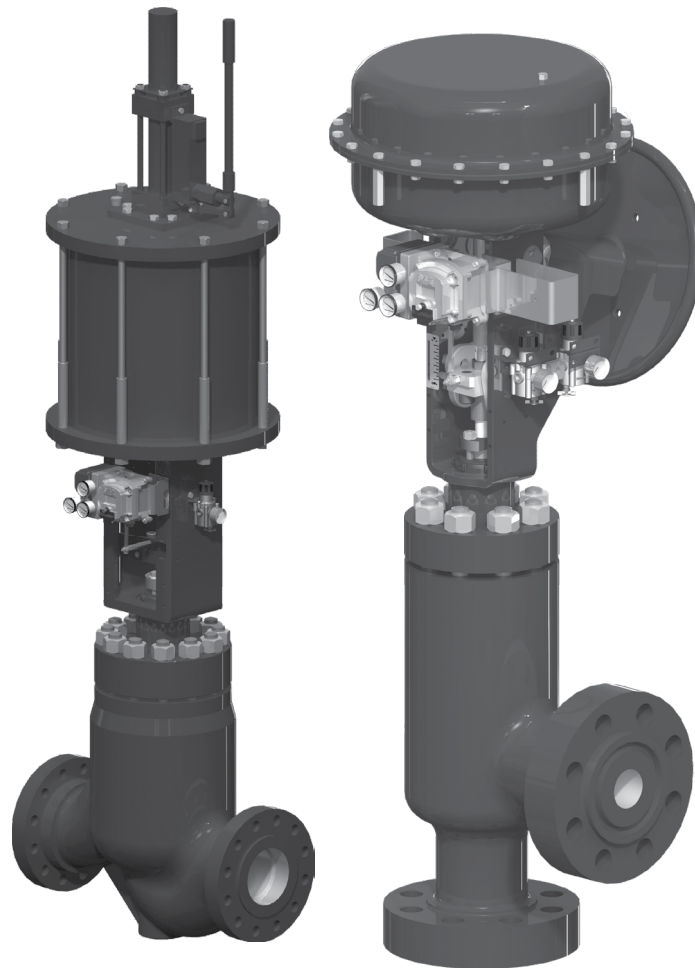


78400/18400 Series LincolnLog™

High Pressure Anti-Cavitation Control Valve

Instruction Manual (Rev. G)



THESE INSTRUCTIONS PROVIDE THE CUSTOMER/OPERATOR WITH IMPORTANT PROJECT-SPECIFIC REFERENCE INFORMATION IN ADDITION TO THE CUSTOMER/OPERATOR'S NORMAL OPERATION AND MAINTENANCE PROCEDURES. SINCE OPERATION AND MAINTENANCE PHILOSOPHIES VARY, BAKER HUGHES (AND ITS SUBSIDIARIES AND AFFILIATES) DOES NOT ATTEMPT TO DICTATE SPECIFIC PROCEDURES, BUT TO PROVIDE BASIC LIMITATIONS AND REQUIREMENTS CREATED BY THE TYPE OF EQUIPMENT PROVIDED.

THESE INSTRUCTIONS ASSUME THAT OPERATORS ALREADY HAVE A GENERAL UNDERSTANDING OF THE REQUIREMENTS FOR SAFE OPERATION OF MECHANICAL AND ELECTRICAL EQUIPMENT IN POTENTIALLY HAZARDOUS ENVIRONMENTS. THEREFORE, THESE INSTRUCTIONS SHOULD BE INTERPRETED AND APPLIED IN CONJUNCTION WITH THE SAFETY RULES AND REGULATIONS APPLICABLE AT THE SITE AND THE PARTICULAR REQUIREMENTS FOR OPERATION OF OTHER EQUIPMENT AT THE SITE.

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Table Of Contents

- Safety Information 1**
 - About this Manual 1
 - Warranty..... 1
- Introduction..... 3**
 - Scope 3
 - Serial Plate..... 3
 - After Sales Service..... 3
 - Spare Parts 3
 - Actuator and Accessories..... 3
- Numbering System..... 3**
- Unpacking 4**
- Installation..... 4**
 - Recommended Installation..... 4
 - Piping Cleanliness 4
 - Isolation Bypass Valve 4
 - Heat Insulation 4
 - Hydrostatic Testing and Line Cleaning..... 4
 - Flow Direction 4
 - Welded Connections 4
 - Actuator Assembly 4
- Disassembly..... 5**
 - Valve Actuation..... 5
 - Disconnect Instrumentation..... 5
 - Air-to-Retract Actuators 5
 - Air-to-Extend Actuators 5
 - Actuator Removal..... 5
 - Valve Disassembly 5

- Maintenance and Repair 6**
 - Packing Box 6
 - Packing Box Efficiency 7
 - Parts Repair 7
 - Guiding Surfaces 7
 - Seating Surfaces 7
 - Seat Lapping..... 8
 - Soft Seat Repair 8
 - Gaskets..... 8
 - Metal Seal..... 8
 - Valve Plug and Stem 9
 - Plug Removal 9
- Valve Reassembly 9**
 - Plug Stem Assembly 9
 - Valve Reassembly 9
- Parts References 11**
- Appendix for high pressure LincolnLog valves 78400/18400 API 6A Series 16**

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.



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



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



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



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 78400/18400 LincolnLog control valves, and do not apply for other valves outside of this product line.

Life Period

The current estimated useful life period for the 78400/18400 LincolnLog control valves 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.

WARNING

1. It is the end user's responsibility to ensure properly loaded and/or supported piping to avoid undesired stresses on the product which may result in damage to the product, loss of containment, or loss of functionality and resulting unsafe states or conditions.
2. It is the end user's responsibility to correctly identify end locations and place product in areas that may contain explosive atmospheres. The failure of properly following the test, installation, maintenance and/or disassembly/assembly instructions may result in a compromised product which in turn could result in an uncontrolled/unexpected loss of containment and release of pressure.
3. It is the end user's responsibility to take appropriate actions to ensure that site personnel who are performing installation, commissioning, and maintenance have been trained in proper site procedures for working with and around Baker Hughes supplied equipment, per Safe Site Work Practices.
4. The failure of properly following the test, installation, maintenance and disassembly/assembly instructions may result in a compromised product which in turn could result in an uncontrolled or unexpected loss of containment and release of pressure. It is the responsibility of the person conducting the tasks listed above to take great care in following such procedures.
5. It is the end user's responsibility to:
 - Recognize and safely contain any leak.
 - Ensure proper Personal Protective Equipment is available and used.
 - Follow Proper lifting techniques / equipment / procedures, per Safe Site Work Practices.
6. Proper Lockout/Tagout of energy sources prior to maintenance, per Safe Site Work Practices, is the end user's responsibility. This includes any potential control signals or circuits that may have a remote or automated control function over any product. Instructions to properly release spring stored energy is included in this manual.
7. After installation or maintenance, it is the end user's responsibility to ensure the equipment has been properly inspected and returned to proper condition before being returned to service.

Introduction

Scope

The following instructions are designed to guide the user through the installation and maintenance of the **Masoneilan™ 78400/18400 Series** control valves.

The Masoneilan 78400/18400 Series control valve is part of Masoneilan’s Engineered Product portfolio, and is custom designed to fit our customer’s most difficult applications. This document provides detailed installation and maintenance instructions for all sizes, ratings and trim types used in the LincolnLog product line.

Serial Plate

The serial plate is usually fixed to the side of the actuator yoke. It indicates information about the valve including size and type, pressure class rating, body/bonnet material, and serial number.

After Sales Service

Baker Hughes offers After Sales Service comprised of highly qualified technicians to support the installation operation, maintenance and repair of its Masoneilan equipment. For support, please contact the local Baker Hughes representative or Masoneilan factory located closest to you.

Spare Parts

Only Masoneilan replacement parts should be used when carrying out maintenance operations. Obtain replacement parts through local Baker Hughes representatives or Masoneilan Parts Department.

When ordering spare parts, the model and serial numbers indicated on the manufacturer’s serial plate must be given. Refer to Figure 1 for serial numbering system.

Actuator and Accessories

Actuators and other valve accessories have their own instruction manuals, that provide information and details on the assembly and installation. Refer to the appropriate instruction manual for each unique accessory.

Numbering System

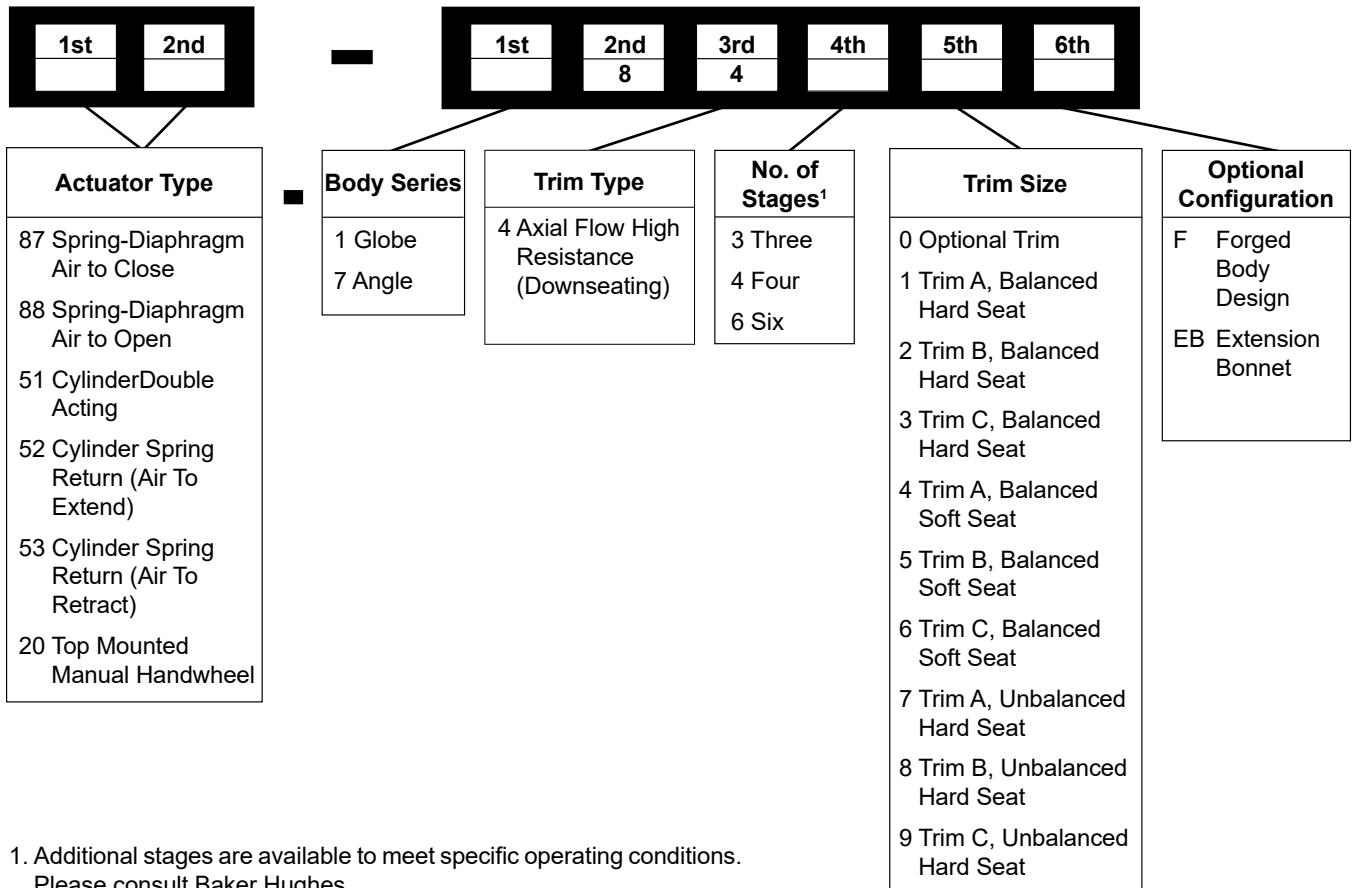


Figure 1: LincolnLog 78400/18400 Series Numbering System

Unpacking

Care must be exercised when unpacking the valve to prevent damage to the accessories and component parts. Contact the local Baker Hughes Sales Office or Service Center with any issues or problems. Be sure to note the Masoneilan valve model number and serial number in all correspondences.

Installation

CAUTION

The 78400/18400 Series valve must always be installed with the flow tending to open the valve plug. For applications where insulation of the valve body is required, do not insulate the valve bonnet.

Recommended Installation

It is recommended to install the 78400/18400 Series valves in the vertical position with the actuator extended up whenever possible. This orientation eliminates the need for additional pipe support, reduces the side load friction on the actuator, and provides ease of removal of the trim during maintenance for weld-end construction designs.

Piping Cleanliness

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 mating surfaces must be thoroughly cleaned to ensure leak-free joints. Sacrificial start-up fixtures can be purchased from Baker Hughes to protect the operational trim during the installation and line flushing phases.

WARNING

If major system or piping modifications (or repairs) are performed, thorough flushing and blowdown of the system will be required prior to reinstalling the LincolnLog trim. Sacrificial flushing trim should be installed in the valve to protect the integrity of the flow passages. Failure to follow this warning will violate the valve warranty agreement and could result in control instability, excessive noise levels, and valve leakage.

Isolation Bypass Valve

To allow for in-line inspection, maintenance and removal of the valve without service interruption, provide a manually operated shutoff valve on each side of the control valve and a manually operated throttling valve in the bypass line.

Heat Insulation

In case of a heat-insulated installation, do not insulate the valve bonnet and take protective measures relative to personal safety.

Hydrostatic Testing and Line Cleaning

During this operation, the control valve must not be used as an isolating valve. This means that the valve must always be opened before carrying out pressure tests in the process line, cleaning of pipes, etc. Otherwise equipment damage or failure of the seal rings could result. If the valve is to remain installed during line cleaning, flushing trim must be installed to prevent damage to trim components.

Flow Direction

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

Welded Connections

CAUTION

Carefully review the information in this section prior to welding any valves inline. Refer any additional questions to the local Baker Hughes Sales Office or Service Center.

Pre-Weld Preparation

Carefully follow the installation steps defined in the sections noted above prior to performing weld procedures.

Welding Process

Perform welding process in accordance with the standard requirements for the materials and weld construction of the specific valve. Apply post weld heat treatment if required.

CAUTION

Internal valve components should be removed prior to performing welding or pre/post weld heat treatment in order to prevent damaging any soft goods (such as PTFE seals). If unable to remove the elastomeric components, then other methods must be employed to prevent the local temperature around the seals from exceeding the maximum material limits (typically 450°F / 232°C for PTFE-based materials).

Post Weld Cleaning and Assembly

Inspect the body, bonnet, and trim components for cleanliness and surface condition. Remove any foreign materials, such as weld chips, slag or scale. Make sure there are no nicks, scratches, burrs or sharp corners on sealing and sliding surfaces. Clean all gasket interface surfaces and reassemble using new gaskets to ensure sealing integrity.

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).

Disassembly

CAUTION

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

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.

CAUTION

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

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.

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 (liner or seat ring) 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.

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.

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.

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. All numbered parts listed in the following instructions can be referenced in Table 3 and Figures 9, 10, 10A, 11, 11A, 12, and 12A.

1. Disconnect the piping to the leak detector connection on the bonnet (if applicable).
2. Remove the body stud nuts (7).

Note: For valve sizes 1" through 2", the bonnet (23) is a one-piece construction. Valve sizes 3" and larger have a bonnet (23) with a separate bonnet flange (24). These larger sizes also use a metal seal (10) and multiple seat ring gaskets (11) at various locations.

For valve sizes 1" through 2" follow disassembly instructions 3-10:

3. Disassemble the bonnet (23) and plug (20) / stem (21) subassembly from the valve body as a single unit.
4. Remove the packing flange nuts (2), packing flange (3), and the packing follower (4).
5. Remove the plug (20) and stem (21) subassembly from the valve bonnet (23).

CAUTION

Be careful not to damage the plug (20) or liner (18) while removing the plug/stem subassembly.

6. Remove the old packing set (22) and lantern ring (17).
Note: Applicable only for units with the optional leak detector bonnet option.
7. Remove the body gasket (10), liner (18), and seat ring (19) from the body.
Note: Valve sizes 1" and 1.5" have integral seat rings in the liners.
8. Remove the retainer (8), seal ring, and back-up rings (9) from the liner.
Note: The retainer, seal ring and back-up rings are only used in the balanced valve assemblies.
9. Remove the seat ring gasket (11).
Note: 2" size valves have multiple seat ring gaskets.
10. Inspect the bonnet (23), plug (20) and stem (21) assembly, liner (18), seat ring (19), and body (25) for any visual defects or damage. Carefully inspect the dynamic sliding surfaces and the seal interface areas.

For valve sizes 3" and larger follow disassembly instructions 11-19:

11. Disassemble the bonnet flange (24) and metal seal (10) from the valve.
Note: The metal seal (10) will require some force to remove from the valve. Using a common tool, such as an open-end wrench, lever the seal up at various points to lift out evenly.
12. Remove the bonnet (23) and plug (20) / stem (21) subassembly from the valve body as a single unit.

13. Remove the packing flange nuts (2), packing flange (3), and the packing follower (4).
14. Remove the plug (20) and stem (21) subassembly from the valve bonnet (23).

CAUTION

Be careful not to damage the plug (20) or liner (18) while removing the plug/stem subassembly.

15. Remove the old packing set (22) and lantern ring (17).
Note: Applicable only for units with the optional leak detector bonnet option.
16. Remove the liner (18) and seat ring (19) from the body.
17. Remove the retainer (8), seal ring, and back-up rings (9) from the liner.
Note: The retainer, seal ring and back-up rings are only used in the balanced valve assemblies.
18. Remove the seat ring (19) and seat ring gaskets (11).
Note: There is also a seat ring gasket between the liner and bonnet.
19. Inspect the bonnet (23), plug (20) and stem (21) assembly, liner (18), seat ring (19), and body (25) for any visual defects or damage. Carefully inspect the dynamic sliding surfaces and the seal interface areas.

Maintenance and 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.

Packing Box

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 (2) against the packing flange (3). 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.

Proceed as follows :

Braided PTFE with Carbon or Aramid Core (Standard)

Note: The Braided PTFE/Carbon or Aramid packing rings have a skive cut allowing packing replacement without disconnecting the plug stem from the actuator connector or actuator stem.

- A. Loosen and remove packing flange nuts (2).
- B. Lift the packing flange (3) and packing follower (4) up the valve stem.
Note: They may be taped in place to keep them out of the way before proceeding.

- C. By means of a hooked instrument, remove packing rings (22) 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 must also be removed to gain access to lower packing rings.

- D. Replace packing rings (22).
Note: Assemble and compress rings one at a time into packing box. The skive cut of each packing ring must be placed about 120 degrees apart.

- E. Replace packing follower (4) and packing flange (3).
- F. Replace and tighten packing stud nuts (2).
Note: On valves equipped with an optional lubricator connection, care must be taken to make note of order packing rings and lantern ring is taken out. This will help during assembly.

CAUTION

Do not over tighten.

- G. Place valve back in service and only tighten packing as necessary to stop external leakage.
Note: In an emergency, string packing may be used as a temporary repair only. It must be replaced with the correct packing as soon as possible.

Flexible Graphite Rings

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. Loosen and remove packing flange nuts (2).
- B. Remove packing flange (3) and packing follower (4) from the plug stem (21).
- C. By means of a hooked instrument, remove packing (22) 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 must also be removed to gain access to lower packing rings.

- D. Replace new packing set (22); 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.
Note: Assemble and compress rings one at a time into packing box. Care must be taken to make note of order packing rings and lantern ring is taken out. This will help during assembly.

- E. Assemble packing follower (4) and packing flange (3).
- F. Assemble and tighten packing stud nuts (2).

CAUTION

Do not over-tighten.

- G. Proceed to appropriate instructions for actuator and valve assembly adjustment.
- H. Place valve back in service and only tighten packing as necessary to stop external leakage.

Low-E Packing

The Masoneilan Low-E (Low Emissions) Packing from Baker Hughes is a high performance packing system capable of containing fugitive emissions well below the specifications of the most severe recommendations. It is also available as fire proof configuration if required.

The packing is provided as a set of rings consisting of middle rings and bound by end rings also referred to as anti-extrusion rings. All of our Low-E solutions come with Live Loading which is imperative to maintain a constant load on the packing and is necessary for thermal cycling applications.

Applied properly, this packing exhibits below current regulations. Consequently, it can effectively prevent fugitive emissions leaks from a control valve. The Low-E packing system can directly replace conventional packing, requiring no modification to the control valve or actuator.

The packing material could vary depending on the specifications and timing when the valve was ordered. It is important to understand the specific packing material that is being replaced.

Installation should be performed by a qualified technician. The following paragraphs will provide guidance. Please also refer to the Masoneilan Valve Packing Manual for additional information.

Preparation

Stem

Inspect stem for any nicks or scratches on the surface finish. Reject the stem for any of these reasons as they may damage packing.

Note: A properly etched part number on the stem in the packing area will have no adverse effect on the performance of the packing.

Stem finish should be 3-7 AARH (Ra 0,1/0,2).

Packing Box

Note: Bonnets that have a lube hole or leak detection port are unacceptable for use with the packing arrangement.

CAUTION

Packing box should be clean and free of burrs, rust, and any foreign matter. Parts can be cleaned with denatured alcohol.

Note: Packing box finish should be 125 AARH (Ra 3,2) or better.

The packing box may be bored or honed oversize by up to 0.015" (0.38 mm) above the nominal diameter to improve the finish. For instance, a nominal 0.875" (22.22 mm) packing box may be bored or honed up to 0.890" (22.60 mm) and the Low-E packing will still seal properly.

Packing box must be finished to the bottom of the bore.

Packing

Inspect packing rings. DO NOT use packing if any nicks or scratches on packing are observed. Check packing instructions to ensure that it is in proper arrangement (different packing materials contain arrangements specific to the design).

Packing Installation

- Refer to the packing instructions that were provided with the packing for proper installation.
- Please refer to the Masoneilan Valve Packing Manual for additional aid while completing the packing installation.
- The packing should be checked for leakage.

Note: All exposed surfaces of the packing set must be covered with the lubricant.

- Packing load should be checked after the valve has cycled approximately 500 times. Adjust if necessary. Plant maintenance / operation personnel should periodically inspect valves to spot leakage. Adjust if necessary and per OEM recommendations. If leak is not resolved, packing and any non-confirming hardware part must be replaced.

Packing Box Efficiency

The constant supervision of the packing box is one of the main routing operations of the maintenance service. In order to provide a correct functioning of the valve, the packing should not be tightened over the compression value sufficient to provide the tightness. The packing box efficiency is obtained by the compression of the packing, or by combining it with use of the lubricant. As it wears, gradually re-tighten the packing up to the limits of the possible compression. In order to add packing, it is necessary only to remove the packing follower and flange and introduce one or two split rings.

Note: In case of urgency, the braided packing of suitable section can be inserted without removal of the worn rings. Before this operation, the valve must be put out of service. If the packing is made up of non-split rings, it may be necessary to disassemble the valve and remove the worn packing and reassemble valve.

Parts Repair

Carefully examine parts for any scratches, unusual wear, or other visual damage prior to re-assembly.

Guiding Surfaces

Guiding surfaces shown in Figure 2, including the liner (18), valve plug (20), and plug stem (21) must be checked. If there is only slight wear indications, then use a light abrasive to smooth out the specific guiding surface areas. Parts with greater damage or wear on the guide surfaces must be replaced.

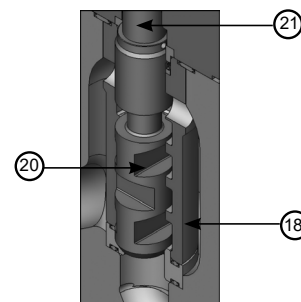


Figure 2: Plug, Liner, and Stem Guiding Surface

Seating Surfaces

The seat ring (19) (or liner (18) with integral seat), and valve plug (20) seating surfaces must be completely free of dents, scratches, wear, or other visual damage. Any seating surfaces showing signs of minor deterioration may be refurbished in accordance with the following guidelines.

Seat Lapping

Seating surfaces may need to be lapped in order to restore the necessary surface integrity to meet valve leakage requirements. A maximum of .015" (0.4mm) metal removal from both the plug and seat surfaces is allowable for any valve size. Make sure the seating angles on the reworked parts are within the specified tolerances as shown in the Figure 3 below. Parts requiring more metal removal to restore shall be discarded and replaced.

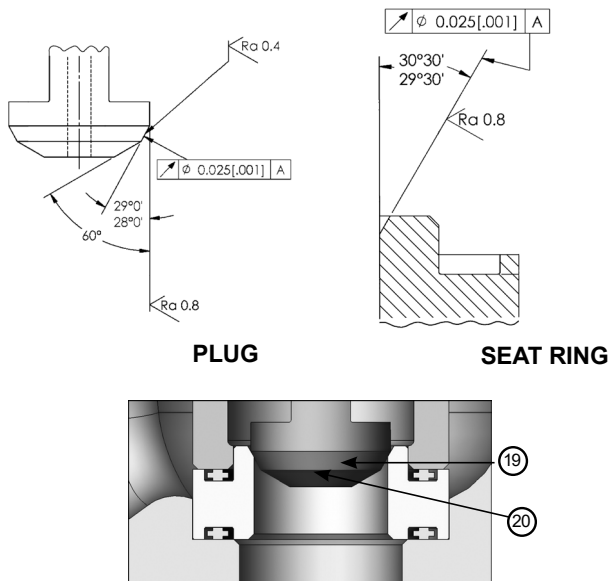


Figure 3: Plug and Seat Ring Seating Surfaces

1. Clean body gasket surface areas.
2. Place seat ring (19) onto a flat surface, noting the seating angle is up.
3. If lapping procedure is done outside of the valve body, proceed to step 4. Otherwise if lapping procedure is done inside of valve body, install a new seat ring gasket (11).

Note: Seat ring gasket (11) is temporarily placed to hold the seat ring during lapping.

It is imperative to use a new gasket or a test part having the same geometrical characteristics in order to insure the correct position of the seat ring during lapping.

This gasket (or similar part) can be kept after lapping for future lapping use.

The gasket used for lapping must not be reused for the body reassembly.

4. Spread a fine layer of high quality lapping compound (600 grit) on the seating surface.

CAUTION

Do not allow the lapping compound to get onto the liner (18) and upper sections of the plug (20).

5. Assemble the liner (18) on top of the seat ring.
6. Place an appropriate tool on the valve stem (21) thread to allow for manual rotation. Options for creating a manual resurfacing tool include using a T-handle secured with a locknut, or using a flat piece of steel with a drilled hole and several locknuts to fasten to the valve stem (21).
7. Insert the plug (20) and stem (21) assembly into the liner (18) until the plug contacts the seat ring.
8. Lap the seat ring (19) by rotating the plug (20) in short oscillating strokes. After 8 to 10 strokes, lift the plug (20) and repeat the operation three more times at increments of 90°, 180°, and 270° from the original position.

Note: Performing the operation at various increments is critical in maintaining concentricity between the parts during lapping.

9. Lapping can be repeated, but should be limited as much as possible so that the seat remains sufficiently narrow to guarantee tightness.
10. After lapping, disassemble the parts to clean them and then reassemble, making sure the seating angles are within tolerance. See Figure 3.

Soft Seat Repair

The soft seat assemblies include swaged retainers and can not be repaired in the field. These should be returned to the local Masoneilan service center for replacement or maintenance of the PTFE "reservoir". Refer to Figure 4 below.

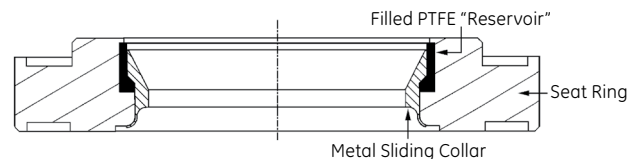


Figure 4: Soft Seat Option

Gaskets

Gasket seating surfaces must be free of dents, scratches, corrosion, or other types of damage. Clean mating surfaces as required and replace any non-conforming parts. Spiral wound gaskets (Items 10 and 11) must always be replaced after disassembly.

Metal Seal

For valves 3" and larger:

Prior to reassembly, the metal seal (10) should be inspected for cracks or signs of wear on the coating. The metal seal can be reused if it is free from scratches, erosion, corrosion, or any other type of damage.

If the coating is not intact or slight wear exists, a new layer of coating should be re-applied to the original condition by a Masoneilan Authorized Repair Center (MARC™).

Prior to reassembly of the valve, inspect the inside of the valve body around the area where the metal seal seats. It is common to find slight ridges or depressions from where the seal was originally seated. During initial assembly these depressions aid in the sealing of the valve, however these areas can become leak paths during reassembly if the surface is not restored to its original finish.

To prevent this potential leakage, machine the seating angle of the bonnet at 40 degrees by approximately 0.1 inches (2.5 mm) deep, thus causing the seal ring to seat further inside the valve body (on a new undeformed surface). Refer to Figure 5 for details.

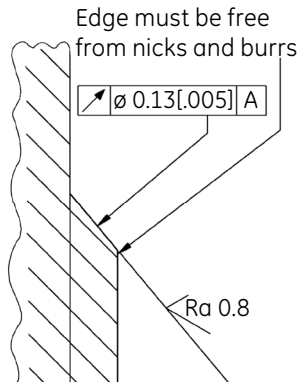


Figure 5: Bonnet Seating Angle Details

Valve Plug and Stem

If the valve stem needs to be replaced, then the plug must also be changed in order to guarantee correct pinning of the assembly. However, an undamaged valve stem can be reused even if the valve plug needs to be replaced.

CAUTION

Be careful not to damage the plug guiding or seating surfaces while performing the following operations.

Plug Removal

Drive out the plug pin (12) using a punch or by drilling it out. If drilling is required, use a drill bit that is smaller than the plug pin size. Unscrew the plug (20) from the stem (21) following complete removal of the plug pin.

CAUTION

In case of 440C stainless steel or other hardened materials, plug and stem assembly can not be machined or drilled. If either the plug or stem is damaged, the parts must be purchased as a complete assembly.

Valve Reassembly

After completing the recommended maintenance and repair actions noted above, reassemble the valve using the following procedures.

Plug Stem Assembly

Reassemble the plug and stem subassembly using new replacement parts as required. Thread the valve plug (20) into the stem (21), making sure that the assembly is tight and secure. Apply torque to stem per Tables 1A and 1B.

Stem Size		Torque		Dimension A	
inches	mm	ft-lbs	daNm	inches	mm
0.500	12.70	50	7	.190/.187	4.8/4.7
0.750	19.05	125	17	.190/.187	4.8/4.7
1.000	25.40	250	34	.219/.218	5.6/5.5
1.125	28.58	250	34	.380/.375	9.6/9.5

Table 1A: Stem Assembly All Materials (Except 440C)

Stem Size		Torque		Dimension A	
inches	mm	ft-lbs	daNm	inches	mm
0.500	12.70	44	6	.200/.197	5
0.750	19.05	118	16	.200/.197	5
1.000	25.40	184	25	.319/.315	8
1.125	28.58	184	25	.400/.394	10

Table 1B: Stem Assembly 440C Material (Only) Pin Installation

Drill a hole for the groove pin per dimension 'A' in Table 1A or Table 1B depending on stem material. Place the plug and stem assembly on a V-block and drill into the plug and stem. Apply a small amount of grease on the replacement pin and press fit into the hole. See Figure 6 for details.

Note: Make sure the pin is recessed by approximately .06" (1.5mm) below the stem surface on both ends.

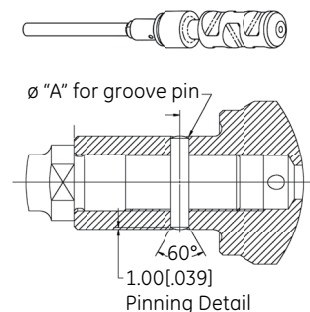


Figure 6: Groove Pin Details

Assembly Alignment

Check the run out of the plug and stem to ensure they are within .005" (0.13mm) TIR. Use a plastic or rubber mallet to tap the parts into alignment if the assembly is out of tolerance.

Valve Reassembly

Make sure the valve body and all gasket surfaces are clean and free of any damage.

CAUTION

Make sure any recommended lubricants or sealing compounds are compatible with the process fluid. Use acceptable substitutes as required.

Valve Sizes 1" and 1-1/2"

1. Assemble the seat ring gasket (11) into the valve body (25).
2. Assemble the liner (18) into the valve body (25) making sure that it aligns correctly on top of the seat ring gasket (11).
3. Assemble the plug (20) and stem (21) subassembly into the liner (18).
4. For the balanced trim design configuration (available in 1.5" size only), lubricate the seal ring and both back-up rings (9) and carefully assemble it over the plug (20). Make sure the lower back-up ring right angle corner is facing the extrusion gap between the liner and plug (see Figures 7A and 7B) and the open end of the seal faces upward or away from the seat. Use the seal retainer (Step 5) to push the balance seal and back-up rings fully into the liner.

- Install the seal retainer (8) into the liner (18). For the balanced configuration, use the seal retainer to push the seal ring and back-up rings (9) fully into the liner.
- Install the body gasket (10) and assemble the bonnet (23) onto the body (25). Be careful not to damage the stem (21) while installing the bonnet.

Valve Sizes 2" to 8"

- Assemble one seat ring gasket (11) into the valve body (25).
- Assemble the other seat ring gasket (11) onto the seat ring (19).

Note: Make sure the seat ring gasket (11) is assembled onto the side of the seat ring (19), which mates with the liner (18). The correct side of the seat ring has the seating surface and a longer boss for alignment with the liner.

- Assemble the seat ring (19) into the valve body (25) making sure that it aligns correctly on top of the seat ring gasket (11) located in the body.
- Assemble the liner (18) into the valve body (25) making sure it aligns correctly on top of the seat ring (19) and seat ring gasket (11).
- Assemble the plug (20) and stem (21) subassembly into the liner (18).
- For the balanced trim design configuration, lubricate the seal ring and both back-up rings (9) and carefully assemble it over the plug (20). Make sure the lower back-up ring right angle corner is facing the extrusion gap between the liner and plug (see Figures 7A and 7B) and the open end of the seal faces upward or away from the seat. Use the seal retainer (step 7) to push the balance seal and back-up rings fully into the liner.
- Install the seal retainer (8) into the liner (18). For the balanced configuration, use the seal retainer to push the seal ring and back-up rings (9) fully into the liner (18).

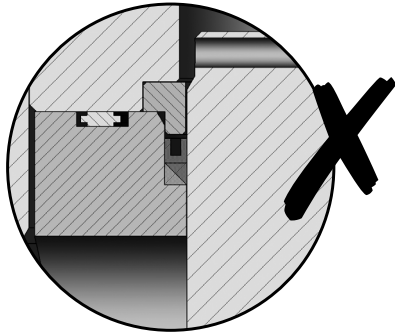


Figure 7A: Incorrect Seal Ring Installation showing lower back-up ring 90° angle facing away from extrusion gap

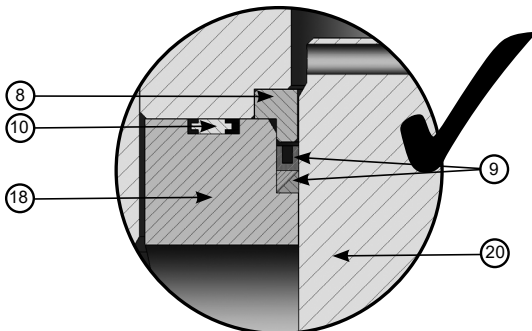


Figure 7B: Correct Seal Ring Installation showing lower back-up ring 90° angle facing the extrusion gap

For 2" valve sizes, follow assembly instruction #8:

- Install the body gasket (10) and assemble the bonnet (23) over the valve stem (21). Push it down carefully and align the bonnet bolt holes with the body studs (6). Be careful not to damage the stem during the assembly process.

For 3" size valves and larger follow assembly instructions 9-11:

- Install the seat gasket (11) onto the liner and assemble the bonnet (23) over the valve stem (21). Push it down carefully and align the bonnet with the seal retainer (8). Be careful not to damage the stem during the assembly process.
- Assemble the metal seal (10) over the bonnet (23) and slide down into the groove formed between the body and bonnet.
- Assemble the bonnet flange (24) over the bonnet (23) and align the bolt holes with the body studs (6). Make sure the bonnet flange is also aligned with the metal seal (10).

Body Bolting

- Grease the threads of the valve body studs (6) and the bearing surfaces of the body nuts (7).
- Assemble the body nuts (7) onto the body studs (6) manually, and hand tighten evenly so that the internal parts are held in place. The face of the bonnet or bonnet flange should be parallel to the top surface of the valve body.
- Tighten the body nuts (7) evenly by applying the torque in the increments and the sequences as defined in Table 2 and Figure 8.

Note: For gasketed bonnet joint designs, torque bonnet down until metal to metal contact exists between body and bonnet.

- Check plug and stem assembly in between various tightening steps to make sure they are not binding due to misalignment.

Valve Size		Bolting Requirements		Torque Requirements	
inches	DN	Size	Qty	ft-lbs	daNm
1 and 1.5	25 and 40	.750- 10UNC	8	120-145	16-20
2	50	1.125- 8UN	8	320-430	43-58
3	80	1.000- 8UNC	8	225-310	31-42
4	100	1.250- 8UN	8	440-580	60-79
6	150	1.375- 8UN	12	610-760	83-103
8	200	1.875- 8UN	12	1700-2000	230-271

Table 2: Body Bolting Torque Requirements

Note: Tighten the body nuts (7) in the following increments (units of ft-lbs [daNm]): 10 [1.3], 20 [2.6], 40 [5], 75 [10], 140 [19], 225 [30], 400 [54], 650 [88], plus increments of 250 [34] until the required torque is reached. Between each pass check to make sure plug assembly strokes freely to ensure proper alignment.

Visually inspect the assembly for proper stud and nut installation by checking the number of exposed threads. If less than one stud thread or more than 2-1/2 threads are extended above the body nut after final tightening, then double check the assembly for proper installation and alignment.

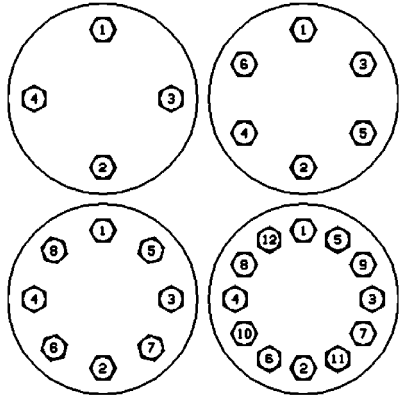


Figure 8: Torque Sequence

Packing Box Assembly

Visually inspect the stem and packing box for cleanliness and proper surface finish. Lubricate the inner diameter of the packing box with Never-Seez or equivalent. Assemble the packing box components per the maintenance instructions on page 5.

Parts References

Valve Sizes 2 Inch and Smaller

Item No.	Description
1	Packing Stud
2	Packing Flange Nut
3	Packing Flange
4	Packing Follower
5	Yoke Nut
6	Body Stud
7	Body Nut
8	Retainer
• 9	Seal Ring and Back-up Rings
• 10	Body Gasket
• 11	Seat Ring Gasket
• 17	Lantern Ring if Applicable
18	Liner
19	Seat Ring
20	Plug
21	Stem
• 22	Packing S/A
23	Bonnet
24	Bonnet Flange
25	Body

Valve Sizes 3 Inch and Larger

Item No.	Description
1	Packing Stud
2	Packing Flange Nut
3	Packing Flange
4	Packing Follower
5	Yoke Nut
6	Body Stud
7	Body Nut
8	Retainer
• 9	Seal Ring and Back-up Rings
• 10	Metal Seal
• 11	Seat Ring Gasket
• 17	Lantern Ring if Applicable
18	Liner
19	Seat Ring
20	Plug
21	Stem
• 22	Packing S/A
23	Bonnet
24	Bonnet Flange
25	Body

• Recommended Spare Parts

Table 3: Valve Parts List

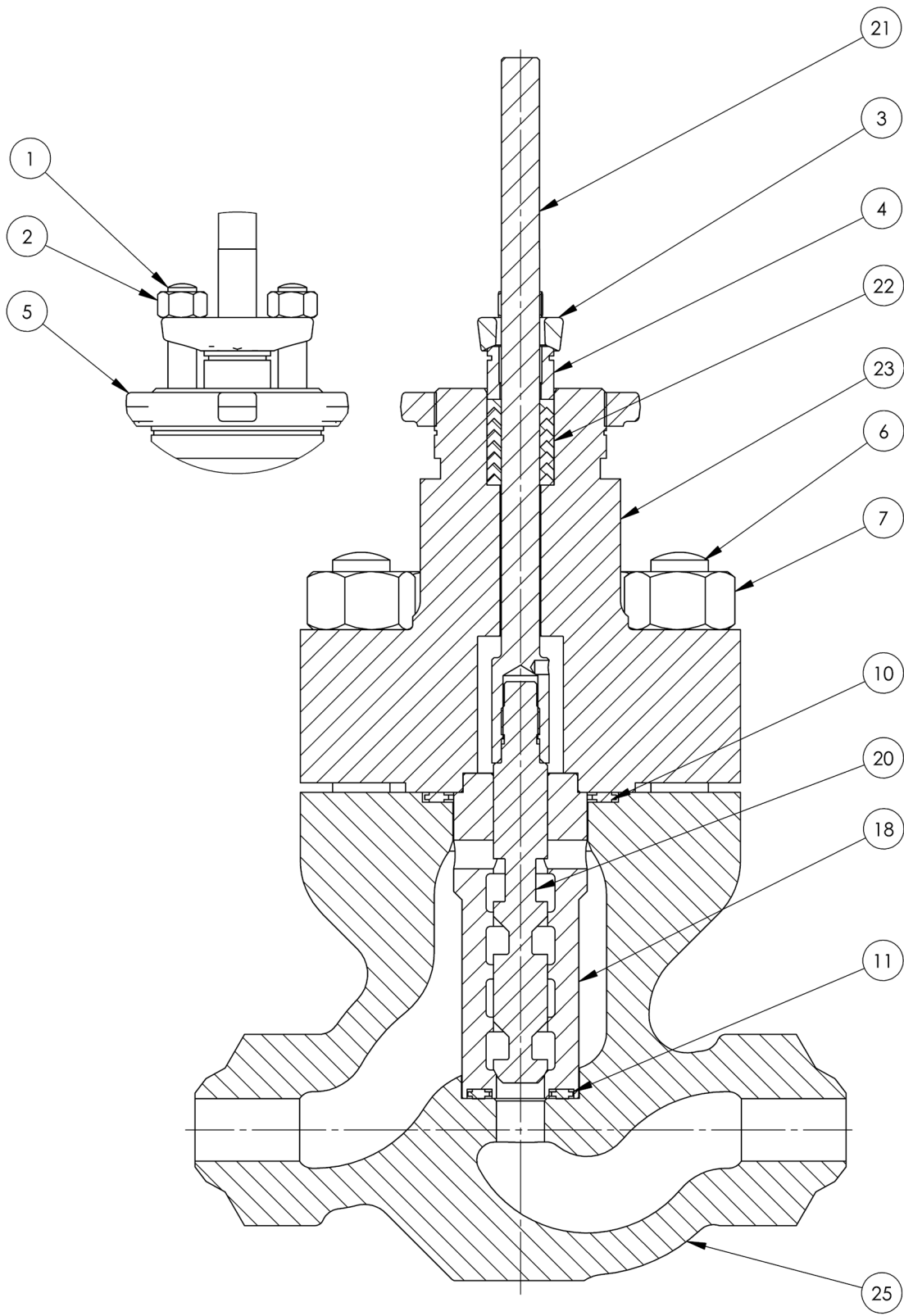


Figure 9 - 1" Size Unbalanced Assembly

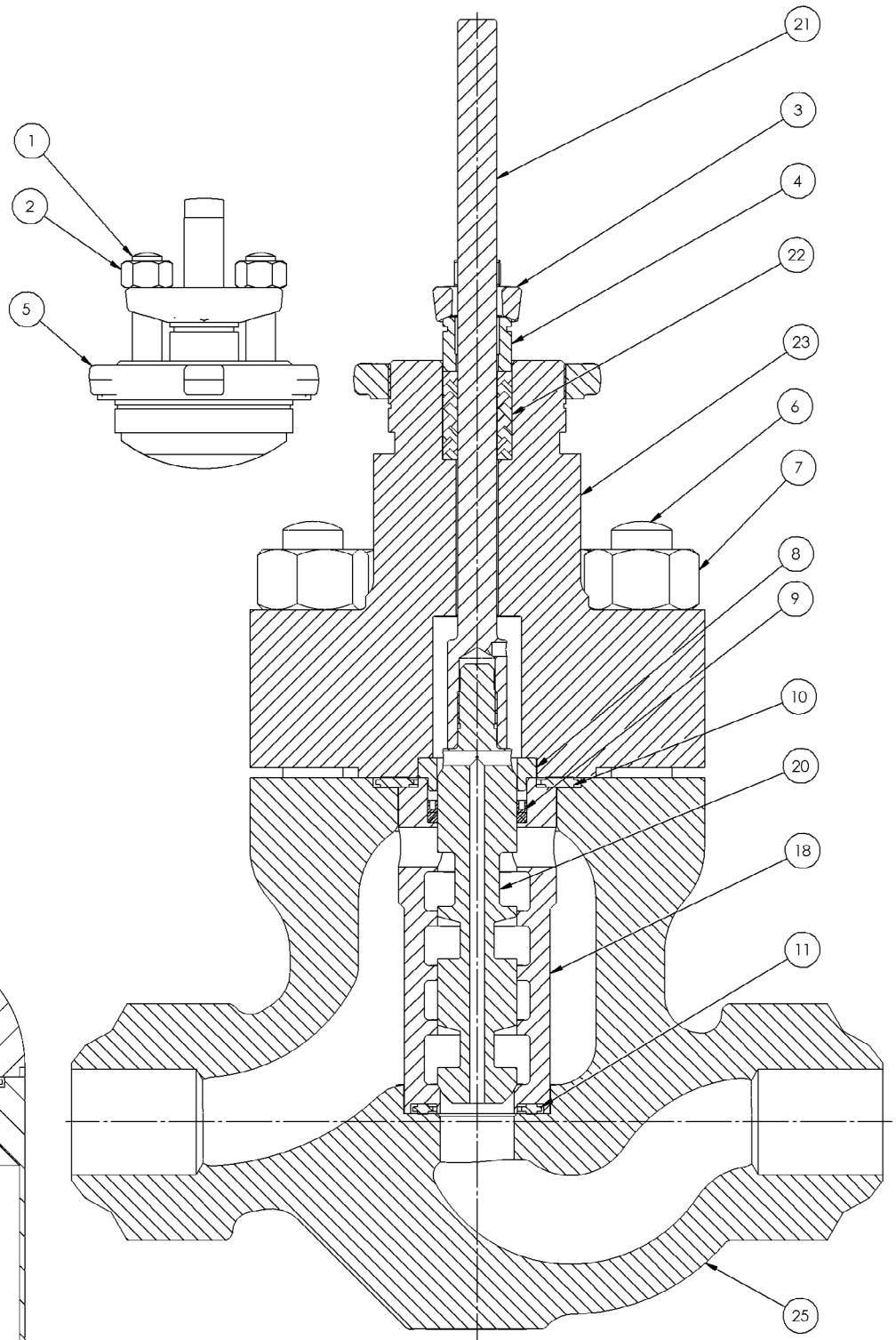


Figure 10 - 1.5" Size Balanced Assembly

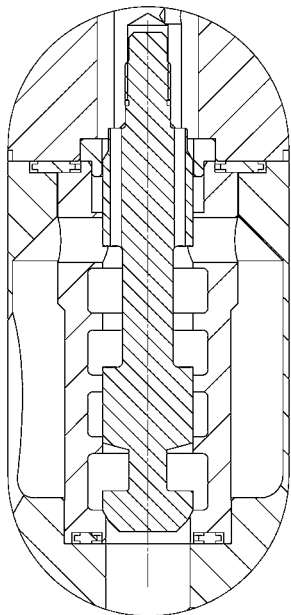


Figure 10A - 1.5" Size Unbalanced Trim Detail

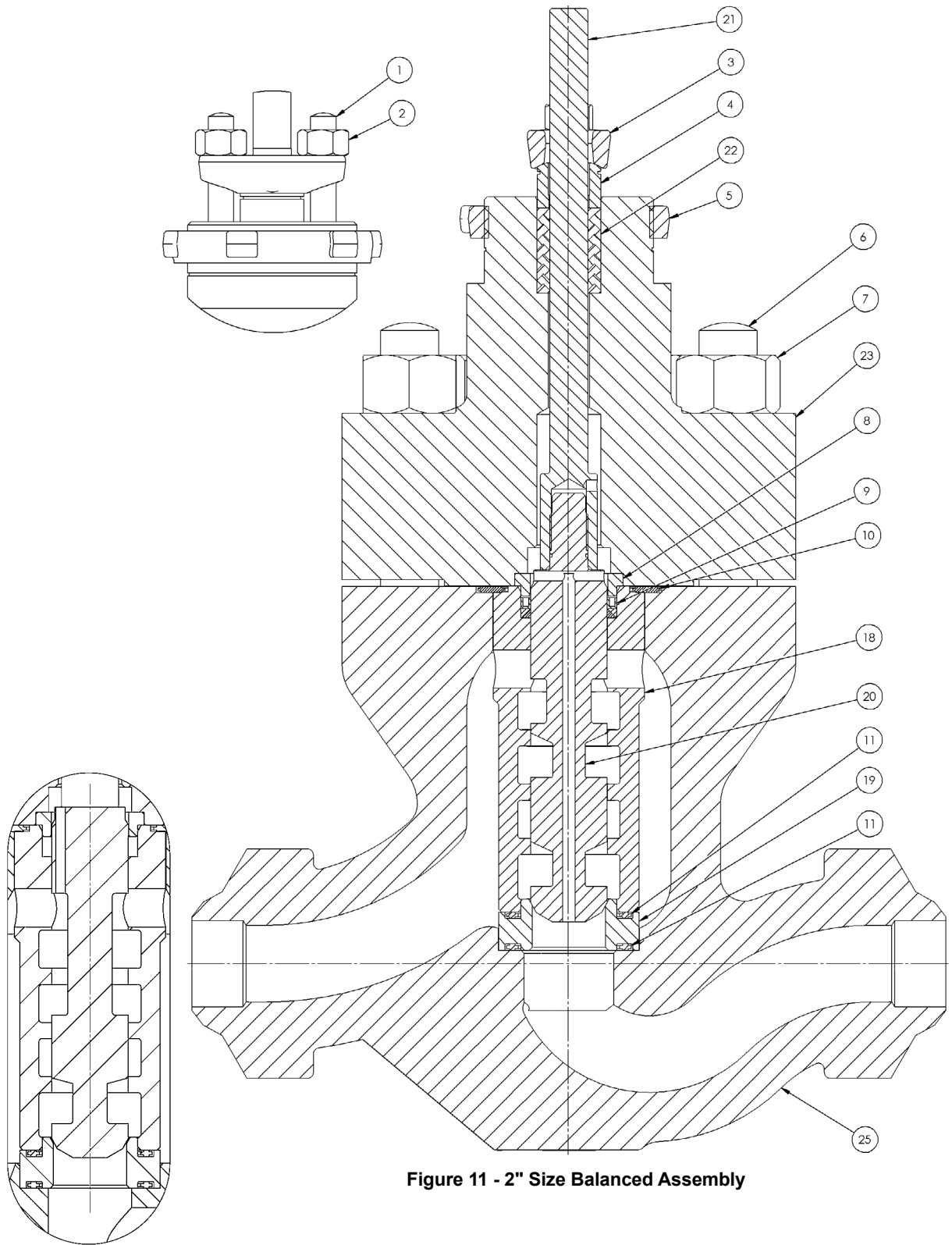


Figure 11 - 2" Size Balanced Assembly

Figure 11A - 2" Size Unbalanced Trim Detail

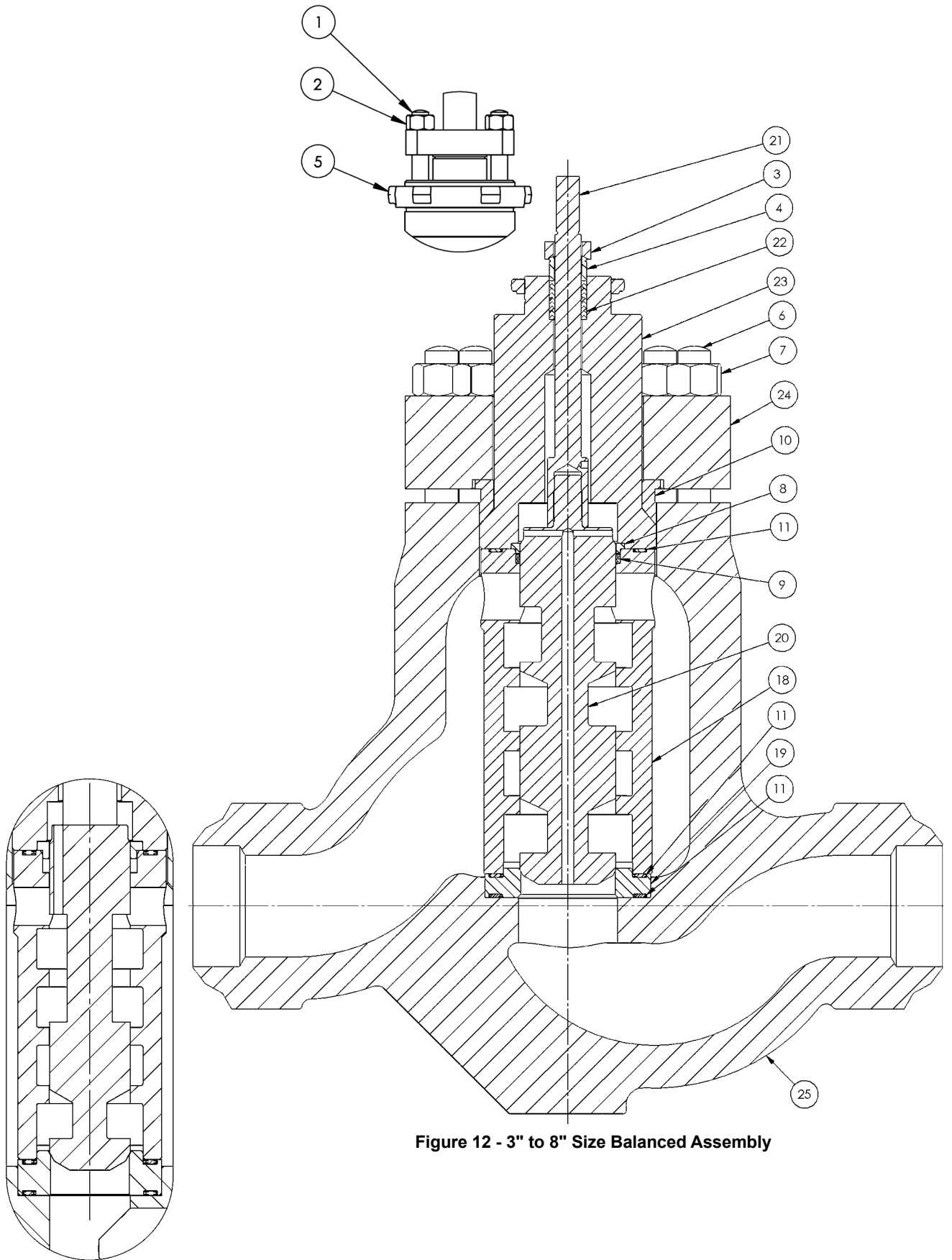


Figure 12 - 3" to 8" Size Balanced Assembly

**Figure 12A - 3" to 8" Size
Unbalanced Trim Detail**

Appendix for high pressure LincolnLog valves 78400/18400 API 6A Series

Introduction

Scope

The following instructions are designed to guide the user through the installation and maintenance of the **Masoneilan™** 78400/18400 API 6A Control Valves for all sizes and high working pressures (i.e. 10K PSI and 15K PSI).

For 78400/18400 API 6A Series, Baker Hughes has developed special options which is the subject of this section in the instruction manual. In this case, the instructions given in this section will always take precedence over the general instructions found in the preceding sections.

Serial Plate

The serial plate is usually fixed to the side of the actuator yoke. It indicates, amongst other things, the type of valve, the working pressure, the material class, temperature class, product specification level, performance requirement used for the pressurized chamber and the air supply pressure of the actuator.

There are two serial plates, one for the valve body sub-assembly and one for the actuator sub-assembly.

After Sales Service

Baker Hughes offers After Sales Service comprised of highly qualified technicians to support the installation operation, maintenance and repair of its Masoneilan equipment. For support contact the local Baker Hughes representative or Masoneilan factory located closest to you.

Spare Parts

When carrying out maintenance operations, only manufacturer's replacement parts must be used, obtained through our local representatives or our Spare Parts Service.

When ordering spare parts, the model and serial numbers indicated on the manufacturer's serial plate must be given. Refer to Figure 13 for serial numbering system.

Actuator and Accessories

The valve is equipped with an actuator; like all the other valve accessories, actuators are the subject of special instructions which provide information on the electric and pneumatic connections. Refer to the appropriate instruction manual for each unique accessory.

Warranty

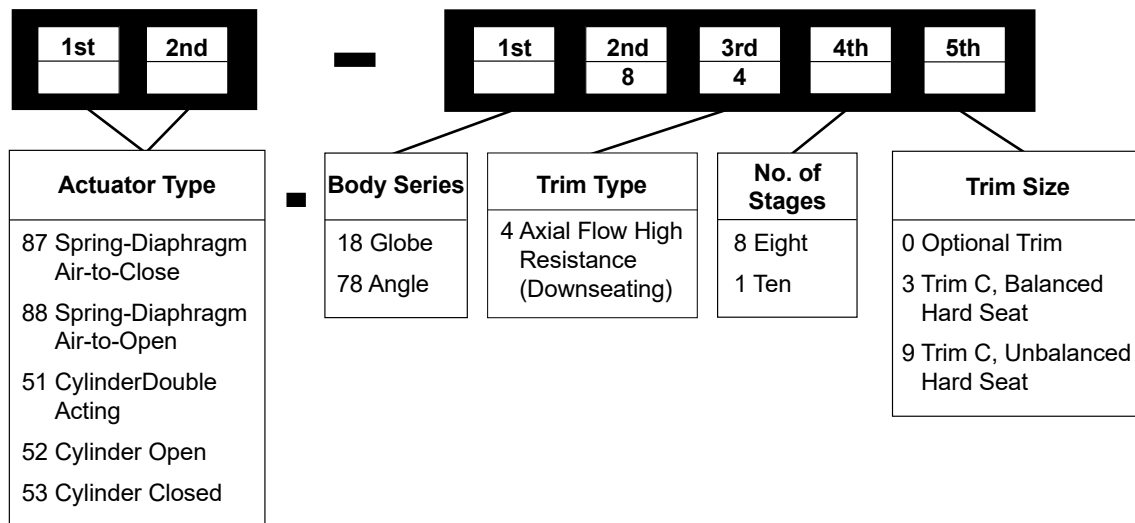
Refer to General terms on page 1 of the Manual.

LincolnLog 78400/18400 API 6A Series should be closed for a short period only. There is a risk of damage for trim parts for long periods of closing.

LincolnLog 78400/18400 API 6A Series are designed as control valves, not as isolating valves.

If used as isolating valve, internal parts damage will not be covered by warranty.

Numbering System



Notes:

- Balanced Trim not available for 1" 78400/18400 API Valves
- Unbalanced Trim not available for 1.5" up to 6" 78400/18400 API Valves

Figure 13: LincolnLog 78400/18400 API 6A Series Numbering System

Unpacking

Care must be exercised when unpacking the valve to prevent damage to the accessories and component parts. Contact the local Baker Hughes Sales Office or Service Center with any issues or problems. Be sure to note the Masoneilan valve model number and serial number in all correspondences.

Installation

CAUTION

The 78400/18400 Series valve must always be installed with the flow tending to open the valve plug. For applications where insulation of the valve body is required, do not insulate the valve bonnet.

Recommended Installation

It is recommended to install the 78400/18400 Series valves in the vertical position with the actuator extended up whenever possible. This orientation eliminates the need for additional pipe support, reduces the side load friction on the actuator, and provides ease of removal of the trim.

Piping Cleanliness

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 mating surfaces must be thoroughly cleaned to ensure leak-free joints. Sacrificial start-up fixtures can be purchased from Baker Hughes to protect the operational trim during the installation and line flushing phases.

WARNING

If major system or piping modifications (or repairs) are performed, thorough flushing and blowdown of the system will be required prior to reinstalling the LincolnLog trim. Sacrificial flushing trim should be installed in the valve to protect the integrity of the flow passages. Failure to follow this warning will violate the valve warranty agreement and could result in control instability, excessive noise levels, and valve leakage.

Isolation Bypass Valve

To allow for in-line inspection, maintenance and removal of the valve without service interruption, provide a manually operated shutoff valve on each side of the control valve and a manually operated throttling valve in the bypass line.

Heat Insulation

In case of a heat-insulated installation, do not insulate the valve bonnet and take protective measures relative to personal safety.

Hydrostatic Testing and Line Cleaning

During this operation, the control valve must not be used as an isolating valve. This means that the valve must always be opened before carrying out pressure tests in the process line, cleaning of pipes, etc. Otherwise equipment damage or failure of the seal

rings could result. If the valve is to remain installed during line cleaning, flushing trim must be installed to prevent damage to trim components..

Flow Direction

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

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).

Disassembly

CAUTION

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

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.

CAUTION

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

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.

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 (liner or seat ring) 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.

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.

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.

Valve Disassembly

The valve must always be reassembled with new packing set, balance seals, metal seal rings, and VG seal ring. Before disassembly, make sure the recommended spare parts are available for reassembly. All numbered parts listed in the following instructions can be referenced in Table 9 and Figures 24, 25, 26, 27 and 28.

1. Remove the body stud nuts (B002) and body stud nut washers (B921).
2. Disassemble the bonnet (B003) and plug (B112) / stem (B120) sub-assembly from the valve body as a single unit.
3. Remove the packing flange nuts (B221), packing flange/follower (B219).
4. Remove the plug (B112) and stem (B120) sub-assembly from the valve bonnet (B003).

CAUTION

Be careful not to damage the plug (B112) or liner (B106) while removing the plug/stem subassembly.

5. Remove the old packing set (B207 and B208)
6. Remove the VG seal ring (B015) from valve body (B001).

Note: The VG seal ring (B015) will require some force to remove from the valve body (B001). Use a common tool to lever the seal at various points and lift out evenly.

CAUTION

Be careful not to damage the plug (20) or liner (18) while removing the plug/stem subassembly.

7. Remove the retainer (B105).
8. Remove the liner (B106), and seat ring (B102) from the body (B001).

Note: Valve size 1" has an integral seat ring and liner.

9. Remove the lip seals (B108 and B118) from the liner.

Note: The lip seals are only used in the balanced valve assemblies.

10. Remove the metal seal rings (B103).

11. Inspect the bonnet (B003), plug (B112) and stem (B120) assembly, liner (B106), seat ring (B102), and body (B001) for any visual defects or damage. Carefully inspect the dynamic sliding surfaces and the seal interface areas.

Maintenance and Repair

Check parts and materials for conformity to bill of material call-out. Check pressure containing parts for clear and legible heat numbers. Remove any foreign matter and clean the sealing surfaces. Inspect body, bonnet, seat ring, lip seals, liner, plug, and plug stem for cleanliness, nicks, scratches, burrs, sharp corners, etc., on sealing and sliding surfaces including the packing box ID. The VG seal ring sealing surfaces on the body (B001) and bonnet (B003) must be free of porosity, scale, or tool chatter. The VG sealing surfaces must be protected prior to assembly, and extra care must be exercised during assembly to prevent damage to these surfaces. API 6A 78400/18400 valves are used in high pressure applications. Make sure there is no damage on sealing surfaces as performance of gaskets and seals are strongly linked to surface roughness.

Packing Replacement

Prior to assembling the packing:

Inspect and confirm surface finish of packing box inside diameter and stem outside diameter is free of porosity, scale, nicks or scratches.

Removal of old packing and Installation of new packing

1. Unscrew and remove the packing flange stud nut (B221) and packing flange flat washer (B921a)
2. Lift the packing flange (B219) up along the valve stem.
3. By means of a puller, remove the packing rings (B207) and anti-extrusion rings (B208), taking care not to damage the sealing surface of the packing box or the valve plug stem.
4. Install anti-extrusion rings (B208) and packing rings (B207) into packing box.

Refer to Figure 15 for packing arrangement.

Note: Number of packing rings provided will vary based on valve size, but a minimum of two anti-extrusion rings will always be provided and must be arranged according to Figure 15.

Note: Assemble new packing with the cuts in the rings located 120° apart from the adjacent ring. Press rings into the packing box one at a time.

5. Assemble packing flange/follower (B219).
6. Assemble and hand tighten packing stud nuts (B221).
7. Confirm that the valve plug (B112) can move freely.
8. Gradually apply torque to the packing stud nuts (B221).

Note: Refer to Table 7 for recommended packing stud nut torque.

Parts Repair

Carefully examine parts for any scratches, unusual wear, or other visual damage prior to re-assembly.

Guiding Surfaces

Guiding surfaces shown in Figure 14, including the liner (B106), valve plug (B112), and plug stem (B120) must be checked. If there is only slight wear indications, then use a light abrasive to smooth out the specific guiding surface areas. Parts with greater damage or wear on the guide surfaces must be replaced.

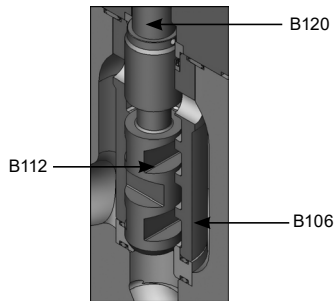


Figure 14: Plug, Liner, and Stem Guiding Surface

Seating Surfaces

The seat ring (B102) (or liner (B106) with integral seat), and valve plug (B112) seating surfaces must be completely free of dents, scratches, wear, or other visual damage. Any seating surfaces showing signs of minor deterioration may be refurbished in accordance with the following guidelines.

Seat Lapping

Seating surfaces may need to be lapped in order to restore the necessary surface integrity to meet valve leakage requirements. A maximum of .015" (0.4mm) metal removal from both the plug and seat surfaces is allowable for any valve size. Make sure the seating angles on the reworked parts are within the specified tolerances as shown in the Figure 16 below. Parts requiring more metal removal to restore shall be discarded and replaced.

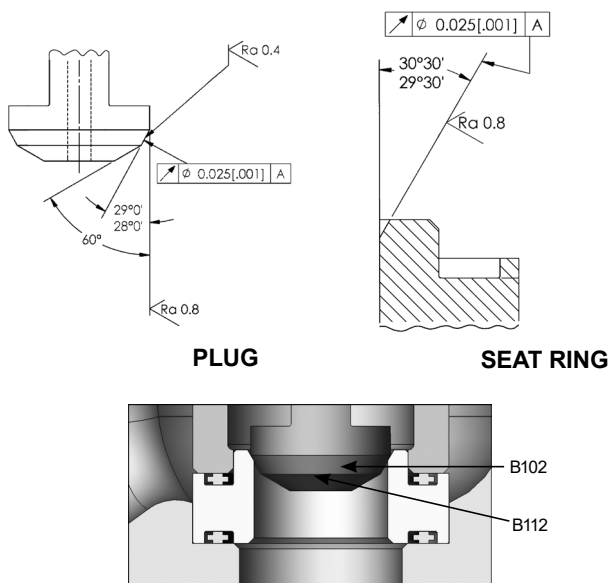


Figure 16: Plug and Seat Ring Seating Surfaces

1. Clean body area of seal groove.
2. Place seat ring (B102) onto a flat surface, noting the seating angle is up.
3. If lapping procedure is done outside of the valve body, proceed to step 4. Otherwise if lapping procedure is done inside of valve body, install a new metal seal ring (B103)

Note: Metal seal ring (B103) is temporarily placed to hold the seat ring during lapping.

It is imperative to use a new metal seal ring or a test part having the same geometrical characteristics in order to insure the correct position of the seat ring during lapping.

This seal ring (or similar part) can be kept after lapping for future lapping use.

The seal ring used for lapping must not be reused for the body reassembly.

4. Spread a fine layer of high quality lapping compound (600 grit) on the seating surface.

CAUTION

Do not allow the lapping compound to get onto the liner (B106) and upper sections of the plug (B112).

5. Assemble the liner (B106) on top of the seat ring (B102).
6. Place an appropriate tool on the valve stem (B120) thread to allow for manual rotation. Options for creating a manual resurfacing tool include using a T-handle secured with a locknut, or using a flat piece of steel with a drilled hole and several locknuts to fasten to the valve stem (B120).
7. Insert the plug (B112) and stem (B120) assembly into the liner (B108) until the plug contacts the seat ring.
8. Lap the seat ring (B120) by rotating the plug (B112) in short oscillating strokes. After 8 to 10 strokes, lift the plug (B112) and repeat the operation three more times at increments of 90°, 180°, and 270° from the original position.

Note: Performing the operation at various increments is critical in maintaining concentricity between the parts during lapping.

9. Lapping can be repeated, but should be limited as much as possible so that the seat remains sufficiently narrow to guarantee tightness.
10. After lapping, disassemble the parts to clean them and then reassemble, making sure the seating angles are within tolerance. See Figure 16.

Metal Seal Ring

Metal Seal surfaces must be free of dents, scratches, corrosion, or other types of damage. Clean mating surfaces as required and replace any non-conforming parts.

VG Seal and Bonnet (Refer to Figure 17)

1. Inspect the surfaces of the VG Seal (B015) and confirm it is free of porosity, scale, or tool chatter.
2. Install the VG Seal into the groove of the Body (B001).
3. Carefully lower the Bonnet (B003) over the Body Studs (B002) and onto the VG Seal (B015).

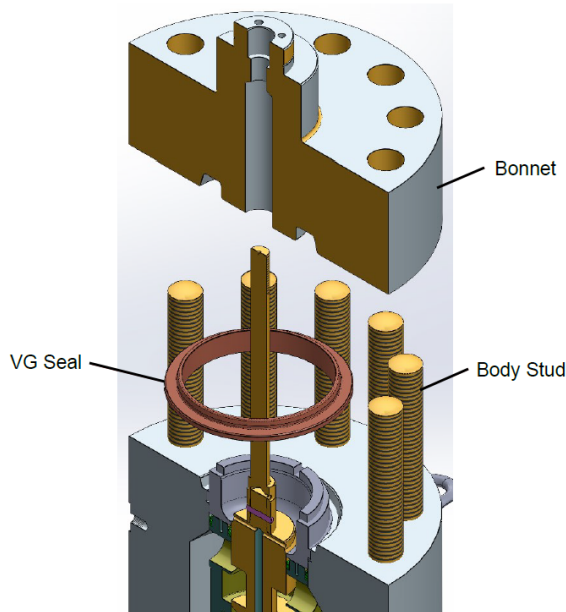


Figure 17: VG Seal and Bonnet Arrangement

Valve Plug and Stem

If the valve stem needs to be replaced, then the plug must also be changed in order to guarantee correct pinning of the assembly. However, an undamaged valve stem can be reused even if the valve plug needs to be replaced.

CAUTION

Be careful not to damage the plug guiding or seating surfaces while performing the following operations.

Plug Removal

Drive out the plug pin (B903) using a punch or by drilling it out. If drilling is required, use a drill bit that is smaller than the plug pin size. Unscrew the plug (B112) from the stem (B120) following complete removal of the plug pin.

CAUTION

In case of other hardened materials, plug and stem assembly can not be machined or drilled. If either the plug or stem is damaged, the parts must be purchased as a complete assembly.

Valve Reassembly

After completing the recommended maintenance and repair actions noted above, reassemble the valve using the following procedures.

Plug Stem Assembly

Prior to assembly, check the stem, plug and pin. Lubricate stem and plug thread. Thread the stem (B120) onto plug (B112) solidly and fully engage metal to metal contact.

Reassemble the plug and stem subassembly using new replacement parts as required. Thread the valve plug into the stem, making sure that the assembly is tight and secure. Apply torque to stem per Table 4.

Stem Size		Torque		Dimension "A"	
				Type F Groove Pins	
				Per ASME B18.8.2	
inches	mm	ft-lbs	daNm	inches	mm
1/2"	12.7	44	6	0.1903/0.1875	4.834/4.763
1/2"	12.7	44	6	0.1903/0.1875	4.834/4.763
3/4"	19.05	118	16	0.1903/0.1875	4.834/4.763
1"	25.4	184	25	0.2219/0.2188	5.560/5.558
1"	25.4	184	25	0.2219/0.2188	5.560/5.558
1 1/8"	28.58	184	25	0.3797/0.3750	9.644/9.525

Table 4: Plug/Stem Torque

Drill a hole for the groove pin per dimension 'A' in Table 4. Place the plug and stem assembly on a V-block and drill into the plug and stem. Apply a small amount of grease on the replacement pin and press fit into the hole. See Figure 18 for details.

Note: Make sure the pin is recessed by approximately .06" (1.5mm) below the stem surface on both ends.

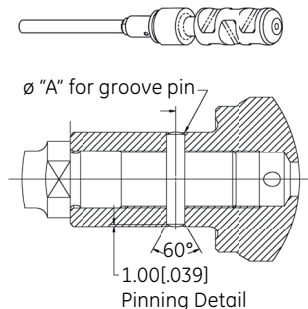


Figure 18: Groove Pin Details

Assembly Alignment

Check the run out of the plug and stem to ensure they are within .005" (0.13mm) TIR. Use a plastic or rubber mallet to tap the parts into alignment if the assembly is out of tolerance.

Packing Box

Packing box maintenance is one of the principal tasks during routine servicing. Tightness of the packing (B207/B208) is maintained by proper compression. Compression is achieved by evenly tightening the packing flange nuts (B221) against the packing flange/ follower (B219). Periodic re-tightening of the packing flange nuts may be required to maintain proper sealing.

Periodic re-tightening of the packing flange nuts may be required to maintain proper sealing.

CAUTION

Care must be taken not to over tighten, as this could create unnecessary friction preventing smooth valve operation. If packing leakage persists after applying maximum compression, then the packing needs to be replaced.

! CAUTION

The valve must be isolated and the process pressure vented prior to performing any packing box maintenance.

LincolnLog API 6A valves are using an integral packing flange/follower design. For packing stud torque values, refer to table 7.

Valve Trim Assembly

Make sure the valve body and all gasket surfaces are clean and free of any damage.

CAUTION

Make sure any recommended lubricants or sealing compounds are compatible with the process fluid. Use acceptable substitutes as required.

Valve Size 1"

Trim Installation - Integral Liner/Seat Ring Installation (Refer to Figure 19)

1. Place the metal seal (CSI Ring) (B103) into the groove located on the bottom surface of the Liner/Seat Ring (B106).
2. Install the Liner/Seat Ring (B106) into Valve Body (B001) making sure that the metal seal (CSI Ring) (B103) stays in place.
 - A small amount of grease can be used to hold the metal seal in place during installation of the Liner/Seat Ring (B106).
3. Carefully lower the Plug Stem (B120) and Plug (B112) into the Liner/Seat Ring (B106).
4. Hand-thread the Trim Retainer (B105) into the Body (B001) until it makes metal-to-metal contact with the top side of the Liner/Seat Ring (B106), ensure metal-to-metal contact before proceeding to the next step.
5. Using the appropriate tool¹ to engage the Trim Retainer (B105), apply the torque specified in Table 5 to the Trim Retainer.

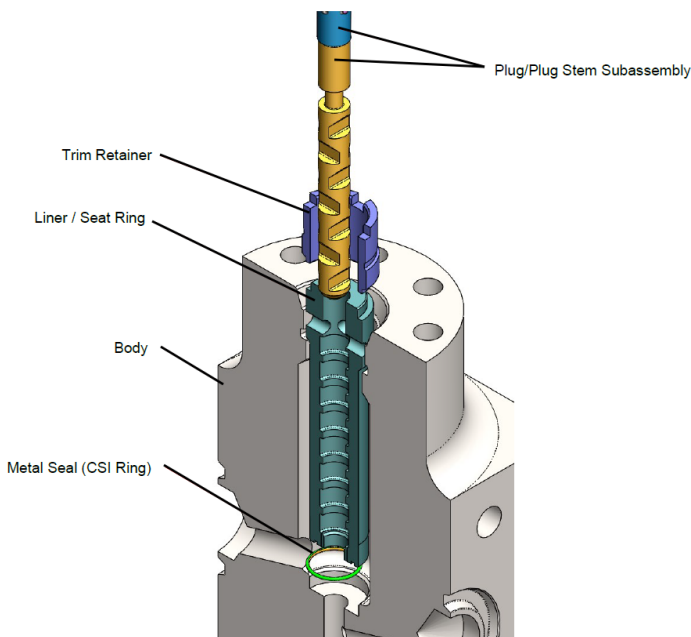


Figure 19: Exploded View of Trim Assembly - Integral Liner/Seat Ring (Unbalanced 1")

1. Baker Hughes offers a seat retainer tool. Refer to Figure 29.

Valve Size 1.5" up to 6"

Trim Installation - Seat Ring and Liner Installation (Refer to Figure 20)

1. Place a metal seal (CSI Ring) (B103) into the groove located on the bottom surface of the Seat Ring (B102).
2. Place the other metal seal (CSI Ring) (B103) into the groove located on the top surface of the Seat Ring (B102).
3. Install Seat Ring into the Valve Body (B001) making sure that the metal seal (CSI Ring) (B103) stays in place.
 - A small amount of grease can be used to hold the metal seals in place during installation of the Seat Ring (B102) into the Body (B001).
4. Place the (Static) Lip Seal (B118) into the Liner (B106), in the orientation shown in Figure 21.
5. Install the Liner (B106) into the Valve Body (B001) and onto the Seat Ring (B102). Take care to guide the (Static) Lip Seal (B118) into position and confirm that it is seated. Confirm the Liner (B106) is seated on the Seat Ring (B102).
6. Place the (Dynamic) Lip Seal (B108) onto the Plug (B112), in the orientation and in the approximate position shown in Figure 21.
7. Carefully lower the Plug Stem (B120) and Plug (B112) into the Liner (B106). Take care to guide the (Dynamic) Lip Seal (B108) into the dedicated groove in the Liner (B106) and confirm that it is seated.
8. Hand-thread the Trim Retainer (B105) into the Body (B001) until it makes metal-to-metal contact with the top side of the Liner, ensure metal-to-metal contact before proceeding to the next step.
9. Using the appropriate tool¹ to engage the Trim Retainer (B105), apply the torque specified in Table 5 to the Trim Retainer (B105).

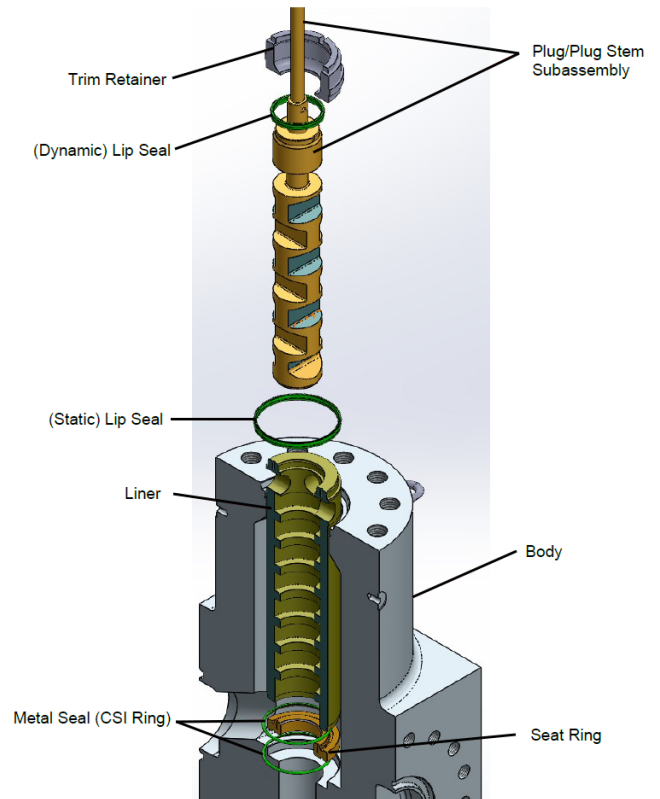


Figure 20: Exploded View of Trim Assembly - Seat Ring and Liner Installation (Balanced 1.5" up to 6")

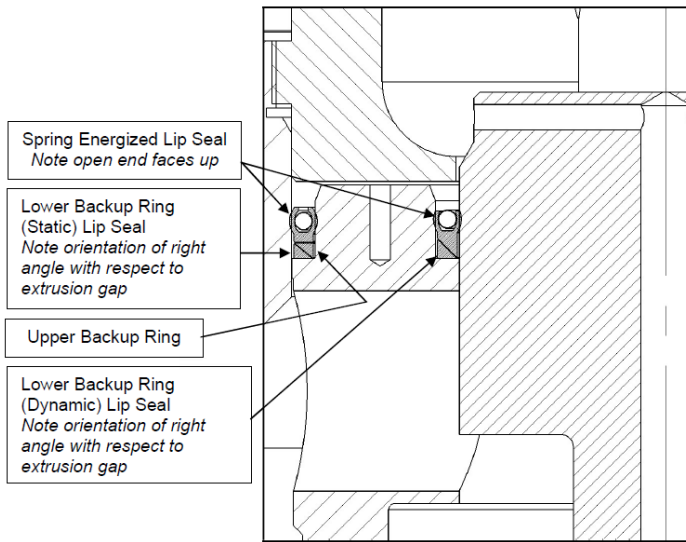


Figure 21: Dynamic and Static Lip Seal Orientation (Balanced)

Body Bolting

1. Grease the threads of the valve body studs (B002) and washers (B921) and the bearing surfaces of the body nuts (B014).
2. Assemble the body nuts (B014) onto the body studs (B002) manually, and hand tighten evenly so that the internal parts are held in place. The face of the bonnet (B003) should be parallel to the top surface of the valve body (B001).
3. Tighten the body nuts (B014) evenly by applying the torque in the increments and the sequences as defined in Table 6 and Figure 22.

WARNING

The VG Seal will not allow the bonnet and body to be in metal to metal contact.

4. Stroke plug and stem assembly in between various tightening steps to make sure they are not binding due to misalignment.

Description	Valve Size (in)	1	1.5	2	3	4	6
	Valve Class	10K/15K	10K/15K	10K/15K	10K/15K	10K/15K	10K/15K
Trim Retainer	Thread Size	287	457	575	1837	3474	4101
	Torque [ft-lb]	96	103	162	162	354	354
	Torque [ft-lb]	103	114	177	177	391	383

Table 5: Trim Retainer Torque Requirement

Description	Valve Size (in)	1		1.5		2		3		4		6	
	Valve Class	10K	15K	10K	15K	10K	15K	10K	15K	10K	15K	10K	15K
Stud Material	Bolt Thread size	3/4" – 10 UNC-2A		0.75-10 UNC	0.875-9 UNC	0.875-9 UNC	1.125- 9 UN	1.125- 8UN	1.25- 8UN	1"1/2- 8UN-2A	1"3/4- 8UN-2A	1"7/8-8UN-2A	
	Bolt number	8	8	8	8	8	8	8	8	8	8	8	12
Body studs B7 /L7	Min Torque [daN.m]	13	13	14	22	22	48	48	67	120	195	242	242
	Min Torque [ft-lb]	96	96	103	162	162	354	354	494	885	1438	1785	1785
	Max Torque [daN.M]	14	14	15.4	24	24	53	52	73	132	215	266	266
	Max Torque [ft-lb]	103	103	114	177	177	391	383	538	974	1586	1962	1962
Body studs B7M/L7M	Min Torque [daN.m]	10	10	11	17	17	37	37	51	92	149	184	184
	Min Torque [ft-lb]	74	74	81	125	125	273	272	376	679	1099	1357	1357
	Max Torque [daN.M]	11	11	12	19	19	41	40	56	101	164	202	202
	Max Torque [ft-lb]	81	81	89	140	140	302	295	413	745	1210	1490	1490

Table 6: Body / Bonnet Bolting Torque Requirements

5. Visually inspect the assembly for proper stud and nut installation by checking the number of exposed threads. If less than one stud thread or more than 2-1/2 threads are extended above the body nut after final tightening, then double check the assembly for proper installation and alignment.

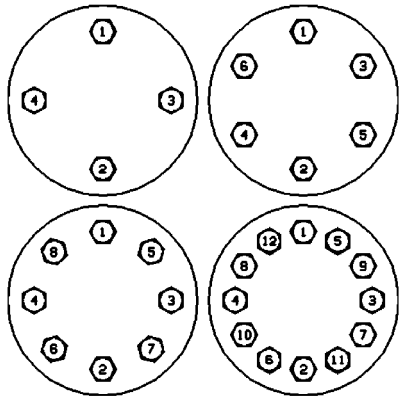


Figure 22: Torque Sequence

Packing Box Assembly

Visually inspect the stem and packing box for cleanliness and proper surface finish. Lubricate the inner diameter of the packing box with Never-Seez or equivalent.

LincolnLog API 6A valves are using an integral packing flange/follower design. Refer to Table 7 for the required packing stud nut torque values.

Packing Studs, Packing Nut, Packing, and Packing Flange Installation

1. Inspect and confirm surface finish of packing box inside diameter is free of porosity, scale, or tool chatter and meets the required surface finish given on the part manufacturing drawing.

2. Inspect and confirm surface finish of stem outside diameter is free of porosity, scale, or tool chatter and meets the required surface finish given on the part manufacturing drawing.

Note: Failure of either part to meet the requirements of the inspection is cause for rejection.

3. Apply a small amount of Never-Seez, or equivalent anti-seize lubricant, onto threads of the Packing Stud (B220).
4. Install Packing Studs (B220) until fully engaged into Bonnet (B003).
5. Install Anti-extrusion Rings (B208) and Packing Rings (B207) into packing box.
 - Refer to Figure 15 for packing arrangement.
 - Number of packing rings provided will vary based on valve size, but a minimum of two anti-extrusion rings will always be provided and must be arranged according to Figure 15.
 - Skive cuts must be staggered between consecutive pieces of packing (approx. 120 degrees).
6. Assemble Packing Flange/Follower (B219).
7. Assemble and hand-tighten Packing Stud Nuts (B221).
8. Confirm that the Valve Plug (B112) can move freely.
9. Gradually apply torque to the Packing Stud Nuts (B221) until target torque is reached. See Table 7 for torque value.

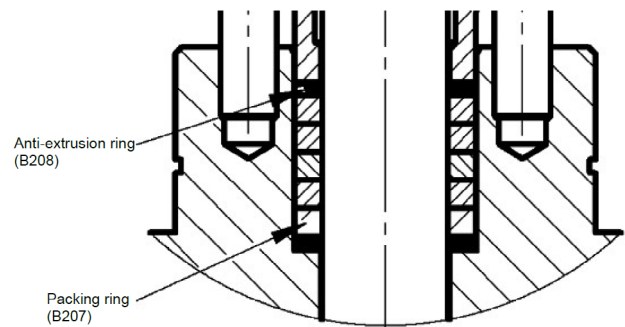


Figure 15 - Packing Arrangement

Description	Valve Size (in)	1	1.5	2	3	4	6
	Stem Size (in)	0.5	0.5	0.75	1	1	
	Valve Class	10K/15K	10K/15K	10K/15K	10K/15K	10K/15K	10K/15K
Trim Retainer	Thread Size	3/8"-16UNC	3/8"-16UNC	1/2"-13UNC	1/2"-13UNC	1/2"-13UNC	1/2"-13UNC
	No of Bolt	4	4	4	4	4	4
	Torque [ft-lb]	20	20	50	82	82	69
	Torque [ft-lb]	15	15	37	60	60	51

Table 7: Torque Values for Packing Stud Nuts

Body Stud Assembly

- Install Body Studs (B002) with a stud driver until fully engaged into Body (B001). For stud projection reference data see Figure 23 and Table 8.

Note: With the correct studs and body machining, this inspection assures that the proper engagement between stud and body has been achieved.

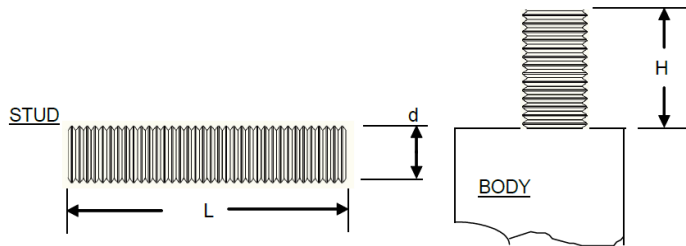
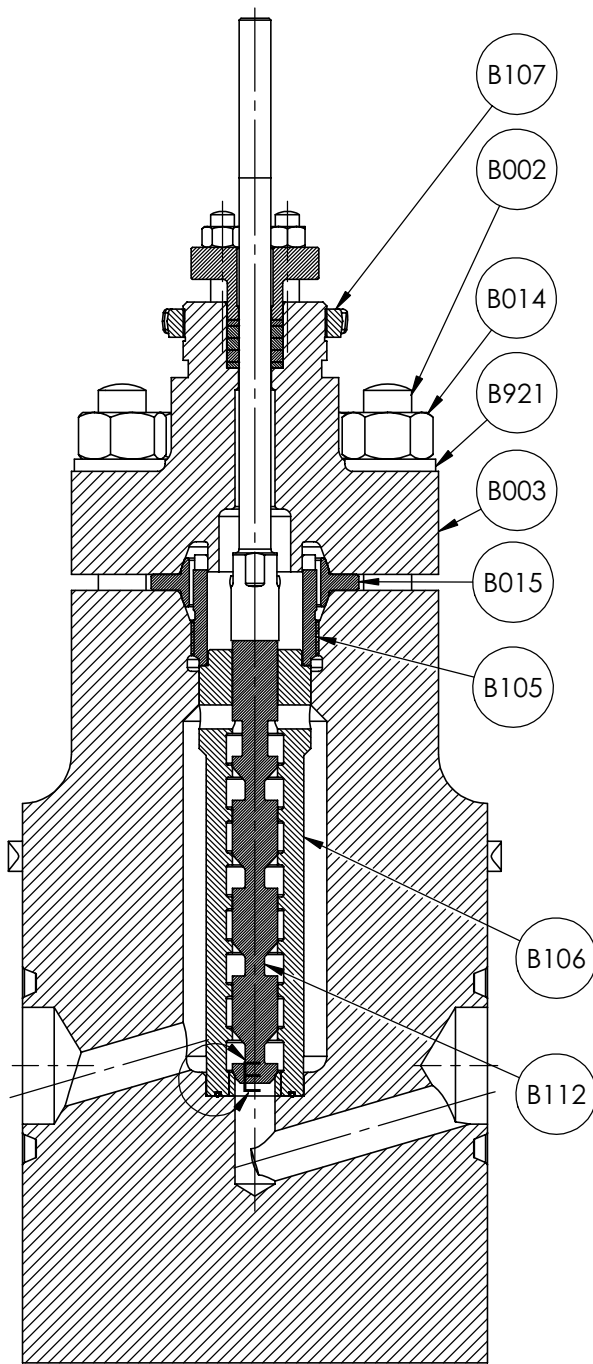


Figure 23: Stud Projection - Dimensions

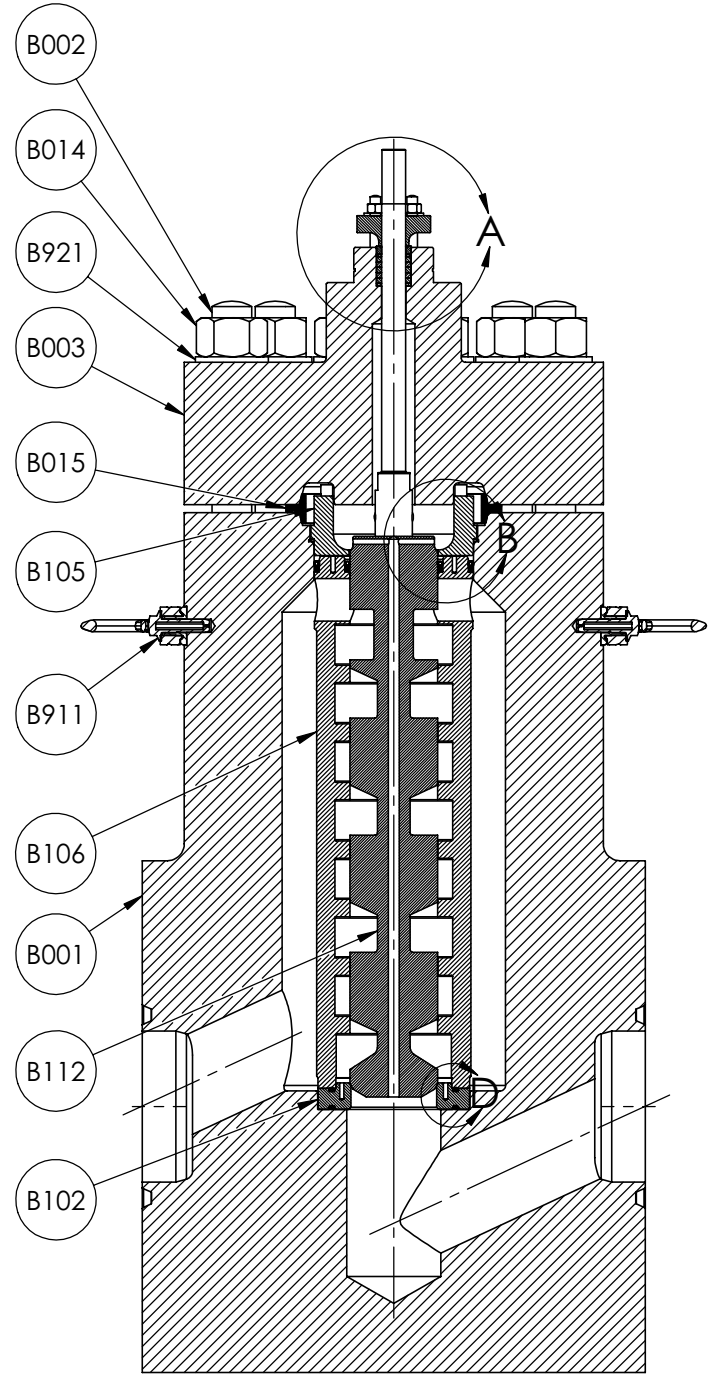
Valve Size (in)	Max Working Pressure (psi)	Material Yield Strength	Number of Studs	Stud Dia. inch	L Inch [mm]	H inch [mm]
1	API 10K/15K	Sy < 120 ksi	8	0.75	4.12 [104.6]	3.13 [79.6]
1	API 10K/15K	Sy >= 120 ksi	8	0.75	3.75 [95.3]	2.77 [70.3]
1.5	API 15K	Sy < 120 ksi	8	0.875	5.12 [130.0]	3.97 [100.98]
1.5	API 15K	Sy >= 120 ksi	8	0.875	4.85 [123.0]	3.7 [93.98]
1.5	API 10K	Sy < 120 ksi	8	0.75	4.13 [105.0]	3.37 [85.55]
1.5	API 10K	Sy >= 120 ksi	8	0.75	3.63 [92.0]	2.86 [72.55]
2	API 15K	Sy < 120 ksi	8	1.125	5.98 [152.0]	4.56 [115.83]
2	API 15K	Sy >= 120 ksi	8	1.125	5.55 [141.0]	4.13 [104.83]
2	API 10K	Sy < 120 ksi	8	0.875	5.12 [130.0]	3.97 [100.98]
2	API 10K	Sy >= 120 ksi	8	0.875	4.72 [120.0]	3.58 [90.98]
3	API 15K	Sy < 120 ksi	8	1.25	180 [7.09]	55.7 [2.19]
3	API 15K	Sy >= 120 ksi	8	1.25	153 [6.02]	48.7 [1.92]
3	API 10K	Sy < 120 ksi	8	1.125	164.8 [6.48]	53.8 [2.12]
3	API 10K	Sy >= 120 ksi	8	1.125	152 [5.98]	50.7 [1.99]
4	API 15K	Sy < 120 ksi	8	1.75	9.76 [248.0]	7.44 [189.0]
4	API 15K	Sy >= 120 ksi	8	1.75	8.27 [210.0]	6.06 [154.0]
4	API 10K	Sy < 120 ksi	8	1.5	8.07 [205.0]	6.10 [155.0]
4	API 10K	Sy >= 120 ksi	8	1.5	7.20 [183.0]	5.24 [133.0]
6	API 10K	Sy < 120 ksi	8	1.875	10.63 [270.0]	8.31 [211.0]
6	API 15K	Sy < 120 ksi	12	1.875	12.01 [305.0]	9.69 [246.0]
6	API 10K	Sy >= 120 ksi	8	1.875	8.66 [220.0]	6.39 [161.0]
6	API 15K	Sy >= 120 ksi	12	1.875	9.65 [245.0]	7.32 [186.0]

Table 8: Stud Projection Data

LincolnLog valve 78400/18400 API 6A Series Body Sub-Assembly Cross Section



Unbalanced Assembly
1" 18489 API 6A 15K



Balanced Assembly
1.5" up to 6" 18483 API 6A 15K

Figure 24 - Cross Sectional Views of 78400/18400 API 6A Design

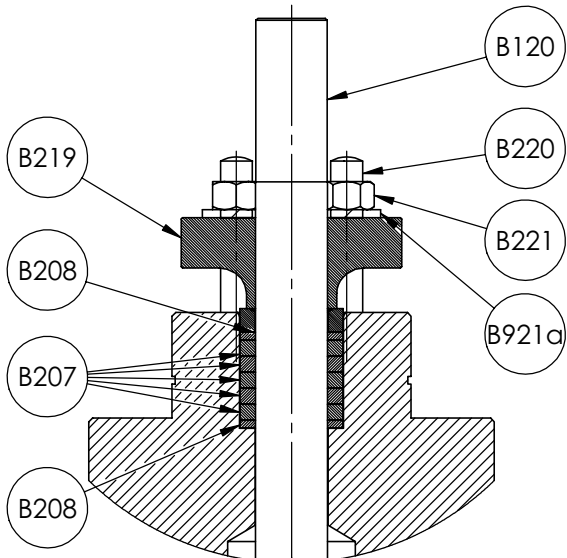


Figure 25 - Detail A - Packing Box

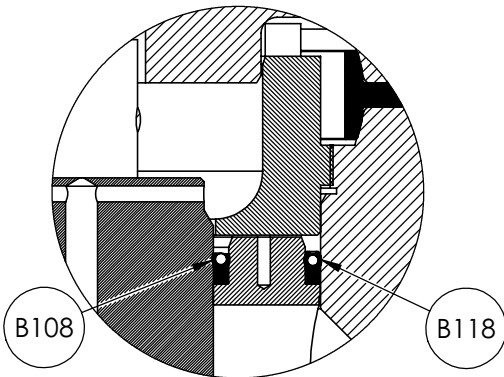


Figure 26 - Detail B - Balanced Plug Seals

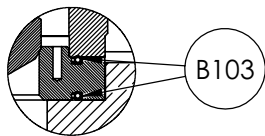


Figure 27 - Detail C - Seat Ring/Liner Seals

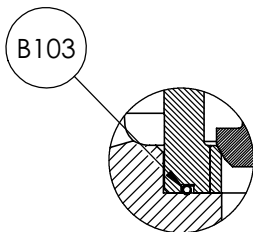


Figure 28 - Detail D - Seat Ring Seal

Part Tag Codes	Spare Part Code	Valve Body S/A Part Description
B001	N	VALVE BODY
B002	N	BODY STUD
B003	N	VALVE BONNET
B014	N	BODY NUTS
B015	C	BODY GASKET
B017	N	DRIVE NUT (NOT REPRESENTED IN DWG)
B102	W	SEAT RING
B103	C	SEAT RING GASKET
B105	N	TRIM RETAINER
B106	W	LINER
B108	C	DYNAMIC SEAL, PLUG TO LINER
B112	W	PLUG
B118	C	STATIC SEAL, LINER TO BODY
B120	W	PLUG STEM
B207	C	PACKING RINGS
B208	C	ANTI-EXTRUSION RINGS
B219	N	PACKING FLANGE/FOLLOWER
B220	N	PACKING STUD
B221	N	PACKING NUT
B903	W	PLUG PIN
B911	N	LIFTING LUG
B915	N	YOKE/BONNET SCREWS (NOT REPRESENTED IN DWG)
B921	N	BODY PLAIN WASHER
B921a	N	PACKING PLAIN WASHER

Notes: C = Consumable
W = Wear Parts
N = Not a Spare Part

Table 9 - LincolnLog 78400/18400 API 6A Series Parts List

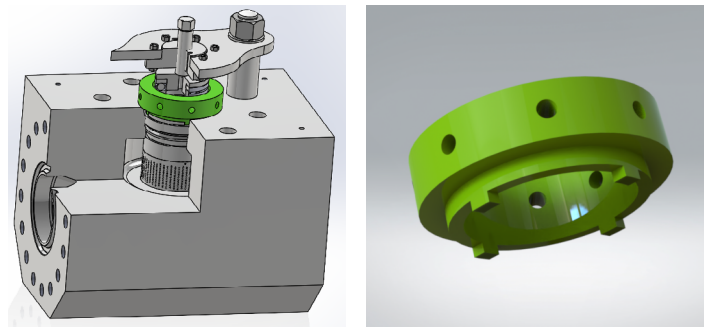
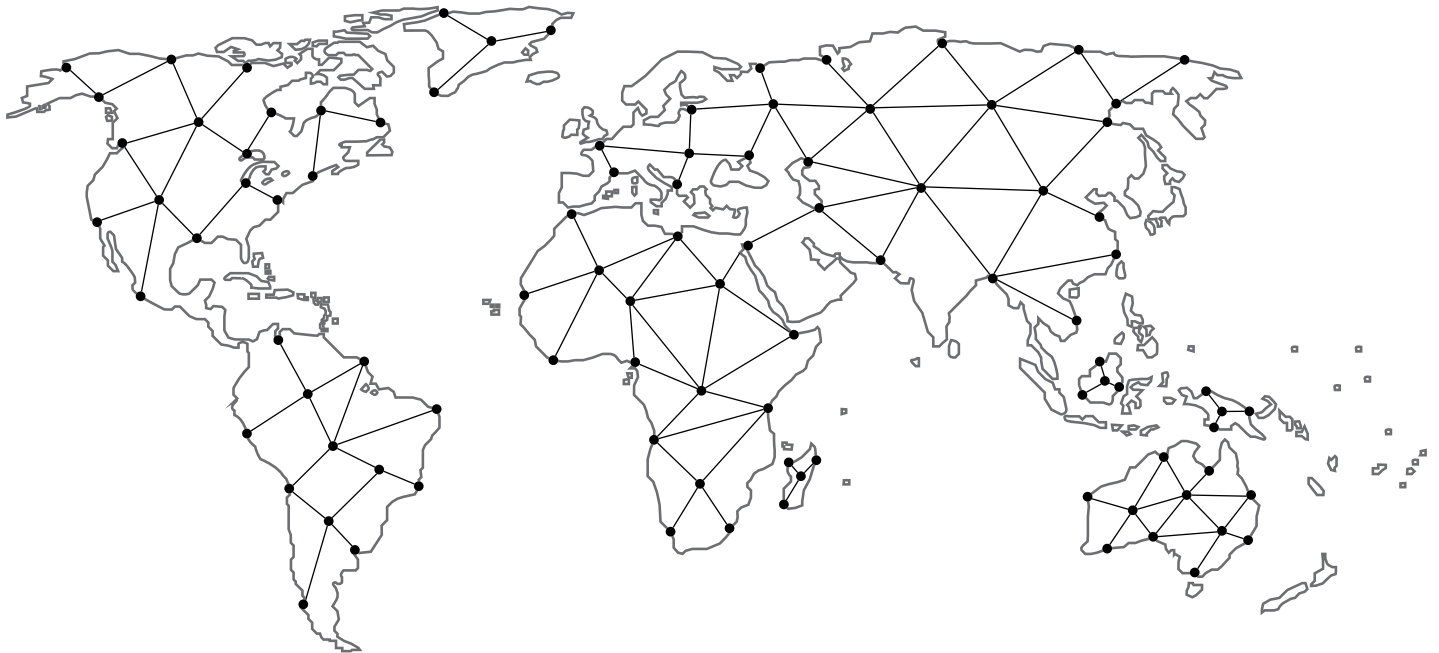


Figure 29 - Seat Retainer Tool
(Available as an option, please consult factory)

Notes

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