Masoneilan

a Baker Hughes business

48000 Series

High Temperature High Pressure Globe Cage Valves

Instruction Manual (Rev.A)

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Safety Information

Important - Please read before installation

These instructions contain **DANGER**, **WARNING**, and **CAUTION** labels, where necessary, to alert you to safety related or other important information. Read the instructions carefully before installing and maintaining your control valve. **DANGER** and **WARNING** hazards are related to personal injury. **CAUTION** hazards involve equipment or property damage. Operation of damaged **equipment can, under certain operational conditions, result in degraded process system performance that can lead to injury or death. Total compliance with all DANGER**, **WARNING**, and **CAUTION** notices is required for safe operation.

This is the safety alert symbol. It alerts you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

CAUTION

When used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, could result in property damage.

Note: Indicates important facts and conditions.

About this Manual

- The information in this manual is subject to change without prior notice.
- The information contained in this manual, in whole or part, shall not be transcribed or copied without Baker Hughes's written permission.
- Please report any errors or questions about the information in this manual to your local supplier.
- These instructions are written specifically for the **Masoneilan™** 48000 Series Control Valve, and do not apply for other valves outside of this product line.

Life Period

The current estimated useful life period for the 48000 Series Control Valve is 25+ years. To maximize the useful life of the product, it is essential to conduct annual inspections, routine maintenance and ensure proper installation to avoid any unintended stresses on the product. The specific operating conditions will also impact the useful life of the product. Consult the factory for guidance on specific applications if required prior to installation.

Warranty

Items sold by Baker Hughes are warranted to be free from defects in materials and workmanship for a period of one year from the date of shipment provided said items are used according to Baker Hughes recommended usages. Baker Hughes reserves the right to discontinue manufacture of any product or change product materials, design or specifications without notice.

Note: Prior to installation

- The valve must be installed, put into service and maintained by qualified and competent professionals who have undergone suitable training.
- All surrounding pipe lines must be thoroughly flushed to ensure all entrained debris has been removed from the system.
- Under certain operating conditions, the use of damaged equipment could cause a degradation of the performance of the system which may lead to personal injury or death.
- Changes to specifications, structure, and components used may not lead to the revision of this manual unless such changes affect the function and performance of the product.

Numbering System

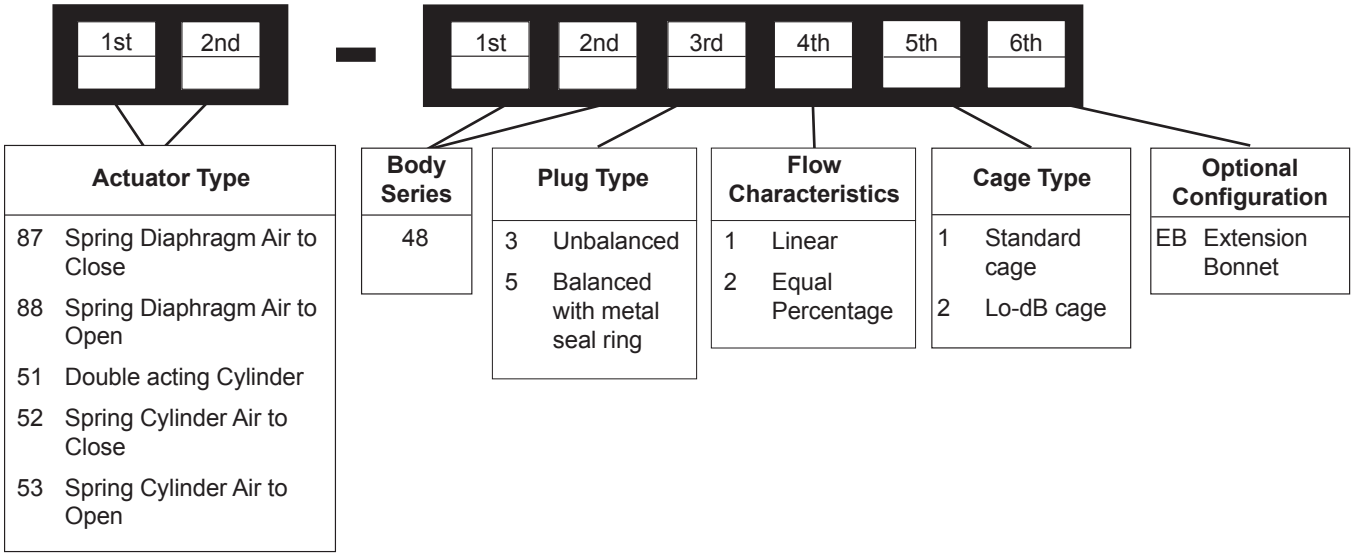


Figure 1 - Numbering System

1. Introduction

The following instructions should be thoroughly reviewed and understood prior to installing, operating or performing maintenance on this equipment. Throughout the text, safety and/or caution notes will appear and must be strictly adhered to, otherwise, serious injury or equipment malfunction could result.

Baker Hughes has a highly skilled After Sales Department available for start- up, maintenance and repair of our valves and component parts.

Arrangements for this service can be made through your local Baker Hughes's Masoneilan representative or sales department. When performing maintenance use only Masoneilan replacement parts. Parts are obtainable through your local representative or spare parts department. When ordering parts, always include model and Serial number of the unit being repaired.

2. General

These installation and maintenance instructions apply to all sizes and ratings of the 48000 Series control valves regardless of the type of trim used.

The 48000 Series control valves are designed especially for high temperature and nigh pressure steam services where the cages tend to be deformed due to high heat-cycle frequency or thermal stress by sudden changes of temperature.

Note that the 48000 Series would be well suited for vapors other than steam and gases.

The basic structure of the 48000 Series is of the hung cage type. The cage is hung and the seat ring is directly fixed to the valve body by screwing. This allows the cage to be less affected by heat to prevent leak from the seat ring gasket caused by heat cycles in the normal retainer structure and erosion of the gasket resulting from the leak.

A seat ring gasket is inserted between the body and the seat ring for sealing.

Three types of trims (plugs) are available : Single – seat contoured (Unbalanced contoured), Unbalanced and Balanced. For the balanced type plug, double seal ring structure is provided to reduce valve seat leakage.

3. Unpacking

Care must be exercised when unpacking the valve to prevent damage to the accessories and component parts. Should any problems arise, contact your local Baker Hughes's Masoneilan representative or sales department.

4. Installation

4.1 Before installing the valve in the line, clean piping and valve of all foreign material such as welding chips, scale, oil, grease or dirt. Gasket surfaces should be thoroughly cleaned to ensure leak-proof joints.

4.2 To allow for in-line inspection, maintenance or removal of the valve without service interruption, provide a manually operated stop valve on each side of the 48000 Series valve with a manually operated throttling valve mounted in the by-pass line (See Figure 2).

4.3 The valve must be installed so that the controlled substance will flow through the valve in the direction indicated by the flow arrow located on the body.

- *Lo-dB*™ cage design: flow-to-open
- Standard cage design: flow-to-close

4.4 For heat-insulated installation, do not insulate the valve bonnet. Take necessary protective measures relate to personal safety.

5. Air Piping

The actuators are designed to accept 1/4" NPT air supply piping. Use 1/4" OD tubing (4 x 6 mm) or equivalent for all air lines. If the supply air line exceeds 25 feet in length (7 meters) or if the valve is equipped with volume boosters, then 3/8" tubing (6 x 8 mm) is preferred. AII connections must be free of leaks.

⚠ CAUTION

Do not exceed supply pressure indicated on serial plate located on the yoke of the actuator.

6. Actuator Assembly

Assemble the actuator onto the control valve using the appropriate instructions for the specific actuator model and type. Connect air pressure lines to the actuator ports to meet intended operating mode (i.e., air-to-extend, air-to-retract, or double-acting).

7. Disassembly

⚠ CAUTION

Prior to performing maintenance on the valve, isolate the valve and vent the process pressure.

7.1 Valve actuation

Access to the internal components of the valve should be accomplished with the actuator removed. Follow the detailed instructions below and refer to the appropriate actuator instruction manuals.

⚠ WARNING

Actuator may be pre-loaded with tension from air pressure or springs. Prior to disconnecting instrumentation read all instructions for the specific actuator.

7.2 Disconnect Instrumentation

Disconnect all mechanical connections between the positioner and the other instruments. Disassemble the valve stem and actuator stem coupling as described in the following sections.

7.3 Air-to-Retract Actuators

Apply sufficient air pressure to the actuator to retract the stem completely. Disconnect the plug stem from the actuator stem depending on the connection type as described below.

Threaded Connection

Unscrew the plug stem from the actuator stem, making sure the plug never contacts the seating area at any time during disassembly.

⚠ CAUTION

Contact between the plug and seating area during this disassembly process may cause damage to the seating surfaces. It may be necessary to disassemble the actuator yoke from the valve bonnet and lifting the actuator off the valve to avoid plug to seating surface contact.

Stem Connector

Remove the screws and disassemble the stem connector from the valve and actuator stems.

7.4 Air-to-Extend Actuators

For this actuator configuration, the valve plug is already in the fully retracted position without any air pressure applied. Disconnect the plug stem and actuator stem as described in the threaded connection and stem connector sections above depending on the connection type.

7.5 Actuator Removal

Disconnect all electrical and air connections to and from the actuator. Disassemble yoke nut or yoke attachment screws, and lift the actuator off of the valve being careful not to damage the bonnet threads.

7.6 Valve disassembly

The valve must always be reassembled with new packing set and gaskets. Before disassembly, make sure the recommended spare parts are available for reassembly.

A. If there is a leak detector connection on the lateral NPT port of the bonnet, disconnect this piping as well.

B. Remove body stud nuts (19).

C. Remove packing flange nut (3), packing flange (4), and packing follower (5).

D. Remove bonnet (18).

⚠ CAUTION

Take care at this point, because the plug subassembly may come out together with the bonnet.

Note: Spiral wound body gaskets (9) are standard in the 48000 Series design and it is imperative that a new gasket be installed each time the valve is disassembled.

E. Lift up plug stem (1) and separate plug (15) from the valve.

⚠ CAUTION

Care must be taken to avoid damage to the plug and plug guide.

F. Remove body gasket (9) and lift out cage (16) by its lifting holes. If seal rings (10, 11) are hard to remove, place subassembly on a level base with rags or cardboard spread on top to avoid scratching the underside of the plug and cage. Then either use a press to push down plug stem or tap plug stem lightly with a wooden or plastic hammer. Inspect

the seal rings (10, 11) and replace them if worn. (48200 Unbalance Type valve is not provided with a seal ring.)

G. Remove body gasket (9).

H. Loosen seat ring retainer (13) with special tool and remove it. Because seat ring retainer (13) is provided with right-handed thread, loosen it by turning it firmly to the left.

I. Remove seat ring (12) and seat ring gasket (14).

J. Remove old packing (6) [and optional lantern ring (20) if a leak detection connection has been installed]. Refer to Figure 4.

K. All components may now be inspected for wear and service damage. After determining the maintenance required, proceed to the appropriate Section of this instruction manual.

8. Maintenance & repair

The purpose of this section is to provide recommended maintenance and repair procedures. These procedures assume the availability of standard shop tools and equipment.

8.1 Lapping Seats

Lapping is the process of working the valve plug against the seat ring with an abrasive to produce a close fit . If valve leakage is excessive, lapping becomes necessary. The plug and seat ring seating surfaces should be free of large scratches or other defects, and the contact surfaces of the seats should be as narrow as possible. This may require dressing both parts in a lathe. The seating surface angle of the balance plug is 32 degrees, the unbalance plug is 28 degrees and the seat ring is 30 degrees (relative to the centerline axis). A good grade of fine grinding compound is required for the lapping operation.

The compound should be mixed with a small quantity of lubricant such as graphite. This will slow the cutting rate and prevent tearing of the seating surfaces. The amount of lapping required depends on the materials, condition of seating surfaces, and accuracy of machining. If a short period of lapping does not visibly improve seating, there is usually no advantage in continuing as excessive lapping may result in rough seats. The only remedy is replacement or re-machining of one or both parts. When lapping new plugs and seat rings, begin with a medium fine (240grit) and finish with a finer grade (600grit).

Note: Lapping should produce a line contact area, not the entire surface, due to the difference in seat angles.

⚠ CAUTION

Before lapping, the plug and stem sub-assembly must be concentric. (See pinning operation, section 7.2).

1. Clean body gasket surface areas.
2. Ensure that seat ring gasket surface in the body bridge and the threads are thoroughly cleaned.

   Note: Anti-seize compound compatible with the process should be applied sparingly to the seat ring retainer threads and bottom surface.
3. Install seat ring and seat ring retainer, and tighten seat ring retainer by hand.

⚠ CAUTION

Do not tighten seat ring retainer to final torque specifications at this time. The seat ring and seat ring retainer is removed after lapping seats.

4. Insert the cage into the body.
5. Apply lapping compound on the plug at several spots equally spaced around the seating area.
6. Insert the stem and plug sub-assembly carefully into the cage until it is seated.
7. Place bonnet on the body and fasten the bonnet to the body using four body stud nuts spaced equally apart. Apply slight pressure and tighten evenly.

⚠ CAUTION

Do not tighten nuts to final torque specifications at this time. The bonnet is used temporarily for guiding purposes only.

8. Insert two or three pieces of packing (6) into the packing box to assist in guiding the stem and plug during lapping.
9. Screw a drilled and tapped rod with a T-handle onto the plug stem and secure with a locknut (see Figure 3).

   Note: As an alternative, drill a hole through a flat steel plate and fasten to the plug stem using two locknuts.
10. Apply slight pressure on the stem, and rotate the stem in short oscillating strokes (around 8 to 10 times). Repeat this step as necessary.

    Note: The plug should be lifted and turned 90° each time before repeating Step (10). This intermittent lifting is required to keep the plug and seat ring concentric during lapping.

⚠ CAUTION

Avoid over-lapping as this can cause damage to the seating surface rather than improve leakage performance.

11. After completion of the lapping operation, remove bonnet and internal parts. The seating area of the seat ring and the plug must be cleaned of all lapping compound in preparation for reassembly.

8.2 Plug Stem Pinning

Plug stem pinning in the field may be required for the following:

— Replacing existing plug and stem, or

— Replacing existing stem only

Replacing Plug and Stem

If it is necessary to replace the plug, then the plug stem must be replaced at the same time. The original pin hole in an existing stem will not provide the necessary fit, and might seriously impair the strength of the assembly.

Note: While pinning is being performed, care must be taken not to damage the seating surface or plug guide. Always use

a soft metal or plastic vice jaws with cylindrical features to hold the plug guide area (see Figure 6).

A. Screwing Stem to Plug

- Hold the plug (with vise jaw assembly) in a vise.
- Lubricate the plug stem thread and other contact surface with plug.
- Lock two nuts against each other on the end of the new plug stem, and screw the stem solidly into the plug using a wrench on the upper nut. When properly assembled, the shoulder of the plug stem should be contact with the top surface of the plug.

B. Drilling the new Parts

Drill the stem to the same diameter (Diameter B in Figure 6) as the plug shank hole.

C. Pinning the Plug-Stem assembly

Note: Staking type plug-stem pin is standard in the 48000 Series design and it is imperative that a new plug-stem pin be inserted into the drilled hole.

1. Apply a small amount of grease on the pin and hand assemble it into the hole in the plug.
2. Both ends of the pin must be expanded to outward by using the special staking tool shown in Figure6.
3. After the plug has been pinned, it should be placed in a lathe to ensure it is concentric with the stem.

   If the assembly is not running true, then the stem should be placed in a collet with the plug guide against it and the plug should be adjusted. Alignment of plug stem can be performed by means of a soft faced mallet.

Replacing existing Stem only

A. Removing existing Pin and Stem

1. Place the plug on a V-block and use a drift punch to drive out the old pin.

   Note: If it is necessary to drill out the pin, use a drill bit slightly smaller than the pin diameter.
2. Hold the plug guide in a vise.

   Note: While pinning is being performed, care must be taken not to damage the seating surface or plug guide. Always use a soft metal or plastic vice jaws with cylindrical features to hold the plug guide area (see Figure 6).
3. Lock one nut against another at the end of the plug stem.

   Using a wrench on the lower nut, unscrew the stem from the plug. The stem is removed by turning it counter-clockwise.

B. Screwing Stem to Plug

Refer to step B of the previous section on “REPLACING PLUG AND STEM”.

C. Drilling the new Stem

Place the plug on a V-block and use a suitable size drill bit to drill the stem (use the hole in the plug as a guide).

D. Pinning

Note: Staking type plug-stem pin is standard in the 48000 Series design and it is imperative that a new plug-stem pin be inserted into the drilled hole.

Ensure plug stem alignment following the pinning operation.

8.3 Packing Box (figures 5 and 7)

Packing box maintenance is one of the principle action items of routine servicing. Tightness of the packing is maintained by packing compression. Compression is achieved by evenly tightening the packing flange nuts (3) against the packing flange (4). Care must be taken not to over tighten as this could prevent smooth operation of the valve. If all compression is used up and the valve leaks, then new packing is required.

⚠ CAUTION

Valve must be isolated and the pressure vented before performing packing box maintenance.

Note: Flexible graphite packing rings replacement may require disconnecting the plug stem from the actuator stem and removal of the actuator if rings are not skive cut.

A. Remove actuator from the body S/A. Refer to 6.2 to 6.5 of the previous section.

B. Loosen and remove packing flange nuts (3).

C. Remove packing flange (4) and packing follower (5) from the plug stem.

D. By means of a hooked instrument, remove packing (6) ensuring not to damage the sealing surfaces of the packing box or plug stem.

Note: On valves equipped with an optional lubricator connection, the lantern ring (20) must also be removed to gain access to lower packing rings.

E. Replace new packing set (6); first assemble a back- up ring (Graphite Filament Yarn braided ring), then the flexible graphite rings (smooth rings), and finally another braided back-up ring (refer to Figure 5).

Note: Assemble and compress rings one at a time into packing box.

Note: On valves equipped with an optional lubricator connection, refer to Figure 6 for correct arrangement according to valve size.

F. Assemble packing follower (5) and packing flange (4).

G. Assemble and tighten packing stud nuts (3).

⚠ CAUTION

Do not over-tighten.

H. Proceed to appropriate instructions for actuator and valve assembly adjustment.

I. Place valve back in service and only tighten packing as necessary to stop external leakage.

9. Valve Body reassembly

After completion of the required maintenance, the valve should be reassembled using the following procedures:

Note: If any of the following steps were completed during maintenance, then proceed to the next step.

A. Clean all gasket mating surfaces.

Note: Spiral wound seat ring gasket (14) is standard in 48000 Series design. It is imperative that a new gasket be installed each time the valve is disassembled.

B. Install seat ring gasket (14) in the specified position.

C. Place seat ring (12) on top of the seat ring gasket.

D. Apply a small amount of anti-seize compound compatible with process to seat ring retainer (13) threads and bottom surface.

E. Install and screw seat ring retainer into the body by finger tight.

F. Tighten seat ring retainer with special tool and torque to the value given in Figure8.

Note: Spiral wound body gaskets (9) are standard in 48000 Series design. It is imperative that a new gasket be installed each time the valve is disassembled.

G. Install body gasket (9), and insert cage (16) into the valve body. Be sure to align the hacker of the seat ring retainer with the slot in the underside of the cage.

H. Install seal rings (10, 11) on plug (15). Open lightly the ring with precaution and slide them along the plug up to their seating. Their cutting must be diametrically opposed. (48200 Unbalance Type valve is not provided with a seal ring.)

I. Install plug (15) in the cage.

J. Install another body gasket (9) on the shoulder of the cage.

K. Assemble the bonnet (18) carefully along the plug stem.

L. Coat threads of body studs (19) and the contact surface between body nuts (7) and bonnet with anti-seize compound.

M. Tighten the body nuts crosswise and evenly.

N. Insert packing (6) [and lantern ring (20) on valve equipped with an optional lubricator connection]. Refer to Section 7.3 for proper packing assembly procedure for standard or optional designs.

O. Install packing follower (5) and packing flange (4).

P. Install packing flange stud nuts (3).

⚠ CAUTION

Do not over-tighten (See Section "8.3. Packing Box").

Q. If a leak detection connection was installed, connect it on the lateral NPT port in the bonnet. If not, ensure that the 1/4" NPT plug remained in place (Figure 4). Install packing flange stud nuts (3).

R. For actuator assembly and plug stem adjustment, proceed to the appropriate actuator instruction manual.

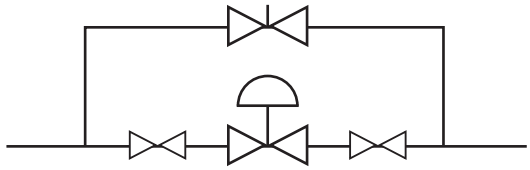


Figure 2 - Typical Installation

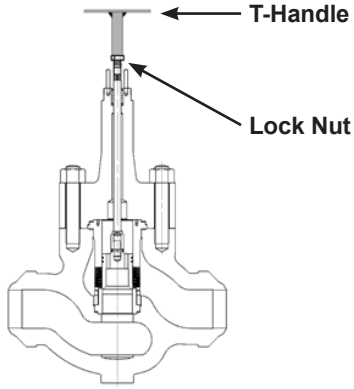


Figure 3 - Seat Lapping Device

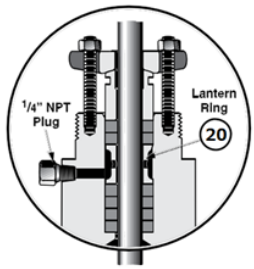


Figure 4 - Lubricator Connection (Optional)

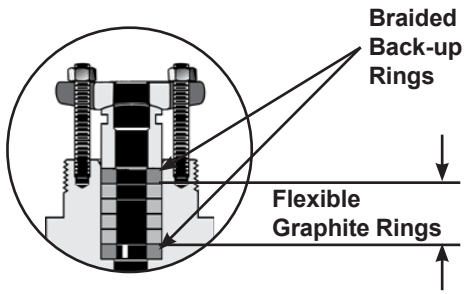
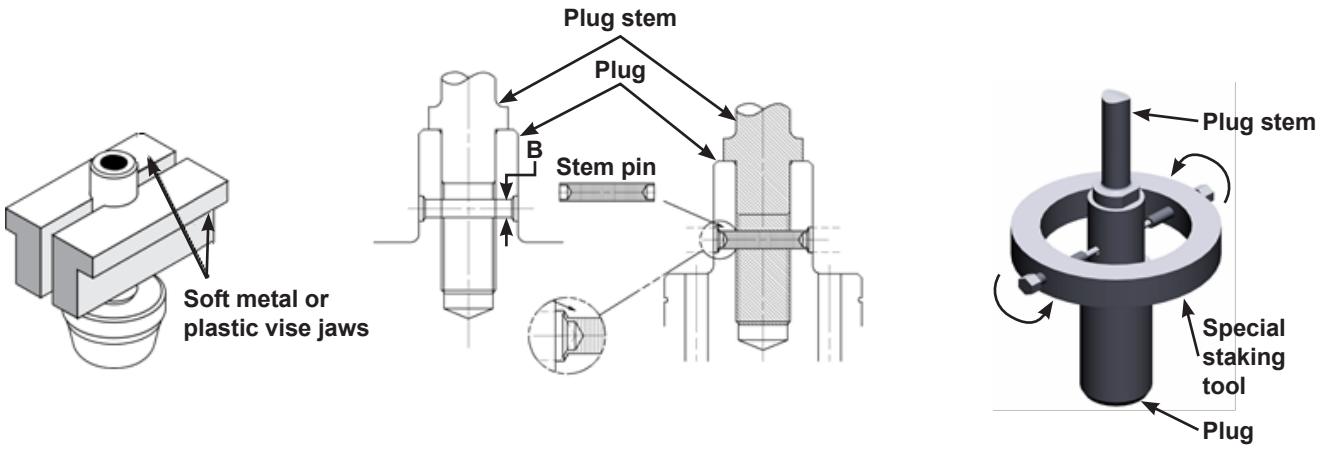
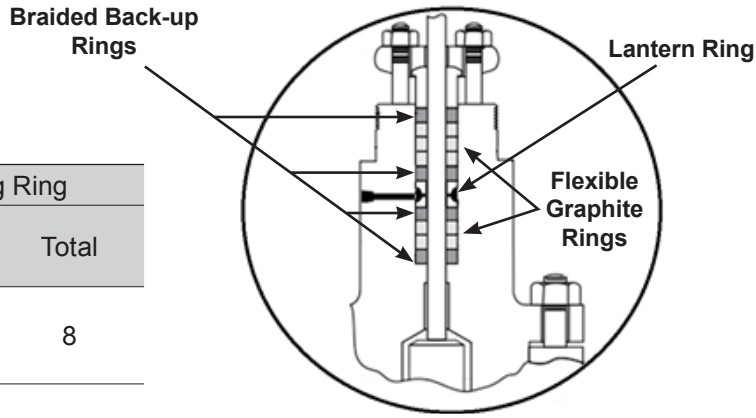


Figure 5 - flexible graphite arrangement



Plug stem Dia. "A"		Pin hole Dia. "B"	
in	mm	in	mm
1/2	12.70	.185	4.70
5/8	15.88	.216	5.50
3/4	19.05	.248	6.30
1	25.40	.311	7.90

Figure 6 - Plug Stem Pinning



Plug stem Dia.		Quantity of Packing Ring		
		Above	Below	
in	mm	Lantern ring		Total
1/2	12.70			8
5/8	15.88			9
3/4	19.05			9
1	25.40			9

Figure 7 - Packing ring arrangements with optional Lubricator Connection

Assembly Torque requirements

Valve Size		2"	3"	4"	6"
Seat ring retainer thread		3.00"-16UN	3.625"-16UN	5.0"-16+UN	6.5"-16UN
Torque	daN-m	150	250	560	1270
	ft-lbs	1110	1840	4130	9360

Figure 8 - Seat ring Tightening Torques

Body	Body stud Nuts		Torque	
Valve size (in)	Thread size	Number	daN-m	ft-lbs
2	1.5”-8 UN	6	212	1560
3	1.625”-8 UN	8	261	1920
4	1.875”-8 UN	8	372	2740
6	1.75”-8 UN	12	315	2320

Notes: 1. Do not exceed Maximum Torque values listed.

2. Tighten in increments until required torque levels are reached.

3. Reject assembly if metal-to-metal contact is not achieved after reaching Maximum Torque.

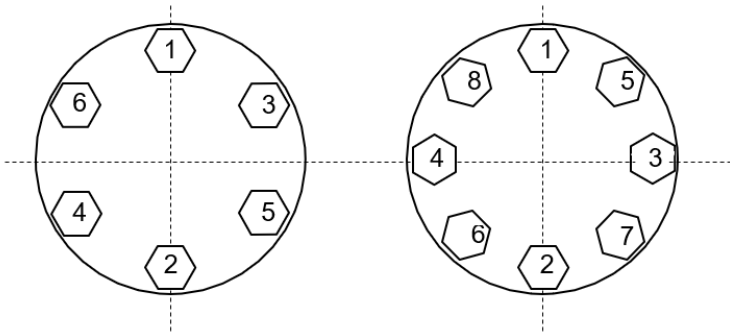


Figure 9 - Bolting Torques and Tightening Sequence

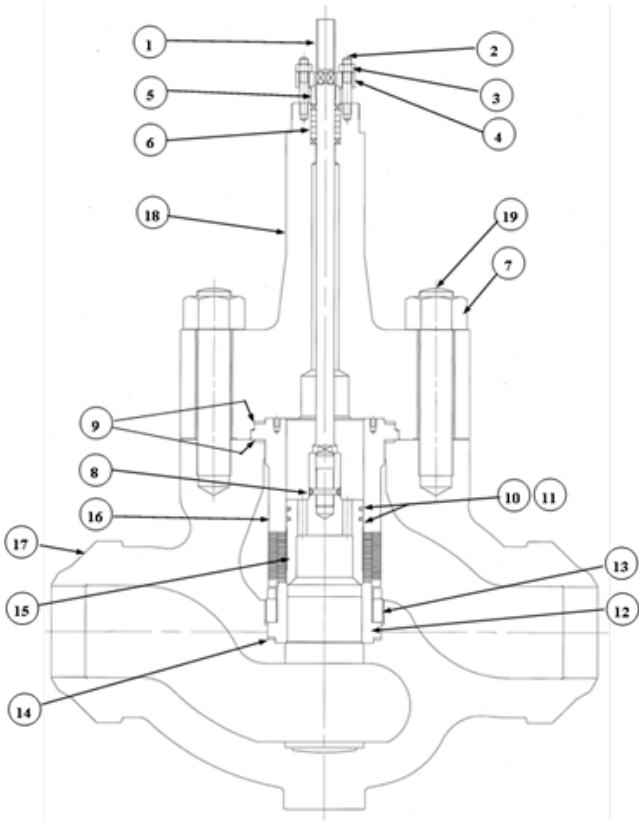


Figure 10
Balance Trim Design

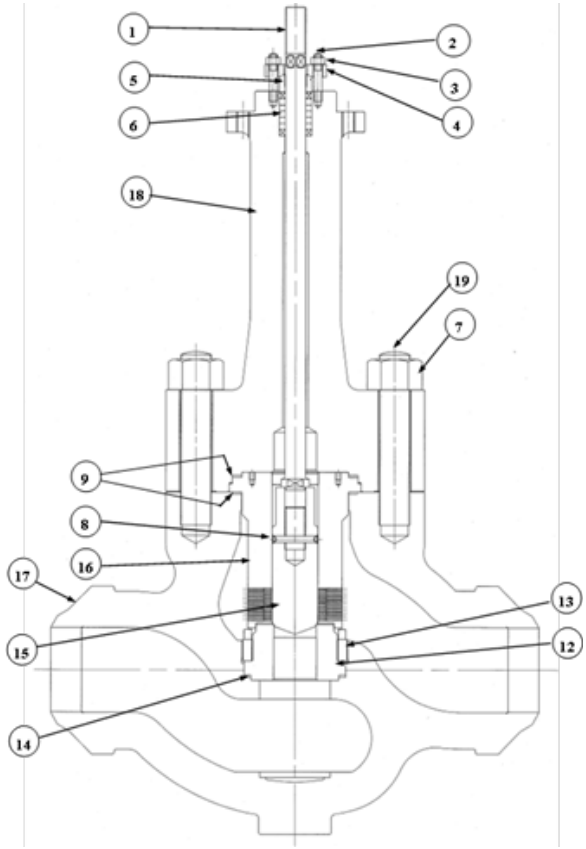


Figure 11
Unbalance Trim Design

Parts Reference

Ref.	Part Name	Ref.	Part Name	Ref.	Part Name
1 •	Plug Stem	9 •	Body Gasket	17	Body
2	Packing Flange Stud	10 •	External Seal Ring[1]	18	Bonnet
3	Packing Flange Stud Nut	11 •	Inner Seal Ring[1]	19	Body Stud
4	Packing Flange	12 •	Seat Ring	20	Lantern Ring (optional)
5	Packing Follower	13	Seat Ring Retainer		
6 •	Packing	14 •	Seat Ring Gasket		
7	Body Stud Nut	15 •	Plug		
8 •	Plug Stern Pin	16 •	Cage		

1. Only on Balance Trim

• Recommended spare parts

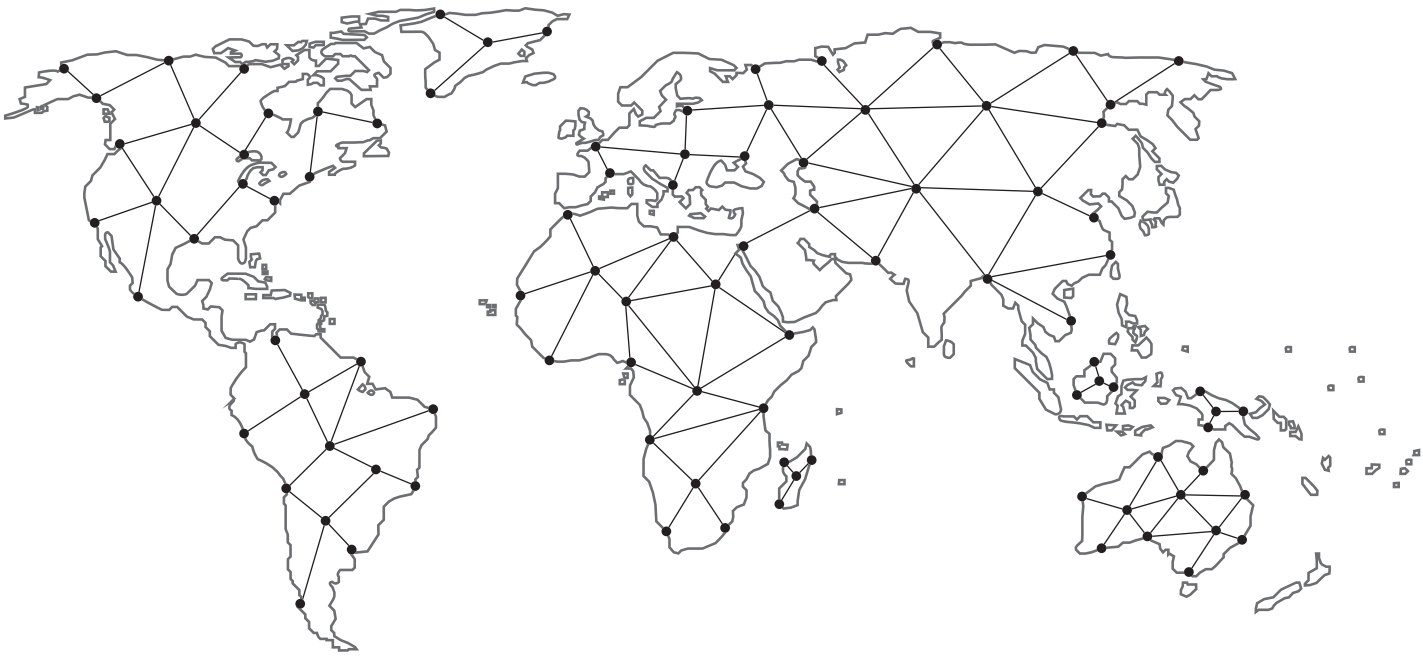
Notes

Notes

Notes

Find the nearest local Channel Partner in your area:

valves.bakerhughes.com/contact-us



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