

BALL VALVES CATALOGUE

FLOATING AND TRUNNION MOUNTED SPLIT
BODY AND TOP ENTRY FCA BS AND BT
MODEL BALL VALVES



FCA
FLOW CONTROL APPLICATIONS



FCA - WORKING CLOSELY WITH YOU TO ACHIEVE EXCELLENCE

Even with the most careful and meticulous planning, the success of a project can only be assured with good execution after the contract is signed. **FCA** team of engineering designers, production specialists, logistics experts and process engineers, plays its role to ensure quality products, timely delivery, smooth start-up and plant optimization.

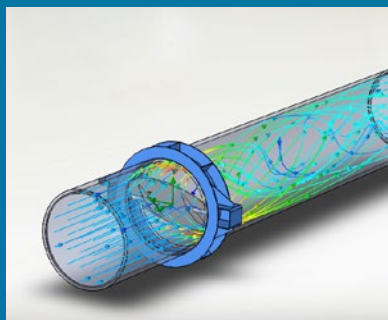
More and more customers trust our DNV certified solutions. **FCA** innovation-driven valves find solutions to any customer challenge or toughest application.

Our target-oriented dynamic team provides **FCA** with enough expertise to efficiently handle highly customized orders. Knowledge of how to manage our resources and capabilities ensures **FCA** to bring customers' expectations further.

Advanced software applications including Finite Element Analysis (FEA), computational fluid dynamics and three-dimensional solid modeling, and our proven know-how, help **FCA** designing high specification valves that meet the most demanding working requirements.

FCA aims partnering with major EPCs and End Users to develop innovative solutions for their valving needs. **FCA** specific capabilities include valve design; stress and finite element analysis; flow analysis; MAST and torque calculation; actuator sizing; testing and test data analysis; and validation of retrofit changes.

FCA offers a wide range of solutions for the toughest industry applications to meet each customer's requirements. This target is only achievable having a flexible multidisciplinary team focused on each customer's particular needs. **FCA** puts effort and makes sure that offers the most complete package assuring the highest quality.



WORLDWIDE THERE WHERE OUR CUSTOMER IS

From a global vision of the sector and development dynamics of each country, **FCA** offers revolutionary supply alternatives to the customer, preserving the quality from its full design in Ibarra (Spain). Thanks to innovative applications, a professional team and its experience, **FCA** ensures quick response and results tailored to the needs of the customers anywhere in the world.

Its international service network is geared towards local attention in order provide flexible, close and customized solutions; getting so successful responses to new market needs and continuing to expand the activity at a geographical and sectorial level.

FCA valves are used in a wide range of applications such as Hydro Power plants and dams, mineral processing, Oil and Gas, Chemical and Petrochemical plants, Pulp and Paper, Steel industry, Thermal Power plants, Water treatment, Water distribution and Water pump stations as principal applications. Oriented according to main **OIL & GAS, MINERALS, POWER** and **WATER** sectors.



QUALITY

Due to the applications where our products are installed, our standards are highly demanding. **FCA** valves are engineered to meet most industry's or key player's requirements, providing full code compliance solutions.

FCA comply with ISO 9001-2000 quality standard, guaranteed and certified by DNV. Additionally, international certifications are met such as CE for Pressure Equipment Directive (97/23/EC), Directive 2006/42/EC for machinery, ATEX Directive 94/9/EC, GOST TR/CU, etc...



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SPLIT BODY FLOATING BALL VALVES

- CLASS 150#
- CLASS 300#
- CLASS 600#

SPLIT BODY TRUNNION MOUNTED BALL VALVES

- CLASS 150#
- CLASS 300#
- CLASS 600#
- CLASS 900#
- CLASS 1500#
- CLASS 2500#

SPECIFICATIONS AND STANDARDS

FCA Ball valves are specially engineered for heavy duty applications outstanding at high pressure working conditions, up to ASME Class 2500# and sizes up to 36". **BS** and **BT** model Ball valves solutions ensure a perfect performance at primary and secondary sealing due to an accurate design concept at any size.

Two or three pieced construction bodies can adopt **FCA** floating or trunnion mounted ball designs according valve rating and size, ensuring a bubble tight shut off and an efficient control. **BS** model stands for a split body design, for casted or forged carbon or stainless steel material. **BT** model relates to a top entry design, the main advantage of this valve consists in the chance to do any maintenance work without dismantling the valve from the pipeline. Depending on the application, both models can be supplied with soft or metal sealing.

FCA Ball valves come with a variety of end connections: Flanged type, as standard, comes with Raised Face (RF) according to ASME Class 150#, 300# and 600#, and with Ring-Type-Joint flanges (RTJ) for Class ratings of 900#, 1500# and 2500#. Buttwelded ends can also be supplied, with schedule according to customer specifications.



COVERING STANDARDS

FCA Ball Valves are mainly designed and manufactured according to API 6D "Specification for pipeline valves" and considering standards such as ASME BPVC "Boiler and Pressure Vesel Code", ASME B16.34 "Valves Flanged, Threaded and Welding Ends", ASME B16.10 "Face to Face dimensions of Flanged valves", ANSI B16.5 "Pipe Flanges and Flanged Fittings", ANSI B16.25 "Buttwelding Ends".

Other applied standards related to other requirements and testing are ANSI/API 607 "Fire Test for Soft-Seated Quarter Turn Valves", API 6FA "Specification for Fire Test for Valves", API 598 "Valve Inspection and Testing"...



GENERAL FEATURES

HIGHLIGHTS

- Design and Manufacture according to API 6D.
- Floating and Trunnion mounted configurations.
- 2 or 3-piece split body or top entry designs.
- Soft or metal seated.
- Hardfacing coating with Stellite, ENP or Tungsten carbide.
- Full or reduced bore option. Suitable for pigging operations.
- Fire safe design.
- Anti-static devices.
- Blowout proof stem.
- Lever or gearbox, electric, pneumatic and hydraulic actuation.
- Double Block and Bleed service.
- Cavity Relief.
- Sealant injection system.
- Extended stem availability.
- Bi-directional flow
- Wide range of materials and hardenings.

SECTORS

- Oil & Gas.
- Petrochemical plants.
- Steel industry.
- Thermal Power plants.
- Water distribution.
- Water pump stations.
- etc...

APPLICATIONS

- Natural Gas pipelines.
- Oil pipelines.
- Refineries.
- Corrosive fluids.
- etc...



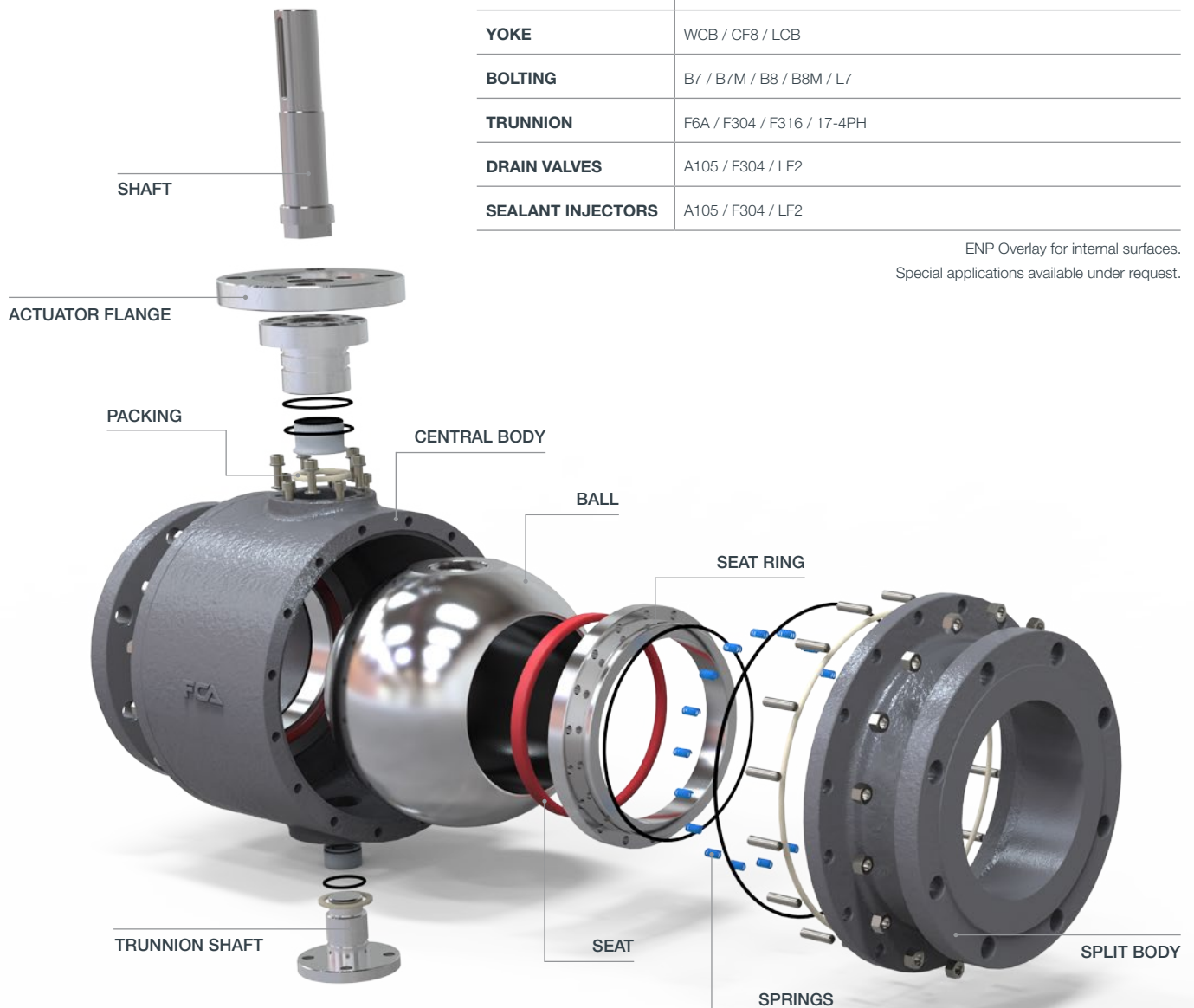
MANUFACTURING PROGRAM

TYPE	CLASS	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	28"	30"	36"	
		Floating [BS & BT Mod.]	150#	●	●	●	●	●									
300#	●		●	●	●	●											
600#	●		●	●													
API 6D	Trunnion mounted [BS & BT Mod.]	150#						●	●	●	●	●	●	●	●	●	
		300#						●	●	●	●	●	●	●	●	●	
		600#				●	●	●	●	●	●	●	●	●	●	●	●
		900#	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		1500#	●	●	●	●	●	●	●	●	●	●	●	●			
		2500#	●	●	●	●	●	●	●								

GENERAL MATERIALS

BODY	WCB / WCC / A105 / LCB / LCC / LF2/ CF8M / CF3M / F316 / F51 / F44
BALL	A105 / F6A / SS316 / CF8M / CF3M / LF2 / F51 / F44 / 17-4PH
SPRING	INCONEL 750
SEAT RING	A105 / F6A / SS316 / CF8M / CF3M / LF2 / F51 / F44 / 17-4PH
SEAT	PTFE / RPTFE / NYLON / MOLON / PEEK / VITON / DEVLON
STEM	F6A / F304 / F316 / 17-4PH
PACKING	GRAPHITE / PTFE
O-RING	VITON
BUSHING	PTFE / METAL+PTFE / BRAIDED GRAPHITE
YOKE	WCB / CF8 / LCB
BOLTING	B7 / B7M / B8 / B8M / L7
TRUNNION	F6A / F304 / F316 / 17-4PH
DRAIN VALVES	A105 / F304 / LF2
SEALANT INJECTORS	A105 / F304 / LF2

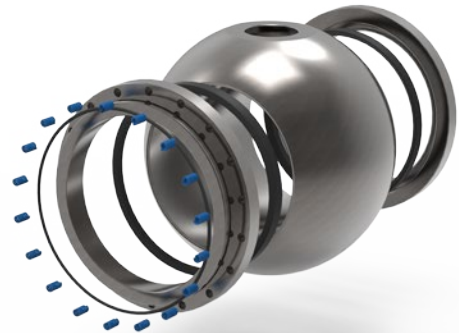
ENP Overlay for internal surfaces.
Special applications available under request.



SOFT AND METAL SEATED VALVES

FCA offers a wide range of seat materials to guarantee zero leakage for high pressure at different operation temperature applications. According to seat material, friction could be reduced and will result in torque reduction when operating the valve.

Metal seated **FCA** valves are suitable for tough applications such as high temperature and abrasive services, corrosive fluids, slurry, etc... In these cases, Stellite 6, Tungsten or Chromium Carbide coatings may be applied on ball and seats to ensure component hardness and assure seating. This makes the valve maintenance free.



SELF-RELIEVING SEAT RINGS

Two independent floating seats ensure the bi-directional seating of the ball valve, for soft or metal seated configurations. The coil springs press the seat ring against the ball to guarantee the contact between both components. These spring loaded seats are carefully designed to achieve low operating torque even with high pressure working conditions. Each ring achieves the alignment by itself, whenever the valve is fully opened or not.

PISTON EFFECT

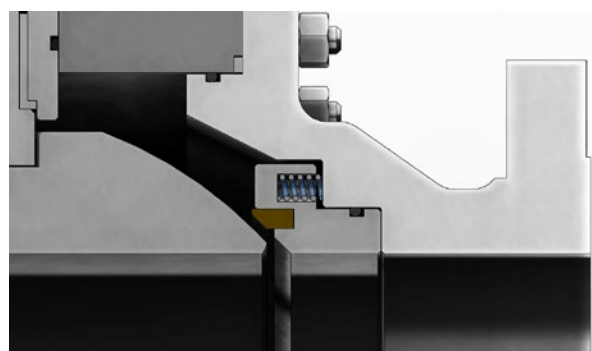
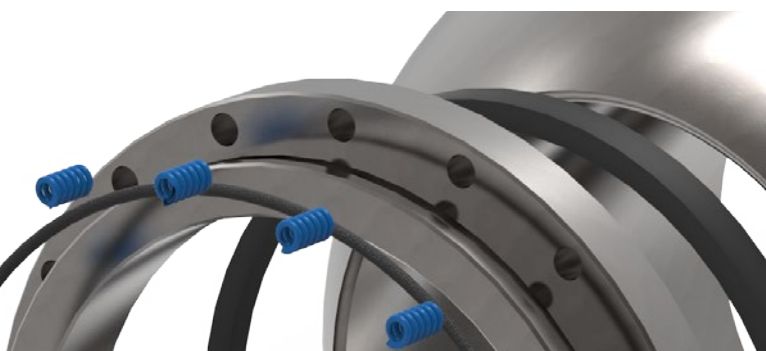
Seat configuration has been specially designed to meet what is called a "piston effect". In cases where the line pressure increases, the seat differential area creates a piston effect that pushes the seat against the ball surface. This action results in an additional load towards the seating as line pressure increases.

The piston effect principle assures a tight sealing simultaneously on both sides of the ball (upstream and downstream).

Double piston or combination of seats upstream/downstream can be supplied on request.

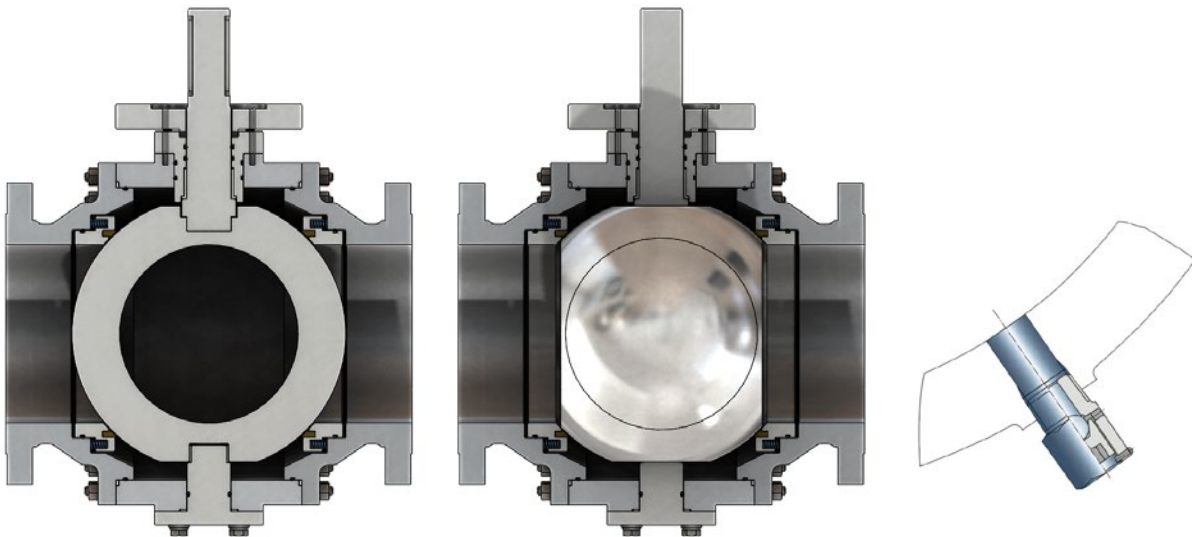
CAVITY PRESSURE RELIEF

In case that a trunnion mounted ball valve is in the closed position, fluid media may be trapped in the body cavity. This media is subjected to a thermal expansion as the temperature rises, resulting in an increase of the pressure of the cavity. In order to avoid a determinate excess of pressure, the seat arrangement is designed to automatically self-relieve, allowing the media in the body cavity to escape to the pipeline.



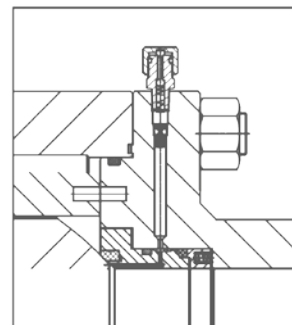
DOUBLE BLOCK AND BLEED (DBB)

As the floating seating design performs sealing over upstream and downstream seat sides simultaneously, and anti-blow-out vent and drain plug allows the valve to vent and drain the body cavity in both open and closed positions.



SEALANT INJECTION

Valve can be supplied with emergency sealant injectors that are located between the upper o-rings and the graphite packing gasket and also directly over the seat rings. This feature enables the injection of a viscous sealant as a security agent in case of sealing failure. This system maintains temporary valve sealing until maintenance takes place.



ANTI-BLOW-OUT STEM

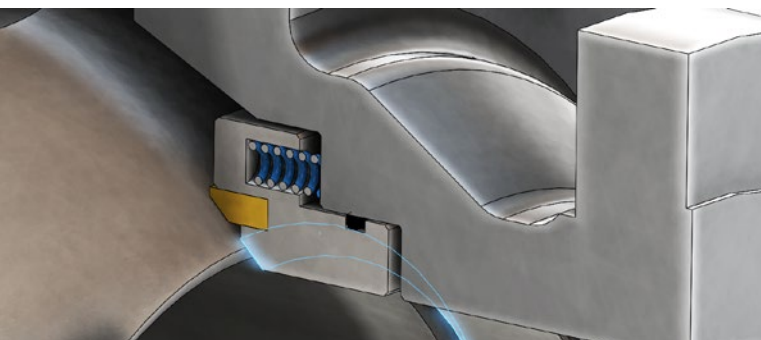
FCA provides a T-shaped stem as standard. When medium passes through the valve, the pressure may push the stem out and can cause serious safety problems. The stem is designed in order to prevent it from coming out of the body structure.



FIRE SAFE DESIGN

FCA BS and BT ball valves are firesafe designed according to API 6FA and API 607.

In case of fire inside the valve, the nonmetal packing and soft seat will be burnt. Once the seat is melted, the ball will contact directly to the metal face of the seat ring, thus preventing medium leakage out from the burnt seat and avoiding fire spreading.



ANTI-CORROSIVE TREATMENTS

As standard, iron or carbon steel components are painted with an anti-corrosive treatment, providing the necessary protection against corrosion and an excellent surface finish.

Painting consists of:

- Epoxy primer with excellent corrosive protection and adhesion on every type of metal.
- BLUE RAL-5019 painting.

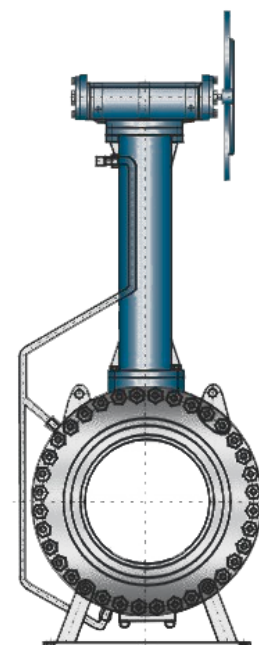
Depending on the valve application, **FCA** offers special treatments for specific abrasive and corrosive solutions like hardening, valve or component protective coating, etc... More information on request.

ANTI-STATIC DEVICE

While operating the valve, the friction between the ball (or stem) and a non metallic seat like PTFE may produce electrostatic charge that can be accumulated on the ball and can cause fire. To prevent static sparks, an anti-static device is placed on the ball-stem and on the stem-body structure to derive the accumulated electric charge.

EXTENDED STEM FOR BURIED SERVICE

Extension device may be provided for buried ball valves, which include valve stem extension, greasing valve and discharge valve. Will be designed according to customer specifications and length.



MATERIAL SELECTION

For material selection fluid type characteristic, pressure and working temperature shall be considered. FCA carries many years of experience with special materials such as duplex, superduplex, hastelloy, inconel, nickel alloys, etc... Moreover standard forged or casted steels are daily work standard for our engineers. Other materials could be considered and provided on request according to customer specifications.

For internal parts such as seat rings and ball, corrosion and wear resistant materials are considered in addition to pressure drop values and temperature working range specifications. Stainless steel materials are provided as standard, considering Stellite contribution for seat components, and hardened stainless steels for higher corrosion resistance.

The following table presents frequently used materials for FCA ball valves, generally selected for severe service working applications:

MATERIAL	CASTED (ASTM)	FORGED (ASTM)
Carbon Steel	A216 Gr. WCB	A105
Stainless Steel	A351 Gr. CF8 / CF8M	A182 F316
Duplex Steel	A890 Gr. 4A	A182 F51
Superduplex Steel	A890 Gr. 5A / Gr. 6A	A182 F53 / F55
Inconel	-	Alloy 718

*Other materials on request.

SEALING MATERIALS

FCA Soft seated Ball Valves commonly used sealing materials, and depending on the application and working conditions, are VITON, PTFE, RPTFE, PCTFE, NYLON, MOLON, DEVLON, PEEK. Other materials on request.

ACTUATION DEVICES

All valves are available with different actuators. FCA has close cooperation with many world leader actuator manufactories and can offer a wide variety of interchangeable actuators:

- Lever.
- Bevel gear - handwheel.
- Electric motor.
- Pneumatic cylinder.
- Hydraulic cylinder.



Cv FLOW COEFFICIENT VALUES

Cv is known as flow coefficient value of a valve. This coefficient Cv is related to the flow and pressure conditions by the following basic liquid equation:

$$Cv=Q*(SG/ \Delta P)^{1/2}$$

It is a relative measure of valves efficiency at allowing fluid flow. Q determines the flow rate (in gpm), SG refers to fluid specific gravity and Pressure drop is considered in psi. It describes the relationship between the pressure drop across the valve and the corresponding flow rate. In more practical terms, the flow coefficient Cv is the volume (in US gallons) of water at 60°F that will flow per minute through a valve with a pressure drop of 1 psi across the valve.

TYPE	CLASS	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	28"	30"	36"
Full Bore Ball Valves	150#	400	1250	2300	4900	8500	14000	22000	28000	38000	51000	58000	86000	120000	135000	195000
	300#	400	1200	2300	4850	8000	13000	20000	27000	37000	50000	58000	84000	120000	125000	185000
	600#	350	1000	2000	4400	7500	12500	18000	26000	34500	50000	55000	84000	115000	110000	170000
	900#	300	900	1900	4320	7000	11000	17500	24000	30000	47000	52000	80000	95000	95000	158000
	1500#	300	850	1850	3750	6200	9500	16000	21000	28000	41000	45000	74000	-	-	-
	2500#	240	650	1320	2800	4800	8000	14000	-	-	-	-	-	-	-	-

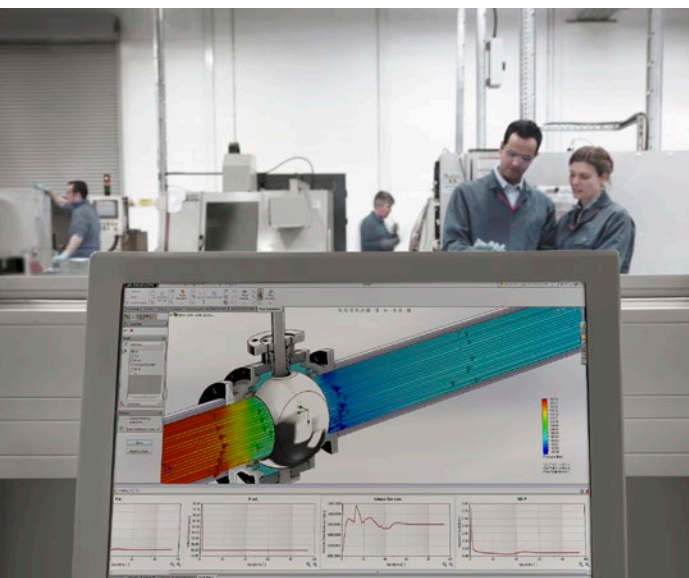
TYPE	CLASS	3"x2"	4"x3"	6"x4"	8"x6"	10"x8"	12"x10"	14"x12"	16"x14"	18"x16"	20"x18"	24"x20"	30"x24"	36"x30"
Reduced Bore Ball Valves	150#	200	500	750	2100	4000	7000	12000	15000	22000	27000	31000	36000	62000
	300#	200	500	750	2100	3800	7000	12000	15000	21000	26500	31000	35500	60000
	600#	200	480	720	1800	3800	7000	11500	14000	21000	26000	29500	32000	56000
	900#	180	480	700	1800	3800	6500	11500	14000	19500	26000	28000	31000	55000
	1500#	180	460	690	1680	3600	6400	11500	12000	18000	24000	25300	-	-
	2500#	170	440	660	1620	3400	6200	-	-	-	-	-	-	-

TORQUE VALUES

Torque ratings listed below are for reference only. Properties of medium, seat materials and valve operation frequency shall be considered and extra factors may be applied.

For reference, a factor of 0.80 can be applied in case of clean lubricating oil medium and 1.20 for clean and slightly viscous particles or steam service. For heavy fluids such as slurry the torque may be increased by a factor of 1.50 and finally, a value of 2.00 should be applied for dry fine solids.

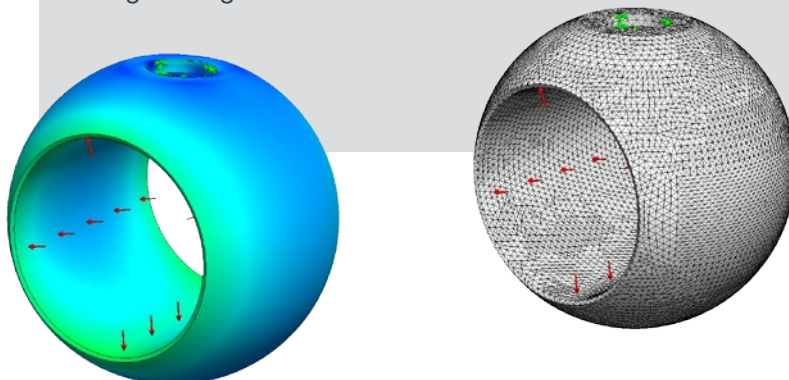
TYPE	CLASS	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	28"	30"	36"
Floating [BS & BT Mod.]	150#	25	65	125	410	700	-	-	-	-	-	-	-	-	-	-
	300#	60	160	280	950	1550	-	-	-	-	-	-	-	-	-	-
	600#	190	460	770	-	-	-	-	-	-	-	-	-	-	-	-
Trunnion mounted [BS & BT Mod.]	150#	57	122	192	274	832	1105	1502	1946	3164	3793	4769	7529	9832	11172	22987
	300#	99	212	335	544	1250	1736	2388	3224	5139	6194	7826	12958	15620	18703	34170
	600#	168	360	572	912	2177	3093	4282	7458	9310	14639	20011	31226	39897	41832	52262
	900#	228	512	946	1784	4116	5910	10137	14141	18866	22400	28544	43276	52486	56210	70355
	1500#	390	831	1524	2934	7215	11128	16103	24518	29630	34392	40918	65351	-	-	-
	2500#	589	1577	1965	5501	11786	13222	20075	-	-	-	-	-	-	-	-



CAE ENGINEERING TOOLS

Advanced software applications including Finite Element Analysis (FEA), computational fluid dynamics (CFD) and three-dimensional solid modeling, and our proven know-how, help FCA designing high specification valves to meet most demanded working requirements.

FCA Ball valves are engineered to meet high pressure working conditions, up to Class 2500#, considering the most cost effective design. For this aim, parametric studies with finite element analysis are performed by FCA engineering team.



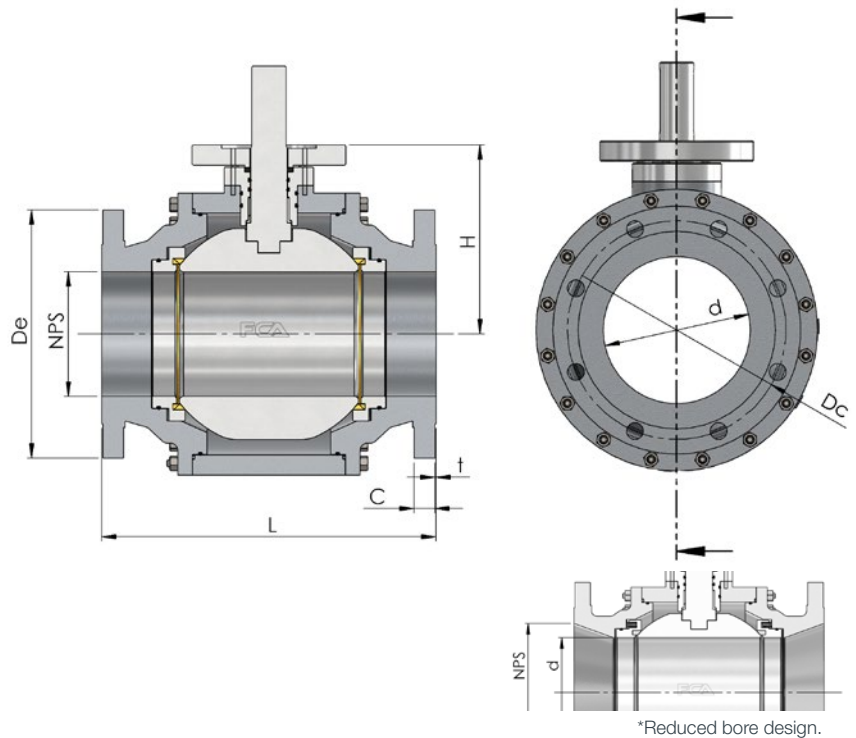
DIMENSIONAL DATA

SPLIT BODY FULL AND REDUCED BORE FLOATING BALL VALVES - BS MODEL

Standard version available from DN50/2" to DN200/8" and pressure rating up to Class 600#. Other sizes and pressure on request.

ACCESORIES AND OPTIONS

- Switch indicator for manually operated valves.
- Locking devices.
- Anti-blow-out stem.
- Antistatic devices.
- Fire protection structure.
- Self-relieving seating.
- Full and reduced bore.
- Different end connections and flange drillings.



DIMENSIONS - CLASS 150#

SIZE		L			d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
2"	50	178	190.5	216	49	85	152	120.7	91.9	4-Ø19.1	15.8	1.6
2"x1 1/2"	50x40	178	190.5	216	40	98	152	120.7	91.9	4-Ø19.1	15.8	1.6
3"	80	203	216	283	74	131	191	152.4	127	4-Ø19.1	19.1	1.6
3"x2 1/2"	80x65	203	216	283	65	120	191	152.4	127	4-Ø19.1	19.1	1.6
4"	100	229	241	305	100	155	229	190.5	157.2	8-Ø19.1	23.9	1.6
4"x3"	100x80	229	241	305	74	138	229	190.5	157.2	8-Ø19.1	23.9	1.6
6"	150	394	406.5	457	150	260	279	241.3	215.9	8-Ø22.2	25.4	1.6
6"x4"	150x100	394	406.5	457	100	165	279	241.3	215.9	8-Ø22.2	25.4	1.6
8"	200	457	470	521	201	315	343	298.5	269.7	8-Ø22.2	28.4	1.6
8"x6"	200x150	457	470	521	150	237	343	298.5	269.7	8-Ø22.2	28.4	1.6

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5

DIMENSIONS - CLASS 300#

SIZE			L		d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
2"	50	216	232	216	49	85	165	127	91.9	8-Ø19.1	22.4	1.6
2"x1 1/2"	50x40	216	232	216	40	98	165	127	91.9	8-Ø19.1	22.4	1.6
3"	80	283	299	283	74	131	210	168.3	127	8-Ø22.2	28.4	1.6
3"x2 1/2"	80x65	283	299	283	65	120	210	168.3	127	8-Ø22.2	28.4	1.6
4"	100	305	321	305	100	155	254	200.2	157.2	8-Ø22.2	31.8	1.6
4"x3"	100x80	305	321	305	74	138	254	200.2	157.2	8-Ø22.2	31.8	1.6
6"	150	404	419	457	150	260	318	269.8	215.9	12-Ø22.2	36.6	1.6
6"x4"	150x100	404	419	457	100	165	318	269.8	215.9	12-Ø22.2	36.6	1.6
8"	200	502	518	521	201	315	381	330.2	269.7	12-Ø25.4	41.1	1.6
8"x6"	200x150	502	518	521	150	237	381	330.2	269.7	12-Ø25.4	41.1	1.6

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5

DIMENSIONS - CLASS 600#

SIZE			L		d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
2"	50	292	295	292	49	85	165	127	91.9	8-Ø19.1	25.4	6.4
2"x1 1/2"	50x40	292	295	292	40	98	165	127	91.9	8-Ø19.1	25.4	6.4
3"	80	356	359	356	74	131	210	168.3	127	8-Ø22.2	31.8	6.4
3"x2 1/2"	80x65	356	359	356	65	120	210	168.3	127	8-Ø22.2	31.8	6.4
4"	100	432	435	432	100	155	273	215.9	157.2	8-Ø25.4	38.1	6.4
4"x3"	100x80	432	435	432	74	138	273	215.9	157.2	8-Ø25.4	38.1	6.4

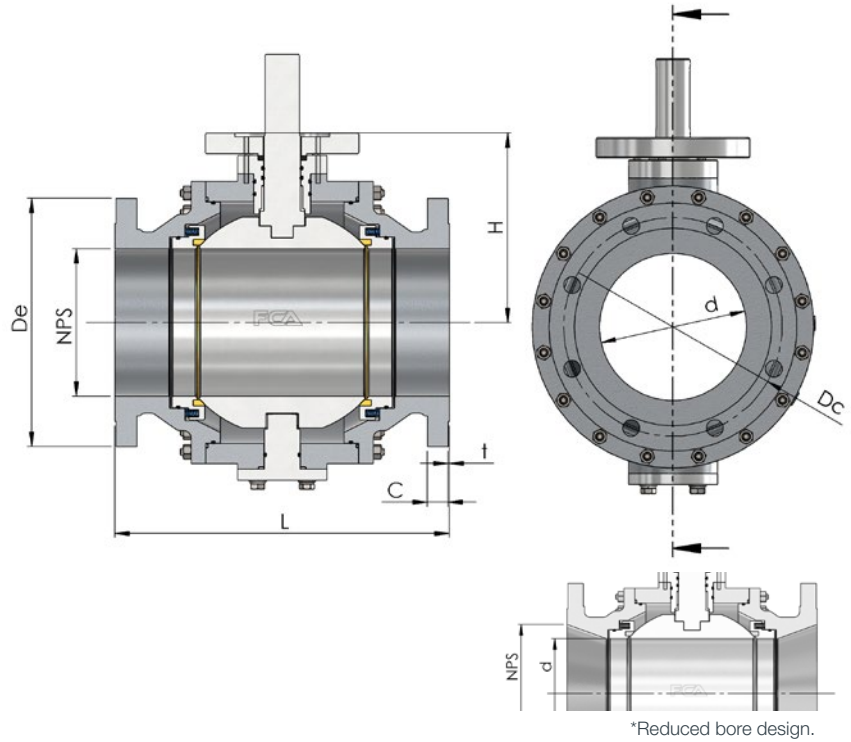
Notes: Dimensions in (mm). Flange drilling according to ASME B16.5

SPLIT BODY FULL AND REDUCED BORE TRUNNION MOUNTED BALL VALVES - BS MODEL

Standard version available from DN50/2" to DN900/36" and pressure rating up to Class 2500#. Other sizes and pressure on request.

ACCESORIES AND OPTIONS

- Switch indicator for manually operated valves.
- Locking devices.
- Anti-blow-out stem.
- Antistatic devices.
- Fire protection structure.
- Self-relieving seating.
- Full and reduced bore.
- Different end connections and flange drillings.
- Double Block and Bleed DBB feature.
- Extended bonnet and stem.



DIMENSIONS - CLASS 150# FULL BORE

SIZE			L		d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
10"	250	533	546	559	252	415	406	362	323.9	12-Ø25.4	30.2	1.6
12"	300	609.5	622	635	303	480	483	431.8	381	12-Ø25.4	31.8	1.6
14"	350	686	698.5	762	334	545	533	476.2	412.8	12-Ø28.6	35.1	1.6
16"	400	762	775	838	385	675	597	539.8	469.9	16-Ø28.6	36.6	1.6
18"	450	864	876	914.5	436	720	635	577.9	533.4	16-Ø31.8	39.6	1.6
20"	500	914.5	927	991	487	774	699	635	584.2	20-Ø31.8	42.9	1.6
24"	600	1067	1079.5	1143	589	994	813	749.3	692.2	20-Ø34.9	47.8	1.6
28"	700	1245	-	1346	684	1090	927	863.6	800.1	28-Ø34.9	71.4	1.6
30"	750	1295	-	1397	735	1145	984	914.4	857.3	28-Ø34.9	74.7	1.6
36"	900	1524	-	1727	874	1378	1168	1085.9	1022.4	32-Ø41.3	90.4	1.6

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5/B16.47

DIMENSIONS - CLASS 150# REDUCED BORE

SIZE			L		d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
10"x8"	250x200	533	546	559	201	345	343	298.5	323.9	12-Ø25.4	28.4	1.6
12"x10"	300x250	609.5	622	635	252	415	406	362	381	12-Ø25.4	30.2	1.6
14"x12"	350x300	686	698.5	762	303	480	483	431.8	412.8	12-Ø28.6	31.8	1.6
16"x14"	400x350	762	775	838	334	545	533	476.2	469.9	16-Ø28.6	35.1	1.6
18"x16"	450x400	864	876	914.5	385	675	597	539.8	533.4	16-Ø31.8	36.6	1.6
20"x18"	500x450	914.5	927	991	436	720	635	577.9	584.2	20-Ø31.8	39.6	1.6
24"x20"	600x500	1067	1079.5	1143	487	775	813	749.3	692.2	20-Ø34.9	47.8	1.6
30"x24"	750x600	1295	-	1397	589	1006	984	914.4	857.3	28-Ø34.9	74.7	1.6
36"x30"	900x750	1524	-	1727	735	1147	1168	1085.9	1022.4	32-Ø41.3	90.4	1.6

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5/B16.47

DIMENSIONS - CLASS 300# FULL BORE

SIZE			L		d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
10"	250	568	584	568	252	415	445	387.4	323.9	16-Ø28.6	47.8	1.6
12"	300	648	664	648	303	480	521	450.9	381	16-Ø31.8	50.8	1.6
14"	350	762	787	762	334	545	584	514.4	412.8	20-Ø31.8	53.8	1.6
16"	400	838	854	838	385	675	648	571.5	469.9	20-Ø34.9	57.2	1.6
18"	450	914	930	914	436	720	711	628.7	533.4	24-Ø34.9	60.5	1.6
20"	500	991	1010	991	487	774	775	685.8	584.2	24-Ø34.9	63.5	1.6
24"	600	1143	1165	1143	589	994	914	812.8	692.2	24-Ø41.3	69.9	1.6
28"	700	1346	1372	1346	684	1090	1035	939.8	800.1	28-Ø44.5	85.9	1.6
30"	750	1397	1422	1397	735	1145	1092	991	857.3	28-Ø47.6	91.9	1.6
36"	900	1727	1756	1727	874	1378	1270	1168.4	1022.4	32-Ø54	104.6	1.6

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5/B16.47

DIMENSIONS - CLASS 300# REDUCED BORE

SIZE			L		d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
10"x8"	250x200	568	584	568	201	345	445	387.4	323.9	16-Ø28.6	47.8	1.6
12"x10"	300x250	648	664	648	252	415	521	450.9	381	16-Ø31.8	50.8	1.6
14"x12"	350x300	762	787	762	303	480	584	514.4	412.8	20-Ø31.8	53.8	1.6
16"x14"	400x350	838	854	838	334	545	648	571.5	469.9	20-Ø34.9	57.2	1.6
18"x16"	450x400	914	930	914	385	675	711	628.7	533.4	24-Ø34.9	60.5	1.6
20"x18"	500x450	991	1010	991	436	720	775	685.8	584.2	24-Ø34.9	63.5	1.6
24"x20"	600x500	1143	1165	1143	487	775	914	812.8	692.2	24-Ø41.3	69.9	1.6
30"x24"	750x600	1397	1422	1397	589	1006	1092	991	857.3	28-Ø47.6	91.9	1.6
36"x30"	900x750	1727	1756	1727	735	1147	1270	1168.4	1022.4	32-Ø54	104.6	1.6

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5/B16.47

DIMENSIONS - CLASS 600# FULL BORE

SIZE			L		d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
6"	150	559	562	559	150	394	356	292.1	215.9	12-Ø28.6	47.8	6.4
8"	200	660	664	660	201	450	419	349.2	269.7	12-Ø31.8	55.6	6.4
10"	250	787	791	787	252	502	508	431.8	323.9	16-Ø34.9	63.5	6.4
12"	300	838	841	838	303	560	559	489	381	20-Ø34.9	66.5	6.4
14"	350	889	892	889	334	586	603	527.1	412.8	20-Ø38.1	69.9	6.4
16"	400	991	994	991	385	690	686	603.2	469.9	20-Ø41.3	76.2	6.4
18"	450	1092	1095	1092	436	730	743	654.1	533.4	20-Ø44.5	82.6	6.4
20"	500	1194	1200	1194	487	778	813	723.9	584.2	24-Ø44.5	88.9	6.4
24"	600	1397	1407	1397	589	1002	940	838.2	692.2	24-Ø50.8	101.6	6.4
28"	700	1549	1562	1549	684	1086	1073	965.2	800.1	28-Ø54	111.3	6.4
30"	750	1651	1664	1651	735	1166	1130	1022.4	857.3	28-Ø54	114.3	6.4
36"	900	2083	2099	2083	874	1304	1314	1193.8	1022.4	32-Ø66.7	124	6.4

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5/B16.47

DIMENSIONS - CLASS 600# REDUCED BORE

SIZE			L		d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
6"x4"	150x100	559	562	559	100	182	356	292.1	215.9	12-Ø28.6	47.8	6.4
8"x6"	200x150	660	664	660	150	394	419	349.2	269.7	12-Ø31.8	55.6	6.4
10"x8"	250x200	787	791	787	201	450	508	431.8	323.9	16-Ø34.9	63.5	6.4
12"x10"	300x250	838	841	838	252	502	559	489	381	20-Ø34.9	66.5	6.4
14"x12"	350x300	889	892	889	303	560	603	527.1	412.8	20-Ø38.1	69.9	6.4
16"x14"	400x350	991	994	991	334	586	686	603.2	469.9	20-Ø41.3	76.2	6.4
18"x16"	450x400	1092	1095	1092	385	690	743	654.1	533.4	20-Ø44.5	82.6	6.4
20"x18"	500x450	1194	1200	1194	436	730	813	723.9	584.2	24-Ø44.5	88.9	6.4
24"x20"	600x500	1397	1407	1397	487	778	940	838.2	692.2	24-Ø50.8	101.6	6.4
30"x24"	750x600	1651	1664	1651	589	1002	1130	1022.4	857.3	28-Ø54	114.3	6.4
36"x30"	900x750	2083	2099	2083	735	1166	1314	1193.8	1022.4	32-Ø66.7	124	6.4

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5/B16.47

DIMENSIONS - CLASS 900# FULL BORE

SIZE		L			d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
2"	50	368	371	368	49	126	216	165.1	91.9	8-Ø25.4	38.1	6.4
3"	80	381	384	381	74	180	241	190.5	127	8-Ø25.4	38.1	6.4
4"	100	457	460	457	100	225	292	235	157.2	8-Ø31.8	44.5	6.4
6"	150	610	613	610	150	396	381	317.5	215.9	12-Ø31.8	55.6	6.4
8"	200	737	740	737	201	451	470	393.7	269.7	12-Ø38.1	63.5	6.4
10"	250	838	841	838	252	502	546	469.9	323.9	16-Ø38.1	69.9	6.4
12"	300	965	968	965	303	550	610	533.4	381	20-Ø38.1	79.2	6.4
14"	350	1029	1038	1029	322	588	641	558.8	412.8	20-Ø41.3	85.9	6.4
16"	400	1130	1140	1130	373	686	705	616	469.9	20-Ø44.5	88.9	6.4
18"	450	1219	1232	1219	423	730	787	685.8	533.4	20-Ø50.8	101.6	6.4
20"	500	1321	1334	1321	471	770	857	749.3	584.2	20-54	108	6.4
24"	600	1549	1568	1549	570	1001	1041	901.7	692.2	20-Ø66.7	139.7	6.4

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5

DIMENSIONS - CLASS 900# REDUCED BORE

SIZE		L			d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
3"x2"	80x50	381	384	381	49	126	241	190.5	127	8-Ø25.4	38.1	6.4
4"x3"	100x80	457	460	457	74	180	292	235	157.2	8-Ø31.8	44.5	6.4
6"x4"	150x100	610	613	610	100	225	381	317.5	215.9	12-Ø31.8	55.6	6.4
8"x6"	200x150	737	740	737	150	396	470	393.7	269.7	12-Ø38.1	63.5	6.4
10"x8"	250x200	838	841	838	201	451	546	469.9	323.9	16-Ø38.1	69.9	6.4
12"x10"	300x250	965	968	965	252	502	610	533.4	381	20-Ø38.1	79.2	6.4
14"x12"	350x300	1029	1038	1029	303	550	641	558.8	412.8	20-Ø41.3	85.9	6.4
16"x14"	400x350	1130	1140	1130	322	588	705	616	469.9	20-Ø44.5	88.9	6.4
18"x16"	450x400	1219	1232	1219	373	686	787	685.8	533.4	20-Ø50.8	101.6	6.4
20"x18"	500x450	1321	1334	1321	423	730	857	749.3	584.2	20-54	108	6.4
24"x20"	600x500	1549	1568	1549	471	770	1041	901.7	692.2	20-Ø66.7	139.7	6.4

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5

DIMENSIONS - CLASS 1500# FULL BORE

SIZE		L			d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
2"	50	368	371	368	49	150	216	165.1	91.9	8-Ø25.4	38.1	6.4
3"	80	470	473	470	74	192	267	203.2	127	8-Ø31.8	47.8	6.4
4"	100	546	549	546	100	215	311	241.3	157.2	8-Ø34.9	53.8	6.4
6"	150	705	711	705	144	342	394	317.5	215.9	12-Ø38.1	82.6	6.4
8"	200	832	841	832	192	388	483	393.7	269.7	12-Ø44.5	91.9	6.4
10"	250	991	1000	991	239	460	584	482.6	323.9	12-Ø50.8	108	6.4
12"	300	1130	1146	1130	287	520	673	571.5	381	16-Ø54	124	6.4
14"	350	1257	1276	1257	315	560	749	635	412.8	16-Ø60.3	133.4	6.4
16"	400	1384	1407	1384	360	600	826	704.9	469.9	16-Ø66.7	146.1	6.4
18"	450	1537	1559	1537	406	696	914	774.7	533.4	16-Ø73	162.1	6.4
20"	500	1664	1686	1664	454	724	984	831.9	584.2	16-79.4	177.8	6.4
24"	600	1943	1972	1943	546	806	1168	990.6	692.2	16-Ø92	203.2	6.4

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5

DIMENSIONS - CLASS 1500# REDUCED BORE

SIZE		L			d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
3"x2"	80x50	470	473	470	49	150	267	203.2	127	8-Ø31.8	47.8	6.4
4"x3"	100x80	546	549	546	74	192	311	241.3	157.2	8-Ø34.9	53.8	6.4
6"x4"	150x100	705	711	705	100	215	394	317.5	215.9	12-Ø38.1	82.6	6.4
8"x6"	200x150	832	841	832	144	342	483	393.7	269.7	12-Ø44.5	91.9	6.4
10"x8"	250x200	991	1000	991	192	388	584	482.6	323.9	12-Ø50.8	108	6.4
12"x10"	300x250	1130	1146	1130	239	460	673	571.5	381	16-Ø54	124	6.4
14"x12"	350x300	1257	1276	1257	287	520	749	635	412.8	16-Ø60.3	133.4	6.4
16"x14"	400x350	1384	1407	1384	315	560	826	704.9	469.9	16-Ø66.7	146.1	6.4
18"x16"	450x400	1537	1559	1537	360	600	914	774.7	533.4	16-Ø73	162.1	6.4
20"x18"	500x450	1664	1686	1664	406	696	984	831.9	584.2	16-79.4	177.8	6.4
24"x20"	600x500	1943	1972	1943	454	724	1168	990.6	692.2	16-Ø92	203.2	6.4

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5

DIMENSIONS - CLASS 2500# FULL BORE

SIZE		L			d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
2"	50	451	545	451	42	173	235	171.5	91.9	8-Ø28.6	50.8	6.4
3"	80	578	584	578	62	226	305	228.6	127	8-Ø34.9	66.5	6.4
4"	100	673	683	673	87	274	356	273.1	157.2	8-Ø41.3	76.2	6.4
6"	150	914	927	914	131	370	483	368.3	215.9	8-Ø54	108	6.4
8"	200	1022	1038	1022	179	420	552	438.2	269.7	12-Ø54	127	6.4
10"	250	1270	1292	1270	223	541	673	539.7	323.9	12-Ø66.7	165.1	6.4
12"	300	1422	1445	1422	265	643	762	619.2	381	12-Ø73	184.2	6.4

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5

DIMENSIONS - CLASS 2500# REDUCED BORE

SIZE		L			d	H	De	Dc	ØRF	Drilling	C	t
NPS	DN	RF	RTJ	BW								
3"x2"	80x50	578	584	578	42	173	305	228.6	127	8-Ø34.9	66.5	6.4
4"x3"	100x80	673	683	673	62	226	356	273.1	157.2	8-Ø41.3	76.2	6.4
6"x4"	150x100	914	927	914	87	274	483	368.3	215.9	8-Ø54	108	6.4
8"x6"	200x150	1022	1038	1022	131	370	552	438.2	269.7	12-Ø54	127	6.4
10"x8"	250x200	1270	1292	1270	179	420	673	539.7	323.9	12-Ø66.7	165.1	6.4
12"x10"	300x250	1422	1445	1422	223	541	762	619.2	381	12-Ø73	184.2	6.4

Notes: Dimensions in (mm). Flange drilling according to ASME B16.5

HEADQUARTERS

Pol. Ind. Apatta-Erreka, Parc. E3, Nave 8
20400 IBARRA (Gipuzkoa) Spain

Tel.: + 34 943 216 148
Fax: + 34 943 210 438

fca@fcavalves.com

www.fcavalves.com

