Base Load Power Hub (BLPH)

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

MANUAL VALVES – BALL, DBB & SBB, MONOFLANGE

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.



Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map



Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

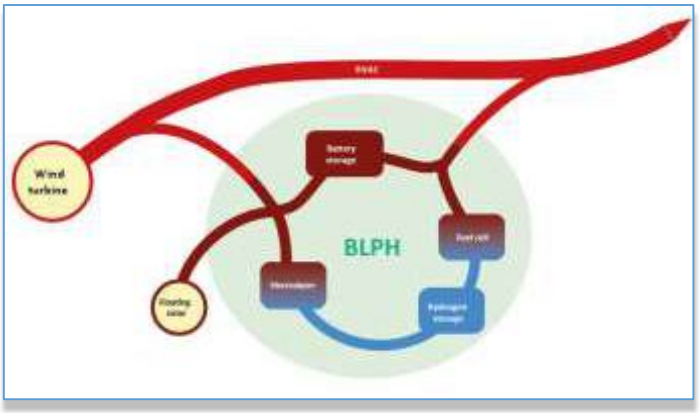


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2 DOCUMENT SCOPE

This manual outlines the methods to be used for the storage, protection, installation, operation and maintenance of flanged-flanged, flanged-threaded and welded ball valves (SB-SBB-DB-DBB). The purpose of this manual is to maintain the best levels of performance of the valves over the long term, providing the user with instructions for the correct methods to be used for the storage, protection, installation, correct operation and maintenance of the valves.

2.1 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	CW
CONTRACTOR (CTR):	RM
PROJECT:	HKN WIND PARK Project
ASME	THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
SB	SINGLE BLOCK
DBB	DOUBLE BLOCK AND BLEED
DB	DOUBLE BLOCK
API	AMERICAN PETROLEUM INSTITUTE
PED	PRESSURE EQUIPMENT DIRECTIVE

Table 2 - Definitions and Abbreviations

GENERAL INSTRUCTIONS FOR INSTALLATION, MAINTENANCE AND SAFETY FOR FLOATING BALL VALVES

SERIES SB-SBB-DB-DBB

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WARNING:

Depressurize the circuit before carrying out any operations, especially in the presence of dangerous fluids. The pressure in the circuit must be the same as that of the outside environment.

Please refer to tag plate information for operating use.

1.0 Purpose of this manual

This manual outlines the methods to be used for the storage, protection, installation, operation and maintenance of flanged-flanged, flanged-threaded and welded ball valves (SB-SBB-DB-DBB). The purpose of this manual is to maintain the best levels of performance of the valves over the long term, providing the user with instructions for the correct methods to be used for the storage, protection, installation, correct operation and maintenance of the valves.

2.0 Limitations of use

- Must not exceed the admissible limits described on the plate
- the end user is responsible for equipping the line with adequate safety accessories to protect against exceeding the admissible limits.

Service: On/Off (fully open/fully closed)

Note: INDRA soft seal valves cannot be used as control valves.

Level of seal for new valves:

- Hydrostatic test on casing: Permitted leak: None
- Hydrostatic test on seats: Permitted leak: None
- Pneumatic test on seats (air 6±1 bar): Permitted leak: None

The rated values for INDRA valves are compliant with Standard ASME B16.34, based on the materials used. As an example, the rated pressure values at ambient temperature are provided for the main materials used. Different temperature conditions cause variations in the rated pressure values as set out in Standard B16.34 and on the information plate on the supplied product. The rated pressure/temperature values also depend on the seals used in making the product. For further details please contact INDRA S.r.l.

ASME B16.34 Material	Temperature	150#	300#	600#	900#	1500#	2500#
A105, A350 LF2	-29°C / +38°C	19.6	51.1	102.1	153.2	255.3	425.5
	+200°C	*13.8*	*43.8*	*87.6*	*131.4*	*219.0*	*365.0*
	+450°C	*4.6*	*23.0*	*46.0*	*69.0*	*115.0*	*191.7*
A276/A182 F316/F316L	-29°C / +38°C	19.0	49.6	99.3	148.9	248.2	413.7
	+200°C	*13.7*	*35.7*	*71.3*	*107.0*	*178.3*	*297.2*
	+450°C	*4.6*	*28.8*	*57.7*	*86.5*	*144.2*	*240.4*
A276/A182 F44/F51/F53/F55	-29°C / +38°C	20.0	51.7	103.4	155.1	258.6	430.9
	+200°C	*13.8*	*42.7*	*85.3*	*128.0*	*213.3*	*355.4*
	*+450°C**	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
B443/B446/B564 N06625 (Inconel 625)	-29°C / +38°C	20.0	51.7	103.4	155.1	258.6	430.9
	+200°C	*13.8*	*48.3*	*96.7*	*145.0*	*241.7*	*402.8*
	+450°C	*4.6*	*33.7*	*67.7*	*101.4*	*169.0*	*281.8*

B462/B564/B574/B575/B622 N10276 (Hastelloy C-276)	-29℃ / +38℃	20.0	51.7	103.4	155.1	258.6	430.9
	+200°C	*13.8*	*48.3*	*96.7*	*145.0*	*241.7*	*402.8*
	+450°C	*4.6*	*33.7*	*67.7*	*101.4*	*169.0*	*281.8*

** This material may become brittle after service at moderately elevated temperature. Should not be used over 315°C.*

All valves are tested in accordance with Standards API 598 and 2014/68/EU PED

- Hydraulic test on casing: The pressure used for the hydrostatic test on the valve casing is calculated at a value higher than or equal to 1.5 times the rated pressure at ambient temperature.
- Hydraulic test on seats: The pressure used for the hydrostatic test on the seats is calculated at 1.1 times the rated pressure at ambient temperature.
- Pneumatic test on seats (low pressure): The pressure values for the pneumatic test for the seats are as follows for all classes: 6 ±1 bar.
- Max. operating Temp. at rated pressure: See table below

RATING	**150#**	**300#**	**600#**	**900#**	**1500#**	**2500#**
Seat Material	PEEK			METAL SEAT/ GRAPHITE		
Max operating Temperature	*+200°C*			*+450°C*		

For pressure/temperature rating for valves compliant to API std design, refer to API 6A (contact INDRA technical office if necessary).

2.1 Temperature: Ambient and Process

It is important to maintain the valve, during all the stages of storage and operation, within the limits of the temperature range provided. The following tables represents the temperature range of the floating ball valves.

AMBIENT TEMPERATURE	
NON EAC (STANDARD)	**EAC**
-46°C +80°C	*-54°C +80°C*

PRODUCT	**CATEGORY**	**SEALING**	**NON EAC (STANDARD)**	**EAC**
VSF (BALL VALVES) (*)	**STANDARD**	*PEEK/FKM/GRAPHITE*	*-46°C +200°C*	*-54°C +200°C*
	CRYOGENIC	*KEL-F/GRAPHITE*	*-110°C +100°C*	
		KEL-F/Lip-Seal/ GRAPHITE	*-196°C +100°C*	
	HIGH TEMPERATURE	*Metal Seat/GRAPHITE*	*-46°C +450°C*	*-54°C +450°C*

(*) Includes Floating and Trunnion mounted ball valves.

The surface temperature of manual ball valves depends exclusively on the higher of the ambient or process temperature. Make sure that T is not higher than the minimum ignition temperature of the gas (considering an appropriate safety factor), which determines the temperature class of the area where the equipment will be installed.

The surface temperature of actuated ball valves depends on the greater of the ambient or process temperature increased by 60 ° C (possibility of maximum overheating due to friction and rubbing between the parts). Make sure that Tmax is not higher than the minimum ignition temperature of the gas (considering an appropriate safety factor), which determines the temperature class of the area where the equipment will be installed.

Manual Ball Valve				Actuated Ball Valve		
Class [Max temperature allowed]	Tmax Valve Surface	T process/amb.		Class [Max temperature allowed]	Tmax Valve Surface	T process/amb.
T6 [85°C]	75°C	75°C		T6 [85°C]	75°C	15°C
T5 [100°C]	90°C	90°C		T5 [100°C]	90°C	30°C
T4 [135°C]	125°C	125°C		T4 [135°C]	125°C	65°C
T3 [200°C]	190°C	190°C		T3 [200°C]	190°C	130°C
T2 [300°C]	290°C	290°C		T2 [300°C]	290°C	230°C
T1 [450°C]	440°C	440°C		T1 [450°C]	440°C	380°C

2.2 Precautions and limitations of use

Below is a list of possible hazardous conditions which, if not previously specified on the contractual documents, have not been considered during the design stage.

Caution! Possible hazardous conditions:

- **Acoustic vibrations and/or vibrations induced by flow;**
- **Ram;**
- **Chemical attack;**
- **Thermal expansion;**
- **Stray currents**
- **Pressure and thermal fatigue;**
- **Seismic loads;**
- **External corrosion;**
- **Contaminated fluid;**
- **Cavitation and flashing;**
- **External flame;**
- **External loads.**

Any hazardous conditions (e.g.: temperature and pressure gradients etc.) attributable to the operation of the component or system are in any case the responsibility of the user.

Precautions and additional information

The user should always check that the valves are not used for services at temperatures and pressure values that exceed the maximum values declared by the manufacturer and given on the valve information plate/label.

The user should always provide the necessary means to ensure that the valve is not installed for services that exceed the envisaged limits.

The valve may release any excess pressure present in the casing through the seats. Before carrying out any maintenance operations, carry out a full opening and closing maneuver (with the line not under pressure).

The user must provide suitable means to prevent rapid opening and/or closing actions from creating ram effects in the valve.

Split-body valves are sized for low stress factors caused by axial loads on the line. Please contact INDRA for special conditions.

The user must guarantee that for valves installed at the end of a line any opening of the valve does not cause fluid to be released freely into the environment.

Do not remove or replace or assemble any valve components with the valve under pressure or without having released any pressure trapped in the cavity of the casing (e.g. before removing the bleed plug, make sure there is no pressure inside the valve casing).

The valves should be used with clean fluids that are not abrasive and free of solid particles.

3.0 Storage and preservation

Ball valves must be delivered suitably packed in containers normally made from cardboard and wrapped in their standard packaging. It is also possible to apply customized packaging on the specific request of the customer. We recommend storing the valves in their packaging until they are installed.

Valves should be stored in a clean, dry and closed space.

Valves removed from their packaging before installation should be stored with the handle open (in line with the valve casing or in line with the main circuit).

Valves removed from their packaging should be stored in a clean and dry place. If left in the open, they should be protected against knocks. All valve connections, whether they are flanged or threaded, should be protected with specific plugs or adhesive discs and covered with anti-corrosion paint, as required.

WARNING: Do not use the handle to lift the valve during transport and handling. 

If the valves have to be stored for a long period on site prior to their installation, they should be kept covered and dry. It is mandatory that the end covers, and original packaging are kept in good condition. All the valves are supplied with end plugs, to protect the internal parts. These end plugs must not be removed during storage. If it is necessary for maintenance or inspection, care should be taken to replace them when the valves are returned to the store.

3.1 Scheduled maintenance during storage

In case of extended storage time, the valves should be inspected and checked as follows at least every 6 months:

- External surface inspection checking any alteration of the protective coating. In case of presence of rust and/or damaged paint work, the area should wire brushed and degreased using an appropriate chemical solvent.
- Inspection of the protective coating. In case of damages, it should be locally restored as per the applicable packing procedure.
- Removal of the end protection plugs and without moving the ball, inspection of the internal surfaces of the valve for the complete absence of dust, rust, foreign matter and the integrity of lubricant coat.
- Rotate the ball by completely opening and closing the valve.
- The ball must be kept always in the fully open position.
- Replace the protective end plugs.

4.0 Safety instructions

All installation and maintenance operations on the valve should be carried out by qualified personnel and with the circuit fully de-pressurized (the pressure in the circuit must be the same as that of the outside environment).

The valve and/or plugs on the vents should only be removed when the circuit is fully de-pressurized (the pressure in the circuit must be the same as that of the outside environment).

The bonnets (where present), and the associated anti-unscrewing pins, should not be removed from their housings on the valve casing.

The maximum torsion torque for operating the bonnet (where present), is 0.8 Nm (0.6 lb.ft)

Avoid subjecting the valve to knocks or impacts greater than 40 Nm (30 lb.ft).

The technical data given on the valve must always be legible. Paint or anything else that could obscure the technical data on the valve should be avoided

5.0 Operating instruction

VALVE OPERATION

Rotating the handle anti-clockwise by one quarter turn causes the ball to open the passage; the handle is in line with the valve casing or the main circuit. (Valve in OPEN position).
Rotating the handle clockwise by one quarter turn causes the ball to close the passage; the handle is perpendicular to the valve casing or the line of the main circuit. (Valve in CLOSED position).

WARNING: Handles locking device must be removed before operation (see para. 12) 

VENT

Rotating the wheel on the bonnet (T-Bar) or the handle anti-clockwise, causes the shutter in the bonnet to open the passage. Rotating the wheel (T-Bar) or the handle clockwise, causes the shutter in the bonnet to close the passage. (Approximately 5 full rotations are required to close the passage). Bonnets equipped with stainless steel anti-dust caps allow you to view the status of the bonnet (open or closed).

6.0 Installation instructions

All valve installation operations must be carried out by qualified personnel.

Installation should be carried out in such a way as to ensure the information provided on the valve casing remains visible:

- Manufacturer's name (INDRA)
- Product code
- Rating
- Material
- Manufacturing lot
- Additional labelling (if required)

Before installation check that the project data is compatible with the valve specifications, in particular: material, pressure, temperature, process fluid type.

Check that safety regulations for operators are observed before handling or installing the valve.

Check that the installation layout is suitable for the correct operation of the valve, avoiding any interference with pipes or other nearby components that could obstruct the correct operation of the valve.

Remove the valve from its packaging and inspect it for any damage that may have occurred during transport.

Check the condition of the valve before installation.

Make sure that the handle and any accessible seals are clean and free of any visible damage.

Connect the valve to the circuit, tightening the nuts on the flange and/or connecting the pipes to the threaded connections.

When the valve is open the lever is parallel to (in line with) the axis of the main channel of the valve and of the flow.

When the valve is closed the lever is orthogonal (at 90°) to the axis of the main channel of the valve and of the flow.

WARNINGS:

- **Do not install the valve if it has been visibly damaged by knocks. Inform the INDRA technical department immediately by sending an e-mail to: indra@indra.it with photographs attached.**
- **The valve can operate once it has been fully installed into the circuit.**
- **The valve must be operated in accordance with the procedures in point 4.0.**
- **The valve must be operated using its own handle. Avoid the use of screwdrivers, pipe wrenches, etc.**
- **Before connecting any measuring and/or monitoring instruments, the line must be bled in order to eliminate any residues created by mechanical processes or other residues which, if present, could interfere with the correct operation of the instrument downstream, as well as causing possible greater damage due to the presence of contaminant residues. We therefore recommend pressurizing and bleeding the circuit several times before and after the valve is installed. In the presence of process fluids with contaminant particles, it is essential to fit filters upstream of the valve. The necessary measuring and monitoring instruments should only be installed after having completed these operations.**

6.1 Instructions for Weld End valves (BW)

The execution of the permanent joint of the valve to the pipeline is entirely the responsibility of whoever installs the valve into the line.

It is not necessary to disassemble the valve during the phases of welding connection to the pipeline.

During the welding process, the valve must be kept in the fully open position, in order to avoid possible sticking or damage of internal seals caused by thermal conduction.

During the welding process (preheating, welding, heat treatment), the temperature of valves with soft seats should not exceed 93 C° in the area of the valve seats.

In the event of damage to external painting, it is essential to quickly repair any defects.

The welding activity must be conducted to prevent the introduction of debris and dirt into the line. Such debris could damage valve seals and seats.

WARNINGS:

- **Personnel involved in welding operations shall be provided and use all applicable personal safety devices needed to carry out each activity in safe conditions (shoes; clothing; gloves; glasses; mask; etc...).**
- **Particular attention must be paid during welding performed at considerable heights.**
- **Particular attention must be paid considering presence of hot surfaces (> 80°C).**

7.0 Maintenance instructions

The valves are designed and manufactured to provide continuous operation with little or no maintenance. However, the instructions provided below are useful for maintaining valve efficiency:

Periodically check the efficiency of the seals (no leaks).

In the event of a leak in the valve, it must be removed from the system, identifying the cause of the leak, and replacing the seal if necessary.

WARNINGS:

- **Before removal the valve should be opened and closed at least twice and then kept partially open. (handle at 45° with respect to the axis of the valve or line of the main pipe).**
- **Process fluids may potentially be toxic or hazardous, the user must therefore ensure that maintenance staff are aware of which fluids they may come into contact with and also that they use the required and suitable accident prevention and protection systems.**
- **Even when the valve is isolated from the line, the cavities of the valve casing may still contain trapped pressure, we therefore recommend checking that all pressure has been fully released from the valve casing using the vent, before any activities are carried out.**

8.0 Eliminating leaks

WARNING: The valve should only be removed or dismantled by trained personnel.

Valve series: SB-SBB-DB-DBB

Leaks from the valve control stem (Fig.1 component “A”).
[See Fig.1] - If the stem is the source of the leak, tighten nut (B) even further using a suitable wrench, after having loosened nut (D) or hex screw (E) for valves that have these.

Leak from the bonnet stem (Fig.1 component “C”).
[See Fig.2] - Fully open the bonnet by rotating wheel (1) anti-clockwise, remove the tightening screw on wheel (9), wheel (1) and anti-dust cap (2). Loosen and unscrew the locking nut (4) by 2-3 threads. Gradually tighten the compression nut (3), avoiding excessive movements, 1-2 mm max., until the leak has been eliminated (see torsion torque value table). Once the leak has been eliminated tighten the locking nut (4) once again, reposition the anti-dust cap (2) and the wheel (1), re-tighten the tightening screw on the wheel (9) and check that the leak has been eliminated.

WARNING: If the leak persists, contact INDRA for maintenance requests.

9.0 Removing SB-SBB-DB-DBB valves

For instructions on how to remove and reassemble the components of the KITS listed below, please refer to the Spare Parts Replacement Procedure documents:

KIT_RC_VSF_FB_01
KIT_RC_VSF_RB_01

The first module applies to full-bore ball valves, and the second to reduced-bore ball valves. These modules contain the necessary instructions for safely replacing the following spare parts:

2 metal spheres
2 PEEK seats
2 closure sealing rings in graphite
4 stem sealing rings in graphite
2 O-rings or 2 Lip Seals (per closure)
2 O-rings or 2 Lip Seals (per stem)
1 Bonnet
1 Protective cap

10.0 Torsion torque values for operating the bonnet

Maximum torque for bonnet maneuver: 0.8 Nm (0.6 lb.ft).

11.0 Tightening torque values for the seal compression nut

Seal compression nut tightening torque: 10 Nm (7.4 lb.ft).

12.0 Drawing of the valve

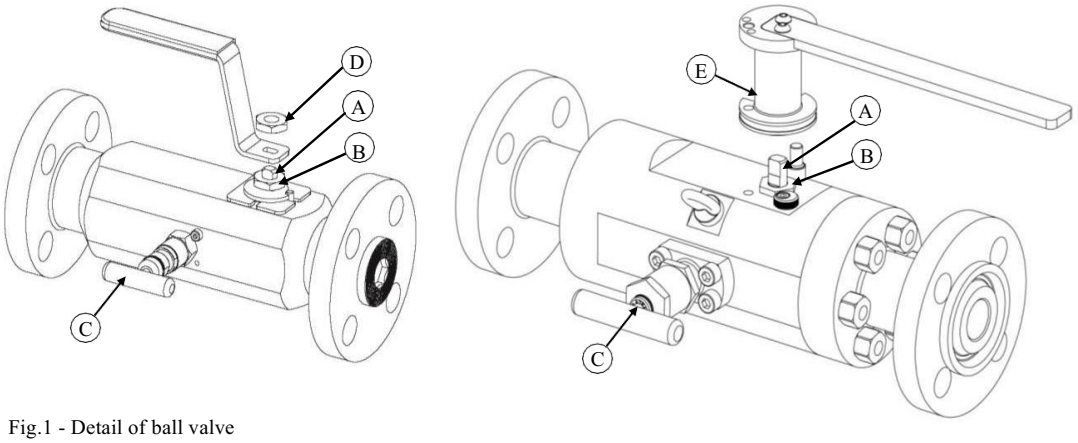
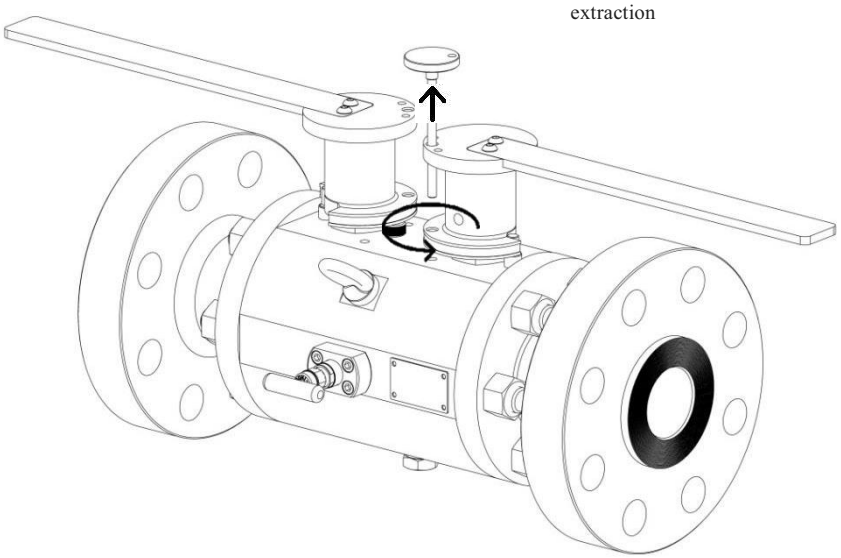


Fig.1 - Detail of ball valve
SB-SBB-DB-DBB

Fig.1A - Detail of ball valve
SB-SBB-DB-DBB with locking device

Anti-clockwise rotation for extraction



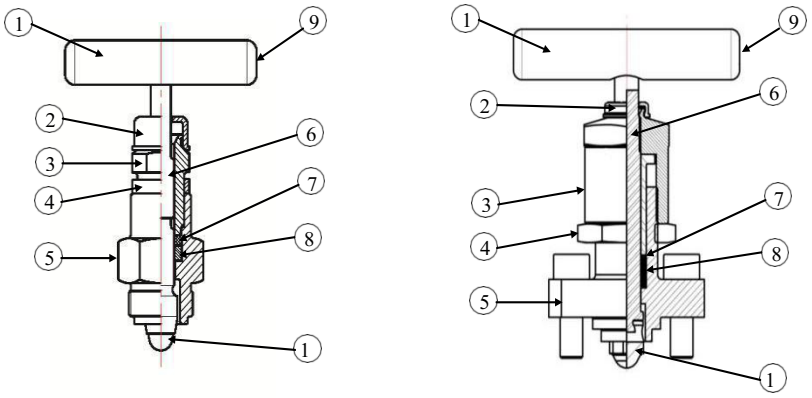


Fig. 2 Detail of bonnet components

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