCHUN NCC' chemical complex
12 LG Chemical Co., Ltd. business registration.

Since 1990 Improvement

1992 **11** Obtained LG Chemical Co., Ltd. best cooperative partner

1994 **04** Awarded best supplier to LG Chemical Co., Ltd.
10 Incorporated Dongsan Valve Co., Ltd. [CEO-JEONG MYUNG-JU]
11 Established as a valve Manufacturing Company Kace Co., Ltd. [Gimhae plant]

1995 **10** Obtained the Lloyd's certificate for Ball valve of Fire Safe type approval

1996 **08** Authorized API Monogram
10 Moved Head office [Hwajang-Dong, Yeosu]

1997 **07** Certified ISO 9001 from ABS QE in U.S.A

1998 **02** Registered as a vendor for LG Engineering Co., Ltd.
04 Started with Expansion of Casting Foundry

1999 **11** Moody certificate for fire safe type approval according to API 607 4th Edition for high pressure valves

Since 2000 Growth

2000 **11** Korea trade day of the 1 million dollar export tower Prize

2001 **01** Moved factory in Gimhae City
03 Selected Defense Procurement Agency, Public Procurement Service Delivery and eligible supplier
03 Established Daesan office
03 Obtained LG DAGU Chemical Co., Ltd. best cooperative partner in China

2002 **03** Obtained the CE Mark(PED/97/23/EC) Certificate for Ball V/V from B.V.
12 Awarded Prime Minister, Minister of Commerce, industry and water

2003 **03** Combined Dongsan Co., Ltd. and Kace Co., Ltd.
(AGENT : SAMWOO KJS TEC, 3Z, SWI, TECHNOVA CO.,LTD. , SUNGKWANG BEND, UNICOM VALVE, HYUNWOO INDUSTRIAL CO.,LTD. , CCI USA, ASAHI AV VALVE CO.,LTD. , A-SUNG VALVE, DONGYANG F&C, PEACH VALVE, SUSUNG VALVE, WOOSUNG VALVE, AJU FITTING CO.,LTD. , DHP ENGINEERING)
12 Contracted with C&C as sole agency

2004 **03** Involved LG Chemical factory expansion in China
TIANJIN LG DAGU CHEMICAL CO., LTD. (PVC PROJECT)
TIANJIN LG BOHAI CHEMICAL CO., LTD. (VCM PROJECT)
NINGBO LG YONGXING CHEMICAL CO., LTD. (ABS PROJECT)
11 Korea trade day of the 3 million dollar export tower Prize
12 Registered trade mark FORCE in Korea, U.S.A and Malaysia
Certified the clean factory by the minister of labor
Obtained two patents for ball valve

2005 **04** Obtained Fire Safe Certificates for Trunnion and Reduced port ball Valve from ABS.
Registered Korea Electric Power-Plant

2006 **11** Korea trade day of the 5 million dollar export tower Prize

2009 **10** Opened Seoul Office [Deungchon-Dong, Seoul]
11 Korea trade day of the 10 million dollar export tower Prize
12 Obtained SERVEONE' best cooperative partner

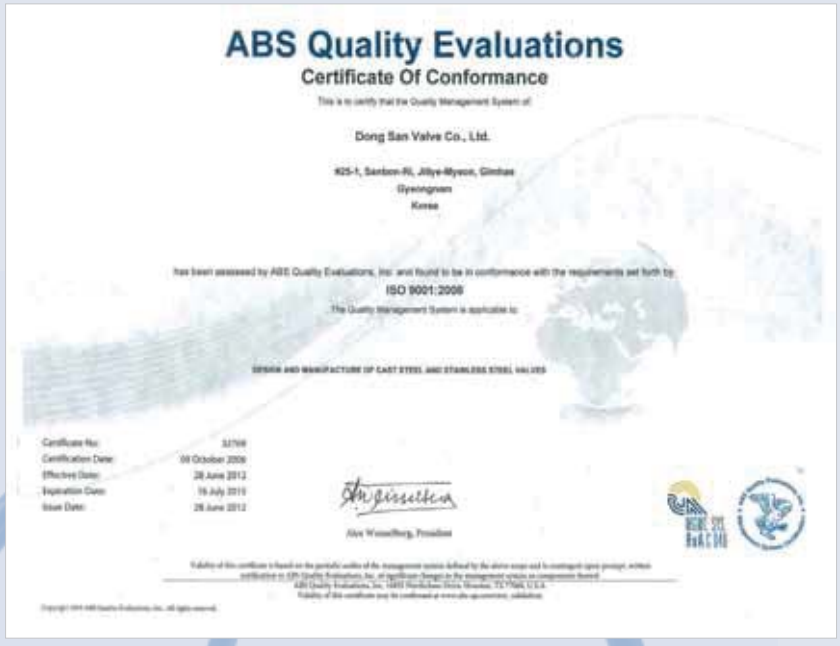
Since 2010 Enterprise

2010 **02** Performed Hyundai Engineering and construction projects in Colombo
07 Established a Shanghai branch in China
08 Performed Linde Engineering RRE2 project in U.A.E

2011 **04** Delivered to Hanwha Chemical Corporation in China
10 Certified Russia GOST

2012 **03** Established Dongsan Sales Co., Ltd. [Mugyo-dong, Seoul]
07 Inaugurated Seong-Kyu, Kim as C.E.O
12 Korea trade day of the 30 million dollar export tower Prize
Registered as a vendor for POSCO E&C

CERTIFICATES



ABS Quality Evaluations

Certificate Of Conformance

This is to certify that the Quality Management System of:

Dong San Valve Co., Ltd.

625-1, Sanbon-Ri, Jillye-Myeon, Gimhae

Gyeongnam

Korea

has been assessed by ABS Quality Evaluations, Inc. and found to be in conformance with the requirements set forth by:

ISO 9001:2008

The Quality Management System is applicable to:

DESIGN AND MANUFACTURE OF CAST STEEL AND STAINLESS STEEL VALVES

Certificate No: 32769

Certification Date: 09 October 2009

Effective Date: 28 June 2012

Expiration Date: 16 July 2015

Issue Date: 28 June 2012

Alex Wasselberg, President

Validity of this certificate is based on the periodic audits of the management system defined by the above scope and is contingent upon prompt, written notification to ABS Quality Evaluations, Inc. of significant changes in the management system or components thereof.

ABS Quality Evaluations, Inc. 16855 Northchase Drive, Houston, TX 77060, U.S.A.

Validity of this certificate may be confirmed at www.abs-qe.com/cert_validation

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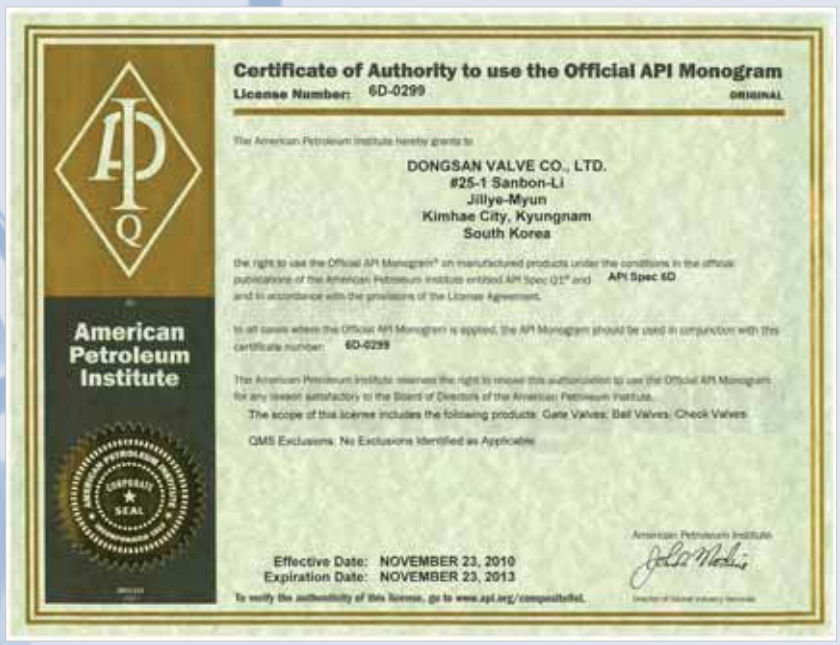
ISO 9001



Certificate of Authority to use the Official API Monogram

License Number: 6D-0299 ORIGINAL

The American Petroleum Institute hereby grants to

DONGSAN VALVE CO., LTD.
#25-1 Sanbon-Li
Jillye-Myun
Kimhae City, Kyungnam
South Korea

the right to use the Official API Monogram® on manufactured products under the conditions in the official publications of the American Petroleum Institute entitled API Spec Q1® and API Spec 6D and in accordance with the provisions of the License Agreement.

In all cases where the Official API Monogram is applied, the API Monogram should be used in conjunction with this certificate number: 6D-0299

The American Petroleum Institute reserves the right to revoke this authorization to use the Official API Monogram for any reason satisfactory to the Board of Directors of the American Petroleum Institute.

The scope of this license includes the following products: Gate Valves; Ball Valves; Check Valves

QMS Exclusions: No Exclusions Identified as Applicable

American Petroleum Institute

Effective Date: NOVEMBER 23, 2010
Expiration Date: NOVEMBER 23, 2013

To verify the authenticity of this license, go to www.api.org/compositelist.

API 6D

ATTESTATION D'APPROBATION DE SYSTEME DE QUALITE
CERTIFICATE OF QUALITY SYSTEM APPROVAL
N° CE-PED-H-KCL 001-11-KOR

DONGSAN VALVE CO., LTD.

FORCE

Cast Ball Valve

Trunnion type ball valve : TR, Floating type ball valve : FL.

BV CE Certificate 1

ANNEXE à l'attestation d'approbation de système de qualité
ANNEX to the certificate of quality system approval
N° CE-PED-H-KCL 001-11-KOR

Liste des équipements concernés
List of the concerned equipment

Trunnion type ball valve

Floating type ball valve

BV CE Certificate 2

РОССИЙСКАЯ ФЕДЕРАЦИЯ
СЕРТИФИКАТ СООТВЕТСТВИЯ

GOST

CERTIFICATES

FIRE SAFETY

QUALITY

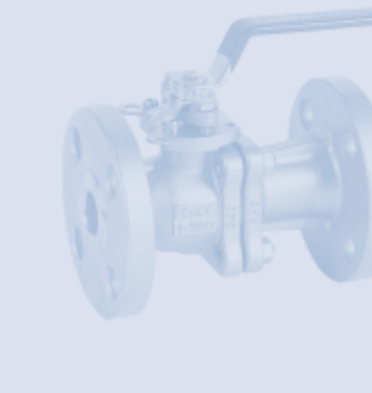
FORCE Valve quality is guaranteed by the strictest adherence to the ISO 9000 and API Q1 audited quality standards.
We at **FORCE** Valve have dedicated ourselves to providing the highest quality valve products to meet our customers expectations.
FORCE Valves are manufactured in strict accordance with all applicable ANSI, API and other standards.
Every valve is tested and documented to the API 598 and API 6D testing requirements.
Our valves are manufactured to comply with NACE standards with complete MTR traceability.

Contents

FLOATING BALL VALVE

TRUNNION BALL VALVE

FLOATING BALL VALVE FEATURES



General

FORCE floating ball valves are designed in accordance with API 608 or ISO17292(BS5351) for ANSI Class ratings 150 to 2500, Nominal sizes from 1/2" to 12". Valves have been designed for use with various combinations of materials such as; Carbon Steel, Low Carbon Steel, Special Alloy, Stainless Steel, Monel, Inconel.

Body Joint Construction

The one piece unibody end entry design, graphite ring or o-ring, Viton (upon request) seals ensure absolute seal integrity. The two piece bolted body designs include a tight toleranced overlapping metal fit between the body and the adapter to minimize any possibility of movement due to pipeline stress. A special high temperature spiral wound stainless steel / grafoil filled gasket is utilized for absolute seal. This gasket is encapsulated by the body and adapted on all four sides. Body and adaptors are dimensioned for metal contact to ensure correct gasket crush.

Blow-Out Proof Stem

Stem is made separately from the ball, anti blow-up design with suitable PTFE and graphite rings and antistatic device.
The lower end of the stem is designed with an integral collar to be blowout-proof. It also functions as the backseat for assured stem sealing. (Fig. 1)

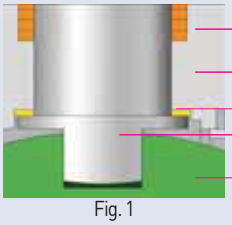


Fig. 1

Anti-Static Device

All floating flanged ball valves include dual grounding systems from stem to ball and stem to body. Valve testing to ISO17292(BS5351) was performed for all sizes, and witnessed by a third party inspection company.
An antistatic feature is provided to ensure electrical continuity for assured stem sealing. (Fig. 2)

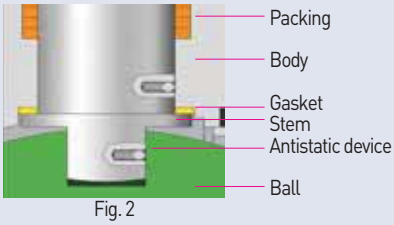


Fig. 2

Top Works

Stem head design provides mounting of the lever handle always in parallel to the flow passage. Facility for mounting a locking device for prevention of accidental valve operation is provided (Fig. 3)

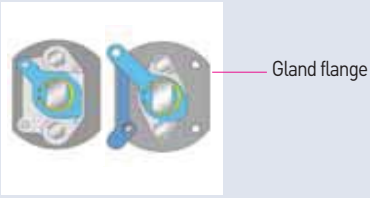
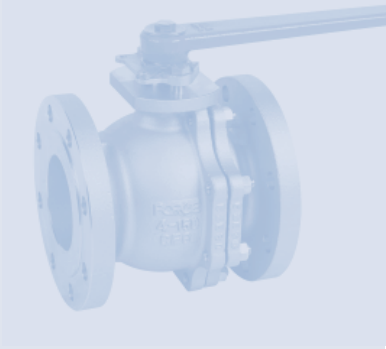


Fig. 3



Fire Safety

All fire-safe valves conform to API 607 and API 6FA standards. When a fire accident occurs at a jobsite where the valve is operating, components such as seat ring, stem back seat, stem packing and mid-flange gasket which made of non-metallic material such as PTFE were broken or destroyed. However, FORCE's particularly metal to metal added seal seated designed ball valves can effectively control external or interal leakage.
FORCE's soft seated fire safety designed as follows: (Fig. 4~ 9)

Longevity of Life

Special consideration was devoted to the attainment of enhanced life and operation of our valve throughout design, development, testing and manufacturing stages.
Valve designs combined with the selection of advanced materials are such that long periods of inactivity should not affect the operations of efficiency.

Contact between stem and valve shell

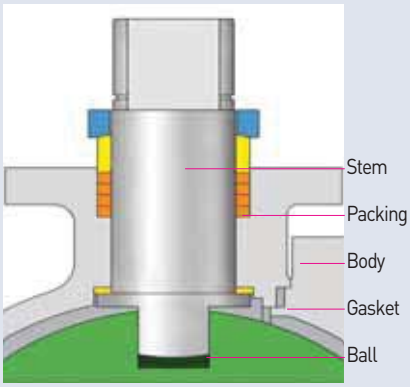


Fig. 4 (Before Fire)

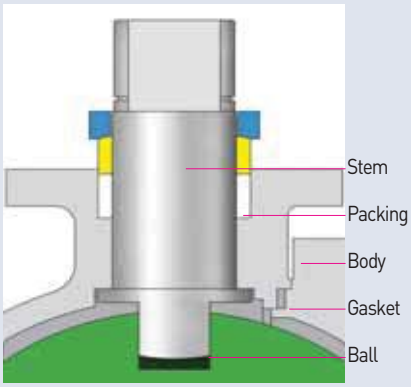


Fig. 5 (After Fire)
Metal-to-metal contact

Contact between ball and valve shell

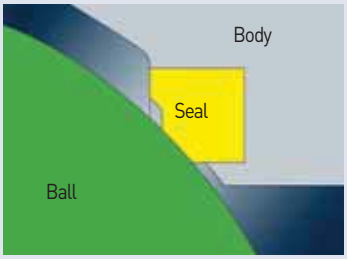


Fig. 6 (Before Fire)

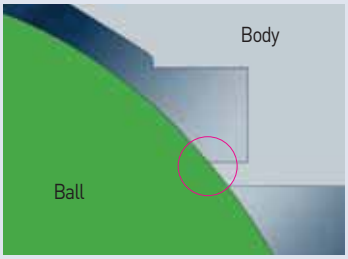


Fig. 7 (After Fire)
Metal-to-metal contact

Valve shell coupling flanges of split body design

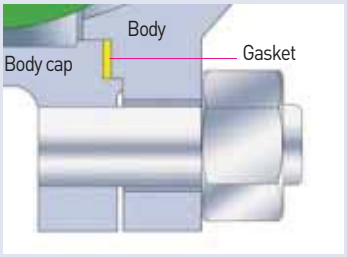


Fig. 8 (Before Fire)

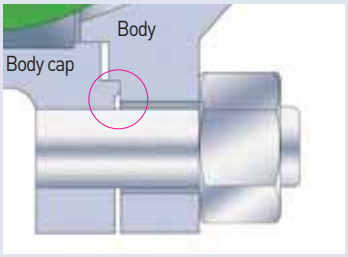


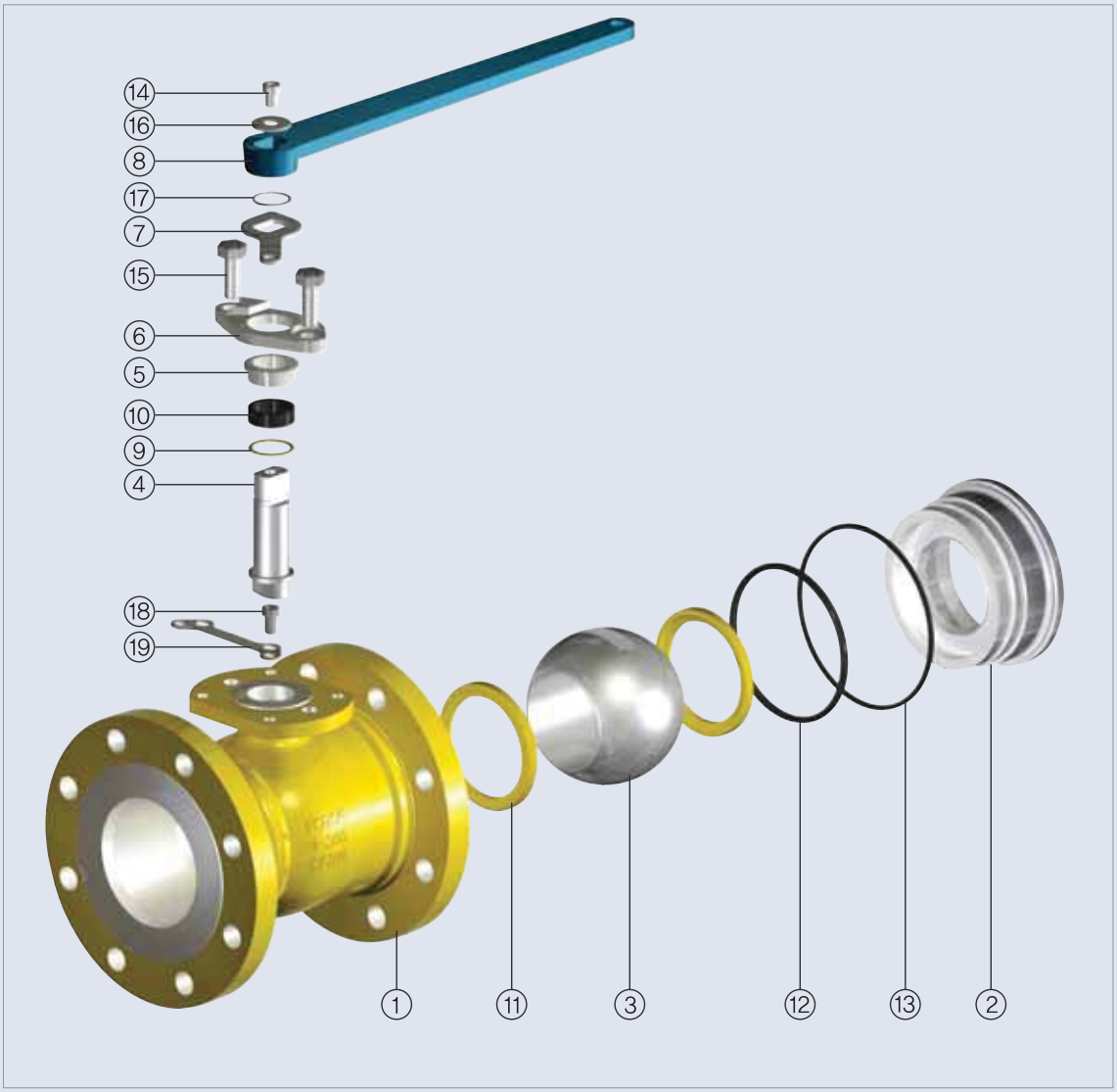
Fig. 9 (After Fire)
Metal-to-metal contact

PARTS LIST AND MATERIAL SPECIFICATIONS (TYPICAL) BU

MODEL BU

No.	Part Name	Q'ty	Carbon Steel	Stainless Steel
1	Body	1	A216-WCB	A351-CF8M
2	Insert	1	A217-WCB	A351-CF8M
3	Ball	1	A351-CF8M	A351-CF8M
4	Stem	1	A276-316	A276-316
5	Gland	1	A276-316	A276-316
6	Gland Flange	1	A351-CF8	A351-CF8
7	Stopper	1	A240-304	A240-304
8	Handle	1	Ductile Cast Iron	Ductile Cast Iron
9	Thrust Washer	1	RTFE	RTFE
10	Gland Packing	1set	Graphite+Carbon Fiber	Graphite+Carbon Fiber

No.	Part Name	Q'ty	Carbon Steel	Stainless Steel
11	Seat	2	RTFE	RTFE
12	O-ring	1	VITON	VITON
13	Gasket	1	Graphite	Graphite
14	Handle Bolt	1	A193-B8	A193-B8
15	Gland Bolt	2	A193-B8	A193-B8
16	Top Washer	1	A240-304	A240-304
17	Snap Ring	1	A686-W1 + Ni Plated	A686-W1 + Ni Plated
18	Locking Device bolt	2	A307-B	A193-B8
19	Locking Device	1	SS400+ Zn Plated	A240-304

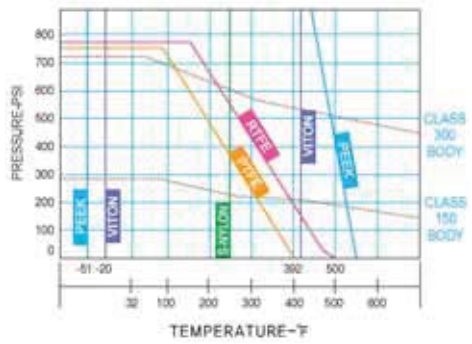


ENGINEERING DATA BU

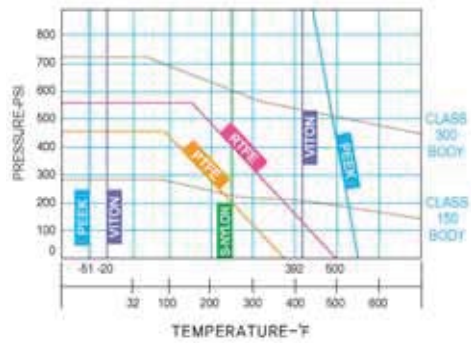
MODEL BU

Pressure / Temperature Ratings for Model BU

REDUCED PORT 2" ~ 6"



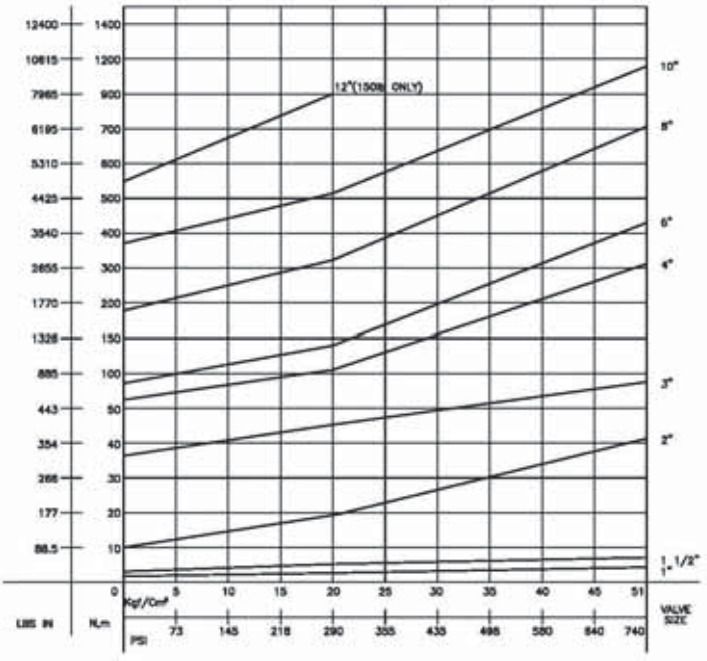
REDUCED PORT 8" ~ 10"

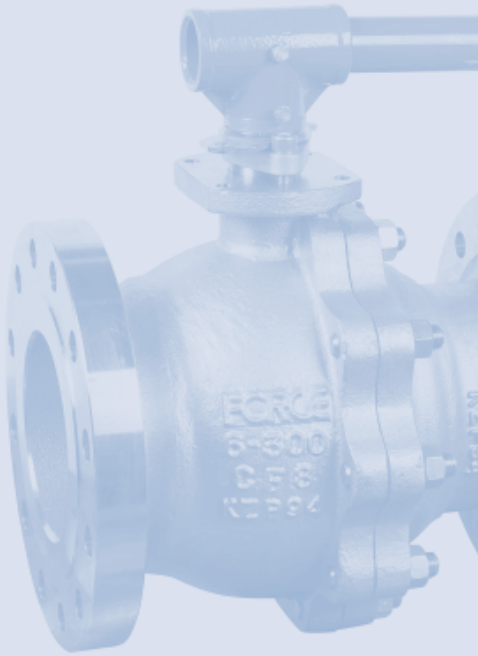


The dotted lines indicate Working Pressures for casting stainless steel bodies. (ASTM A351-CF8M)
The operating temperature of the valves is limited by the material of seat and seal.

Torque Data for MODEL BU

Seat Material: Reinforced PTFE. When selecting an actuator, add a 25% safety factor to the required torque.



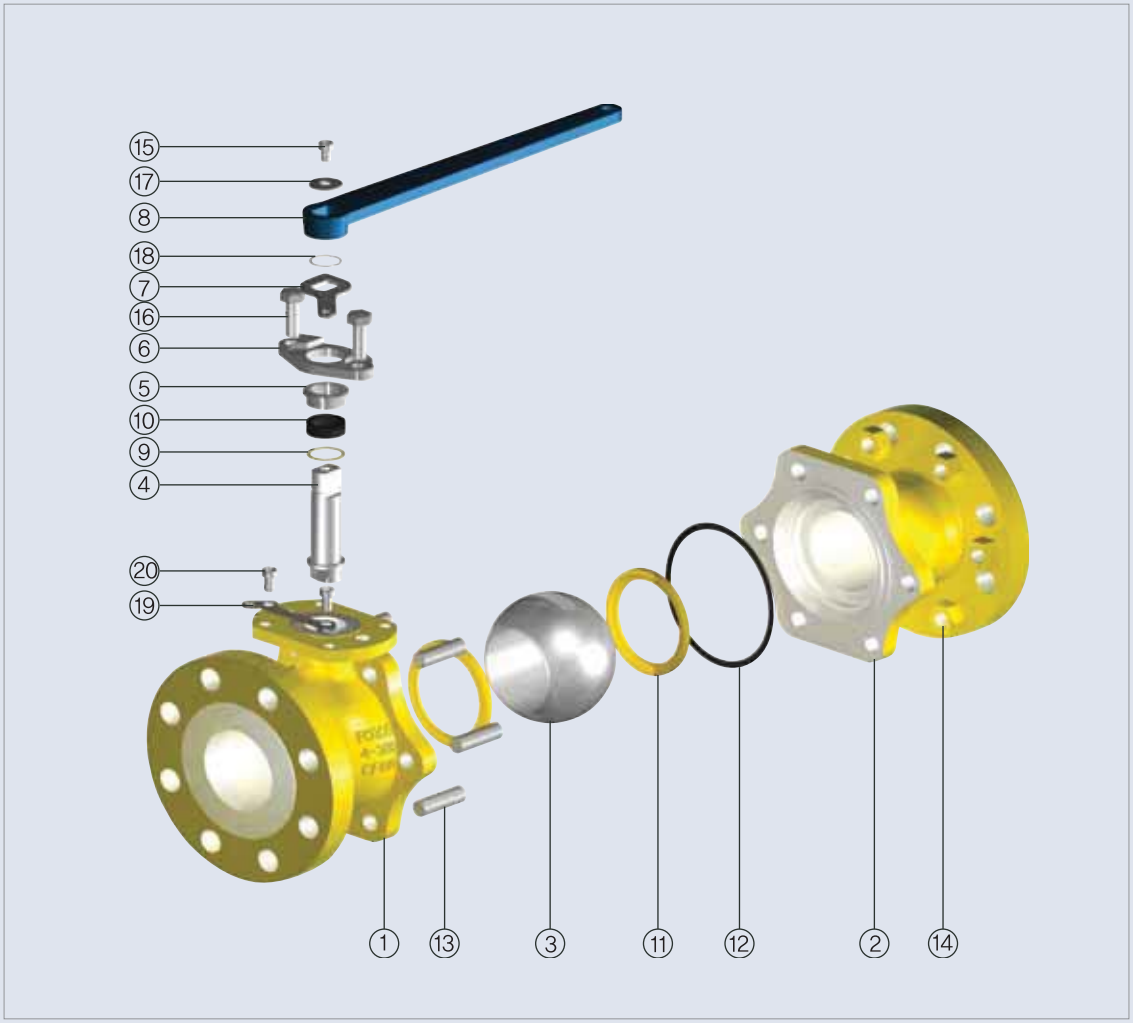


PARTS LIST AND MATERIAL SPECIFICATIONS (TYPICAL) BF

MODEL BF

No.	Part Name	Q'ty	Carbon Steel	Stainless Steel
1	Body	1	A216-WCB	A351-CF8M
2	Cap	1	A217-WCB	A351-CF8M
3	Ball	1	A351-CF8M	A351-CF8M
4	Stem	1	A276-316	A276-316
5	Gland	1	A276-316	A276-316
6	Gland Flange	1	A351-CF8	A351-CF8
7	Stopper	1	A240-304	A240-304
8	Handle	1	Ductile Cast Iron	Ductile Cast Iron
9	Thrust Washer	1	RTFE	RTFE
10	Gland Packing	1set	Graphite+Carbon Fiber	Graphite+Carbon Fiber

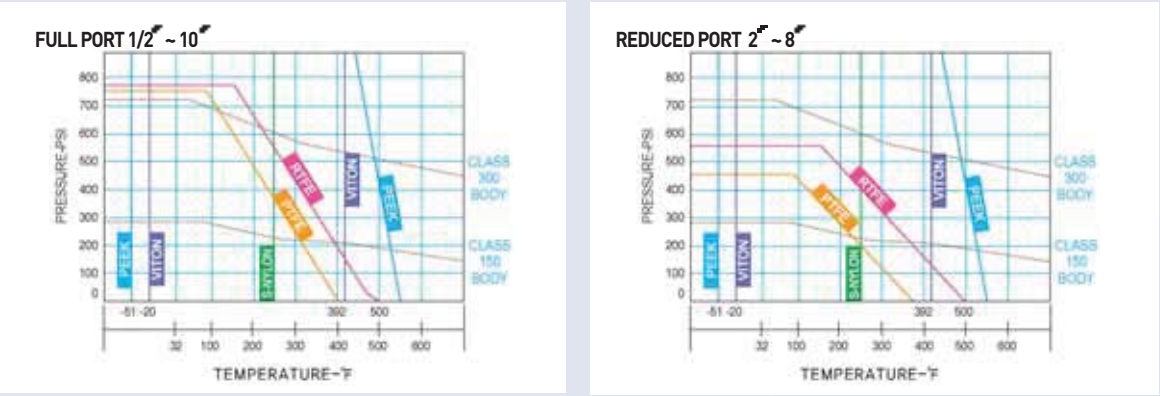
No.	Part Name	Q'ty	Carbon Steel	Stainless Steel
11	Seat	2	RTFE	RTFE
12	Gasket	1	SPW304+Graphite	SPW316+Graphite
13	Cap Bolt	1set	A193-B7	A193-B8
14	Cap Bolt Nut	1set	A194-2H	A194-8
15	Handle Bolt	1	A193-B8	A193-B8
16	Gland Bolt	2	A193-B8	A193-B8
17	Top Washer	1	A240-304	A240-304
18	Snap Ring	1	A686-W1 + Ni Plated	A686-W1 + Ni Plated
19	Locking Device	1	SS400+ Zn Plated	A240-304
20	Locking Device bolt	2	A307-B	A193-B8



ENGINEERING DATA BF

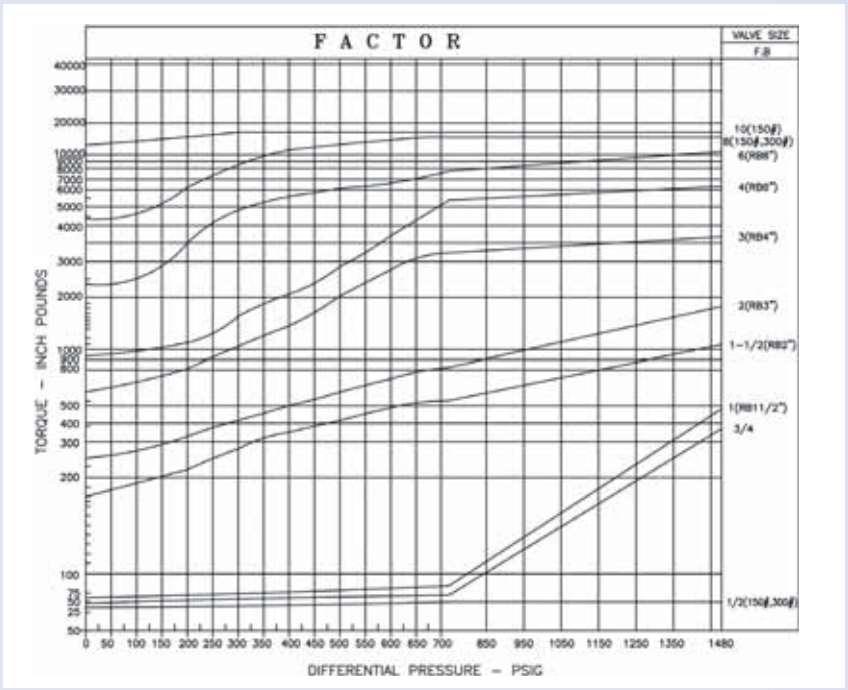
MODEL BF

Pressure / Temperature Ratings for Model BF



The dotted lines indicate Working Pressures for casting stainless steel bodies. (ASTM A351-CF8M)
The operating temperature of the valves is limited by the material of seat and seal.

Torque Data for MODEL BF

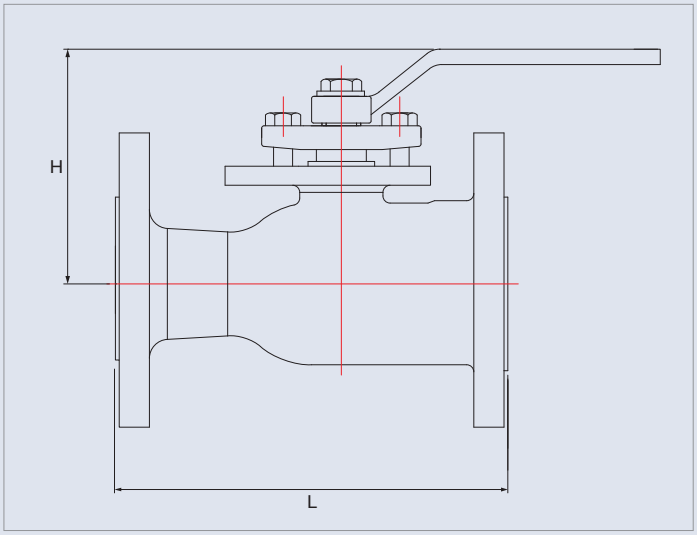


Seat Material: Reinforced PTFE. When selecting an actuator, add a 25% safety factor to the required torque. For other sizes not listed, contact Force.

FLOATING BALL VALVES ANSI 150 & 300

BU Series

Reduced bore: sizes 1-1/2" to 12"
For pipeline, oilfield or process Industry



Standard Materials

Body: Carbon Steel (WCB, LCB)
Stainless Steel (CF8, CF8M)
Ball: Stainless Steel (CF8, CF8M)
Stem: SS304, SS316
Seats: PTFE, RTFE, Modified TFE

CLASS 150 DIMENSIONS Units : inch / mm

NPS	1 1/2	2	2 1/2	3	4	6	8	10	12
d (Bore)	1	1.5	2	2.32	3	4	5.67	7.32	8.66
	25	38	51	59	76	102	144	186	220
L	6.5	7	7.5	8	9	10.5	11.5	13	14
	165	178	191	203	229	266.7	292	330	355.5
H	4	5	5.6	6.1	6.7	8.1	10.9	12.8	16.5
	102	127	142	154	170	206	278	325	419
Cv Value	106	153	276	317	449	899	1,180	3,277	4,350

CLASS 300 DIMENSIONS Units : inch / mm

NPS	1/2	2	3	4	6	8	10
d (Bore)	1	1.5	2.32	3	4.1	5.67	7.4
	25	38	59	76	102	144	203
L	7.5	8.5	11.14	12	15.87	16.5	18
	191	216	283	305	403	419	459
H	4	5	6.1	6.7	8.1	10.9	12.8
	102	127	154	170	206	378	325
Cv Value	106	156	361	533	1,039	1,402	3,277

FLOATING BALL VALVES ANSI 150 & 300

BF Series
Full bore: sizes 1/2" to 12"
For oilfield or process industry

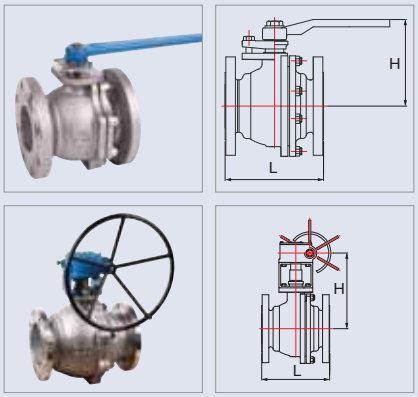
CLASS 150 DIMENSIONS Units : inch / mm

NPS	1/2	3/4	1	1.1/2	2	2.1/2	3	4	6	8	10	12
d (Bore)	0.5	0.75	1	1.5	2	2.5	3	4	6	8	10	12
	13	19	25	38	51	64	76	102	152	203	254	305
L	4.3	4.6	5.0	6.5	7.0	7.5	8.0	9.0	15.5	18.0	21.0	24.0
	108	117	127	165	178	191	203	229	394	457	533	610
H	3.7	3.9	4.0	5.0	5.31	5.7	6.29	7.55	12.2	14.56	18.9	21.3
	94	99	102	127	135	145	160	192	310	370	480	540
Cv Value	26	61	113	270	470	740	1250	2250	5200	9550	15050	23050

CLASS 300 DIMENSIONS Units : inch / mm

NPS	1/2	3/4	1	1.1/2	2	3	4	6	8	10
d (Bore)	0.5	0.75	1	1.5	2	3	4	6	8	10
	13	19	25	38	51	76	102	152	203	254
L	5.5	6	6.5	7.5	8.5	11.1	12	15.9	19.8	22.4
	140	152	165	191	216	283	305	403	502	568
H	3.70	3.89	4	5	5.31	6.29	8.1	12.2	14.56	18.9
	94	99	102	127	135	160	206	310	370	480
Cv Value	26	61	113	270	470	1100	2150	5150	9450	15050

Standard Materials
Body: Carbon Steel (WCB, LCB)
Stainless Steel (CF8, CF8M)
Ball: Stainless Steel (CF8, CF8M)
Stem: SS304, SS316
Seats: PTFE, RTFE, Modified TFE



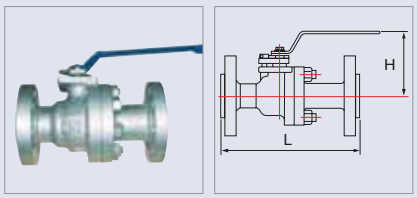
FLOATING BALL VALVES ANSI 600

BF Series
Full bore: sizes 1/2" to 6"
Reduced bore: sizes 2" to 8"
For oilfield or process Industry

CLASS 600 DIMENSIONS Units : inch / mm

NPS	1/2	3/4	1	1.1/2	2	3X2	3X3	4X3	4X4	6X4	6X6	8X6
d (Bore)	0.5	0.75	1	1.5	2	2	3	3	4	4	6	6
	13	19	25	38	51	51	76	76	102	102	152	152
L	6.5	7.5	8.5	9.5	11.5	14	14	17	17	22	22	26
	165	190	210	241	292	356	356	432	432	559	559	660
H	3.85	4.17	4.56	5.55	6.25	6.25	7.75	7.75	9.44	9.44	11.65	11.65
	98	106	116	141	159	159	197	197	240	240	296	296
Cv Value	21	44	75	239	450	250	1050	650	1900	840	4650	2200

Standard Materials
Body: Carbon Steel (WCB, LCB)
Stainless Steel (CF8, CF8M)
Ball: Stainless Steel (CF8, CF8M)
Stem: SS304, SS316
Seats: PTFE, Nylon, PEEK



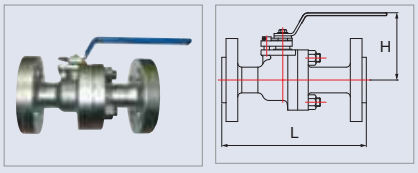
FLOATING BALL VALVES ANSI 900 & 1500

BF Series
Full bore: sizes 1/2" to 2"
For oilfield or process Industry

CLASS 900 & 1500 DIMENSIONS Units : inch / mm

NPS	1/2	3/4	1	1.1/2	2
d (Bore)	0.5	0.75	1	1.5	2
	13	19	25	38	51
L	8.5	9.0	10.0	12.0	14.5
	216	229	254	305	368
H	3.90	4.00	4.50	5.70	6.90
	99	102	115	144	176
Cv Value	14	34	60	180	380

Standard Materials
Body: Carbon Steel (WCB, LCB)
Stainless Steel (CF8, CF8M)
Ball: Stainless Steel (CF8, CF8M)
Stem: SS304, SS316
Seats: Nylon, RTFE or Devlon® PEEK



MATERIALS

BODY & TRIM MATERIAL

CARBON STEEL

A105 A216 WCB A216 WCC

LOW TEMPERATURE CARBON STEEL

A350 LF2 A352 LCB A352 LCC

LOW ALLOY STEEL

AISI 4140 A694 F65 A694 F52
A694 F60 A350 LF3
API 6A 60 K(A694 F60 Mod)

MARTENSITIC STAINLESS STEEL

A182 F6A A182 F6NM
A217 CA15 A487 CA6NM

AUSTENITIC STAINLESS STEEL

A182 F316 A182 F316L
A182 F316 LN-Mod. A182 F347
A182 F44(6% Mo) A182 FXM-19
(UNS S31254) (Nitronic 50)
A351 CF8M A351 CF3
A351 CF3M
PRECIPITATION HARDENING
STAINLESS STEEL
A564 Gr 630 H 1150M (UNS S 17400)

NICKEL ALLOYS

Incoloy 825 (UNS N08825)
Inconel 625 (UNS N06625)
Inconel 750 (UNS N07750)
Monel 400
Monel K500
Incoloy 925 (UNS N09925)
Inconel 718 (UNS N07718)

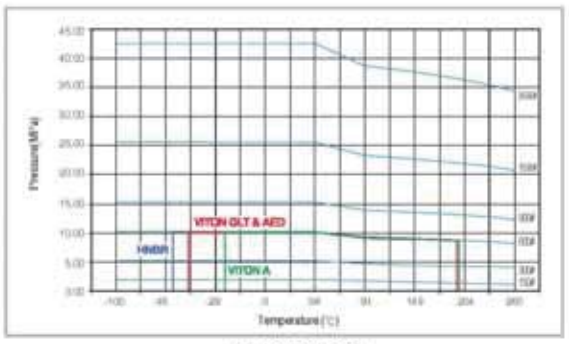
DUPLEX STAINLESS STEEL

A181 F51 (UNS S31803)
A182 F53 (UNS S32750)
A182 F55 (UNS S32760)
A890-4A (UNS S31803)
A890-6A (UNS S32760)

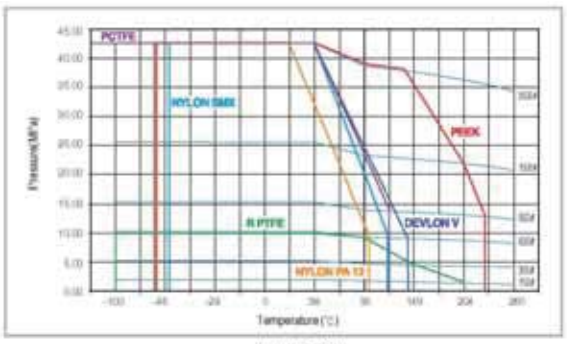
SEAT RING & SEAL MATERIALS OPERATING (DYNAMIC) LIMITS*

MATERIAL	TEMP °C		PRESSURE CLASS		SIZE	
	MIN.	MAX	SEAT RING	SEAL	SEAT RING	SEAL
Nylon SMX	-40	120	2500	N/A	64"	N/A
Lauramid (Nylon 12G)	-60	100	2500	N/A	64"	N/A
Devlon (Nylon 6)	-60	140	2500	N/A	64"	N/A
Peek	-60	220	2500	N/A	36"	N/A
PTFE Glass Filled (25%)	-100	200	600	N/A	24"	N/A
PTFE Carbon Filled (25%)	-100	180	300	N/A	24"	N/A
PCTFE	-196	150	2500	N/A	36"	N/A
HNBR-Therban	-40	150	600	2500	64"	64"
FKM A (Viton A)	-29	180	600	2500	64"	64"
FKM GLT (Viton GLT)	-40	180	600	2500	64"	64"
FKM AED	-29	180	600	2500	64"	64"
PTFE + Elgiloy Springs	-196	200	N/A	2500	N/A	36"

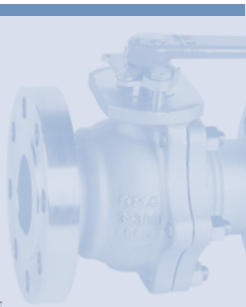
SEAT RING -OPERATING CONDITION



(ELASTOMERS)



(PLASTIC)



MATERIAL FOR SEALING AND SEAT RING

Material	General Temperature Range	USE / Characteristics	Not Recommended for	Properties
FM (Viton A)	-13°F - 400°F (- 25°C ~ 204°C)	aliphatic hydrocarbons (petroleum oil, mineral oil/grease, fuel oils, butane, propane, natural gas), aromatic hydrocarbons (benzene, toluene), chlorinated hydrocarbons, high vacuum, most acids/chemicals	brake fluid with glycol base, ammonia gas, amines, alkalis, acetone, skydrol, ethyl acetate, superheated steam, polar solvents (ketone, acetone, acetic acid, etc), low molecular esters and ethers	excellent resistance for wear, ozone, weather, aging, compression set, permeation
FKM (Viton GLT)	-50°F - 400°F (-45°C ~ 204°C)	extended low temperature service over Viton A. Excellent for water, steam and mineral acids in addition to use of Viton A	same as those of Viton A	similar to those of Viton A except a little inferior compression set and permeability
NBR (Buna-N, Nitrile)	-35°F - 212°F (-37°C ~ 100°C)	aliphatic hydrocarbons (petroleum oil, mineral oil/grease, fuel oils, butane, propane, natural gas) dilute acids, alkali, and salt solutions at low temperature, water	fuels of high aromatic content aromatic hydrocarbons (benzene), chlorinated hydrocarbons, polar solvents (ketone, acetone, acetic acid, ethylene-ester), strong acid, glycol based brake fluid, ozone, weather and atmospheric aging	good resistance for wear, compression set, permeation
PTFE	-400°F - 450°F (-240°C ~ 232°F)	almost all chemicals and solvents including strong acid and alkali, high and very low temperature service.	high mechanical loading	weather resistance, thermal stability, low friction
Nylon 6 + MOS2	-65°F - 250°F (-54°C ~ 121°C)	aliphatic and aromatic hydrocarbons, ketones, acetone, ethers, weak alkalis, and acids, inorganic salt solutions	strong acids and alkali, strong ammonia, sodium hydroxide	excellent load bearing, strength and rigidity, self lubricating, good abrasion resistance
PEEK (polyethereth erketon)	-40°F - 500°F (-40°C ~ 260°C)	superb chemical resistance including alcohols, acids, ammonia, esters, halogenated organics, hydrocarbons and inorganics	some strong acids - nitric, chromic, sulfuric, benzene sulfonic acids and aqua regia, etc, some inorganics - bromine, chlorine and fluorine, etc.	good high temperature performance, wear resistance, very low smoke and toxic gas emission, good hydrolysis resistance
Polymite	- 65°F - 275°F 185°F, water based fluids (-54°C ~ 135°C)	petroleum and water based fluids, phosphate ester fluids, some chlorinated fluids and solvents, ketones, ethylene base glycols	strong acid, alcohols, brake fluids, dry chlorine, water over 185°F	very high sealability, tear strength, abrasion and extrusion resistance

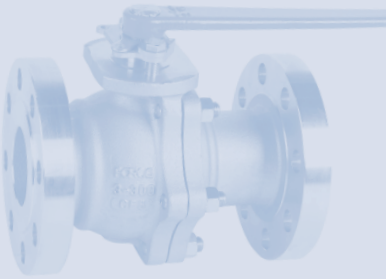
TEMPERATURE LIMITS OF METAL PARTS

Forging	Casting	Low Temperature	High Temperature
A105	A216 WCB	-20° F (-29° C)	800° F (426° C)
A350 LF2	A352 LCB, LCC	-50° F (-46° C)	650° F (343° C)
A182 F 316	A351 CF8M	-425° F (-254° C)	1500° F (815° C)

TYPICAL GASKET SPECIFICATIONS

Type	Material	Low Temperature	High Temperature	Max. Pressure
Spiral wound	316 SS + Graphite	-420° F (-250° C)	1500° F (815° C)	6,250 psi (430bar)
Spiral wound	316 SS + PTFE	-200° F (-129° C)	450° F (232° C)	6,000 psi (415bar)

GEAR ACTUATOR DATA

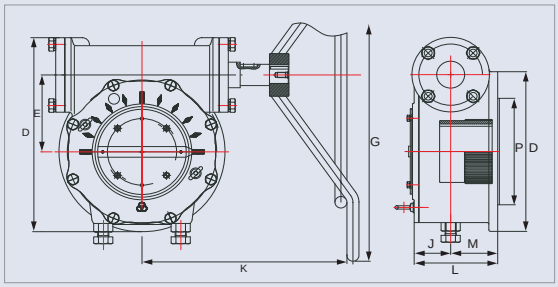


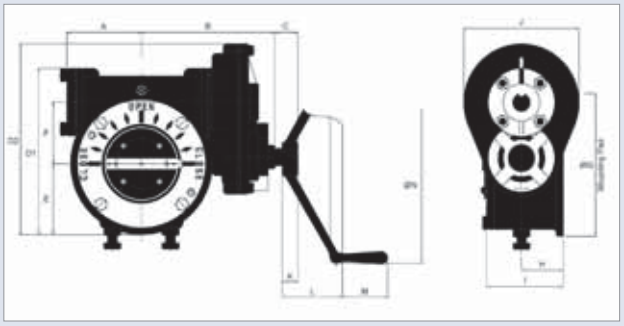
Valve Automation

FORCE is able to offer a comprehensive package of control equipment including actuators, switches, solenoids and positioners. Detail of actuator are available on request.

Gear Operated

The gear operator can be furnished upon request





Part no.	Units	flange size	A	B	C	D1	D2	E	F	G	H	I	J	K	L	M	N	Max. Output Torque (ft-lb)	Weight	
																			lb	kg
G-SBWG-BF	inch	F-07	2.28	-3.58	2.24	4.84	N/A	1.87	1.59	3.74	1.57	3.03	N/A	0.98	5.12	3.94	15.75	236	8.8	4
	mm		58	91	57	123	N/A	47.5	40.5	95	40	77	N/A	25	130	100	400			
G-SBWG-0	inch	F-10	2.83	4.13	2.24	5.94	N/A	2.46	2.09	4.92	1.69	3.23	N/A	0.98	5.12	3.94	15.75	516	13.2	6
	mm		72	105	57	151	N/A	62.5	53	125	43	82	N/A	25	130	100	400			
G-SBWG-00	inch	F-12	3.31	5.35	3.19	7.01	N/A	2.95	2.46	5.91	2.05	3.74	N/A	1.18	5.91	3.94	19.69	738	19.8	9
	mm		84	136	81	178	N/A	75	62.5	150	52	95	N/A	30	150	100	500			
G-SBWG-00-SPUR	inch	F-12	3.29	5.94	1.54	7.01	7.68	2.95	2.46	5.91	2.05	3.74	4.57	1.18	5.91	3.94	19.69	738	28.6	13
	mm		83.5	151	39	178	195	75	62.5	150	52	95	116	30	150	100	500			
G-SBWG-01	inch	F-14	3.66	5.71	3.19	7.99	N/A	3.44	2.95	6.89	2.13	3.82	N/A	1.18	5.91	3.94	19.69	1180	28.6	13
	mm		93	145	81	203	N/A	87.5	75	175	54	97	N/A	30	150	100	500			
G-SBWG-01-SPUR	inch	F-14	3.64	6.30	1.54	7.99	8.70	3.44	2.95	6.89	2.13	3.82	4.57	1.18	5.91	3.94	19.69	1180	37.4	17
	mm		92.5	160	39	203	221	87.5	75	175	54	97	116	30	150	100	500			
G-SBWG-02	inch 1	F-16	4.37	6.65	3.66	9.72	N/A	4.13	3.60	8.27	2.48	4.53	N/A	1.38	8.27	3.94	27.95	1920	46.2	21
	mm		111	169	93	247	N/A	105	91.5	210	63	115	N/A	35	210	100	710			
G-SBWG-02-SPUR	inch	F-16	4.35	7.05	1.73	9.72	10.71	4.13	3.60	8.27	2.48	4.53	5.91	1.38	8.27	3.94	27.95	1920	59.4	27
	mm		110.5	179	44	247	272	105	91.5	210	63	115	150	35	210	100	710			
G-SBWG-03	inch	F-20	124	7.17	3.66	11.34	N/A	4.92	4.45	9.84	2.48	4.61	N/A	1.38	8.27	3.94	27.95	3170	66.1	30
	mm		124	182	93	288	N/A	125	113	250	63	117	N/A	35	210	100	710			
G-SBWG-03-SPUR	inch	F-20	4.88	7.60	1.73	11.34	12.32	4.92	4.45	9.84	2.48	4.61	5.91	1.38	8.27	3.94	27.95	3170	79.2	36
	mm		124	193	44	288	313	125	113	250	63	117	150	35	210	100	710			
G-SBWG-04	inch	F-25	6.10	8.15	3.39	15.20	N/A	6.40	6.02	11.81	2.87	5.71	N/A	1.38	9.06	3.94	31.50	7670	123.5	56
	mm		155	207	86	386	N/A	162.5	153	300	73	145	N/A	35	230	100	800			
G-SBWG-04-SPUR	inch	F-25	6.10	9.57	1.73	15.20	16.46	6.40	6.02	11.81	2.87	5.79	8.03	1.38	9.06	3.94	31.50	7670	154.3	70
	mm		155	243	44	386	418	162.5	153	300	73	147	204	35	230	100	800			
G-SBWG-05	inch	F-30	6.50	8.54	3.39	17.24	N/A	7.38	7.09	13.78	3.07	6.10	N/A	1.38	9.06	3.94	31.50	11720	194	88
	mm		165	217	86	438	N/A	187.5	180	350	78	155	N/A	35	230	100	800			
G-SBWG-05-SPUR	inch	F-30	6.50	9.92	1.73	5.43	18.50	7.38	7.09	13.78	3.07	6.10	8.03	1.38	9.06	3.94	31.50	11720	224.4	102
	mm		165	252	44	138	470	187.5	180	350	78	155	204	35	230	100	800			

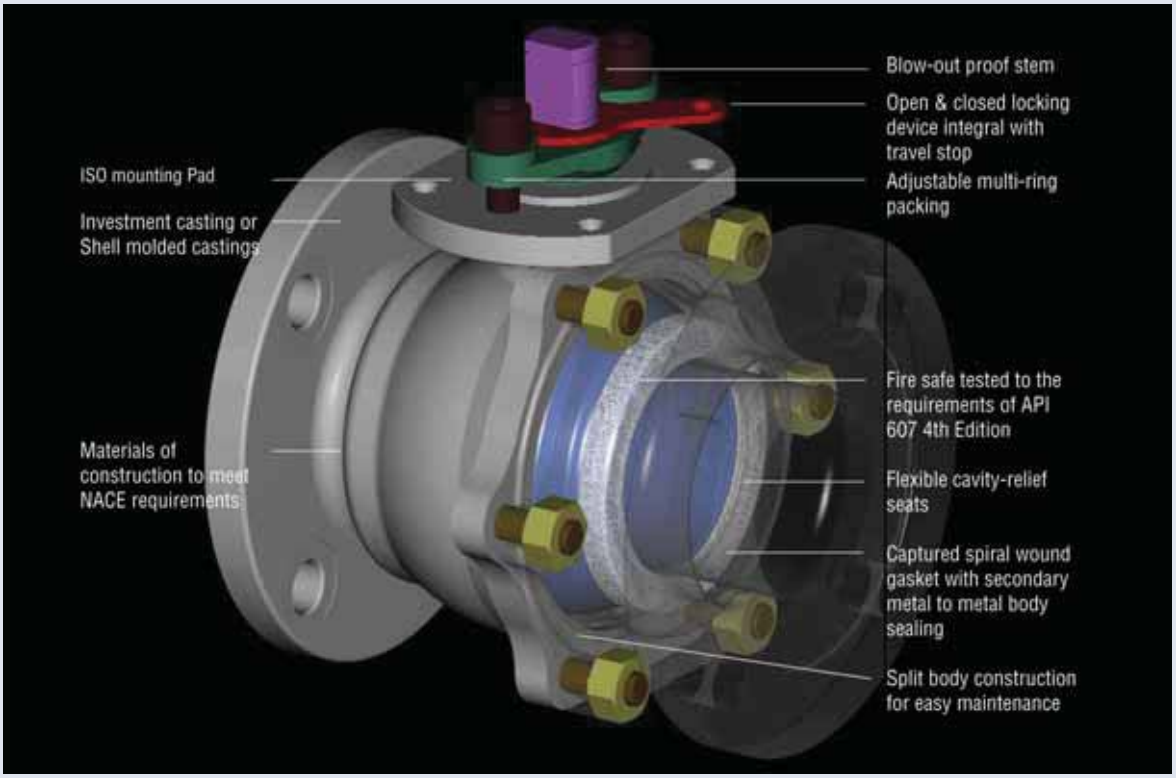
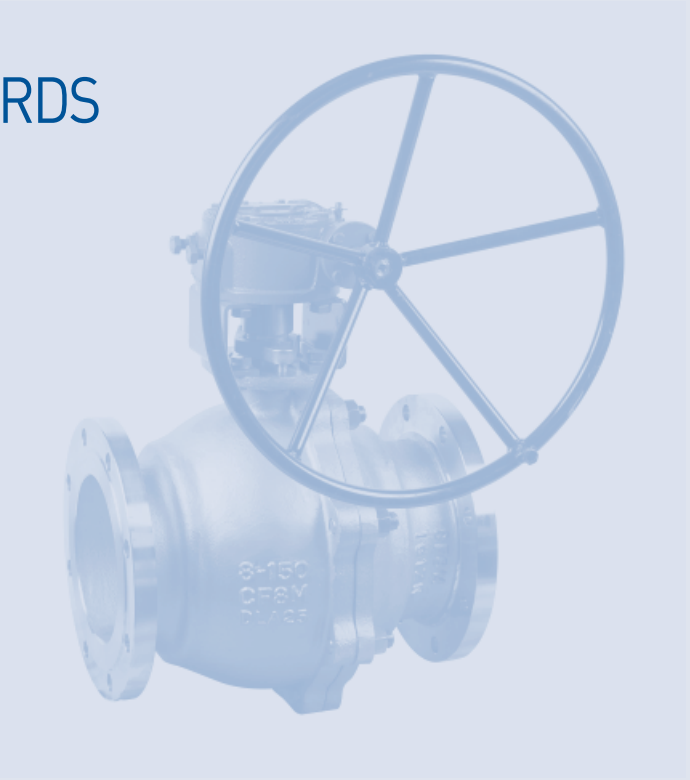


FIGURE NUMBER CODING CHART

BF		1		1		A		A		A		1		L	
VALVE TYPE		BORE		PRESSURE CLASS		BODY MATERIAL		TRIM MATERIAL		SEAT MATERIAL		END CONNECTION		OPERATOR	
BU	1 PIECE BALL VALVE	1	FULL	1	CLASS 150	A	A216-WCB(A105)	A	CS+ENP	A	PTFE	1	RF	E	ELECTRIC ACTUATOR
BF	2 PIECE BALL VALVE	2	REDUCED	2	CLASS 300	B	A351-CF8(F304)	B	304	B	RTFE(GLASS)	2	RTJ		
BN	3-WAY BALL VALVE (90°)	3	REGULAR	3	CLASS 600	C	A351-CF8M(F316)	C	316	C	RTFE(CARBON)	3	WE	P	PNEUMATIC ACTUATOR
BY	3-WAY BALL VALVE (120°)			4	CLASS 900	D	A351-CF3(F304L)	D	304L	D	SUPER TEFLON	4	RF✕WE		
BT	TRUNNION BALL VALVE			5	CLASS 1500	E	A351-CF3M(F316L)	E	316L	E	PFA	5	RTJ✕WE	G	GEAR OPERATOR
BTP	TRUNNION BALL VALVE(INJECTOR)			6	CLASS 2500	F	A351-CN7M	F	ALLOY 20	F	PEEK				
B6A	F6A BALL VALVE			0	OTHER	G	A217-WC1	G	410	G	NYLON			B	BARE STEM
BFM	METAL SEAT BALL VALVE					H	A217-WC6(F11)	Q	DUPLEX	H	METAL			L	LEVER
BFC	CRYOGENIC BALL VALVE					J	A217-WC9(F22)	R	MONEL	I	PCTFE				
BP	POCKETLESS BALL VALVE					K	A352-LCC	S	HASTELLOY	J	DEVLON				
BJ	JACKETED BALL VALVE					L	A352-LC2	T	TITANIUM	K	GRAPHITE				
						M	A352-LC3	X	OTHER	X	OTHER				
						N	A352-LCB(LF2)								
						P	A217-C5								
						Q	DUPLEX								
						R	MONEL								
						S	HASTELLOY								
						T	TITANIUM								
						U	INCONEL								
						X	OTHER								

DESIGN AND TEST STANDARDS



Shell Wall Thickness :	ASME B16.34 & API 6D
Pressure Temprature Rating :	ASME B16.34
Pressure Test :	API 6D and API 598
Face to Face Dimensions :	ASME B16.10
End Flange Dimensions :	ASME B16.5
Casting Inspection :	MSS SP-55
Fire Safety Test :	API 607 4th Edition & API 6FA
General Design :	ASME B16.34 / API 6D / API 608
Material Requirements :	NACE MR0175 Latest Edition
Quality Control :	API Q1 and ISO 9001

CERTIFICATES

- ISO 9001-2008 Certificate of Conformance issued by ABS Quality Evaluations. API 6D Monogram License - Number 6D-0299 issued by API
- BS 6755 Part 2 (1987) Testing of Valves incorporating API 607, 4th Edition, and API 6FA Fire Testing issued by Lloyd's Register
- BS 6755 Part 2 (1987) Testing of Valves incorporating API 607, 4th Edition, and API 6FA Fire Testing issued by Moody International LTD Korea
- Certificate of Witness of Fire Test number 123476-0310 issued by ABS Consulting
- Certificate of Quality System - Approval No. CE-PED-H-KCI. 001-08-KOR covering Floating and Trunnion Ball Valves issued by BUREAU VERITAS
- GOST Certification No. POCC KR AI064 B18723

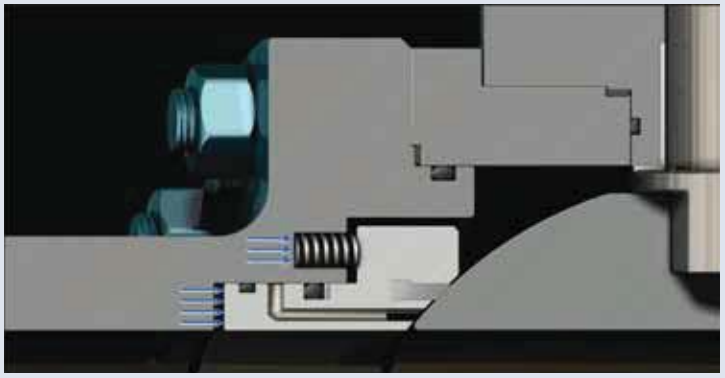
TRUNNION BALL VALVE

TRUNNION BALL VALVE

TRUNNION VALVE FEATURES

Seat To Ball Sealing

Soft seats are standard. Seat inserts of synthetic material such as RTFE, Devlon, or PEEK are contained within a one-piece metal seat ring. With no, or very low, line pressure, sealing between the seats and ball is achieved by the seat springs. As line pressure increases, it begins to work in conjunction with the seat springs to assure the integrity of the seal.

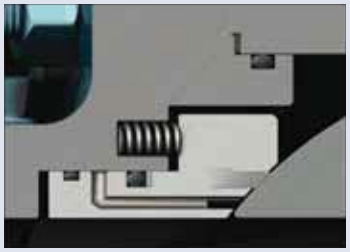


Self Relieving Seat

This standard feature is designed to prevent excessive pressure buildup within the valve by automatically relieving pressure when body cavity pressure exceeds the spring load on the seats. Double Piston Seat is also available as an option.

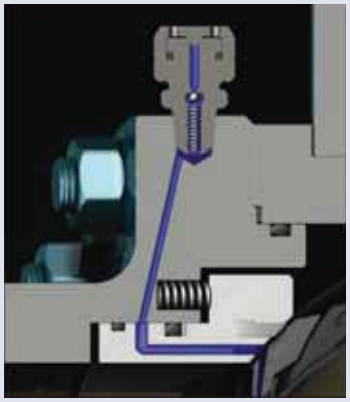
Seat To Body Sealing

Two different types of seals are used to isolate the line pressure from the body cavity. Primary sealing is accomplished by an elastometric seal such as Viton® or HNBR, and secondary firesafe sealing is accomplished by a graphite seal ring.



Sealant Injection Fittings

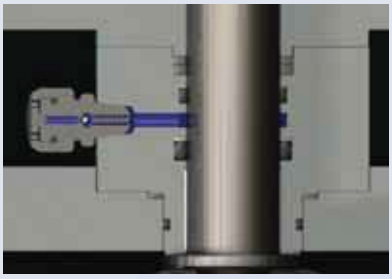
Sealing injection fittings are standard on all Force Trunnion ball valves. If the seat ring becomes damaged, this feature provides the user with an easy way to inject an emergency sealant to restore a tight seal. It also allows for the sealing surfaces of the ball and seat to be periodically flushed to clear away debris which may impair sealing.



TRUNNION VALVE FEATURES

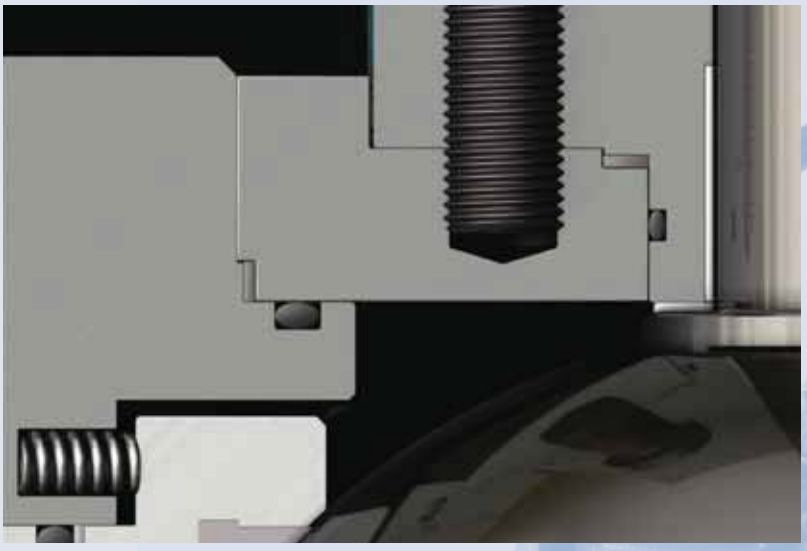
Stem Sealing & Sealant Injection Fitting

ANSI Class 150 through 2500 utilize two "O" Rings and a graphite packing ring to effect a tight stem to body seal. In case of damage to the soft seals, stem seal integrity can be restored by injecting sealant into the sealant injection fitting.



Double Seals at all Joints

All connecting parts employ a double sealing design incorporating a spiral wound 316 SS/graphite gasket and o-ring to ensure positive sealing. Delta ring is used optionally for class 1500. 2500.



Double Block and Bleed

Force Trunnion ball valves incorporate an independent positive seal at both the upstream and downstream ends. In the fully closed position, the body cavity is isolated from upstream/downstream pressure. The body cavity may be vented by use of the body bleed plug to confirm the integrity of the seats.

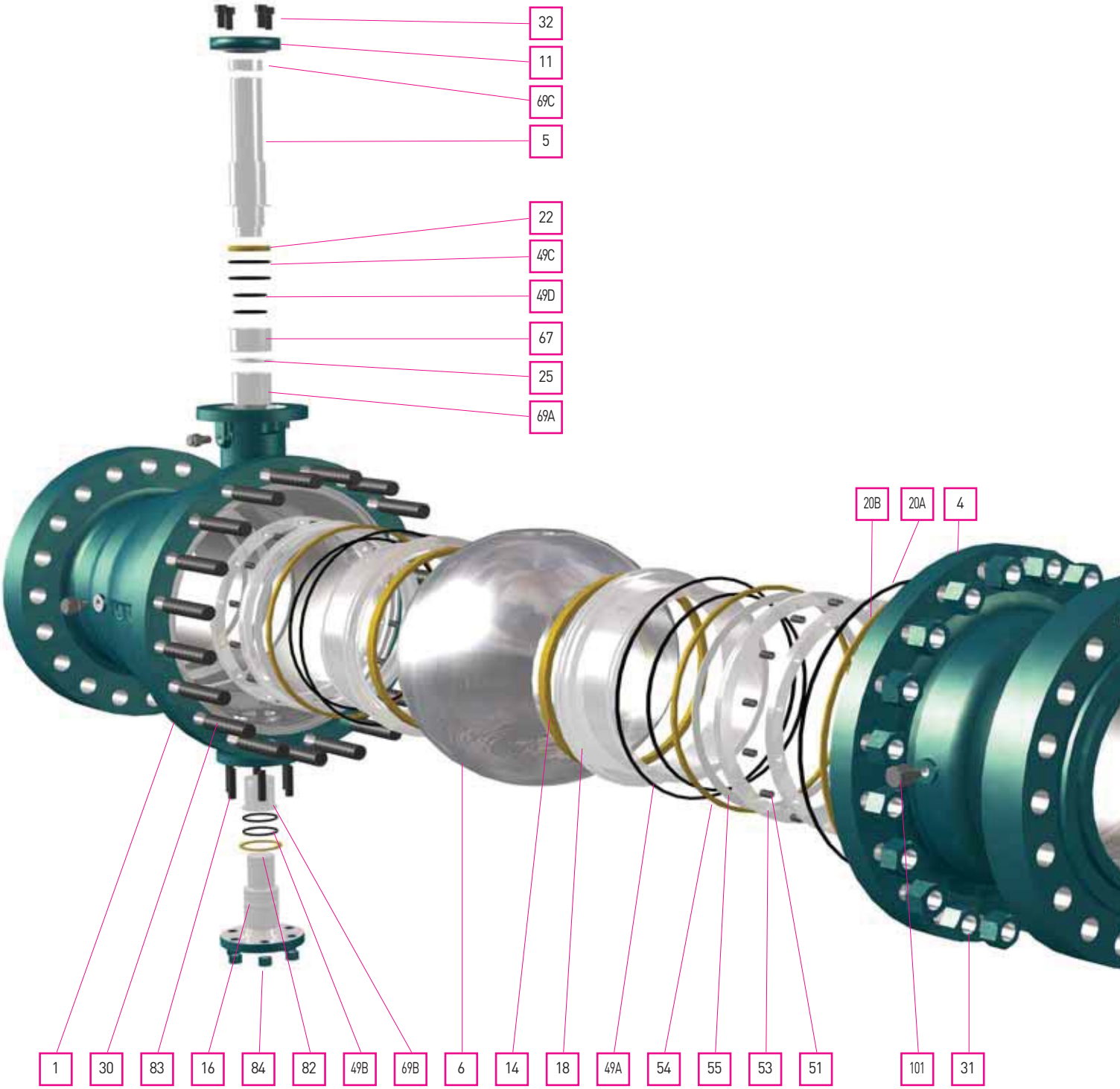
Low Friction Stem / Trunnion Bearings and Thrust Washers

Heavy duty PTFE lined carbon or stainless steel bearing and thrust washers ensure durable and low torque operation.

Other Features

. Anti Static Device for grounding
. Blow-Out proof stem
. Compliance with NACE MR-0175 latest edition
. Fire safe design per API 6FA and API 607
. ISO 5211 Mounting Pad
. Stem Extensions available
. Pup Joints available

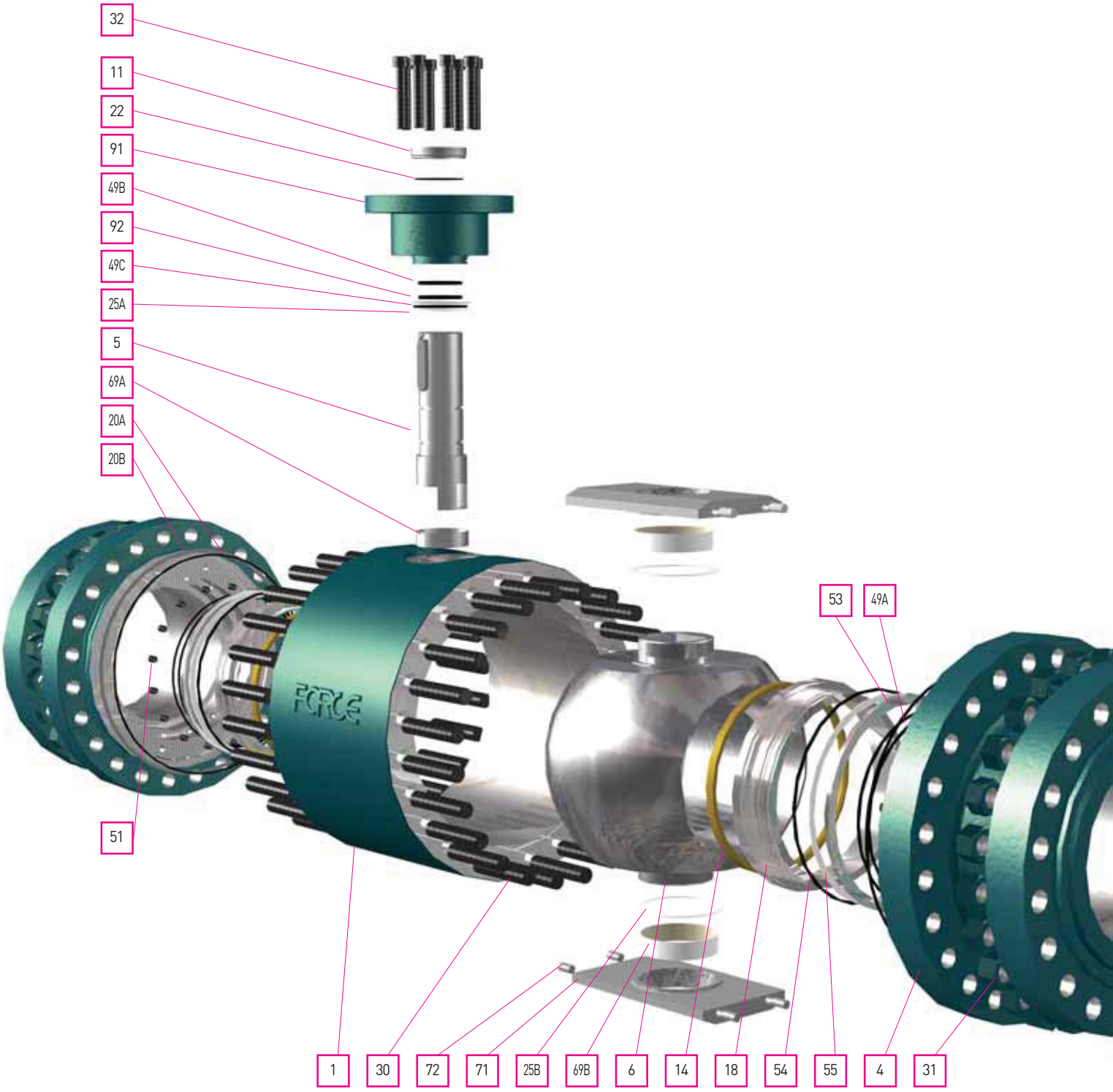
FORCE 2 PIECE TRUNNION PARTS LIST AND



BILL OF MATERIAL (TYPICAL) BT

No.	Part Name	Q'ty	Carbon Steel	Stainless Steel	Low Temp Carbon Steel
1	Body	1	A216 WCB	A351 CF8M	A352 LCC
4	Cap	1	A216 WCB	A351 CF8M	A352 LCC
5	Stem	1	410SS/ENP	316SS	410SS/ENP
6	Ball	1	A216 WCB/ENP	A351 CF8M	A352 LCC/ENP
11	Gland Flange	1	AISI1020	A276 304	AISI1020
14	Seat Ring	2	NYLON		
16	Bottom Cover	1	A216 WCB/ENP	A351 CF8M	A352 LCC/ENP
18	Seat Retainer	2	A216 WCB/ENP	A351 CF8M	A352 LCC/ENP
20A	O-Ring	1	VITON		
20B	Gasket	1	SPW 304 + Graphite	SPW 316 + Graphite	SPW 304 + Graphite
22	Gland Packing	1	Graphite		
25	Thrust Washer	1	A240 316 Teflon Coated		
30	Cap Bolt	1set	A193 B7	A193 B8	A320 L7
31	Cap Bolt Nut	1set	A194 2H	A194 8	A194 7
32	Gland Bolt	1set	AISI4140	A193 B8	AISI4140
49A	O-Ring	2	VITON		
49B	O-Ring	2	VITON		
49C	O-Ring	2	VITON		
49D	O-Ring	2	VITON		
49E	O-Ring	2	VITON		
51	Spring	1set	INCONEL X-750		
53	Seat Insert	2	A216 WCB/ENP	A351 CF8M	A352 LCC/ENP
54	Retainer Seat	2	Graphite		
55	Retainer Seat	2	PTFE		
67	Stem Bushing	1	AISI1020/ENP	A276 316	AISI1020/ENP
69A	Du-Bush	1	COMMERCIAL TEFLON COATED		
69B	Du-Bush	1	COMMERCIAL TEFLON COATED		
69C	Du-Bush	1	COMMERCIAL TEFLON COATED		
82	Bottom Gasket	1	SPW 304 + Graphite	SPW 316 + Graphite	SPW 304 + Graphite
83	Bottom Bolt	1set	A193 B7	A193 B8	A320 L7
84	Bottom Nut	1set	A194 2H	A194 8	A194 7
101	Sealant	1set	AISI1020 Zn Plated	316SS	AISI1020 Zn Plated
103	Bleed Fitting	1	AISI1020 Cr Plated	316SS	AISI1020 Cr Plated

FORCE 3 PIECE TRUNNION PARTS LIST AND



BILL OF MATERIAL (TYPICAL) BTP

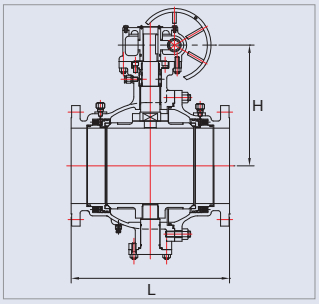
No	Part Name	Q'ty	Carbon Steel	Stainless Steel	Low Temp Carbon Steel
1	Body	1	A105	A182 F316	A350 LF2
4	Cap	2	A216 WCB	A351 CF8M	A352 LCC
5	Stem	1	410SS/ENP	316SS	410SS/ENP
6	Ball	1	WCB or A105/ENP	CF8M or F316	LCC or LF2/ENP
11	Gland Flange	1	AISI1020	A276 304	AISI1020
14	Seat Ring	2	NYLON		
18	Seat Retainer	2	WCB or A105/ENP	CF8M or F316	LCC or LF2/ENP
20A	O-Ring	2	VITON		
20B	Gasket	2	SPW 304+Graphite	SPW 316+Graphite	SPW 304+Graphite
22	Gland Packing	1	Graphite		
25A	Thrust Washer	1	A240 316 Teflon Coated		
25B	Thrust Washer	2	A240 316 Teflon Coated		
30	Cap Bolt	1set	A193 B7	A193 B8	A320 L7
31	Cap Bolt Nut	1set	A194 2H	A194 8	A194 7
32	Gland Bolt	1set	AISI4140	A193 B8	AISI4140
49A	O-Ring	4	VITON		
49B	O-Ring	1	VITON		
49C	O-Ring	2	VITON		
51	Spring	1set	Inconel X-750		
53	Seat Insert	2	A216 WCB/ ENP	A351 CF8M	A352-LCC/ENP
54	Retainer Seat	2	Graphite		
55	Retainer Seat	2	PTFE		
69A	Du-Bush	1	COMMERCIAL TEFLON COATED		
69B	Du-Bush	2	COMMERCIAL TEFLON COATED		
71	Ball Guide	2	AISI1020	A240 316	AISI1020
72	Pin	1set	A276 304	A276 316	A276 304
91	"Mounting Flange"	1	A216 WCB	A351 CF8M	A352 LCC
92	"M/Flange Gasket"	1	SPW 304+Graphite	SPW 316+Graphite	SPW 304+Graphite
101	Sealant	1set	AISI1020 Zn Plated	316SS	AISI1020 Zn Plated
103	Bleed Fitting	1	AISI1020 Cr Plated	316SS	AISI1020 Cr Plated

ANSI 150 WEIGHTS AND DIMENSIONS

Full Bore: Sizes 2" to 48"
Reduced Bore: Sizes 2" to 48"

Standard Materials

Body: A216-Gr. WCB
Trim: Carbon Steel/E.N.P.
Seats: Glass Filled Teflon®
Seals: Viton
(Special materials available on request)



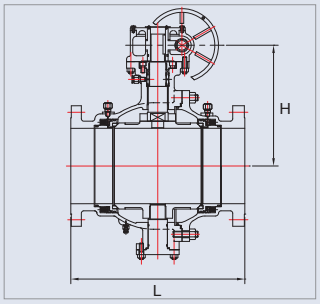
NPS	L		H		Weight	
	n	mm	in	mm	lb	Kg
2 x 1.5	7.0	177.8	6.2	157.0	26.5	12
2 x 2	7.0	177.8	6.5	165.0	35	16
3 x 2	8.0	203.2	6.5	165.0	49	22
3 x 3	8.0	203.2	7.3	186.0	57	26
4 x 3	9.0	228.6	7.3	186.0	88	40
4 x 4	9.0	228.6	9.3	237.0	123	56
6 x 4	15.50	393.70	9.3	237.0	264	120
6 x 6	15.50	393.70	11.4	290.0	275	125
8 x 6	18.00	457.20	11.4	290.0	330	150
8 x 8	18.00	457.20	13.2	335.0	429	195
10 x 8	21.00	533.40	13.2	335.0	506	230
10 x 10	21.00	533.40	16.4	417.0	594	270
12 x 10	24.00	609.60	16.4	417.0	653	296
12 x 12	24.00	609.60	17.9	455.0	1014	460
14 x 12	27.00	685.80	17.9	455.0	1036	470
14 x 14	27.00	685.80	19.1	486.0	1742	790
16 x 14	30.00	762.00	19.1	486.0	1418	643
16 x 16	30.00	762.00	20.6	524.0	2271	1030
18 x 16	34.00	863.60	20.6	524.0	2408	1092
18 x 18	34.00	863.60	23.1	586.0	3043	1380
20 x 18	36.00	914.40	23.1	586.0	3308	1500
20 x 20	36.00	914.40	25.4	646.0	4653	2110
24 x 20	42.00	1,066.80	25.4	646.0	5332	2418
24 x 24	42.00	1,066.80	27.9	708.0	6196	2810
26 x 26	45.00	1,143.00	29.7	755.0	7040	3200
28 x 28	49.00	1,244.60	31.7	805.0	8030	3650
30 x 24	51.00	1,295.40	27.9	708.0	6160	2800
30 x 30	51.00	1,295.40	33.9	860.0	10670	4850
36 x 30	60.00	1,524.00	33.9	860.0	12650	5750
36 x 36	60.00	1,524.00	38.2	970.0	16610	7550
40 x 36	70.00	1,778.00	38.2	970.0	18810	8550

ANSI 300 WEIGHTS AND DIMENSIONS

Full Bore: Sizes 2" to 48"
Reduced Bore: Sizes 2" to 48"

Standard Materials

Body: A216-Gr.WCB
Trim: Carbon Steel/E.N.P.
Seats: Glass Filled Teflon
Seals: Viton
(Special materials available on request)



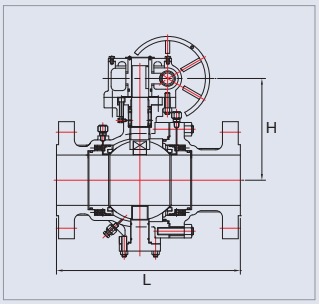
NPS	L		H		Weight	
	n	mm	in	mm	lb	Kg
2 x 1.5	8.5	215.9	6.2	157.0	39.7	18
2 x 2	8.5	215.9	6.5	165.0	79.37	36
3 x 2	11.12	282.4	6.5	165.0	92.60	42
3 x 3	11.12	282.4	7.3	186.0	127.87	58
4 x 3	12.0	304.8	7.3	186.0	136.60	62
4 x 4	12.0	304.8	9.3	237.0	165	75
6 x 4	15.88	403.35	9.3	237.0	297	135
6 x 6	15.88	403.35	11.4	290.0	334	152
8 x 6	19.75	501.65	11.4	290.0	440	200
8 x 8	19.75	501.65	13.2	335.0	517	235
10 x 8	22.38	568.45	13.2	335.0	616	280
10 x 10	22.38	568.45	16.4	417.0	660	300
12 x 10	25.50	647.70	16.4	417.0	860	390
12 x 12	25.50	647.70	17.9	455.0	1147	520
14 x 12	30.00	762.00	17.9	455.0	1323	600
14 x 14	30.00	762.00	19.1	486.0	2139	970
16 x 14	33.00	838.20	19.1	486.0	2271	1030
16 x 16	33.00	838.20	20.6	524.0	2646	1200
18 x 16	36.00	914.40	20.6	524.0	3021	1370
18 x 18	36.00	914.40	23.1	586.0	4190	1900
20 x 18	39.00	990.60	23.1	586.0	4322	1960
20 x 20	39.00	990.60	25.4	646.0	4763	2160
24 x 20	45.00	1,143.00	25.4	646.0	5858	2430
24 x 24	45.00	1,143.00	27.9	708.0	6637	3010
26 x 26	49.00	1,244.60	29.7	755.0	8690	3950
28 x 28	53.00	1,346.20	31.7	805.0	9350	4250
30 x 24	55.00	1,397.00	27.9	708.0	8866	4030
30 x 30	55.00	1,397.00	33.9	860.0	12892	5860
36 x 30	68.00	1,727.20	33.9	860.0	15510	7050
36 x 36	68.00	1,727.20	38.2	970.0	18370	8350
40 x 36	78.00	1,981.20	38.2	970.0	21010	9550

ANSI 600 WEIGHTS AND DIMENSIONS

Full Bore: Sizes 2" to 36"
Reduced Bore: Sizes 2" to 36"

Standard Materials

Body: A216-Gr. WCB
Trim: Carbon Steel/E.N.P.
Seats: Nylon
Seals: Viton
(Special materials available on request)



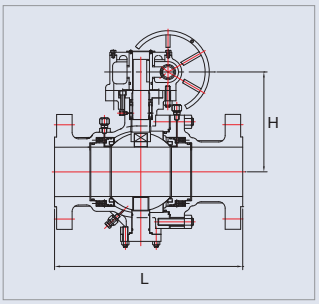
NPS	Bore		L				H		Weight	
			RF/BW		RTJ					
	in	mm	in	mm	in	mm	in	mm	lb	Kg
2 x 1.5	1.5	39.0	11.5	292.1	11.6	294.6	6.6	167.0	84	38
2 x 2	2.0	50.0	11.5	292.1	11.6	294.6	6.8	172.0	88	40
3 x 2	2.0	50.0	14.0	355.6	14.1	358.1	6.8	172.0	132	60
3 x 3	3.0	76.0	14.0	355.6	14.1	358.1	8.3	210.0	154	70
4 x 3	3.0	76.0	17.0	431.8	17.1	434.3	8.3	210.0	209	95
4 x 4	4.0	102.0	17.0	431.8	17.1	434.3	10.3	262.0	243	110
6 x 4	4.0	102.0	22.0	558.8	22.1	561.3	10.3	262.0	342	155
6 x 6	6.0	153.0	22.0	558.8	22.1	561.3	12.5	317.0	476	216
8 x 6	6.0	153.0	26.0	660.4	26.1	662.9	12.5	317.0	639	290
8 x 8	8.0	203.0	26.0	660.4	26.1	662.9	14.3	363.0	816	370
10 x 8	8.0	203.0	31.0	787.4	31.1	789.9	14.3	363.0	1080	490
10 x 10	10.0	254.0	31.0	787.4	31.1	789.9	16.9	428.0	1359	615
12 x 10	10.0	254.0	33.0	838.2	33.1	840.7	16.9	428.0	2156	980
12 x 12	12.0	305.0	33.0	838.2	33.1	840.7	18.4	468.0	2420	1100
14 x 10	10.0	254.0	35.0	889.0	35.1	891.5	16.9	428.0	2310	1050
14 x 14	13.2	336.5	35.0	889.0	35.1	891.5	16.1	408.0	2932	1330
16 x 12	12.0	305.0	39.0	990.6	39.1	993.1	18.4	468.0	2860	1300
16 x 16	15.2	386.0	39.0	990.6	39.1	993.1	22.7	576.0	3858	1750
18 x 14	13.2	336.5	43.0	1092.2	43.1	1094.7	16.1	408.0	3344	1520
18 x 18	17.2	438.0	43.0	1092.2	43.1	1094.7	23.9	606.0	5071	2300
20 x 16	15.2	386.0	47.0	1193.8	47.2	1198.9	22.7	576.0	4620	2100
20 x 20	19.3	489.0	47.0	1193.8	47.2	1198.9	26.9	682.0	6614	3000
22 x 18	17.2	438.0	51.0	1295.4	51.4	1305.6	23.9	606.0	5940	2700
22 x 22	21.1	538.0	51.0	1295.4	51.4	1305.6	28.7	728.0	7370	3350
24 x 20	19.3	489.0	55.0	1397.0	55.4	1407.2	26.9	682.0	7150	3250
24 x 24	23.2	590.0	55.0	1397.0	55.4	1407.2	30.4	773.0	7788	3540

ANSI 900 WEIGHTS AND DIMENSIONS

Full Bore: Sizes 2" to 24"
Reduced Bore: Sizes 2" to 24"

Standard Materials

Body: ASTM A 105 or ASTM A216 . Gr. WCB
End Caps: ASTM A216 . Gr. WCB
Trim: Carbon Steel/E.N.P.
Seats: Devlon®
Seals: Viton
(Special materials available on request)



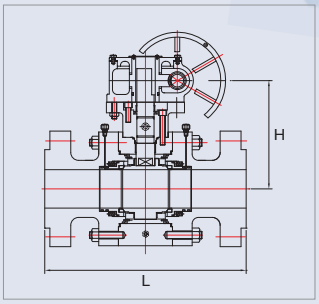
NPS	Bore		L				H		Weight	
			RF/BW		RTJ					
	in	mm	in	mm	in	mm	in	mm	lb	Kg
2 x 1.5	1.5	39.0	14.5	368.3	14.6	370.8	6.6	167.0	121	55
2 x 2	2.0	50.0	14.5	368.3	14.6	370.8	7.0	177.0	154	70
3 x 2	2.0	50.0	15.0	381.0	15.1	383.5	7.0	177.0	198	90
3 x 3	3.0	76.0	15.0	381.0	15.1	383.5	8.5	215.0	243	110
4 x 3	3.0	76.0	18.0	457.2	18.1	459.7	8.5	215.0	374	170
4 x 4	4.0	102.0	18.0	457.2	18.1	459.7	10.4	263.0	573	260
6 x 4	4.0	102.0	24.0	609.6	24.1	612.1	10.4	263.0	682	310
6 x 6	6.0	153.0	24.0	609.6	24.1	612.1	12.7	322.0	794	360
8 x 6	6.0	153.0	29.0	736.6	29.1	739.1	12.7	322.0	1166	530
8 x 8	8.0	203.0	29.0	736.6	29.1	739.1	15.9	403.0	1367	620
10 x 8	8.0	203.0	33.0	838.2	33.1	840.7	15.9	403.0	1562	710
10 x 10	10.0	254.0	33.0	838.2	33.1	840.7	18.1	460.0	2067	950
12 x 10	10.0	254.0	38.0	965.2	38.1	967.7	18.1	460.0	2244	1020
12 x 12	12.0	303.0	38.0	965.2	38.1	967.7	22.3	566.0	2866	1300
14 x 10	10.0	254.0	40.5	1028.7	40.9	1038.9	18.1	460.0	2574	1170
16 x 12	12.0	303.0	44.5	1130.3	40.9	1038.9	22.3	566.0	3256	1480

ANSI 1500/2500 WEIGHTS AND DIMENSIONS

Full Bore: Sizes 2" to 16"
Reduced Bore: Sizes 2" to 16"

Standard Materials

Body: ASTM A105 or ASTM A216 . Gr. WCB
End Caps: ASTM A216 . Gr. WCB
Trim: Carbon Steel/E.N.P.
Seats: Devlon®
Seals: Viton
(Special materials available on request)



NPS	Bore		L				H		Weight	
			RF / BW		RTJ					
	in	mm	in	mm	in	mm	in	mm	in	mm
ANSI 1500:										
2 x 1.5	1.50	39.0	14.5	368.3	14.6	370.8	6.6	167.0	121	55
2 x 2	2.00	50.0	14.5	368.3	14.6	370.8	7.0	177.0	154	70
3 x 2	2.00	50.0	18.5	469.9	18.6	472.4	7.0	177.0	242	110
3 x 3	3.00	76.0	18.5	469.9	18.6	472.4	8.5	215.0	287	130
4 x 3	3.00	76.0	21.5	546.1	21.6	548.6	8.5	215.0	418	190
4 x 4	4.00	102.0	21.5	546.1	21.6	548.6	10.6	268.0	617	280
6 x 4	4.00	102.0	27.8	704.9	28.0	711.2	10.6	268.0	748	340
6 x 6	5.67	144.0	27.8	704.9	28.0	711.2	12.7	323.0	1124	510
8 x 6	5.67	144.0	32.8	831.9	33.1	840.7	12.7	323.0	1408	640
8 x 8	7.56	192.0	32.8	831.9	33.1	840.7	18.2	463.0	1543	700
10 x 8	7.56	192.0	39.0	990.6	39.4	1001.0	18.2	463.0	2200	1000
10 x 10	9.45	245.0	39.0	990.6	39.4	1000.8	19.6	497.0	2646	1200
12 x 10	9.45	245.0	44.5	1130.3	45.1	1145.5	19.6	497.0	3190	1450
12 x 12	11.34	288.0	44.5	1130.3	45.1	1145.5	20.6	522.0	3968	1800
14 x 10	9.45	240.0	49.5	1257.3	50.2	1275.1	19.6	497.0	3300	1500
16 x 12	11.34	288.0	54.5	1384.3	55.4	1407.2	20.6	522.0	5500	2500
ANSI 2500:										
2 x 2	1.75	44.0	17.8	450.9	17.9	454.2	7.5	191.0	220	100
3 x 2	1.75	44.0	22.8	577.9	23.0	584.2	7.5	191.0	330	150
3 x 3	2.52	64.0	22.8	577.9	23.0	584.2	10.1	256.0	550	250
4 x 3	2.52	64.0	26.5	673.1	26.9	682.8	10.1	256.0	726	330
4 x 4	3.50	89.0	26.5	673.1	26.9	682.8	11.7	298.0	814	370
6 x 4	3.50	89.0	36.0	914.4	36.5	927.1	11.7	298.0	1320	600
6 x 6	5.25	133.0	36.0	914.4	36.5	927.1	16.1	408.0	1870	850
8 x 6	5.25	133.0	40.3	1022.4	40.9	1038.4	16.1	408.0	2420	1100
8 x 8	7.13	181.0	40.3	1022.4	40.9	1038.4	20.1	510.0	3960	1800
10 x 8	7.13	181.0	50.0	1270.0	50.9	1292.4	20.1	510.0	4840	2200
10 x 10	8.80	225.0	50.0	1270.0	50.9	1292.4	23.03	585.0	5940	2700
12 x 10	8.80	225.0	56.0	1422.4	56.9	1444.8	23.03	585.0	8360	3800
12 x 12	10.51	267.0	56.0	1422.4	56.9	1444.8	27.0	685.0	9460	4300

MATERIAL FOR SEALING AND SEAT RING

Material	General Temperature Range	Use/Characteristics	Not Recommended for	Properties
FM (Viton A)	-13° F - 400° F (- 25°C ~ 204°C)	aliphatic hydrocarbons (petro°©leum oil, mineral oil/grease, fuel oils, butane, propane, natural gas), aromatic hydrocarbons (benzene, toluene), chlorinated hydrocarbons, high vacuum, most acids/chemicals	brake fluid with glycol base, ammonia gas, amines, alkalis, acetone, skydrol, ethyl acetate, superheated steam, polar sol°©vents (ketone, acetone, acetic acid, etc), low molecular esters and ethers	excellent resistance for wear, ozone, weather, aging, compression set, permeation
FKM (Viton GLT)	-50° F - 400° F (-45°C ~ 204°C)	extended low temperature ser°©vice over Viton A. Excellent for water, steam and mineral acids in addition to use of Viton A	same as those of Viton A	similar to those of Viton A except a little inferior compression set and permeability
NBR (Buna-N, Nitrile)	-35°F - 212° F (-37°C ~ 100°C)	aliphatic hydrocarbons (petro°©leum oil, mineral oil/grease, fuel oils, butane, propane, natural gas), dilute acids, alkali, and salt solutions at low temperature, water	fuels of high aromatic content, aromatic hydrocar°©bons (benzene), chlorinated hydrocarbons, polar solvents (ketone, acetone, acetic acid, ethylene-ester), strong acid, glycol based brake fluid, ozone, weather and atmospheric aging	good resistance for wear, compression set, °©permeation
PTFE	-400° F - 450° F (-240°C ~ 232° F)	almost all chemicals and solvents including strong acid and alkali, high and very low temperature service	high mechanical loading	weather resistance, thermal stability, low friction
DEVLON	-285°F - +350°F (-176°C ~ +176°C)	general purpose oil and gas applications, aliphatic and aro°©matic hydrocarbons,ketones, acetone, ethers, weak alkalis, and acids, inorganic salt solutions	chlorine, fluorine, hydrofluoric acid, phosphoric acid, nitric acid, hydrochloric acid, sulfuric acid, acetic acid, hydrogen peroxide	The particularly low moisture absorption of this grade provides high dimensional stability. This feature combines with excellent impact wear characteristics to make this material invaluable for offshore applications where weight saving and non-corrosion are imperative
PEEK	-40° F - 500° F (-40°C ~ 260°C)	superb chemical resistance including alcohols, acids, ammonia, esters, halogenated organics, hydrocarbons and inorganics	some strong acids - nitric, chromic, sulfuric, benzene sul°©fonic acids and aqua regia, etc., some inorganics - bromine, chlorine and fluorine, etc.	good high temperature performance, wear resistance, very low smoke and toxic gas emission, good hydrolysis resistance
HNBR	-50°F ~ +350°F (-46°C ~ +180°C)	dilute acids, weak alkalis, lower alcohols, amines, aliphatic hydrocarbons, kerosene, animal oils and fats, synthetic and min°©eral oils and lubricants, sweet or sour (H2S) oil & gas, amine corrosion inhibitors, explosive decompression resistant	aromatic phosphate esters, ethers, ketones, aromatic hydrocarbons, chlorine	These materials have the excellent oil/fuel re°©sistance of traditional nitrile elastomers. They also have superior mechanical properties and can sustain higher service temperatures: e.g. up to 180°ΔC in oil. In addition, they display superior resistance to aggressive fluids such as sour crude oil and have excellent resistance to ozone

TEMPERATURE LIMITS OF METAL PARTS

Forging	Casting	Low Temperature	High Temperature
A105	A216 WCB	-20˚ F (-29˚ C)	800˚ F (426˚ C)
A350 LF2	A352 LCB, LCC	-50˚ F (-46˚ C)	650˚ F (343˚ C)
A182 F 316	A351 CF8M	-425˚ F (-254˚ C)	1500˚ F (815˚ C)

TYPICAL GASKET SPECIFICATIONS

Type	Material	Low Temperature	High Temperature	Max. Pressure
Spiral wound	316 SS + Graphite	-420˚ F (-250˚ C)	1500˚ F (815˚ C)	6,250 psi (430bar)
Spiral wound	316 SS + PTFE	-200˚ F (-129˚ C)	450˚ F (232˚ C)	6,000 psi (415bar)

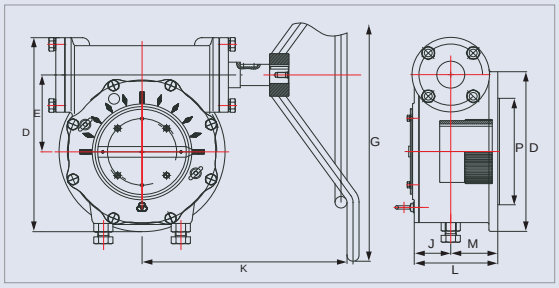
GEAR ACTUATOR DATA

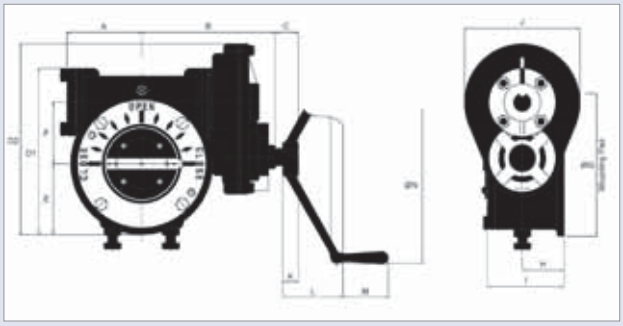
Valve Automation

FORCE is able to offer a comprehensive package of control equipment including actuators, switches, solenoids and positioners. Detail of actuator are available on request.

Gear Operated

The gear operator can be furnished upon request





Part no.	Units	flange size	A	B	C	D1	D2	E	F	G	H	I	J	K	L	M	N	Max. Output Torque (ft-lb)	Weight	
																			lb	kg
G-SBWG-BF	inch	F-07	2.28	-3.58	2.24	4.84	N/A	1.87	1.59	3.74	1.57	3.03	N/A	0.98	5.12	3.94	15.75	236	8.8	4
	mm		58	91	57	123	N/A	47.5	40.5	95	40	77	N/A	25	130	100	400			
G-SBWG-0	inch	F-10	2.83	4.13	2.24	5.94	N/A	2.46	2.09	4.92	1.69	3.23	N/A	0.98	5.12	3.94	15.75	516	13.2	6
	mm		72	105	57	151	N/A	62.5	53	125	43	82	N/A	25	130	100	400			
G-SBWG-00	inch	F-12	3.31	5.35	3.19	7.01	N/A	2.95	2.46	5.91	2.05	3.74	N/A	1.18	5.91	3.94	19.69	738	19.8	9
	mm		84	136	81	178	N/A	75	62.5	150	52	95	N/A	30	150	100	500			
G-SBWG-00-SPUR	inch	F-12	3.29	5.94	1.54	7.01	7.68	2.95	2.46	5.91	2.05	3.74	4.57	1.18	5.91	3.94	19.69	738	28.6	13
	mm		83.5	151	39	178	195	75	62.5	150	52	95	116	30	150	100	500			
G-SBWG-01	inch	F-14	3.66	5.71	3.19	7.99	N/A	3.44	2.95	6.89	2.13	3.82	N/A	1.18	5.91	3.94	19.69	1180	28.6	13
	mm		93	145	81	203	N/A	87.5	75	175	54	97	N/A	30	150	100	500			
G-SBWG-01-SPUR	inch	F-14	3.64	6.30	1.54	7.99	8.70	3.44	2.95	6.89	2.13	3.82	4.57	1.18	5.91	3.94	19.69	1180	37.4	17
	mm		92.5	160	39	203	221	87.5	75	175	54	97	116	30	150	100	500			
G-SBWG-02	inch 1	F-16	4.37	6.65	3.66	9.72	N/A	4.13	3.60	8.27	2.48	4.53	N/A	1.38	8.27	3.94	27.95	1920	46.2	21
	mm		111	169	93	247	N/A	105	91.5	210	63	115	N/A	35	210	100	710			
G-SBWG-02-SPUR	inch	F-16	4.35	7.05	1.73	9.72	10.71	4.13	3.60	8.27	2.48	4.53	5.91	1.38	8.27	3.94	27.95	1920	59.4	27
	mm		110.5	179	44	247	272	105	91.5	210	63	115	150	35	210	100	710			
G-SBWG-03	inch	F-20	124	7.17	3.66	11.34	N/A	4.92	4.45	9.84	2.48	4.61	N/A	1.38	8.27	3.94	27.95	3170	66.1	30
	mm		124	182	93	288	N/A	125	113	250	63	117	N/A	35	210	100	710			
G-SBWG-03-SPUR	inch	F-20	4.88	7.60	1.73	11.34	12.32	4.92	4.45	9.84	2.48	4.61	5.91	1.38	8.27	3.94	27.95	3170	79.2	36
	mm		124	193	44	288	313	125	113	250	63	117	150	35	210	100	710			
G-SBWG-04	inch	F-25	6.10	8.15	3.39	15.20	N/A	6.40	6.02	11.81	2.87	5.71	N/A	1.38	9.06	3.94	31.50	7670	123.5	56
	mm		155	207	86	386	N/A	162.5	153	300	73	145	N/A	35	230	100	800			
G-SBWG-04-SPUR	inch	F-25	6.10	9.57	1.73	15.20	16.46	6.40	6.02	11.81	2.87	5.79	8.03	1.38	9.06	3.94	31.50	7670	154.3	70
	mm		155	243	44	386	418	162.5	153	300	73	147	204	35	230	100	800			
G-SBWG-05	inch	F-30	6.50	8.54	3.39	17.24	N/A	7.38	7.09	13.78	3.07	6.10	N/A	1.38	9.06	3.94	31.50	11720	194	88
	mm		165	217	86	438	N/A	187.5	180	350	78	155	N/A	35	230	100	800			
G-SBWG-05-SPUR	inch	F-30	6.50	9.92	1.73	5.43	18.50	7.38	7.09	13.78	3.07	6.10	8.03	1.38	9.06	3.94	31.50	11720	224.4	102
	mm		165	252	44	138	470	187.5	180	350	78	155	204	35	230	100	800			

METAL SEATED BALL VALVES

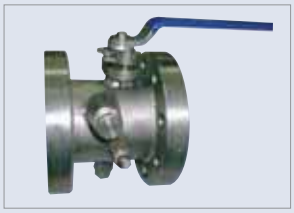
BFM Series

- Full Bore & Reduced Bore
- Applicable Standards
  ANSI B16.34, BS5351 & API 6D
- Face to Face: ANSI B16.10
- End Flange Dimensions: ANSI B16.5

FORCE Metal Seated Ball Valves are:

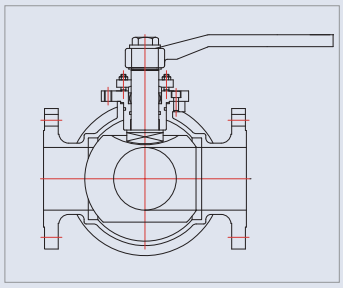
- Very economical when used with metal seat on standard valves
- Easy maintenance with the 2-piece or 3-piece split body construction
- Fire safety constructed to required specifications and materials
- Made for use in high temperature, high pressure and high frequency
- Supplied with ISO Mounting pad for actuation
- Made to meet ANSI B16.10 Class V and MSS SP-61 Sealing Requirements





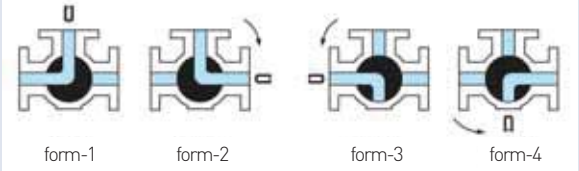

3-WAY 4-SEAT BALL VALVES

- T Port or L Port
- Side Entry and Top Entry
- 4-Seat Design
- Face to Face: manufacturer standard
- End Flange Dimensions: ANSI B16.5
- Full Bore

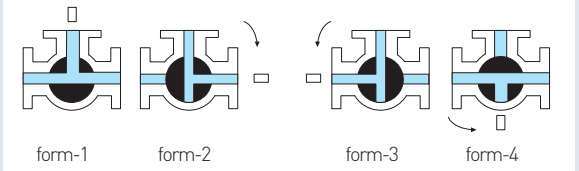



Operating Forms

3-way L-Port

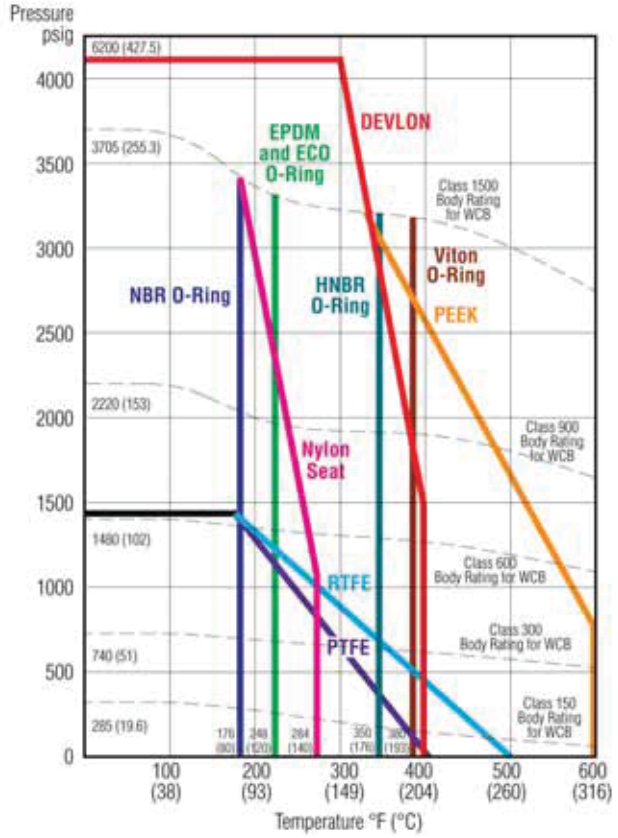


3-way T-Port



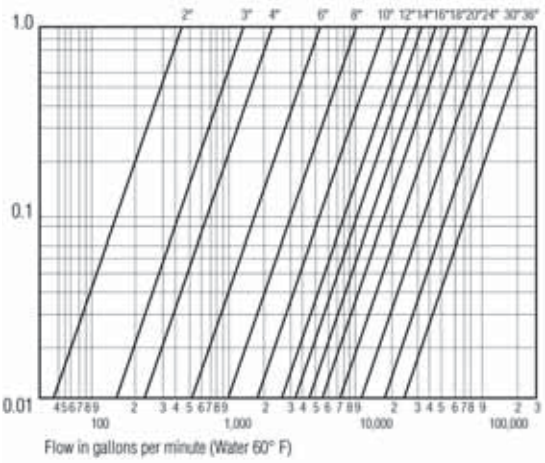
Flow direction is marked on top of stem

PRESSURE / TEMPERATURE RATING

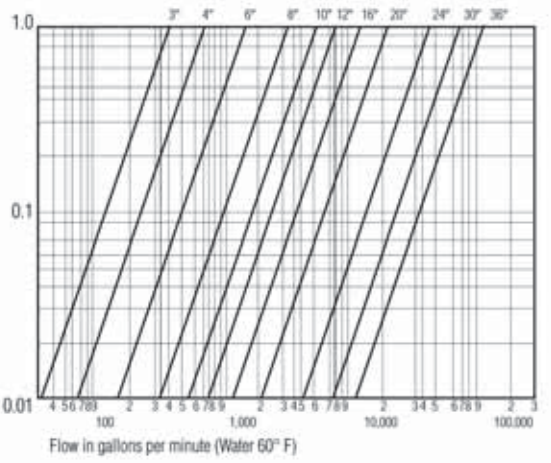


Pressure Loss vs. Flow Rate

Full Port Ball Valves

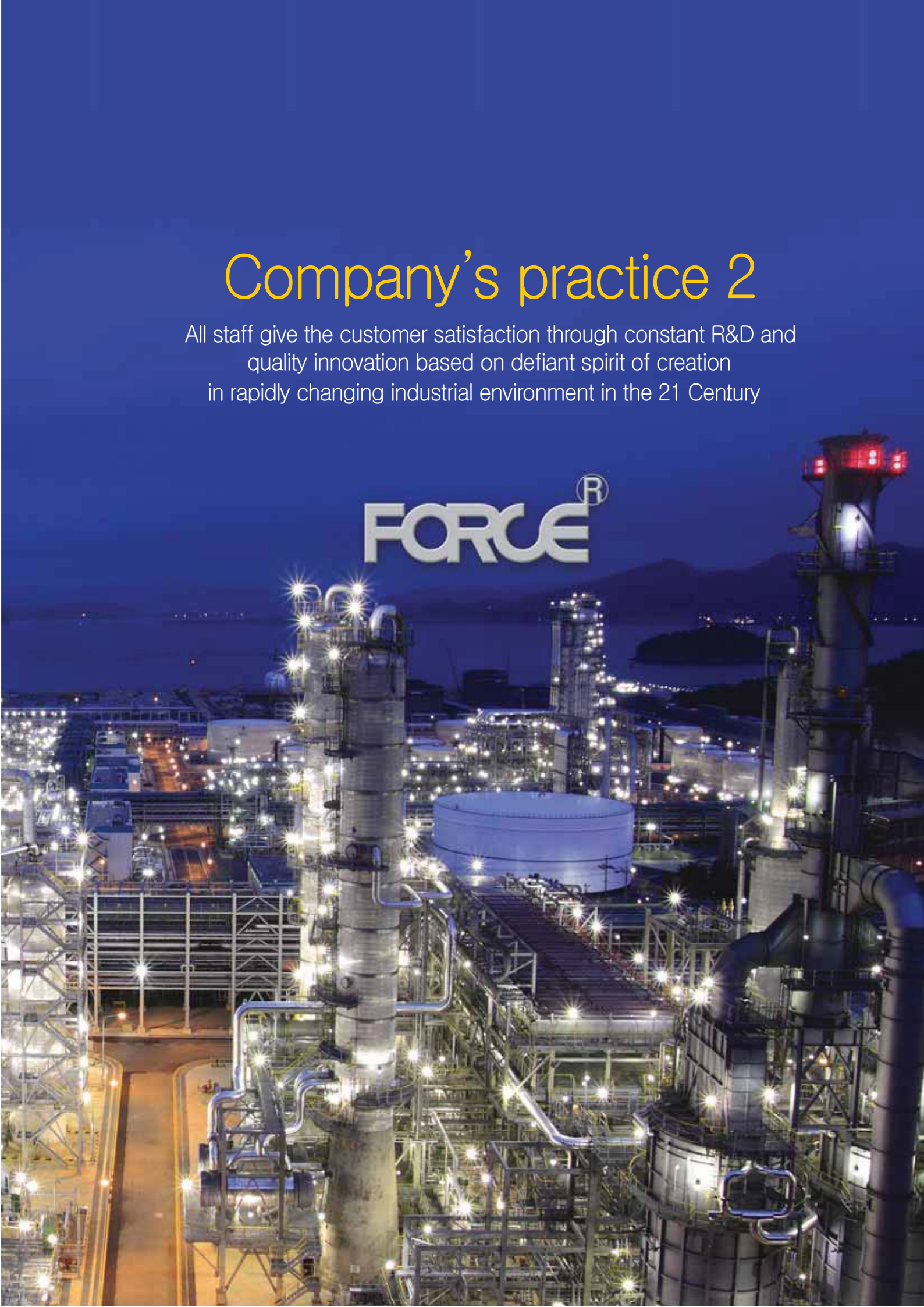


Reduced Port Ball Valves



Company's practice 2

All staff give the customer satisfaction through constant R&D and
quality innovation based on defiant spirit of creation
in rapidly changing industrial environment in the 21 Century



FORCE®

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