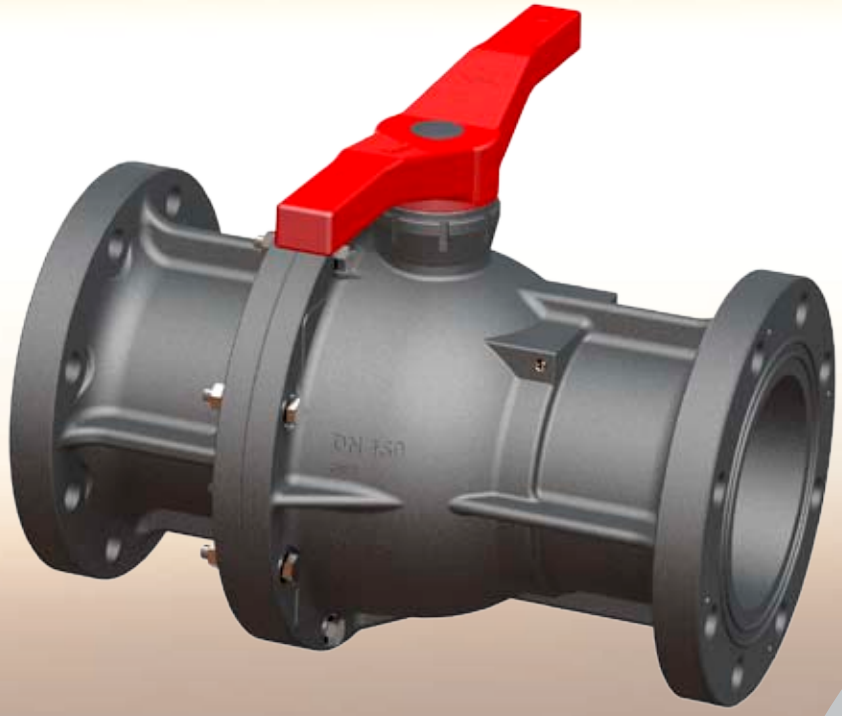
SAFI

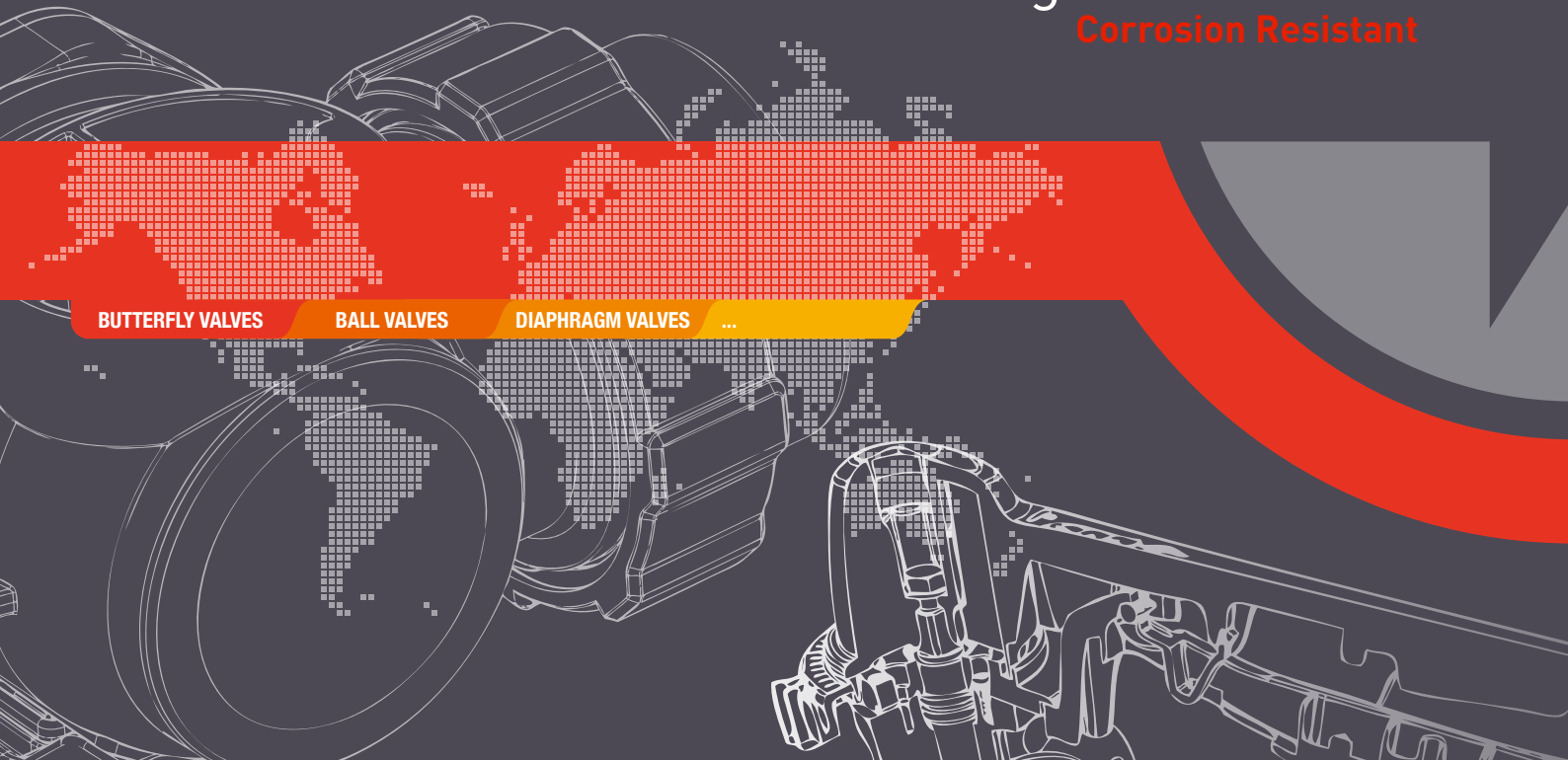
Thermoplastic Valve Solutions



# Flanged **ball valve**

## Corrosion Resistant

BUTTERFLY VALVES | BALL VALVES | DIAPHRAGM VALVES | ...



CONTENTS



**Logistics**

Intermediate Bulk Containers, Flexible tanks.

**Water Treatment & Environment**

Clean water, waste water, effluent, seawater, cooling water, landfill gas, gas scrubbing.

**Chemical Industries**

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

**Agriculture**

Automated sprayers

# You are in **good hands**

Founded in 1963, SAFI has unrivalled experience in handling corrosive and abrasive chemicals with thermoplastic materials.

SAFI is committed to offering solutions to meet the modern industry requirements for handling corrosive chemicals, taking into account, costs and technical demands as well as increasing regulations and standards.

Our R&D department has developed our products over many years with the continuous co-operation of our customers. We have produced advanced designs using unique combinations of material.

With a global approach to our business, SAFI offers quality products with local customer support.

# **Real solutions for** corrosive fluids

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

Leaking valves cause corrosion to neighbouring equipment with damage to buildings and the environment. Valve failures create a hazard and cause unscheduled maintenance. Quality valves eliminate high unbudgeted costs. SAFI offers valves that are reliable and trouble free over a long time, «Fit & Forget».

Many polymer materials have been shown to outlast metals in agressive applications. Properly selected, SAFI valves can last many years without maintenance.

Used throughout the World, SAFI valves are specified by leading consultants for use in chemical processes, chemical storage and distribution, pharmaceutical, mining and metal treatment, potable and wastewater treatment, landfill, power generation, agrochemicals, chlor-alkali, pigments and speciality chemicals.

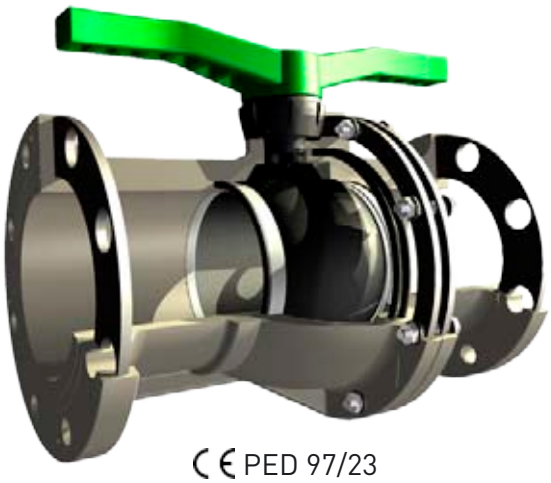
# **Quality assured** integral flanged ball valves

SAFI's integral flanged ball valves form a range of extremely robust and reliable valves for use with corrosive chemicals such as strong acids and alkalies. They offer good alternatives to lined steel diaphragm valves, lined plug valves and lined ball valves.

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 have TA-Luft and ISO 15848 certification. Food grade and ATEX (Ex) compliant grades are available.

Flange options available are compatible with DIN and ANSI standards. The valves are also available with face to face dimensions compatible with most diaphragm valves on the market to allow easy substitution.



CE PED 97/23

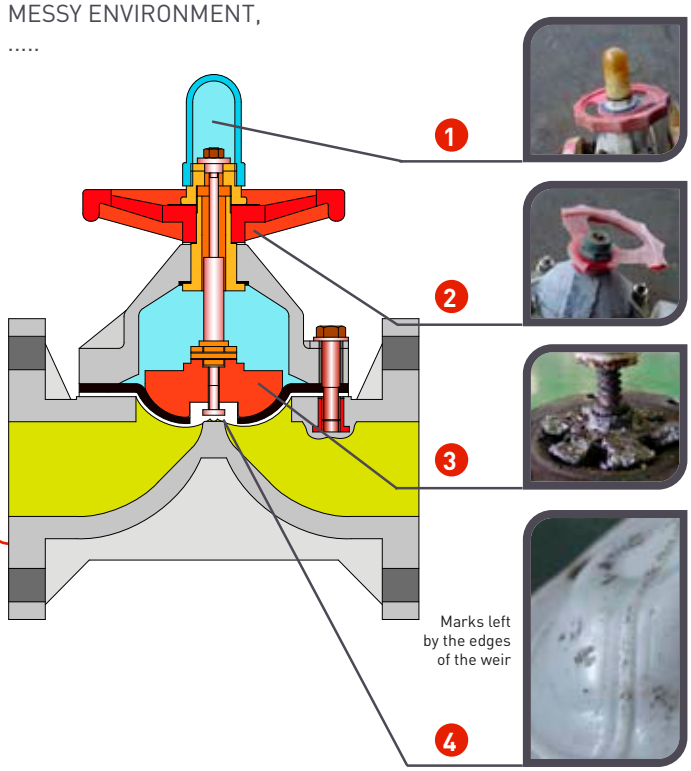
DN15 - DN50 (1/2" - 2")

DN80 - DN100 (3 and 4")

DN150 (6")

# A recognised alternative **to diaphragm valves**

BREAKAGE, BLOCKAGE, LEAKAGE, SHORT LIFE
CORROSION OF ADJACENT EQUIPMENT,
MESSY ENVIRONMENT,
.....




## The problems

Diaphragm valves require multiple turns of the hand-wheel to operate, this can cost valuable seconds in an emergency, although valve position indicators are now available any damage to the indicator makes it difficult to identify if the valve is open or closed.

- To compensate for «leaking or damaged valves» it is common practice to over-tighten the hand-wheel, this can cause damage to the operating spindle and plunger assembly.

- Corrosion caused by the external environment or due to leakage of fluid into the bonnet can make diaphragm valves difficult to open/close, operators often revert to using excess force or wheel keys which can cause damage to the hand wheel.

- Sealing integrity is reliant upon the condition of the diaphragm. Elastomers such as EPDM, FKM and FEP can suffer from premature ageing and result in valve leakage. Diaphragms lined with PTFE are widely selected to handle the most corrosive chemicals, particularly when solid particles are present in the fluid. However PTFE is not elastic and repeated bending, solid trapped particles and where the diaphragm is clamped can all cause the diaphragm to develop stress cracks and leak.

- Diaphragm valves are generally weir type and have a reduced bore which can increase the possibility of a blockage.

- Glass lined metal diaphragm valves can be affected by thermal shock causing the glass to crack and corrosive liquid to attack the metal body.

## The solutions

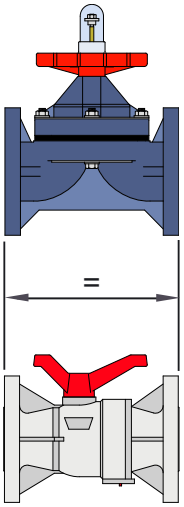
Ball Valves are generally a better choice than diaphragm valves for on-off services.
SAFI Ball Valves can last for years without any leaks and any maintenance, even in most slurry services.

**100% positive** shut-off
**TA-Luft** approved
**1/4 turn** operation
**Easily identified** valve position (open/closed)
**Full bore / full flow** 1/2" to 6" (DN15 to DN150)

## 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% Sulphuric Acid storage tank.



# The alternative to **stainless steel valves**

**1)** Stainless steels, duplex steels and even high nickel alloys such as Alloy 20 are resistant to acids due to a thin natural invisible «passivation» layer of nickel oxide or halide which occurs at the surface of the metal during the manufacturing process. This natural passivation layer «shields» the metal from chemical attack and protects against corrosion.
**2)** In common textbooks and chemical resistance charts stainless steel is shown to have resistance to many corrosive chemicals. However often this resistance is conditional and only applicable when the stainless steel is immersed in «still» liquid (without flow). Corrosion factors should be considered such as fast flow, turbulence or the presence of solid particles in the fluid.
**3)** The fragile protective film is continuously removed by the motion of the fluid leaving the metal exposed to continuous and a surprisingly fast destruction of 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 problems through leakage and diaphragm failures.

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

SAFI 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.

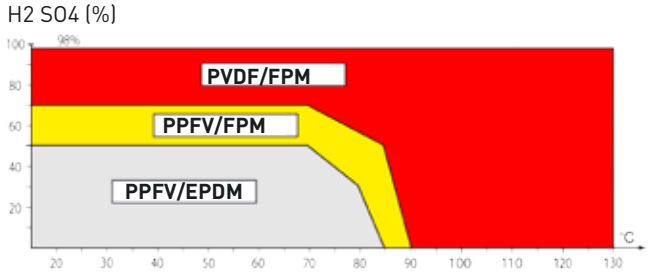
**PP and PVDF are abrasion resistant materials :**

On a TABER abrasion test, SAFI's PVDF performs 10 times better than 304 stainless steel. Polypropylene comes second with a score of 3 times better than 304.
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 ball valve seats provide a perfect surface contact with the ball, preventing the introduction of solids between the two surfaces reducing the effects of scratches to the ball or seats.

# **sulfuric acid** applications

SAFI Flanged ball valves surpass stainless steel ball valves and lined steel or lined cast iron valves in most applications involving sulphuric 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 FKM 75 O-rings can serve in all concentrations of sulphuric acid, and oleum at room temperature. Dilution has no effect 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.



# Valve Bodies

**- Glass Reinforced Polypropylene :** This is the most common material used for SAFI Flanged Ball valves. Reinforced with 20% borosilicate glass fibres, 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 the addition of synthetic UV stabilisers. An anti-oxidant additive improves its resistance to oxidising chemicals.
**- Anti-static Polypropylene :** This optional material contains 20% carbon fibres, and conducts electricity. It is used in explosion hazard areas where anti-static devices are mandatory.
**- 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.
**- Polyvinylidene Fluoride :** 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. PVDF has excellent chemical & abrasion resistance properties. The grade used by SAFI will not blister in wet chlorine. PVDF is not recommended for strong alkalies and polar solvents such as ketone, esters and amines.

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

ATEX Compliant
Zone 1 and 2

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

| Properties | Applicable ASTM Standard | Unit | GRPP | PP | ASPP | PVDF |
|---|---|---|---|---|---|---|
| - % Fibre | - | % | 20 (glass) | 0 | 20 | 0 |
| - Density | D 792 | g/cm³ | 1.04 | 0.9 | 1.02 | 1.78 |
| **Mechanical Properties** | | | | | | |
| - Rupture stress | D 638 | MPa | 55 | 35 | 75 | 50 |
| - Tensile Rupture Stress | D638 | Mpa | | | | |
| - Elongation at break | D638 | % | 3 | 200 | 2.5 | 40 |
| - Flexural rupture stress | D 790 | Mpa | 70 | 35 | 95 | 94 |
| - Flexural modulus | D 790 | Mpa | 4200 | 1200 | 4900 | 2500 |
| - Resilience, IZOD impact test | D 256 | J/m | 80 | - | | 100 to200 |
| - Hardness, Rockwell R | D 785 | | 105 | 30 | | 115 |
| - Hardness, Shore D | D 785 | | 74 | - | | 77 to 82 |
| **Thermal Properties** | | | | | | |
| - Heat deflection temperature 18.5 kg/cm² | D 648 | °C | 125 | 52 | | 115 |
| - Vicat softening point under 5kg | D 1525 | °C | 140 | 152 | | 147 |
| - Linear expansion coefficient, 0 to 100°C | D 696 | 10 /°C | 6 | 13 | | 11 |
| **Electrical Properties** | | | | | | |
| - Surface Resistance | ASTM D257 | ohm | | | 10 | |
| - Resistance to tracking | NFC 26-220 | V | | | 270 | |

# Rings and seals

**- EPDM (Ethylene propylene diene methylene terpolymer) Grade 60 :** A quality EPDM suitable for hydrochloric acid at all concentrations 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 (Fluorinated ethylene propylene copolymer) 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).
**- FKM (Vinylidene fluoride hexaflouropropylene copolymer) grade 73 or Viton B601C :** A good grade of fluoroelastomer superior to Viton A. Suitable for sulphuric acid < 70%, and any concentration of hydrochloric acid. Not suitable for caustic soda. Also sensitive to polar solvents such as ketones, and sulphides.
**- FKM 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» where metal valves corrode and ordinary plastic valves are prohibited ?

SAFI Flanged Ball Valves are available in corrosion resistant anti-static thermoplastics filled with carbon fibre.The surface resistivity of the materials is less than 109 ohms, as required by the standard EN 50014 and the total resistance between any two points of the valve is less than 106 ohms. The valves qualify for ATEX zones 1 and 2 according to the European directives ATEX 99/92/CE and ATEX 94/9/CE.

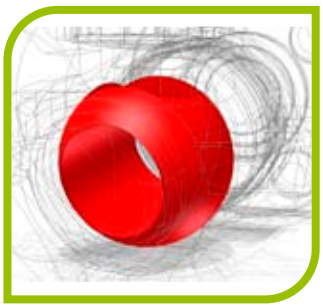
# Manufacturing **process**

MOULDING

Most 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 and has a tendency to distort. This is the most likely point of failure. 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 therefore has no tendency to distort and no point ok weakness.

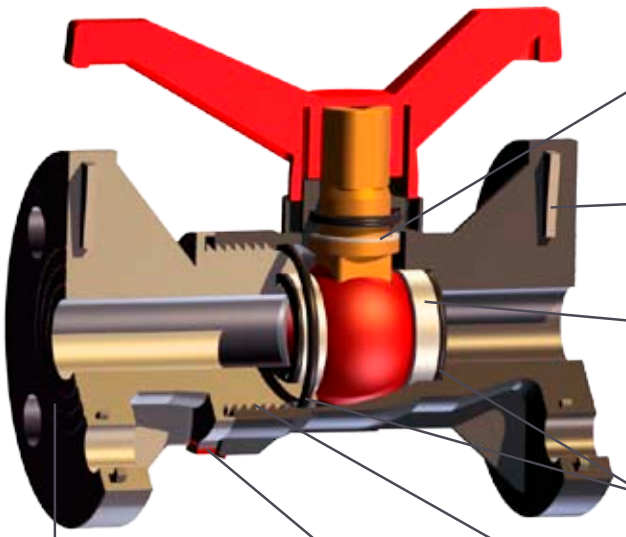

MACHINING

All SAFI valve components 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 ball.



TESTING

Pressure tests are carried out on all SAFI valves. The valve bodies, seats and stem seals are tested. Every valve is initially tested at low pressure, then at 6 bar **this ensures that all valves are bubbletight and free from leaks.**



DN15 to DN50

PTFE thrust bearing washer to reduce torque provides smoother operation and increases service life.

Fully encapsulated steel reinforced flanges. Removes the need for an exposed metal backing ring.

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

O-rings give energised seat/floating ball, ensuring sealing at low pressures, low operation torque. «Piston» mounted body O-rings. Sealing avoids tension stress from the piping.

2-piece body with buttress thread. This thread is extremely robust and suited to plastics

Body locking device :
Prevents the loosening of valve body under the effects of pipe stresses.

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

# The robust **Solution**

## 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 |
|---|---|---|---|---|
| DN15 | 1/2" | 100 | 75 | 52 |
| DN20 | 3/4" | 100 | 75 | 52 |
| DN25 | 1" | 100 | 65 | 45 |
| DN40 | 1.1/2" | 85 | 50 | 35 |
| DN50 | 2" | 80 | 40 | 28 |
| DN80 | 3" | 45 | 30 | 21 |
| DN100 | 4" | 45 | 30 | 21 |
| DN150 | 6" | 45 | 24 | 17 |

DN80 - DN100

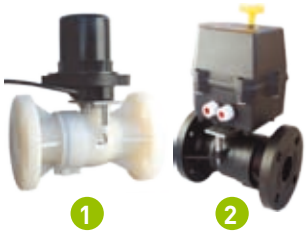
DN150

# Valves **with pneumatic actuators**

- Kinetrol vane type actuators
- Rack & pinion actuators
- Max-Air corrosion resistant thermoplastic actuators
- Limit switch boxes
- Manual over-ride
- Positioners 3-15 PSI or 4-20mA available

# Valves **with electric actuators**

- All types of electric actuators possible
- SAFI manufactured actuators for DC 12V, 24V, 48V and AC 110V, 240V
- Corrosion resistant Thermoplastic casing IP65/NEMA 4
- Option 1 : SM-1 Small & Compact (1)
- Option 2 : SM-2 manual override and visual indicator as standard (2)
- Optional extras include : Anti-condensate heater, Extra switches, Battery back-up unit

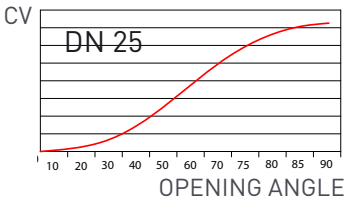


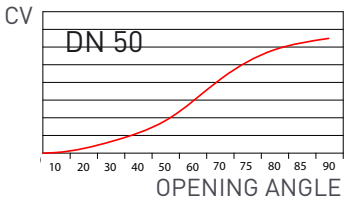

# Options **for manual operations**

- Lockable handle (1)
- Extended stem (2)
- Spring return handle (3)
- Handwheel Reduction Gear (4)


# V-port flow **control valves**

Complete valve and actuator packages can be provided to meet your flow requirements at the same time as being corrosion and erosion resistant.



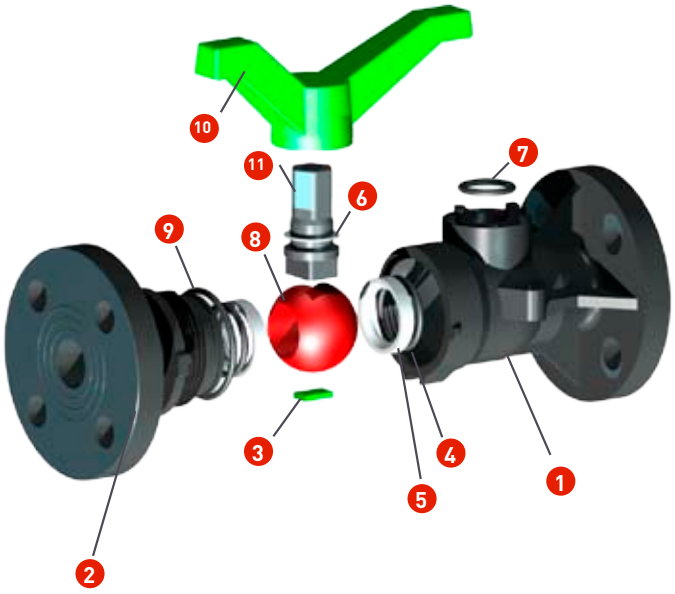




# Ball relief **hole**

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.

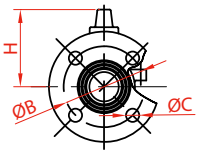
# **3 way** Valves

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




# 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 |



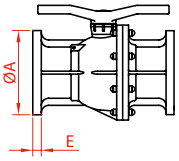

# Dimensions **and weights**

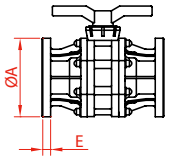
| Valve size | | A | B | | C | | | | E | H | Face to Face | Weight (kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | DIN | ANSI | DIN | ANSI | BS | JIS | | | | GRPP | PVDF |
| DN15 | 1/2" | 95 | 65 | 60 | 14 | 16 | 14 | 15 | 14 | 75 | 130 | 0.50 | 0.75 |
| DN20 | 3/4" | 105 | 75 | 70 | 14 | 16 | 14 | 15 | 16 | 75 | 150 | 0.60 | 0.92 |
| DN25 | 1" | 115 | 85 | 79.5 | 14 | 16 | 14 | 19 | 16 | 95 | 160 | 1.05 | 1.00 |
| DN32 | 1.1/4" | 140 | 100 | 89 | 18 | 16 | 14 | | 18 | 99 | 180 | 1.60 | 1.45 |
| DN40 | 1.1/2" | 150 | 110 | 98.4 | 18 | 16 | 14 | 19 | 18 | 106 | 200 | 1.95 | 1.95 |
| DN50 | 2" | 165 | 125 | 120.6 | 18 | 19 | 18 | 19 | 20 | 230 | 230 | 2.45 | 2.60 |
| DN80 | 3" | 200 | 160 | 152.4 | 18 (8) | 19 (4) | 17.5 (4) | 19 (8) | 22 | 180 | 310 | 5.50 | 9.00 |
| DN100 | 4" | 220 | 180 | 190.5 | 18 (8) | 19 (8) | 17.5 (4) | 19 (8) | 24 | 180 | 350 | 5.80 | 9.50 |
| DN150 | 6" | 285 | 240 | 241.3 | 22 | 22.22 | 19.05 | 23 (8) | 26 | 235 | 480 | 15.00 | 20.00 |

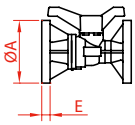
ANSI : ANSI B16.5 class 150

DIN : EN 1092-1/DIN2501 ISO 7005 PN10/16

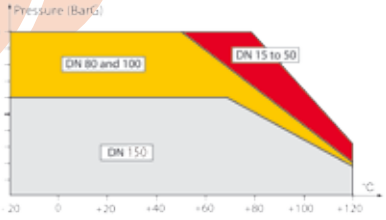
DIN : Compatible with EN 558-1 R1 / ISO 5752/1, PN10



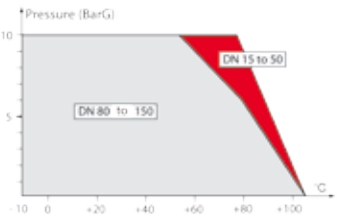




# Recommended **temperature and pressure limit**




PVDF and ASPVDF




GRPP and ASPP

# 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 |

# 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 to7 |

# Handle **torque (m.Kg)**

| DN | GRPP Ball valve | | PVDF Ball Valve | |
|---|---|---|---|---|
| | With no pressure | 10 bar pressure | With no pressure | 10 bar 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 |

ANY QUESTIONS ? NEED MORE INFORMATION OR A QUOTATION ?
JUST COPY AND FILL IN THE FORM BELOW AND FAX IT TO OUR SALES DEPARTMENT OR TO YOUR LOCAL DISTRIBUTOR.

ENQUIRY FORM

# Customer

**Contact Name :**

**Tel :**

**Fax :**

**E-mail :**

**Process :**

**Nature of your business :**

LOOK FOR YOUR LOCAL DISTRIBUTOR
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/F :** 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 ☐ FKM ☐ SPECIAL

**Flange Standard :** ☐ ANSI ☐ DIN (PN10) ☐ DIN (PN16) ☐ JIS ☐ BS

**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 ☐ 220-240VAC ☐ 380/415V 3ph

☐ Extra 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

**Other options :** ☐ 3 core wire ☐ 5 core wire ☐ More...

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