

**FORCE**<sup>®</sup>

# Floating Ball Valve

Class 150, 300, 600, 900, 1500 & 2500



[www.force-valves.com](http://www.force-valves.com)

**Dongsan Valve Co., Ltd.**

# Information

Since the foundation in 1983, **Dongsan** has been experiencing strong growth through challenging with hard works over 30 years. We've been trying continuous technology development, product investment, education and R&D.

**Dongsan** intends to become a leading company by developing new businesses, building future businesses, expanding global markets through international business, and strengthening financial structure.

In addition, **Dongsan** knows it is God's mission given to **Dongsan** that it should be used for evangelization of the world by receiving the blessing of **Immanuel** which God be with us.

We will help grows the **Remnants** who will shoulder our future, and realize it as a common value that all members must observe.

**Dongsan** entering upon the second foundation period will make efforts to succeed the tradition and management philosophy which have been built up and to set up the base which all of members can follow their big dreams with a vision by incorporating the sound and future-oriented organizational culture through innovation.

Please pay attention to our endless challenge and accomplishment of making **"Global Dongsan through the innovation"** and I hope to get a lot of supports and encouragement from our customers



## CERTIFICATES

**Dongsan's** quality program is fully compliant with the industry's most stringent standards.

Total reliability on products comes from exhaustive inspection and thorough such analysis as mechanical and physical properties over the whole processes.

**Dongsan** holds all major approvals, including ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, API 6D, CE-PED, Fire-test Cert', ISO 15848, API 641, TRCU, KOGAS's approval, TAT, Type approval Cert'-Cryo Ball Valves.

The collage displays the following certificates:

- KOGAS approval for under 2" valve**: Certificate of Approval from KOGAS.
- KOGAS approval for above 3" valve**: Certificate of Approval from KOGAS.
- ISO 9001:2015**: ABS Quality Evaluations Certificate of Conformance.
- TYPE APPROVAL CERT**: DNV-GL Approval Certificate.
- CE-PED**: Attestation of Conformity to Pressure Directive.
- ISO 15848**: Certificate of Fugitive Emission Test.
- API 641**: Test Report for Type Testing of Quarter-turn Valves for Fugitive Emission.
- FIRE-SAFE**: Certificate of Fire Safety Test.
- TRCU**: Certificate of Conformity from TRCU.
- ISO 14001:2015**: Certificate of Compliance.
- API Monogram -6D**: Certificate of Compliance for API 6D.

# APPLICABLE STANDARDS

## ■ AMERICAN PETROLEUM INSTITUTE ..... API

- API Spec. Q1 ; Specification for Quality Management Systems
- API Spec. 6D ; Specification for Pipeline and Piping Valves
- API Standard 598 ; Valve Inspection and Testing
- API Standard 607 ; Fire Test for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats
- API Standard 608 ; Metal Ball Valves-Flanged, Threaded, and Welding Ends
- API Specification 6FA ; Specification for Fire Test for Valves

## ■ AMERICAN SOCIETY OF MECHANICAL ENGINEERS ..... ASME

- ASME B16.34 ; Valves- Flanged, Threaded, and Welding End
- ASME B16.5 ; Pipe Flanges and Flanged Fittings
- ASME B16.10 ; Face-to-Face and End-to-End Dimensions of Valves
- ASME B16.11 ; Forged Fittings, Socket-Welding and Threaded
- ASME B16.25 ; Buttwelding Ends
- ASME Boiler and Pressure Vessel Code Section II-Part D
- ASME Boiler and Pressure Vessel Code Section V
- ASME Boiler and Pressure Vessel Code Section VIII Div.1 and 2
- ASME Boiler and Pressure Vessel Code Section IX

## ■ MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE & FITTINGS INDUSTRY ..... MSS

- MSS SP-25 ; Standard Marking System for Valves, Fittings, Flanges, and Unions
- MSS SP-44 ; Steel Pipeline Flanges
- MSS SP-72 ; Ball Valves with Flanged or Butt-Welding Ends for General Service
- MSS SP-82 ; Valve Pressure Testing Methods

## ■ INTERNATIONAL ORGANIZATION FOR STANDARDIZATION ..... ISO

- ISO 9001 ; Quality management systems
- ISO 17292 ; Metal Ball Valves for Petroleum, Petrochemical and Allied Industries
- ISO 5211 ; Industrial Valves- Part-Turn Actuator Attachments
- ISO 5208 ; Industrial Valves- Pressure Testing of Valves
- ISO 10497 ; Testing of Valves- Fire type-Testing Requirements

## ■ NATIONAL ASSOCIATION OF CORROSION ENGINEERS ..... NACE

- NACE MR0175 ; Petroleum, Petrochemical, and Natural Gas Industries- Materials for use in H<sub>2</sub>S-containing environments in oil and gas production-



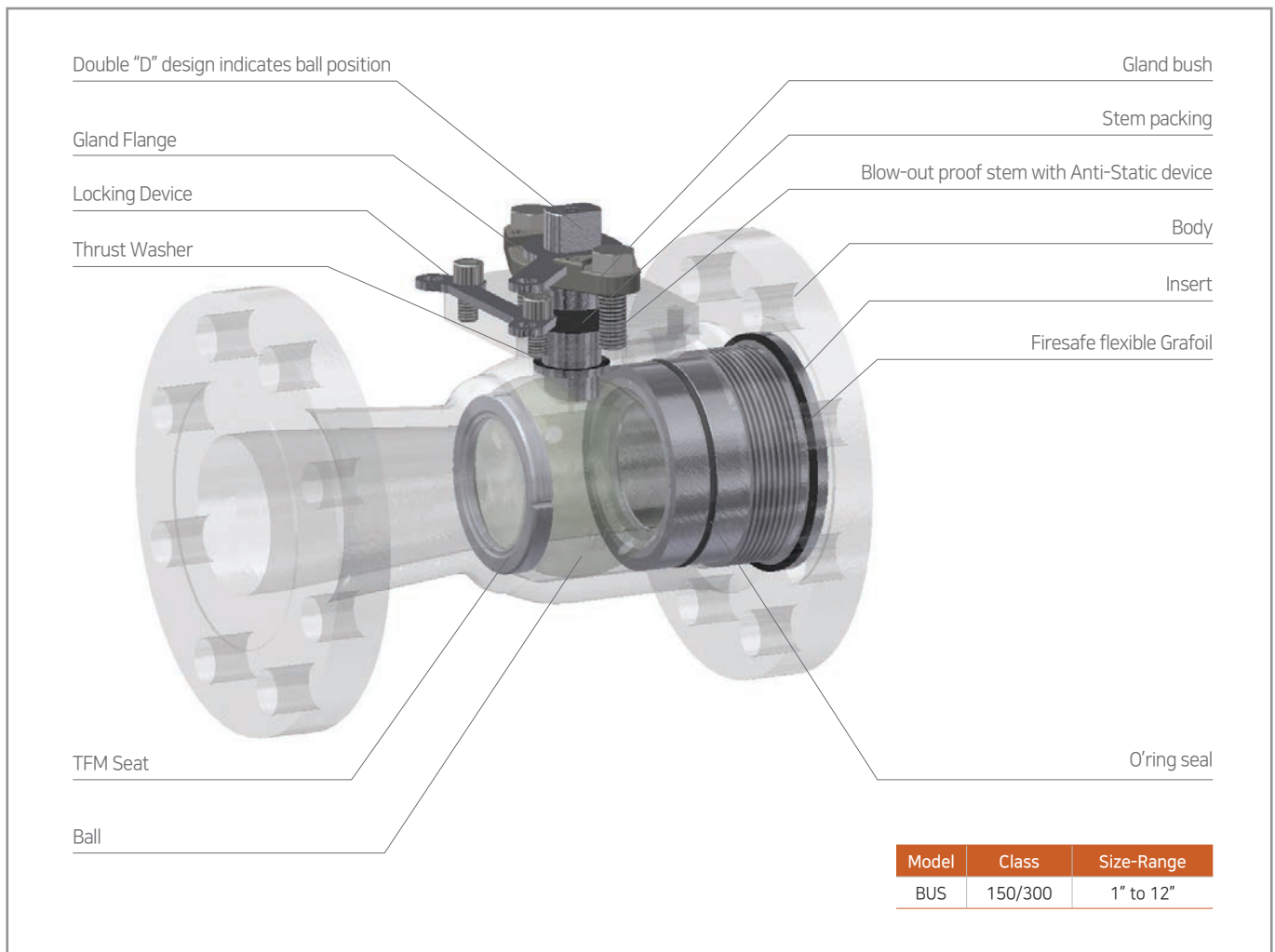
# Floating Ball Valve

Standard design features, product line range, material selection, and a centrally-located operations facility all combine to make **FORCE** the first choice for floating ball valves.

The inherent ball valve characteristics of quick quarter-turn operation, bi-directional shut-off capability, ease of automation, and low maintenance are enhanced with many additional features such as stainless steel gland, grafoil stem packing, heavy bolting meeting **NACE MR0175**.

The pressure equalization hole at the top of the ball combined with seat design are engineered to maintain the pressure balance in the line and in the body cavity while the valve is in the open or closed position.

**API 6D** or **API 598** to assure the integrity of the shell and seals, and final inspection to confirm that all marking, tagging and processing have been performed in accordance with **FORCE** and industry standards.



\* This is an illustrated of a typical BUS reduced port, Uni-body(One-piece), floating type ball valve exhibiting the basic design concept.

\* The actual design of a valve may be slightly different from this illustration, depending on its size and pressure class.

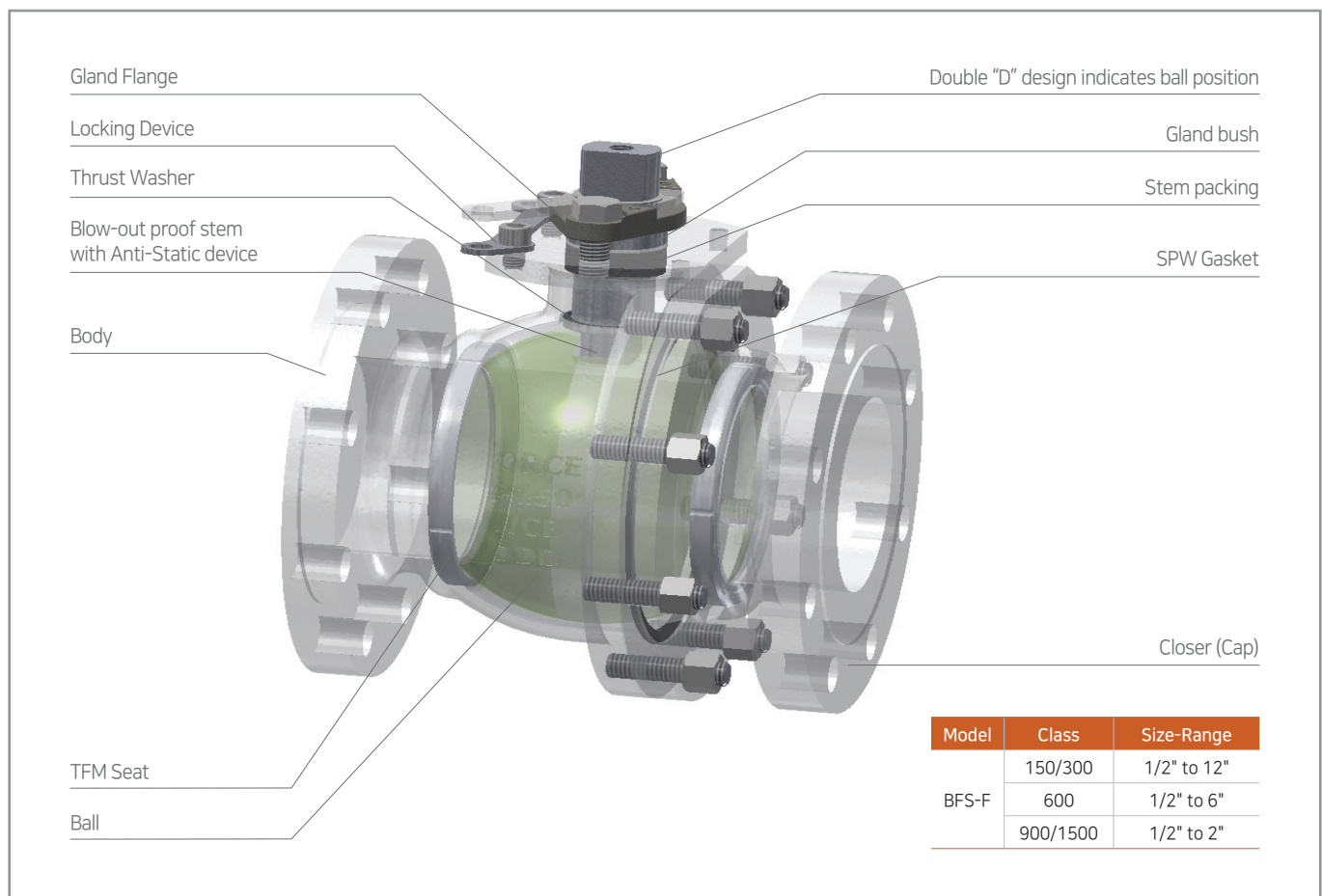
## RANGE OF PRODUCTION

Product Range, BUS Series, Reduced Port, Flanged Ends												
Body Material	ASME Class	Port	1"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"
CS & SS & Special	Class 150	Reduced	Lever	Lever	Lever	Lever	Lever	Lever	Lever	Lever/Gear	Lever/Gear	Lever/Gear
	Class 300		X	Lever	Lever	X	Lever	Lever	Lever	Lever/Gear	Lever/Gear	X

Body materials for all series floating ball valves are **WCB** and **CF8M**, with stainless steel trim ; other body or trim materials, including **Alloy 20**, **Monel** and **Hastelloy**, are available upon requires. Seat and seal options include materials designed to stand up to severe environments and repeated cycling. Whether your intended use is in petrochemical, pharmaceutical, or pulp and paper industry, **FORCE** floating ball valves are designed to provide you with a new standard in service and value.

The bolted body providing gap free engagement incorporating a solid ball supported via flexing seat rings provides tight shut-off of flow in either direction whilst maintaining the highest level of safety from the high integrity stem sealing system. Potential for atmospheric leakage is minimized via a double live loaded sealing system before or after fire condition. Reliable seating is enhanced via precise pre-compression of the ball between the two flexing seat rings allowing the ball to float along the valve axis providing bubble tight and bi-directional sealing capability. Bearings and incorporated at the top and bottom of the stem guarantees rigid alignment for optimum operation whilst aiding consistent torque combined with longevity of stem sealing and life cycle capability.

Effective body joint is guaranteed via the fully contained Spiral Wound Gasket or via an O’ring and fully contained graphited gasket ensuring zero leakage and fire safety assurance.



\* This is an illustrated of a typical reduced port, Split-body(Two-piece), floating type ball valve exhibiting the basic design concept.

\* The actual design of a valve may be slightly different from this illustration, depending on its size and pressure class.

**RANGE OF PRODUCTION**

Product Range, BFS Series, Full & Reduced Port, Flanged Ends														
Body Material	ASME Class	Port	1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"
CS & SS & Special	Class 150	Full	Lever	Lever	Lever	Lever	Lever	Lever	Lever	Lever	Lever/Gear	Lever/Gear	Lever/Gear	Lever/Gear
	Class 300		Lever	Lever	Lever	Lever	Lever	Lever	Lever	Lever	Lever/Gear	Lever/Gear	Lever/Gear	X
	Class 600	"Full & Reduced"	Lever	Lever	Lever	Lever	Lever	Lever	Lever	Lever/Gear	Lever/Gear	X	X	X
	Class 900		Lever	Lever	Lever	Lever	Lever/Gear	X	X	X	X	X	X	X
	Class 1500		Lever	Lever	Lever	Lever	Lever/Gear	X	X	X	X	X	X	X

# Floating Ball Valve

## BODY JOINT CONSTRUCTION

The One-piece/ Uni-body Side entry design, Graphite ring or O'ring, Viton(upon request) seals ensure absolute seal integrity.

The Two-piece/ Split-body Side entry 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.

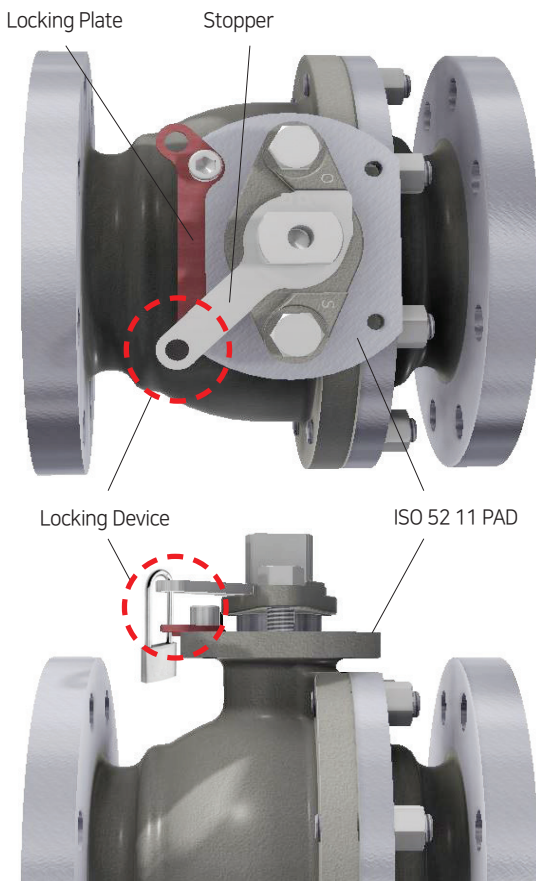
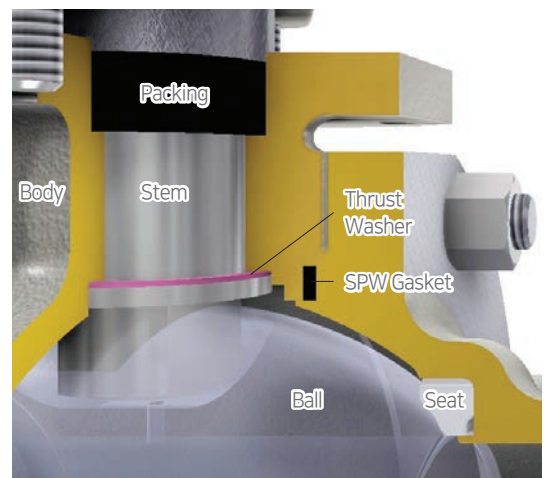
Body and adaptors are dimensioned for metal contact to ensure correct gasket crush.

## SEAT DESIGN

Standard valves utilise reinforced PTFE seats for maximum chemical compatibility and are designed to FLEX ensuring positive sealing performance across a wide pressure range whilst providing controlled operational torque and cavity relief capability. Reliable sealing is enhanced via precise pre-compression of the ball between the two flexing seat rings allowing the ball to float along the valve axis providing bubble tight and bi-di rectional performance.

## 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 blow-out proof. It also functions as the backseat for assured stem sealing.



## ANTI-STATIC DEVICE

All floating flanged ball valves include dual grounding system from stem to ball and stem to body.

Valve testing to **API 6D 24edition-Annex.H** or **ISO 17292** was performed for all sizes, and witnessed by a third party inspection company.

An anti-static feature is provided to ensure electrical continuity for assured stem sealing.

## ISO 5211 & EN ACTUATOR MOUNTING

Allows precise mounting of actuator, mounting bolts are independent from stem packing gland bolts or cover bolts.

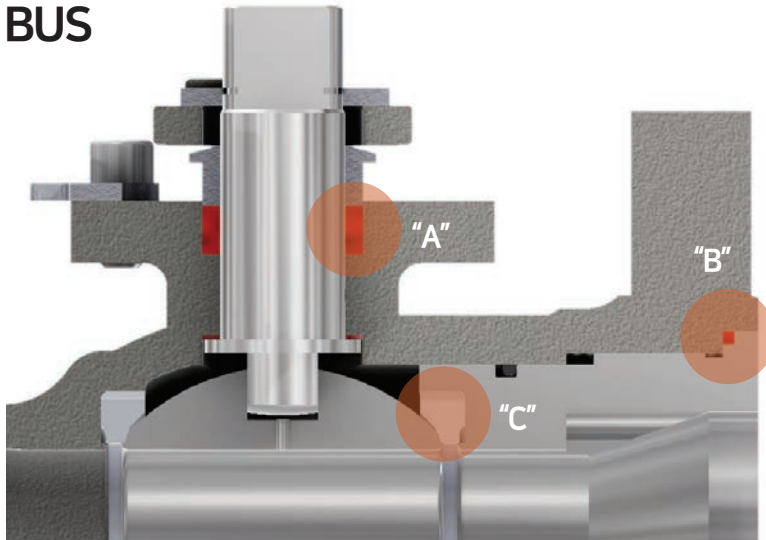
Exact alignment reduces torque requirements and prevents side load causing out-of-line wear and additional stress to stem.

## TOP WORKS/ LOCKING DEVICE

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

## BUS



### FIRE SAFE DESIGN

All fire-safe valves conform to **API 607**, **ISO 10497** and **API 6FA** standard. 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-metallic material such as PTFE were broken or destroyed.

**FORCE's** particularly metal to metal added seal seated designed ball valves can effectively control external or internal leakage.

#### "A"

All stem packings of **FORCE's** floating ball valves is a high performance set designed for the most fire-safe design

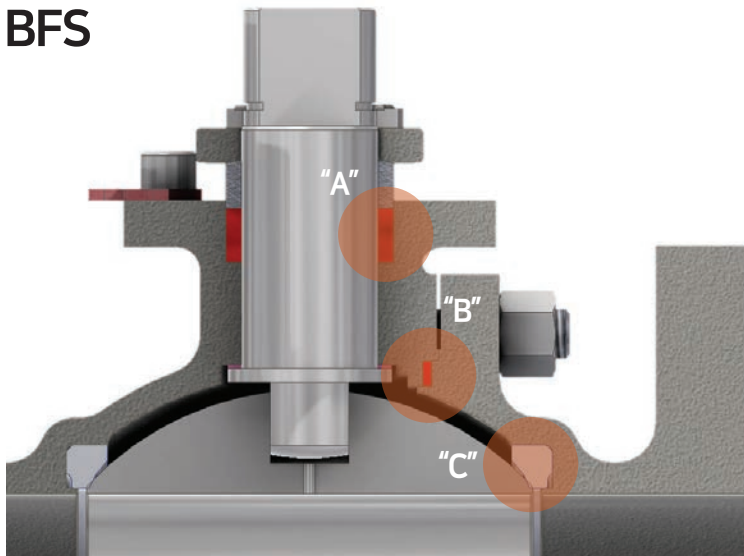
#### "B"

Special attention has been paid to the mechanical strength and sealing efficiency of the central flanged joint of the valve body the valve body and closer. Heavy castings & graphite filled spiral wound gasket assure zero leakage between body and cap.

#### "C"

In the event of a fire, the valve is required to make a downstream seal. Even after the disintegration of the **TEFLON** seat ball valves provide an excellent metal to metal seal. should the valve seat rings be destroyed by the effects of fire, the ball will drift to the low pressure side to form a metal to metal seal on the integral secondary metal seat within the valve body.

## BFS



### NACE MR0175

**FORCE's** all floating ball valves conform to **NACE** specification **MR0175**.

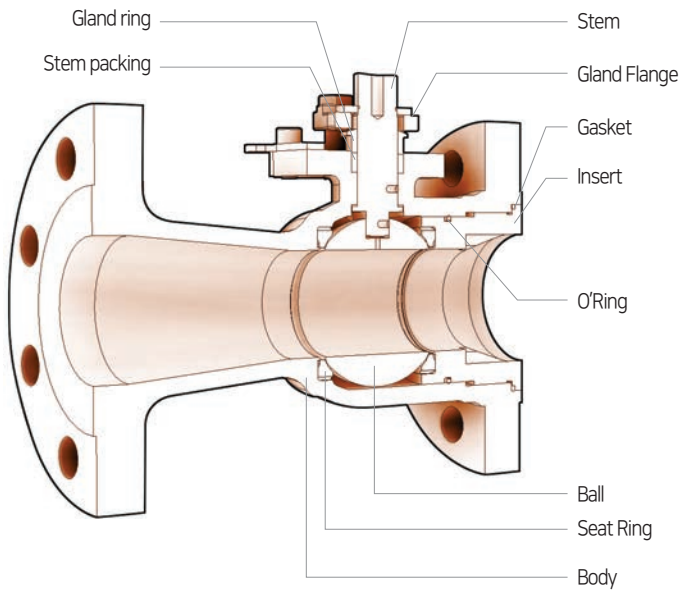
This is a standard feature. Inclusive to the above, all floating ball valves are supplied standard with 316 Stainless Steel balls and stems.

### 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.

# BUS Series

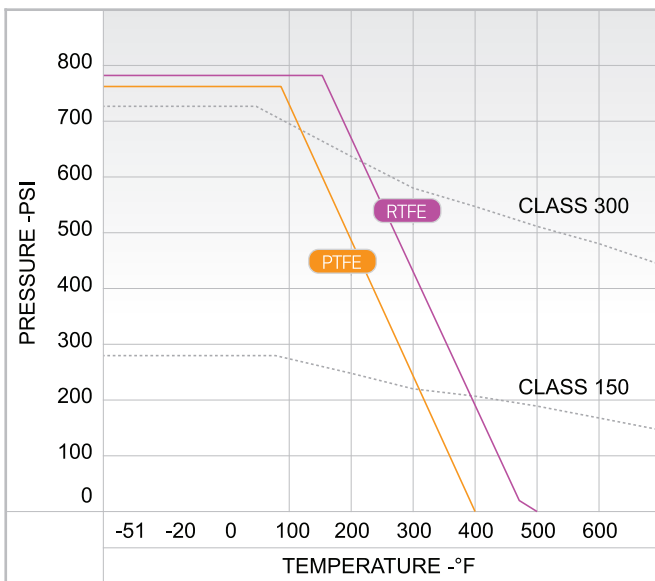
“Uni-Body, Free Floating Ball, Soft Seated & Casting Valves”



## FEATURES

- Basic design : API 6D, API 608 and ISO 17292
- One-piece body & side entry design
- Blow out-proof stem construction
- Anti-static design
- Locking device
- Micro-finished ball for long service life
- Ball includes pressure equalization hole to prevent trapped pressure in body cavity
- Reduced port
- Size range : NPS 1(DN 25) to NPS 12(DN 300)
- Pressure rating : ASME Class 150 to Class 300
- Graphite gasket and Stem packing prevent post-fire external leakage.
- Post-fire metal-to-metal seal prevents internal leakage after fire.
- Fire-safe design : API 607/ ISO 10497 or API 6FA

## SEAT RATING CHART



## STANDARD MATERIALS

No.	Parts	Stainless Steel	Carbon Steel
001	Body	ASTM A351-CF8M	ASTM A216-WCB
003	Insert	ASTM A351-CF8M	ASTM A216-WCB
004	Ball	ASTM A351-CF8M	
005	Stem	ASTM A276-316	
011	Gland Ring	ASTM A276-316	
012	Gland Flange	ASTM A351-CF8	
015	Seat Ring	PTFE or Reinforced PTFE	
S01	Packing	GRAPHITE	
S02	Gasket	GRAPHITE	
S09	O'Ring	VITON or HNBR	
S21	Thrust Washer	Reinforced PTFE	
P01	Top Washer	ASTM A240-304	
P02	Stopper	ASTM A240-304	
P03	Locking Plate	ASTM A240-304	AISI 1020 with Zn Plated
P04	Lever	ASTM A283-D with Vinyl Coated	
B11	Stopper Bolt	ASTM A193-B8	ASTM A307-B
B12	Gland Bolt	ASTM A193-B8	

Extended pressures and temperatures may be achieved by altering design for specific applications. Consult factory with service conditions. The valve rating is the lesser of the body rating and the seat rating.

**FORCE** manufactures an extensive line of high pressure valves capable of the full seat ratings shown.

Consult factory for details.

## DESIGN SPECIFICATIONS AVAILABLE

API 6D 24edition	Piping Valve (design)
API 608	Metal Ball Valves (design)
ASME B16.34	Steel Valves (design)
ISO 17292 / BS 5351	Steel Ball Valve (design)
ASME B16.5	Pipe flanges and flanges Fitting
ASME B16.10	Face-to-face and End-to-end dimensions
MSS SP-72	Ball Valves
API 607 / ISO 10497	Fire test for soft seated valves
NAVE MR 0175	Sour gas service application



**STANDARD MATERIALS**

- Body : Carbon Steel (WCB, LCC), Stainless Steel (CF8, CF8M)
- Ball : Stainless Steel (CF8, CF8M)
- Stem : SS304, SS316
- Seat : PTFE, RTFE, Modified TFE



**SPECIFICATIONS**

**Construction**

Uni-body, Side entry, Reduced port, Free floating ball, "Fire-safe" designed to **API 607 / ISO 10497 or API 6FA** Blow out proof stem, Anti-static device, Cavity relieving seats.

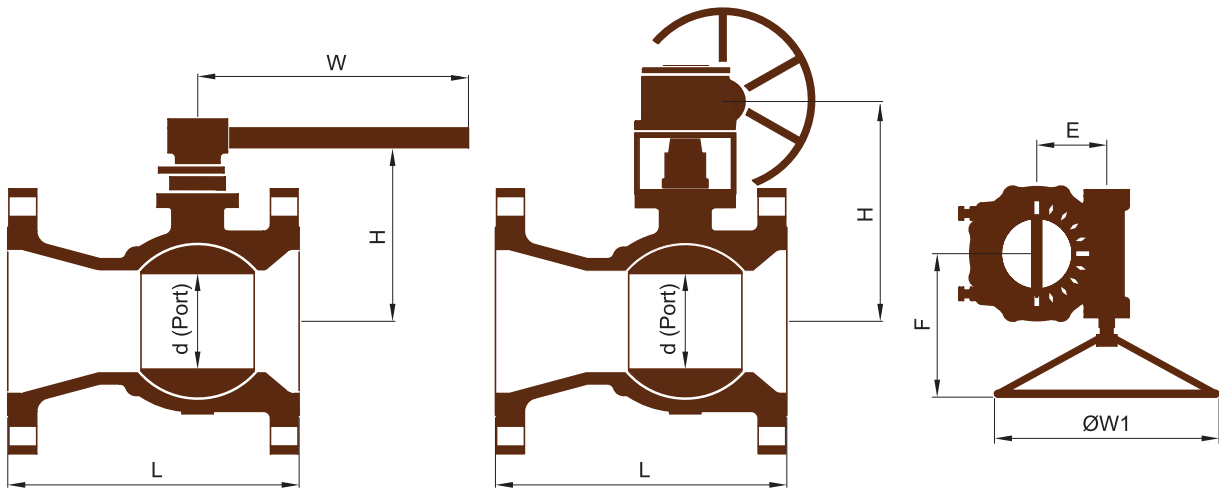
Valves are designed to **API 6D, ASME B16.34, API 608 and ISO 17292 / BS 5351** specifications.

Manufactured and conforms to **NACE standard MR 0175**.

**Test pressure (psig / CS material)**

ASME Class	Max. Working pressure	Shell (Hydro.)	Seat (Hydro. / Air)
Class 150	285	450	325 / 80
Class 300	740	1125	825 / 80

**DIMENSIONS**



Valve Size		1-1/2"	2"	2-1/2"	3"	4"	6"	8"	10"	12"	
Ød (port)	inch	1	1.5	2	2.32	3	4	5.67	7.32	8.66	
	mm	25	39.8	51	59	76	102	144	186	220	
L (RF)	150	inch	6.5	7	7.5	8	9	10.5	11.5	13	14
		mm	165	178	191	203	229	266.7	292	330	355.5
	300	inch	7.5	8.5	-	11.14	12	15.87	16.5	18	-
		mm	191	216	-	283	305	403	419	457	-
H	inch	4	5	5.6	6.1	6.7	8.1	10.9	12.8	16.5	
	mm	102	127	142	154	170	206	278	325	419	
W	inch	6.3	9	9	14.7	14.7	17.7	23.6	31.5	39.4	
	mm	160	230	230	380	380	450	600	800	1,000	
ØW1	inch	-	-	-	-	-	-	19.7	19.7	28	
	mm	-	-	-	-	-	-	500	500	710	
E	inch	-	-	-	-	-	-	2.74	3.3	3.8	
	mm	-	-	-	-	-	-	69.5	82.5	97	
F	inch	-	-	-	-	-	-	11.34	11.7	14.8	
	mm	-	-	-	-	-	-	288	297	376	
Approx. Weight	150	lb	15.4	22.0	30.8	37.4	61.6	103.4	169.4	352	477.4
		kg	7	10	14	17	28	47	77	160	217
	300	lb	19.8	26.4	-	50.6	85.8	143.0	290.4	462	-
		kg	9	12	-	23	39	65	132	210	-

Gear operators are available for most sizes.

# BUS Series

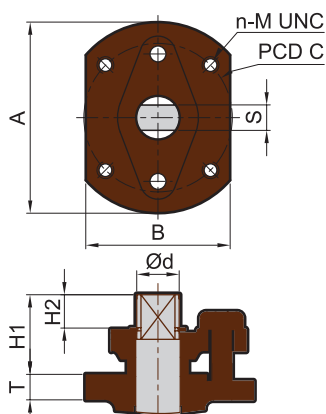
"Uni-Body, Free Floating Ball, Soft Seated & Casting Valves"

## FLOW COEFFICIENT (CV)

Valve Size		1-1/2"	2"	2-1/2"	3"	4"	6"	8"	10"	12"
Cv.Value	Class 150	106	153	276	317	449	899	1,180	3,277	4,350
	Class 300	106	156	-	361	533	1,039	1,402	3,277	-

Cv is defined as the volume of water flowing through the valve, in U.S.Gallons per minute at 60°F(15°C), which will result in a pressure drop of 1 psi. The table gives Flow Coefficient(Cv) values for Series 'BU' ball valves in the Full open position.

## TOP WORKS DIMENSIONS

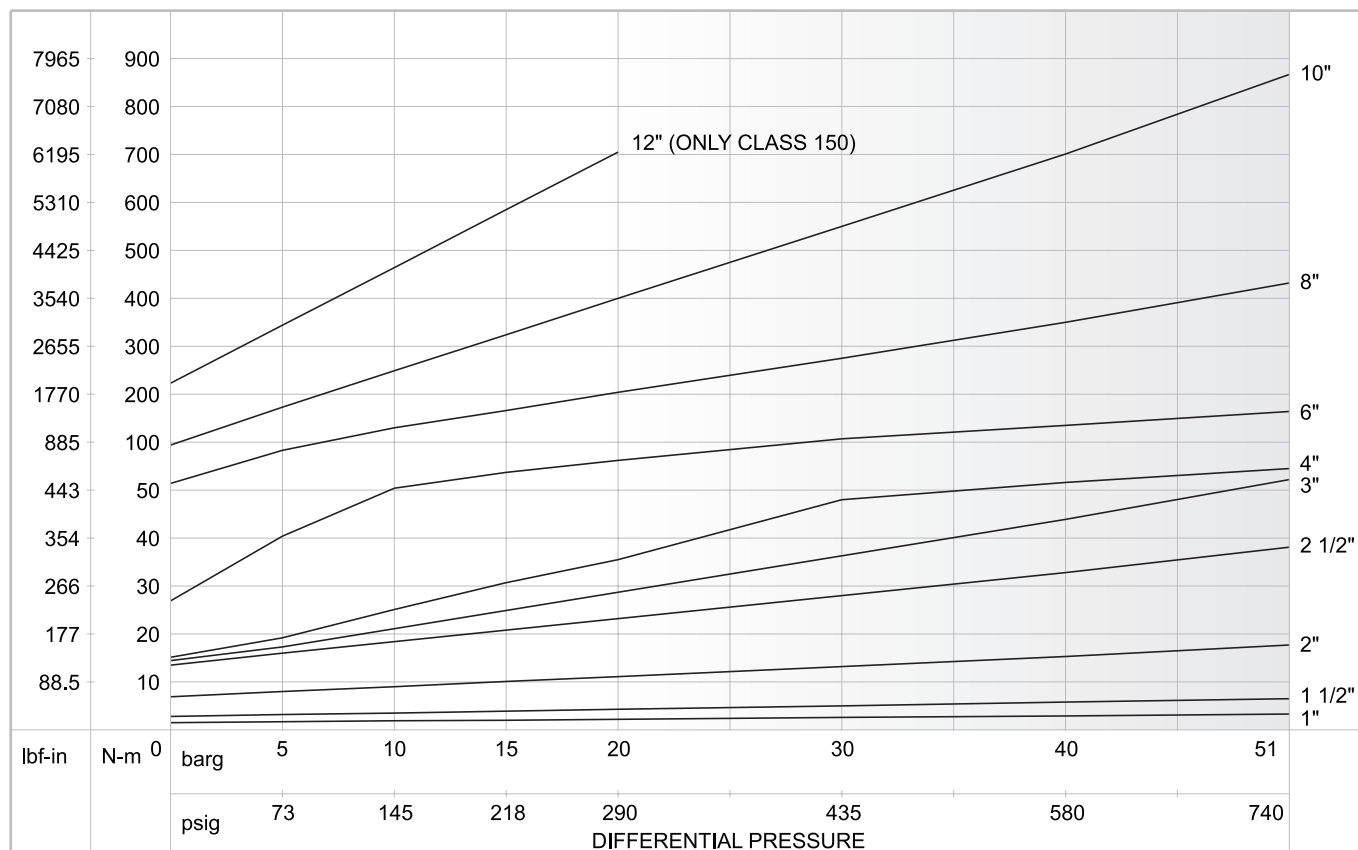


Size	Ød	S	A	B	C	n-M	H1	H2	T	ISO 5211
1-1/2"	14	8	65	50	50	4-1/4"	21.7	-	9	F05
2"	20	12	90	68	70	4-5/16"	31	9.8	150:13	F07
									300:11	
2-1/2"	20	12	90	68	70	4-5/16"	31	9.8	14	F07
3"	27	17	125	95	102	4-3/8"	43.5	18.3	14	F10
4"	27	17	125	95	102	4-3/8"	43.5	17	15	F10
6"	34	22	125	95	102	4-3/8"	49	24	18	F10
8"	44	26	153	116.4	125	4-1/2"	59	26.5	19	F12
10"	51	32	175	134	140	4-5/8"	73	34.3	20	F14
12"	50	38	200	165	165	4-3/4"	98.5	46.3	24	F16

All construction data sheet for Class 300 same as Class 150

Unit : mm

## TORQUE DATA



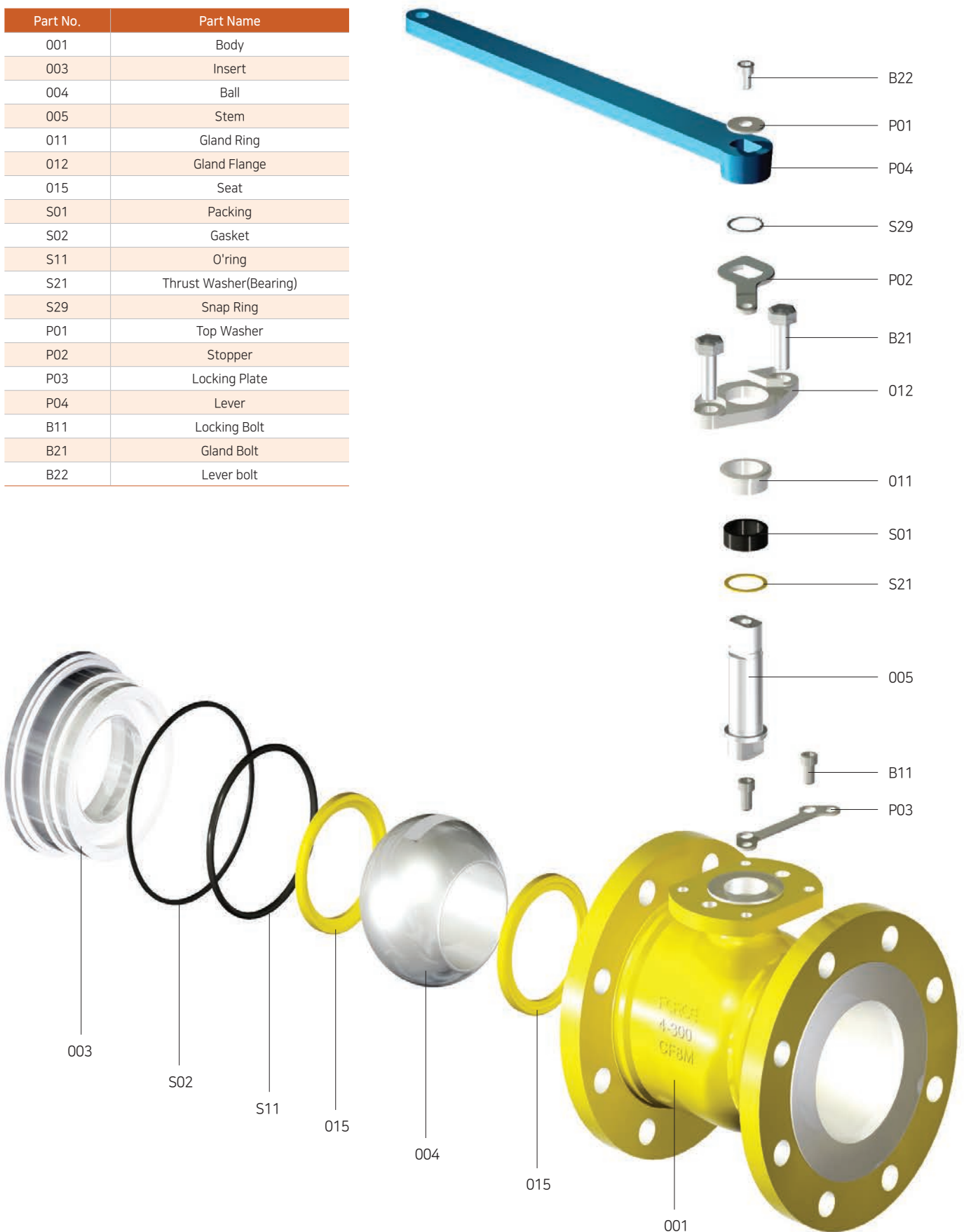
\* Seat material : PTFE & Reinforced PTFE.

\* To select the actuator, adding 25% safety factor to the required torque should be considered.

# BUS Series

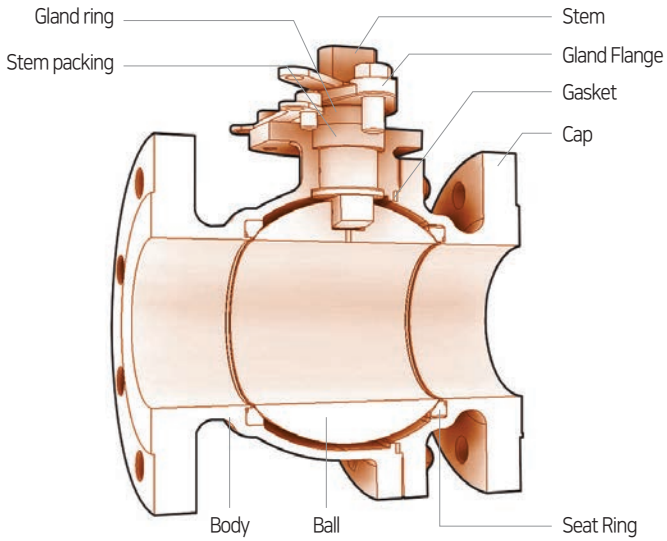
“Uni-Body, Free Floating Ball, Soft Seated & Casting Valves”

Part No.	Part Name
001	Body
003	Insert
004	Ball
005	Stem
011	Gland Ring
012	Gland Flange
015	Seat
S01	Packing
S02	Gasket
S11	O'ring
S21	Thrust Washer(Bearing)
S29	Snap Ring
P01	Top Washer
P02	Stopper
P03	Locking Plate
P04	Lever
B11	Locking Bolt
B21	Gland Bolt
B22	Lever bolt



# BFS Series

"Split-Body, Free Floating Ball, Soft Seated & Casting Valves"

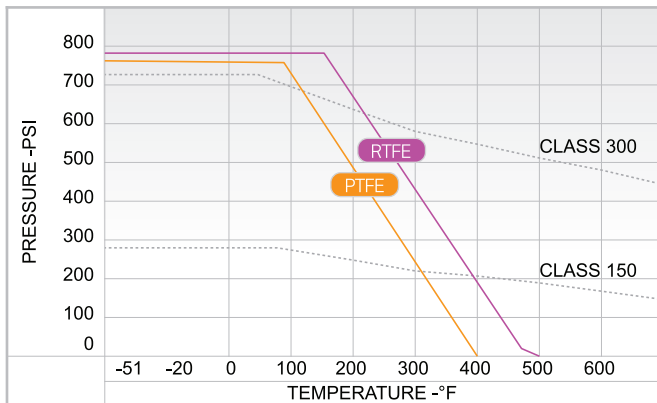


## FEATURES

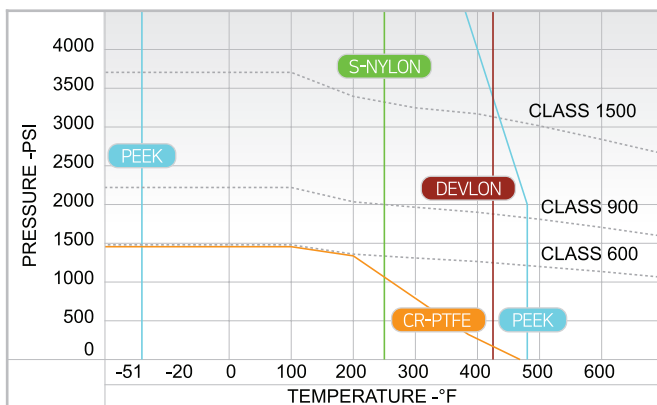
- Basic design : API 6D, API 608 and ISO 17292
- Two-piece body & side entry design
- Blow out-proof stem construction
- Anti-static design
- Locking device
- Micro-finished ball for long service life
- Ball includes pressure equalization hole to prevent trapped pressure in body cavity
- Full & Reduced port
- Size range : NPS 1/2(DN 15) to NPS 12(DN 300)
- Pressure rating : ASME Class 150 to Class 1500
- Graphite gasket and Stem packing prevent post-fire external leakage.
- Post-fire metal-to-metal seal prevents internal leakage after fire.
- Fire-safe design : API 607/ ISO 10497, or API 6FA

## SEAT RATING CHART

### Class 150 & 300



### Class 600 & Above



Extended pressures and temperatures may be achieved by altering design for specific applications. Consult factory with service conditions. The valve rating is the lesser of the body rating and the seat rating.

**FORCE** manufactures an extensive line of high pressure valves capable of the full seat ratings shown. Consult factory for details.

## STANDARD MATERIALS

No.	Parts	Stainless Steel	Carbon Steel
001	Body	ASTM A351-CF8/ CF8M	ASTM A216-WCB
002	Closer(Cap)	ASTM A351-CF8/ CF8M	ASTM A216-WCB
004	Ball	ASTM A351-CF8M	
005	Stem	ASTM A276-316	
011	Gland Ring	ASTM A276-316	
012	Gland Flange	ASTM A351-CF8	
015	Seat Ring	PTFE or Reinforced PTFE	
S01	Packing	Graphite	
S02	Gasket(Cap)	SPW316-Graphite	
S21	Thrust Washer	Reinforced PTFE	
P01	Top Washer	ASTM A240-304	
P02	Stopper	ASTM A240-304	
P03	Locking Plate	ASTM A240-304	AISI 1020 with Zn Plated
P04	Lever	ASTM A283-D with Vinyl Coated or A536	
B01	Joint Bolt	ASTM A193-B8/ B8M	AST A193-B7/B7M
N01	Jount Nut	ASTM A194-8/ 8M	ASTM A194-2H/2HM
B11	Stopper Bolt	ASTM A193-B8	ASTM A307-B
B21	Gland Bolt	ASTM A193-B8	

## DESIGN SPECIFICATIONS AVAILABLE

API 6D 24Edition	Piping Valve(Design)
API 608	Metal Ball Valves(Design)
ASME B16.34	Steel Valves(Design)
ISO 17292/ BS 5351	Steel Ball Valves(Petrochemical Industry)
ASME B16.5	Pipe Flanges and Flanged Fitting
ASME B16.10	Face-to-face and End-to-end Dimensions
MSS SP-72	Ball Valves
API 607/ ISO 10497	Fire Test for Soft Seated Valves
NACE MR 0175	Sour Gas Service Application

**STANDARD MATERIALS**

- Body : Carbon Steel (WCB, LCC), Stainless Steel (CF8, CF8M)
- Ball : Stainless Steel (CF8, CF8M)
- Stem : SS304, SS316
- Seat : PTFE, RTFE, Modified TFE



**SPECIFICATIONS**

**Construction**

Split-body, Side entry, Full/Reduced port, Free floating ball, "Fire-safe" designed to **API 607 / ISO 10497 or API 6FA** Blow out proof stem, Anti-static device, Cavity relieving seats.

Valves are designed to **API 6D, ASME B16.34, API 608** and **ISO 17292 / BS 5351** specifications.

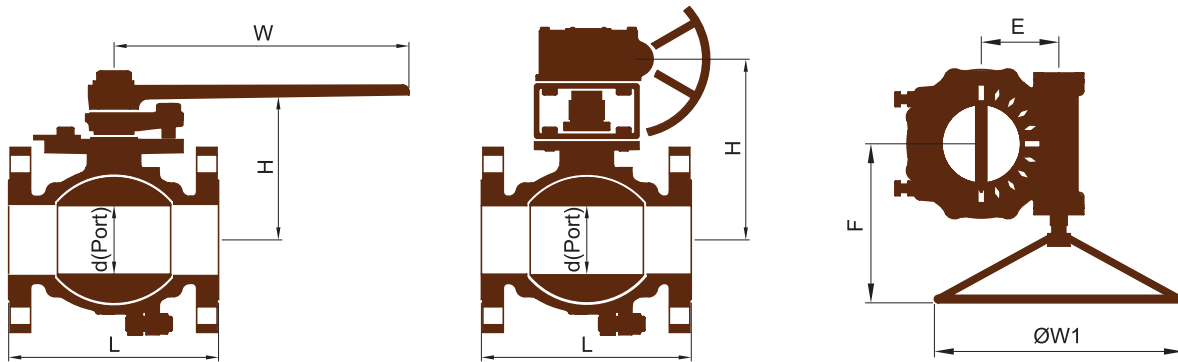
Manufactured and conforms to **NACE** standard **MR 0175**.

**Test pressure (psig / CS material)**

ASME Class	Max. Working pressure	Shell (Hydro.)	Seat (Hydro. / Air)
Class 150	285	450	325 / 80
Class 300	740	1125	825 / 80

**DIMENSIONS**

**CLASS 150 & 300**

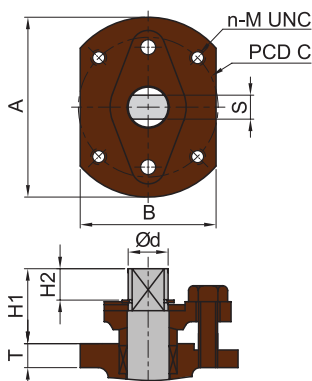


Valve Size		1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"	
Ød (port)	inch	0.5	0.7	1.0	1.5	2.0	2.5	3.0	4.0	6.0	8.0	10.0	12.0	
	mm	13	19	25	38	51	64	76	102	152	203	254	305	
L	150	inch	4.25	4.61	5.00	6.50	7.01	7.50	8.00	9.02	15.51	17.99	21.00	24.02
		mm	108	117	127	165	178	190.5	203.2	229	394	457	533.4	610
	300	inch	5.51	5.91	6.50	7.50	8.50	9.49	11.14	12.01	15.87	19.76	22.37	-
		mm	140	150	165	190.5	216	241	283	305	403	502	568.3	-
H	inch	3.70	3.90	4.57	5.31	6.10	6.10	6.57	7.80	12.99	14.80	19.49	20.47	
	mm	94	99	116	135	155	155	167	198	330	376	495	520	
W	inch	5.12	5.12	6.10	9.06	9.06	14.96	14.96	17.72	23.62	31.50	39.37	-	
	mm	130	130	155	230	230	380	380	450	600	800	1000	-	
ØW1	inch	-	-	-	-	-	-	-	-	19.69	19.69	27.95	27.95	
	mm	-	-	-	-	-	-	-	-	500	500	710	710	
E	inch	-	-	-	-	-	-	-	-	11.34	11.69	12.44	12.44	
	mm	-	-	-	-	-	-	-	-	288	297	316	316	
F	inch	-	-	-	-	-	-	-	-	2.74	3.25	3.82	3.82	
	mm	-	-	-	-	-	-	-	-	69.5	82.5	97	97	
Approx. Weight	150	lb	4.0	5.1	7.1	14.6	21.6	34.8	47.0	76.5	163.1	288.8	454.2	1005.3
		kg	1.8	2.3	3.2	6.6	9.8	15.8	21.3	34.7	74	131	206	456
	300	lb	5.3	7.9	11.2	23.8	31.3	46.7	62.8	110.5	227.1	385.8	617.3	-
		kg	2.4	3.6	5.1	10.8	14.2	21.2	28.5	50.1	103	175	280	-

Gear operators are available for most sizes.

**TOP WORKS DIMENSIONS**

**CLASS 150 & 300**



Size	Ød	S	A	B	PCD C	n-M	H1	H2	T	ISO 5211
1/2"	10	6	55	39	42	4-1/4"	20	9.5	8	F04
3/4"	10	6	55	39	42	4-1/4"	20	9.5	8	F04
1"	14	8	65	48	50	4-1/4"	22.7	9.7	9	F05
1 1/2"	20	12	90	68	70	4-5/16"	32	9.8	9	F07
2"	20	12	90	68	70	4-5/16"	32	9.8	11	F07
2 1/2"	27	17	125	95	102	4-3/8"	44.5	18.3	14	F10
3"	27	17	125	95	102	4-3/8"	43.5	17	12	F10
4"	34	22	125	95	102	4-3/8"	49	24	12	F10
6"	44	26	153	116	125	4-1/2"	59	26.5	16	F12
8"	51	32	175	134	140	4-5/8"	73	34.3	19	F14
10"	50	38	210	165	165	4-3/4"	99.5	44.5	24	F16

Unit : mm

\* The data above can be changed without previous notice.

# BFS Series

"Split-Body, Free Floating Ball, Soft Seated & Casting Valves"

## STANDARD MATERIALS

- Body : Carbon Steel (WCB, LCC), Stainless Steel (CF8, CF8M)
- Ball : Stainless Steel (CF8, CF8M)
- Stem : SS304, SS316
- Seat : Modified TFE, NYLON/DEVLON, PEEK



## SPECIFICATIONS

### Construction

Split-body, Side entry, Full/Reduced port, Free floating ball, "Fire-safe" designed to **API 607/ISO 10497** or **API 6FA**, Blow out proof stem, Anti-static device, Cavity relieving seats.

Valves are designed to **API 6D, ASME B16.34, API 608** and **ISO 17292 / BS 5351** specifications.

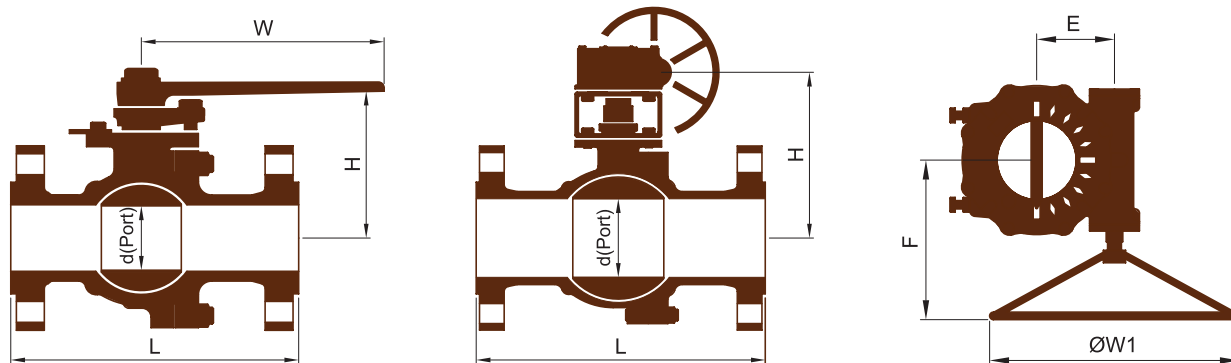
Manufactured and conforms to **NACE** standard **MR 0175**.

### Test pressure (psig / CS material)

ASME Class	Max. Working pressure	Shell (Hydro.)	Seat (Hydro. / Air)
Class 600	1480	2225	1650 / 80

## DIMENSIONS

## CLASS 600

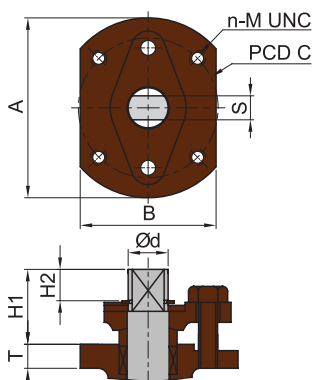


Valve Size	1/2"	3/4"	1"	1 1/2"	2"	3"x2"	3"	4"x3"	4"	6"x4"	6"	8"x6"
Ød (port)	inch	0.5	0.7	1.0	1.5	2.0	2.0	3.0	3.0	4.0	4.0	6.0
	mm	13	19	25	38	51	51	76	76	102	102	152
L	inch	6.50	7.50	8.50	9.50	11.50	14.02	14.00	17.01	17.01	22.01	26.00
	mm	165.1	190.5	215.9	241.3	292	356	355.6	432	432	559	660.4
H	inch	3.86	4.17	4.57	5.55	6.26	6.26	7.76	7.76	9.45	9.45	13.31
	mm	98	106	116	141	159	159	197	197	240	240	338
W	inch	9.65	9.65	9.65	14.57	14.57	14.57	17.72	17.72	23.62	23.62	31.50
	mm	245	245	245	370	370	370	450	450	600	600	800
ØW1	inch	-	-	-	-	-	-	-	-	19.69	19.69	19.69
	mm	-	-	-	-	-	-	-	-	500	500	500
E	inch	-	-	-	-	-	-	-	-	11.34	11.69	11.69
	mm	-	-	-	-	-	-	-	-	288	297	297
F	inch	-	-	-	-	-	-	-	-	2.74	3.25	3.25
	mm	-	-	-	-	-	-	-	-	69.5	82.5	82.5
Approx. Weight	lb	8.6	14.6	18.3	34.6	75.0	37.5	132.3	121.3	242.5	255.7	443.1
	kg	3.9	6.6	8.3	15.7	34	29	60	55	110	116	201

Gear operators are available for most sizes.

## TOP WORKS DIMENSIONS

## CLASS 600

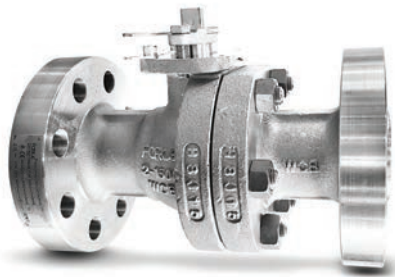


Size	Ød	S	A	B	PCD C	n-M	H1	H2	T	ISO 5211
1/2"	15	10	65	47	50	4-1/4"	23	9.5	9	F05
3/4"	15	10	65	48	50	4-1/4"	26	9.5	9	F05
1"	15	10	65	48	50	4-1/4"	28.5	10	9	F05
1 1/2"	21	14	90	68	70	4-5/16"	35.5	16	11	F07
2"	21	14	90	68	70	4-5/16"	37.5	16	12	F07
2 1/2"	34	22	125	95	102	4-3/8"	49.5	25.2	15	F10
3"	34	22	125	95	102	4-3/8"	49.5	24.5	15	F10
4"	44	26	153	116	125	4-1/2"	57	24.8	18	F12
6"	51	32	175	134	140	4-5/8"	71	34.5	19	F14

Unit : mm

**STANDARD MATERIALS**

- Body : Carbon Steel (WCB, LCC), Stainless Steel (CF8, CF8M)
- Ball : Stainless Steel (CF8, CF8M)
- Stem : SS304, SS316
- Seat : Modified TFE, NYLON/DEVLON, PEEK



**SPECIFICATIONS**

**Construction**

Split-body, Side entry, Full/Reduced port, Free floating ball, "Fire-safe" designed to **API 607/ISO 10497** or **API 6FA**, Blow out proof stem, Anti-static device, Cavity relieving seats.

Valves are designed to **API 6D, ASME B16.34, API 608** and **ISO 17292 / BS 5351** specifications.

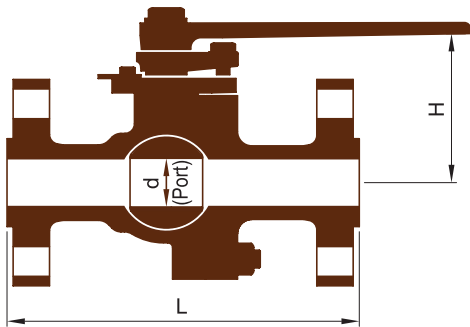
Manufactured and conforms to **NACE** standard **MR 0175**.

**Test pressure (psig / CS material)**

ASME Class	Max. Working pressure	Shell (Hydro.)	Seat (Hydro. / Air)
Class 900	2220	3350	2450 / 80
Class 1500	3705	1175	4100 / 80

**DIMENSIONS**

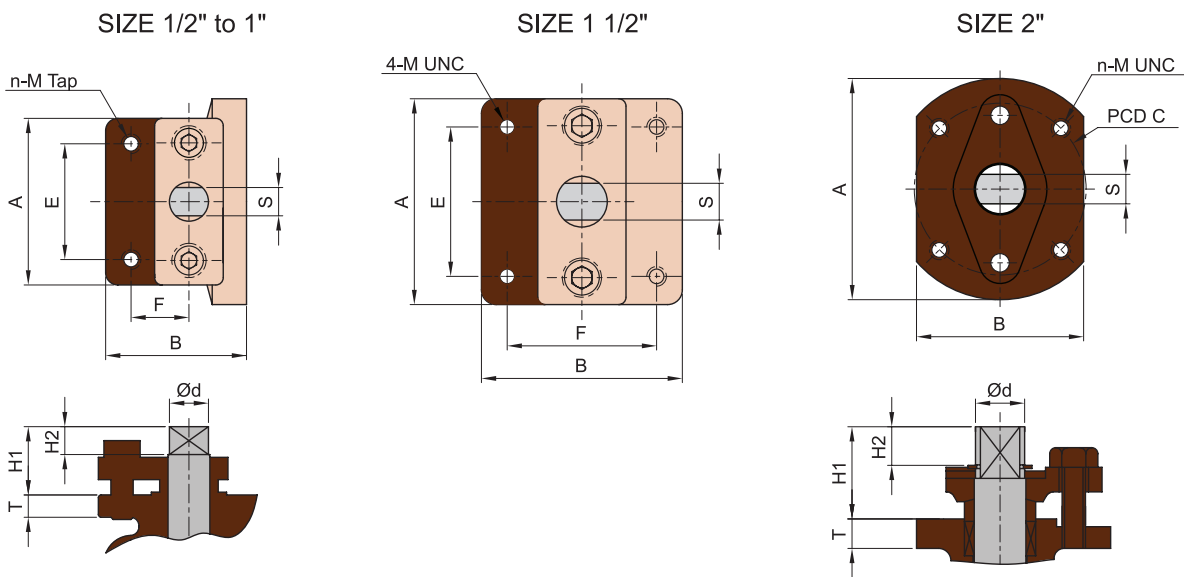
**CLASS 900 & 1500**



Valve Size		1/2"	3/4"	1"	1 1/2"	2"
Ød (port)	inch	0.5	0.7	1.0	1.5	2.0
	mm	13	19	25	38	51
L	inch	8.50	9.02	10.00	12.01	14.49
	mm	216	229	254	305	368
H	inch	3.90	4.02	4.53	5.67	6.93
	mm	99	102	115	144	176
W	inch	9.65	9.65	9.65	14.57	14.96
	mm	245	245	245	370	380
Approx. Weight	lb	41.3	51.0	72.9	128.8	233.3
	kg	8.5	10.5	15	26.5	48

**TOP WORKS DIMENSIONS**

**CLASS 900 & 1500**



Size	Ød	S	A	B	E	F	PCD C	n-M	H1	H2	T	ISO 5211
1/2"	12	8	68	58	44.5	24.7	-	2-M8	20	9.5	8.5	-
3/4"	12	8	68	60.5	44.5	24.7	-	2-M8	22	9.5	9	-
1"	12	8	68	63	44.5	25	-	2-M8	22.5	11	9	-
1 1/2"	18.5	12	84	82	44.5	60	-	4-3/8"	32	16	13	-
2"	27	17	125	95	-	-	102	4-3/8"	45.5	20	15	F10

Unit : mm

\* The data above can be changed without previous notice.

# BFS Series

"Split-Body, Free Floating Ball, Soft Seated & Casting Valves"

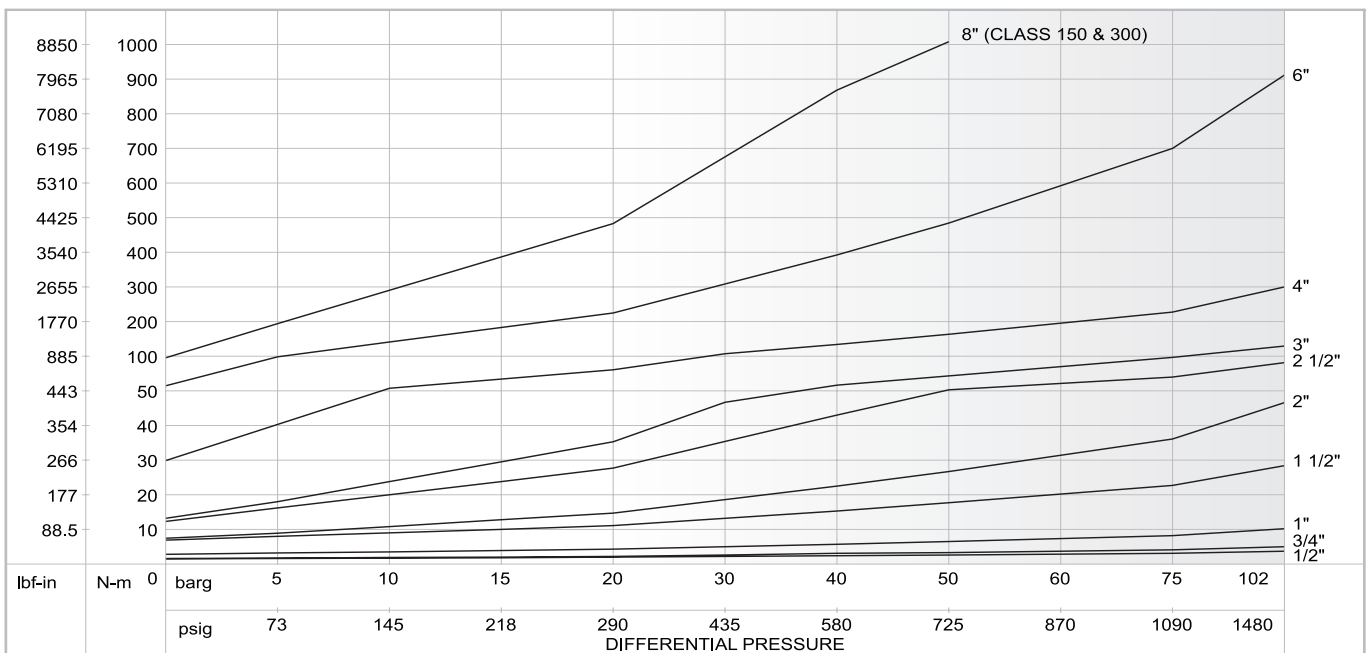
## FLOW COEFFICIENT (CV)

Valve Size		1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"
Cv.Value	Class 150	26	61	113	270	470	740	1,250	2,250	5,200	9,550	15,050	23,050
	Class 300	26	61	113	270	470	-	1,100	2,150	5,150	9,450	15,050	-
Valve Size		1/2"	3/4"	1"	1 1/2"	2"	3"x2"	3"	4"x3"	4"	6"x4"	6"	8"x6"
Cv.Value	Class 600	21	44	75	239	450	250	1,050	650	1,900	840	4,650	2,200
	Class 900/1500	14	34	60	180	380	-	-	-	-	-	-	-

Cv is defined as the volume of water flowing through the valve, in U.S.Gallons per minute at 60°F(15°C), which will result in a pressure drop of 1 psi. The table gives Flow Coefficient(Cv) values for Series 'BF' ball valves in the Full open position.

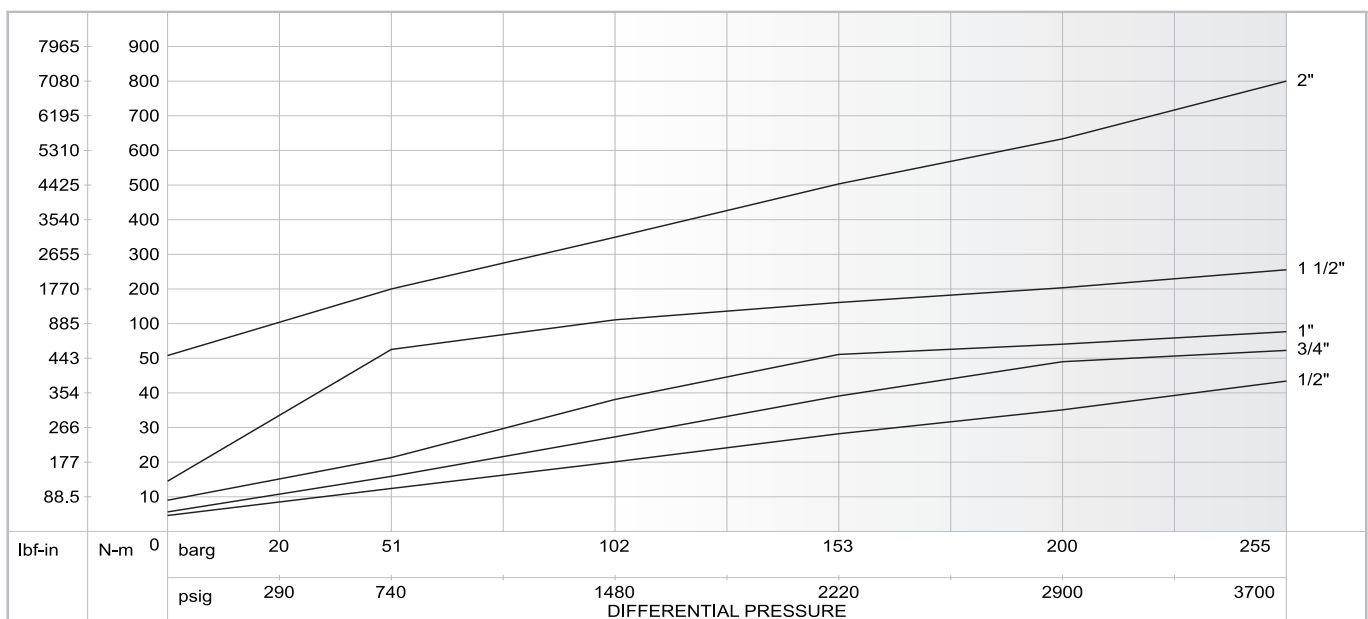
## TORQUE DATA

### Class 150 to 600



\* Seat material : PTFE & Reinforced PTFE.  
 \* To select the actuator, adding 25% safety factor to the required torque should be considered.

### Class 900 & 1500



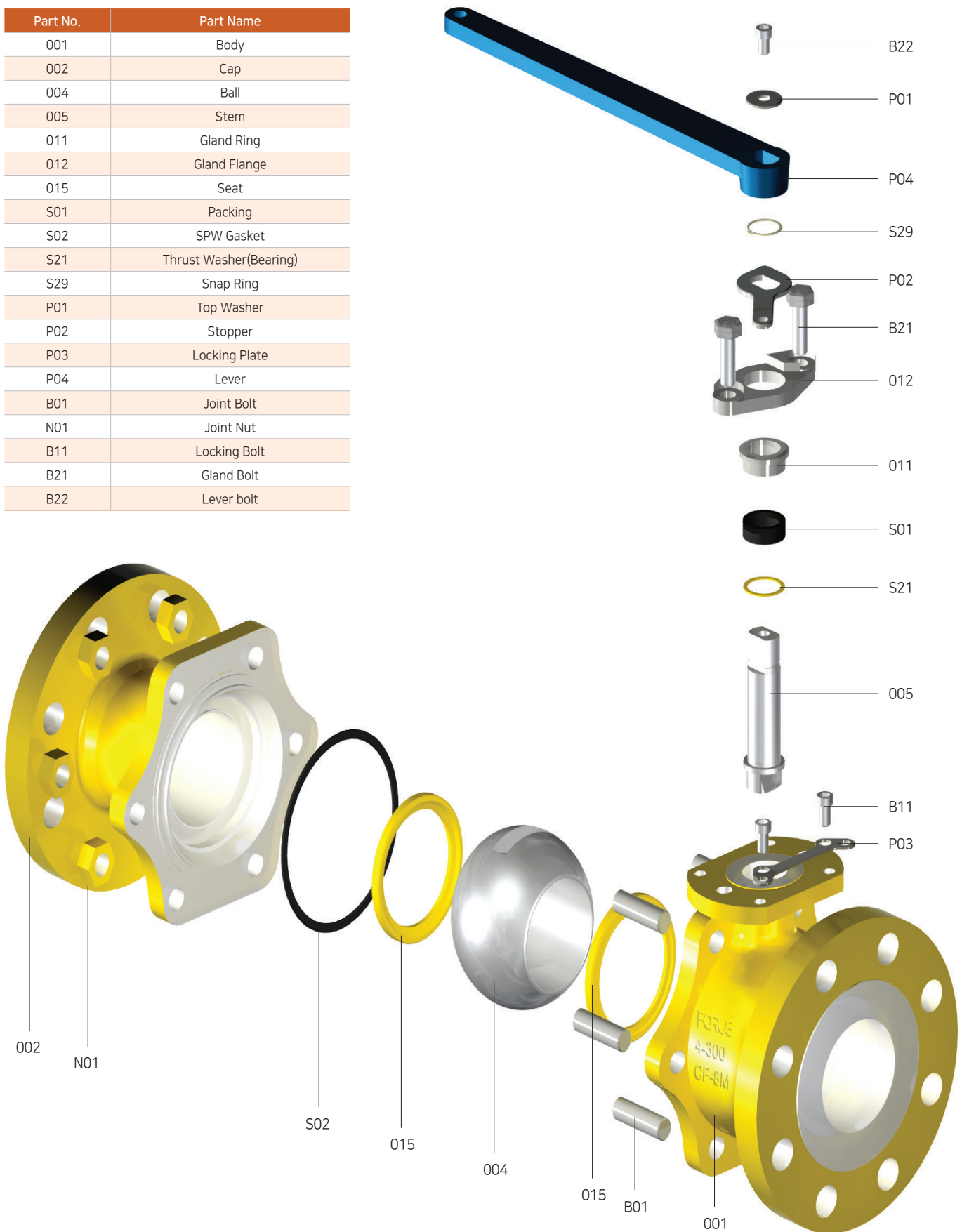
\* Seat material : NYLON & DEVLON V.  
 \* To select the actuator, adding 25% safety factor to the required torque should be considered.



# BFS Series

“Split-Body, Free Floating Ball, Soft Seated & Casting Valves”

Part No.	Part Name
001	Body
002	Cap
004	Ball
005	Stem
011	Gland Ring
012	Gland Flange
015	Seat
S01	Packing
S02	SPW Gasket
S21	Thrust Washer(Bearing)
S29	Snap Ring
P01	Top Washer
P02	Stopper
P03	Locking Plate
P04	Lever
B01	Joint Bolt
N01	Joint Nut
B11	Locking Bolt
B21	Gland Bolt
B22	Lever bolt



# DFS Series

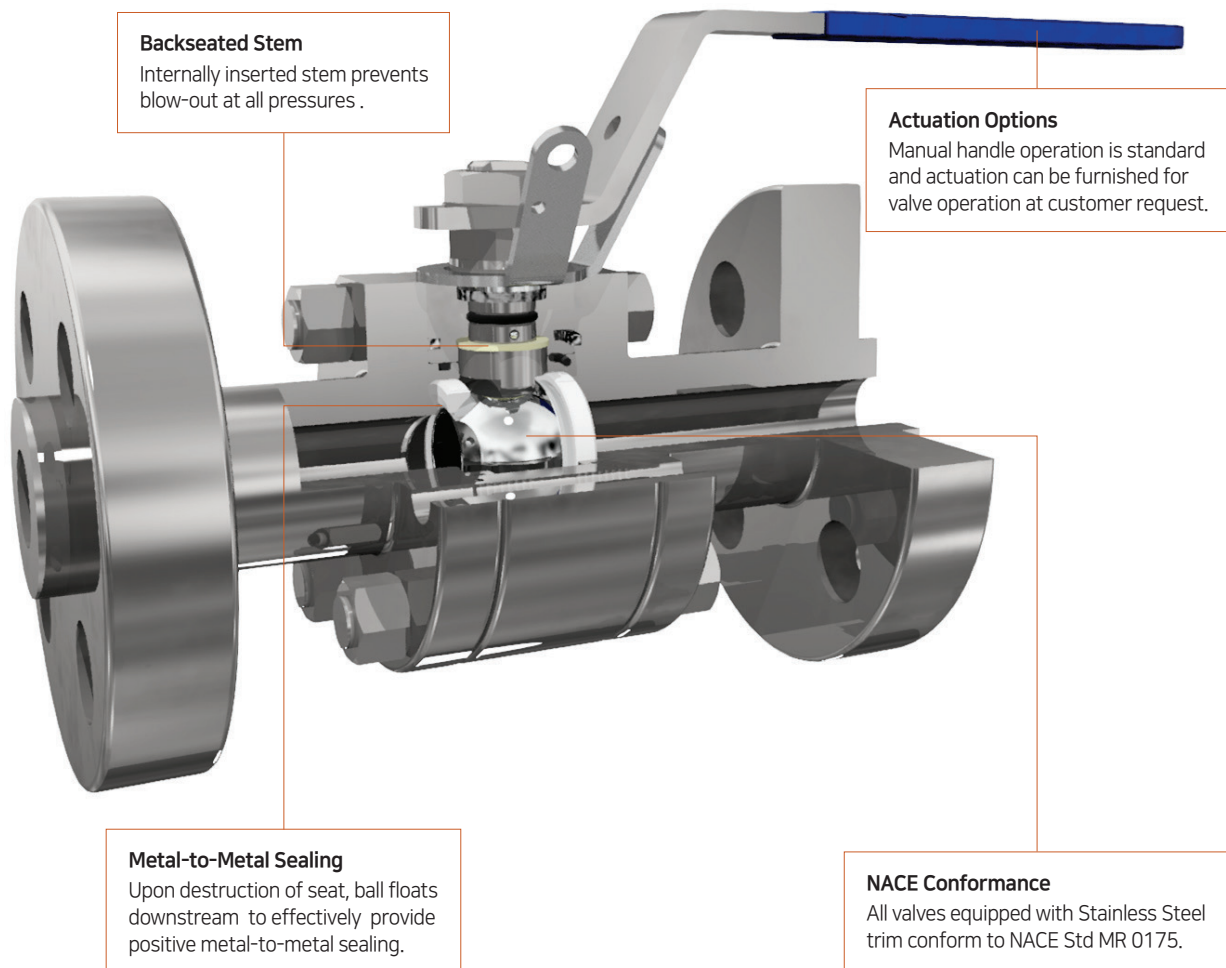
“Split-Body, Free Floating Ball, Soft Seated & Forged Valves”

## FEATURES

- Basic design : **API 6D, API 608** and **ISO 17292**
- Split-body & side entry design
- Blow out-proof stem construction
- Anti-static design
- Locking device
- Micro-finished ball for long service life
- Ball includes pressure equalization hole to prevent trapped pressure in body cavity
- Full & Reduced port
- Size range : NPS 1/2(DN 15) to NPS 2(DN 50)
- Pressure rating : **ASME** Class 150 to 2500
- Graphite gasket and Stem packing prevent post-fire external leakage.
- Post-fire metal-to-metal seal prevents internal leakage after fire.
- Fire-safe design : **API 607/ ISO 10497** or **API 6FA**



Model	Class	Size-Range
DFS	150 to 2500	1/2" to 2"



\* This is an illustrated of a typical full port, Split-body(Three-piece), floating type ball valve exhibiting the basic design concept.  
\* The actual design of a valve may be slightly different from this illustration, depending on its size and pressure class.

**STANDARD MATERIALS**

- Body : Carbon Steel (A105, LF2), Stainless Steel (F304, F316)
- Ball : Stainless Steel (F304, F316)
- Stem : SS304, SS316
- Seat : PTFE, RTFE, Modified TFE



**SPECIFICATIONS**

**Construction**

Class 150/300 ; Split-body(2-piece), Side entry, Full/Reduced port, Free floating ball, "Fire-safe" designed to **API 607/ISO 10497** or **API 6FA** Blow out proof stem, Anti-static device, Cavity relieving seats.

Valves are designed to **API 6D, ASME B16.34, API 608** and **ISO 17292/BS 5351** Specifications.

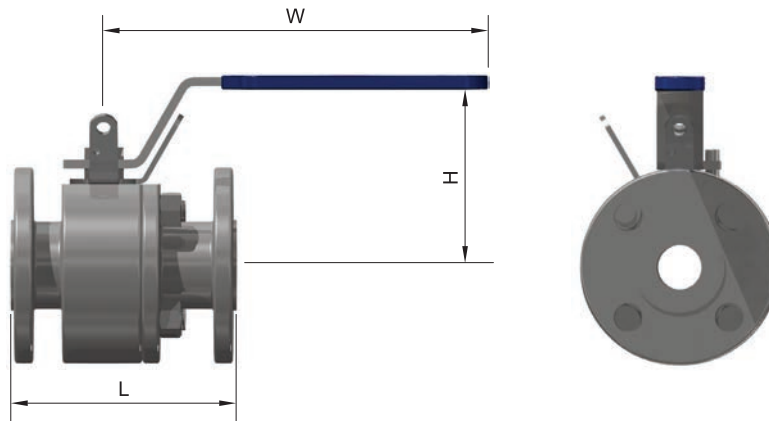
Manufactured and confirms to NACE standard **MR 0175**

**Test pressure (psig / CS material)**

ASME Class	Max. Working pressure	Shell (Hydro.)	Seat (Hydro. / Air)
Class 150	285	450	325 / 80
Class 300	740	1125	825 / 80

**DIMENSIONS**

**CLASS 150 & 300**



Valve Size		1/2"x3/8"	1/2"	3/4"x1/2"	3/4"	1"x3/4"	1"	1 1/2"x1"	1 1/2"	2x1 1/2"	2"	
Class 150	Ød (Ball port)	inch	0.43	0.5	0.5	0.75	0.75	1.0	1.0	1.5	1.5	1.9
		mm	11	13	13	19	19	25	25	38	38	49
	L	inch	4.25	4.25	4.61	4.61	5.00	5.00	6.50	6.50	7.01	7.01
		mm	108	108	117	117	127	127	165	165	178	178
	H	inch	3.66	3.66	3.66	3.94	3.94	4.13	4.13	4.92	4.92	5.31
		mm	93	93	93	100	100	105	105	125	125	135
W	inch	5.12	5.12	5.12	7.09	7.09	8.46	8.46	9.65	9.65	10.63	
	mm	130	130	130	180	180	215	215	245	245	270	
Approx. Weight	lb	6.2	6.6	7.7	8.8	10.8	14.3	19.8	23.6	39.7	46.3	
	kg	2.8	3.0	3.5	4.0	4.9	6.5	9.0	10.7	18.0	21.0	
Class 300	Ød (Ball port)	inch	0.43	0.5	0.5	0.75	0.75	1.0	1.0	1.5	1.5	1.9
		mm	11	13	13	19	19	25	25	38	38	49
	L	inch	5.51	5.51	5.98	5.98	6.50	6.50	7.48	7.48	8.50	8.50
		mm	140	140	152	152	165	165	190	190	216	216
	H	inch	3.66	3.66	3.66	3.94	3.94	4.13	4.13	4.92	4.92	5.31
		mm	93	93	93	100	100	105	105	125	125	135
	W	inch	5.12	5.12	5.12	7.09	7.09	8.46	8.46	9.65	9.65	10.63
		mm	130	130	130	180	180	215	215	245	245	270
	Approx. Weight	lb	7.7	8.4	9.9	11.0	13.2	17.6	26.5	29.5	49.6	79.4
		kg	3.5	3.8	4.5	5.0	6.0	8.0	12.0	13.4	22.5	36.0

\* The data above can be changed without previous notice.

# DFS Series

"Split-Body, Free Floating Ball, Soft Seated & Forged Valves"

## STANDARD MATERIALS

- Body : Carbon Steel (A105, LF2), Stainless Steel (F304, F316)
- Ball : Stainless Steel (F304, F316)
- Stem : SS304, SS316
- Seat : PTFE, RTFE, Modified TFE, NYLON/ DEVLON, PEEK



## SPECIFICATIONS

### Construction

Class 600 to 2500 ; Split-body(3-piece), Side entry, Full/Reduced port, Free floating ball, "Fire-safe" designed to **API 607/ISO 10497 or API 6FA** Blow out proof stem, Anti-static device, Cavity relieving seats.

Valves are designed to **API 6D, ASME B16.34, API 608** and **ISO 17292/BS 5351** Specifications.

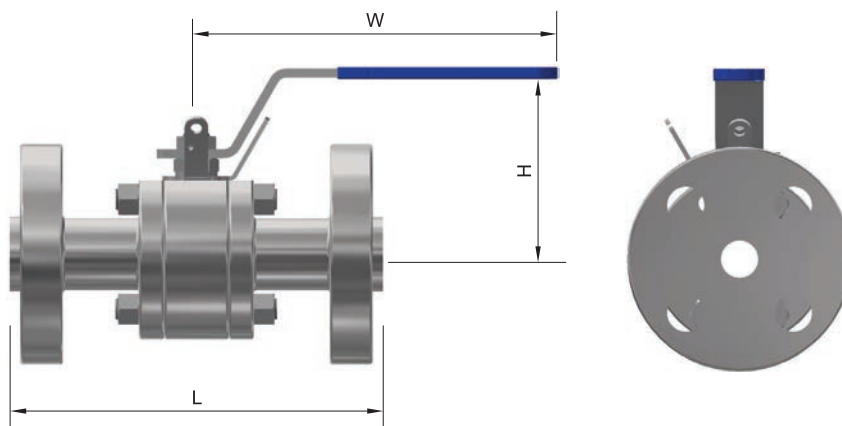
Manufactured and confirms to **NACE** standard **MR 0175**

### Test pressure (psig / CS material)

ASME Class	Max. Working pressure	Shell (Hydro.)	Seat (Hydro. / Air)
Class 600	1480	2225	1650/ 80
Class 900	2220	3350	2450/ 80
Class 1500	3705	1175	4100/ 80
Class 2500	6170	9275	6800/ 80

## DIMENSIONS

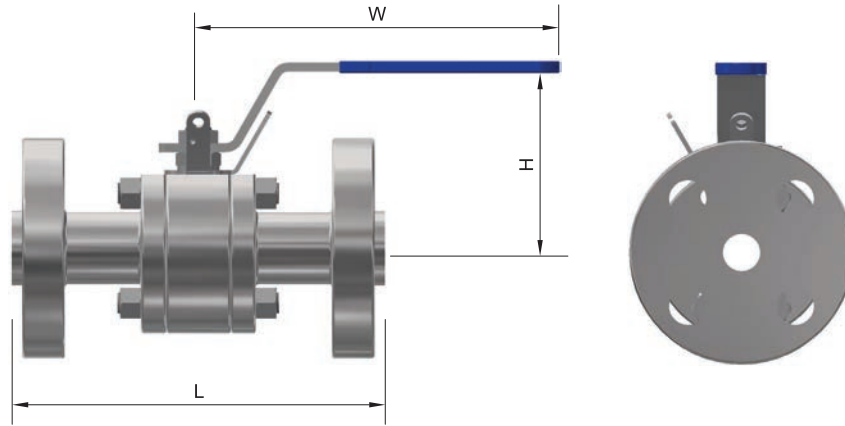
## CLASS 600



Valve Size		1/2"x3/8"	1/2"	3/4"x1/2"	3/4"	1"x3/4"	1"	1 1/2"x1"	1 1/2"	2x1 1/2"	2"	
Class 600	Ød (Ball port)	inch	0.43	0.5	0.5	0.75	0.75	1.0	1.0	1.5	1.5	1.9
		mm	11	13	13	19	19	25	25	38	38	49
	L	inch	6.50	6.50	7.48	7.48	8.50	8.50	9.49	9.49	11.50	11.50
		mm	165	165	190	190	216	216	241	241	292	292
	H	inch	3.74	3.74	3.74	4.13	4.13	4.33	4.33	5.12	5.12	5.51
		mm	95	95	95	105	105	110	110	130	130	140
	W	inch	7.09	7.09	7.09	8.46	8.46	9.06	9.06	9.65	9.65	10.63
		mm	180	180	180	215	215	230	230	245	245	270
	Approx. Weight	lb	11.7	13.2	17.6	18.7	19.8	26.5	39.7	44.1	75.0	101.4
		kg	5.3	6.0	8.0	8.5	9.0	12.0	18.0	20.0	34.0	46.0

**DIMENSIONS**

**CLASS 900 TO 2500**



Valve Size		1/2"x3/8"	1/2"	3/4"x1/2"	3/4"	1"x3/4"	1"	1 1/2"x1"	1 1/2"	2x1 1/2"	2"	
CLASS 900/1500	Ød (Ball port)	inch	0.43	0.5	0.5	0.75	0.75	1.0	1.0	1.5	1.5	1.9
		mm	11	13	13	19	19	25	25	38	38	49
	L	inch	8.50	8.50	9.02	9.02	10.00	10.00	12.01	12.01	14.49	14.49
		mm	216	216	229	229	254	254	305	305	368	368
	H	inch	4.06	4.21	4.21	4.53	4.53	4.92	4.92	5.71	5.71	6.30
		mm	103	107	107	115	115	125	125	145	145	160
	W	inch	8.46	8.46	8.46	9.65	9.65	9.65	9.65	10.63	10.63	13.78
		mm	215	215	215	245	245	245	245	270	270	350
	Approx. Weight	lb	22.0	23.1	24.3	27.6	30.9	37.5	55.1	81.6	92.6	110.2
		kg	10.0	10.5	11.0	12.5	14.0	17.0	25.0	37.0	42.0	50.0
Valve Size		1/2"x3/8"	1/2"	3/4"x1/2"	3/4"	1"x3/4"	1"	1 1/2"x1"	1 1/2"	2x1 1/2"		
CLASS 2500	Ød (Ball port)	inch	0.43	0.5	0.5	0.75	0.75	1.0	1.0	1.5	1.5	
		mm	11	13	13	19	19	25	25	38	38	
	L	inch	10.39	10.39	10.75	10.75	12.13	12.13	15.12	15.12	17.76	
		mm	264	264	273	273	308	308	384	384	451	
	H	inch	5.12	5.35	5.35	6.14	59.69	6.65	6.65	7.01	7.01	
		mm	130	136	136	156	1516	169	169	178	178	
	W	inch	10.63	10.63	10.63	13.78	13.78	15.75	15.75	19.69	19.69	
		mm	270	270	270	350	350	400	400	500	500	
	Approx. Weight	lb	33.1	36.4	40.8	44.1	60.6	70.5	105.8	114.6	147.7	
		kg	15.0	16.5	18.5	20.0	27.5	32.0	48.0	52.0	67.0	

\* The data above can be changed without previous notice.

# SFS Series

"Split-Body, Free Floating Ball, Soft Seated & Forged Valves"

## STANDARD MATERIALS

- Body : Carbon Steel (A105, LF2), Stainless Steel (F304, F316)
- Ball : Stainless Steel (F304, F316)
- Stem : SS304, SS316
- Seat : PTFE, RTFE, Modified TFE, NYLON/ DEVLON, PEEK



## SPECIFICATIONS

### Construction

Class 800/1500 ; Split-body(3-piece), Side entry, Full/Reduced port, Free floating ball, **Screwed Ends**, "Fire-safe" designed to **API 607/ISO 10497 or API 6FA** Blow out proof stem, Anti-static device, Cavity relieving seats.

Valves are designed to **API 6D, ASME B16.34, API 608** and **ISO 17292/BS 5351** Specifications.

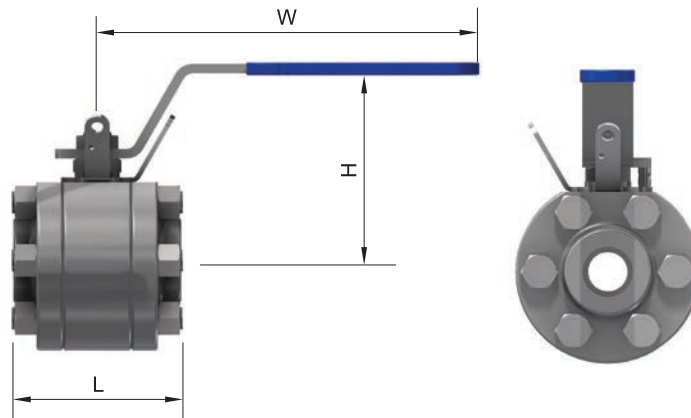
Manufactured and confirms to **NACE** standard **MR 0175**

### Test pressure (psig / CS material)

ASME Class	Max. Working pressure	Shell (Hydro.)	Seat (Hydro. / Air)
Class 800	2000	3000	2200/ 80
Class 1500	3705	1175	4100/ 80

## DIMENSIONS

## CLASS 800 & 1500



Valve Size		1/2"x3/8"	1/2"	3/4"x1/2"	3/4"	1"x3/4"	1"	1 1/2"x1"	1 1/2"	2x1 1/2"	2"	
Class 800	Ød (Ball port)	inch	0.43	0.5	0.5	0.75	0.75	1.0	1.0	1.5	1.5	1.9
		mm	11	13	13	19	19	25	25	38	38	49
	L	inch	3.54	3.54	3.94	3.94	4.53	4.53	5.12	5.12	6.30	6.30
		mm	90	90	100	100	115	115	130	130	160	160
	H	inch	3.94	4.13	4.13	4.33	4.33	4.53	4.53	4.92	4.92	5.51
		mm	100	105	105	110	110	115	115	125	125	140
W	inch	7.09	7.09	7.09	8.46	8.46	9.06	9.06	9.65	9.65	10.63	
	mm	180	180	180	215	215	230	230	245	245	270	
Approx. Weight	lb	3.3	4.4	5.5	7.1	8.4	11.0	12.1	16.5	18.7	26.5	
	kg	1.5	2.0	2.5	3.2	3.8	5.0	5.5	7.5	8.5	12.0	
Class 1500	Ød (Ball port)	inch	0.43	0.5	0.5	0.75	0.75	1.0	1.0	1.5	1.5	1.9
		mm	11	13	13	19	19	25	25	38	38	49
	L	inch	3.94	3.94	4.33	4.33	4.92	4.92	5.51	5.51	6.69	6.69
		mm	100	100	110	110	125	125	140	140	170	170
	H	inch	4.33	4.53	4.53	4.72	4.72	4.92	4.92	5.31	5.31	5.91
		mm	110	115	115	120	120	125	125	135	135	150
	W	inch	8.46	8.46	8.46	9.65	9.65	9.65	9.65	10.63	10.63	13.78
		mm	215	215	215	245	245	245	245	270	270	350
	Approx. Weight	lb	6.6	8.4	9.9	13.2	14.8	17.6	20.9	28.7	33.1	44.1
		kg	3.0	3.8	4.5	6.0	6.7	8.0	9.5	13.0	15.0	20.0

**STANDARD MATERIALS**

- Body : Carbon Steel (A105, LF2), Stainless Steel (F304, F316)
- Ball : Stainless Steel (F304, F316)
- Stem : SS304, SS316
- Seat : PTFE, RTFE, Modified TFE, NYLON/ DEVLON, PEEK



**SPECIFICATIONS**

**Construction**

Class 800/1500 ; Split-body(3-piece), Side entry, Full/Reduced port, Free floating ball, **Socket-weld End**, "Fire-safe" designed to **API 607/ISO 10497** or **API 6FA** Blow out proof stem, Anti-static device, Cavity relieving seats.

Valves are designed to **API 6D, ASME B16.34, API 608** and **ISO 17292/BS 5351** Specifications.

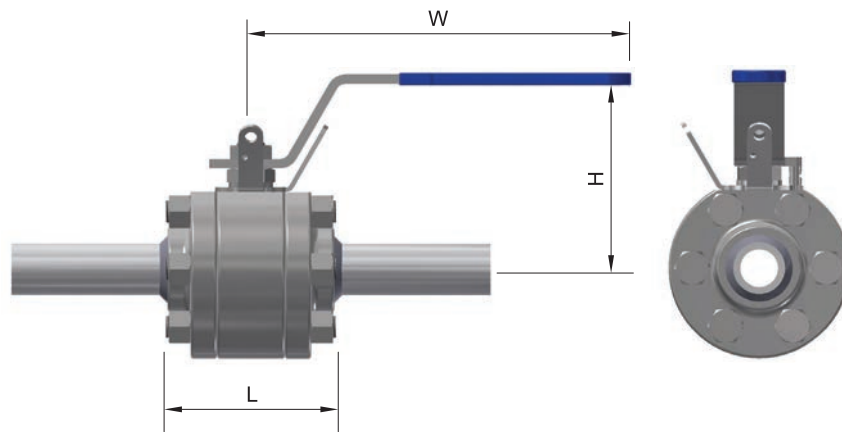
Manufactured and confirms to **NACE standard MR 0175**

**Test pressure (psig / CS material)**

ASME Class	Max. Working pressure	Shell (Hydro.)	Seat (Hydro. / Air)
Class 800	2000	3000	2200/ 80
Class 1500	3705	1175	4100/ 80

**DIMENSIONS**

**CLASS 800 & 1500**



Valve Size		1/2"x3/8"	1/2"	3/4"x1/2"	3/4"	1"x3/4"	1"	1 1/2"x1"	1 1/2"	2x1 1/2"	2"	
Class 800	Ød (Ball port)	inch	0.43	0.5	0.5	0.75	0.75	1.0	1.0	1.5	1.5	1.9
		mm	11	13	13	19	19	25	25	38	38	49
	L (without Nipple)	inch	5.71	5.71	5.91	5.91	6.10	6.10	7.09	7.09	7.87	7.87
		mm	145	145	150	150	155	155	180	180	200	200
	L (with Nipple)	inch	3.15	3.15	3.94	3.94	4.53	4.53	5.12	5.12	6.30	6.30
		mm	80	80	100	100	115	115	130	130	160	160
	H	inch	3.94	4.13	4.13	4.33	4.33	4.53	4.53	4.92	4.92	5.51
		mm	100	105	105	110	110	115	115	125	125	140
	W	inch	7.09	7.09	7.09	8.46	8.46	9.06	9.06	9.65	9.65	10.63
		mm	180	180	180	215	215	230	230	245	245	270
	Approx. Weight	lb	4.5	6.0	7.4	9.5	11.3	14.9	16.4	22.3	25.3	35.7
		kg	2.0	2.7	3.4	4.3	5.1	6.8	7.4	10.1	11.5	16.2
Class 1500	Ød (Ball port)	inch	0.43	0.5	0.5	0.75	0.75	1.0	1.0	1.5	1.5	1.9
		mm	11	13	13	19	19	25	25	38	38	49
	L (without Nipple)	inch	5.71	5.71	5.91	5.91	6.10	6.10	7.09	7.09	7.87	7.87
		mm	145	145	150	150	155	155	180	180	200	200
	L (with Nipple)	inch	3.94	3.94	4.33	4.33	4.92	4.92	5.51	5.51	6.69	6.69
		mm	100	100	110	110	125	125	140	140	170	170
	H	inch	3.66	3.66	3.66	3.94	3.94	4.13	4.13	4.92	4.92	5.31
		mm	93	93	93	100	100	105	105	125	125	135
	W	inch	8.46	8.46	8.46	9.65	9.65	9.65	9.65	10.63	10.63	13.78
		mm	215	215	215	245	245	245	245	270	270	350
	Approx. Weight	lb	8.9	11.3	13.4	17.9	19.9	23.8	28.3	38.7	44.6	59.5
		kg	4.1	5.1	6.1	8.1	9.0	10.8	12.8	17.6	20.3	27.0

\* The data above can be changed without previous notice.

## SEAT INSERT & SEAL MATERIAL LIMITATION

Material	Temperature (°C)		Pressure Class		Nominal Size	
	Min.	Max.	Seat	Seal	Seat	Seal
PTFE/PFA	-	200	150	-	NPS 10	-
	-	150	300	-	NPS 10	-
	-	120	600	-	NPS 10	-
PCTFE	-	130	150	-	NPS 60	-
	-	120	300	-	NPS 60	-
	-	100	600	-	NPS 60	-
	-	70	900	-	NPS 60	-
	-	40	2500	-	NPS 60	-
	-	130	150	-	NPS 60	-
Polyamide& Devlon V	-	120	300	-	NPS 60	-
	-	100	600	-	NPS 60	-
	-	70	900	-	NPS 60	-
	-	40	1500	-	NPS 60	-
PEEK	-	150	900	-	NPS 60	-
	-	120	1500	-	NPS 60	-
	-	100	2500	-	NPS 60	-

Operating conditions considering the maximum pressure class

Source, TOTAL general specification GS EP PVV 142 REV.09

Material		Temperature (°C)		Pressure Class		Nominal Size	
		Min.	Max.	Seat	Seal	Seat	Seal
Elastomeric	NBR	0	80	-	-	-	-
	HNBR	-40	150	-	-	-	-
	FKM	-30	180	-	-	-	-
	FFKM	-20	220	-	-	-	-
Thermoplastic	PTFE(Virgin/ Filled)	-200	200	-	-	-	-
	KELF PCTFE	-200	100	-	-	-	-
	TEFLON FEP	-80	140	-	-	-	-
	TEFLON PFA	-200	200	-	-	-	-
	NYLON 12	-20	100	-	-	-	-
	DEVLON V	-20	100	-	-	-	-
	PEEK	-80	150	-	-	-	-
	TURCITE 243	-200	250	-	-	-	-
Other	VESPEL SP 21	-200	260	-	-	-	-
	GRAPHITE	-240	550	-	-	-	-
	METALLIC	-240	550	-	-	-	-

Source, TOTAL general specification GS EP PVV 142 REV.09

Material		Temperature (°C)		Pressure Class		Nominal Size	
		Min.	Max.	Seat	Seal	Seat	Seal
Elastomeric	HNBR -EOL 985	-40	150	600	2500	NPS 60	NPS 60
	FKM A/B (VITON A/B)	-29	180	600	2500	NPS 60	NPS 60
	FKM GLT (VITON GLT)	-40	200	600	2500	NPS 60	NPS 60
	PTFE+Elgiloy Springs	-196	200	-	2500	-	NPS 36
Thermoplastic	Nylon SMX	-60	140	2500	-	NPS 60	-
	Nylon 12-G(Lauramid)	-60	100	2500	-	NPS 60	-
	Nylon 6(Devlon-V API)	-100	140	2500	-	NPS 60	-
	PEEK -Virgin	-100	240	2500	-	NPS 36	-
	PEEK -Vespel	-20	280	2500	-	NPS 36	-
	PTFE glass filled(25%)	-100	200	600	-	NPS 20	-
	PTFE carbon filled(25%)	-100	240	300	-	NPS 20	-
Other	PCTFE	-196	150	2500	-	NPS 30	-
	GRAPHITE	-240	560	-	2500	-	NPS 60

Temperature ratings shown are the maximum range and reduce as pressure increases. As size increases, pressure/ temperature ratings can decrease, especially seat insert materials. Similarly, at lower temperatures and in larger sizes, the pressure/ temperature rating of elastomers and seat insert materials is affected.



**MATERIAL SPECIFICATIONS FOR BALL VALVES****Body and Trim Material****■ Carbon Steel**

I ASTM A216 gr. WCB

I ASTM A105

**■ Carbon Steel**

I ASTM A352 gr. LCC

I ASTM A350 gr. LF2

**■ Low Alloy Steel**

I AISI 4140

I ASTM A694 gr. F60

I ASTM A694 gr. F65

**■ Martensitic Stainless Steel**

I ASTM A182 gr. F6A

I ASTM A182 gr. F6NM

**■ Austenitic Stainless Steel**

I ASTM A182 gr. F304/ F304L

I ASTM A182 gr. F316/ F316L

I ASTM A182 gr. F321

I ASTM A182 gr. XM19

I ASTM A351 gr. CF8/CF3

I ASTM A351 gr. CF8M/ CF3M

**■ Precipitation Hardening Stainless Steel**

I ASTM A564 gr. 630 H1150M (UNS S17400)

**■ Ferritic - Austenitic Stainless Steel**

I ASTM A182 gr. F51 (UNS S31803)

I ASTM A182 gr. F53 (UNS S32750)

I ASTM A182 gr. F55 (UNS S32760)

**■ Nickel Alloy**

I INCOLOY 825 (UNS N08825)

I INCONEL 625 (UNS N06625)

I INCONEL 718 (UNS N07718)

**NACE**

I On request, our side-entry ball valves can be supplied in accordance with NACE MR 0175/ ISO 15156 requirements.

**Bolts and Nuts**

I ASTM A193 gr. B7 and A194 gr. 2H

I ASTM A320 gr. L7 and A194 gr. 7 or 4

I ASTM A193(or A320) gr. B8 and A194 gr. 8

I ASTM A193(or A320) gr. B8M CL.2 and A194 gr. 8M or 8MA

I UNS S31803 and UNS S31803 (DUPLEX SS)

I ASTM A193 gr. B7M and A194 gr. 2HM

I ASTM A320 gr. L7M and A194 gr. 7M

I ASTM A193(or A320) gr. B8M and A194 gr. 8M or 8MA

I ASTM A453 gr.660 CL.A and A453 gr. 660 CL.A

**Seal Materials****■ Elastomers**

I HNBR : Low temperature &amp; AED

I FKM : Viton® gr. B, GF, GLT &amp; AED

I AFLAS compounds

I Elast-O-Lion® : HNBR -985 or 101 &amp; AED

**■ Thermoplastic**

I PTFE®(Virgin)

I R-PTFE®(Carbon &amp; Glass filled 25%)

I NYLON : Devlon®

I PCTFE : KEL-F®

I PEEK : Virgin &amp; Carbon filled

**■ Static & Dynamic Seals**

I Lip seal (radial &amp; face-seal, O type springs)

I Chevron type packing (PTFE &amp; R-PTFE rings)

I Grafoil Packing

I Spiral wound gaskets (Graphite &amp; PTFE filled)

# General Terms of Sale

## ■ General

On to terms and subject to the conditions set forth, seller agrees to sell to Buyer and Buyer agrees to buy from Seller, the products or services specified in the sales contract agreement which includes Seller's offer.

## ■ Price And Payment

All sales are subject to approval of Seller's credit department. If Buyer fails to make a payment when due, Seller may withhold all subsequent deliveries until full payment is made and require such security as Seller deems appropriate to secure future payments.

Full risk of loss shall pass to the buyer upon delivery to FOB point or destination port in case of CIF however, Seller retains title, for security purposes only, to all products until paid for in full in cash. Unless other terms are specified hereof, payment is due in U.S.

dollars, thirty(30) days after invoice date to by Letter of Credit. Amounts not paid by Buyer on or before due date shall bear interest at the lesser rate of buyer, the date of readiness for delivery shall be deemed date of delivery for invoice purposes and Seller may impose a storage charge.

## ■ Shipment

Shipment dates offered are estimates and represent the date materials may be available. Shipment dates offered commence only after receipt of Buyer's Purchase Order, clarification of required technical information, resolution of engineering and/or commercial issues of customer's written approval of drawings when required. Any product offered from stock is subject to prior sale

## ■ Warranty

All FORCE Ball Valves are guaranteed against defects in workmanship for a period of twelve(12) months after being placed in service, but not exceeding eighteen(18) months after shipment, when products are properly installed and used within the service and pressure range for which they were manufactured. This guarantee is limited to replacement free of charge any parts found to be defective in material or workmanship in **FORCE** Ball Valve products voids this warranty.

## ■ Cancellation

No order may be canceled by the Buyer except upon written notice to Seller and upon payment to Seller of all costs incurred by it arising out of, or in connection with, the order. Seller shall have the right to cancel any order or to refuse to ship or to cancel shipment in the event Buyer fails to submit payments when due or perform any other obligations of Buyer. Export of goods covered hereby is subject to Korean Government control. In the event the Korean Government denies a validated Export License Buyer's order(s) will be immediately canceled and Buyer will be liable for the other value or actual costs incurred, whichever the greater.

## ■ Return of Goods

No product shall be returned to Seller without written authorization and shipping instructions having been obtained from Seller. Products authorized for return are to be shipped freight prepaid to the FOB manufacture point and are subject to restocking charge.

## ■ Limitation of Liability

The liability of Seller under this agreement or with respect to any products supplied or services, performed pursuant to this agreement, whether in contract, in tort, in strict liability or otherwise, shall not exceed the purchase price paid by Buyer with respect thereto. In no event will Seller be liable in contract, in tort, in strict liability or otherwise for any special, indirect, incidental or consequential damages, including, but not limited to, loss of anticipated profits or revenues, loss of use, non-operation or increased expense of operation of equipment, cost of capital, or claims of customers of Buyer for failure or delay in achieving anticipated profits or products.

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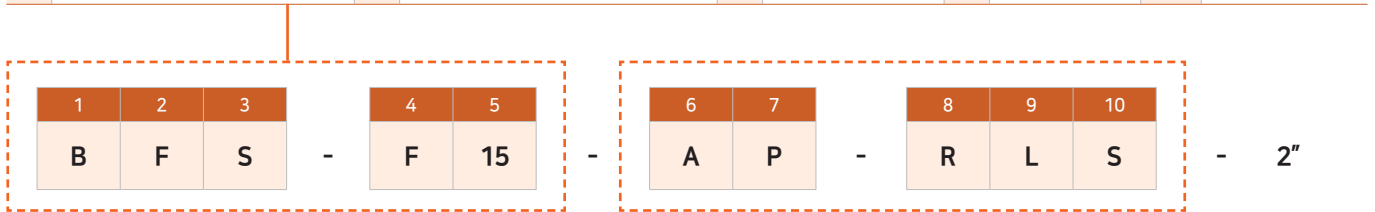
## ■ Policy for Change of Design

**FORCE** Valve reserve the right to discontinue the manufacture or, or change or modify, the design and construction of any **FORCE** Valve product **without prior notice**, in due course of our manufacturing procedure, without incurring any obligation to accept for credit, to replace or furnish or install such changes or modifications on products previously or subsequently sold.

**HOW TO ORDER**

**FIGURE NUMBER CODING SYSTEM**

1.Type of valve		2. Type of ball & valve body		3. Type of Valve seat		4. Type of Ball port		5. Pressure Class	
B	Side entry, Casting Ball Valves	U	Floating Ball, Uni-body(1-piece)	S	Soft Seated	F	Full Port	15	ASME Class 150
D	Side entry, Forged Ball Valves	F	Floating Ball, Split-body(2/3-piece)	C	Soft Seated for Cryogenic Service	R	Reduced Port	30	ASME Class 300
S	Side entry, Screwed & Socket welded Ends Ball Valves	T	Trunnion Mounted, Split-body (2/3-piece)	M	Metal Seated	G	Regular Port	60	ASME Class 600
T	Top entry, Casting Ball Valves	W	Trunnion Mounted, Uni-body (1-piece)					80	ASME Class 800
G	Top entry, Forged Ball Valves							90	ASME Class 900
3	3 Way Ball Valves							51	ASME Class 1500
J	Jacket Ball Valves							52	ASME Class 2500
								10K	JIS 10K
								20K	JIS 20K
								30K	JIS 30K
								40K	JIS 40K
								63K	JIS 63K



6. Material of Construction : Body/Cap & Trim parts		7. Material of Construction : Seat		8. End Connection		9. Operators		10. Options	
A	ASTM A216-WCB(A105)/CS+ENP TRIM	P	PTFE	B	But-Welding End	L	Manual Lever	S	FORCE Standard
B	ASTM A216-WCB(A105)/SS316 TRIM	R	R-PTFE (Reinforced Glass)	F	Flanged End ; FF	G	Enclosed Wormgear	A	with Limit Switch
C	ASTM A351-CF8(F304)/SS304 TRIM	E	CR-PTFE (Reinforced Carbon)	R	Flanged End ; RF	B	Bare Stem	L	with Mechanical Locking System
D	ASTM A351-CF8M(F316)/SS316 TRIM	N	NYLON	H	Hub End	M	Motor Actuator	E	Extended Stem
E	ASTM A351-CF3(F304L)/SS304L TRIM	V	DEVLON V	J	Flanged End ; RTJ	P	Pneumatic Actuator	B	Extended Bonnet
F	ASTM A351-CF3M(F316L)/SS316L TRIM	K	PEEK	T	Threaded End (Screwed End)	H	Hydraulic Actuator	C	cladding & Overlay
G	ASTM A351-CF8C(F321)/SS316 TRIM	D	DELIN	W	Socket Welding End (with/without Nipple)	O	Gas Oval Actuator	X	Special(According to any project spec.)
H	Duplex Stainless Steel	C	PCTFE (KEL-F)	C	Compact Flange	X	Special		
I	Nickel Alloy (Inconel)	M	Tungsten Carbide Coating	K	Large Groove				
J	ASTM A352-LCC(LF2)/LTCS+ENP TRIM	S	Stellite	S	Small Groove				
K	ASTM A352-LCC(LF2)/SS316 TRIM	X	Special	X	Special				
M	Monel								
R	Al-Bronze								
X	Special								

# FORCE<sup>®</sup>

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