

**Operation and maintenance**  
**manual for**

**BALL**  
**VALVES**

**P/N**  
**5220**  
**5320**  
**5321**

Approved for use by

President of Factory, JAFAR S.A.

Failure to comply with the guidelines and instructions in this Operation and Maintenance Manual releases the manufacturer from all obligations, liability and guarantee.

Due to continuous business development, we reserve the right to introduce modifications and design changes to the presented product.

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## 1 TECHNICAL DESCRIPTION

### 1.1 PRODUCT DESIGNATION AND IDENTIFICATION

The subject of this Operation and Maintenance Manual is:

Flanged ball valve

#### **TYPE 5220**

- full bore design
- stainless steel free-floating ball (closure)
- stainless steel spindle
- spindle seal
- closure soft sealing
- sectional design
- optional drive actuator ready

#### **TYPE 5320**

- reduced bore design
- stainless steel free-floating ball (closure)
- stainless steel spindle
- spindle seal
- closure soft sealing
- monolithic design
- optional drive actuator ready

#### **TYPE 5321**

- reduced bore design
- stainless steel free-floating ball (closure)
- stainless steel spindle
- spindle seal
- closure soft sealing
- monolithic design
- optional drive actuator ready

### 1.2 USE

The TYPE 5220 & 5320 flanged and TYPE 5321 welded ends ball valves are intended for isolation of medium flow in industrial systems, heating systems and other systems. (Group 2 fluids, ref. Directive 97/23/EC). The valves can be operated both in underground and overground installations as installed in vertical or horizontal pipelines.

#### **NOTE:**

**Due to the limitations caused by application of specific materials in various operating environment types, it is critical to precisely determine the operating conditions, i.e. the temperature, pressure and medium characteristics. This will eliminate any problems during operation of the valve.**

### 1.3 TECHNICAL SPECIFICATION

The ball valves are intended for isolation of medium flow in industrial systems, heating systems, and other systems. (Group 2 fluids, ref. Directive 97/23/EC). The TYPE 5220, 5320 & 5321 steel and cast iron ends valves are designed for operating temperatures of +160°C maximum. The operating parameters of each valve are indelibly marked on the valve body.

Nominal diameter (dimension) and nominal pressure PN range:

- TYPE 5220 with flanged ends, diameter range: DN40-125[mm] - 16/25/40PN;
- TYPE 5220, cast iron, with flanged ends, diameter range: DN4-125[mm] - 16PN;
- TYPE 5320 with flanged ends, diameter range:
 

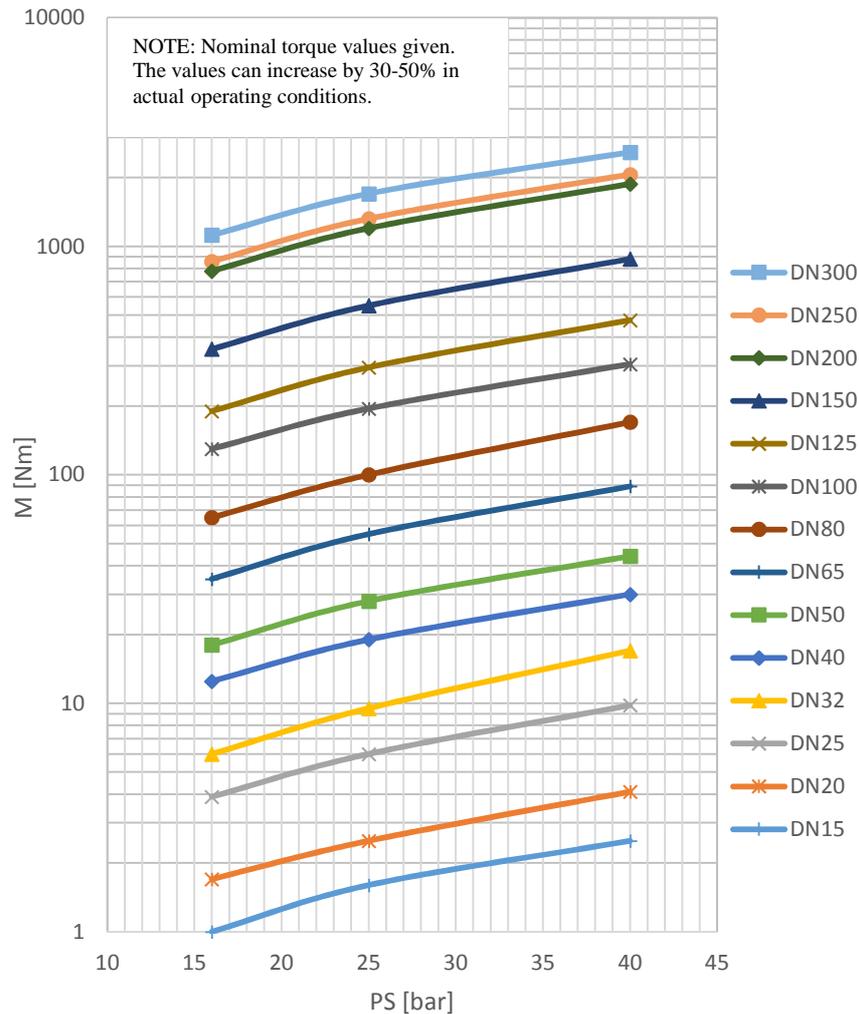
DN15-50[mm]	- 16/25/40PN;
DN50-300[mm]	- 16/25PN;
- TYPE 5321 with welded ends, diameter range:
 

DN15-50[mm]	- 16/25/40PN;
DN15-300[mm]	- 16/25PN.

Maximum medium flow rate:

- liquid: max. 4 [m/s]
- gas: max. 30 [m/s]

PN 16, PN 25 and PN 40 valve opening torque characteristics



**Note: The nominal torque values can increase by 30% in actual operating conditions.**

Valve control mode:

- the standard version of gate valves has the clockwise closing sense of rotation.

The valves are designed for installation between flange end faces acc. to PN-EN 1092-1: 2013 and PN-EN 1092-2: 1999 with bolt holes for the pressure rating of PN16/25/40. Installation length: per the Technical File, see the table for sizes.

## 2 DESIGN

### 2.1 DESCRIPTION OF THE VALVE DESIGN

F.A. JAFAR S.A manufactures the TYPE 5220, 5320 & 5321 water ball valves, with the TYPE 5220 full bore valves and the TYPE 5320 & 5321 reduced bore valves. The valve body is a welded structure with a free-floating ball up to DN200 (larger sizes have trunnion balls), an internal compensation system, and a closure seal in the form of a ball set in a seat, made by two seals. The ball seals are supported with disk springs to ensure continuous pressure of the seals on the ball, even when the ball valve is operated at varying temperatures, and compensate the thermal expansion of the valve. The chromium steel spindle, interfaced with the ball, is sealed within the valve body by o-rings located on the cylindrical surface, and a Teflon seal on the conical surface. A manual control lever is mounted on the valve spindle and formed as a steel handle coated with a plastic material; another form is a mechanical drive gear. The turning angle limiter ensures proper positioning of the ball closure in the fully open and fully closed positions. The ball valve is fully open with the control lever in parallel to the valve centreline, and fully closed with the control level square to the valve centreline.

Ends:

- TYPE 5220 & 5320 flanged ends are designed per PN-EN 1092-1:2013 and PN-EN 1092-2:1999;
- TYPE 5321 welded ends are designed per PN-EN 12627:2002.

### 2.2 MATERIALS

The tables below list the structural materials of the TYPE 5120, 5121, 5124, 5220, 5320 & 5321 ball valves.

#### TYPE 5220

Item	Part designation	Material	Reference standard
1	Body	Steel grade 1.0582 Steel grade 1.0037 Cast-iron, EN-GJS-400-15	PN-EN ISO 3183:2013 PN-EN 10025-2:2007 PN-EN 1563:2012
2	Ball	Steel grade 1.4301	PN-EN 10088-1: 2014
3	Spindle	Steel grade 1.4021	PN-EN 10088-1: 2014
4	Screw plug	Steel grade 1.0037 + Zn	PN-EN 10025-2:2007
5	Ball seal	PTFE+C	PN-EN ISO 13000-1:2007
6	Turn limiter	Steel grade 1.4301	PN-EN 10088-1: 2014
7	Spindle seal	PTFE+C	PN-EN ISO 13000-1:2007
8 9	O-ring	EPDM, VITON	PN-ISO 1629:2005
10 11	Retaining ring		PN-81/M-85111

**TYPE 5320**

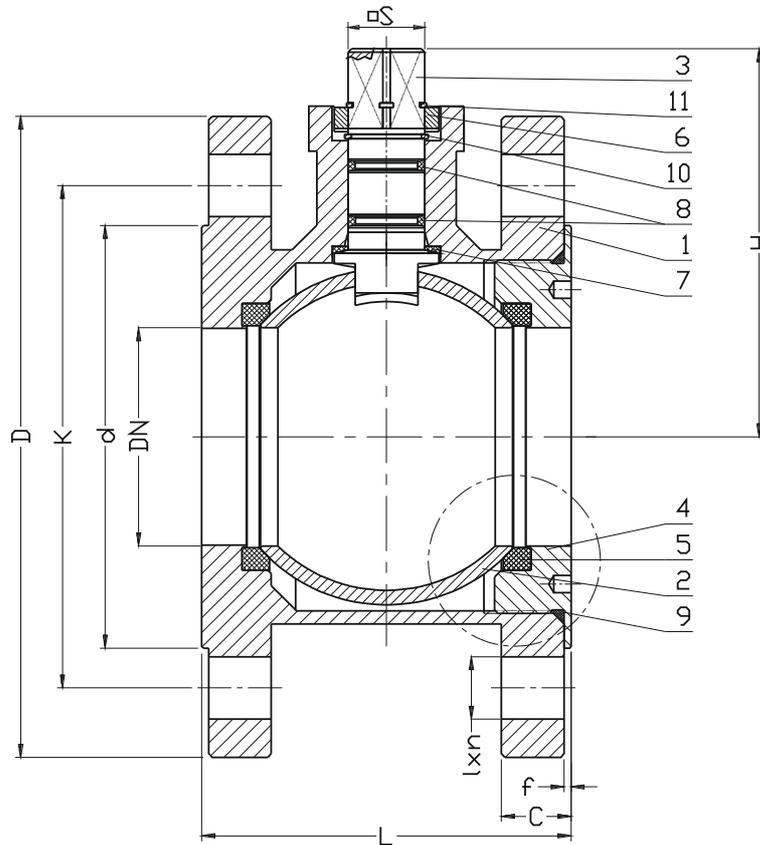
Item	Part designation	Material	Reference standard
1 2	Body	Steel grade 1.0425	PN-EN 10028-2:2010
3	Spring	Steel grade 1.8159	PN-EN 10270-3:2011
4	Ball	Steel grade 1.4541 Steel grade 1.4301	PN-EN 10088-1: 2014
5	Ball seal	PTFE+C	PN-EN ISO 13000-1:2007
6	Seal mount	Steel grade 1.0425	PN-EN 10028-2: 2010
7	Nut	Steel, Fe/Zn5 Stainless steel, A4	PN-EN ISO 4032:2013
8	Spindle	Steel grade 1.4301	PN-EN 10088-1: 2014
8 9	O-ring	EPDM, VITON	PN-ISO 1629:2005
10	Handle	Steel grade 1.0038	PN-EN 10025-2:2007

**TYPE 5321**

Item	Part designation	Material	Reference standard
1 2	Body	Steel grade 1.0425	PN-EN 10028-2:2010
3	Spring	Steel grade 1.8159	PN-EN 10270-3:2011
4	Ball	Steel grade 1.4541 Steel grade 1.4301	PN-EN 10088-1: 2014
5	Ball seal	PTFE+C	PN-EN ISO 13000-1:2007
6	Seal mount	Steel grade 1.0425	PN-EN 10028-2: 2010
7	Nut	Steel, Fe/Zn5 Stainless steel, A4	PN-EN ISO 4032:2013
8	Spindle	Steel grade 1.4301	PN-EN 10088-1: 2014
8 9	O-ring	EPDM, VITON	PN-ISO 1629:2005
10	Handle	Steel grade 1.0038	PN-EN 10025-2:2007

**2.3 DIMENSIONS**

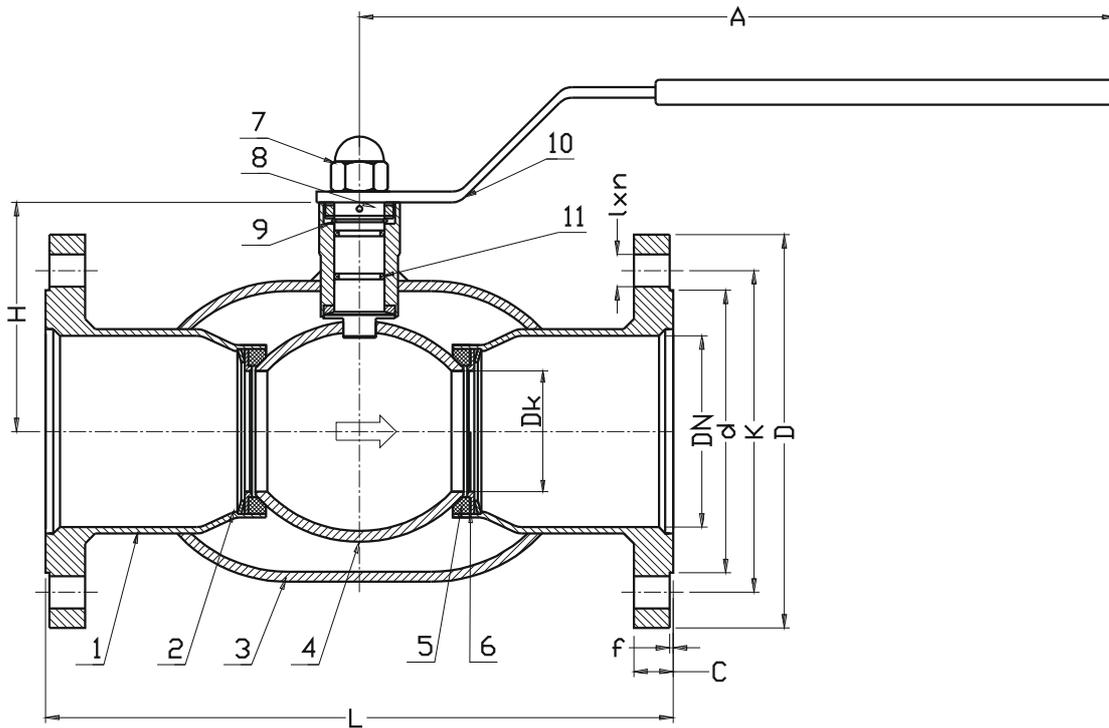
**- TYPE 5220 (flanged ball valve)**



TYPE 5220 table

DN	L	PN	D	d	K	l <sub>xn</sub>	H	S	c	f	Kv	Weight
mm		bar	mm			mm					m <sup>3</sup> /h	kg
Steel												
40	77	16/25/40	150	88	110	4x18	90	11	18	2	105	4,6
50	86		165	102	125	4x18	98	17	20		163	6,1
65	106		185	122	145	8x18	112	17	22		275	8,2
80	120		200	138	160	8x18	130	22	24		418	9,5
100	160	25/40	235	162	190	8xM20	147	22	26	654	16,6	
125	186	25/40	270	188	220	8xM24	164	22	28	1023	23,5	
Cast iron												
40	77	16	150	88	110	4x19	90	11	19	2	105	5,4
50	86		165	102	125	4x19	98	17			163	6,8
65	106		185	122	145	8x19	112	17			275	9,7
80	120		200	138	160	8x19	130	22			418	11,2
100	160		220	158	180	8xM16	147	22			654	17,3
125	186		250	188	210	8xM16	164	22			1023	24,5

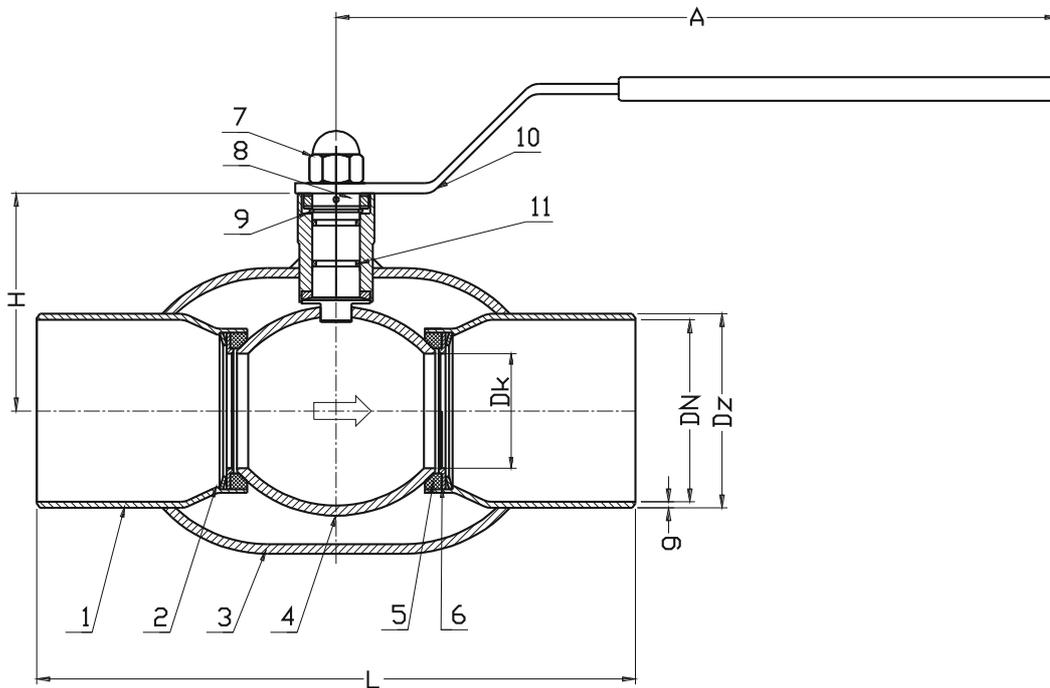
**- TYPE 5320 (reduced bore flanged ball valve)**



TYPE 5320 table

DN	PN	L	Dk	D	C	d	H	f	K	n	l	A	Weight
[mm]	[bar]				[mm]					[pcs.]	[mm]		[kg]
15	16 / 25 / 40	130	10	95	14	45	70	2	65	4	14	120	1,7
20	16 / 25 / 40	150	15	105	16	58	70	2	75	4	14	120	2,4
25	16 / 25 / 40	160	20	115	16	68	85	2	85	4	14	150	3,0
32	16 / 25 / 40	180	25	140	18	78	90	2	100	4	18	150	4,6
40	16 / 25 / 40	200	32	150	18	88	125	2	110	4	18	190	5,6
50	16 / 25 / 40	230	40	165	20	102	125	2	125	4	18	190	7,5
65	16	270	50	185	20	122	145	2	145	8 (4)	18	280	11,0
	25				8					280			
80	16	280	65	200	20	138	150	2	160	8	18	280	13,2
	25				24								
100	16	300	80	220	22	158	170	2	180	8	18	280	16,7
	25			235	26				162				
125	16	325	100	250	22	188	180	2	210	8	18	420	25,8
	25			270	28				220				
150	16	350	125	285	24	212	210	2	240	8	22	550	34,4
	25			300	30				218				
200	16	400	150	340	26	268	260	2	295	12	22	-	72,0
	25			360	32				278			310	
250	16	530	200	405	29	320	-	2	355	12	26	-	100,0
	25			452	35				335			370	
300	16	630	250	460	32	378	-	2	410	12	26	-	200,0
	25			485	38				395			430	

**- TYPE 5321 (reduced bore welded ends ball valve)**



TYPE 5321 table

DN	PS	L	Dk	Dz	g	H	A	Kv	Weight
[mm]	[bar]	[mm]					[m <sup>3</sup> /h]	[kg]	
15	40	230	10	21,3	3,1	50,7	120	6	0,8
20	40	230	15	26,9	2,3	53,5	120	14	1,0
25	40	230	20	33,7	2,6	56,9	150	26	1,3
32	40	260	25	42,4	3	60,2	150	41	1,6
40	40	260	32	48,3	3	83,2	190	67	2,2
50	40	300	40	60,3	3	89,2	190	105	3,0
65	25	300	50	76,1	3	109,1	280	182	4,8
80	25	300	65	88,9	4	121,5	280	315	6,7
100	25	325	80	114,3	4	149,2	280	420	9,9
125	25	325	100	139,7	4,5	164,9	420	650	14,5
150	25	350	125	168,3	6	187,2	550	1070	23,5
200	25	400	150	219,1	4,5	224,5	-	1420	56,0
250	25	530	200	273,1	5	267,5	-	2620	100,0
300	25	550	250	323,9	5,6	317	-	5820	152,0

## 2.4 REFERENCE STANDARDS

PN-EN 1074-2:2003	Valves for water supply. Fitness for purpose requirements and appropriate verification tests. Part 2: Isolating valves.
PN-EN 1983:2008	Industrial valves. Steel ball valves.
PN-EN 12266-1: 2012	Industrial valves. Testing of valves. Part 1: Pressure tests, test procedures and acceptance criteria. Mandatory requirements.
PN-EN 1092-1: 2013	Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 1: Steel flanges.
PN-EN 12266-2: 2012	Industrial valves. Testing of valves. Part 2: Pressure tests, test procedures and acceptance criteria. Supplementary requirements.
PN-EN ISO 9692-2: 2002	Welding and allied processes. Joint preparation. Part 2: Submerged arc welding of steels.
PN-EN 10088-1: 2014	Stainless steels. List of stainless steels.
PN-89/H-84023.05	Special use steel. Improved quality low-carbon, low-alloy and alloy steels. Grades.
PN-EN ISO 12944-5: 2009	Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Protective paint systems.
PN-EN 19: 2005	Industrial valves. Marking of metallic valves.
PN-EN ISO 4017: 2011	Hexagon head screws. Product grades A and B.
PN-EN ISO 4027: 2006	Hexagon socket set screws with cone point.

## 2.5 ORDERING INFORMATION

Water supply system valves are specific purpose industrial valves, therefore orders must include:

- part number (P/N, equal to the product type)
- nominal diameter DN, acc. to PN-EN ISO 6708: 1998
- nominal pressure PN, acc. to PN-89/H-02650;

- max operating temperature, acc. to PN-89/H-02650;
- handled medium type;
- drive type.

## **2.6 PRODUCTION AND ACCEPTANCE**

P/N 5220, 5320 and 5321 ball valves are manufactured and accepted in accordance with: PN-EN 12266-1: 2012 (Industrial valves. Testing of valves. Pressure tests, test procedures and acceptance criteria. Mandatory requirements). All valves (100%) are subject to tightness testing. The tests include external body tightness and closure tightness. The valve closure performance and tightness are tested for both medium flow directions at low and high pressure vales. The tested valves shall be free of any leaks, according to the closure tightness class A per PN-EN 12266-1:2012.

## **2.7 MARKINGS**

The markings of valves are specified in the standards: PN-EN 19: 2005, PN-EN-1074-1: 2002.

Each valve carries a name plate located on the body flange and reading:

- ball valve type (specified as the standard number applicable to the product);
- nominal diameter;
- nominal pressure;
- sealing temperature rating,
- manufacturer's company name and logo;
- product serial number,
- year of production;
- the Polish Construction Mark "B" and the CE mark;
- manufacturer's trade mark.

## **3 PROTECTION, STORAGE & TRANSPORT**

### **3.1 PROTECTIVE COATINGS**

All outer surfaces of the valve body, except for the interface surfaces of TYPE 5220 & 5320 flanged valves and TYPE 5320 valve welded end surfaces are preserved with a RAL 1023 coat.

The anti-corrosion coating layer minimum thickness is 150µm.

The part surfaces are pre-treated for epoxy coating in accordance with the relevant Technical File and PN-EN ISO 12944-5: 2009.

The details e.g. the disc springs on TYPE 5320 & 5321 and the screw plug on TYP 5220 are protected against corrosion by hot-dip galvanizing per PN-EN ISO 1461:2011. The protective coating minimum thickness is 50µm.

### **3.2 PACKAGING**

The TYPE 5220, 5320 & 5321 ball valves are packed on EURO pallets (1200x800) and protected with heat-shrunk film.

### **3.3 STORAGE**

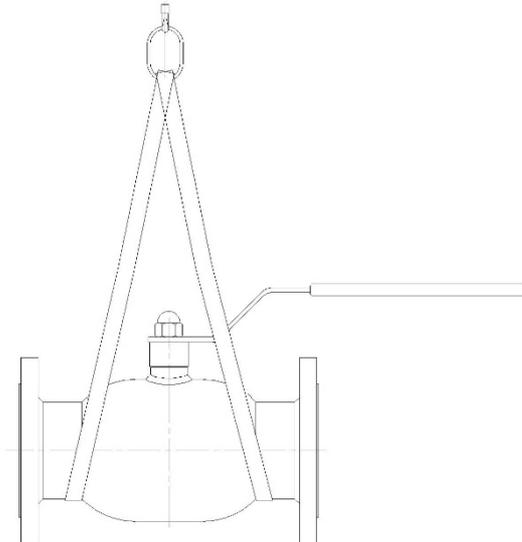
The valves shall be stored packaged and in dry rooms that are sheltered from weather and protected from corrosive substances.

### **3.4 TRANSPORT**

The valves shall be transported in sheltered vehicles and protected against damage. Handle and transport heavy ball valves on strap slings (an example of which is shown in the diagram below).

Use strap slings for:

- TYPE 5220, from DN100
- TYPE 5320, from DN80
- TYPE 5321, from DN100



## 4 ASSEMBLY AND INSTALLATION

### 4.1 ASSEMBLY GUIDELINES

The TYPE 5220, 5320 & 5321 ball valves can be installed in underground or surface pipelines both in horizontal or vertical orientation.

The ball valves:

- with flanged ends (TYPE 5220 & 5320), adapted for flanged connection with the pipeline ends that meet the valve flange dimensions per PN-EN 1092-1:2013 and PN-EN 1092-2:1999;
- with welded ends (TYPE 5321), adapted for welded connection with the pipeline ends that meet the valve welded end dimensions per PN-EN 12627:2002.

Note that the system must not expose the industrial valve to bending or tensile stress from loading with the weight of unsupported pipeline sections. Assemble with consideration to pressure and temperature compensation of the pipeline. The valve assembled and adjusted by the manufacturer is ready for installation.

Disassembly of the valve components without proper care may result in loss of integrity.

### 4.2 ASSEMBLY INSTRUCTIONS

Before attempting to assemble the valve, check the technical and commercial documents for compliance of the valve with the purchase order and its intended medium and operating parameters of the pipeline in which the valve is to be installed. Any change in the operating conditions must be consulted with the valve manufacturer beforehand.

Before the installation, remove the main bore plugs, verify that the valve is fully open, and inspect the inner surfaces of the valve, the valve ends and the pipeline ends. There shall be no damage on the valve ends or misalignment of the valve with the pipeline that may result in unforeseeable installation stress.

- Install the welded ends valves according to the WPS issued by the installation builder and the relevant standards. When welding the valve to the system, control the overheating zone around the ball seals: if overheating may occur, periodically cool down the valve body during welding. Operate the valve lever only with the valve fully cooled down.

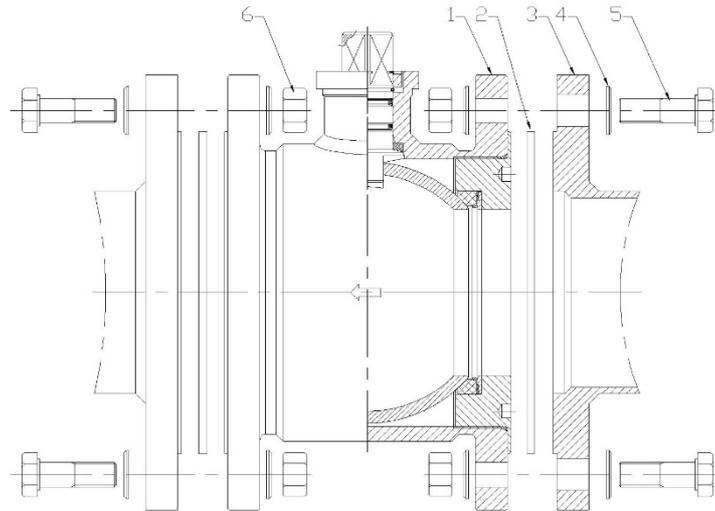
- Flanged valves: to install a flanged valve in a new pipeline system, collect 2 (two) flanges in the size of the valve flange (ref. PN and DN), the flange seals compatible with the system medium, and the bolts, nuts and washers with the minimum mechanical rating of 6.8. First, locate the flange tangent with the pipeline end and keep the flange face parallel with the pipeline centreline, while the flange interface is at least 2mm beyond the pipe edge. Align the flange holes so as to enable free movement of the valve lever when the valve is reinstalled. Tack weld the flange to the pipe in three places, then girth weld around the entire joint circumference. Use gas or arc welding. With the flange welded in place on the pipe, apply the flange gasket to the flange face, and bolt down the ball valve. On the other end of the installation location, locate and align the other flange on the pipe, apply the gasket and bolt down the pipe flange to the valve flange. Tack weld the other flange at 3 places on the pipe. To girth weld the other flange to the pipe, remove the ball valve. With the other flange securely welded on the pipe and cooled

down, bolt the ball valve between the pipe end flanges. Add more gaskets if the flange to flange gap is too wide. Pressure test and strength test the pipeline with the valve fully open.

**Caution! If the product has mechanical damage, do not install it in the pipeline.**

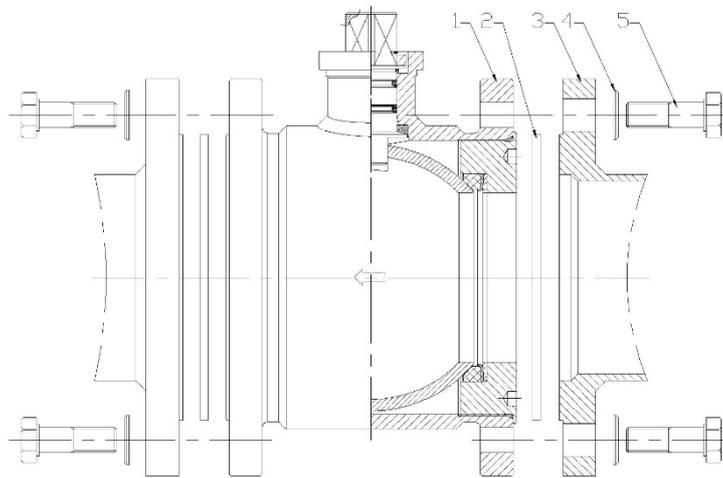
The assembly method is shown in the following figure:

**TYPE 5220 (DN40/50/65/80)**



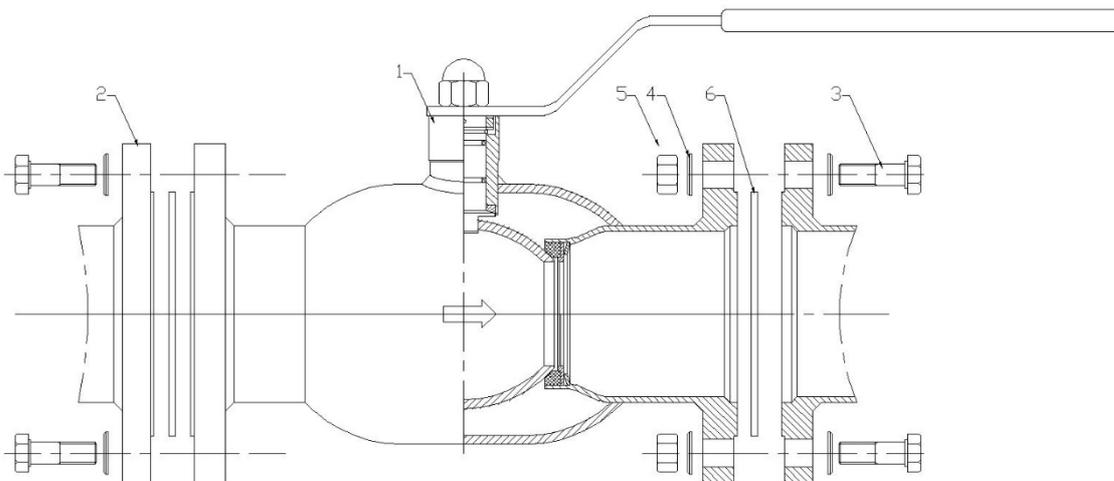
1. Ball valve; 2. Gasket; 3. Pipeline flange; 4. Washer; 5. Fastening bolt; 6. Nut.

**TYPE 5220 (DN100/125)**

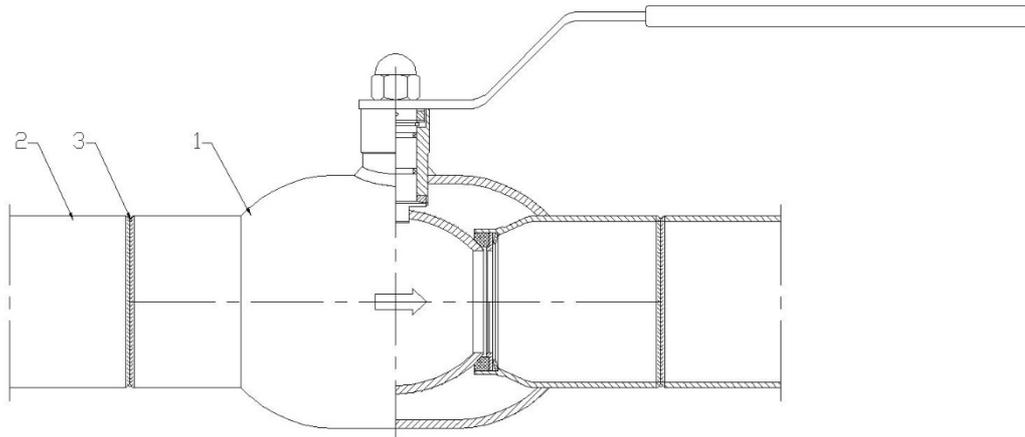


1. Ball valve; 2. Gasket; 3. Pipeline flange; 4. Washer; 5. Fastening bolt.

**TYPE 5320**



1. Ball gate; 2. Pipeline flange; 3. Fastening bolt; 4. Washer; 5. Nut; 6. Seal.



1. Valve; 2. Steel pipeline; 3. Joint.

**Caution! If the product has mechanical damage, do not install it in the pipeline.  
Caution! Keep the cut-off valve closed during the system pressure test.**

#### **4.3 OPERATION**

The ball valve shall be operated according to all relevant requirements for cut-off valves, i.e. either in fully open or fully closed positions. Leaving the valve set partially opened (or closed) may result in seal failure. To ensure full performance, switch the valve periodically (once a year, from fully open to fully closed). Inspect the anti-corrosion protective coat and the valve to system joints. Protect the valve from mechanical damage and keep the valve clean.

#### **MAINTENANCE**

Exceeding the operating limits of the valve may result in damage that will not be covered by the suretyship granted by the manufacturer.

#### **4.4 OCCUPATIONAL HEALTH AND SAFETY**

The ball valves are eligible for the OHS guidelines and recommendation concerning installation of pipelines and devices for industrial processing stations, heat power plants, other facilities, and eligible for the Polish Regulation concerning general OHS laws (use of personal protective equipment for hands, legs and head, and safety garment), especially at work with low or high temperature hazard.

**Misuse of this product is prohibited.**

#### **5 WARRANTY TERMS AND CONDITIONS**

The product assembled, installed and operated in compliance with this Manual is covered by a commercial warranty from the manufacturer. The warranty terms, conditions and period are specified in the relevant Warranty Sheet.