

**INTEGRAL FLANGED BALL VALVES
FOR CORROSIVE SERVICE**



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YOU ARE IN GOOD HANDS

Founded in 1963, SAFI has an unrivalled experience in handling corrosive and abrasive chemicals with thermo-polymer materials. SAFI is committed to offering cost saving solutions to meet the exacting requirements of today's industry in handling corrosive chemicals, taking economic, technical and regulatory considerations into account.

With a strong R&D department and more than forty years of continuous cooperation with the customers, SAFI has produced advanced designs and unique combinations of materials to bring effective and profitable solutions to the problems of corrosive chemicals flow control.

With its strong international presence, SAFI offers its customers more than advanced technology. It provides a combination of quality products, local customers support, product development and value-added to the customers' global business.



Chemicals industries

Base chemicals, Petrochemicals, Pharmaceuticals, Steel rolling mills, Minerals and non-ferrous metals.



Agriculture

Automated sprayers



Water Treatment, Environment

City waters, waste waters, sewers, sea cooling water, landfill gas, gas scrubbing.



Logistics

Intermediate Bulk Containers, Flexible tanks.

REAL SOLUTIONS FOR CORROSIVE FLUIDS

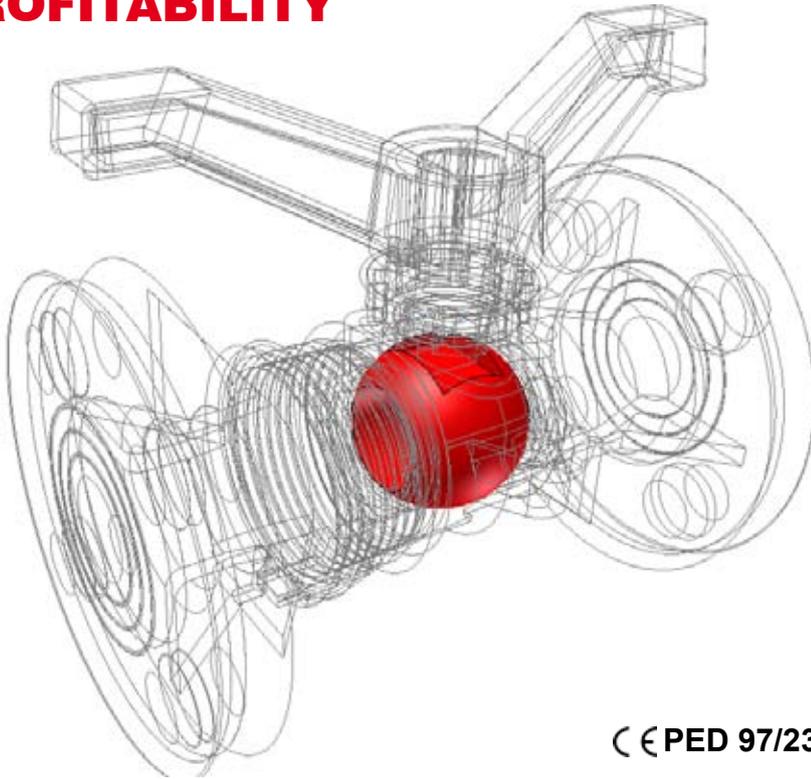
At SAFI, we believe that quality valves are a worthwhile investment.

Leaking valves cause corrosion to neighbouring equipment and damage to buildings. Valves which become inoperable create a hazard and cause unplanned shut-downs. **Quality valves eliminate high hidden costs.**

SAFI offers valves that are dependable, reliable and trouble-free over long periods of time. Polymer materials should be used wherever they outlast metals. When properly selected, SAFI valves can last many years without any maintenance requirement.

Used throughout the World, SAFI valves are specified by leading technology providers for use in chemical process, chemicals storage and distribution, pharmaceuticals, mining and metal treatment, city water and wastewater treatment, landfill, power generation, agrochemicals, chlor-alkali, pigments and speciality chemicals.

INTEGRAL FLANGED BALL VALVES THAT IMPROVE YOUR PROCESS PROFITABILITY



CE PED 97/23

SAFI's integral flanged ball valves form a family of extremely robust and reliable valves for use with corrosive chemicals such as strong acids and alkalis. They offer good alternatives to stainless steel ball valves, lined steel diaphragm valves and lined plug valves, so long as the temperature remains below a defined limit. In some services, they outperform valves made of special metals, such as Alloy 20, chromium cast iron, titanium etc... Their resistance to abrasion is good, and they generally perform better in slurries than PTFE lined diaphragm valves.

The valves received **TA-Luft** and **ISO 15848** certification. **Food grade** and **ATEX** () compliant grades are available.

Flanges **compatible with DIN, ANSI, BS and JIS** standards are available. The valves are also available with face to face dimensions compatible with most diaphragm valves on the market to allow easy substitution.

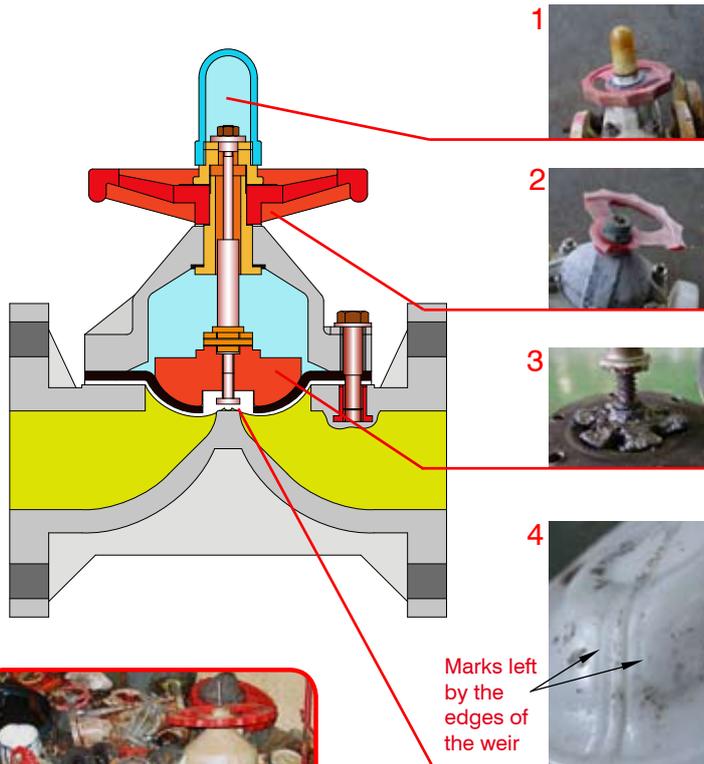


SUBSTITUTION FOR DIAPHRAGM VALVES

Breakage,
Blockage,
Leakage,
Short life,

Corrosion of
adjacent
equipment,

Messy
environment
.....



The Problems

Diaphragm valves are invaluable for adjusting the flow.

But they are also too often used for shut-off service.

Diaphragm valves with PTFE or FEP lined diaphragms are widely selected to handle corrosive chemicals, particularly when solid particles are present in the fluid. However, in practice, PTFE is not elastic, and repeated bending causes the diaphragm liner to crack and leak.

Solid particles also make dents in the PTFE liner, and the edges of the valve weir leave permanent marks (4), once the valve has been operated a few times.

Leakage of the fluid into the bonnet (1) causes the trim to corrode and seize (3). The valve becomes inoperable (2).

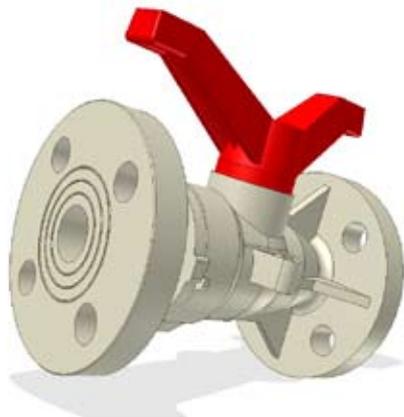
Diaphragm valves cost a lot in maintenance, and in damage due to leaked product.

Maintenance costs money

The solution

Ball Valves are generally a better choice than diaphragm valves for on-off services. When a proper choice of material is made, **SAFI Ball Valves can last for years without any leaks and any maintenance, even in most slurry services.**

SAFI Ball Valves offer :



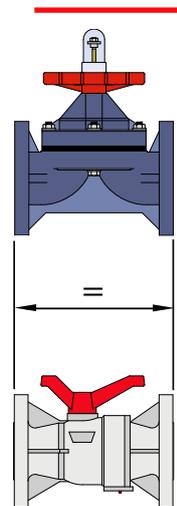
-  **Longlasting positive leaktight shut-off**
-  **TA-Luft approved, zero external leakage**
-  **Instant quarter-turn operation**
-  **Visible open/close position control with the handle**
-  **Low-cost quarter-turn actuators**

COMPATIBLE

SAFI flanged ball valves are available with face-to-face dimensions compatible with most plastic and lined metal diaphragm valves on the market.

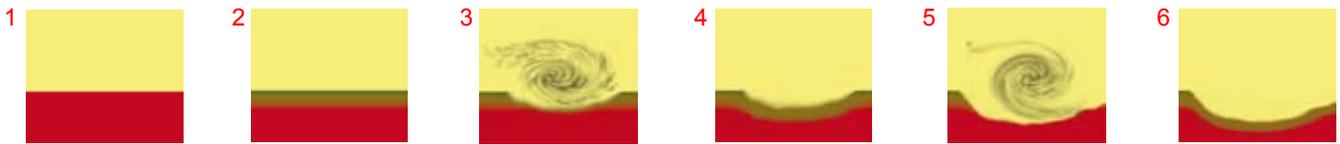


A Safi PVDF valve substitutes for a lined cast iron diaphragm valve at the bottom of a 98% Sulfuric Acid storage tank.



SUBSTITUTION FOR STAINLESS STEEL VALVES

Stainless steels, duplex steels and even high nickel alloys such as Alloy 20, are resistant to acids because a thin invisible layer of nickel oxide or halide spontaneously appears at the surface of the metal. This natural «passivation» layer shields the metal from the chemical (2) and stops the corrosion. For this reason, stainless steel appears in common textbooks and chemical corrosion charts as resistant to many corrosive chemicals. However, such information is only true when the stainless steel is immersed in *still* liquid (without flow). In case of fast flow, turbulence, or the presence of solid particles in the fluid (3), the fragile protective film is continuously taken away by the motion and the corrosion is continuous, as shown on the sequence (4)(5)(6) below. A surprisingly fast destruction of the equipment follows.



SAFI composite material valves completely eliminate this problem.

They exhibit good resistance to abrasion, and a «nonstick» surface preventing the accumulation of scale or crystals.

They are chemically inert with respect to many acids, and erosion-enhanced corrosion is therefore completely eliminated.

APPLICATIONS WITH EROSION AND ABRASION

Diaphragm valves are often selected where solid particles are present in the fluid. In fact, the solid particles damage the diaphragms, especially PTFE diaphragms, which results in frequent through leakage and diaphragm failures.

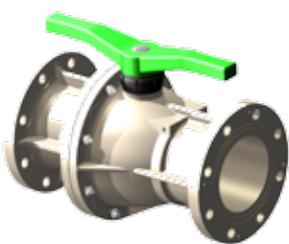
SAFI series IB ball valves have an outstanding resistance to erosion and abrasion.

They are used in waste water treatment, steel pickling lines and pigment factories to handle fluids with as much as 250 g/l of solids.



Steel pickling line, 33%, 80°C, with 120g/litre iron oxyde particles

PP and PVDF are abrasion resistant materials :

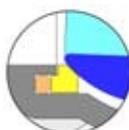


On a TABER abrasion test, SAFI's PVDF performs 10 times better than 304 stainless steel. Polypropylene comes second with an fair score of 3 times better than 304.

On an erosion tests carried out by SOLVAY, PVDF performed 3 times better than carbon steel, and approximately equal to duplex steel 904L.

These tests were carried out in water. When the fluid is corrosive as well as abrasive, the damage to the metal is considerably more, whereas it makes no difference to the polymers. **Polymer valves therefore have a significant advantage over metal alloys for handling dilute acids with solid particles.**

The design of SAFI's ball valve seats provides a perfect surface contact between the ball and the seat, preventing the introduction of solids between the two surfaces, and **reducing the effects of scratches on the seat.**



APPLICATIONS IN SULFURIC ACID



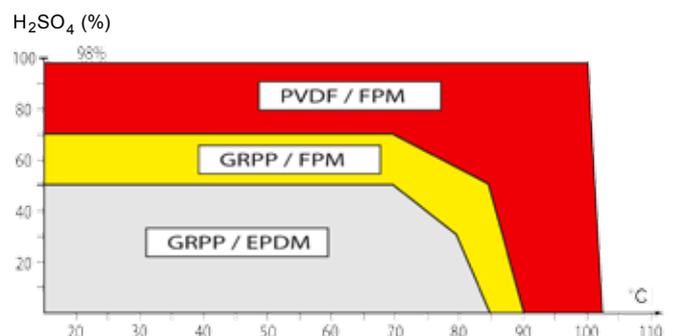
SAFI ball valves series IB surpass stainless steel ball valves and lined steel or lined cast iron valves in most applications involving sulfuric acid at ambient temperature. High flow rate, accidental dilution, and combined erosion affect SAFI ball valves far less than stainless steel valves. The absence of visible metal parts eliminates all external corrosion.

The SAFI PVDF valve with FPM 75 O-rings can serve in all concentrations of sulfuric acid, even in oleum at room temperature. And of course dilution does not harm it, so long as the temperature does not exceed 100°C for any length of time.

For solutions with lower concentrations, **more economic solutions exist with the GRPP bodies and EPDM O-rings up to certain concentrations.** The table below shows the most economic solution for given service conditions. If abrasive particles are present in the fluid, PVDF balls are recommended in valves with GRPP bodies.



Titanium dioxide suspension in sulfuric acid. Safi GRPP Valves.



THE MATERIALS

Bodies and Balls :

- Glass Reinforced Polypropylene : This is the most common material used for SAFI series IB Ball Valves. Reinforced with 20% fibres of chemically resistant borosilicate «C» glass, it has incomparable mechanical strength, machinability, dimensional stability, and resistance to temperature up to 100°C.

Its resistance to UV light is enhanced by carbon black pigment, and by addition of synthetic UV stabilisers. An anti-oxidant additive improves its resistance to oxidising chemicals.

- High mechanical strength
- Long term stability
- UV Resistant (outdoor service)

- Anti-static Polypropylene : This optional material contains 20% carbon fibers, and conducts electricity. It is used in explosion hazard areas where anti-static devices are mandatory.

ATEX Compliant
Zone 1 and 2



- Polypropylene Homopolymer is used as a standard for balls up to 2". UV light and chemical resistance has been enhanced by pigments and additives in the same way as in SAFI's glass Reinforced Polypropylene.

- PVDF : SAFI selects a highly crystalline grade of PVDF produced by the suspension process. This grade exhibits particularly high mechanical resistance and long term stability at high temperatures. PVDF has an outstanding resistance to abrasion.

The chemical resistance of PVDF is well known. The grade used by SAFI will not blister in wet chlorine. PVDF is not suited for strong alkalis and for polar solvents such as ketone, esters, amines.

- High mechanical strength
- Highest chemical resistance to strong acids and oxidizing solutions.

Properties	Applicable ASTM Standard	Unit	GRPP	PVDF	ASPP	PP	PVC
- % Fibre	-	%	20 (glass)	0	20	0	
- Density	D 792	g/cm ³	1.04	1.78	1.02	0.9	1.41
Mechanical Properties							
- Rupture stress	D 638	MPa	55	50	75	35	48
- Tensile Rupture Stress	D638	Mpa					3137
- Elongation at break	D638	%	3	40	2.5	200	-
- Flexural rupture stress	D 790	Mpa	70	94	95	35	90
- Flexural modulus	D 790	Mpa	4200	2500	4900	1200	
- Resilience, IZOD impact test	D 256	J/m	80	100 to 200		-	76
- Hardness, Rockwell R	D 785		105	115		30	112
- Hardness, Shore D	D 785		74	77 to 82		-	70
Thermal Properties							
- Heat deflexion temperature 18.5 kg/cm ²	D 648	°C	125	115		52	74
- Vicat softening point under 5kg	D 1525	°C	140	147		152	
Linear expansion coefficient, 0 to 100°C	D 696	10 ⁻⁵ /°C	6	11		13	
Electrical Properties							
Surface Resistance	ASTM D257	ohm			10 ⁴		
Resistance to tracking	NF C 26-220	V			270		

O Rings :

- EPDM Grade 60 : A quality EPDM suitable for hydrochloric acid at all concentration near room temperature and many aqueous chemicals. Only affected by strong oxidisers and oils.

- EPDM grade 67 : A special formulation of EPDM for acetic acid.

- FEP coated rubber + Kalrez : In this combination, a Kalrez O-ring is used for the stem dynamic seal, whereas all static seals are made of FEP coated rubber. FEP is unaffected by almost all industrial chemicals, including solvents, and also serves where the high purity of the chemical must be preserved (e.g : pharmaceuticals).

- FPM grade 73 or Viton B601C : A good grade of fluoroelastomer superior to Viton A. Suitable for sulphuric acid up to 70%, and conc. Hydrochloric acid at any concentration. Not suitable for caustic soda. Also sensitive to polar solvents such as ketones, and sulphides.

- FPM Special grade 75 : With a high fluorine content >70 % and special mineral additives for the highest chemical resistance to strong acids (hydrochloric, sulphuric 98%, nitric...), chlorine, methanol....



HOW TO HANDLE CORROSIVE FLUIDS IN EXPLOSION HAZARD AREAS ?

How do you handle acids and other corrosive chemicals in an area classified as «explosion hazard area»? Metal Valves corrode and ordinary plastic valves are prohibited. SAFI Integral Flanged Ball Valves are available in corrosion resistant anti-static thermo-polymers filled with carbon fiber. The surface resistivity of the materials is less than 10^9 ohms, as required by the standard EN 50014, and the total resistance between any two points of the valve is less than 10^6 ohms. The valves qualify for ATEX zones 1 and 2 according to the European directives ATEX 99/92/CE and ATEX 94/9/CE.



UNIQUE MANUFACTURING TECHNIQUES



MOULDING

Ordinary valves have components moulded by injecting the molten polymer from one side of the rim, as shown here (1). The polymer flows around the mould from both sides, and joins up on the opposite end. The finished component keeps a «memory» of this asymmetric flow pattern, and later has a tendency to warp. The flow junction will develop into a crack (2) under combined effects of stress, heat, strong chemicals, and ultraviolet light.

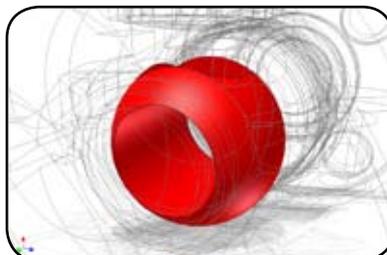


SAFI components are symmetrically injected from the centre (3) (4). The central parts of hollow components are machined out after moulding (5). With this method, the part is perfectly symmetric, has no «junction line», and no tendency to warp.



MACHINING

All components of SAFI valves are heat-treated after moulding for dimensional stabilisation, and then machined to final dimensions. All sealing surfaces are machined, including 100% of the surface of the balls.



TESTING

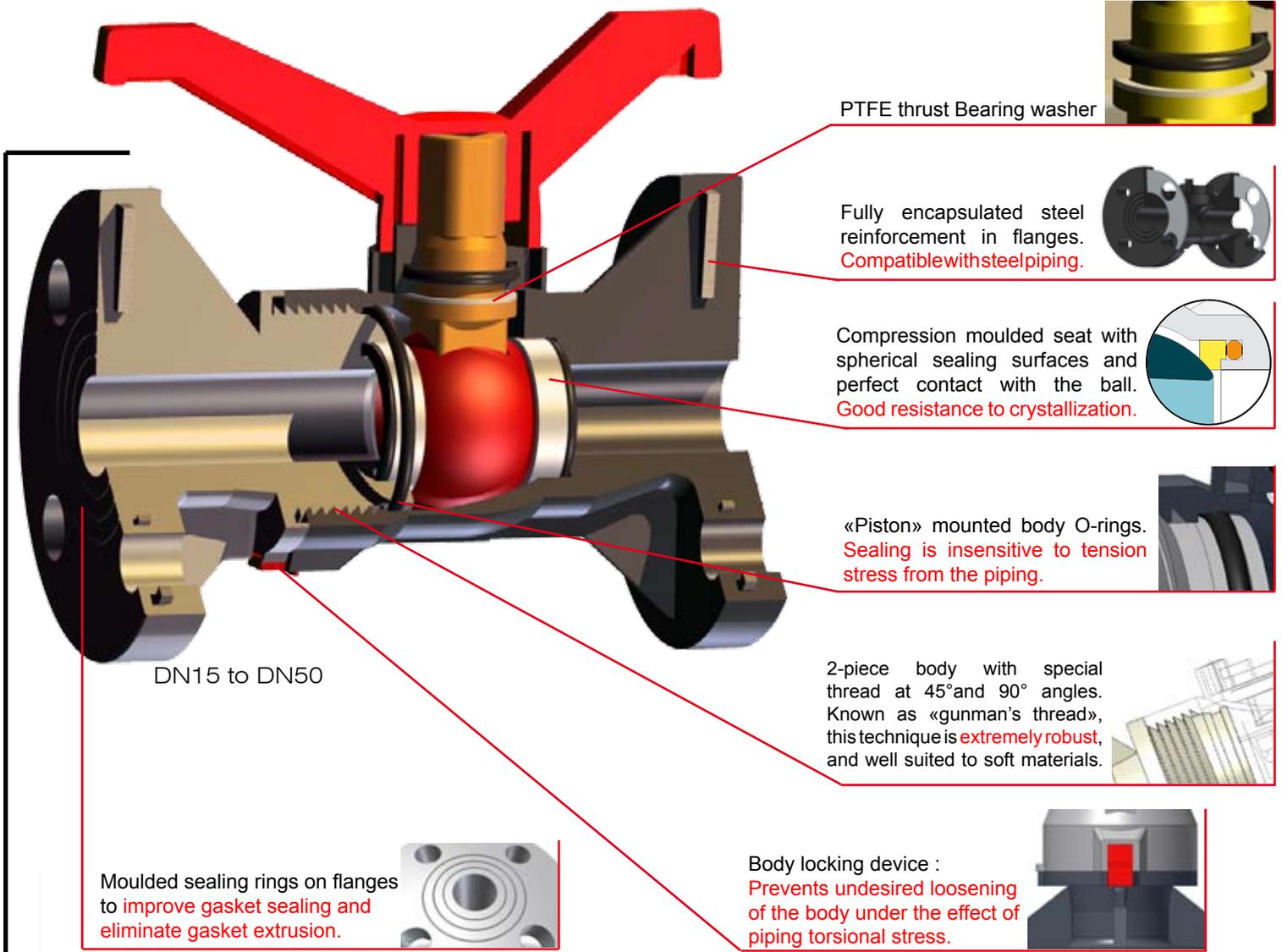
Every SAFI valve is individually tested for body leaks, seat leaks, and proper operation.

Leak Tests are carried out with air under water, first at low pressure, and then at 6 bar.

No bubble is allowed. SAFI valves are **bubbletight**.



FEATURES AND BENEFITS



PTFE thrust Bearing washer

Fully encapsulated steel reinforcement in flanges.
Compatible with steel piping.

Compression moulded seat with spherical sealing surfaces and perfect contact with the ball.
Good resistance to crystallization.

«Piston» mounted body O-rings.
Sealing is insensitive to tension stress from the piping.

2-piece body with special thread at 45° and 90° angles. Known as «gunman's thread», this technique is extremely robust, and well suited to soft materials.

Moulded sealing rings on flanges to improve gasket sealing and eliminate gasket extrusion.

Body locking device :
Prevents undesired loosening of the body under the effect of piping torsional stress.

The Robust Solution

An outstanding mechanical resistance

This test illustrates the exceptional mechanical strength of the SAFI glass and steel reinforced, integral flanged polypropylene ball valves. This 6" valve holds a weight of 250 kg at the end of 1m section of pipe. It will break at 961kg.



Shell Burst Pressure test (Bar)

Size	PVDF Body	GRPP Body	ASPP Body
1/2" DN15	100	75	52
3/4" DN20	100	75	52
1" DN25	100	65	45
1 1/2" DN40	85	50	35
2" DN50	80	40	28
3" DN80	45	30	21
4" DN100	45	30	21
6" DN150	45	24	17



DN80-DN100



DN150

OPTIONS

Valves with pneumatic actuators



- Kinetrol vane type actuators
- Rack & pignon actuators
- Max-Air corrosion free thermopolymer actuators
- Limit switch boxes
- Manual over-ride
- Positioners



Valves with electric actuators



- SAFI electric actuators for DC 12V, 24V, 48V and AC 110V, 240V
- Corrosion-free thermopolymer casing
- Simple model SM1 (1)
- Model SM2 with limit switches and manual over-ride (2)
- Optional heating resistor



Options for manual operation



2

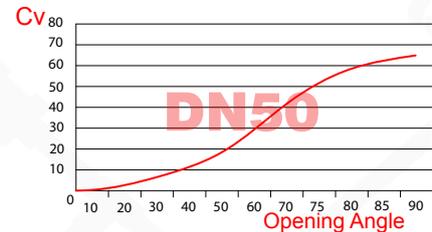
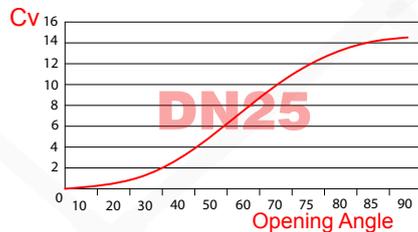


- Lockable handle (1)
- Extended stem (2)
- Limit switch box (3)
- Handwheel Reduction Gear (4)

V-Port Flow Control Valves



SAFI integral flanged ball valves are available with a V-port to control flow with near-linear transfer function. Complete regulation systems with actuators and intelligent positioners can be provided which are insensitive to corrosion and erosion.



Ball Relief hole



The ball of SAFI ball valves may be provided with a lateral hole on the upstream side, to vent the ball cavity in the closed position. This is recommended to avoid trapped pressurized fluids, and avoids accidents with chemicals which tend to decompose and produce gases such as hydrogen peroxide.

3 way valves



Three-way ball valves are available up to DN100, with L-Ball, double-L or T-ball.

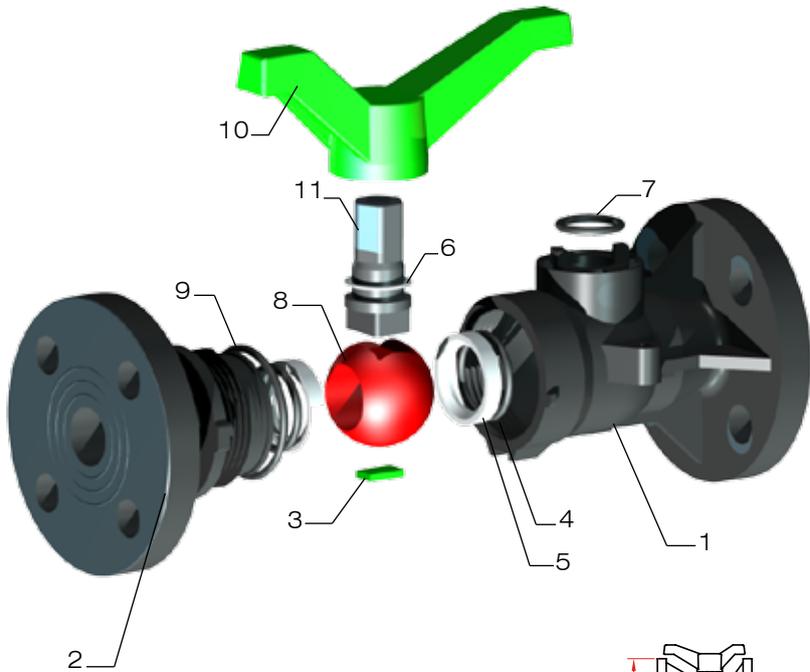


Silicone Free

All SAFI products are moulded with silicone-free mould release agents. Furthermore, an option is available for automobile paint systems. Each component is individually cleaned following a customer-approved procedure, and the assembled product is guaranteed free of silicones and delivered in a sealed plastic bag.

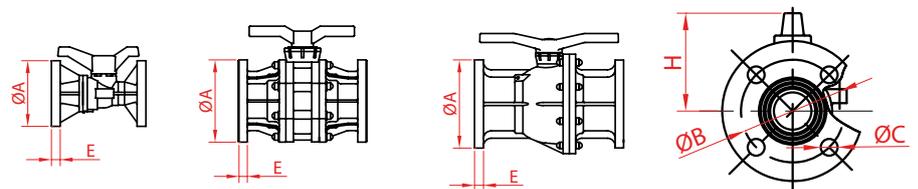


TECHNICAL DATA



BILL OF MATERIALS

No.	Description	Material
1	Body	GRPP/PVDF/ASPP/ASPVDF
2	Flanged end	GRPP/PVDF/ASPP/ASPVDF
3	Locking key	GRPP
4	O'ring (Seat)	EPDM/FKM/FEP Encapsulated
5	Seat	PTFE
6	Thrust Washer	PTFE
7	O'ring (stem)	EPDM/FKM/FFKM
8	Ball	PP/GRPP/PVDF/ASPP/ASPVDF
9	O'ring (Body)	EPDM/FKM/FEP Encapsulated
10	Handle	GRPP/ASPP
11	Stem	GRPP/PVDF with metal insert



DIMENSIONS AND WEIGHTS

Valve size	A	B				C				E	H	Face to face (mm)			Weight (kg)		
		DIN	ANSI	BS	JIS	DIN	ANSI	BS	JIS			DIN	ASAHI	BS5156	GRPP	PVDF	
DN15	1/2"	95	65	60	67	70	14	16	14	15	14	75	130	110	123	0.50	0.75
DN20	3/4"	105	75	70	73	75	14	16	14	15	16	75	150	120	123	0.60	0.92
DN25	1"	115	85	79.5	82	90	14	16	14	19	16	95	160	130	133	1.05	1.00
DN32	1 1/4"	140	100	89	87.3		18	16	14		18	99	180	142	152	1.60	1.45
DN40	1 1/2"	150	110	98.4	98.4	105	18	16	14	19	18	106	200	180	165	1.95	1.95
DN50	2"	165	125	120.6	114.3	120	18	19	18	19	20	230	230	210	196	2.45	2.60
DN80	3"	200	160	152.4	146	150	18 (8)	19 (4)	17.5 (4)	19 (8)	22	180	310	280	260	5.50	9.00
DN100	4"	220	180	190.5	177.8	175	18 (8)	19 (8)	17.5 (4)	19 (8)	24	180	350	340	311	5.80	9.50
DN150	6"	285	240	241.3	234.95	240	22	22.22	19.05	23 (8)	26	235	480	480	412	15.00	20.00

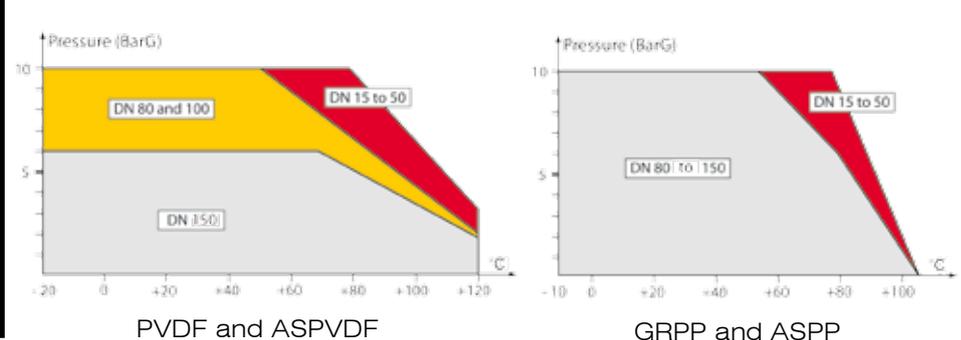
JIS : JIS 2210 10K table 3.1
 BS : BS 10 tables D and E
 ANSI : ANSI B16.5 class 150
 DIN : EN 1092-1/DIN2501 ISO 7005 PN10/16

BS5156 : Compatible with most lined metal diaphragm valve
 ASAHI : Compatible with most plastic diaphragm valve.
 DIN : Compatible with EN 558-1 R1 / ISO 5752/1, PN10

FLOW DATA

DN	Cv	Kv	Max flow rate	
			Q (l/min)	Q (m³/h)
15	22	19	21	1.3
20	37	32	38	2.3
25	57	49	59	3.5
32	90	78	97	6
40	153	132	151	9
50	244	210	236	14
80	760	654	603	36
100	990	852	943	57
150	2093	1800	2121	127

RECOMMENDED TEMPERATURE AND PRESSURE LIMITS



TORQUES FOR FLANGED BOLTING

DN	15	20	25	32	40	50	80	100	150
Ø Flange Bolts	M12	M12	M12	M16	M16	M16	M16	M16	M20
Torque m. Kg	3	3	3	3.5	3.5	3.5	4.5	4.5	5 to 7

HANDLE TORQUE (m.Kg)

DN	GRPP Ball valve		PVDF Ball Valve	
	With no pressure	With pressure	With no pressure	With pressure
15	0.5	1.0	0.5	1.0
20	0.5	1.0	0.5	1.0
25	0.4	0.8	1.0	2.0
32	0.4	0.8	1.0	2.0
40	0.5	1.0	1.0	2.0
50	0.7	1.4	1.2	2.4
80	1.7	3.4	2.0	4.0
100	2.0	4.0	4.0	8.0
150	6.0	12.0	10.0	20.0

VALVE INQUIRY FORM

Any questions ? Need more information, a quotation ? You are welcome ! Just copy and fill in the form below and fax it to our International Sales Department +33 475 53 95 34 or to your local distributor.

CUSTOMER :

Contact Name : _____ Process : _____
Tel : _____ Licensor : _____
Fax : _____ End product : _____
E-mail : _____



Look for your local distributor details on our web site :

www.safi-valves.com

SERVICE CONDITIONS :

Fluid general name : _____
Fluid Composition : _____ %
_____ %
_____ %
Solid Particles ? : _____ g/l
Pressure Bar.g : Normal: _____ Design : _____
Temperature °C : Normal: _____ Design : _____

Comments :

VALVE DEFINITION :

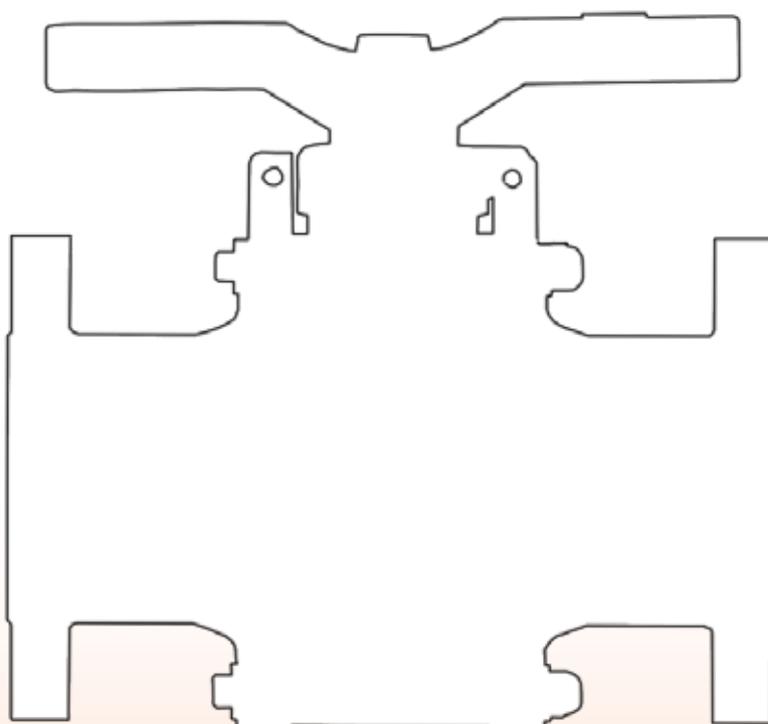
Previously used valve : (if applicable), type and brand : _____
Type of service : On / Off Flow Control Three-way valve
Piping Material : _____
Requested valve material : GRPP PVDF ASPP
Requested O-ring material : EPDM FPM SPECIAL
Flange Standard : ANSI DIN JIS BS Other : _____
Rating : _____
Face to Face (mm) : _____
Options : Pressure relief hole in ball Extended stem Lockable handle
 V-Port (Flow control) Flow rate : _____ Min _____ Max
Regulatory requirements : PED TA-Luft ATEX Food/Water grade
Other requirements : Silicone free Greased with ECTFE grease (oxygen/chlorine)

Comments :

ACTUATED VALVE OPTIONS :

Electric Actuator : 12VDC 24VDC 48VDC 110-120VAC 200-240VAC
 Nb Limit Switches Manual over-ride Heating resistor
Pneumatic Actuator : Fail open Fail close Double acting
Air Supply pressure (min) in Bar G : _____
Accessories : Solenoid Switch box Nb of limit switches Positioner Manual over-ride

DOCUMENTS REQUIRED :



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