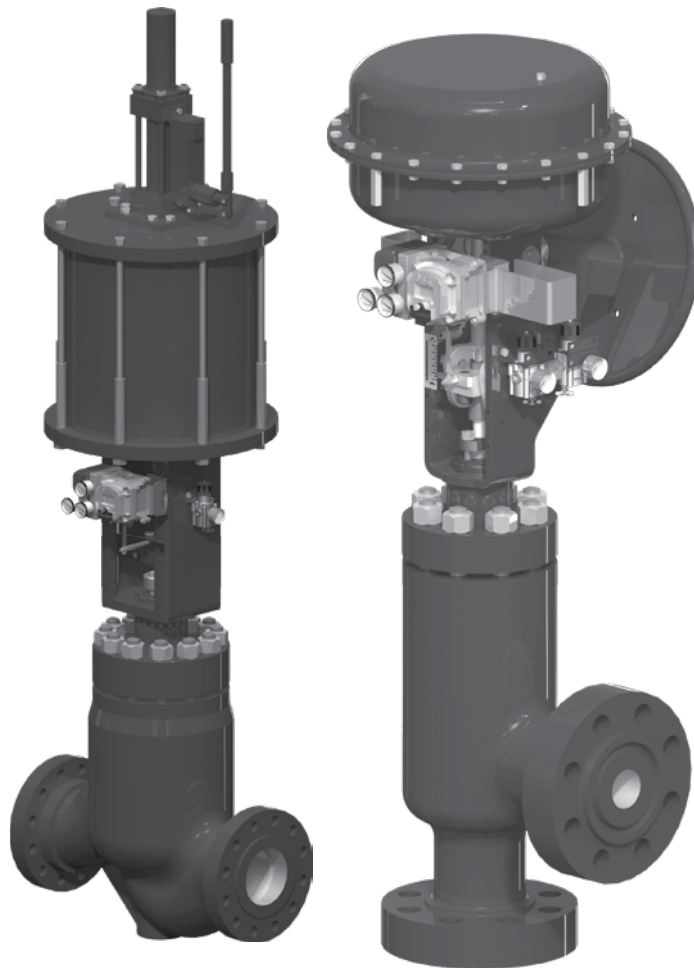


Masoneilan[™] 78400/18400 Series

LincolnLog[™] High Pressure Anti-Cavitation
Control Valve

Instruction Manual (Rev. E)



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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.



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.

Useful 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

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 contact the local Baker Hughes representative or Masoneilan factory located closest to you.

Spare Parts

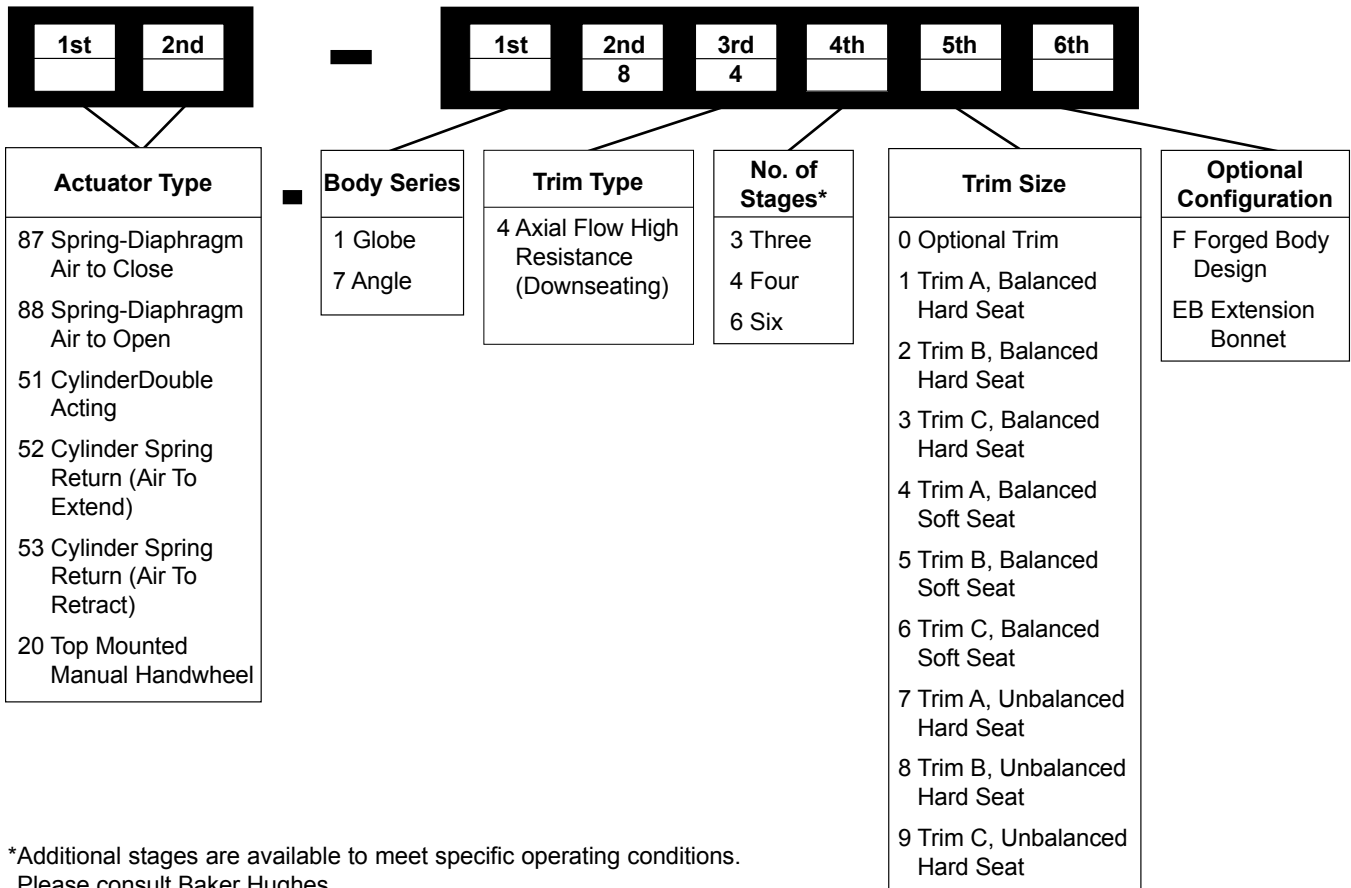
Only Masoneilan replacement parts should be used when carrying out maintenance operations. Obtain replacement parts through local Baker Hughes representatives or Masoneilan Parts Department.

When ordering spare parts, the model and serial numbers indicated on the manufacturer’s serial plate must be given.

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



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 & 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.

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 & 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 principal tasks during routine servicing. Tightness of the packing (22) is maintained by proper compression. Compression is achieved by evenly tightening the packing flange nuts (2) against the packing flange (3). 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.

Packing Replacement

Disassembly of the valve bonnet from the body is recommended before replacing the standard PTFE V-Ring packing. Other packing types can be replaced without removal of the bonnet. Use the following procedures to replace existing packing:

1. Loosen and remove the packing flange nuts (2).
2. Remove the packing flange (3) and packing follower (4).
3. Remove the old packing set (22) and lantern ring (17).
Note: Applicable only for units with the optional leak detector bonnet option.
4. Replace packing (22) referring to Figures 8, 9, or 10 for correct number of packing rings.
Note: For PTFE packing, 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. Reassemble the packing follower (4) and the packing flange (3).
6. Tighten the packing flange nuts (2) without over compressing the packing rings.
7. For graphite packing, open and close the valve several times then retighten the packing as required.
8. Place the valve back into service and check for leakage. Tighten packing flange nuts (2) as required.

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 1, 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.

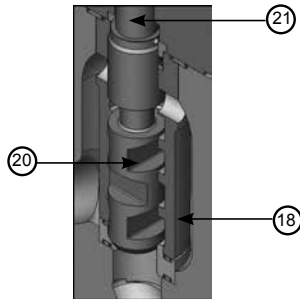


Figure 1: Plug, Liner, and Stem Guiding Surface

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 2 below. Parts requiring more metal removal to restore shall be discarded and replaced.

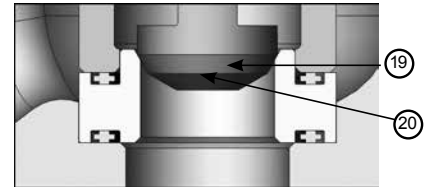
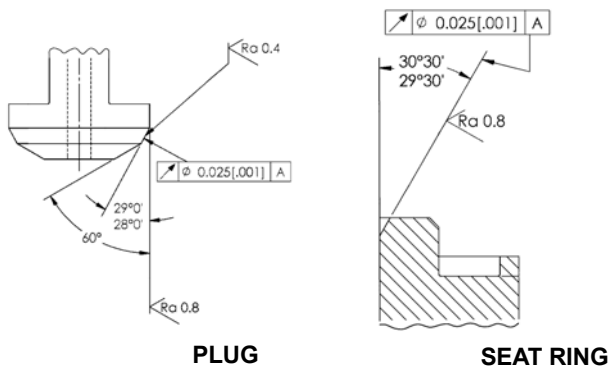


Figure 2: Plug and Seat Ring Seating Surfaces

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 2.

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".

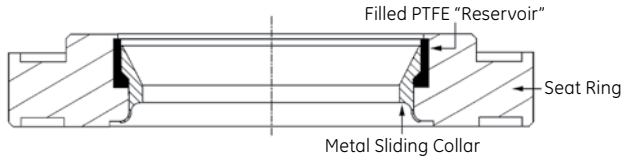


Figure 3: Soft Seat Option

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 & 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 4 for details.

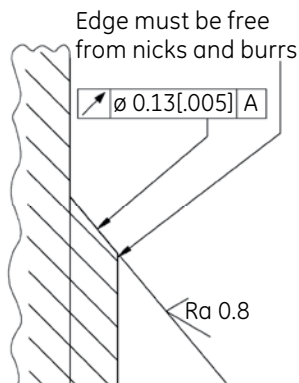


Figure 4: Bonnet Seating Angle Details(see page 16)

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 1. 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 5 for details.

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

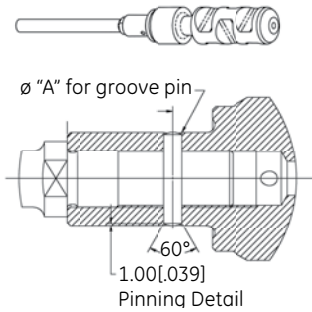


Figure 5: Groove Pin Details

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 6A and 6B) 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.
5. 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.
6. 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"

1. Assemble one seat ring gasket (11) into the valve body (25).
2. 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.

3. 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.
4. 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).
5. Assemble the plug (20) and stem (21) subassembly into the liner (18).
6. 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 6A and 6B) 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.
7. 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).

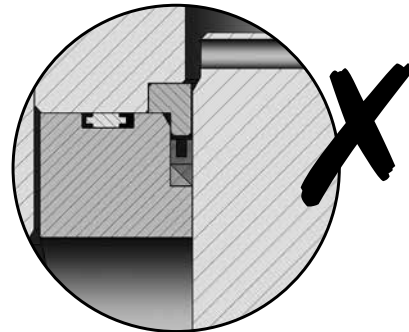


Figure 6A: Incorrect Seal Ring Installation showing lower back-up ring 90° angle facing away from extrusion gap

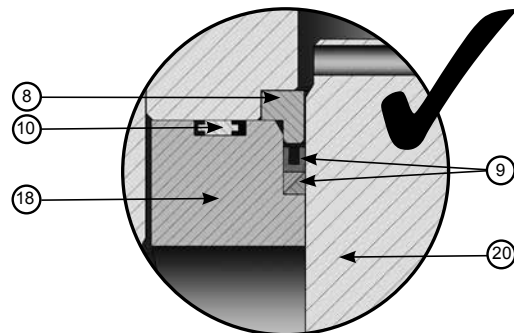


Figure 6B: Correct Seal Ring Installation showing lower back-up ring 90° angle facing the extrusion gap

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

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:

9. 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.
10. Assemble the metal seal (10) over the bonnet (23) and slide down into the groove formed between the body and bonnet.
11. 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

1. Grease the threads of the valve body studs (6) and the bearing surfaces of the body nuts (7).
2. 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.
3. Tighten the body nuts (7) evenly by applying the torque in the increments and the sequences as defined in Table 2 and Figure 7.

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

4. 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 & 1.5	25 & 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.

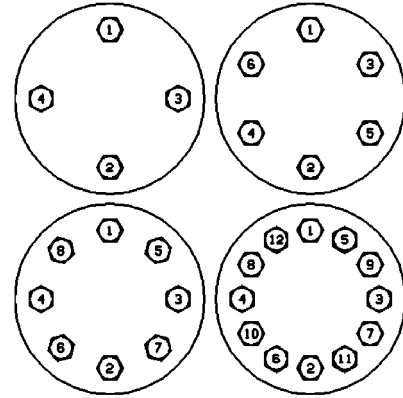


Figure 7: Torque Sequence

Packing Box Assembly

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

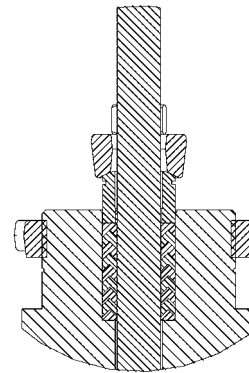


Figure 8 : Standard Packing V-Ring Packing Adapter 7 pieces V-Ring Packing

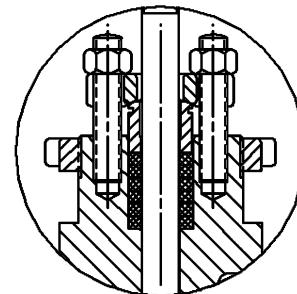


Figure 9 : 285C or Latty 326.1M Packing 6 pieces 285C6 pieces Latty 326.1

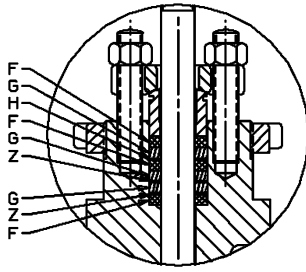
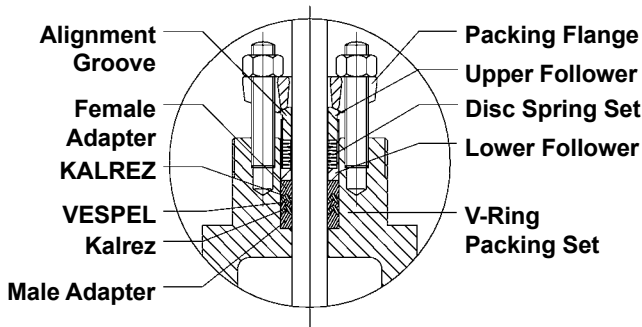


Figure 10 : Graphite Packing

F : 3 pieces Filament Graphite
G : 3 pieces Graphite Ring
Z : 3 pieces Zinc Washer

Low Emissions LE Packing (Optional)

The Masoneilan LE™ (Low Emissions) Packing is a high performance packing system capable of containing fugitive emissions well below the specifications of the most severe recommendations. It is also available in a firesafe configuration.



Packing Set		Follower Assembly	
Part	Qty	Part	Qty
VESPEL Female Adapter	1	Upper Follower	1
KALREZ V-Ring	2	Disc Spring	8
VESPEL V-Ring	1	Lower Follower	1
VESPEL Male Adapter	1		

Figure 11: LE Packing Configuration (Shown in Loaded Position)

The packing is provided as a set of five pieces. It consists of two adapter rings and three V-rings. An alternating pattern of Perfluoroelastomer (PFE) and long carbon fiber filled PTFE V-rings are used.

Applied properly, this packing exhibits very little cold flow (or creep). Consequently, it can effectively prevent fugitive emissions leaks from a control valve. The LE Packing system can directly replace conventional packing, requiring no modification to the control valve or actuator.

A spring loaded, two-piece follower assembly is used to maintain a constant load on the packing, and is necessary for thermal cycling applications. As the definition of thermal cycling can vary, and processes are potentially subject to unpredicted thermal gradients, LE Packing is only available with the spring loaded follower.

Installation should be performed as detailed in the following paragraphs.

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 require installation of a lantern ring within the packing arrangement shown in Figure 12.

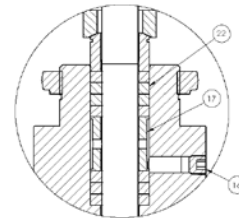
CAUTION

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 0.8) 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 LE Packing will still seal properly.

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



VIEW SHOWN WITH GRAPHITE PACKING OPTION AND LANTERN RING WITH LUBE HOLE

Figure 12

Packaging

Inspect packing rings. DO NOT use packing if any nicks or scratches on packing are observed. Check packing and ensure that it is in the proper arrangement (see Figure 13). PFE material can be identified by the gloss black molded finish. PTFE material has a dull black machined finish.

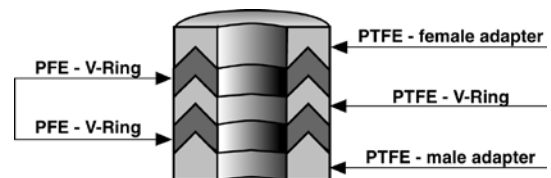


Figure 13

Spring Loaded Follower

The spring loaded follower (available for applications rated ANSI 300 and below) consists of an upper and lower follower and eight (8) disc springs (see Figure 14). The springs are installed inside the lower follower and positioned alternately. The assembly is held together by tape, which must be removed before installation.

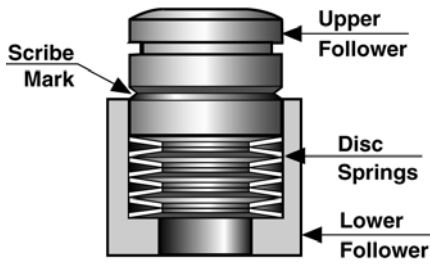


Figure 14

Packing Installation

1. The packing must be lubricated with Krytox® fluorinated grease prior to installation (Krytox GPL206 or equivalent).
2. Packing should be lubricated as a set (not individually) to minimize getting lubricant between the rings.
3. Packing should be lubricated with a generous application to the O.D. and I.D. of the packing set.

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

4. PFE/PTFE is to be installed as a set. Carefully slide the packing set down the stem. Do not cock or force the packing on the threads.

If the packing set separates while on the stem, do not remove. Continue installing the remaining pieces to put the set back together.

5. Gently press the packing into the packing box. Do not tap the packing down into the box.
6. The spring loaded follower is installed on top of the packing. This follower is installed as an assembly held together by tape. This tape should be removed after assembly. Proper assembly of the packing box will leave the top of the Lower Follower 0.25 - 0.50 inches (6 to 13 mm) above the bonnet.

A groove is scribed into the O.D. of the upper follower. The packing flange is tightened evenly until the top of the Lower Follower aligns with the scribe mark (groove) in the Upper Follower.

Note: This is the optimum loading for this packing. Further tightening will shorten life of the packing. Thread locking compound can be used on packing nuts.

7. The packing should be checked for leakage.
8. Packing load should be checked after the valve has cycled approximately 500 times. Adjust if necessary. No further adjustment should be required for the life of the packing.

Valve Travel Requirements

See table below for rated travel by specific valve size.

Valve Size		Travel	
inches	DN	inches	mm
1	25	.25	6.35
1.5	40	.25	6.35
2	50	.38	9.65
3	80	.62	15.7
4	100	.75	19.1
6	150	1.00	25.4
8	200	1.25	31.8

Table 3: Valve Travel

Note: Actuator over travel of 0.12" (3 mm) past the rated travel noted above is necessary to achieve required seat loading.

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 4: Valve Parts List

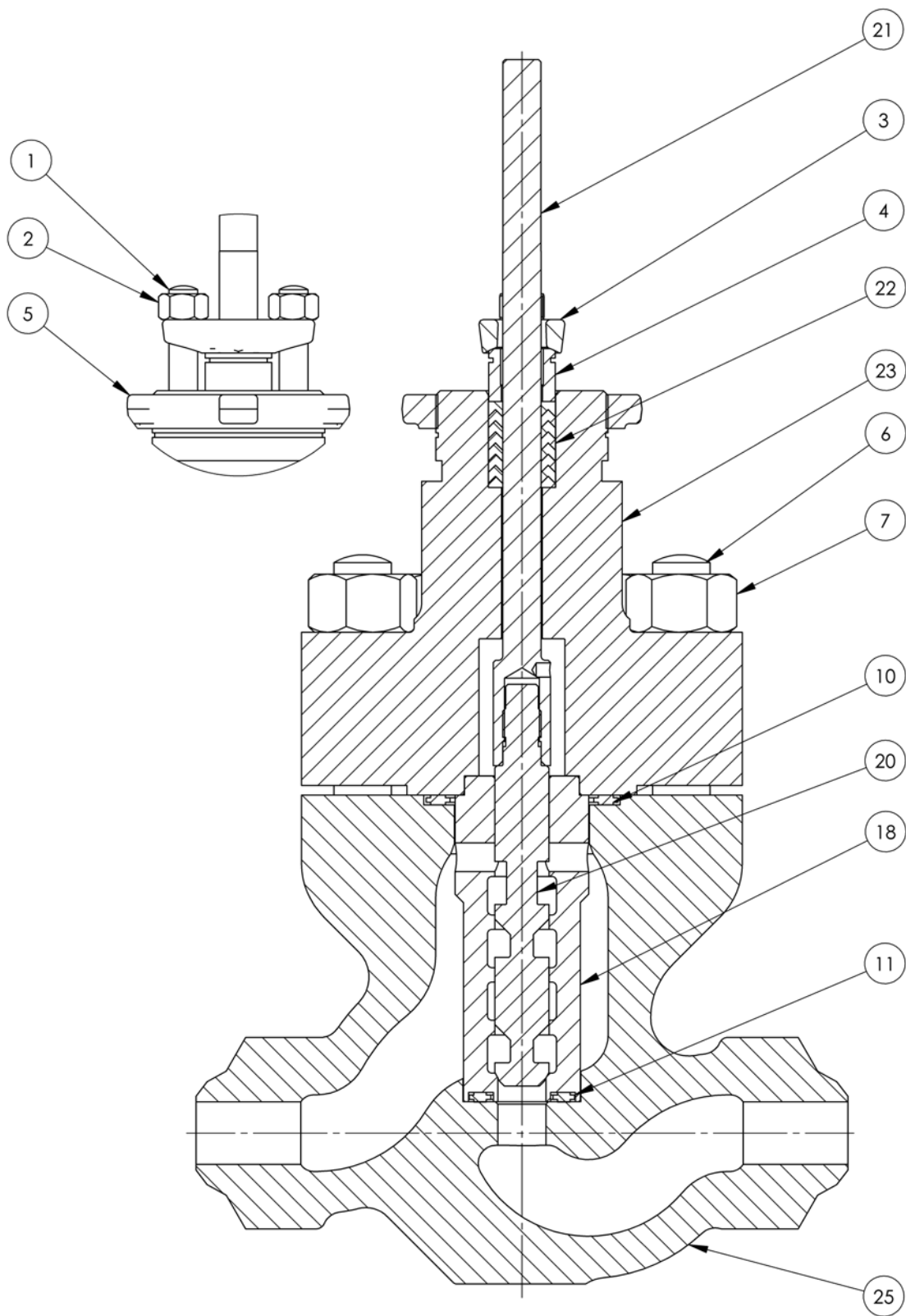
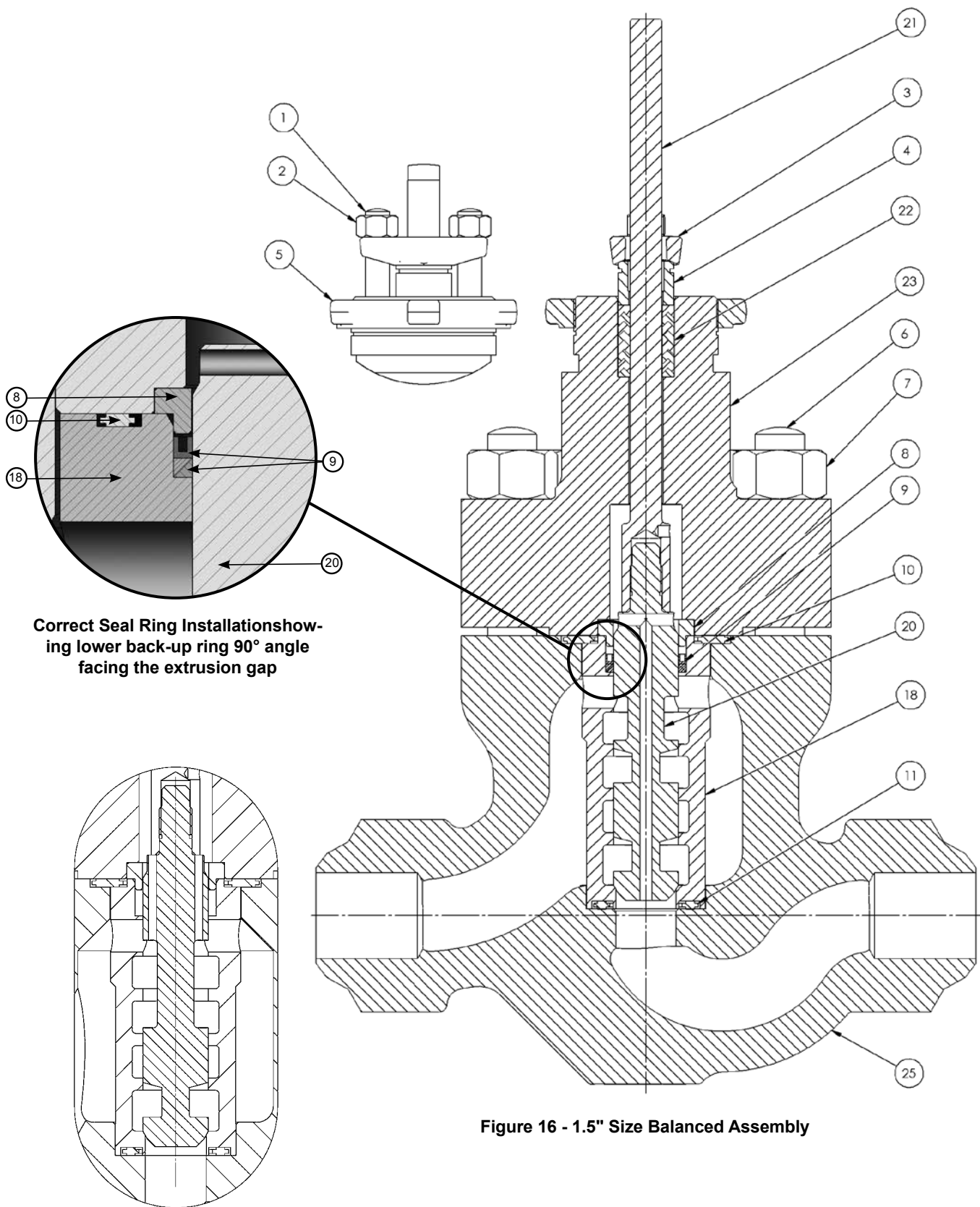


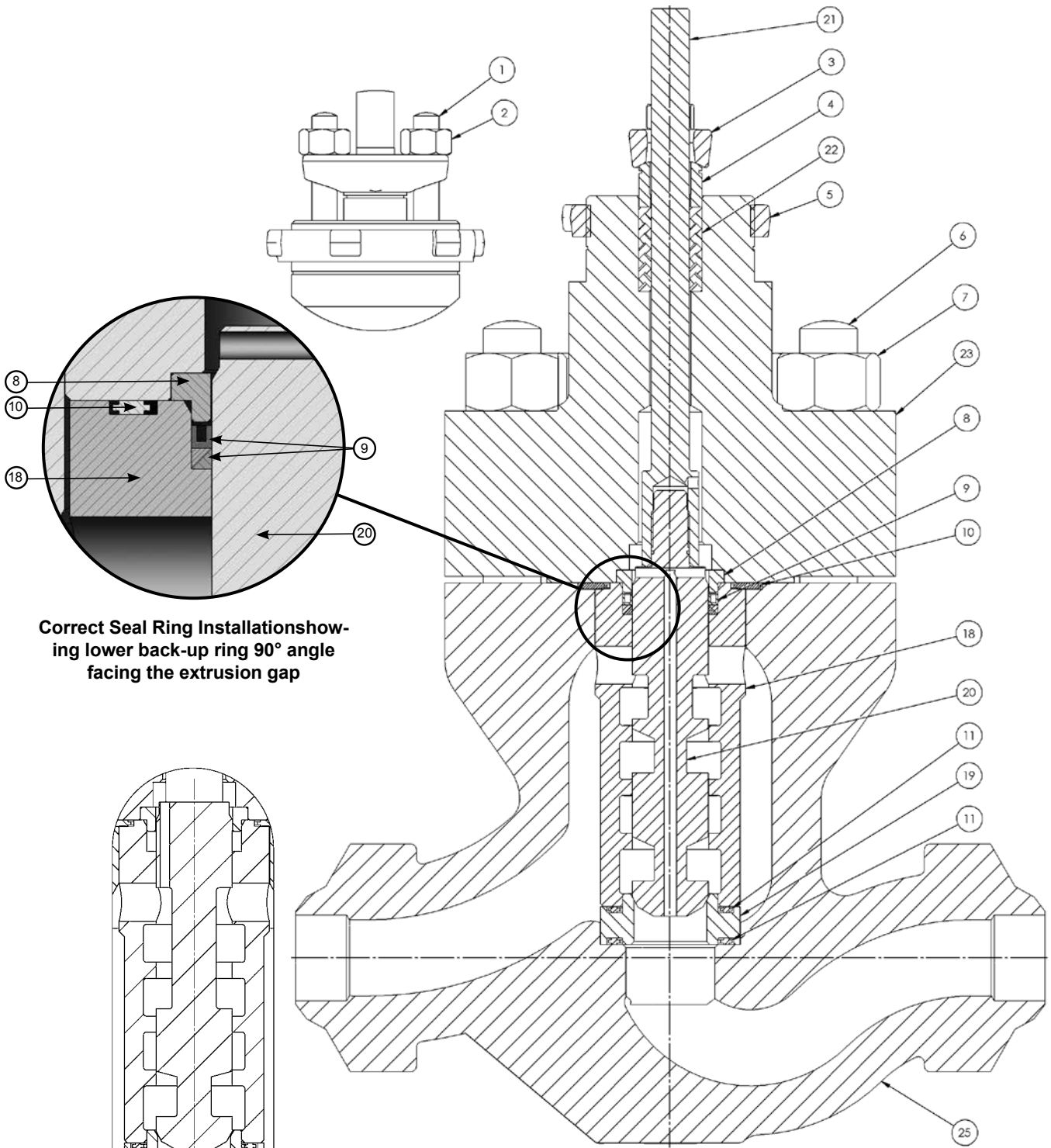
Figure 15 - 1" Size Unbalanced Assembly



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

Figure 16 - 1.5" Size Balanced Assembly

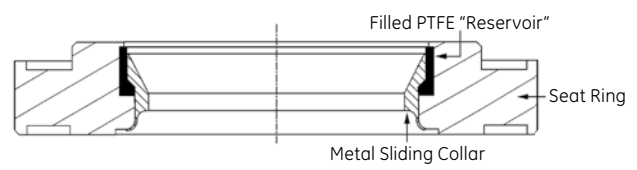
1.5" Size Unbalanced Trim Detail



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

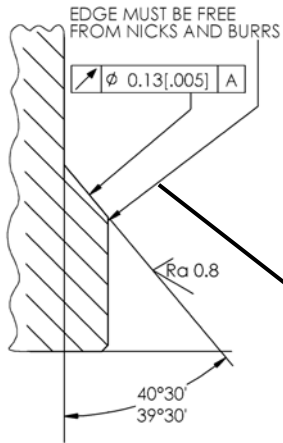
Figure 17 - 2" Size Balanced Assembly

2" Size Unbalanced Trim Detail

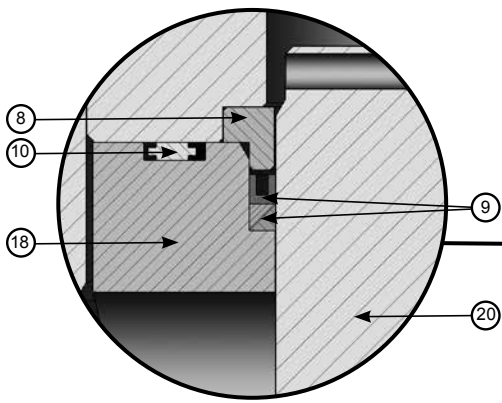


Soft Seat Option

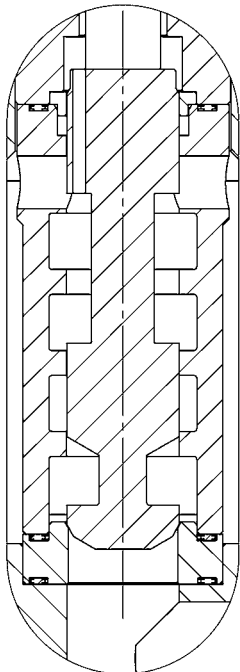
Actuation



Bonnet Seating Angle Detail



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



3" to 8" Size Unbalanced Trim Detail

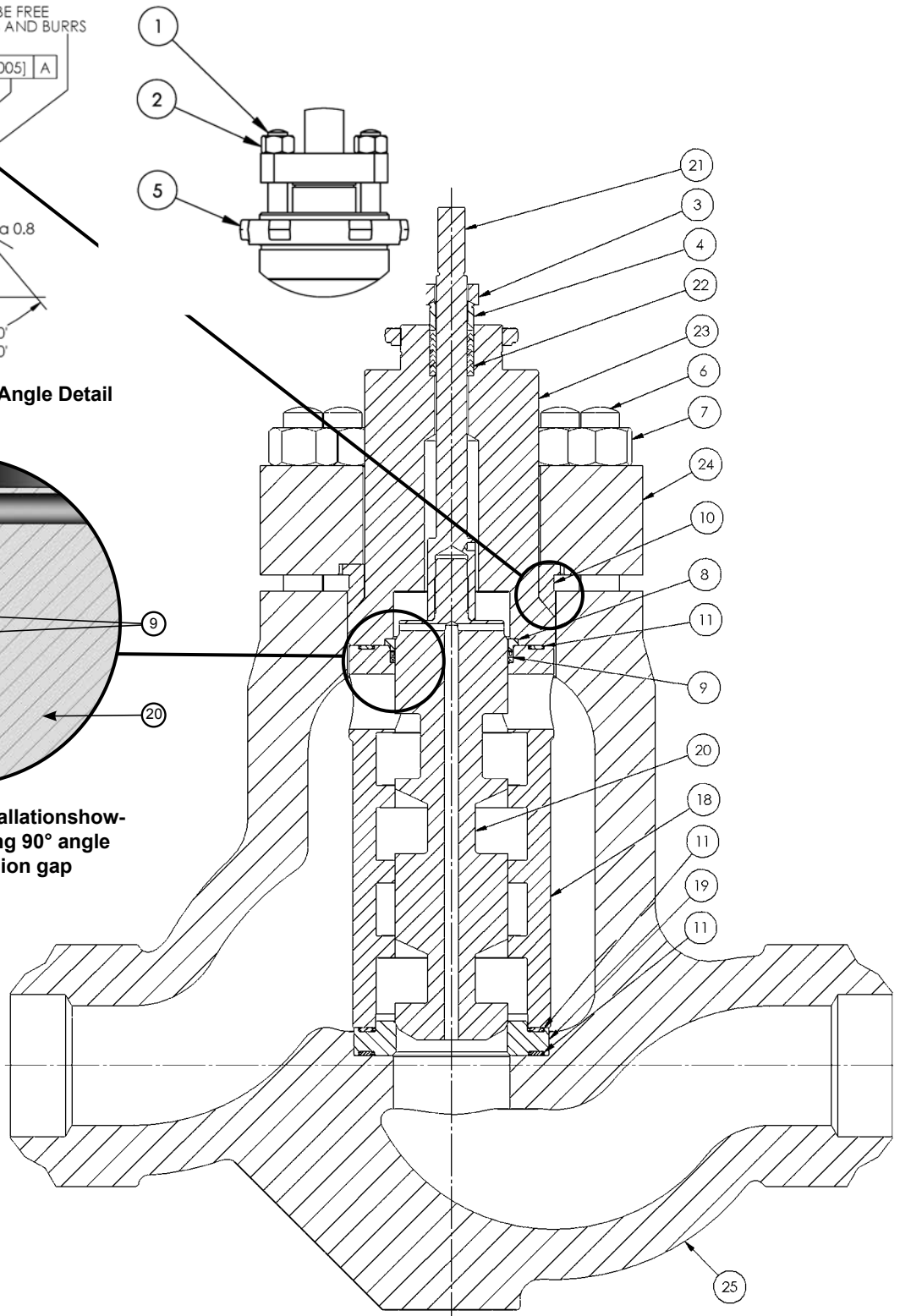
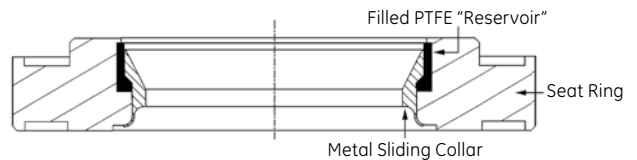


Figure 18 - 3" to 8" Size Balanced Assembly



Soft Seat Option

Type 87/88 Multi-Spring Diaphragm Actuators

Connecting Type 87 (Air to Close) No. 6 Actuator (Refer to schematic page 18)

1. Tightly assemble the hex nuts (1) onto the plug stem.
2. Push down the actuator, and screw on the yoke nut (33) at the same time. Then assemble the bottom stem connector (2). As soon as it becomes possible, insert the valve stem into the actuator stem (10). The stem must be inserted far enough so that when there is no air in the actuator, the valve plug does not touch the seat.
3. Tighten the yoke nut (33).
4. Supply air to the actuator at the final pressure.
5. Use the pointer (7) to set the travel scale (9) to the valve open position.
6. Supply the actuator with air at a sufficiently high pressure to obtain a travel equal to the nominal travel of the valve as specified in Table 3.
7. Unscrew the plug stem until the valve plug is in contact with the seat. Do not turn the valve plug on the seat as this could damage the sealing surfaces.
8. Screw the hex nuts (1) as far as they will go and check that operation is correct.

Connecting Type 88 (Air to Open) No. 6 Actuator (Refer to schematic page 19)

1. Tightly assemble the hex nuts (1) onto the plug stem.
2. Push down the actuator, and screw on the yoke nut (33) at the same time. Then assemble the bottom stem connector (2). As soon as it becomes possible, insert the valve stem into the actuator stem (10). The stem must be inserted far enough so that when there is no air in the actuator, the valve plug does not touch the seat.
3. Tighten the yoke nut (33).
4. Unscrew the valve plug stem until the valve plug comes into contact with the seat. Do not turn the valve plug on the seat as this could damage the sealing surfaces.
5. Supply air to the actuator until the stem has travelled at least .40 inches (10 mm).
6. Unscrew the plug stem by the number of turns N1 specified in Table 5.
7. Screw the hex nuts (1) as far as they will go and check that operation is correct.
8. Use the pointer (7) to set the travel scale (9) to the valve closed position.

Note : All 1" and 1.5" LincolnLog valves equipped with type 88 actuators shall have up travel stops installed in order to control overtravel. To set the travel stop, position limit stop (86) so that travel is not limited. Apply sufficient air pressure to locate the stem at the specified limit. Turn limit stop (86) until contact is made and lock it in place with the jam nut (82).

Plug Stem Diameter	N1 (turn)	in	mm
1"	1.25	0.09	2.3
3/4"	1.25	0.08	2.0
5/8"	1.5	0.08	2.0
1/2"	1.5	0.075	1.9

Table 5: Type 88, Air to Open - Valve Seating

Connecting Type 87 (Air to Close) No. 10, 16 and 23 Actuators (Refer to schematic page 18)

1. Tightly assemble hex nut (1) onto the plug stem.
2. Screw the top stem connector (4) assembly tightly onto the actuator stem (10).
3. Push down the actuator, and screw on the yoke nut (33) at the same time. Then assemble the bottom stem connector (2) assembly by screwing until it comes into contact with the hex nut (1).
4. Push down the actuator and tighten the yoke nut (33).
5. Supply the actuator with air at the initial pressure indicated on the spring scale.
6. Position the stem connector assembly at distance "X" indicated in Table 6.
7. Use the pointer (7) to set the travel scale (9) to the valve open position.
8. Supply the actuator with air at a high enough pressure to obtain a travel equal to the nominal travel of the valve.
9. With the plug correctly positioned on the seat, unscrew the bottom stem connector (2) assembly until it comes into contact with the top stem connector (4). Tighten the socket head cap screws (5), hex nut (1) and lock nut (32) and check that the operation is correct.

Connecting Type 88 (Air to Open) No. 10, 16 and 23 Actuator (Refer to schematic page 19)

1. Supply the actuator with air to retract stem.
2. Unscrew the top stem connector (4) in accordance with dimension "X" in Table 6.
3. Tightly assembly hex nut (1) onto the plug stem.
4. Tightly screw the top stem connector (4) assembly onto the actuator stem (10).
5. Push down the actuator, and screw on the yoke nut (33) at the same time. Then assemble the bottom stem connector (2) assembly by screwing until it comes into contact with the hex nut (1).
6. Push down the actuator and tighten the yoke nut (33).
7. With the plug correctly positioned on the seat, unscrew the bottom stem connector (2) assembly to bring it into contact with the top stem connector (4).
8. Supply air to the actuator until the stem has travelled at least 0.40 inches (10 mm).
9. Unscrew the top stem connector (4) by the number of turns N1 specified in Table 5 then lock manually with hex nut (1).
10. Release the pressure in the actuator. Use pointer (7) to set the travel scale (9) to the actuator supply pressure so that the two stem connectors come into contact. Then tighten the socket head cap screws (5), hex nut (1), and lock nut (32).

11. Shut off the closed valve pressure and check that operation is correct.

Note : All 1" and 1.5" LincolnLog valves equipped with type 88 actuators shall have up travel stops installed in order to control overtravel. To set the travel stop, position limit stop (86) so that travel is not limited. Apply sufficient air pressure to locate the stem at the specified limit. Turn limit stop (86) until contact is made and lock it in place with the jam nut (82).

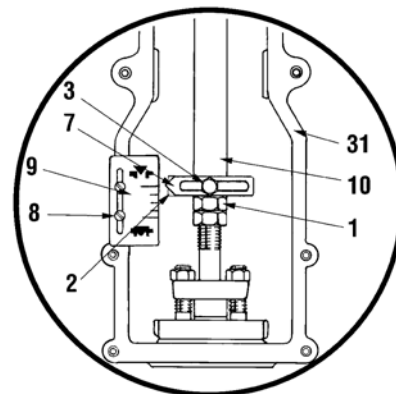
Actuator Size	Travel		"X" Actuator 87		"X" Actuator 88	
	in	mm	in	mm	in	mm
10	0.250	6.35	5.12	130.0	4.62	117.3
10	0.375	9.53				
16	0.375	9.53	8.00	203.2	7.02	178.3
16	0.625	15.88	8.50	215.9		
16	0.750	19.05				
23	0.625	15.88	8.62	218.9		
23	0.750	19.05				
23	1.000	25.40	9.12	231.6		

Table 6: Position of Top Stem Connector

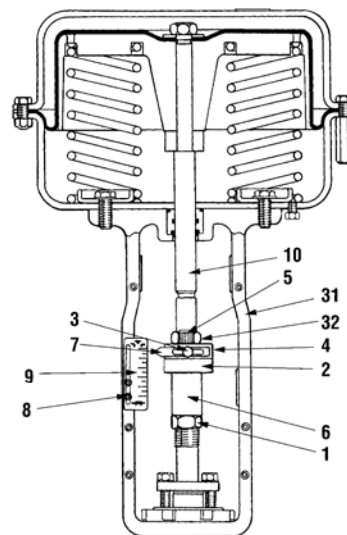
Parts Reference Table – 87/88 Actuators

Ref. No	Description	Ref. No	Description
1	Hex Nut	10	Actuator stem
2	Stem Connector, bottom	31	Yoke, machining
3	Cap Screw, Hex head	• 32	Lock Nut
• 4	Stem Connector, top	33	Yoke Nut
• 5	Cap Screw, socket head	71	Travel Stop
• 6	Connector Insert	80	Upper Diaphragm Case
7	Pointer	82	Jam Nut
8	Screw, Pan head	86	Stopper
9	Scale - Travel		

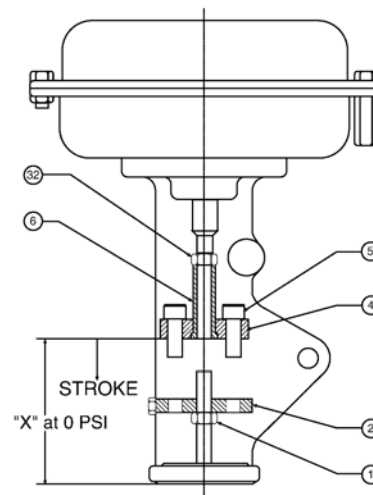
• Not provided for Size 6 Actuator



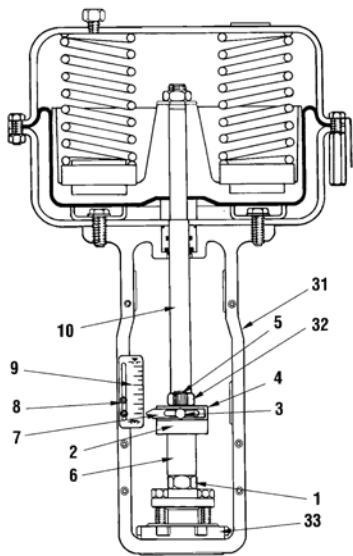
Type 87 Air to Close No. 6



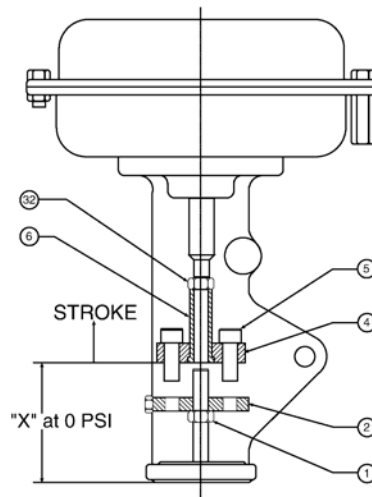
Type 87 Air to Close No. 10-16-23



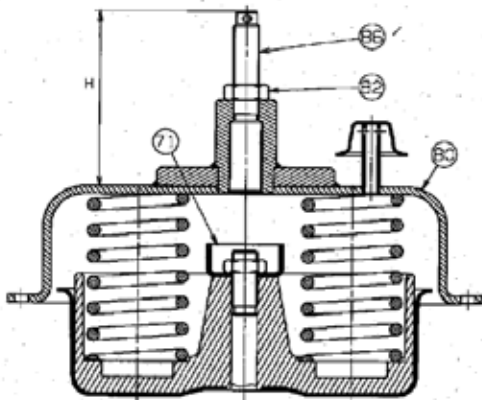
Type 87 Actuator Air to Extend (Close)



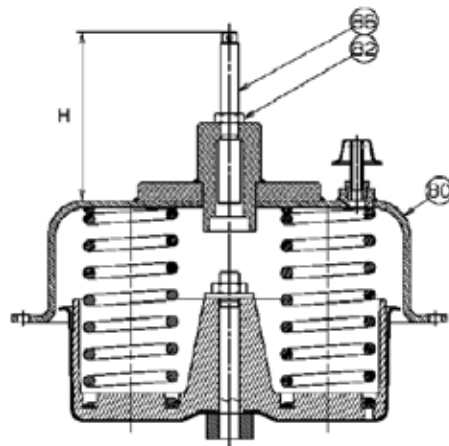
Type 88 Air to Open No. 10-16-23



Type 88 Actuator Air to Retract (Open)



Type 88 Actuator Size 10

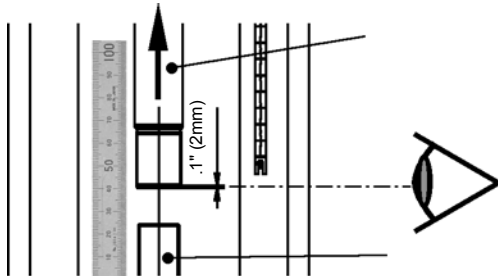


Type 88 Actuator Size 6, 16 & 23

Type 51/52/53 Cylinder Actuators

Connecting Double Acting (Model 51)

1. Install actuator on the valve body with drive nut.
2. Connect manual loading panel tubing to the Top Plate (17).
3. Apply required air pressure through the manual loading panel to completely extend the actuator stem.
4. Reconnect manual loading panel tubing from the Top Plate (17) to the Yoke (1).
5. Retract the actuator stem either pneumatically or with a handwheel approximately .1" (2mm) using the visual stroke scale.



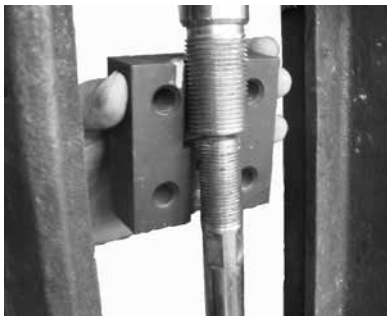
6. Assemble the Split Clamp (22).

Note: If the split clamp does not engage with both stems, then retract the actuator stem until alignment and engagement is achieved.

CAUTION

Make sure the valve is fully extended.

7. Assemble and tighten Indicator Arm (23), Spring Lock Washers (25), and Hexagon Bolts (24).
8. Line up the indicator plate (26), with Indicator arm (23) and check actuator for proper operation.



Connecting Air to Extend (Model 52)

1. Install actuator on the valve body with drive nut.
2. Connect manual loading panel tubing to the top plate (17).
3. Apply required air pressure through the manual loading panel to completely extend the actuator stem.
4. Extend the actuator stem either pneumatically or with a handwheel approximately (.1") 2mm using the visual stroke scale.
5. Assemble the Split Clamp (22).

Note: If the split clamp does not engage with both stems, then extend the actuator stem until alignment and engagement is achieved.

CAUTION

Make sure the valve is fully extended.

6. Assemble and tighten Indicator Arm (23), Spring Lock Washers (25), and Hexagon Bolts (24).
7. Line up the indicator plate (26), with Indicator arm (23) and check actuator for proper operation.

Connecting Air to Retract (Model 53)

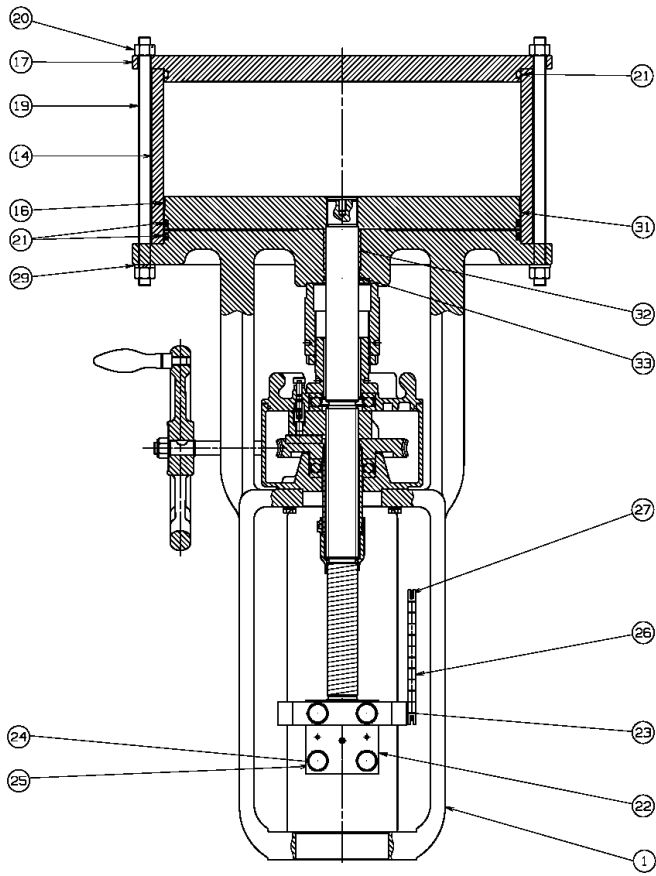
1. Install actuator on the valve body with drive nut.
2. Connect manual loading panel tubing to the yoke (1).
3. Retract the actuator stem either pneumatically or with a handwheel approximately (.1") 2mm using the visual stroke scale.
4. Assemble the Split Clamp (22).

Note: If the split clamp does not engage with both stems, retract the actuator stem until alignment and engagement is achieved.

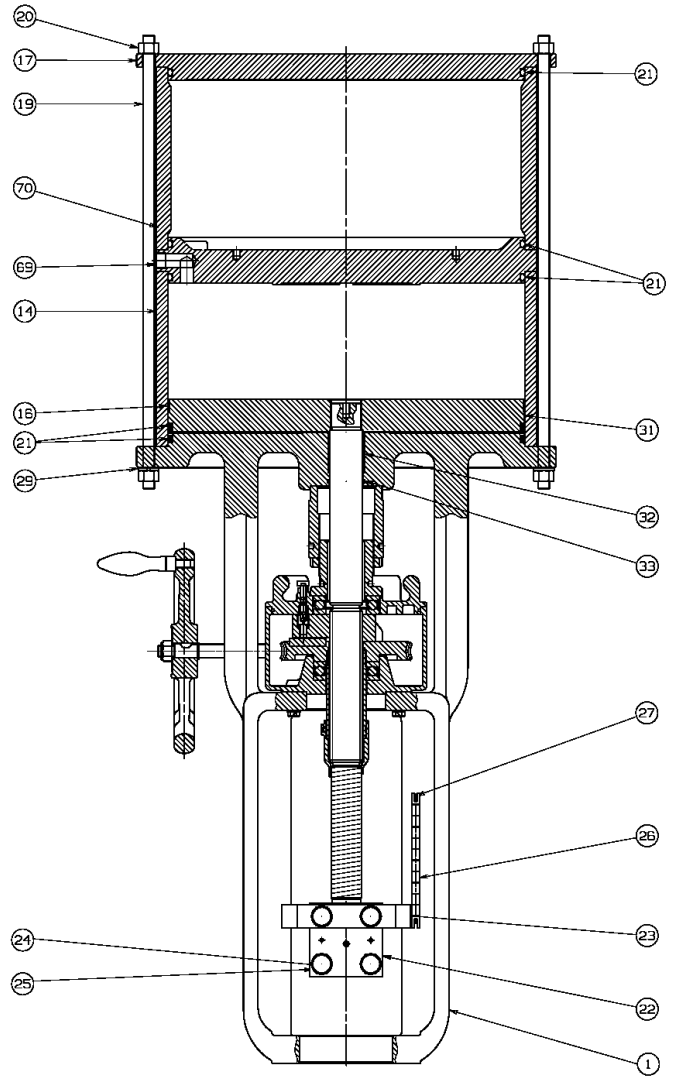
CAUTION

Make sure the valve is fully retracted.

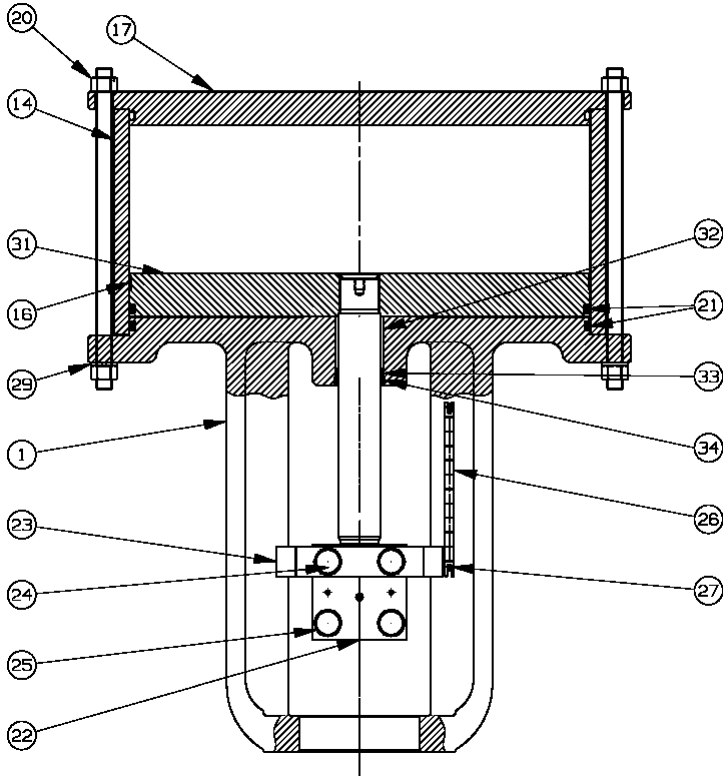
5. Assemble and tighten Indicator Arm (23), Spring Lock Washers (25), and Hexagon Bolts (24).
6. Line up the indicator plate (26), with Indicator arm (23) and check actuator for proper operation.



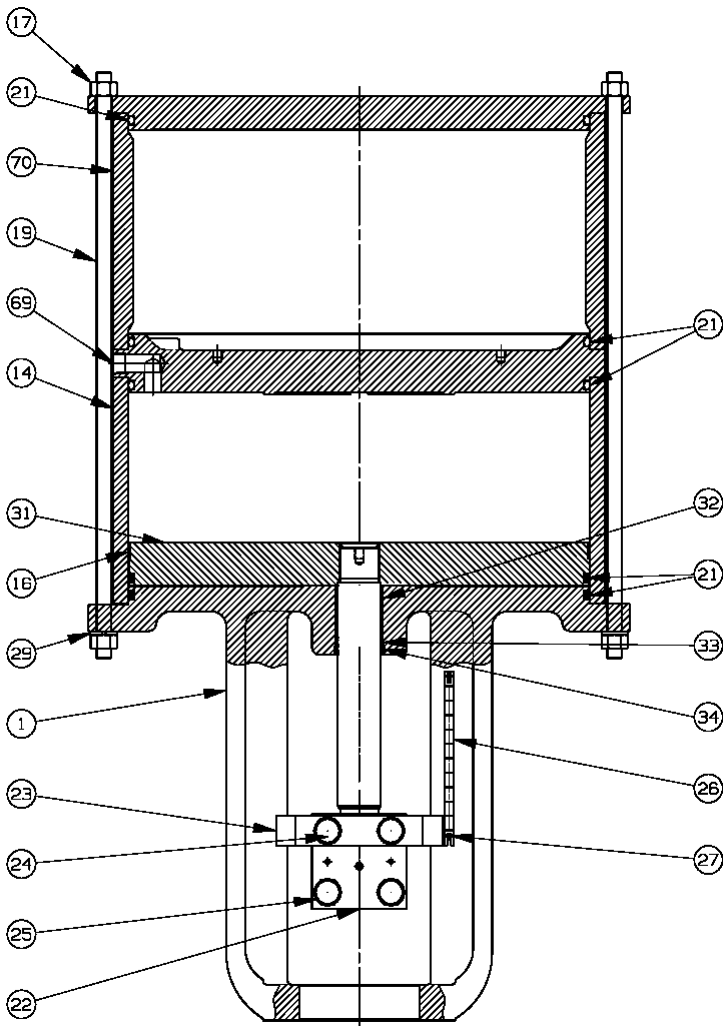
Model 51 Double Acting With handwheel without volume chamber



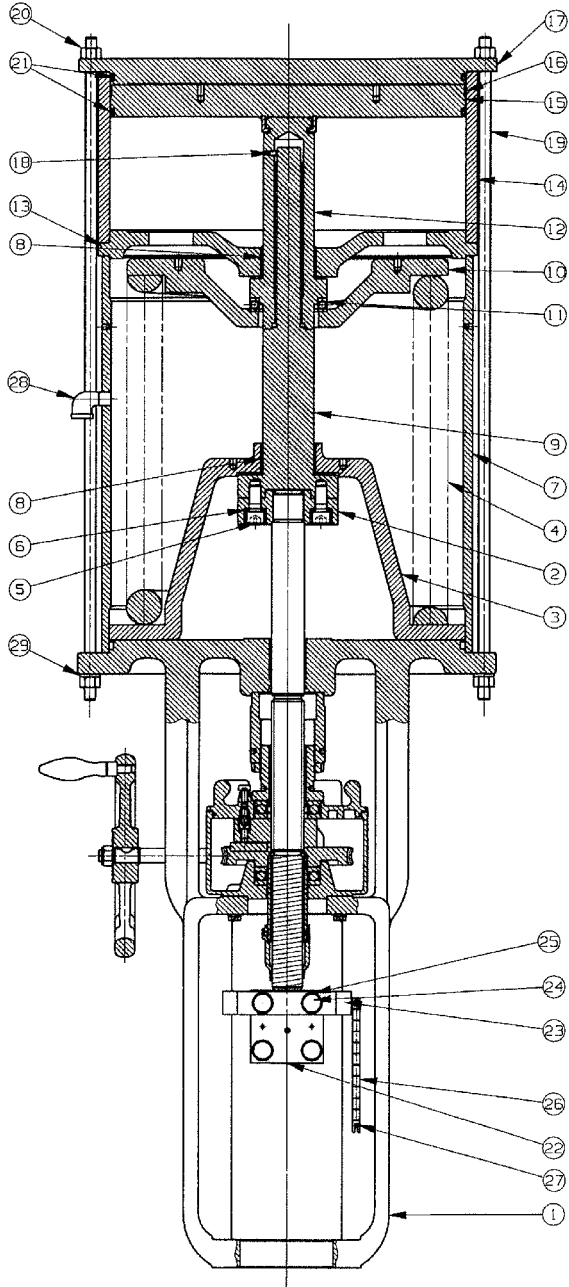
Model 51 Double Acting With handwheel with volume chamber



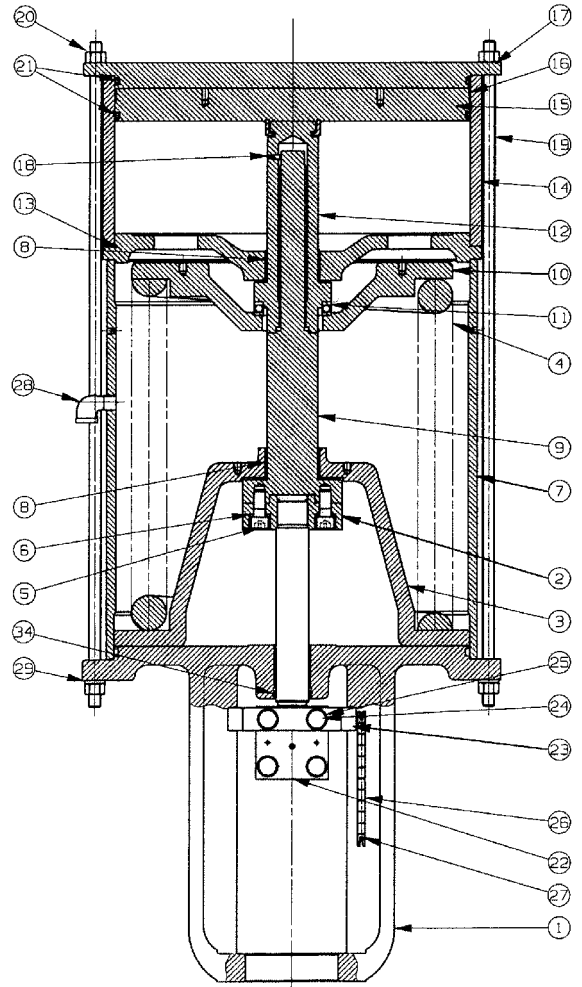
Model 51 Double Acting Without hand-wheel without volume chamber



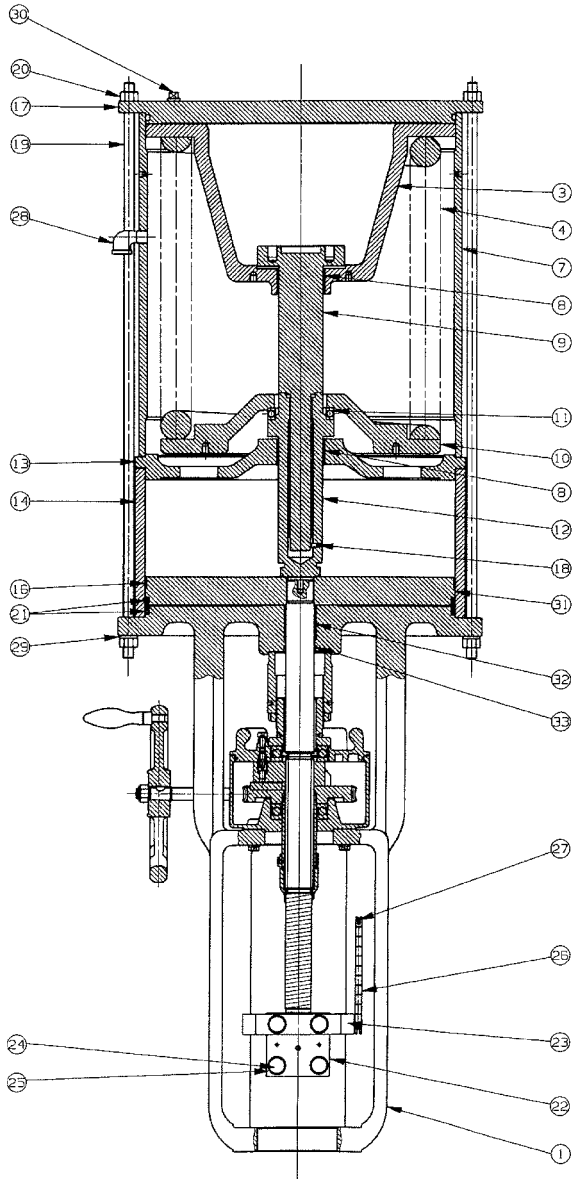
Model 51 Double Acting Without hand-wheel with volume chamber



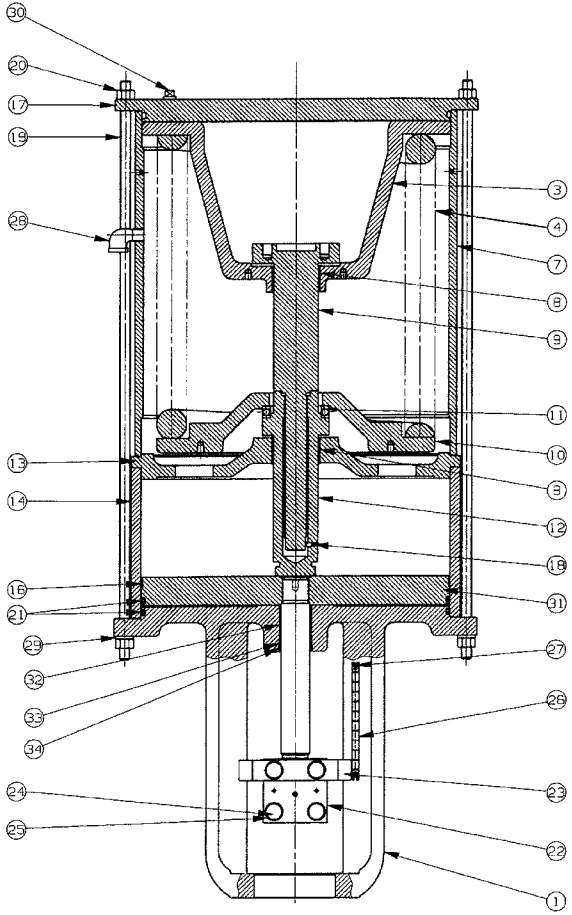
Model 52 Air to Extend with Handwheel



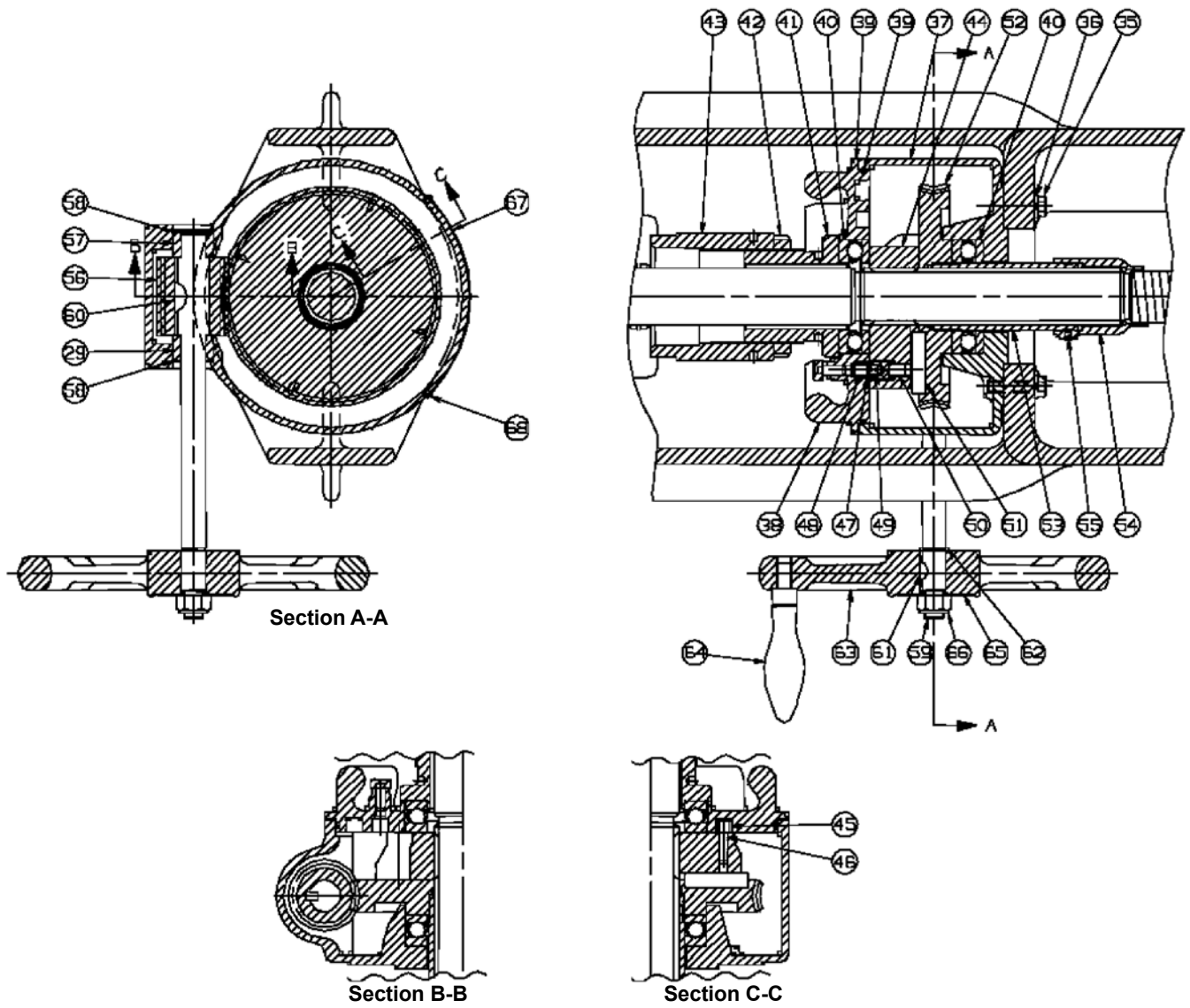
Model 52 Air to Extend without Handwheel



Model 53 Air to Retract with Handwheel



Model 53 Air to Retract without Handwheel



CM and DM Handwheel Typical for Actuators Models 51/52/53

Parts Reference Table – 51/52/53 Actuators

Ref No.	Description	Ref No.	Description	Ref No.	Description
1	Yoke	24	Hexagon bolt	47	Locking pin case
2	Piston rod S/A	25	Spring lock washer	48	Pin
3	Lower spring button	26	Indicator plate	49	Spring
4	Spring	27	Cross recessed head screw	50	Hexagon socket head cap screw
5	Hexagon socket set screw	28	Exhaust pipe	51	Guide key
6	Spring lock washer	29	Spring lock washer	52	Worm gear
7	Spring tube	30		53	Spacer tube
• 8	Guide bushing	• 31	Piston S/A	54	Adapter
9	Compression bolt	• 32	Guide bushing	55	Set screw
10	Upper spring button	• 33	O ring (Piston rod)	56	Worm
11	Thrust bearing	• 34	Rod scraper	• 57	Bearing
12	Compression nut	35	Hexagon bolt	58	Retaining ring
13	Separator plate Model 52/53	36	Spring lock washer	59	Handwheel shaft
14	Cylinder tube	37	Gear box	60	Key (Worm)
15	Cylinder tube	38	Gear box cover S/A	61	Key (Handwheel)
• 16	Guide ring	• 39	O ring	62	Retaining ring
17	Top plate	• 40	Thrust bearing	63	Handwheel
18	Set screw	41	Adjustment screw	64	Grip
19	Center bolt	42	Locking nut	65	Directional plate
20	Hexagon nut	43	Adjustment nut	66	Self locking nut
• 21	O ring (Piston, Top plate)	44	Piston rod engagement	67	Operating information plate
22	Split clamp	• 45	Bearing	68	Drive screw
23	Indicator arm	46	Retaining pin	69	Separator plate (Model 51)
				70	Volume chamber tube

• Recommended Spare Parts

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