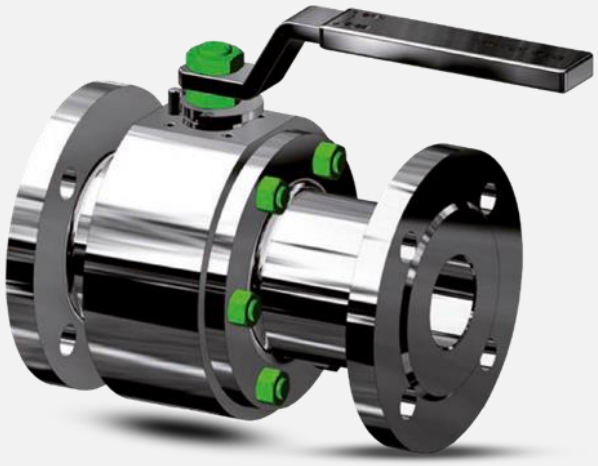
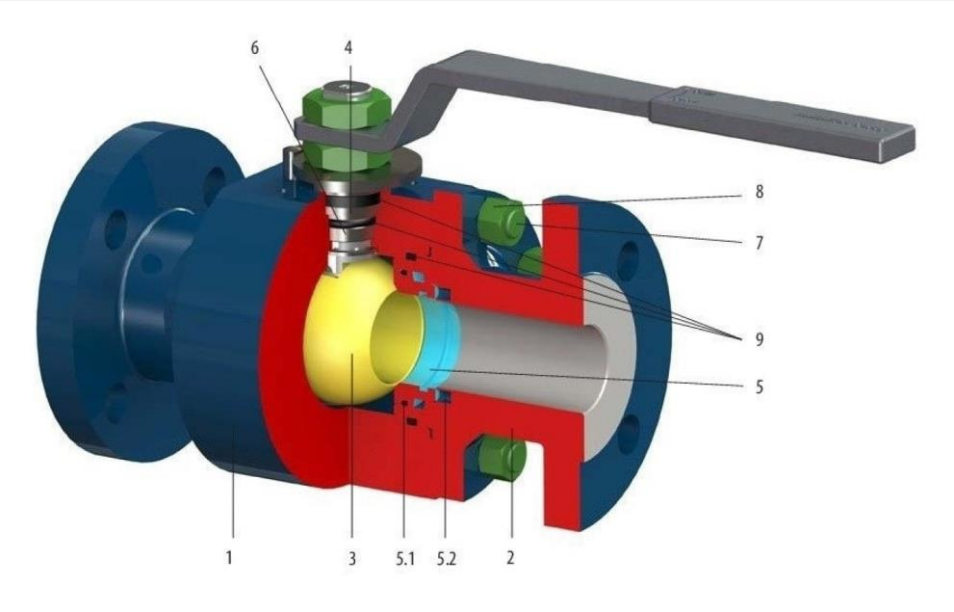
BALL VALVES WITH FLOATING BALL DESIGN

CONTENT



1. Application

Ball valves are designed to fully open or fully close the passage of a fluid in a pipe. They find their main applications in the oil & gas industry, chemical and petrochemical, mining, power engineering, water supply, paper industry, cryogenic applications, etc.
Some design configurations enable the use of these type of valves for short-term throttling, however the throttling in combination with a fluid containing mechanical impurities can result in a loss of tightness.



(Description of the materials used for the components in the page 7)

2. Technical description

The ball valve design meets the requirements of API 6D, PED 97/23/EC or DIN 3230-5 / AD 2000 and EN 14141. The valve construction is tested in accordance with the relevant normative documents and special regulations for:

- Fire safety (Fire Safe)
- Resistance to wear caused by clean gas, contaminated service and for the transport of solids,
- Low fugitive emissions according to TA Luft / EPA and ISO 15848,
- Seismic resistance,
- Climate resistance,
- Functional safety (SIL), etc.

2.1 Sizes

Ball valves with floating ball design have split body and can be provided, depending on the pressure class, in sizes from DN 10 (3/8”) to DN 250 (10”). Larger sizes upon request.
Two pieces design generally is used for sizes DN 10 (3/8”) to DN 125 (5”)
Three pieces design generally is used for sizes DN 150 (6”) to DN 250 (10”)
Larger sizes will come mostly in three pieces design.
The availability of sizes in the different versions of body design is restricted, and can be informed upon request

2.2 Design pressure

Floating ball valves can be supplied in following pressure classes as a standard:

- PN 16, 25 and 40 in sizes to ND 250
- PN 63, 100 and 160 in sizes to ND 200

- ANSI 150# and 300# in sizes to 10”
- ANSI 600# and 900# in sizes to 8”

The availability of pressure classes in the different versions of body design is restricted and can be informed upon request.

Other pressure classes upon request

2.3 Temperature ranges (Operation)

- Ambient temperature: -60°C to +80°C
- Fluid operating temperature: from -196°C to +400°C (higher temperatures on request)

2.4 Body construction and support

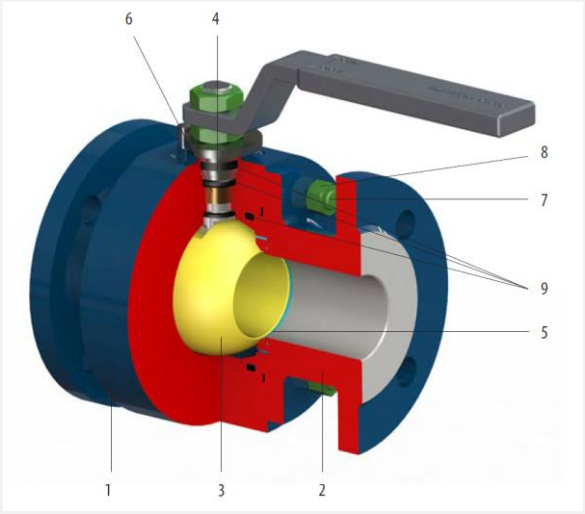
The valve body usually is made of forged material and consists of two or three pieces. Following designs can be supplied:

- Split body
- Fully welded body
- Threaded design
- Wafer type
- Cryogenic design

Upon request the valve body can be supplied with heating jackets

Split body design

The body is manufactured in two or three pieces which are bolted together



(for description of the materials used for the components, see list in page 8)

Fully welded body

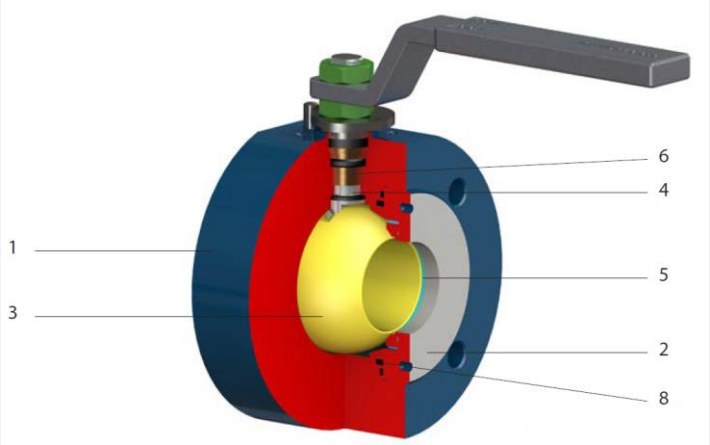
In the fully welded body design the parts of the body are welded together

Threaded design

In the threaded design the two body parts are connected by a thread design.

Wafer type

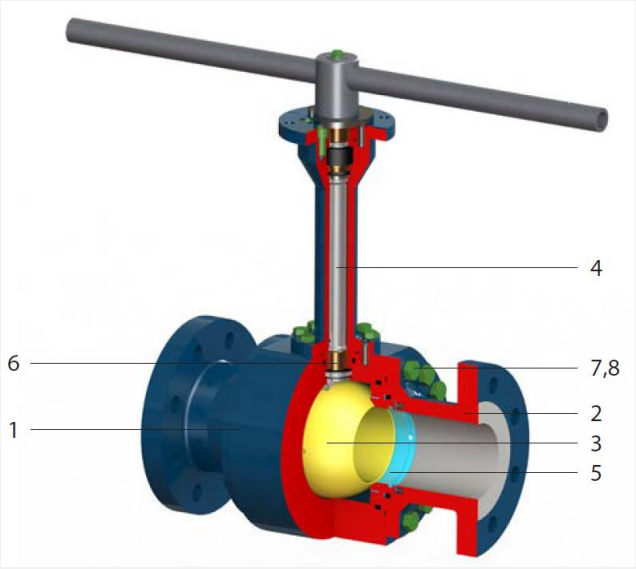
In the wafer design, the valve is installed between the flanges of the pipe.



(for description of the materials used for the components, see list in page 8)

Cryogenic design

In the cryogenic design the materials used are suitable for temperatures down to -196°C and the stem has an extension so that the operation can be done outside the isolation of the pipe. The thickness of the isolation determines the length of the stem extension.



(for description of the materials used for the components, see list in page 8)

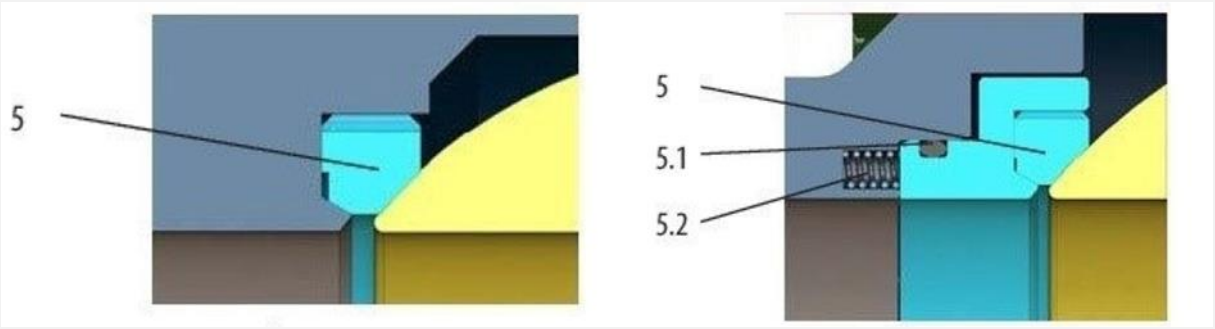
2.5 Ball construction

The ball is made of a single piece of forged material. In order to make the surface resistant to wear and damage, the surface can be plated with different materials depending on the application, ENP, ENP + Si, Stellite weld deposit, F316 stainless steel, nickel alloy , or hard coatings like TCC (Tungsten carbide coating) or CCC (chrome carbide coating) applied in HVOF (High Velocity Oxygen Fuel) or others.

2.6 Seat construction

Soft seated seats

The soft seats are made of PTFE, PEEK, NYLON^{R}, etc. The seats are suitable for gases and liquids with very low content of mechanical impurities.



Soft seat (until DN 150) Soft seat (DN200 y mayor)

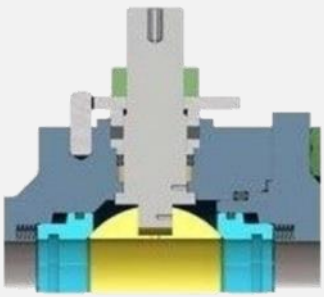
(For description of the component numbers, see material list at page 8)

Metal – metal seats

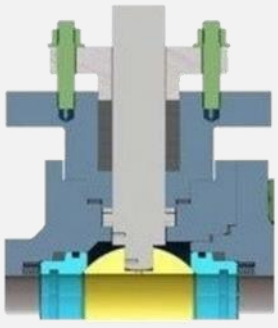
The sealing surfaces of seats and balls are covered with a hard coating with a final thickness of 0.15 to 0.20 mm generally.

The surface can be plated with different materials depending on the application, ENP, ENP + Si, Stellite weld deposit, F316 stainless steel, nickel alloy , or hard coatings like TCC (Tungsten carbide coating) or CCC (chrome carbide coating) applied in HVOF (High Velocity Oxygen Fuel).

After coating the seats and balls are lapped together to achieve the required tightness and marked jointly. Tightness between the seat and the valve body is achieved with an O-ring (up to +220°C maximum) or graphite packing (up to 400°C). This type of seats is suitable for fluids containing solids.



Design for temperature until 200°C



Design for temperature until 400°C

2.7 Stem construction

The standard design of the stem support meets the “ANTI BLOW OUT” requirements, this means the stem cannot be ejected from the valve body by pressure of the fluid. The stem is both radially and axially supported so that no load is applied to the sealing rings. The stem is sealed with O-rings, a graphite packing or a combination of several seals that are independent of each other.

3. Connection to the pipe

- Flanged ends (RF, RTJ, or other) according to ASME B16.5, ASME B16.47, EN 1092-1, etc.
- But welding ends (BW) according to ASME B16.25 or EN 12627.
- Flanged ends with counter flanges, bolting material and selling elements
- Wafer type
- Threaded ends according to ISO 228-1 or ASME B1.20.1

4. Valve bore

- Full bore according to manufacturer´s standard and scrapable
- Reduced bore as required by customer

4.1 Face to face and end to end dimensions

As standard the valves are supplied according to the following normative of dimensions

- API 6D / ISO 14313
- ASME B16.10
- EN 558-1 (flanged ends)
- EN 12982 (but-welding ends)

Nonstandard configurations agreed between manufacturer and user

4.2 Flow characteristic for full bore valves

DN	40	50	80	100	150	200	250
NPS	1 ½"	2"	3"	4"	6"	8"	10"
Kv m^3/h	150	250	760	1300	3300	6500	10700
Cv US gallons per min	170	290	870	1500	3800	7470	12300
ζ factor	0,18	0,16	0,11	0,09	0,07	0,06	0,05

Kv: is the full capacity flow rate through the ball valve in m^3/h with a pressure drop of 1 bar
Cv: is the full capacity flow rate through the ball valve in gallons/min with a pressure drop of 1 psi
ζ factor is the pressure loss coefficient (according to EN 1267)

In general, for the cv or KV values of fully open, full bore ball valves the values used for pipes can be applied. The main characteristic of a ball valve is that there is no restriction in the pass.

5. Materials

The selection of materials of individual components depends on the service conditions (fluid, pressure, temperature).
For pressure containing parts within the meaning of API6D, material certificates according to ISO 10204 3.1 are used as a standard, or inspection certificates according to ISO 10204 3.2 upon request.

5.1 Standard materials

Component		Carbon steel		Stainless steel
		For temp. range -29°C to +400°C	For temp. range -46°C (*-60°C) to 300°C	For temp. range -96°C to +500°C
1	Body	A105	A350 LF2	A182 F316
2	Bonnet			
3	Ball (basic material)	A182 F316		
4	Stem	17-4PH		
5	Seat (basic material)	A182 F316		
5.1	Seat inserts (soft seats)	Filled PTFE, NYLON®, PEEK		
		CCC or TCC applied in HVOF or others		
5.2	Springs	AISI 302 or INCONEL X750		INCONEL X750
6	Bearings	CS+PTFE or SS+PTFE		SS+PTFE
7	Bolts	A320 L7		A193 B8
8	Nuts	A194 Gr 4		A194 B8
9	Seals	HNBR, VITON®, PTFE, GRAPHITE, LIPSEAL®		

***Material tested for -60°C (impact test)**

- The temperature range for materials subject to pressure / temperature curve and applicable technical standards
- Temperature range can be limited depending on the seal material used
- Other materials on request

6. Operation

Ball valves can be actuated with following types of actuators:

- Manual (lever)
- Manual with gear operator
- Electric actuator
- Pneumatic actuator
- Hydraulic actuator
- Gas over oil actuator
- Others

All actuators can be supplied with the corresponding automation components.
For more details see the description of the different types of actuators.

7. Additional design features

7.1 Antistatic design

The design provides for electrical continuity between the ball, stem, and body.

7.2 Upper stem seal removable from the outside (standard feature)

The upper section of the stem packing can be removed and replaced with a dismantling of the valve. This work can be done on the installed valve.

7.3 Fire safety

Fire safety has been proven according to the following standards: API607, API6FA, ISO 10497, BS 6755.

7.4 Seismic and vibration resistance

Resistance has been proven by special tests according to GOST 30546

7.5 Service safety

The valves are certified to SIL 3 according to EN 61508

7.6 Possible accessories (on request)

- Draining ⩾ DN 200 (8") only
- Venting ⩾ DN 200 (8") only
- Stem extension
- Locking device
- End position sensors

8. Test

The valves are subjected to the following tests according to ASME, EN or others standard norms:

- Pressure tests
- Functional tests
- Non-destructive tests and examinations

The scope of testing is specified by the requirements of the customer.

- Material traceability certifications according to EN 10204 3.1 or 3.2

8.1 Standard tests if not specified otherwise

- Hydrostatic pressure test according to API 598 at 1.5 times the nominal pressure of the valve, generally done by using water
- Seat tightness test according to ANSI/FCI70-2 at 1.1 times the nominal pressure of the valve, done with water
- Additional seat tightness test according to ANSI/FCI70-2 class VI or better at low pressure of about 4barg, using air
- Functional test with an actuator without pressure across valve

8.2 Additional tests on request

Material tests

- X-ray of welding seams
- Dye penetration
- Magnetic particles
- PMI (Positive Material Identification)

Valve tests

- Functional test under pressure
- Low pressure test with gas (0,34 / 1 bar) (API6D H3.2)
- Low pressure test with gas (5.5 / 6.9 bar) (API6D H3.3)
- High pressure body test with gas (API6D H4.2)
- High pressure seat test with gas (API6D H4.3)
- Antistatic test (API6D H5)
- Torque measurement (API6D H6)

9. Installation

Ball valves can be installed into any piping (horizontal, vertical, inclined), but taking account the instructions applicable to the installation of the actuator.
Ball valves with diameters ⩾ DN 200 (8") are equipped with foundations plate and lifting eyes as a standard.

10. Advantages of EXaL ball valves

- Many variants of design configurations
- Full and smooth bore resulting in very low-pressure loss and scrapable.
- Long term reliability and maintenance free service
- Possibility to use different type of actuators with couplings according to ISO 5211