



**INSTALLATION, OPERATION AND  
MAINTENANCE MANUAL**  
Trunnion Design

**KROMBACH® TUFSEAT™  
Performance Series Ball Valves**

TUFSEAT by KROMBACH - THE SUPERIOR MSBV

**CRANE**  
®

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# Installation, Operation & Maintenance

## 1. General

### 1.1 Area of Application

This operating manual applies for ball valves produced by KROMBACH brand.

The operating manual also applies to identical valves from other companies if these valves were delivered through Krombach and the contract documents for the delivered valves expressly mention this operating manual. Before the valves are used, the manual must be read carefully and completely.

If there are any discrepancies or if anything is unclear, please contact KROMBACH.

### 1.2 Warning of Danger

#### **⚠ ATTENTION**

If the following caution and warning notes are not observed, this can lead to dangerous situations and the manufacturer's warranty could become ineffective. Please contact KROMBACH if you have any queries.

#### 1.2.1 Installation, Maintenance and Operating Personnel.

#### **⚠ ATTENTION**

To avoid endangering persons and equipment, expert staff must be used for fitting, maintenance and operation. (see DIN IEC 3/B/244/CDV)

#### 1.2.2 Carrying out fitting work on valves

#### **⚠ ATTENTION**

Fitting work on pressurized parts of the valve may only be carried out when the pipeline is depressurized. To prevent pressure and/or medium being trapped inside the ball valve, put the valve in the half-open position. The valve must have cooled down to ambient temperature before work is started.

#### **⚠ ATTENTION**

Fitting work on pressurized parts of valves for caustic or toxic flow media may only be carried out following additional emptying and bleeding of the valve and the respective pipeline.

#### **⚠ ATTENTION**

Caution! Valves have dead spaces where residue (under pressure) can remain after the flow medium has been emptied.

#### **⚠ ATTENTION**

The same safety requirements apply to valves as to the pipeline system they are built into and for the control system that is attached to the drive if appropriate. This manual only states the safety instructions that have to be heeded in addition for the valves.

#### **⚠ ATTENTION**

The safety instructions listed also apply to any heating sheath. The manufacturer's specifications are valid for attachment parts. The manufacturer's manuals contain additional safety instructions for the attached parts.

## 1.3 Product identification and marking

### 1.3.1 General Designation

The valve must be checked for correlation with the specification after delivery, by the customer and before installation in the system.

Standard-series valves produced by Krombach are marked by:

- FK Manufacturer's mark
- Nominal size (DN or NPS)
- Nominal pressure (PN or Class)
- Material designation for valve body and cover

### 1.3.2 Designation with type designation plate

Valves that have been designed and confirmed for special operating data have a name plate attached.

The name plate has the following marking:

- FK Manufacturer's mark
- (DN or NPS) Nominal diameter
- Maximum operating pressure at maximum operating temperature
- Model year
- Consignment figure and serial number

# Installation, Operation & Maintenance

## 1.3.3 CE Designation

Valves that are subject to CE marking are marked additionally by:

- CE mark
- Code of the issuing office

## 1.3.4 Valves for Oxygen

Valves for oxygen (O<sub>2</sub>) have additional markings:

- "Oil and grease-free, suitable for oxygen"

## 1.4 Condition on delivery, transport and storage

The valves are delivered with an outer coating, sealed with protective caps, and in an open position.

Valves made of stainless steel are not coated.

### ATTENTION

The valve must be stored dry in its original packaging and/or sealed with protective caps.

**Sealing surfaces and threads in particular must not be damaged mechanically or through any other factors.**

### ATTENTION

Valves for oxygen are delivered sealed in film. Shipping and storage must be carried out in such a way that the film does not become damaged. Only undamaged transport film guarantees freedom from oil and grease as packed after manufacture.

### ATTENTION

Lifting equipment must be fixed to the valve body. The coating, handwheel and accessory parts must not become damaged by the lifting equipment being hooked on.

Lifting equipment must not be hooked to handwheel or valve spindle. **ACCIDENT HAZARD! DAMAGE** to the product!

The valves should be stored in closed, dry rooms on a firm clean base.

## 2. Product

### 2.1. Proper Use

The valves have been designed exclusively for installation into a pipeline system to block off or guide through media.

### ATTENTION

A valve may not be used if its permissible pressure/temperature range (= "rating") is not sufficient for the operating conditions. The permitted values can be found on the valve name plate or the product data sheet. Special approval is required from KROMBACH for use of the valve outside these values.

**Disregarding this regulation can lead to danger to life and limbs and cause damage in the pipeline system.**

### ATTENTION

It must be guaranteed that the parts of the valve that come into contact with the media are made of materials suitable for the media used. KROMBACH will not accept liability for any damage caused by corrosion through aggressive media.

**Disregarding this regulation can lead to danger to life and limbs and cause damage in the pipeline system.**

### ATTENTION

For valves that are used as an end valve:  
During normal operation, in particular with gaseous, hot and/or hazardous media, **a blind flange or cap must be fitted to the open connection** or (only suitable for short-term use!) the valve must be safely locked in the "CLOSED" position.

### ATTENTION

If the valve has to be opened as an end valve in a pressurised line, this must be done extremely carefully so that the **medium sprayed** out does not cause any damage.

Be careful when closing such a valve: Danger of crushing between housing and ball!

### ATTENTION

If a valve has to be removed from a pipeline:  
Medium can escape from the pipeline or the valve. In the case of media that can be harmful to health or are hazardous, the pipeline has to be completely emptied before the valve is removed. Be careful of **residue that can flow out of dead spaces in the valve or the pipeline or have remained in the valve (under pressure).**

# Installation, Operation & Maintenance

## ⚠ ATTENTION

Make sure that valves that have been operated at operating temperatures of > 50°C or < 20°C and the pipeline connections cannot be touched by the operator, in order to protect the operator from injury.

- The usual flow speeds analogue to EN 593:2004 Table 2 must be observed during permanent operation in the pipeline system. Abnormal operating conditions such as vibrations, pressure surges, erosion, cavitation and more than small shares of solids in the medium – in particular abrasive solids – must be clarified with KROMBACH.
- Media to be conveyed may only have a very small share of solids that can damage or block the seal system.
- The use of abrasive media is not recommended.
- The valves should not be used for media that are prone to inner deposits.
- If a valve is to be used for throttling in permanent operation, this must be agreed when the order is placed.
- The application limits must always be agreed with KROMBACH for cavitation-free operation.

### 2.1.1 Method of Operation

- Ball valves are actuated using a hand lever. (Actuation through gear/drive see 2.7.5)
- A ball with cross-hole is used as a blocking fitting, which either releases or blocks the full medium flow through a swivel movement of 90°. The valve is closed by turning the hand lever to the right (clockwise). The valve is opened by turning the hand lever to the left (anti-clockwise). Respective instructions are on the hand lever itself.
- No torque-enhancing aids may be used to actuate the valve.

### 2.1.2 Design and technical data

The technical design of the valves corresponds to the enclosed documentation.

All the dimensions, materials, special versions, accessories and any further specifications can be found in the enclosed ORDER-RELATED DOCUMENTATION.

The images in the exploded views are only design examples.

## 2.2 Installation in the Pipeline

### 2.2.1 General Instructions

- Before installation in the pipeline, the valve must be checked to make sure that it matches the specification for the installation location
- Clean the valve of storage and transport dirt
- Remove the cap from the valve
- The connection pipeline and pipeline connection flanges must be parallel and the correct distance apart.
- When the system is being painted after valve installation, the stem must remain free of paint.
- When media are used at an operating temperature of under 0°C, the valve has to be dry before it is put into operation.
- Pipelines designed for steam to flow through them must be routed in such a way that condensation draining is possible and water hammers are excluded.
- If fittings are insulated, care must be taken that the stuffing box area remains accessible and controllable in the operating state.

### 2.2.2 Installation position and Direction

The ball valves can be installed in any position, but can be restricted by accessories (e.g. drives).

The normal installation position is to be preferred > stem vertically upright.

The installation position with the stem hanging downwards must be avoided because operating medium can spill over the hand lever if the stem seal is leaking.

If there is a danger of the valves freezing, only the normal installation position is permissible, and the valves must have a draining fitting in the central housing section. The mode of operation must guarantee that the valve does not become damaged by freezing medium.

## ⚠ ATTENTION

Uni-directional valves need to be installed in the preferred direction as indicated by the arrow on the tag of the valve.

# Installation, Operation & Maintenance

## ⚠ ATTENTION

Where liquid media with great strain on the body and cover under pressure. Heat expansion and temperature fluctuations are used in the system. Impermissibly high pressures can result, which place too great a strain on the body and cover under pressure. In such cases, the valve and the pipeline must be secured against impermissibly high pressure. The dead spaces in the valve must be secured separately by means of a pressure-relief bore hole or other measures.

## ⚠ ATTENTION

When the valve is installed in the pipeline, the arrow on the fitting must point in the pressure direction. Tightness in the opposite direction is not guaranteed.

### 2.2.3 Installation

- The valve has to be installed without tension in a clean pipeline.
- Before the valves are installed, check that the connection dimensions of the valve flanges or the welding end connectors match those of the pipeline.
- The flange seals must be centred.
- The fastening screws on the connection flanges must be tightened evenly and crosswise.
- Welded valves are to be welded in place without tension, taking technical rules into account. (Welding and any heat treatment that may be necessary takes place at the responsibility of the pipeline construction company).
- The valve may not serve as an anchor in the pipeline system; it must be carried by the pipeline.

### 2.3 Commissioning

- Before the valve is put into operation, check that the correct valve has been installed in installation position according to 2.3.2.
- Check the correct position of the valve in relation to the way the system works.
- All installation work must be completed correctly before operation is started.
- Check the valve for leaks during and after it has been put into operation by means of visual inspection.

## 2.4 Maintenance and Testing

### 2.4.1 Maintenance Interval

Depending on the type of system and operating data involved, the valve will need some maintenance.

The maintenance interval must be determined by the system owner-operator on the basis of his specific operational experience. In particular, air tightness and function must be checked regularly according to operational experience or legal regulations.

## ⚠ ATTENTION

**CAUTION!** Valves for the flow medium oxygen must not be allowed to come into contact with unsuitable materials, e.g. lubricants!

### 2.4.2 Testing Pressure

The testing pressure for recurring tests must not exceed the value of the testing pressure at the manufacturer's. This can be found in the valve's acceptance test certificates.

### 2.4.3 Stuffing Box on Ball Valves

- Check that the stuffing box is leakproof.
- If the stuffing box is not leakproof, tighten carefully until it is.
- Valve actuation must be guaranteed, however.
- If tightness cannot be achieved, the stuffing box packing must be replaced.

## ⚠ ATTENTION

The stuffing box packing may only be replaced when the instructions under section 1.2 + 2.8 of this operating manual are taken into account.

## ⚠ ATTENTION

The packing ring material must be resistant to the flow medium and be suitable for the respective operating data, operating pressure and operating temperature.

The special packaging instructions of the packing manufacturer must be taken into account for the different packing materials, or the valve manufacturer must be consulted if necessary.

# Installation, Operation & Maintenance

## 2.4.4 Body gaskets and packing

Check the sealing elements for tightness. If they are not leakproof, tighten with the valve depressurised. If tightness is not achieved, a new body gaskets and packing must be used.

### ⚠ ATTENTION

The sealing elements must be replaced with the valve depressurised, the requirements of section 1.2 + 2.8 of this operating manual must be met.

## 2.5 Faults and Fault Rectification

- Determine and define the type of problem.
- If the problem is caused by a heavy leak, the leak spot should be localised if possible.
- Inform KROMBACH. (See Warranty section 2.9)

## 2.6 Accessories

### 2.6.1 Final Position Switch

The installed final position switches must be connected according to the respective circuit diagram and checked for correct adjustment.

### 2.6.2 Locking Fixtures

To prevent the valve being actuated unintentionally, which could lead to danger, locking and catch fixtures are available from the manufacturer.

### 2.6.3 Special Accessories and Versions

Additional specifications must be heeded for valves with special accessories or for special versions.

### 2.6.4 Valves with Gear and/or Actuator

### ⚠ ATTENTION

Special mounting, maintenance and operating instructions from the manufacturer are valid for gears and/or drives!

Please contact KROMBACH if you have any queries.

### ⚠ ATTENTION

Ball valves with gear, electric/pneumatic setting drive are installed in the normal installation position: Stem vertically upright (drive at the top) in the pipeline.

This installation position must be observed!

**KROMBACH must be consulted if other installation positions are required!**

- The direction of rotation (clockwise = CLOSE; anti-clockwise = OPEN) remains the same whether the valve is actuated by means of the gear handwheel or the electric/pneumatic actuating drive!

### ⚠ ATTENTION

The connection of electric cables may only be carried out by specialised staff.

Applicable regulations, in particular VDE 0100 and VDE 0165 (explosion protection) must be heeded.

## 2.6.5 Retrofitting Actuators

### ⚠ ATTENTION

The very wide range of operating conditions and possible installation positions must be taken into consideration in particular when retrofitting drives.

**KROMBACH must always be consulted in such cases!**

## 2.7 Repairs

Repairs and service work on valves may only be carried out by the manufacturer or trained staff, see also section 1.2.

### 2.7.1 Repairs at the Manufacturer's

- Due to increased efforts to protect the environment and the health of our employees, we need to know from you which materials the ball valves to be repaired by our employees have been in contact with.
- Our service technicians may not do any work without this contamination declaration.
- To avoid unnecessary expenditure and delay for you and us, we require your contamination declaration together with the order and shipping papers in the event of repair or replacement work (form is attached or can be requested from us).

### 2.7.2 Repairs at the Operator's

If the valve cannot be repaired at the manufacturer's, this work should be carried out by a service fitter or by trained operator staff. Only original spare parts may be used for this.

# Installation, Operation & Maintenance

### 2.7.3 Repairs at the Operator's

A repair of balls and seat rings, by grinding and polishing, can be accomplished exclusively at the manufacturer. If this is not possible, new parts must be used from the manufacturer.

### 2.8 Warranty

The warranty for this product is regulated by the General Terms and conditions of Krombach and with the supply contract concluded.

- During the warranty period, the valve may only be removed or opened with the approval of KROMBACH or in the presence of a KROMBACH representative.

### 2.9 Declaration of responsibility for user safety

**NOTE - RESPONSIBILITY OF THE USER  
FAILURE OR IMPROPER SELECTION OR IMPROPER USE  
OF THE PRODUCTS OR RESPECTIVE PARTS DESCRIBED  
IN THIS MANUAL CAN CAUSE FATALITIES, INJURY OR  
PROPERTY DAMAGE.**

This document and other information from Krombach contain product or system options for further investigation by users with technical know-how.

The user is solely responsible for the final selection of system and components through examination and testing, and for making sure that all the capacity, durability, maintenance, safety and warning requirements of the application are met. The user has to examine all aspects of the application carefully, follow applicable industrial standards and heed the information related to the product in the current product catalogue as well as all other documents that are provided by Krombach.

As far as Krombach delivers components or system options based on technical data or specifications that have been provided by the user, the user is responsible for checking that these technical data and specifications are suitable and sufficient for all applications and reasonably predictable purposes of application of the systems.

### Trouble-Free Operation

The KROMBACH TUFSEAT Performance Series Ball Valves, applied within their pressure and temperature limitations, properly installed, adjusted, and operated, should require minimum attention supplying long-term, trouble-free

service in a wide variety of applications.

### READ CAREFULLY

The following procedures and illustrations have been prepared to assist you in the maintenance and repair of your Process Ball Valves. Please read these instructions carefully.

#### ATTENTION

### Read And Understand Instructions Before Servicing Valve

Failure to follow instructions could result in death or serious injury. If you have any questions, **please contact the factory at +1 (513) 745-6000 in the Americas and sales-lindau@cranecpe.com elsewhere.**

#### ATTENTION

These instructions have been prepared for valves as they are currently manufactured. If you have an older design valve that needs repair, contact either the factory or your nearest Service Center to make sure that you have the correct repair parts and instructions.

### Maintenance

All KROMBACH TUFSEAT Performance Series ball valves stem seals are adjusted and factory tested for tight shut-off, normally no further adjustment is necessary. If leakage should occur along the stem, follow the simple adjustment instructions below.

#### ATTENTION

Special applications may require no grease at all or require special types of grease. Please consult factory to get additional information.

### Note: Grease types

- 1) For seat and seat seal area surfaces in body and tail use weicon anti-seize nickel assembly paste
- 2) For bolts, nuts & screws use castrol optimal paste TA



# Torques

## Body joint bolting torques, Table-A

Table A (Body joint bolting torques)							
Valve Size		Pressure Class		Bolt QTY	Bolt size	Bolt Torque	
NPS	DN	Class	PN	(no's)	(inch)	(Nm)	(In-lbs)
8"	200	150	10-16	12	¾"-10 UNC	240	2124
8"	200	300	25-40	20	¾"-10 UNC	240	2124
10"	250	150	10-16	16	¾"-10 UNC	240	2124
10"	250	300	25-40	24	7/8"-9UNC	335	2964
12"	300	150	10-16	20	7/8"-9UNC	335	2964
12"	300	300	25-40	28	1"-8UNC	505	4470

## Cover bolting torques, Table B

Valve Size		Bolt Quantity	Bolt size	Bolt Torque	
NPS	DN	(no's)	(inch)	(Nm)	(In-lbs)
8"	200	6	3/8"-16UNC	28	248
10"	250	6	3/8"-16UNC	28	248
12"	300	6	3/8"-16UNC	28	248

## Axial force for pre-deforming body gasket, Table C

Valve Size & Pressure Class				Body Gasket
NPS	DN	Class	PN	F[kN]
8"	200	150-300	10-40	525
10"	250	150-300	10-40	801
12"	300	150-300	10-40	945



## Stem Seal Adjustment

**STEM SEAL ADJUSTMENT (Bolted packing gland) Sizes: 8"-12" Cl.150 & 300, DN200-300, PN10-40 (Type 9156, 9176)**

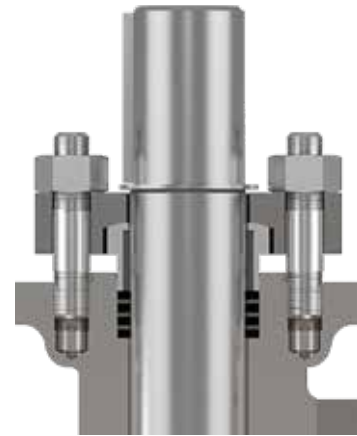
To adjust for leakage along the valve stem, turn the packing adjustment nuts (#23) (2pcs) clockwise, in approximately 1/3-turn increments to compress packing gland (#8) and packing (#13).

For final assembly, use torque values for Gland Nut from below Table D. For pre-compression values used during the assembly process, multiply the Gland Flange Stud-Nut Torques in Table D below by a factor of 1.4.

Note: If a tight seal cannot be obtained, continue with the instructions for valve repair.



**KFO9176: STANDARD TRIM**



**KFO9156: HIGH TEMPERATURE TRIM**

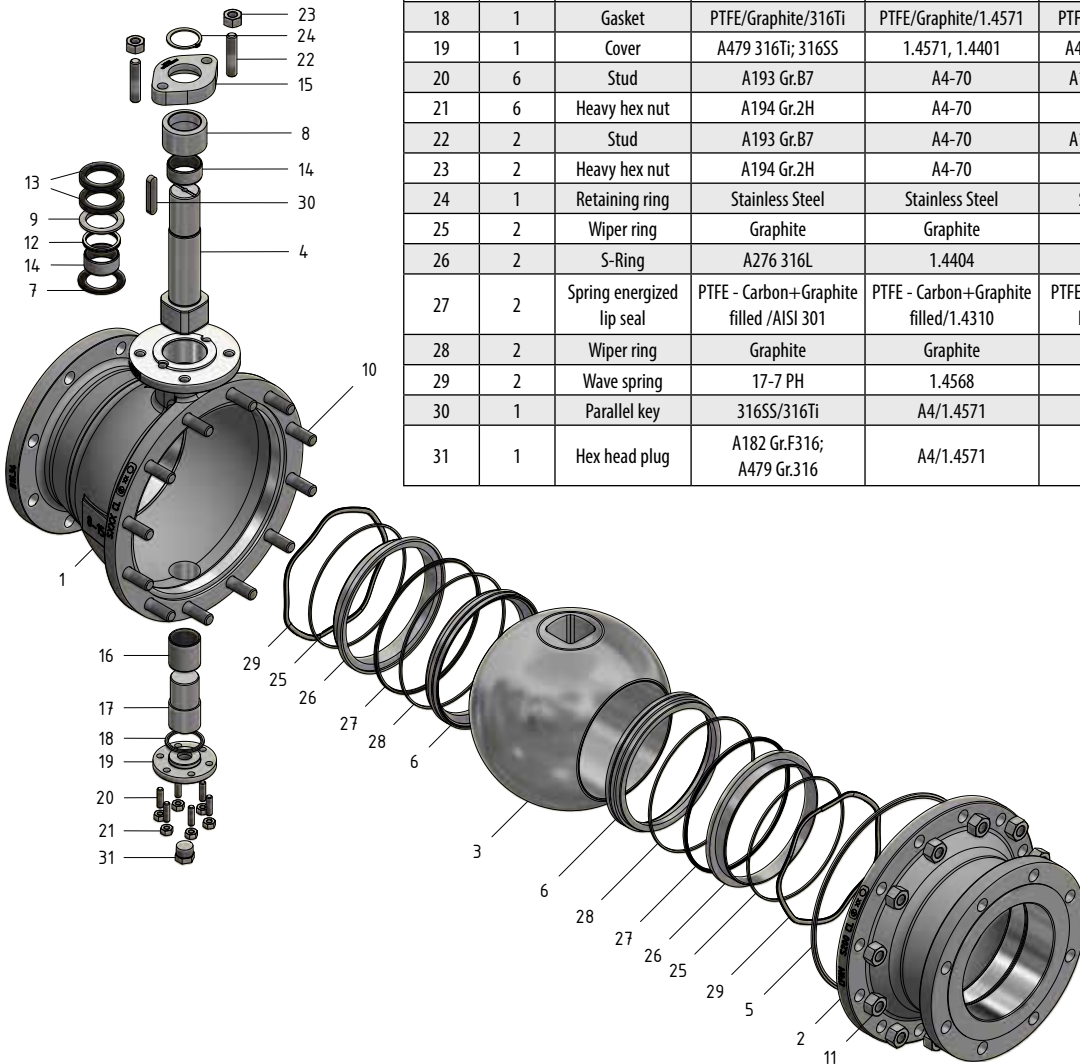
**Table D**

Valve Size		Pressure Class		Gland Flange Stud size	Quantity	Gland Flange Stud-Nut Torque			
						KFO9176		KFO9156	
NPS	DN	Class	PN	(inch)	(no's)	(Nm)	(in-lbs)	(Nm)	(in-lbs)
8"	200	150	10-16	5/8"	2	140	850	96	850
8"	200	300	25-40	1"	2	350	3098	350	3098
10"	250	150	10-16	5/8"	2	140	850	96	850
10"	250	300	25-40	1"	2	350	3098	350	3098
12"	300	150	10-16	1"	2	350	3098	350	3098
12"	300	300	25-40	1"	2	395	3496	395	3496

# Exploded View Trunnion design, Standard Trim

## Trunnion Design

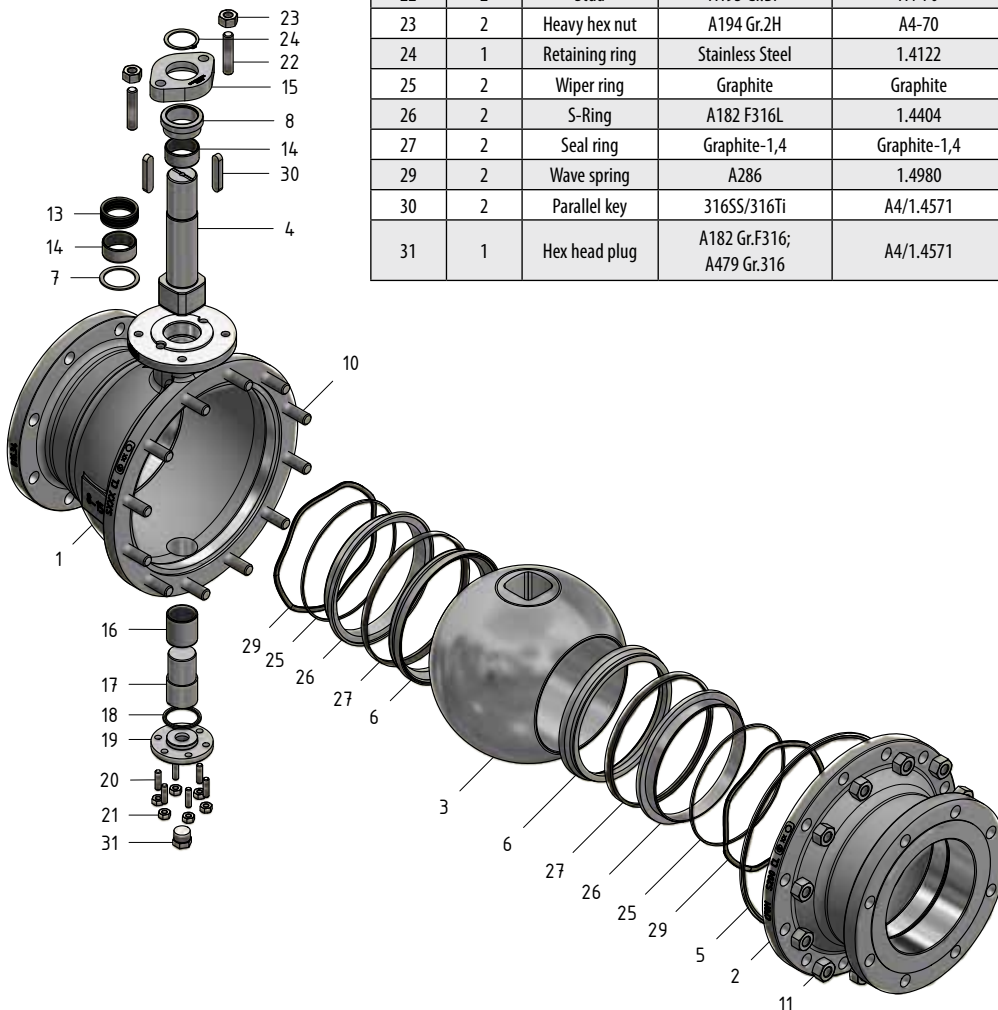
Item	Quantity	Description	Carbon Steel		Stainless Steel	
			ASTM	DIN	ASTM	DIN
1	1	Body	A216 WCB	1.0619	A351 CF8M	1.4408
2	1	Tail	A216 WCB	1.0619	A351 CF8M	1.4408
3	1	Ball	A351 CF8M+coating; A182 F316L+coating	1.4408+coating; 1.4404+coating	A351 CF8M+coating; A182 F316L+coating	1.4408+coating, 1.4404+coating
4	1	Stem	A276 Gr.431	1.4057	A276 Gr.431	1.4057
5	1	Body gasket	PTFE/Graphite/316Ti	PTFE/Graphite/1.4571	PTFE/Graphite/316Ti	PTFE/Graphite/1.4571
6	2	Seat	A182 F316L+coating	1.4404+coating	A182 F316L+coating	1.4404+coating
7	1	Stem seal	Inconel 625	Inconel 625	Inconel 625	Inconel 625
8	1	Gland	A582 303	1.4305	A582 303	1.4305
9	1	Support Ring	A479 316Ti; 316SS	1.4571; 1.4401	A479 316Ti; 316SS	1.4571; 1.4401
10	12	Stud	A193 Gr.B7	A4-70	A193 Gr.B8M Cl.2	A4-70
11	12	Heavy hex nut	A194 Gr.2H	A4-70	A194 Gr.8M	A4-70
12	1	Spring energized lip seal	PTFE - Carbon+Graphite filled/AISI 301	PTFE - Carbon+Graphite filled/1.4310	PTFE Carbon+Graphite Filled/AISI 301	PTFE - Carbon+Graphite filled/1.4310
13	1	Packing set	Graphite	Graphite	Graphite	Graphite
14	2	Sleeve bearing	316L+coating	1.4404+coating	316L+coating	1.4404+coating
15	1	Gland flange	A516 Gr.70	1.0425	A240 316Ti; 316SS	1.4571, 1.4401
16	1	Sleeve bearing	316L+coating	1.4404+coating	316L+coating	1.4404+coating
17	1	Bottom stem	A479 316Ti; 316SS	1.4571, 1.4401	A479 316Ti; 316SS	1.4571, 1.4401
18	1	Gasket	PTFE/Graphite/316Ti	PTFE/Graphite/1.4571	PTFE/Graphite/316Ti	PTFE/Graphite/1.4571
19	1	Cover	A479 316Ti; 316SS	1.4571, 1.4401	A479 316Ti; 316SS	1.4571, 1.4401
20	6	Stud	A193 Gr.B7	A4-70	A193 Gr.B8M Cl.2	A4-70
21	6	Heavy hex nut	A194 Gr.2H	A4-70	A194 Gr.8M	A4-70
22	2	Stud	A193 Gr.B7	A4-70	A193 Gr.B8M Cl.2	A4-70
23	2	Heavy hex nut	A194 Gr.2H	A4-70	A194 Gr.8M	A4-70
24	1	Retaining ring	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
25	2	Wiper ring	Graphite	Graphite	Graphite	Graphite
26	2	S-Ring	A276 316L	1.4404	A276 316L	1.4404
27	2	Spring energized lip seal	PTFE - Carbon+Graphite filled /AISI 301	PTFE - Carbon+Graphite filled/1.4310	PTFE Carbon+Graphite Filled/AISI 301	PTFE - Carbon+Graphite filled/1.4310
28	2	Wiper ring	Graphite	Graphite	Graphite	Graphite
29	2	Wave spring	17-7 PH	1.4568	17-7 PH	1.4568
30	1	Parallel key	316SS/316Ti	A4/1.4571	316ss/316Ti	A4/1.4571
31	1	Hex head plug	A182 Gr.F316; A479 Gr.316	A4/1.4571	A182 Gr.F316; A479 Gr.316	A4/1.4571



# Exploded View Trunnion design, High Temperature Trim

## Trunnion Design

Item	Quantity	Description	Carbon Steel		Stainless Steel	
			ASTM	DIN	ASTM	DIN
1	1	Body	A216 WCB	1.0619	A351 CF8M	1.4408
2	1	Tail	A216 WCB	1.0619	A351 CF8M	1.4408
3	1	Ball	A351 CF8M+coating; A182 F316L+coating	1.4408+coating; 1.4404+coating	A351 CF8M+coating; A182 F316L+coating	1.4408+coating; 1.4404+coating
4	1	Stem	A276 Gr.431	1.4057	A276 Gr.431	1.4057
5	1	Body gasket	PTFE/Graphite/316Ti	PTFE/Graphite/1.4571	PTFE/Graphite/316Ti	PTFE/Graphite/1.4571
6	2	Seat	A182 F316L+coating	1.4404+coating	A182 F316L+coating	1.4404+coating
7	1	Thrust washer	Inconel 625+coating	Inconel 625+coating	Inconel 625+coating	Inconel 625+coating
8	1	Gland	A582 Gr.303	1.4305	A582 Gr.303	1.4305
10	12	Stud	A193 Gr.B7	A4-70	A193 Gr.B8M Cl.2	A4-70
11	12	Heavy hex nut	A194 Gr.2H	A4-70	A194 Gr.8M	A4-70
13	1	Packing set	Graphite	Graphite	Graphite	Graphite
14	2	Sleeve bearing	Inconel 625+coating	Inconel 625+coating	Inconel 625+coating	Inconel 625+coating
15	1	Gland flange	A516 Gr.70	1.0425	A240 316Ti; 316SS	1.4571; 1.4401
16	1	Sleeve bearing	Inconel 625+coating	Inconel 625+coating	Inconel 625+coating	Inconel 625+coating
17	1	Bottom stem	A479 316Ti; 316SS	1.4571, 1.4401	A479 316Ti; 316SS	1.4571, 1.4401
18	1	Sealing	PTFE/Graphite/316Ti	PTFE/Graphite/1.4571	PTFE/Graphite/316Ti	PTFE/Graphite/1.4571
19	1	Cover	A479 316Ti; 316	1.4571; 1.4401	A479 316Ti; 316SS	1.4571; 1.4401
20	6	Stud	A193 Gr.B7	A4-70	A193 Gr.B8M Cl.2	A4-70
21	6	Heavy hex nut	A194 Gr.2H	A4-70	A194 Gr.8M	A4-70
22	2	Stud	A193 Gr.B7	A4-70	A193 Gr.B8M Cl.2	A4-70
23	2	Heavy hex nut	A194 Gr.2H	A4-70	A194 Gr.8M	A4-70
24	1	Retaining ring	Stainless Steel	1.4122	Stainless Steel	1.4122
25	2	Wiper ring	Graphite	Graphite	Graphite	Graphite
26	2	S-Ring	A182 F316L	1.4404	A276 316Ti, 316L	1.4571; 1.4404
27	2	Seal ring	Graphite-1,4	Graphite-1,4	Graphite-1,4	Graphite-1,4
29	2	Wave spring	A286	1.4980	A286	1.4980
30	2	Parallel key	316SS/316Ti	A4/1.4571	316SS/316Ti	A4/1.4571
31	1	Hex head plug	A182 Gr.F316; A479 Gr.316	A4/1.4571	A182 Gr.F316; A479 Gr.316	A4/1.4571



# Assembly and Disassembly Instructions

## DIS-ASSEMBLY

### ⚠ ATTENTION

If lifting tools (for example ropes) are necessary to carry the valve to the workshop the actuator should be free from heavy load and the valve and actuator must not be damaged.

### ⚠ ATTENTION

For shut-off valves with single-acting drives, the drive must be in the safety position for reasons of safety in order to exclude accidental switching during installation. Danger to safety!

1. Remove Operator from valve and then remove Parallel Keys (#30) from slots in stem (#4)
2. Separate the body halves (#1 Body & #2 Tail or Cover) by turning the body stud nuts (#11) counterclockwise and remove
3. Remove the body joint gasket (#5)
4. Remove Retainer Ring (#24) from stem (#4)
5. Remove the packing adjustment nuts (#23) by turning counter-clockwise and remove studs (#22) from the body (#1), remove Gland Flange (#15), Gland (#8) and Sleeve Bearing (#14) by lifting off from stem (#4)
6. Remove the Stem (#4) by pressing it down into the body cavity and through the ball.  
**Note:** Please ensure the removal of Parallel Keys (#30) from slots in stem (#4) before pushing Stem down
7. Remove the Packing (#13), Support Ring (#9) and Spring Energize Lip Seal (#12) from the body.
8. Remove the Hex Head Plug (#31) by turning counter-clockwise
9. Remove the bottom cover Nuts (#21) by turning counter-clockwise.
10. Remove the bottom Cover (#19)
11. Remove the bottom cover Gasket (#18)
12. Remove the Bottom Stem (#17).  
**Note:** using the 16 mm threaded hole in stem can be used to help remove the stem by threading a bolt into hole and using it to pull stem from body.
13. Rotate the ball (#3) to the closed position and remove it from the valve body.
14. Remove the Stem Seal (#7) and Sleeve Bearing (#14) from body (#1)
15. Remove the Seats (#6), Wiper Rings (#25 & #28), S-Ring (#26), Spring Energized Lip-seal (#27) and Wave Spring (#29) from the body (#1) and tail (#2)
16. Be careful, seat sealing surfaces should not be damage while removing it from Body (#1) & Tail (#2).

### ⚠ ATTENTION

Check the seat surface for any damage or dent marks. Replace body, if dent marks above 1mm are found.

## INSPECTION

1. Inspect the valve components for wear or damage.
2. Be sure to carefully inspect the following components for nicks, cracks, breaks, or other defects: • Valve Seat parts (#6,#25,#26,#27,#28,#29) • Ball (#3) • Stem (#4 & #17) • Spring Energized Lip Seal (#12) • Packing Rings (#13) • Sleeve Bearing (#14 & #16) (as shown in Exploded View)
3. The parts listed above, along with the Body Gasket (#5 & #18), are the only components that should require replacement. In addition, carefully inspect the Valve Body and Tail.
4. Inspect the seat pockets, stem bore, packing chamber and body joint gasket areas.
5. Clean all areas thoroughly to remove all signs of corrosion and media build-up.

## Assembly of KFO-9176 (Standard Trim, Trunnion Ball Valve)

### Assembly of KFO-9176 (Standard Trim, Trunnion Ball Valve)

When re-assembling valves, it is recommended that new seal components be used to minimize the chance of internal and external leakage. Seal/ repair kits are available containing new seals for repairing **KROMBACH TUFSEAT** Performance series Ball Valves. The components included in each kit are indicated on the exploded view.

The sealing surfaces on parts must be without surface imperfection & valve without dust or debris particles. Apply grease coating wherever required.

**Note:** Seal/ Repair kit includes: Body Gasket (#5), stem seal (#7), Spring energized lip seal (#12) (if applicable), Packing set (#13), Guide bushing (#14), Wiper rings (#25) (if applicable).

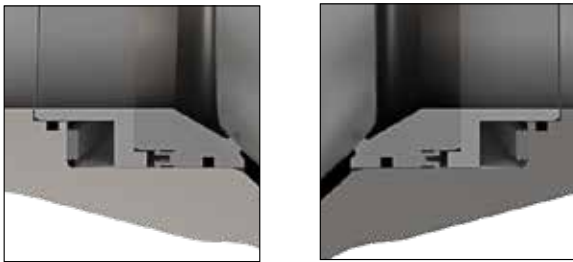


Figure 1a

1. Apply Castrol Optimal paste on short threaded part of the Studs (#10) and insert them into the Body tap holes. Then tighten the Studs.



2. Apply Anti-Seize Nickel paste to the Stem bearing (#14) and stem bearing area in the body and insert the bearing onto the bottom part of the stem chamber from inside the body. Use a rubber hammer to insert the bearing



3. Install Wiper rings (#25) into the Body (#1) and gently push them into the body grooves. Use a plastic tool for easier alignment.



4. Insert Wave Springs (#29) into seat pockets of Body (#1), See Fig. 1a



5. Insert S-Ring (#26) into Body (#1) over Wave spring (#29). Keep orientation of S-ring as shown in Fig. 1a





## Assembly of KFO-9176 (Standard Trim, Trunnion Ball Valve)

6. Slightly Grease the seat wall area with the Anti-Seize Nickel paste. Insert Lip-seal (#27) into the Body (#1) over S-ring (#26). Keep open face of Lip-seal (#27) towards S-ring (#26) as shown in Fig.1a



**Seat Assembly of KFO-9176 (Standard Trim Trunnion Ball Valve)** - (use Anti-Seize Nickel paste as needed)

7. Install Wiper ring (#28) into the groove of "A-Seat" (#6) and push them together into the Body (#1) over the Lip-seal (#27)



**Note:** Carefully press the seat assembly into Body until it slides over the Wiper rings (#25 & #28) and Wave spring (#29) is compressed. Apply grease coating on the seat sealing surface with Anti-Seize Nickel paste



8. Check the fit between the Stem (#4, #17) and the Ball (#3) to ensure an easy assembly afterwards

9. Grease the Thrust washer (#7) area of the stem chamber & insert thrust washer into the groove of Body (#1)



10. Install bottom Sleeve bearing (#16) into the ball's trunnion groove. For easier insertion, put the bearing on the Trunnion/ Bottom stem (#17)



11. Install Ball (#3) into the Body (#1) in the closed position, then rotate Ball (#3) to the open position (Careful not to turn the ball 180 degrees when opening and closing so that it stays as shown in the assembly drawing in accordance to ISO 5211)



## Assembly of KFO-9176 (Standard Trim, Trunnion Ball Valve)



Note: Use a Spirit Level to ensure horizontal position of the open ball

12. Inspect and thoroughly clean the stem. Then gently insert the Stem (#4) into the Ball (#3) (DO NOT PUSH IT THROUGH THE STEM CHAMBER)



13. Install Spiral Wound Body Gasket (#5) in the groove of the Body (#1)



14. Inspect and clean Seat area of the Tail or Cover (#2). Seat area should be without any surface imperfections. Install Wiper ring (#25) into the Tail (#2) and gently push them into the grooves. Use a plastic tool for easier alignment.



15. Insert Wave Springs (#29) into seat pockets of Tail (#2), See Fig. 1a



16. Insert S-Ring (#26) into Tail (#2) over Wave spring (#29). Keep orientation of S-ring as shown in Fig. 1a



17. Slightly Grease the seat wall area with the Anti-Seize Nickel paste. Insert Lip-seal (#27) into the Tail (#2) over S-ring (#26). Keep open face of Lip-seal (#27) towards S-ring (#26) as shown in Fig.1a



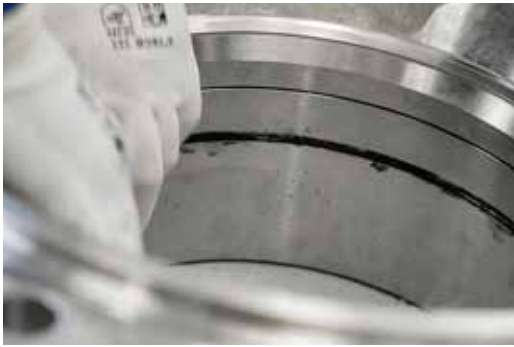


## Assembly of KFO-9176 (Standard Trim, Trunnion Ball Valve)

18. Install Wiper rings (#28) into the grooves of "B-Seat" (#6) and push them together into the Tail (#2) over the Lip-seal (#27)



Note: Carefully press the seat assembly into Tail pocket until slides over the Wiper rings (#25 & #28) and Wave spring (#29) is compressed. Apply grease coating on the seat sealing surface.



19. Place the Tail (#2) onto the Body (#1) (Use jib Crane for safer insertion) & apply Castrol Optimal paste on the Studs threads (#10)



20. Insert the hex head nuts (#11) on bolts and tighten them enough to align the ball



21. Pull the stem out, through the stem chamber. Use a sliding hammer.



# Packing Chamber Assembly of KFO-9176 (Standard Trim, Trunnion Ball Valve)

## Packing Chamber Assembly of KFO-9176 (Standard Trim, Trunnion Ball Valve)



Figure 2

22. Place the Spring Energized Lip Seal (#12) over the Stem (#4) with the open/spring side facing downward into the Body and Install the Support Ring (#9) over the Stem (#4) with the raised step facing downward (as shown in Fig. 2) and gently push both into position (below the packing chamber). (See Fig. 3a & 3b)



Figure 3a



Figure 3b

23. Install one number of 'Graphite packing ring (thick)' & 'Diffusion barrier ring (thin)' (#13) over the Stem (#4), as shown in Fig.2



24. Clean the Gland Follower (#8) and insert the Sleeve bearing (#14) in it (Use the press for easier insertion). Insert gland follower on the stem to push stem seals (#13) into stem chamber.



25. Grease short side of the Studs (#22) and insert them into the tap holes of Body (#1)



26. Insert Gland flange (#15) over the Stem (#4) & locate it between the Studs (#22)



27. Grease the Studs (#22) and insert the hex head nuts (#23) on them. Use a Torque wrench to tighten the nuts (#23) to the assembly pre-compression levels at 1.4 times the final assembly torques as indicated in Table D; tighten the nuts incrementally.



## Packing Chamber Assembly of KFO-9176 (Standard Trim, Trunnion Ball Valve)

28. Cycle the Stem (#4) in full five (5) times from open to closed and back, making sure that the ball goes back to the original assembly position where side "A" matches with seat "A" as per ISO 5211.



29. Remove the gland flange (#15) and gland (#8) with its Sleeve bearing (#14)

30. Repeat the process by installing another set of 'Graphite packing ring (thick)' & 'Diffusion barrier ring (thin) (#13) over the Stem (#4).

31. Insert Gland follower (#8) on the stem to push stem seals (#13) into stem chamber.

32. Insert Gland flange (#15) over the Stem (#4) & locate it between the Studs (#22)

33. Insert the hex head nuts (#23) on Studs (#22). Use a Torque wrench to tighten the nuts (#23) to the assembly pre-compression levels at 1.4 times the final assembly torques as indicated in Table D; tighten the nuts incrementally.



34. Cycle the Stem (#4) in full five (5) times from open to closed and back, making sure that the ball goes back to the original assembly position where side "A" matches with seat "A" as per ISO 5211.

35. Loosen the hex head nuts to decompress the packing.



36. Use a Torque wrench to tighten the nuts (#23) with the torque specified in the Table D. Compress the packing's to the operating compression; tighten the nuts incrementally.

37. Insert the Retaining ring (#24) on the stem groove (Use the retaining ring plier for easier insertion)



38. Apply Anti-Seize Nickel paste on the Trunnion/Bottom stem (#17) and Insert it through the bottom of the Body part (#1) into the bottom ball groove



39. Apply Castrol Optimal paste on short part of the Studs (#20) and insert them into the bottom Body tap holes (#1)





# Packing Chamber Assembly of KFO-9176 (Standard Trim, Trunnion Ball Valve)

40. Insert the bottom seal (#18) of body flange cover (#19)



41. Insert the bottom body flange cover (#19)



42. Grease the Studs (#20) and insert Hex Head Nuts (#21) on them. Use Torque Wrench to tighten the nuts. Use the torque value specified on the Table B



43. Grease the Hex head Plug (#31) and insert it in the tap hole of body flange cover (#19). Use Torque Wrench to tighten the Hex head Plug.



44. Press the valve with a press, and tighten the nuts (#11). Use the specified press compression as per Table C and nut torque values as per table A. When tightening in the crossing pattern (as per Fig. 4), cycle through the pattern at least three (3) times to assure proper and uniform torque.

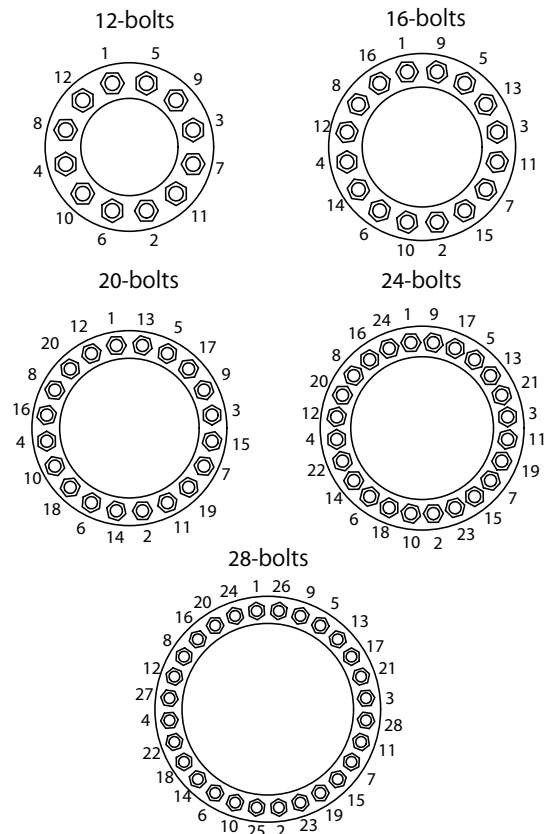


Figure 4

## Assembly of KFO-9156 (High Temperature Trim, Trunnion Ball Valve)

### Assembly of KFO-9156 (High Temperature Trim, Trunnion Ball Valve)

When re-assembling valves, it is recommended that new seal components be used to minimize the chance of internal and external leakage. Seal/ repair kits are available containing new seals for repairing **KROMBACH TUFSEAT** Performance series Ball Valves. The components included in each kit are indicated on the exploded view.

The sealing surfaces on parts must be without surface imperfection & valve without dust or debris particles. Apply grease coating wherever required.

Note- Seal/ Repair kit includes: Body Gasket (#5), stem seal (#7), Packing set (#13), Guide bushing (#14), Seat seal rings (#28), Wiper rings (#25) (if applicable).

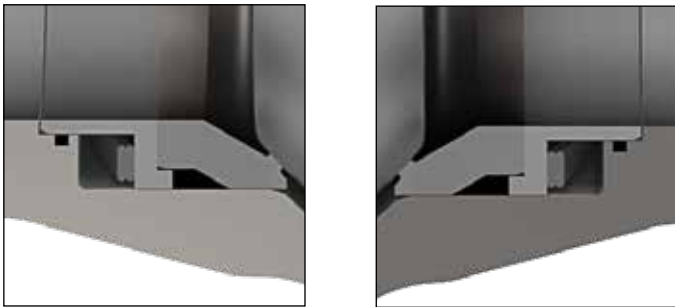


Figure 1b

1. Apply Castrol Optimal paste on short threaded part of the Studs (#10) and insert them into the Body tap holes. Then tighten the Studs.



2. Apply Anti-Seize Nickel paste to the Stem bearing (#14) and stem bearing area in the body and insert the bearing onto the bottom part of the stem chamber from inside the body. Use a rubber hammer to insert the bearing



3. Install Wiper ring (#25) into the Body (#1) and gently push it into the body grooves. Use a plastic tool for easier alignment.



4. Insert Wave Springs (#29) into seat pockets of Body (#1), See Fig. 1b



5. Insert S-Ring (#26) into Body (#1) over Wave spring (#29). Keep orientation of S-ring as shown in Fig. 1b



## Assembly of KFO-9156 (High Temperature Trim, Trunnion Ball Valve)

6. Slightly Grease the seat wall area and axial bearing contact area with the Anti-Seize Nickel paste.



**Seat Assembly of KFO-9156 (High Temperature Trim Trunnion Ball Valve)** - (Use Anti-Seize Nickel paste as needed)

7. Insert conical Seal ring (#27) on the "A-Seat" (#6). Insert "A-Seat" along with conical Seal ring into the Body (#1). Keep the flat face of conical Seal ring towards S-ring (#26) as shown in Fig.1b



Note: Carefully press the seat assembly into Body until it slides over the Wiper rings (#25) and Wave spring (#29) is compressed. Apply grease coating on the seat sealing surface.



8. Check the fit- between the Stem (#4, #17) and the Ball (#3) to ensure an easy assembly afterwards

9. Grease the Thrust washer (#7) area of the stem chamber & insert thrust washer into the groove of Body (#1)



10. Install bottom Sleeve bearing (#16) into the ball's trunnion groove. For easier insertion, put the bearing on the Trunnion/ Bottom stem (#17)



11. Install Ball (#3) into the Body (#1) in the closed position, then rotate Ball (#3) to the open position (Careful not to turn the ball 180 degrees when opening and closing so that it stays as shown in the assembly drawing in accordance to ISO 5211)





## Assembly of KFO-9156 (High Temperature Trim, Trunnion Ball Valve)



Note: Use a Spirit Level to ensure horizontal position of the open ball

12. Inspect and thoroughly clean the stem. Then gently insert the Stem (#4) into the Ball (#3) (DO NOT PUSH IT THROUGH THE STEM CHAMBER)



13. Install Spiral Wound Body Gasket (#5) in the groove of the Body (#1)



14. Inspect and clean Seat area of the Tail or Cover (#2). Seat area should be without any surface imperfections. Install Wiper ring (#25) into the Tail (#2) and gently push them into the grooves. Use a plastic tool for easier alignment.



15. Insert Wave Springs (#29) into seat pockets of Tail (#2), See Fig. 1b



16. Insert S-Ring (#26) into Tail (#2) over Wave spring (#29). Keep orientation of S-ring as shown in Fig. 1b



17. Slightly Grease the seat wall area and axial bearing contact area with the Anti-Seize Nickel paste.





## Assembly of KFO-9156 (High Temperature Trim, Trunnion Ball Valve)

18. Insert conical Seal ring (#27) on the "B-Seat" (#6). Insert "B-Seat" along with conical seal ring into the Tail (#2). Keep the flat face of conical seal ring towards S-ring (#26) as shown in Fig.1b



Note: Carefully press the seat assembly into Tail pocket until slides over the Wiper rings (#25 & #28) and Wave spring (#29) is compressed. Apply grease coating on the seat sealing surface.



19. Place the Tail (#2) onto the Body (#1) (Use jib Crane for safer insertion) & apply Castrol Optimal paste on the Studs threads (#10)



20. Insert the hex head nuts (#11) on bolts and tighten them enough to align the ball



21. Pull the stem out, through the stem chamber. Use a sliding hammer.



# Packing Chamber Assembly of KFO-9156 (High Temperature Trim, Trunnion Ball Valve)

## Packing Chamber Assembly of KFO-9156 (High Temperature Trim, Trunnion Ball Valve)

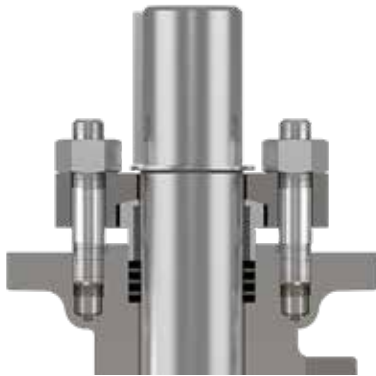


Figure 5

22. Install one number of 'Graphite packing ring (thick)' & 'Diffusion barrier ring (thin)' (#13) over the Stem (#4), as shown in Fig.5



23. Clean the Gland Follower (#8) and insert the Sleeve bearing (#14) in it (Use the press for easier insertion). Insert gland follower on the stem to push stem seals (#13) into stem chamber.



24. Grease short side of the Studs (#22) and insert them into the tap holes of Body (#1)



25. Insert Gland flange (#15) over the Stem (#4) & locate it between the Studs (#22)



26. Grease the Studs (#22) and insert the hex head nuts (#23) on them. Use a Torque wrench to tighten the nuts (#23) to the assembly pre-compression levels at 1.4 times the final assembly torques as indicated in Table D; tighten the nuts incrementally.



27. Cycle the Stem (#4) in full five (5) times from open to closed and back, making sure that the ball goes back to the original assembly position where side "A" matches with seat "A" as per ISO 5211.



## Packing Chamber Assembly of KFO-9156 (High Temperature Trim, Trunnion Ball Valve)

28. Remove the gland flange (#15) and gland (#8) with its Sleeve bearing (#14)

29. Repeat the process by installing another set of 'Graphite packing ring (thick)' & 'Diffusion barrier ring (thin)' (#13) over the Stem (#4)

30. Insert Gland follower (#8) on the stem to push stem seals (#13) into stem chamber.

31. Insert Gland flange (#15) over the Stem (#4) & locate it between the Studs (#22)

32. Insert the hex head nuts (#23) on Studs (#22). Use a Torque wrench to tighten the nuts (#23) to the assembly pre-compression levels at 1.4 times the final assembly torques as indicated in Table D; tighten the nuts incrementally.

33. Rotate the Stem (#4) 5 times  
NOTE: Always cycle in COUNTER-clock direction to open the ball, and in clock wise direction to close the ball.  
Cycle the Stem (#4) in full five (5) times from open to closed and back, making sure that the ball goes back to the original assembly position where side "A" matches with seat "A" as per ISO 5211.

34. Repeat steps 28, 29, 30, 31, 32 & 33 two more times to complete a stack of 8 packing rings; alternate 4 'Graphite packing rings (thick)' & 4 'Diffusion barrier rings (thin).

35. Loosen the hex head nuts to decompress the packing's.



36. Use a torque wrench to tighten the nuts (#23) with the torque specified in the Table D. Compress the packing's to the operating compression; tighten the nuts incrementally.

37. Insert the Retaining ring (#24) on the stem groove (Use the retaining ring plier for easier insertion)



38. Apply Anti-Seize Nickel paste on the Trunnion/Bottom stem (#17) and Insert it through the bottom of the Body part (#1) into the bottom ball groove



39. Apply Castrol Optimal paste on short part of the Studs (#20) and insert them into the bottom Body tap holes (#1)



40. Insert the bottom seal (#18) of body flange cover (#19)



41. Insert the bottom body flange cover (#19)



# Packing Chamber Assembly of KFO-9156 (High Temperature Trim, Trunnion Ball Valve)



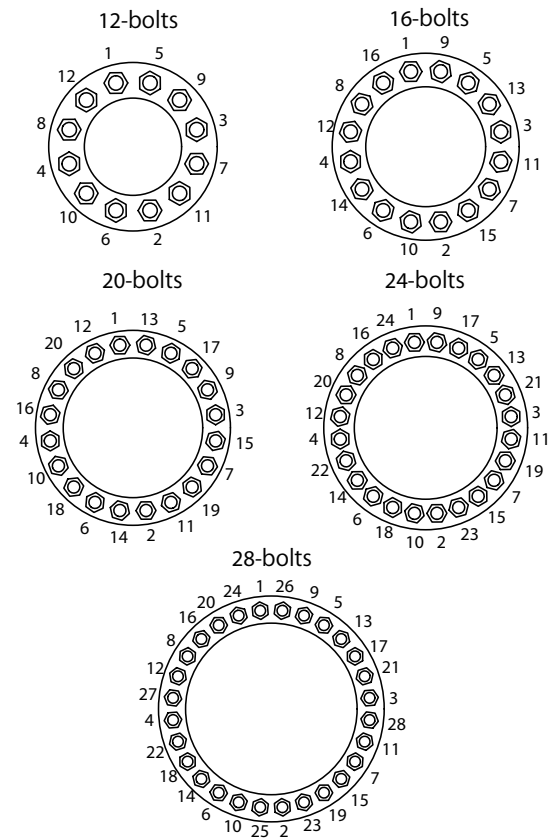
42. Grease the Studs (#20) and insert Hex Head Nuts (#21) on them. Use Torque Wrench to tighten the nuts. Use the torque value specified on the Table B



43. Grease the Hex head Plug (#31) and insert it in the tap hole of body flange cover (#19). Use Torque Wrench to tighten the Hex head Plug.



44. Press the valve with a press, and tighten the nuts (#11). Use the specified press compression as per Table C and nut torque values as per table A. When tightening in the crossing pattern (as per Fig. 4), cycle through the pattern at least three (3) times to assure proper and uniform torque.



**Figure 4**



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