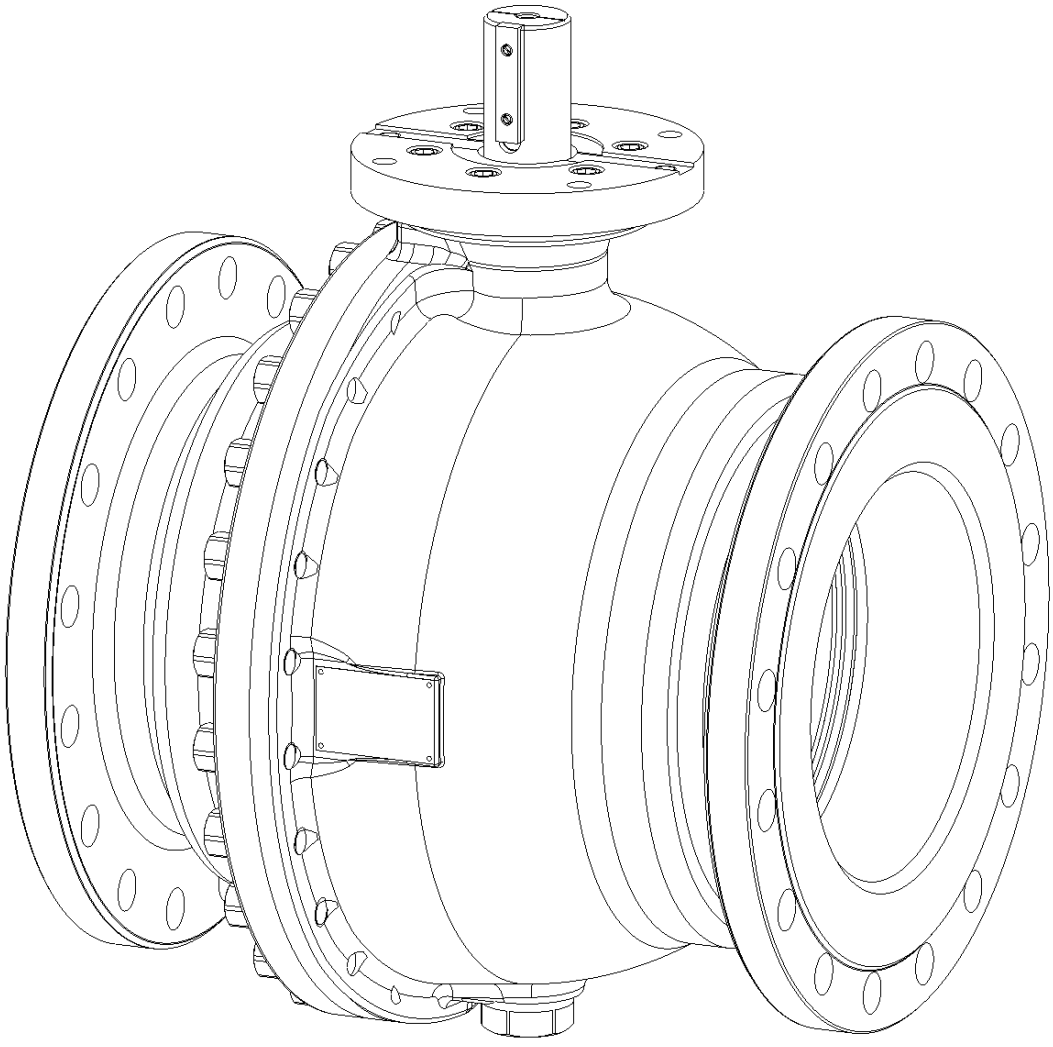
# STANDARD OPERATION MANUAL FOR

# KLINGER VALVES

## BALLOSTAR® KHI BALL VALVES
## STANDARD AND HIGH-TEMPERATURE VERSION
## NOMINAL PIPE SIZE: DN 125 – 1000
## TYPE. 2-PIECE BALL VALVE



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Contents

# 1 Declaration of Conformity

We,

KLINGER Fluid Control GmbH
Am Kanal 8-10
A-2352 Gumpoldskirchen

declare, that the product range

Ball Valve KLINGER Ballostar
Type: **KHI (welded and split version)**
Size: **DN 150 - 1000**
Connection: **Welding ends, flange**

to which this declaration is refering to, is in compliance with the directive 2014/68/EU (PED) and the following standards:

EN 19, EN 1092-1, EN 10213, EN 12266-1, EN 12516-1/-2 (except point 10), EN 13445-3 (only point 11), EN 16668 and AD 2000 (B7, B8)

and was subjected to the following conformity assessment procedure:

Modul H (full quality assurance)

The surveillance of the quality system and the design review is performed by:

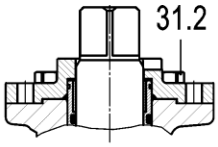
TÜV Süd Landesgesellschaft Österreich GmbH
Tiwagstraße 7
6200 Jenbach
(notified body No. 0531)

Gumpoldskirchen, 01.08.2017 — Manfred Stockinger
(place and date of issue) — (managing director)

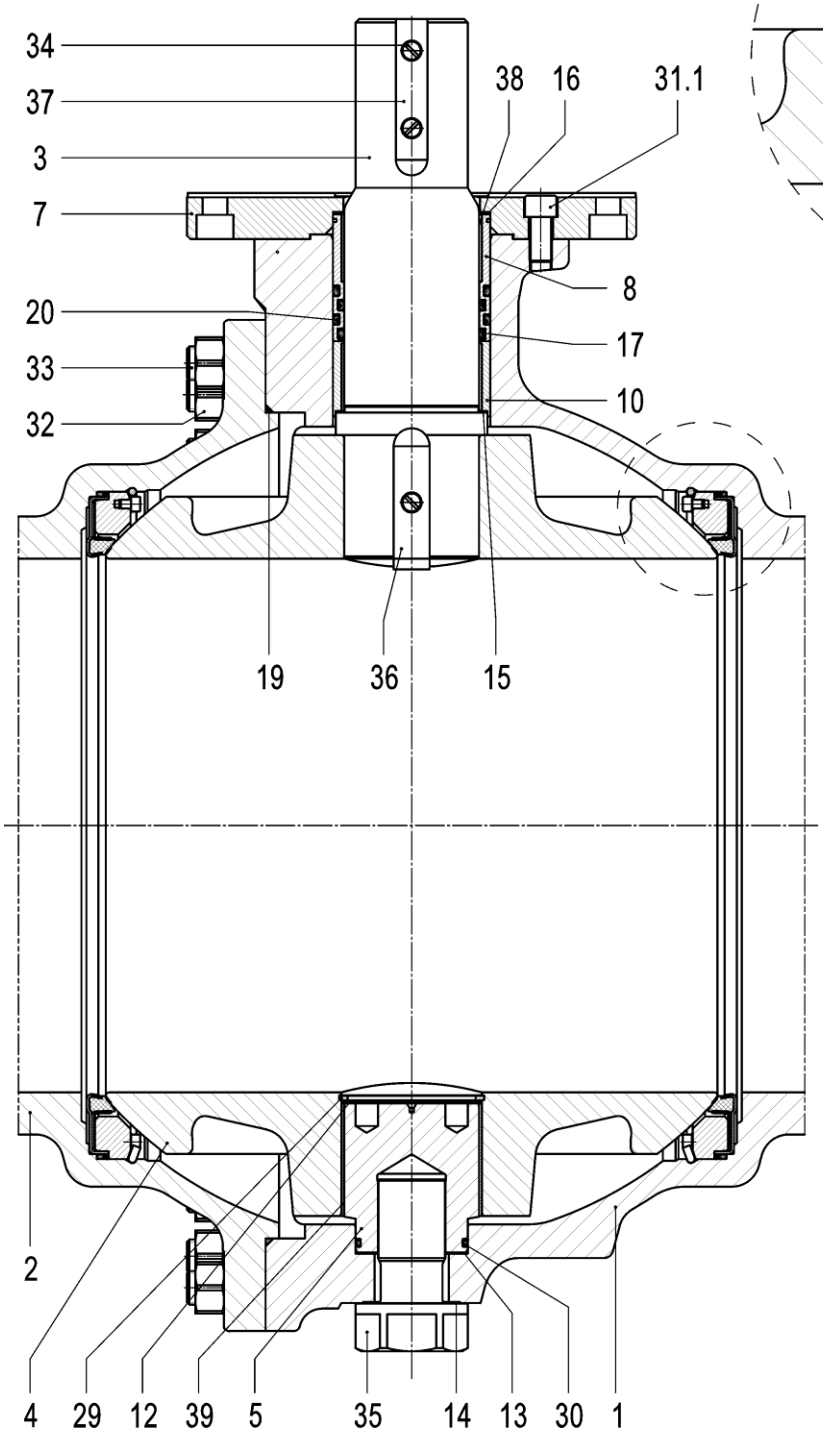
Rev: 08/2017

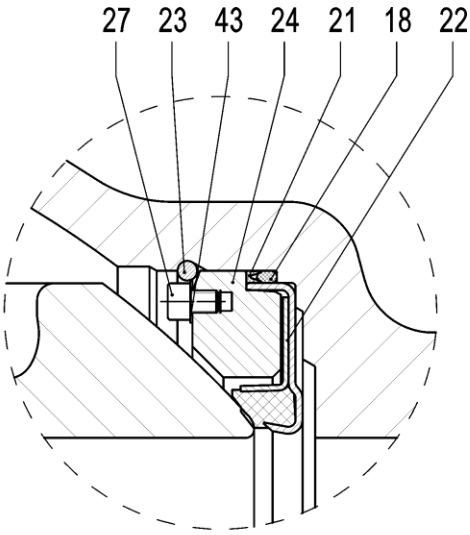
# 2 Individual Parts Designation

DN 125-200




DN 250-1000




1. Body
2. End piece
3. Operating stem
4. Ball
5. Trunnion
7. Top flange
8. Bush insert, upper part
10. Bush insert, lower part
12. Disc
13. Gasket
14. Gasket
15. Washer
16. Washer
17. O-ring
18. O-ring
19. O-ring (spiral wound gasket)
20. O-ring
21. U-sleeve
22. Sealing element
23. Wire ring
24. Back-up ring
27. Top flange head screw
29. Circlip
30. O-ring (DN 700/800/1000)

31.1 Fillister head screw
31.2 Hexagon head screw

32 Hex nut
33 Stud bolt
34 Fillister head screw
35 Trunnion hexagon head screw
36 Fitting key
37 Fitting key
38 Bearing bush
39 Bearing bush
43 Serrated washer

# 3 Proper Use

This product is exclusively intended to shut off or convey media within the approved pressure and temperature limits after installation in a pipeline system. Please see the P/T diagram (pressure temperature diagram) for the permissible threshold values in accordance with the utilized materials. This operating manual must unconditionally be brought to the attention of the corresponding personnel!

Prior to installation and putting into service for the first time, please read the operating manual carefully and pay attention to the hazard and safety notes!

| | |
|---|---|
| ! CAUTION | **Non-compliance with the hazard and safety notes of this operating manual may result in the creation of hazards and loss of the manufacturer's warranty.** Please contact the manufacturer under +43 2252 600-0 for further details. |

Subject to technical alterations and misprints!

# 4 Testing of KLINGER Valves

KLINGER Valves are pressure-tested in accordance with EN 12266-1. The pressure test comprises the tests P10, P11 and P12. Testing the resistance to pressure of the ball (P20) is not included in the standard package.

# 5 Labeling of the Valves

Each valve is provided with the following data listed either on the body or on a type plate.

| | Designation | Comment |
|---|---|---|
| Manufacturer | KLINGER | Please see the operation manual for the address |
| Model | e.g. KHI | Manufacturer's type designation |
| Size | DN and numeric value | Numeric value in mm, e.g. DN 80 or in inch, e.g. 3" |
| PN / class | Numeric value for PN / class | Provides the max. permissible pressure at ambient temperature, e.g. PN 40 |
| FA-No. | Numbers / letters | FA-No. serves identification purposes |
| Material | e.g. 1.0619 or VIII | In accordance with material codes |
| | CE | Market approval symbol |

# 6 Safety Instructions

This operation manual must be brought to the attention of the operating personnel.

## 6.1 General Notes on Safety

The safety instructions for valves also apply to the pipeline systems, into which they are installed. This operating manual exclusively focuses on safety instructions, which are to be additionally complied with for valves.

## 6.2 Safety Instructions for Operators

| | |
|---|---|
| ! Danger to Life | A valve with a permissive pressure/temperature range that is **not** sufficient for the operating conditions may not be operated! This range is to be derived from the P/T diagram. With regard to materials, pressures or temperatures not listed there, contacting the manufacturer is mandatory. **Ignoring this regulation can result in life-threatening situations and can cause damage to the pipeline system.** |
| ! Danger to Life | It must be ensured that materials selected for the parts coming into contact with the media are suitable for the utilized media. The manufacturer takes no responsibility for damages resulting from corrosion or through aggressive media. **Ignoring this regulation can result in life-threatening situations and can cause damage to the pipeline system.** |

The following items do **not** lie in the scope of responsibility of the manufacturer. As a consequence, when utilizing the valve, it must be ensured that

- the valve is only utilized in accordance with its proper use, as illustrated under "Proper Use".
- the actuator unit, which is subsequently mounted on the valve, is adjusted to the valve and correctly adjusted in the end position.
- when connecting a valve actuator to the power grid, the safety notices of the actuator manufacturer are complied with.
- the valves are correctly implemented into the system, especially those connected to the pipeline system by means of welding.
- no additional tensions bear on the valves.
- the operation parameters and operating conditions have been clarified with the manufacturer of the valve and that operating conditions such as vibrations, water hammers, pressure surges, erosion etc. are to be avoided.
- pipeline system connections and valves, which are operated at operating temperatures > 50 °C or < -20 °C, are protected against contact.
- during welding procedures, the safety regulations of the plant operator and/or plant constructor are to be complied with.
- the valve is only operated and maintained by trained personnel.
- valves, which are utilized with hazardous media (inflammable, corrosive, harmful to health etc.), are to be handled in accordance with their dangers. The corresponding handling regulations are the responsibility of the plant operator.
- all ergonomic hazards are to be considered by the plant operator, such as e.g. accessibility, gauges etc.

- when applying internal pressure for the first time (pressure test, trial operation) a sufficient safety distance is to be maintained.
- it is prohibited to open screw connections (with the exception of those on hand levers and handwheels), when pressurized (medium).
- installation and removal of valves is only carried out with a depressurized and drained pipeline.
- all connections, following loosening, are again correctly tightened afterwards.
- no screws are loosened on pressure-retaining parts, unless described so in the operation manual.
- no screwed connections are forcibly opened.
- during longer shutdown periods, in the event of freezing media, the valve is drained and/or that depressurization is achieved in case of expanding media.

## 6.3 Hazard Warnings

### Mechanical hazards:

- Beware of possible sharp or protruding parts posing risk of injury.
- Extra care is required during putting into operation: Do not reach into the bore opening during the valve closing process, as this poses a risk of injury.
- Be careful of falling parts during transportation, maintenance and putting into operation.
- When manipulating lifting appliances, the safety regulations for lifting appliances must be complied with.
- Unauthorized and improper handling can result in undesired and spontaneous pressure loss and can result in significant damage.
- With regard to valves featuring a mounting bracket it must be ensured that moving valve parts do not result in a risk of injury.

### Electrical hazards:

- With regard to valves featuring electric actuators, the operating manual and the safety instructions of the actuator manufacturer must be complied with.

### Thermal hazards:

- During operation, the surfaces of valves may feature high / low temperatures. Caution: Burn hazard.
- Caution: The hot surfaces can cause self-ignition of flammable materials through either contact or heat emission.

### Hazard generated by noise:

- Depending on the application conditions, high levels of noise can be created by the cavitation processes, which bear the risk of hearing damage.
- Opening an internally pressurized valve can result in major noise exposure as a result of exiting media; hearing damage hazard.

### Vibration hazard:

- Caution: Abrupt opening or closing of a valve can lead to undesired surges and vibrations in the pipe, which may possibly damage the valve or the pipeline system.

Electromagnetic radiation hazard:

» The hazards resulting from possibly created electromagnetic radiation are to be consulted in the operating manual of the actuator manufacturer.

Hazards linked to the operational environment:

» The ambient atmosphere and the ambient temperature are to be set in a manner that has no negative influence on the valve, the actuator of the valve, and the medium.

Transportation hazards:

» Please see the chapter “Transportation and Storage” for transportation hazards.

Maintenance hazards:

» All maintenance and repair tasks with the exception of lubricating and subsequent sealing of stuffing boxes are without exception to be carried out in an unpressurized state. Where required, the valve may have to be drained prior to servicing.
» Valves may only be removed from pipeline systems in an unpressurized and empty state.
» Attention must be paid to exiting media when resealing.
» Caution: (Fire and chemical) burn hazard and risk of poisoning caused by valves utilized in dangerous media. Attention must be paid to medium residues during maintenance and putting into operation tasks.
» Maintenance and repairs may only be carried out by qualified personnel.

Placing out of operation hazards:

» When placing out of operation, the valves must be emptied fully and attention must be paid to hazards resulting from medium residue.
» Should valves be no longer used, they are to be disposed of correctly.

Hazards when opening drain valves:

» Danger of exiting medium. If utilized in high temperature water systems, the drain ball valve may only be opened after it has been ensured that the drain line is either correspondingly pressurized or that the temperature is less than 100°C (avoidance of steam hammers in the clearance volume).

Material failure hazard:

» Parts made of grey cast iron are especially sensitive to brittle fracture and impact. This aspect must be considered in the course of material selection.

# 7 Technical Data

## 7.1 Material codes

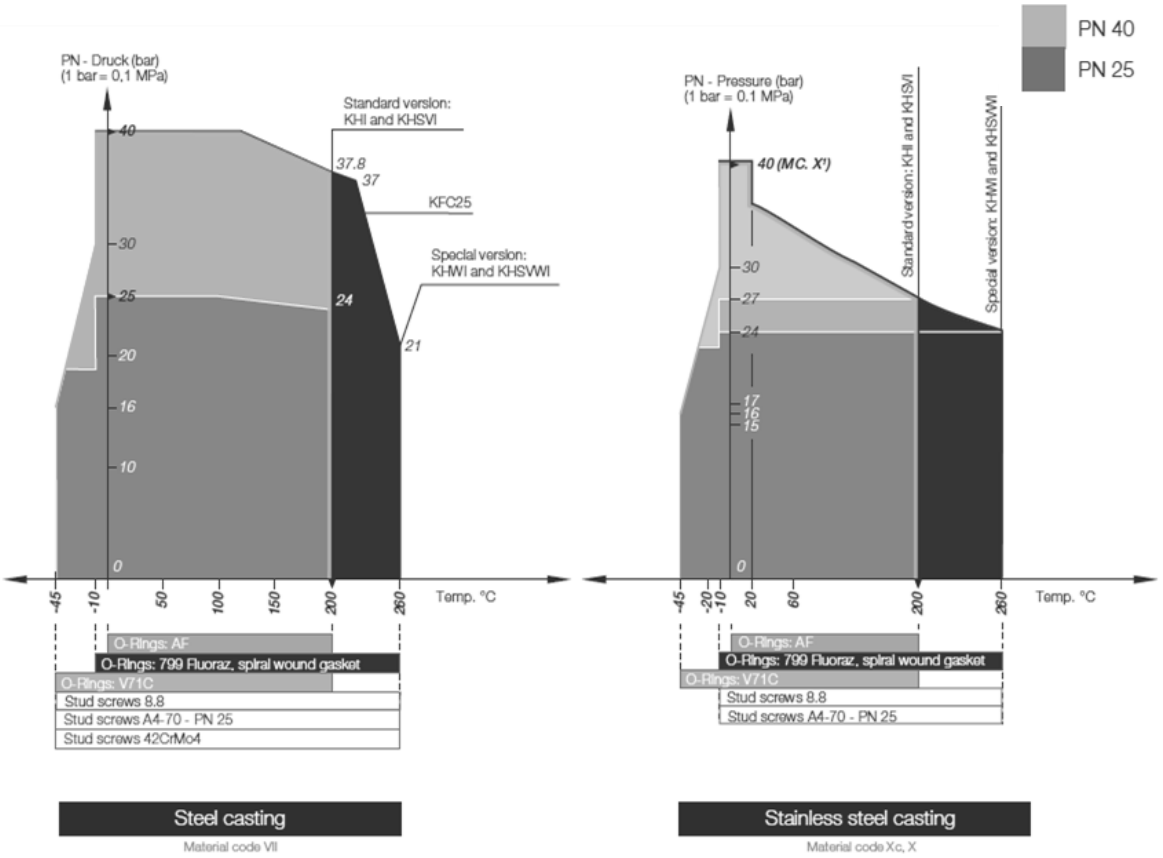
The main criterion of the material codes is the basic material of the body.

| Symbol | Body | Interior Parts |
|---|---|---|
| III | Grey cast iron | Without nonferrous metal parts |
| IV | Brass | Nonferrous metal parts possible |
| VI | Spheroidal cast iron | Without nonferrous metal parts |
| VII | Cast steel | Nonferrous metal parts possible |
| VIII | Cast steel | Without nonferrous metal part |
| X | Stainless steel | Parts coming into contact with the medium are acid-resistant |
| Xc | Stainless steel | All parts acid-resistant |

The above table may also contain material codes unavailable for this product.

## 7.2 P/T Diagrams

The applicable maximum limitations of use regarding pressure and temperature are defined by their mutual interdependency. A P/T diagram is an ideal tool in order to select a suitable valve for pre-defined operational characteristics.




| | |
|---|---|
| ! CAUTION | The diagrams illustrate all possible limitations of use of KLINGER valves. **The area of application for standard valves is from -10 °C up to +200 °C.** Special designs with a suitable sealing system exist for the temperature range from **-45 °C to -10 °C** as well as from **200 °C to 260 °C**. |

## 7.3 Tightening Torques

Tightening torques of the split body flange hex nuts (Pos. 32) for standard designs with O-rings and designs with spiral wound gaskets (e.g. KHWI):

| Nominal size | Dimension | Tightening torques (Nm) | | |
|---|---|---|---|---|
| | | VII, VIII, X | Xc | Spiral wound gasket |
| 125,150 | M 16 | 160 | 130 | 200 |
| 200 | M 20 | 310 | 245 | 390 |
| 250 | M 22 | 320 | 290 | 700 |
| 300 | M 24 | 470 | 330 | 700 |
| 350 | M 22 | 320 | 290 | 700 |
| 400 | M 27 | 650 | 400 | 1,000 |
| 500 | M 30 | 1,000 | 540 | 1,200 |
| 600 | M 33 | 1,400 | | 1,900 |
| 700 | M 36 | 1,900 | | 2,400 |
| 800 | M 39 | 2,200 | | 2,700 |
| 1000 | M 39 | 2,500 | | |

Tightening torques of the trunnion hexagon head screw (Pos. 35):

| Nominal size | Dimension | Tightening torques (Nm) | |
|---|---|---|---|
| | | VII, VIII, X | Xc |
| 125,150 | M 24 | 270 | 270 |
| 200 | M 30x2 | 540 | 540 |
| 250,300 | M 36x1,5 | 900 | 900 |
| 350,400 | M 48x1,5 | 2,100 | 2,100 |
| 500,600 | M 60x2 | 5,300 | |
| 700,800 | M 85x2 | 19,800 | |
| 1000 | M 95x2 | 21,000 | |

Tightening torques of the top flange head screws (Pos. 31):

| Nominal size | Dimension | Tightening torque (Nm) | |
|---|---|---|---|
| | | VII, VIII, X | Xc |
| 125,150 | M 12 | 28 | 38 |
| 200 | M 16 | 68 | 94 |
| 250,300 | M 16 | 220 | 94 |
| 350,400 | M 20 | 428 | 142 |
| 500,600 | M 20 | 428 | 142 |
| 700,800 | M 30 | 1,478 | |
| 1000 | M 36 | 1,827 | |

## 7.4 Table of Weights

This table provides a weight estimation of a PN 40 ball valve with flange connection (full bore).

| DN | Weight (excl. gear box) | Weight (incl. gear box) |
|---|---|---|
| 150 | 85 kg | 103 kg |
| 200 | 160 kg | 180 kg |
| 250 | 240 kg | 286 kg |
| 300 | 410 kg | 468 kg |
| 350 | 620 kg | 685 kg |
| 400 | 856 kg | 970 kg |
| 500 | 1,330 kg | 1,535 kg |
| 600 | 1,863 kg | 2,068 kg |
| 700 | 3,350 kg | 3,742 kg |
| 800 | 5,055 kg | 5,447 kg |
| 1000* | 7,480 kg | 8,240 kg |

*) only available with welding ends

# 8 Transportation and Storage

Check the shipment immediately upon receipt for completeness of delivery and transport damage. Furthermore, it should be ensured that the valves and possibly mounted actuators have not been damaged during transport. Please also check that the supplied valves (types, nominal sizes etc.) correspond with the order. KLINGER Fluid Control is to be notified immediately of any kind of deviations. Regarding damage obviously resulting from transportation, please contact the freight forwarder in charge of delivery.

Ballostar® KHI ball valves are supplied in the OPEN position with the connections covered in order to protect against dirt and damage. These covers may only be removed immediately prior to installation.

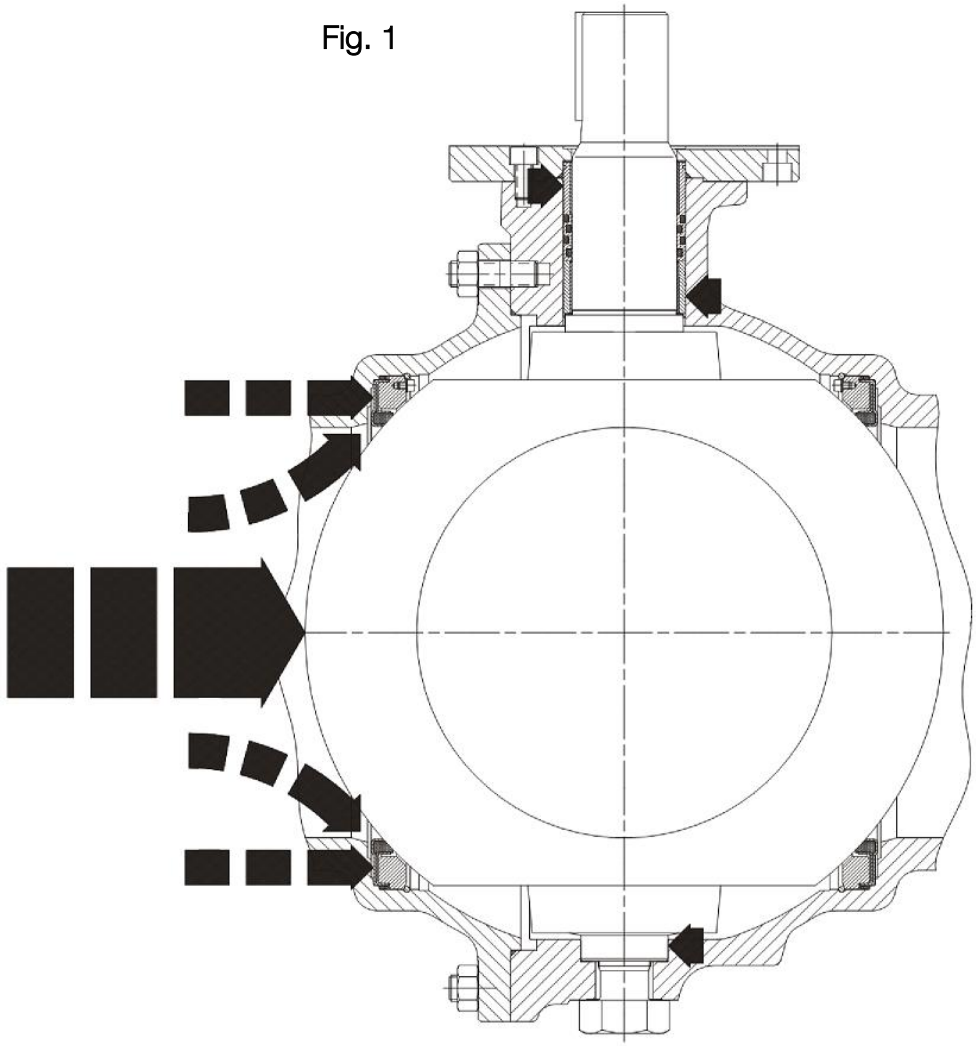
- Storage in the default factory packaging.
- The valves are to be stored in closed rooms, in a non-aggressive atmosphere, and protected against humidity and contaminants.
- In the event that protective sheeting or shrinking foils are used, it must be ensured – through adequate measures – that the atmosphere within the covers remain free of condensation.
- Corresponding protective measures are recommended for storage in dusty rooms.
- In order to avoid mix-ups, all stored parts should be labeled in accordance with the shipping notes and stored in the correct place.
- The temperature in the storage rooms should not exceed the limits -20 °C and +50 °C. Rapid temperature changes are to be avoided whenever possible (condensate water).
- Possible changes originating from KLINGER Fluid Control and having an impact on storage will be announced in a timely manner in the form of a circular.
- The operation manual is part of the delivery and must be stored with the item. This ensures that all important information and documents can be passed on.
- Lift lines suitable for the weight and the lifting aids on the valve (to the extent present) are to be used for manipulation purposes.

**Damages resulting from incorrect storage or manipulation free KLINGER Fluid Control from any obligations derivable from the warranty, guarantee and product liability.**

# 9 Operating Principle

Thanks to its **"elastic sealing system"** the ball valve guarantees absolute tightness in both high-pressure and lowest-pressure scenarios. This is achieved by means of two elastic sealing elements, which work independent of each other. The necessary contact force is achieved a) through pre-stressing during assembly and b) by means of the differential pressure created in the valve (Fig. 1).
The forces generated at the ball, comprising the shut-off section multiplied by the prevailing differential pressure, are not transmitted to the sealing rings, but instead onto the trunnions for the ball, installed for this purpose. As a consequence, in terms of construction, the trunnion-mounting and sealing function are decoupled from each other. The torque required to pivot the shut-off element is therefore kept low.
This mode of construction reduces wear and tear and increases the service life of the valve.

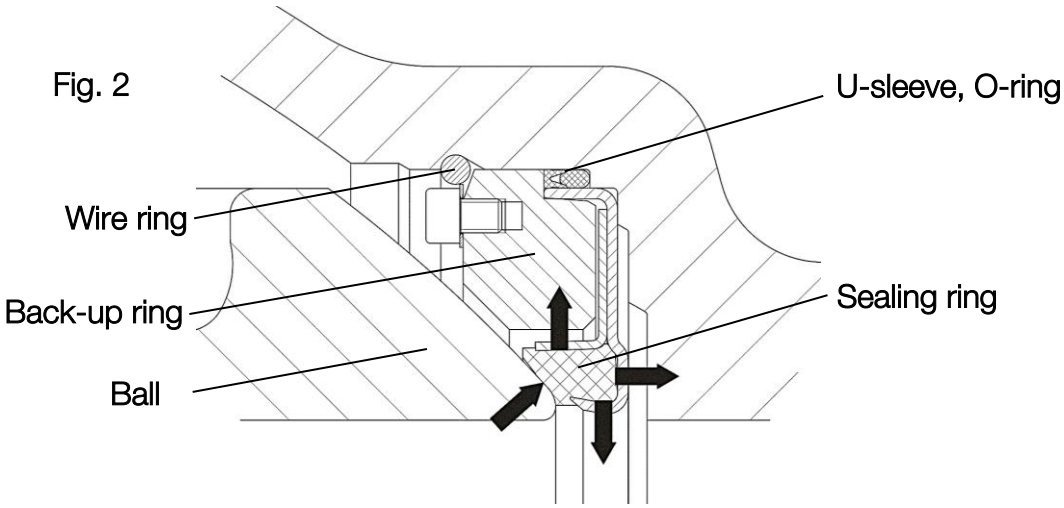
Fig. 1



# 10 Mode of Operation

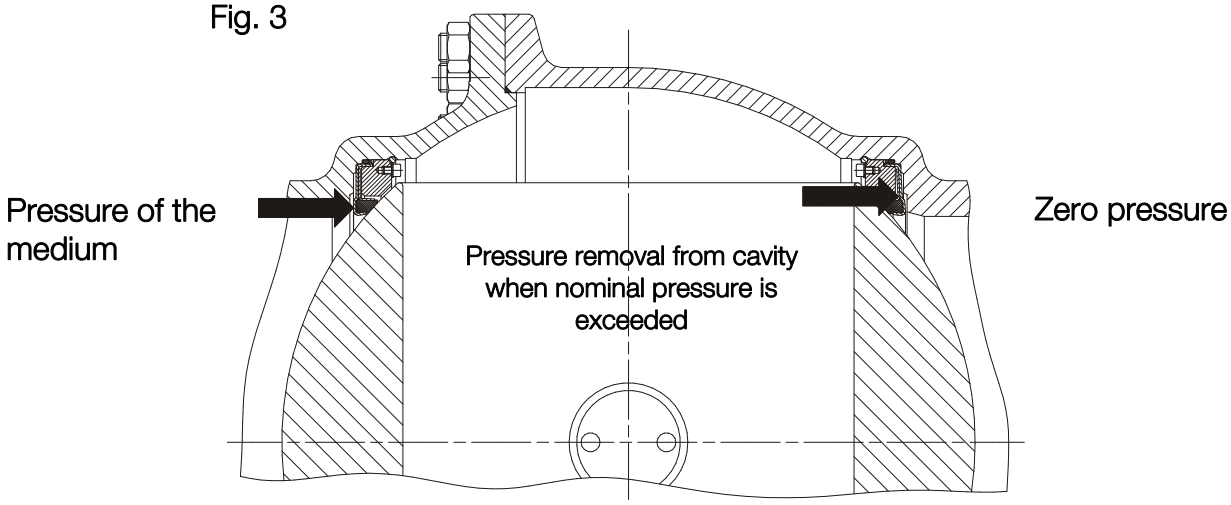
During assembly of the body and the end piece, the sealing system is elastically deformed. The two pre-stressed, elastic sealing elements made of stainless steel, together with the sealing rings and a seal at the periphery, create a sealing system with the ball both upstream and downstream of the ball valve. A back-up ring protects the elastic sealing element against overstressing, a wire ring serves to lock the sealing unit. (Fig. 2)

Fig. 2




Due to the elasticity and up to a certain pressure, two primary sealing points are continuously maintained in the bore. The differential areas at the sealing element cause the pressure of the medium on the upstream side of the ball valve to press the sealing ring onto the surface of the ball. If pressurization, exceeding the nominal pressure, originates from the cavity between the sealing rings, then the sealing element on the non-pressurized side or the downstream side is lifted from the ball surface. (Fig. 3)

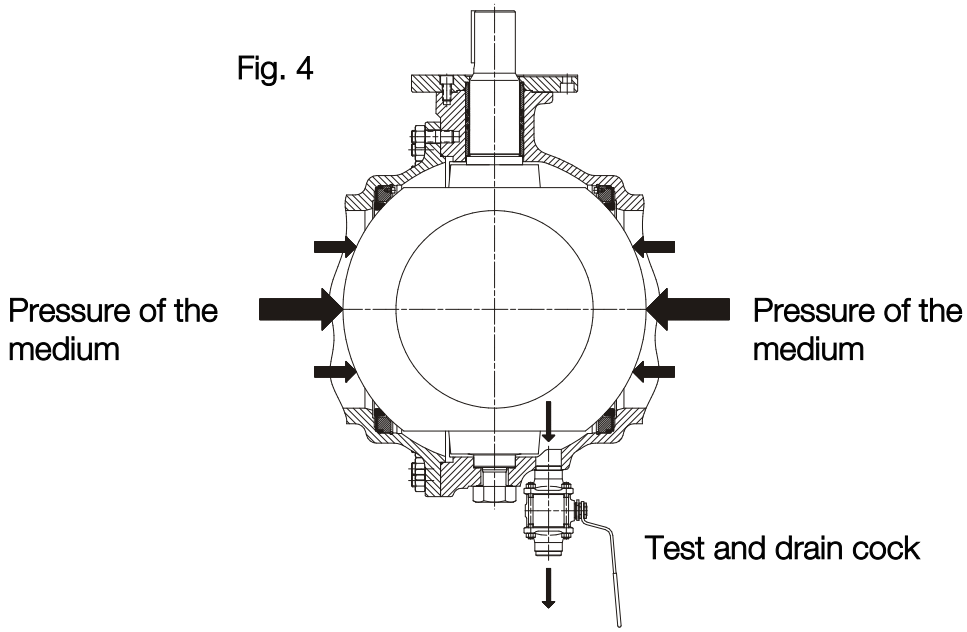
Fig. 3




The ball valve can be pressurized in both flow directions.
Thermal expansions are compensated by the elasticity of the sealing elements.

In the closed state of the valve, the ball valve cavity can be discharged and/or vented or depressurized by means of a special sealing system via a test/drain cock. This allows for testing the function of both sealing rings following depressurization (Block & Bleed).

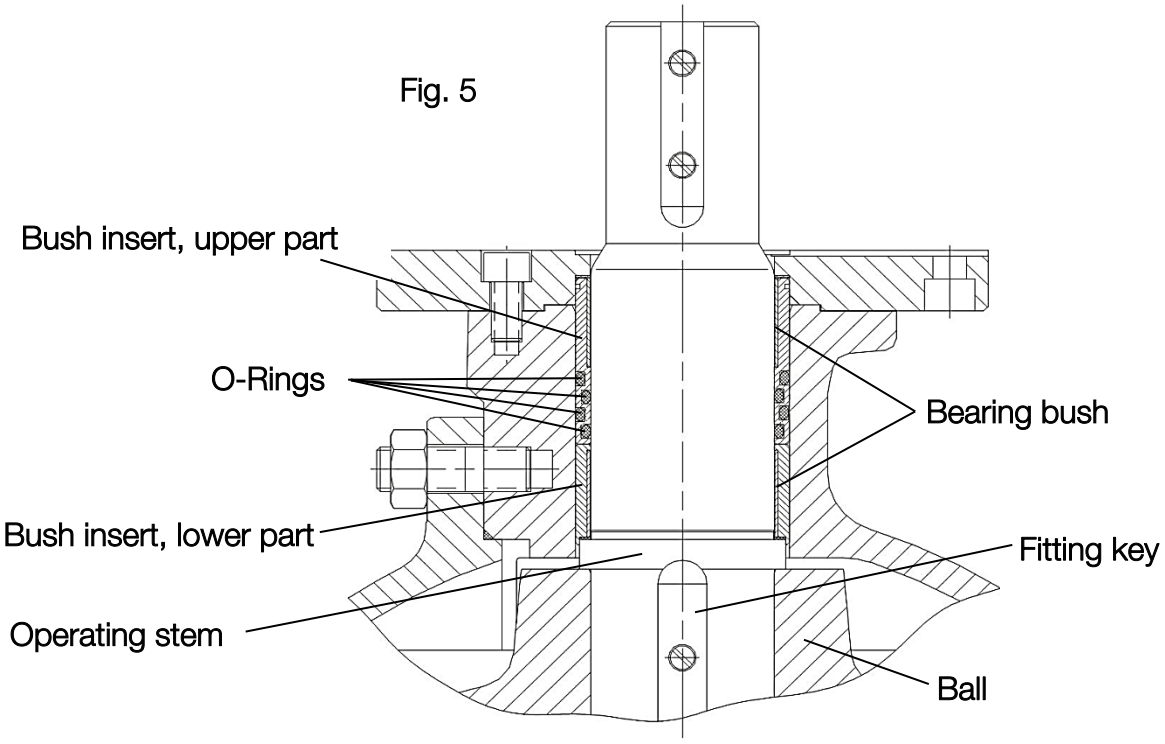
Fig. 4




Furthermore, repair work can also be carried out on a depressurized section between the two ball valves belonging to the pressurized pipe without hazard: The medium cannot enter the repair section.

An operating stem is utilized to operate the ball. The connection stem-hub is achieved via fitting keys. The tightness to atmosphere is ensured by means of consecutively arranged O-rings. In order to simplify their replacement, they are located in the bush inserts. The occurring bearing forces are absorbed by the bearing bushes.

Fig. 5



In order to guarantee the centered orientation of the ball, a trunnion is located on the opposite site. Guided into the vertical bore of the ball by a bearing bush, it is locked in place by a hex screw to counter forces generated within the body. Tightness to atmosphere is achieved through flat gaskets and O-rings.
In the standard design, the connection between the body and the end piece is sealed by means of a static O-ring (Fig. 6a). A spiral wound gasket (Fig. 6b) is utilized for the high-temperature design. The parts are held together by a bolted connection, i.e. the flanges are pressed against each other across their entire surface. This serves to absorb the occurring tensile and bending forces.

Fig. 6a

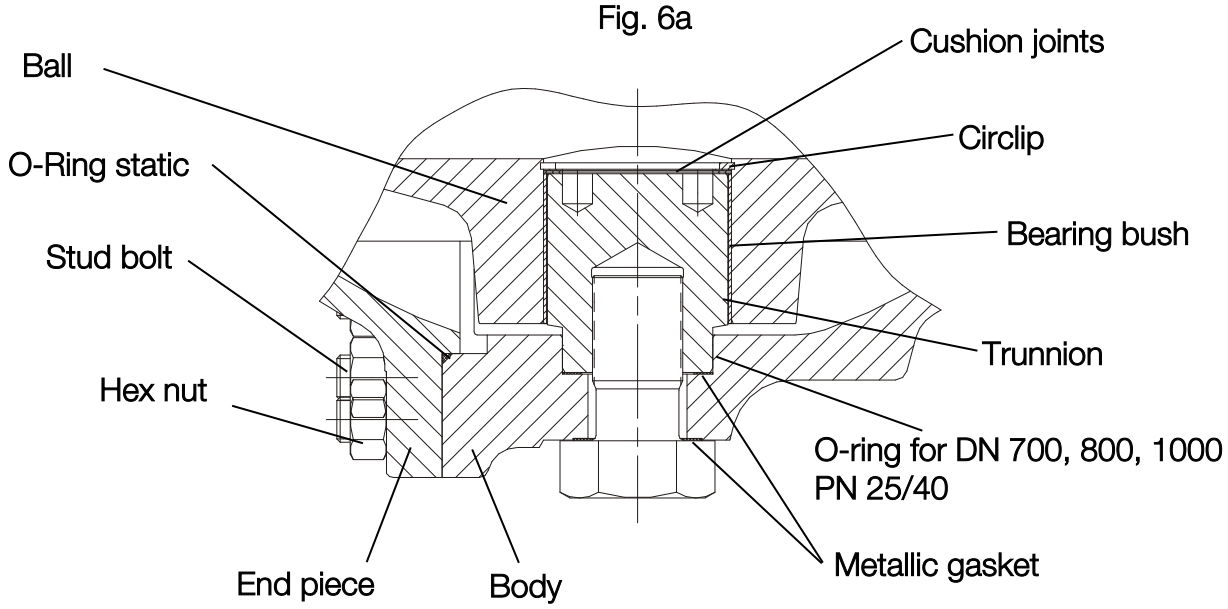
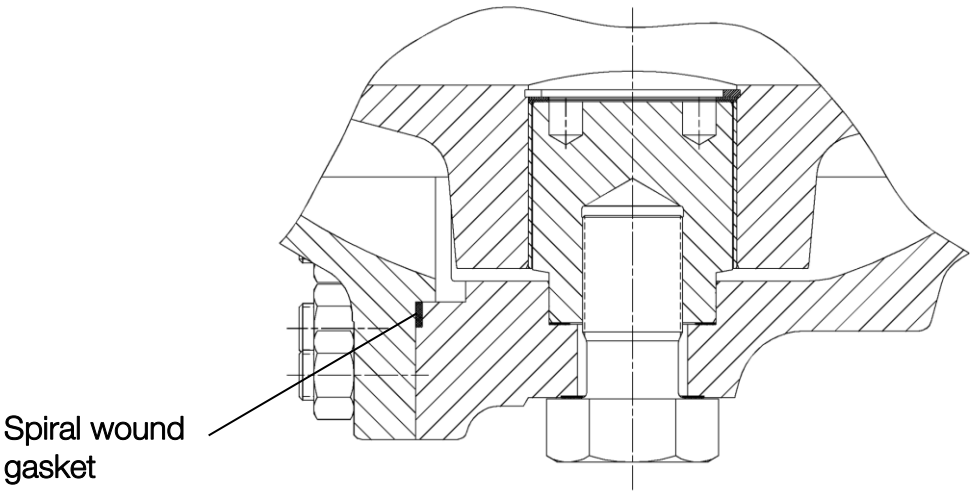



Fig. 6b




All seals and bearings are MAINTENANCE-FREE

# 11 Installation and Putting into Service Regulations

In order to protect against impurities and damage, the connections of the valves are covered. We recommend removal of these covers only prior to installation.

Ballostar® KHI ball valves can be installed in any given orientation. Installation should be executed in the "open" position (supplied state) in order to avoid damaging the surface of the ball.

Valves with welding ends may generally be welded into a pipework by means of fusing welding procedures. In this context, the welding and quality requirements and their norms are to be complied with. As a consequence, welding may only be carried out by qualified personnel. The safety regulations of the plant operator and/or the plant manufacturer are also to be complied with.

Installation of valves with flange ends may only be carried out by qualified personnel in accordance with EN 1591. It must in this case be observed that no additional tension is exerted on the valve, such as for example as the result of selecting a too large distance between the to be bolted flanges.

Following installation and prior to putting into service, it must be ensured that solids and impurities, which are not part of the medium, have been removed from the pipeline system and/or from the facility.

A pressure and a function test must be carried out prior to putting into operation. Prior to putting into service of valves in steam pipes, proper condensate draining must be ensured in order to avoid steam hammer hazards. In extreme cases, a steam hammer may lead to breaking of the valve. Rapid increases in temperature and pressure are to be avoided during all operation phases (start – operation – shutting down).

The maximum permissible test pressure is 1.1 x PN if the valve is in a closed state. The valve must be open when testing the pipe pressure (1.5 x PN).

The ball valves are also to be secured against toppling or falling down during transportation to the place of installation. Furthermore, they are to be protected against colliding with each other or other forms of damage.

## 11.1 Welding Instructions

The ball valve must be in the OPEN position during the entire welding process. This ensures that damaging the ball surface is avoided.

The applicable welding and quality-technical requirements and their respective standards must be complied with during welding.

The welding temperature may not exceed 200 °C at a distance of 115 mm from the welding seam for nominal sizes of up to DN 350, and, with regard to nominal sizes ≥ DN 400, this temperature may not be exceeded at a distance of 170 mm.

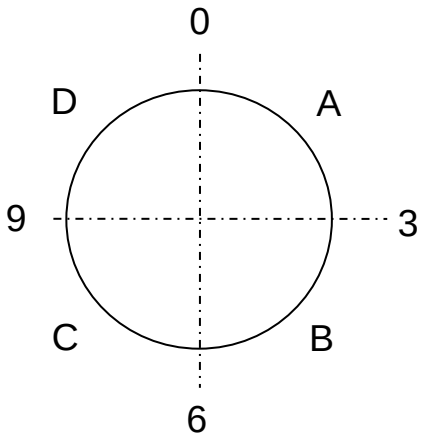
The preferred welding methods for the creation of welding seams are:

- Manual electro-welding
- TIG
- MAG / MIG

The welding seam sequence is defined as follows:

Vertical-down weld: A - C - D - B

Rising weld: A - C - B - D




# 12 Service and Maintenance

Maintenance and inspection intervals are to be determined by the operator dependent on the operating mode, as these valves can be utilized under a number of different operating conditions.

In order to increase service life at low activation counts, we recommend carrying out an activation from time to time. For this purpose it is fully sufficient to only shift the ball by a few angular degrees.

Maintenance and inspection work may only be carried out by trained personnel.

Prior to the start of service and maintenance work, it must be ensured that the pipeline system is depressurized and that no medium residues are contained within.

In the event of tightness to atmosphere not being achieved at certain positions, the tightening torques at the corresponding positions should be checked for their conformity with the tightening torque table.

When removing an actuator, it is necessary to protect it against rotation prior to loosening of the connecting screws.

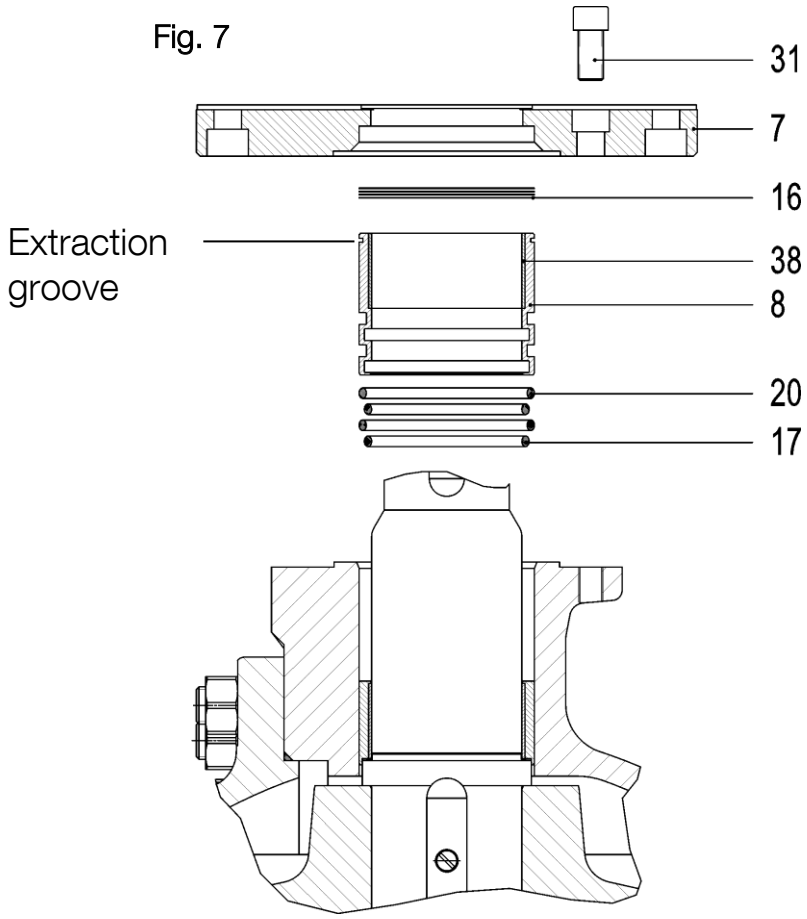
## 12.1 Disassembly

### 12.1.1 Disassembly for Seal Exchange at the Operating Stem

» Depressurize the pipe system
» Bring the valve into the OPEN position
» Remove valve lever and actuating unit respectively
» Loosen top flange head screws (Pos. 31) and lift top flange (Pos. 7) over the end of the operating stem
» Remove washer (Pos. 16) – please note that these must be reinstalled in the correct amount and strength during assembly
» Pull the bush insert – upper part (Pos. 8) out of the body – use the extraction groove

» Exchange the seals (Pos. 17, 20) in accordance with the spare parts list. Clean the spare parts and treat them with a suitable type of grease to simplify installation
» Inspect the bearing surface (Pos. 38). Should any damage be found – exchange the bearings
» Installation in the reverse order

Fig. 7




### 12.1.2 Disassembly of Individual Parts for Exchange of Sealing Elements

» Bring valve into the OPEN position
» Depressurize the pipe system
» Remove valve from the pipe system. For improved handling during disassembly of the individual parts, place body on connection flange. Place on an appropriate material that does not lead to damaging of the contact surface
» **Mark the removal positions of the parts with regard to each other! (Fig. 8)**
» Loosen hex nuts (Pos. 32), lift end piece (Pos. 2) and place on connecting face

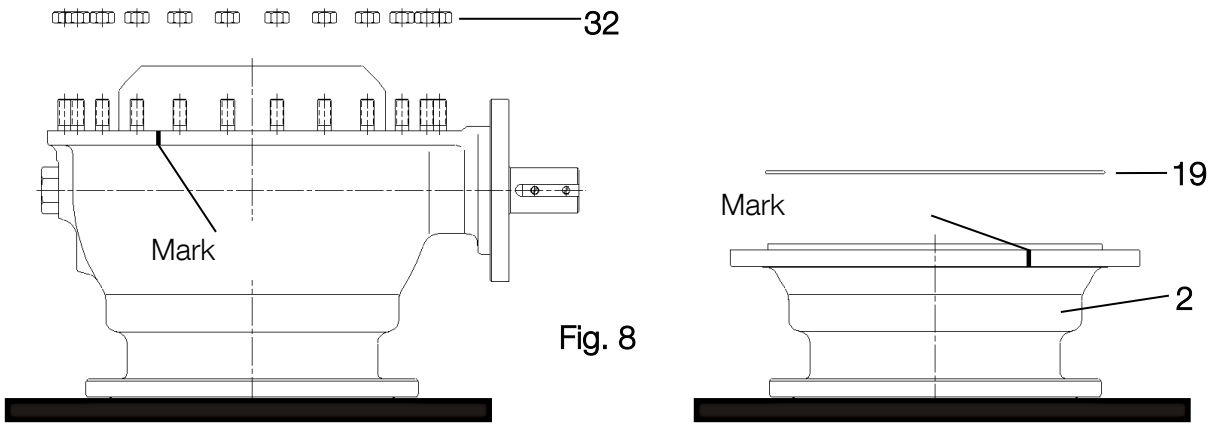
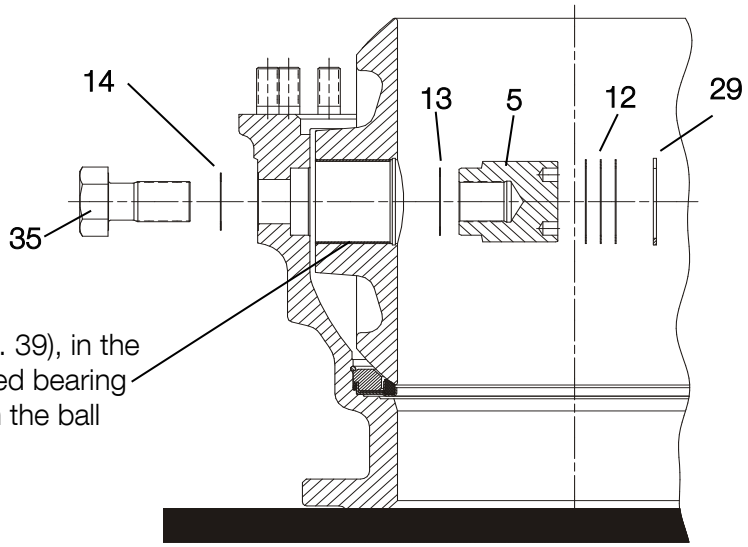



Fig. 8

» Remove seal (Pos. 19)
» Withdraw hexagon head screw (Pos. 35) from trunnion (Pos. 5), remove flat gasket (Pos. 14)
» Remove circlip (Pos. 29) from ball hub, remove discs (Pos. 12) for vertical centering
» Push trunnion (Pos. 5) into the bore of the ball (careful application of force), remove flat gasket (Pos.13)

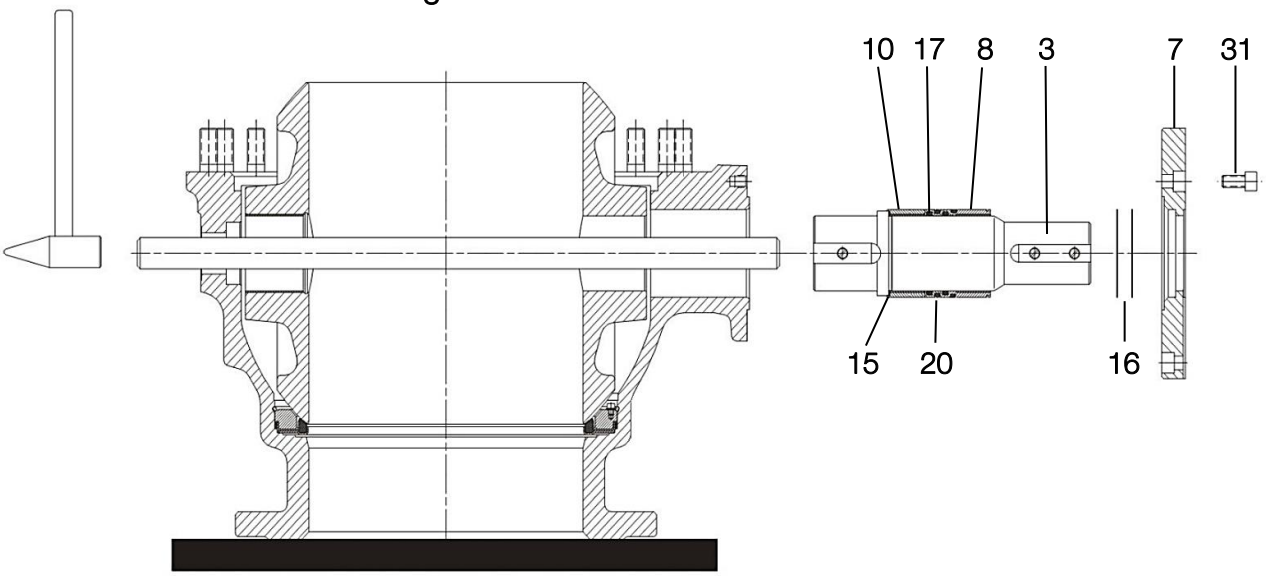
| | |
|---|---|
| ! CAUTION | A washer must be used in the same amount and strength for installation! |

Fig. 9



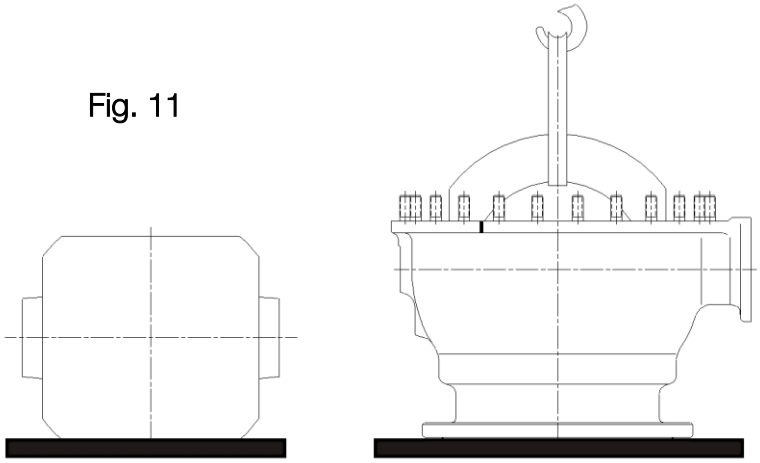

» Remove consoles etc.
» Withdraw head screws (Pos. 31) and pull out flange (Pos. 7) over end of operating stem. Remove washer (Pos. 16).

Fig. 10



» Carefully remove operating stem (Pos. 3) and bush inserts (Pos. 8, 10) together with sealing rings and bearing bushes out of the body
» Manually rotate the ball by 90°, lift out of body, and place on suitable surface material

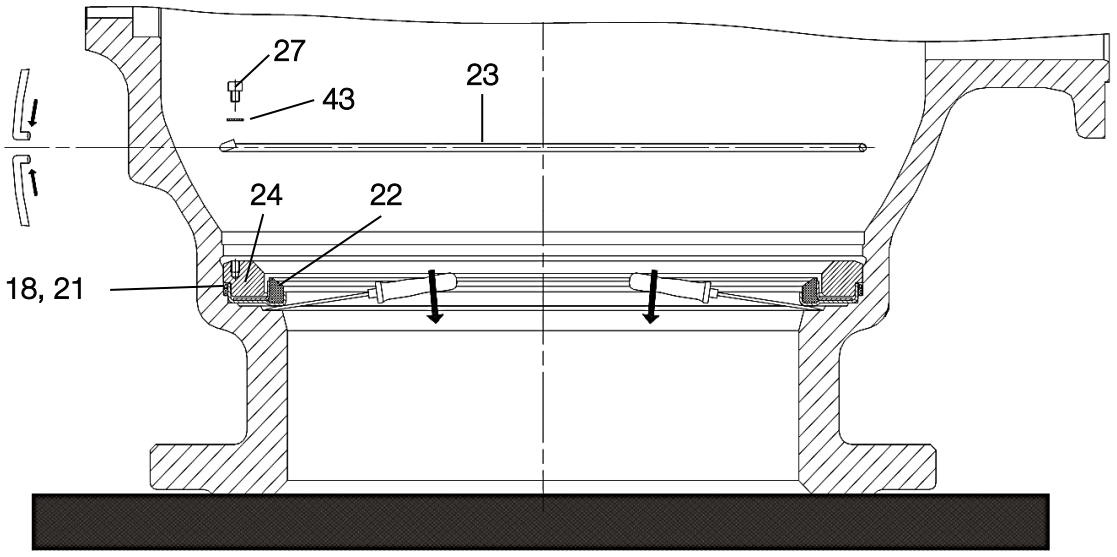
Fig. 11



## 12.1.3 Disassembly of the Sealing Element

» Withdraw fillister head screws (Pos. 27) with serrated washer (Pos. 43) from back-up ring (Pos. 24)
» Squeeze open end of wire ring (Pos. 23) and lift out of nut
» Insert two larger screwdrivers on opposing sides into the gap between the sealing element and the body (end piece) – push the sealing element (Pos. 22) and the back-up ring (Pos. 24) out of the groove by applying leverage
» Remove the remaining seals (Pos. 18, 21) from the interior

Fig. 12




| | |
|---|---|
| ! CAUTION | All individual parts, especially seals and sealing surfaces, must be diligently checked prior to installation and must be replaced by new parts in the event of damage. Visible pollution on the machined surface must be cleaned. Cleaned individual parts are to be treated with a thin layer of grease prior to installation. |

## 12.2 Assembly

All parts must be cleaned, and, if necessary, lubricated prior to assembly.

### 12.2.1 Standard Lubricants

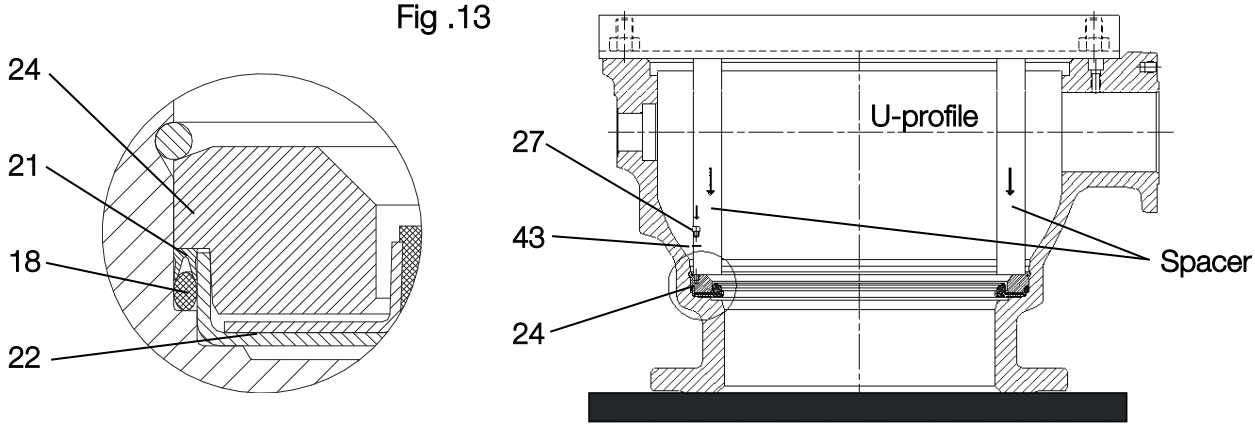
**O-Rings:** Silicon grease OKS 1110
**Other parts:** MOLYKOTE 55 M

In special cases, the lubricants designated in the course of the order must be utilized.
**e.g.:** Oxygen applications **Klüberalfa YV93-302**
Gas applications **Klüber Nontrop ZB91**
Sterile steam applications **Klüberalfa YV91**

### 12.2.2 Installation of the Sealing Element

- » Insert new sealing element (Pos. 22) **(all sealing elements are pre-assembled for immediate installation!)**
- » Mount sealing ring (Pos. 18) over the periphery of the sealing element and press down, place U-sleeve (Pos. 21) on top with closed side facing upwards – lightly squeeze open side and press into the nut
- » Insert back-up ring (Pos. 24) and lock with wire ring (open end of the wire ring in the vicinity of the trunnion). It must snap on into the ring nut – spread the open end in order to ensure firm seating. Should bringing the wire ring into position prove difficult, then it may be necessary to exert tension on the sealing element. Press down the back-up ring by means of two spacers and an U-profile, which is bolted down by means of 2 hex nuts.

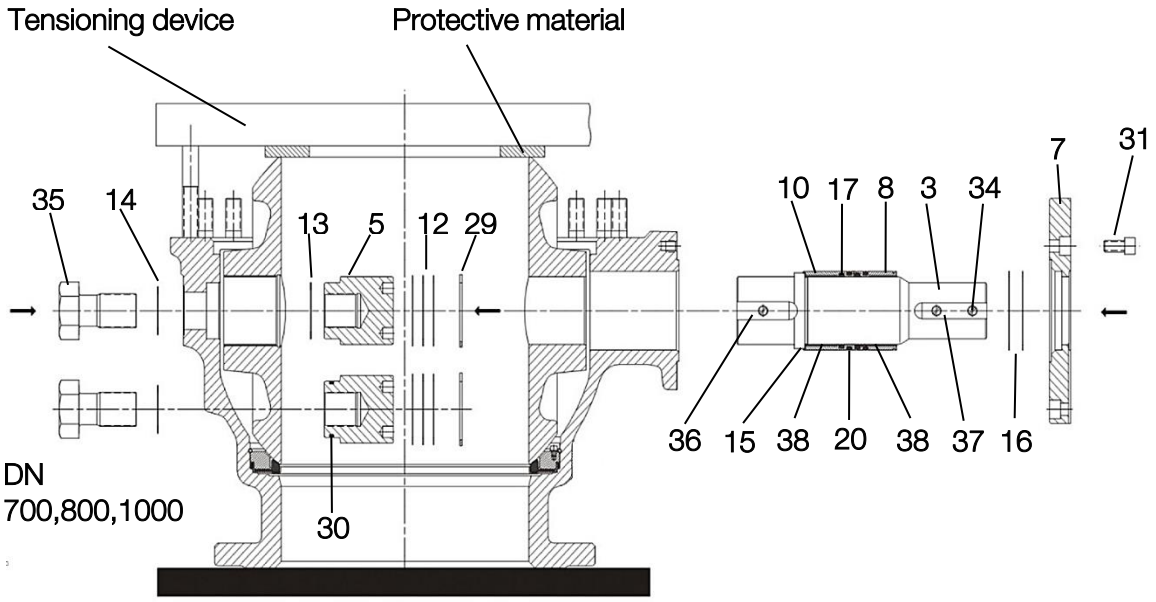
Fig .13




- » Screw fillister head screws (Pos. 27) with serrated washers (Pos. 43) firmly into the threaded holes of the back-up rings
- » Remove all assembly aids

### 12.2.3 Assembly of the Individual Parts

» Lift ball into body (hub with feather key nut on operating stem side) and place on sealing element
» Manually turn ball to the OPEN position
» Pre-assemble bush inserts (Pos. 8, 10) with all individual parts (Pos. 15, 17, 20, 38) on operating stem, place feather keys in existing hubs and bolt
» Insert operating stem with mounted parts on top flange side into body and ball until the flange rests on the ball hub. Install washer (Pos.16)
» Seat flange (Pos. 7) in the correct orientation and bolt to body on block (Pos. 31)
» Insert new degreased soft nickel gasket (Pos. 13) and the trunnion (Pos. 5) in the groove of the body
» As a result of pre-stressing the sealing element, it may be necessary to push the ball down in order to allow for trunnion insertion into the bore of the body. Push down with an aid device in order to align with receiving bores.




» Bolt hexagon head screw (Pos. 35) with degreased soft nickel gasket (Pos. 14)
» and tighten with pre-defined tensioning torque (Tab. 2) (if necessary, apply counter-pressure with two-pin wrench on interior side)
» Place washer (Pos. 12) in the same amount and at the same height as during disassembly on the trunnion and lock with circlip (Pos. 29), which must latch on in the pre-determined nut on the ball hub. The nominal ball sizes DN 125 and 150 do not feature a circlip – the ball centers itself in the sealing elements
» Function test
» Place end piece (Pos. 2) with sealing ring (Pos. 19) on the marked position of the body and allow to latch onto spigot
» Screw hex-nuts (Pos. 32) on projecting stud screws and tighten crosswise with defined torque (Tab.1)
» Installation of mounted elements (valve lever, gear box etc.)

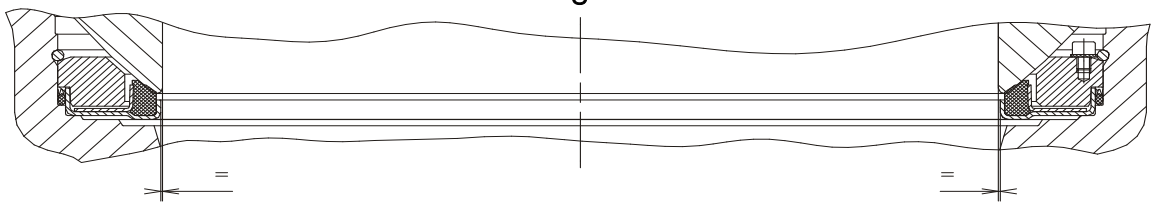
| | |
|---|---|
| ! CAUTION | Ball valve closes CLOCKWISE |

## 12.2.4 Inspection of Axial Orientation of the Ball

In the event that the ball is not correctly aligned in terms of its axial orientation or displays a too large axial freedom of movement, **(DN 200 – 400 max. 0.3 mm; DN 500 – 1000 max. 0.5 mm)**, then discs on the trunnion a) and cushion joints on the top flange b) have to be used to ensure placement in the center of the body.

The orientation is carried out in the OPEN position, either visually or by means of a measurement device, from the bore of the ball to the sealing element.

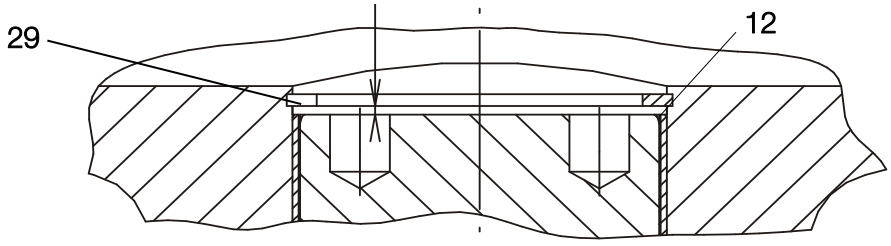
Fig. 15



a) **Discs (Pos. 12) on the trunnion**

- » The space between the trunnion and the lower edge of the circlip determines the number and height of the discs
- » Insert discs
- » Insert circlip (Pos. 29)
- » Push the ball, as far as possible, in the direction of the trunnion

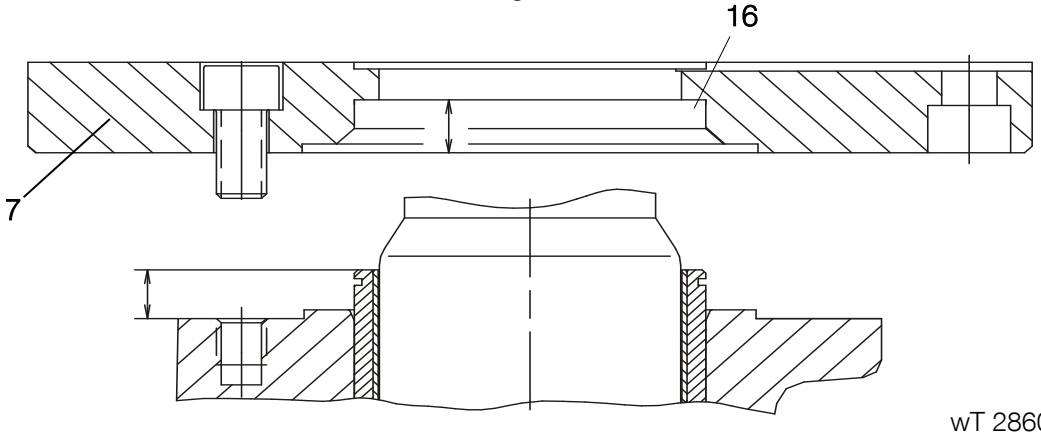
Fig. 16




b) **Cushion joints (Pos. 16) on the top flange**

- » Comparison of measurements: Projection of the bush insert over the body vs. groove depth of bush insert on flange
- » The measurement difference minus 0.3 or 0.5 (required axial freedom) provides the number and height of to be inserted cushion joints
- » Assembly of the top flange (Pos.7)

Fig. 17

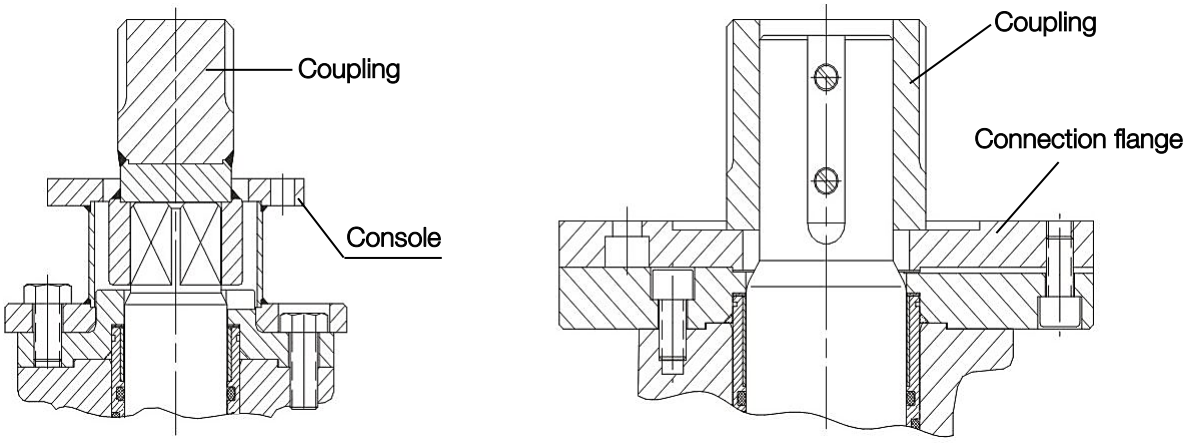


# 13 Actuator Mounting

Subsequent mounting of an actuator is possible at any given time and does not require disassembly of the valve. The actuator is to be executed with a torque in accordance with the nominal size. The values are to be defined with the manufacturer following a technical query (pressure, sealing material, media etc.). The couplings must be manufactured in accordance with the actuator size.

Connection flanges are designed and manufactured in accordance with ISO 5211 as a standard.

Fig. 18




DN 125 – 200 DN 250 – 1000

## 13.1 Fitting the Actuator

When fitting actuators, the requirements of the actuator manufacturer have to be mandatorily complied with. The manufacturer of the KLINGER Ballostar® KHI assumes no liability for damage resulting from improper actuator installation. In case of doubt, it is recommended to discuss every actuator installation with the manufacturer of the actuator and the valve. Installation work may only be carried out by qualified personnel.

- » Bring ball valve into the "OPEN" position.
- » Mount the coupling element
- » Attach the console to the ball valve (DN 150, DN 200) or mount the actuator flange on the gear box/actuator (DN 250-DN 1000)
- » Place the actuator in the correct positional arrangement and screw together. If necessary, bolt.
- » Set the end positions.
- » Function test.

| | |
|---|---|
| ! CAUTION | With regard to electrical actuators, it must be ensured that the end positions are limited by the path end switches and not by the torque end switches. |

| | |
|---|---|
| ! CAUTION | The valve is closed clockwise. It is to be ensured that the 90° movement is precisely complied with in its OPEN-CLOSED end positions. |

# 14 Spare Parts List

## Ball Valve Ballostar® DN 150/125

| Pos. | Pcs. | Individuals Parts Designation | Material | | | | Dimension |
|---|---|---|---|---|---|---|---|
| | | | VII | VIII | X | Xc | |
| 13 | 1 | Gasket | Soft nickel | | | | 35/43x1 |
| 14 | 1 | Gasket | Soft nickel | | | | 26/36x1 |
| 15 | 1 | Cushion Joint | KFC-25 | | | | 45/54x1 |
| 16 | 3 | Cushion Joint | K-Sil | | | | 46/58x0.3/0.5 |
| 17 | 2 | O-Ring | *) | | | | 43.82x5.33 |
| 18 | 2 | O-Ring | *) | | | | 164.7x3.53 |
| 19 | 1 | O-Ring / spiral wound gasket | **) | | | | 202.8x3.53 / 222.5x206x4.5 |
| 20 | 2 | O-Ring | *) | | | | 46.99x5.33 |
| 21 | 2 | U-Sleeve | KFC-25 | | | | 125 KLN 2416 |
| 22 | 2 | Sealing element | VIII/KFC | | X-KFC | | 125 KLN 2414/2 ***) |
| 38 | 2 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 45/50x20 |
| 39 | 1 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 50/55x30 |

## Ball Valve Ballostar® DN 150 & 200/150

| Pos. | Pcs. | Individuals Parts Designation | Material | | | | Dimension |
|---|---|---|---|---|---|---|---|
| | | | VII | VIII | X | Xc | |
| 13 | 1 | Gasket | Soft nickel | | | | 35/43x1 |
| 14 | 1 | Gasket | Soft nickel | | | | 26/36x1 |
| 15 | 1 | Cushion Joint | KFC-25 | | | | 45/54x1 |
| 16 | 3 | Cushion Joint | K-Sil | | | | 46/58x0.3/0.5 |
| 17 | 2 | O-Ring | *) | | | | 43.82x5.33 |
| 18 | 2 | O-Ring | *) | | | | 194.45x3.53 |
| 19 | 1 | O-Ring / spiral wound gasket | **) | | | | 234.55x3.53 / 259x242x4.5 |
| 20 | 2 | O-Ring | *) | | | | 46.99x5.33 |
| 21 | 2 | U-Sleeve | KFC-25 | | | | 150 KLN 2416 |
| 22 | 2 | Sealing element | VIII/KFC | | X-KFC | | 150 KLN 2414/2 ***) |
| 38 | 2 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 45/50x20 |
| 39 | 1 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 50/55x30 |

*) O-Ring compound in accordance with areas of utilization
**) Gasket in accordance with areas of utilization
***) Sealing elements available in special designs in accordance with specification

Subject to modification of design and dimensions.

## Ball Valve Ballostar® DN 200 & 250/200

| Pos. | Pcs. | Individuals Parts Designation | Material | | | | Dimension |
|---|---|---|---|---|---|---|---|
| | | | VII | VIII | X | Xc | |
| 13 | 1 | Gasket | Soft nickel | | | | 36/55x1 |
| 14 | 1 | Gasket | Soft nickel | | | | 35/46x1 |
| 15 | 1 | Cushion Joint | KFC-25 | | | | 60/70x1 |
| 16 | 3 | Cushion Joint | K-Sil | | | | 61/75x0.3/0.5 |
| 17 | 2 | O-Ring | *) | | | | 59.69x5.33 |
| 18 | 2 | O-Ring | *) | | | | 253.6x3.53 |
| 19 | 1 | O-Ring / Spiral wound gasket | **) | | | | 304.39x3.53 / 344.5x328x4.5 |
| 20 | 2 | O-Ring | *) | | | | 62.87x5.33 |
| 21 | 2 | U-Sleeve | KFC-25 | | | | 200 KLN 2416 |
| 22 | 2 | Sealing element | VIII/KFC | | X-KFC | | 200 KLN 2414/2 ***) |
| 38 | 2 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 60/65x28 |
| 39 | 1 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 60/65x44 |

## Ball Valve Ballostar® DN 250 & 300/250

| Pos. | Pcs. | Individuals Parts Designation | Material | | | | Dimension |
|---|---|---|---|---|---|---|---|
| | | | VII | VIII | X | Xc | |
| 13 | 1 | Gasket | Soft nickel | | | | 50/65x1 |
| 14 | 1 | Gasket | Soft nickel | | | | 36/55x1 |
| 15 | 1 | Cushion Joint | KFC-25 | | | | 70/80x1 |
| 16 | 3 | Cushion Joint | K-Sil | | | | 71/85x0.3/0.5 |
| 17 | 2 | O-Ring | *) | | | | 69.22x5.33 |
| 18 | 2 | O-Ring | *) | | | | 304.39x3.53 |
| 19 | 1 | O-Ring / Spiral wound gasket | **) | | | | 380.59x3.53 / 414.5x398x4.5 |
| 20 | 2 | O-Ring | *) | | | | 72.39x5.33 |
| 21 | 2 | U-Sleeve | KFC-25 | | | | 250 KLN 2416 |
| 22 | 2 | Sealing element | VIII/KFC | | X-KFC | | 250 KLN 2414/2 ***) |
| 38 | 2 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 70/75x40 |
| 39 | 1 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 70/75x50 |

*) O-Ring compound in accordance with areas of utilization
**) Gasket in accordance with areas of utilization
***) Sealing elements available in special designs in accordance with specification

Subject to modification of design and dimensions.

## Ball Valve Ballostar® DN 300 & 350/300

| Pos. | Pcs. | Individuals Parts Designation | Material | | | | Dimension |
|---|---|---|---|---|---|---|---|
| | | | VII | VIII | X | Xc | |
| 13 | 1 | Gasket | Soft nickel | | | | 50/65x1 |
| 14 | 1 | Gasket | Soft nickel | | | | 36/55x1 |
| 15 | 1 | Cushion Joint | KFC-25 | | | | 70/80x1 |
| 16 | 3 | Cushion Joint | K-Sil | | | | 71/85x0.3/0.5 |
| 17 | 2 | O-Ring | *) | | | | 69.22x5.33 |
| 18 | 2 | O-Ring | *) | | | | 354.97x5.33 |
| 19 | 1 | O-Ring / Spiral wound gasket | **) | | | | 456.06x3.53 / 486.5x470x4.5 |
| 20 | 2 | O-Ring | *) | | | | 72.39x5.33 |
| 21 | 2 | U-Sleeve | KFC-25 | | | | 300 KLN 2416 |
| 22 | 2 | Sealing element | VIII/KFC | | X-KFC | | 300 KLN 2414/2 ***) |
| 38 | 2 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 70/75x40 |
| 39 | 1 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 70/75x50 |

## Ball Valve Ballostar® DN 350 & 400/350

| Pos. | Pcs. | Individuals Parts Designation | Material | | | | Dimension |
|---|---|---|---|---|---|---|---|
| | | | VII | VIII | X | Xc | |
| 13 | 1 | Gasket | Soft nickel | | | | 61/85x1 |
| 14 | 1 | Gasket | Soft nickel | | | | 50/75x1 |
| 15 | 1 | Cushion Joint | KFC-25 | | | | 90/105x1 |
| 16 | 3 | Cushion Joint | K-Sil | | | | 91/110x0.3/0.5 |
| 17 | 2 | O-Ring | *) | | | | 91.44x5.33 |
| 18 | 2 | O-Ring | *) | | | | 430.65x5.33 |
| 19 | 1 | O-Ring / Spiral wound gasket | **) | | | | 532.18x5.33 / 564x538x7.2 |
| 20 | 2 | O-Ring | *) | | | | 97.79x5.33 |
| 21 | 2 | U-Sleeve | KFC-25 | | | | 350 KLN 2416 |
| 22 | 2 | Sealing element | VIII/KFC | | X-KFC | | 350 KLN 2414/2 ***) |
| 38 | 2 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 90/95x48 |
| 39 | 1 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 95/100x73 |

*) O-Ring compound in accordance with areas of utilization
**) Gasket in accordance with areas of utilization
***) Sealing elements available in special designs in accordance with specification

Subject to modification of design and dimensions.

## Ball Valve Ballostar® DN 400 & 500/400

| Pos. | Pcs. | Individuals Parts Designation | Material | | | | Dimension |
|---|---|---|---|---|---|---|---|
| | | | VII | VIII | X | Xc | |
| 13 | 1 | Gasket | Soft nickel | | | | 61/85x1 |
| 14 | 1 | Gasket | Soft nickel | | | | 50/75x1 |
| 15 | 1 | Cushion Joint | KFC-25 | | | | 90/105x1 |
| 16 | 3 | Cushion Joint | K-Sil | | | | 91/110x0.3/0.5 |
| 17 | 2 | O-Ring | *) | | | | 91.44x5.33 |
| 18 | 2 | O-Ring | *) | | | | 456.06x5.33 |
| 19 | 1 | O-Ring / Spiral wound gasket | **) | | | | 582.68x5.33 / 634x604x7.2 |
| 20 | 2 | O-Ring | *) | | | | 97.79x5.33 |
| 21 | 2 | U-Sleeve | KFC-25 | | | | 400 KLN 2416 |
| 22 | 2 | Sealing element | VIII/KFC | | X-KFC | | 400 KLN 2414/2 ***) |
| 38 | 2 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 90/95x48 |
| 39 | 1 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 95/100x73 |

## Ball Valve Ballostar® DN 500 & 600/500 & 450/500

| Pos. | Pcs. | Individuals Parts Designation | Material | | | | Dimension |
|---|---|---|---|---|---|---|---|
| | | | VII | VIII | X | Xc | |
| 13 | 1 | Gasket | Soft nickel | | | | 75/100x1 |
| 14 | 1 | Gasket | Soft nickel | | | | 61/85x1 |
| 15 | 1 | Cushion Joint | KFC-25 | | | | 120/135x1.5 |
| 16 | 3 | Cushion Joint | K-Sil | | | | 122/140x0.3/0.5 |
| 17 | 2 | O-Ring | *) | | | | 120.02x6.99 |
| 18 | 2 | O-Ring | *) | | | | 582.68x5.33 |
| 19 | 1 | O-Ring / Spiral wound gasket | **) | | | | 735x5.33 / 769x739x7.2 |
| 20 | 2 | O-Ring | *) | | | | 126.37x6.99 |
| 21 | 2 | U-Sleeve | KFC-25 | | | | 500 KLN 2416 |
| 22 | 2 | Sealing element | VIII/KFC | | X-KFC | | 500 KLN 2414/2 ***) |
| 38 | 2 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 120/125x60 |
| 39 | 1 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 120/125x100 |

*) O-Ring compound in accordance with areas of utilization
**) Gasket in accordance with areas of utilization
***) Sealing elements available in special designs in accordance with specification

Subject to modification of design and dimensions.

## Ball Valve Ballostar® DN 600 & 700/600

| Pos. | Pcs. | Individuals Parts Designation | Material | | | | Dimension |
|---|---|---|---|---|---|---|---|
| | | | VII | VIII | X | Xc | |
| 13 | 1 | Gasket | Soft nickel | | | | 75/100x1 |
| 14 | 1 | Gasket | Soft nickel | | | | 61/85x1 |
| 15 | 1 | Cushion Joint | KFC-25 | | | | 120/135x1.5 |
| 16 | 3 | Cushion Joint | K-Sil | | | | 122/140x0.3/0.5 |
| 17 | 2 | O-Ring | *) | | | | 120.02x6.99 |
| 18 | 2 | O-Ring | *) | | | | 690x5.33 |
| 19 | 1 | O-Ring / Spiral wound gasket | **) | | | | 890x5.33 / 929x894x7.2 |
| 20 | 2 | O-Ring | *) | | | | 126.37x6.99 |
| 21 | 2 | U-Sleeve | KFC-25 | | | | 600 KLN 2416 |
| 22 | 2 | Sealing element | VIII/KFC | | X-KFC | | 600 KLN 2414/2 ***) |
| 38 | 1 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 120/125x60 |
| 39 | 2 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 120/125x100 |

## Ball Valve Ballostar® DN 700 & 800/700

| Pos. | Pcs. | Individuals Parts Designation | Material | | | | Dimension |
|---|---|---|---|---|---|---|---|
| | | | VII | VIII | X | Xc | |
| 13 | 1 | Gasket | Soft nickel | | | | 90/130x1 |
| 14 | 1 | Gasket | 1.4401 | | | | 90/120x1 |
| 15 | 1 | Cushion Joint | KFC-25 | | | | 150/180x2 |
| 16 | 3 | Cushion Joint | K-Sil | | | | 151/190x0.3/0.5 |
| 17 | 2 | O-Ring | *) | | | | 151.77x6.99 |
| 18 | 2 | O-Ring | *) | | | | 815x7 |
| 19 | 1 | O-Ring / Spiral wound gasket | **) | | | | 1060x5.33 / 1099x1064x7.2 |
| 20 | 2 | O-Ring | *) | | | | 177.17x6.99 |
| 21 | 2 | U-Sleeve | KFC-25 | | | | 700 KLN 2416 |
| 22 | 2 | Sealing element | VIII/KFC | | X-KFC | | 700 KLN 2414/2 ***) |
| 30 | 1 | O-Ring | *) | | | | 120.02x5.33 |
| 39 | 5 | Bearing Bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 150/155x60 |

*) O-Ring compound in accordance with areas of utilization
**) Gasket in accordance with areas of utilization
***) Sealing elements available in special designs in accordance with specification

Subject to modification of design and dimensions.

## Ball Valve Ballostar® DN 800

| Pos. | Pcs. | Individuals Parts Designation | Material | | | | Dimension |
|---|---|---|---|---|---|---|---|
| | | | VII | VIII | X | Xc | |
| 13 | 1 | Gasket | Soft nickel | | | | 90/130x1 |
| 14 | 1 | Gasket | 1.4401 | | | | 90/120x1 |
| 15 | 1 | Cushion Joint | KFC-25 | | | | 150/180x2 |
| 16 | 3 | Cushion Joint | K-Sil | | | | 151/190x0.3/0.5 |
| 17 | 2 | O-Ring | *) | | | | 151.77x6.99 |
| 18 | 2 | O-Ring | *) | | | | 920x7 |
| 19 | 1 | O-Ring / Spiral wound gasket | **) | | | | 1220x5.33 / 1259x1225x7.2 |
| 20 | 2 | O-Ring | *) | | | | 177.17x6.99 |
| 21 | 2 | U-Sleeve | KFC-25 | | | | 800 KLN 2416 |
| 22 | 2 | Sealing element | VIII/KFC | | X-KFC | | 800 KLN 2414/2 ***) |
| 30 | 1 | O-Ring | *) | | | | 120.02x5.33 |
| 38 | 2 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 150/155x80 |
| 39 | 3 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 150/155x60 |

## Ball Valve Ballostar® DN 1000

| Pos. | Pcs. | Individuals Parts Designation | Material | | | | Dimension |
|---|---|---|---|---|---|---|---|
| | | | VII | VIII | X | Xc | |
| 13 | 1 | Gasket | Soft nickel | | | | 170x100x1 |
| 14 | 1 | Gasket | 1.4401 | | | | 130/100x1 |
| 15 | 1 | Cushion Joint | KFC-25 | | | | 220/190x2 |
| 16 | 5 | Cushion Joint | K-Sil | | | | 191/235x0.5 |
| 17 | 2 | O-Ring | *) | | | | 193.7x7 |
| 18 | 2 | O-Ring | *) | | | | 1122.99x6.92 |
| 19 | 1 | O-Ring / Spiral wound gasket | **) | | | | 1510x5.33 / 1510x1566x7.2 |
| 20 | 2 | O-Ring | *) | | | | 212x7 |
| 21 | 2 | U-Sleeve | KFC-25 | | | | 1000 KLN 2416 |
| 22 | 2 | Sealing element | VIII/KFC | | X-KFC | | 1000 KLN 2414/2 ***) |
| 30 | 1 | O-Ring | *) | | | | 158.12x5.33 |
| 39 | 5 | Bearing bush | St/Bz/Flon | AISI 316 L/PTFE 90 | | | 190x195x80 |

*) O-Ring compound in accordance with areas of utilization
**) Gasket in accordance with areas of utilization
***) Sealing elements available in special designs in accordance with specification

Subject to modification of design and dimensions.

# 15 Disposal

To the extent that other laws do not require a deviating treatment, the utilized materials should be separated in accordance with their properties and entered into the raw materials recycling process. The pre-requirement in this regard is that the raw materials have been correspondingly decontaminated on the order of the operator.