

41005 Series

Cage Guided Globe Valve with Lo-dB
Anti-cavitation/API 6A capabilities

Instruction Manual (Rev. G)



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Safety Information

Important - Please Read Before Installation

Masoneilan™ 41005 Series 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 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 41005 Series 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 Masoneilan 41005 Series control valve is 25+ years. To maximize the useful life of the product it is essential to conduct annual inspections, routine maintenance and ensure proper installation to avoid any unintended stresses on the product. The specific operating conditions will also impact the useful life of the product. Consult the factory for guidance on specific applications if required prior to installation.

Warranty

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

Note: Prior to installation:

- The valve must be installed, put into service and maintained by qualified and competent professionals who have undergone suitable training.
- 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.
- All surrounding pipe lines must be thoroughly flushed to ensure all entrained debris has been removed from the system.

WARNING

Safety Information (cont.)

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, are the end user's responsibility.
4. 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. 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 included in IOM.
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.

1. General

Important

This document contains all the instructions required for the installation, operation and maintenance of the equipment.

Regular maintenance, strict observance of these instructions and the use of manufacturer's replacement parts will guarantee optimum operation and reduce maintenance costs.

1.1 Scope

The following instructions are designed to guide the user through the installation and maintenance of the 41005 Series valves for all sizes and all pressure classes.

1.2 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 pressure class, the material used for the pressurized chamber and the air supply pressure of the actuator.

1.3 After Sales Service

Baker Hughes offers its clientele an After Sales Service comprising highly qualified technicians, for the operation, maintenance and repair of its equipment. To benefit from this service, contact our local representative or the After Sales Service whose email address is given at the end of this document.

1.4 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.

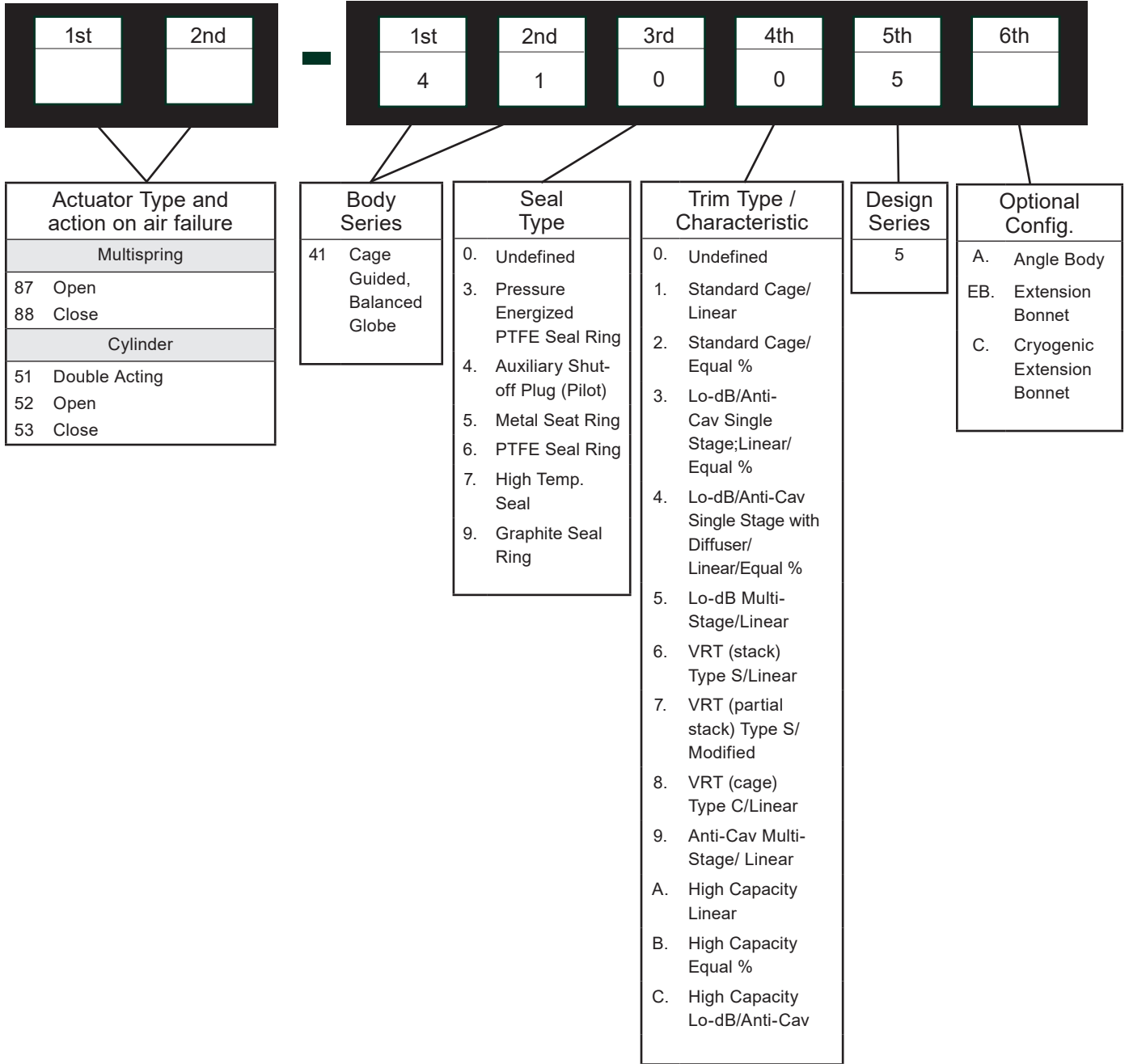
When ordering spare parts, the model and serial numbers indicated on the manufacturer's serial plate must be given.

The recommended spare parts are indicated in the parts list included in this instruction manual on page 35.

1.5 Actuator and Other 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. The instruction manuals to be used for standard actuators are 19530 for types 87/88 and 31188 for types 51/52/53.

2. Numbering System



Note: This instruction manual describes all the standard options in the 41005 Series valve. To satisfy the particular conditions of your application, Baker Hughes may have had to develop a special option which is the subject of an additional clause to this instruction manual. In this case, the instructions given in the additional clause always take precedence over the general instructions.

3. Installation

3.1 Cleanness of Piping

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

3.2 Isolating By-Pass Valve

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

3.3 Heat Insulation

In case of heat insulated installation, do not insulate the valve bonnet and take protection measures related to personal safety.

3.4 Hydraulic Test and Cleaning of Lines

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 damages or destroying of seal rings could result.

3.5 Flow Direction

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

4. Disassembly

4.1 Removal of Actuator

(Figures 9, 10, 11, 12, and 13)

Access to the internal components of the body should be accomplished with the actuator removed. To carry out this operation, follow the instructions below and refer to the specific actuator instructions, reference 19530 for a type 87/88 actuator and 31188 for types 51/52/53.

4.1.1 Disconnection of instruments

Disconnect all mechanical couplings between the positioner and the other instruments on the one hand and the valve stem/actuator stem coupling on the other hand.

4.1.2 Plug stems screwed into the actuator stem

In the case of air-to-retract actuators, apply sufficient air pressure on the diaphragm to retract the stem completely. Loosen the counter-nut, unscrew the stem.

CAUTION

During this operation, make sure that the plug does not turn when it is seated. If the plug travel is very small and there is a large amount of plug stem inside the actuator, it may be necessary to remove the yoke nut and lift the actuator so that the plug is not touching the seat.

4.1.3 Stems attached with a stem connector

In the case of air-to-retract actuators, apply sufficient air pressure on the diaphragm to retract the stem completely.

Loosen the screws and remove the stem connector.

4.1.4 Removal of actuator

Disconnect all the ingoing and outgoing air and electrical connections from the actuator. Loosen the yoke nut or attachment screws and lift the actuator, making sure that the concentricity and/or the thread of the bonnet is not damaged.

4.2 Opening of the Pressurized Chamber (Figures 15, 16, 17, 18, and 19)

! DANGER

Prior to disassembly, vent the process pressure and isolate the valve if necessary.

Note: The valve must always be reassembled with new packing rings and gaskets; before disassembly, make sure that the appropriate parts are available.

A. Remove the packing flange nuts (3) then remove the packing flange (4) and the packing follower (23).

- B. Check that the exposed part of the valve plug stem (1) is clean enough for the bonnet (7) to be removed easily.
- C. Remove the body stud nuts (8).
- D. By means of a pad eye secured instead of the actuator, lift the bonnet (7) up and separate it from the valve body (18). During this operation, the valve plug stem (1) must be pushed downwards so that the valve plug remains in the valve body (18).
- E. Remove the spring washer (17) and the body gasket (10).
- F. In the case of type 41305, 41375, 41505, 41605 and 41905 valves, remove the valve plug stem (1) and valve plug (15) assembly from the cage by pulling the valve plug stem upward, then remove the cage (16) and 'stack' (37) assembly for 41375 type valve.

In case of a 41905 series valve [equipped with a graphite ring (45)], make sure that the ring is not damaged during the operation.

CAUTION

Because of the plug balance seal (31), the cage can sometimes be lifted along with the valve plug. If this should happen, press down on the cage so that it remains in the body. If the cage is lifted along with the valve plug, it could slip during handling and fall.

- G. In case of a 41405 valve, remove the valve plug and body cage assembly by pulling the valve stem upward: in this case, the valve plug has a shoulder which prevents the cage from falling. Remove the valve plug from the cage by pulling on the end of the plug stem.
- H. Remove the seat ring (13) and the seat ring gasket (14) from the valve body (18).
- I. Remove the the packing (6), the packing spacer (5) and the guide bushing (22) from the bonnet (7). (on the next line add a note) Note: A packing spacer (5) is only mounted when the bonnet has a side connection.

4.3 Disassembly of Valve Plug Stem

The valve plug stem is screwed and pinned into the valve plug (15).

To dismount the stem, the valve plug must be held as indicated below, taking care not to damage the guiding surfaces; the plug stem pin (9) is then removed. By means of flats or using a nut and counter-nut on the end of the stem, unscrew the stem taking care not to apply a bending moment which could deform it.

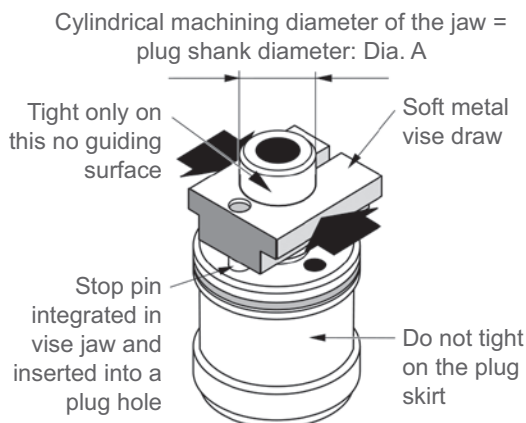


Figure 1 - Valve Plug Stem

4.4 Disassembly of the Auxiliary Pilot Plug

When the valve is of the 41405 type.

In the case of 50, 80 or 100 mm (2", 3" or 4") valves (Figure 15).

Exert a sufficient force on the auxiliary pilot plug (20) to compress the spring washers (12). The retaining ring (19) can then be removed, releasing the auxiliary pilot plug and spring washers.

In the case of 150 to 400 mm (6" to 16") valves (Figure 16).

To carry out this operation safely, screws of the diameter and length indicated in the table in hereunder must be used. Thread the socket head cap screws through the holes in the auxiliary pilot plug (20). Tighten until the retainer ring (19) can be removed. Loosen the screws gradually. Remove the auxiliary pilot plug and the spring (12).

Valve size		Pilot Dismounting Screws Size			
mm	in.	Qty.	Length		Dia.
			mm	in.	
150	6	2	57	2.25	3/8" – 16 UNC 2A
200	8	2	70	2.75	
250	10	2	63.5	2.5	
300	12	3	101.5	4	
400	16	3	63.5	2.5	

4.5. Disassembly of 41705 HTS Plug

This plug type can only be serviced in the field by factory qualified Masoneilan valve maintenance technicians due to critical features that cannot be easily addressed in the field.

Note to factory qualified Masoneilan valve technicians: See the latest revision of CES-189 for instructions and maintenance values.

The metal piston rings (11) can be replaced in the field per instructions for plug type 41505.

5. Maintenance – Repair

5.1 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 (3) against the packing flange (4). Care must be taken not to over tighten as this could prevent smooth operation of the valve. If all compression is used up and the valve leaks, then new packing is required.

CAUTION

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

Proceed as follows :

5.1.1 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.

- Loosen and remove packing flange nuts (3).
- Lift the packing flange (4) and packing follower (23) up the valve stem.

Note: They may be taped in place to keep them out of the way before proceeding.

- By means of a hooked instrument, remove packing rings 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.

- Replace packing rings.

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.

Note: On valves equipped with an optional lubricator connection, pay close attention to the number and order of packing rings an lantern are arranged. This will help with assembly.

- E. Replace packing follower (23) and packing flange (4).
- F. Replace and tighten packing stud nuts (3).

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.

5.1.2 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 (3).
- B. Remove packing flange (4) and packing follower (23) from the plug stem.
- C. By means of a hooked instrument, remove packing (6) ensuring not to damage the sealing surfaces of the packing box or plug stem.

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

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

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

Note: On valves equipped with an optional lubricator connection, pay close attention to the number and order of packing rings an lantern are arranged. This will help with assembly.

- E. Assemble packing follower (23) and packing flange (4).
- F. Assemble and tighten packing stud nuts (3).

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.

5.1.3 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 while Packing Manual Ref. 34620 is also available.

5.1.3.1 Preparation

5.1.3.1.1 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).

5.1.3.1.2 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 LE Packing will still seal properly.

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

5.1.3.1.3 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).

5.1.3.2 Packing Installation

- a. Refer to the packing instructions that were provided with the packing for proper installation.

- b. Packing Manual Ref 34620 is also available as an additional aid while completing the packing installation.
- c. The packing should be checked for leakage.

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

- d. 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.

5.1.4 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, remove the worn packing, and follow directions to reassemble.

5.2 Repair of Parts

Before re-assembly, the parts must be carefully examined in order to eliminate any scratched, worn or damaged parts.

5.2.1 Guiding Surfaces

The guiding surfaces of the cage and valve plug, the guide bushing, and the guiding surfaces of the plug stem and auxiliary pilot plug must be checked in particular. If there is only slight damage, a light abrasive can be used.

Otherwise the part must be replaced as soon as possible (see paragraph "Spare parts").

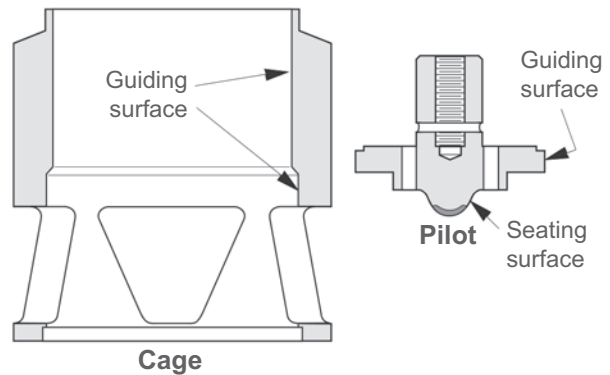


Figure 2 - Cage and Valve Plug

5.2.2 Seating Surfaces

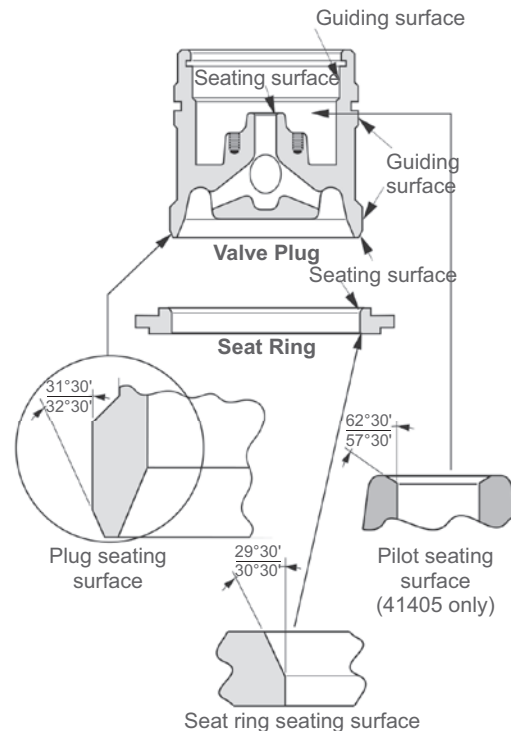


Figure 3 - Seating Surfaces

Inspect all seating surfaces per Figure 3 which represents all plug and seat types.

For type 41405 valves, if the surface of the auxiliary pilot plug (20) is damaged, the auxiliary pilot plug must be replaced (see paragraph "Spare parts").

The seat ring (13), plug and auxiliary pilot plug (20) seating surfaces must be completely free of dents, wear and scratches.

If the auxiliary pilot plug seat in the valve plug (15) and/or other valve plug or seat ring seating surfaces show signs of slight deterioration, they can be touched up on a lathe.

For all valve types, when dressing up critical surfaces, no more than 0.25 mm (0.010") of metal must be removed in the case of a 50, 80 or 100 mm (2", 3" or 4") valve and no more than 0.4 mm (0.015") in the case of a 150 to 400 mm (6" to 16") valve. Make sure that the seating angle indicated in Figure 3 is respected.

If a slight defect exists on any of the above seating surfaces, lapping can be envisaged, in which case the following must be respected:

- Spread a fine layer of high quality sealing compound on the seating surface.
- Put the seat ring (13) in the body, noting the angle.
- In the case of 41305, 41505, 41605 and 41905 valves, put the cage (16) on the seat ring.
- In case of 41375 valves, put the stack (48) on the seat ring and the cage (16) on the stack.
- In the case of 41405 and 41705 valves, assemble the valve plug, cage and stem (15)-(16)-(1).
- In case of 41305, 41505, 41605, 41375 and 41905, assemble the valve plug (15) and stem (1).
- Assemble the bonnet (7) and its guide bushing (22).
- Place an appropriate tool on the valve plug stem (1) to turn it.
- Lap by slightly rotating the valve plug or the auxiliary pilot plug in alternative directions. After several rotations, lift the valve plug, turn it 90°, and start again.
- Lapping can be repeated, but must be limited as much as possible so that the seat remains sufficiently narrow to guarantee tightness.
- Disassemble the parts, clean them and put them back, respecting the initial angle.

5.2.3 Gasket seating surfaces

Gasket seating surface must be free of dents, scratches and corrosion; otherwise, they will need to be repaired.

5.2.4 Seal rings and gaskets

Spiral-wound gaskets (10), (14) and (36) must always be changed after disassembly. Seal rings (11A), (11C) or (11E) can be reused if they are free of scratches, erosion and corrosion.

5.2.5 Valve plug, valve plug stem

If the valve plug has to be changed, then the stem must also be completely changed to guarantee correct pinning of the assembly. If only the valve plug stem has to be changed, then the valve plug can be reused.

6. Valve Reassembly

6.1 Pinning the Valve Plug Stem

The valve plug (15) and stem (1) assembly consists of a stem threaded into the valve plug and pinned in place.

If the valve plug (15) [or the auxiliary pilot plug (20) in the case of a 41405 valve] needs to be replaced, it is recommended using a new stem. The hole of the original pin in an old stem often prevents satisfactory results being obtained and can seriously impair the mechanical strength of the stem-valve assembly.

Assembly is carried out as follows:

6.1.1 Reference Marking on the Valve Plug Stem

Make a reference mark on the valve plug stem at a distance "X" (Table 1 and Figure 4), equivalent to the stem recess in the valve plug.

Note: *For shouldered plug stems with two flats, the above marking is unnecessary.*

6.1.2 Tightening of the plug stem

To carry out this operation, the valve plug must be prevented from moving by holding the plug shank with an appropriate tool.

Screw two nuts on to the end of the new plug stem and lock them together. Screw the valve plug stem solidly into the plug, checking that the reference mark is level with the end of the plug shank.

If the stem has flats, apply a torque "T" using a wrench of dimension "E" (see Table 1).

6.1.3 Drilling the pin hole (Table 1 and Figure 4)

Note: *For this operation, it is recommended clamping the valve plug-stem assembly by the plug shank to avoid damaging the guiding surfaces; particular care must be taken so that the pin hole goes through the valve plug axis.*

If the valve plug is new, drill a hole of diameter "C" at a distance "D" from the end of the valve plug; choose the diameter "C" from the table according to the type of pin used (metric or English pin). If the hole is already drilled in the valve plug, use the hole as a guide to drill through the valve plug stem.

6.1.4 Pinning

By means of a hammer, introduce the pin into the hole. Complete the pinning operation, taking care to ensure that the pin is recessed by the same amount at both sides.

Using a ball tooling and hammer, caulk the pin hole edge of the plug.

Place the assembly in the soft jaw chuck of a lathe to check alignment of the two parts; correct any alignment defects.

6.2 Assembly of Ring or Spring-Energized Seal Ring

6.2.1 41305 valve (Figures 5, 17 and 20)

These valves have a spring-energized seal rings composed of a PTFE-based jacket maintained expanding by a spring.

To insert the ring into the plug groove:

- Lubricate the entry chamber.
- Place the ring over the conical top of the plug so that the lips of the ring face to the pressure (see Figure 5).

ring.

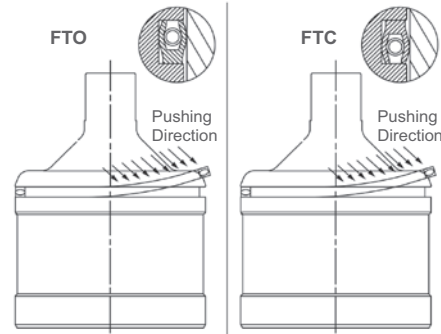


Figure 5 - Spring Energized Seal Ring

CAUTION

To the assembly direction of the radial ring (11F) on the plug (see Figure 5). Flow Tends to Open: the open side is in the top. Flow Tends to Close: the open side is in the lower part.

- Slip the ring into the groove (without spinning it) as shown in Figure 5. This operation can be facilitated by heating the ring. The temperature of the ring should not exceed 150°C.
- Keep the ring retained until it returns to room temperature and goes back in place within the groove. Clamping with a collar (SERFLEX type) will help to properly position the

6.2.2 41405 and 41505 and 41705 Valves (Figures 17 and 19)

These valves are equipped with metal rings; the inner ring has a straight cut while the outer ring has a staggered cut.

To insert the rings into the cage groove, open the rings slightly by hand and slide them, one after the other, along the plug making sure that the parts are not damaged.

Note: The cuts in the outer and inner rings are to be placed at about 180° from each other.

6.2.3 41605 Valve (Figure 20)

These valves are equipped with an inner elastomeric ring

Table 1 - Valve Plug Reference Marking

Valve plug stem diameter B	Diameter A	Metric pin, diameter C	Anglo-Saxon pin dia. C	F	D	Distance X	E	Torque T	
								Non-Shouldered stem	Shouldered stem
mm (in.)	mm (in.)	mm	In.	mm (in.)	mm (in.)	mm (in.)	mm (in.)	N.m (Ft.lbs)	N.m (Ft.lbs)
12.7 (1/2)	20 (.79)	3.5	0.14	18 (.70)	18.5 (.73)	6 (.24)	17 (11/16)	50 (37)	60 (44)
15.87 (5/8)	25.5 (.98)	5.0	0.2	24 (.95)	28 (1.1)	8 (.30)	22 (7/8)	50 (37)	160 (118)
19.05 (3/4)	35 (1.38)	5.0	0.2	30 (1.2)	45 (1.77)	19 (.75)	27 (11/16)	160 (118)	160 (118)
25.4 (1.0)	44.5 (1.66)	8.0	5/16	40 (1.58)	47.5 (1.88)	25 (.98)	30 (11/4)	160 (118)	250 (184)
31.75 (1 1/4)	58 (2.28)	8.0	5/16	55 (2.20)	70 (2.76)	31.5 (1.24)	40 (1 5/8)	-	800 (590)
38.1 (1 1/2)	70 (2.76)	10.0	-	65 (2.56)	90 (3.54)	33 (1.30)	50 (2)	-	1 500 (1100)

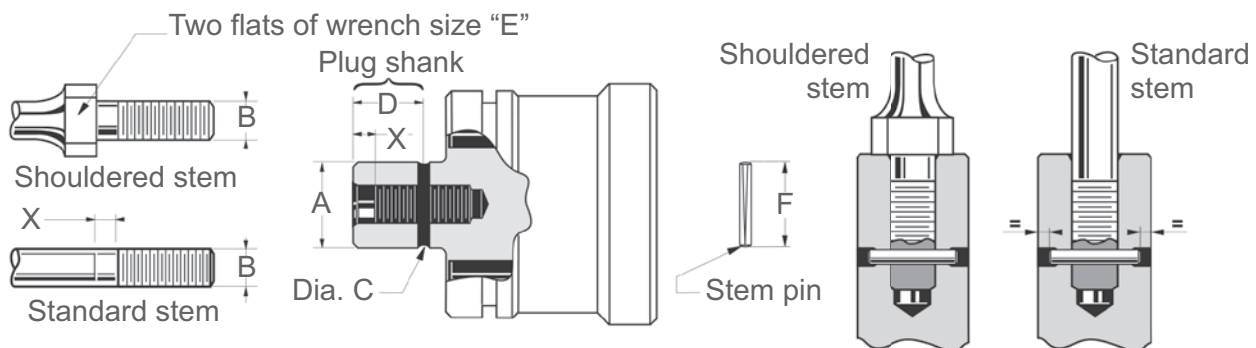


Figure 4 - Plug Stem Marking

and a PTFE gasket.

Insert the elastomeric ring (11D) in the groove.

Place the PTFE gasket (11C) at a temperature of 100°C (boiling water) to 160°C for a few minutes to facilitate insertion, then slide along the plug until it slips into the groove.

For optimum insertion of the ring, a Serflex type ring compressor can be used to compress the ring in the groove for several minutes.

6.2.4 41905 Valve (Figure 20)

These valves are equipped with rings; the inner metal ring has a straight cut and the outer ring is made of graphite.

The new graphite seal ring (11A) is supplied in the form of a closed ring in which a notch must be cut before being inserted.

CAUTION

Graphite seal rings are fragile and the following operations must be carried out very carefully.

Using a sharp blade, carry out two V notches on the two opposite faces. Hold the ring on either side of the notch between the thumb and index and bend until it breaks.

Using a very fine file, adjust each end of the ring so that its external circumference corresponds to the internal circumference of the inside diameter of the cage (16).

To adjust the length of the ring correctly, insert the new graphite ring into the cage, with the ring against the inner wall of the hole in the cage, allowing minimum play between the two ends of the ring.

To insert the inner ring, then the graphite ring into the cage groove, slightly open the rings by hand and slide them one after the other along the plug, taking care not to damage the parts.

Note: The cuts on each ring are to be placed at about 180° from each other.

6.2.5 41375 high temperature valve (232°C to 316°C) (Figure 19)

These valves are equipped with a seal ring composed of a jacket and a metallic spring and two backup rings (11G).

Assemble the different parts as shown in Figure 19, starting by the backup rings.

CAUTION

Put these parts as shown in Figure 19, the angle of 90° of the backup ring in front of the extrusion gap between cage and plug.

6.3 41405 Valve Plug and Cage Assembly (Figure 18)

6.3.1 Assembly of valve plug and auxiliary pilot plug

Assemble, as appropriate, the flat spring or the coil springs then the valve plug/plug stem assembly.

Using the same tools as those used for disassembly (see chapter "Disassembly"), compress the springs so that the retaining ring can be inserted in the groove of the main plug.

6.3.2 Assembly of cage

Place the cage over the valve plug assembly via the top of the plug stem. When doing so, take particular care to position the ring correctly.

6.4 Assembly of the Parts Inside the Valve Body (Figures 15,16,17,18,19)

Proceed as follows:

- After checking that the surfaces are perfectly clean, place the seat gasket (14) in the valve body, making sure that it is centered as well as possible.
- Mount the seat ring or the diffuser seat (13).
- Mount:
 - The cage (16) for 41305, 41605 and 41905 valves,
 - The cage/plug/stem assembly for 41405 valves,
 - The STACK assembly (making sure that the face with the smallest number of holes is in contact with the seat ring), and cage (16) for 41375 valves.

CAUTION

For the double-cage assembly, carry out the following operations:

- Put the inner cage (16) upside down,
- Encase the outer cage (75) on the inner cage, maintain them together with the two pins (76).
- In the case of valves other than 41405 valves, insert the valve plug/stem/ring assembly into the cage taking particular care as it goes past the ring or spring-energized seal ring.
- In the case of valves with a N.D. less than 150 (6"), place the body/cage gasket in the valve body, making sure that it is centered as well as possible.
- For valve sizes 150 to 400 mm (6 to 16"), insert either the cage gasket (24) or the flat spring washer (17).
- For valve sizes 450, 600 and 750 mm (18, 20 and 24"), insert either the first cage gasket, the cage washer and the second cage gasket or the flat spring depending on the type of valve, then place the body gasket (10) in the valve body making sure that it is centered as well as possible.

CAUTION

To the direction of assembly of spring washer:

- ND 150 (6") to 450 (18") valves, the concave face is upwards,
- ND 500 (20"), and 600 (24"), the concave face is downwards and the tapped holes are visible.

6.5 Assembly of Bonnet

Check that the packing ring (6), the spacer (5) and the guide bushing (22) have been removed from the bonnet.

Position the bonnet (7) above the valve, so that the packing flange studs (2) are perpendicular to the flow direction of the valve.

Lower the bonnet (7) onto the valve stem (1) and push it down carefully until it goes into the valve body studs (21) and takes up its correct position.

Grease the threads of the valve body studs (21) and the bearing surfaces of the body stud nuts (8).

Screw on the body stud nuts by hand. Tighten the nuts lightly and evenly so that the internal parts are held in place. The face of the bonnet should be parallel to the upper face of the body.

Slide the guide bushing (22) onto the valve plug stem and let it drop to the bottom of the packing box housing.

6.6 Tightening of Body Stud Nuts

Alignment of internal parts

In order to achieve perfect alignment of the seat ring and the valve plug, a force must be applied to the plug stem during tightening of the bonnet which results in correct relative positioning of the two parts.

The force can be applied with the pneumatic actuator as follows:

Place the actuator on the valve bonnet (7) by means of the yoke nut (33) or attachment screws and connect the valve plug stem to the actuator stem. See chapter on actuators for installation instructions.

Align the internal parts as follows:

In the case of air-to-extend actuators, supply air to the actuator at the maximum pressure indicated on the serial plate and in the case of spring-to-extend actuators, do not supply air to the actuator, so that the optimum positioning of the valve plug and seat can be obtained.

Single bolting circle:

Evenly tighten the nuts (8) by applying the torque indicated in table 2 up to 5 and the tightening sequence in Figure 6.

Double bolting circle:

Beginning by the internal nuts, manually screw all the bolts. Screw the internal nuts in order indicated by the Figure 6 and screw them by successive, uniform and progressive levels. During the tightening, make sure that the bonnet face stays parallel at that of the body. When the torque values given in the following table are reached, the bonnet face must be in contact with that of the body. Screw the external nuts in order indicated by the Figure 6 and screw them by successive, uniform and progressive levels until the torque values given in the tables on next pages.

CAUTION

During this operation, make sure that the plug does not turn when it is seated. If the plug travel is very small and there is a large amount of plug stem inside the actuator, it may be necessary to remove the yoke nut and lift the actuator so that the plug is not touching the seat.

6.7 Assembly of Packing Box

To assemble the packing box, proceed as indicated in the "maintenance" chapter, paragraph 5.1.1 or 5.1.4.

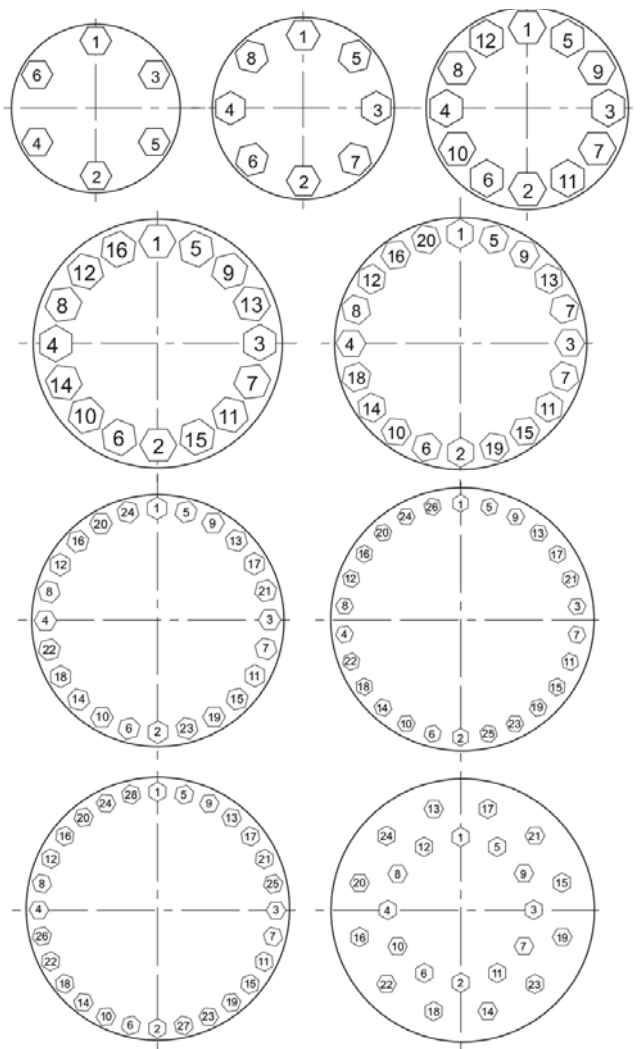


Figure 6 - Tightening Sequence of Nuts (8)

Table 2 - Torque Requirements: Body / Bonnet Bolting [ft-lb]

Body		Bolts		Torques in ft-lb		
Nominal sizes (in)	ASME Classes	Sizes (in)	Quantity	- <u>body/bonnet</u> : all materials - <u>bolts materials</u> : A 193 Gr B7 / A194 Gr 2H, EN 1.7225 / A194 Gr 2H,, A 193 Gr B7M / A194 Gr 2HM, A 320 Gr L7 / A194 Gr 7, A 193 Gr B16 / A194 Gr 7 or A 453 Gr 660 / A194 Gr 7	- <u>body/bonnet material</u> : stainless steel - <u>bolts materials</u> : A 453 Gr 660 / A 194 GR 8	- <u>body/bonnet material</u> : stainless steel - <u>bolts materials</u> : A 193 Gr B8 class 2 / A 194 GR 8
2	300	3/4-10UNC-2A	6	103	162	162
3 x 2 4 x 2	600	3/4-10UNC-2A	6	162	258	258
2	900	7/8-9UNC-2A	8	155	243	
	1500	7/8-9UNC-2A	8	221	354	
	2500	1-1/4-8-UN-2A	6	406	649	
3 x 2 4 x 2	900 - 1500	1-8UN-2A	8	332	531	
3 4 x 3 6 x 3	300	3/4-10UNC-2A	8	133	214	214
	600	3/4-10UNC-2A	8	162	258	258
	900	1-1/4-8-UN-2A	6	561	900	
	1500	1-1/4-8-UN-2A	6	811	1306	
3	2500	1-1/2-8UN-2A	6	774	1239	
4 6 x 4 8 x 4	300	7/8-9UNC-2A	8	170	273	
	600	7/8-9UNC-2A	8	258	413	
	900	1-1/2-8UN-2A	6	885	1431	
	1500	1-1/2-8UN-2A	6	1365	2205	
4	2500	1-5/8-8UN-2A	8	922	1497	
6 8 x 6 10 x 6	300	1-8UN-2A	8	325	516	
	600	1-8UN-2A	12	236	376	
	900 - 1500	1-3/4-8UN-2A	8	1365	2220	
6	2500	1-7/8-8UN-2A	8	1401	2279	
8 10 x 8 12 x 8	300	1-1/4-8-UN-2A	8	524	841	
	600	1-1/4-8-UN-2A	12	479	774	
	900	1-3/4-8UN-2A	8	1365	2220	
	1500	1-3/4-8UN-2A	8	1770	2877	
8	2500	1-3/4-8UN-2A	12	1217	1992	
10	300	1-1/2-8UN-2A	8	848	1372	
	600	1-1/2-8UN-2A	12			
	900	1-3/4-8UN-2A	12	1365	2220	
	1500	1-3/4-8UN-2A	12	1623	2633	
	2500	2-8UN-2A	12	2065	3363	
12 16 x 12	300	1-1/2-8UN-2A	8	922	1490	
	600	1-1/2-8UN-2A	12	848	1372	
	900	1-1/2-8UN-2A	16	922	1490	
	1500	1-3/4-8UN-2A	16	1623	2633	
12	2500	1-7/8-8UN-2A	20	1623	2641	
14	300	1-1/2-8UN-2A	8	1564	1778	
	600	1-1/2-8UN-2A	12	1564	1778	
	900	2-8UN-2A	16	3275	3717	
	1500	2-1/2-8UN-2A	16	6609	7501	
16	300	1-1/2-8UN-2A	12	848	1372	
	600	1-1/2-8UN-2A	16	922	1490	
	900	1-1/2-8UN-2A	20	1106	1792	
	1500	1-3/4-8UN-2A	20	1918	3113	
	2500	2-8UN-2A	24	1955	3186	
18	300	1-3/8-8UN-2A	16	679	1092	
	600	1-3/4-8UN-2A	16	1512	2456	
	900	2-1/4-8UN-2A	12	3356	5480	
	1500	2-1/2-8UN-2A	16	4794	7848	
20	300	1-3/8-8UN-2A	24	738	1202	
	600	1-3/4-8UN-2A	24	1549	2515	
	900	1-7/8-8UN-2A	24	2950	4802	
24	300	1-3/4-8UN-2A	20	1401	2279	
	600	1-3/4-8UN-2A	26	1770	2877	
	900	2-1/2-8UN-2A	20	5163	8453	

Table 3 - Torque Requirements: Body / Bonnet Bolting [ft-lb] 410A5, 410B5, or 410C5 High Capacity Design

Body		Bolts		Torques in ft-lb		
Nominal sizes (in)	ASME Classes	Sizes (in)	Quantity	- <u>body/bonnet</u> : all materials - <u>bolts materials</u> : A 193 Gr B7 / A194 Gr 2H, EN 1.7225 / A194 Gr 2H,, A 193 Gr B7M / A194 Gr 2HM, A 320 Gr L7 / A194 Gr 7, A 193 Gr B16 / A194 Gr 7 or A 453 Gr 660 / A194 Gr 7	- <u>body/bonnet material</u> : stainless steel - <u>bolts materials</u> : A 193 Gr B7 / A194 Gr 2H A 453 Gr 660 / A 194 GR 8	- <u>body/bonnet material</u> : stainless steel - <u>bolts materials</u> : A 193 Gr B8 class 2 / A 194 GR 8
6	150/300	1-8UN-2A	10	332	376	
	600	1-8UN-2A	12	317	354	
8	150/300	1-1/4-8-UN-2A	10	465	546	
	600	1-1/4-8-UN-2A	12	487	546	
10	150/300	1-1/2-8UN-2A	8	1254	1269	
	600	1-1/2-8UN-2A	10	1313	1342	
12	150/300	1-3/4-8UN-2A	12	810	906	
	600	1-3/4-8UN-2A	12	1214	1360	
16	150/300	1-3/4-8UN-2A	10	1984	2021	
	600	2-8UN-2A	10	3135	3208	
18	150/300	1-1/2-8UN-2A	20	826	937	
	600	1-3/4-8UN-2A	20	1785	2021	
20	150/300	1-3/4-8UN-2A	20	1401	2279	
24	150/300	2-1/2-8UN-2A	12	5236	5089	

Table 4 - Torque Requirements: Body / Bonnet Bolting [m.daN]

Body		Bolts		Torques in m.daN		
Nominal sizes (in)	ASME Classes	Sizes (in)	Number	- <u>body/bonnet</u> : all materials - <u>bolts materials</u> : A 193 Gr B7 / A194 Gr 2H, EN 1.7225 / A194 Gr 2H,, A 193 Gr B7M / A194 Gr 2HM, A 320 Gr L7 / A194 Gr 7, A 193 Gr B16 / A194 Gr 7 or A 453 Gr 660 / A194 Gr 7	- <u>body/bonnet material</u> : stainless steel - <u>bolts materials</u> : A 453 Gr 660 / A 194 GR 8	- <u>body/bonnet material</u> : stainless steel - <u>bolts materials</u> : A 193 Gr B8 class 2 / A 194 GR 8
2	300	3/4-10UNC-2A	6	14	22	22
3 x 2 4 x 2	600	3/4-10UNC-2A	6	22	35	35
2	900	7/8-9UNC-2A	8	21	33	
	1500	7/8-9UNC-2A	8	30	48	
	2500	1-1/4-8-UN-2A	6	55	88	
3 x 2 4 x 2	900 - 1500	1-8UN-2A	8	45	72	
3 4 x 3 6 x 3	300	3/4-10UNC-2A	8	18	29	29
	600	3/4-10UNC-2A	8	22	35	35
	900	1-1/4-8-UN-2A	6	76	122	
	1500	1-1/4-8-UN-2A	6	110	177	
3	2500	1-1/2-8UN-2A	6	105	168	
4 6 x 4 8 x 4	300	7/8-9UNC-2A	8	23	37	
	600	7/8-9UNC-2A	8	35	56	
	900	1-1/2-8UN-2A	6	120	194	
	1500	1-1/2-8UN-2A	6	185	299	
4	2500	1-5/8-8UN-2A	8	125	203	
6 8 x 6 10 x 6	300	1-8UN-2A	8	44	70	
	600	1-8UN-2A	12	32	51	
	900 - 1500	1-3/4-8UN-2A	8	185	301	
6	2500	1-7/8-8UN-2A	8	190	309	
8 10 x 8 12 x 8	300	1-1/4-8-UN-2A	8	71	114	
	600	1-1/4-8-UN-2A	12	65	105	
	900	1-3/4-8UN-2A	8	185	301	
	1500	1-3/4-8UN-2A	8	240	390	
8	2500	1-3/4-8UN-2A	12	165	270	
10	300	1-1/2-8UN-2A	8	115	186	
	600	1-1/2-8UN-2A	12			
	900	1-3/4-8UN-2A	12	185	301	
	1500	1-3/4-8UN-2A	12	220	357	
	2500	2-8UN-2A	12	280	456	
12 16 x 12	300	1-1/2-8UN-2A	8	125	202	
	600	1-1/2-8UN-2A	12	115	186	
	900	1-1/2-8UN-2A	16	125	202	
	1500	1-3/4-8UN-2A	16	220	357	
12	2500	1-7/8-8UN-2A	20	220	358	
14	300	1-1/2-8UN-2A	8	212	241	
	600	1-1/2-8UN-2A	12	212	241	
	900	2-8UN-2A	16	444	504	
	1500	2-1/2-8UN-2A	16	896	1017	
16	300	1-1/2-8UN-2A	12	115	186	
	600	1-1/2-8UN-2A	16	125	202	
	900	1-1/2-8UN-2A	20	150	243	
	1500	1-3/4-8UN-2A	20	260	422	
	2500	2-8UN-2A	24	265	432	
18	300	1-3/8-8UN-2A	16	92	148	
	600	1-3/4-8UN-2A	16	205	333	
	900	2-1/4-8UN-2A	12	455	743	
	1500	2-1/2-8UN-2A	16	650	1064	
20	300	1-3/8-8-UN 2A	24	100	163	
	600	1-3/4-8UN-2A	24	210	341	
	900	1-7/8-8UN-2A	24	400	651	
24	300	1-3/4-8UN-2A	20	190	309	
	600	1-3/4-8UN-2A	26	240	390	
	900	2-1/2-8UN-2A	20	700	1146	

Table 5 - Torque Requirements: Body / Bonnet Bolting [m.daN] 410A5, 410B5, or 410C5 High Capacity Design

Body		Bolts		Torques in m.daN		
Nominal sizes (in)	ASME Classes	Sizes (in)	Number	- <u>body/bonnet</u> : all materials - <u>bolts materials</u> : A 193 Gr B7 / A194 Gr 2H, EN 1.7225 / A194 Gr 2H., A 193 Gr B7M / A194 Gr 2HM, A 320 Gr L7 / A194 Gr 7, A 193 Gr B16 / A194 Gr 7 or A 453 Gr 660 / A194 Gr 7	- <u>body/bonnet material</u> : stainless steel - <u>bolts materials</u> : A 193 Gr B7 / A194 Gr 2H A 453 Gr 660 / A 194 GR 8	- <u>body/bonnet material</u> : stainless steel - <u>bolts materials</u> : A 193 Gr B8 class 2 / A 194 GR 8
6	150/300	1-8UN-2A	10	45	51	
	600	1-8UN-2A	12	43	48	
8	150/300	1-1/4-8-UN-2A	10	63	74	
	600	1 1/8 8 UN 2A	12	66	74	
10	150/300	1-1/2-8UN-2A	8	170	172	
	600	1-1/2-8UN-2A	10	178	182	
12	150/300	1-3/4-8UN-2A	12	110	123	
	600	1-3/4-8UN-2A	12	165	177	
16	150/300	1-3/4-8UN-2A	10	269	274	
	600	2-8UN-2A	10	425	435	
18	150/300	1-1/2-8UN-2A	20	112	127	
	600	1-3/4-8UN-2A	20	242	274	
20	150/300	1-3/4-8UN-2A	20	190	309	
24	150/300	2-1/2-8UN-2A	12	710	690	

7. Actuation

CAUTION

For coupling operations of actuators on valves, it is necessary as a preliminary:

- to position the plug on its seat ring. (In no case, one should not turn the plug on its seat, to avoid any deterioration of tightness seat).
- connect a temporary air supply line to the actuator.

Type 87/88 Multi-Spring Diaphragm Actuators

Connecting Type 87 (Air to Extend) No. 6 Actuator (Figure 9)

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.
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 Retract) No. 6 Actuator (Figure 9)

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 2.
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.

Table 6 - Type 88 Actuator, Air to Open - Valve Seating

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

Connecting Type 87 (Air to Extend) No. 10, 16 and 23 Actuators (Figure 9)

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 4.
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 Retract) No. 10, 16 and 23 Actuator (Figure 9)

1. Supply the actuator with air to retract stem.
2. Unscrew the top stem connector (4) in accordance with dimension "X" in Table 5.
3. Tightly assemble 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 2 then lock manually with hex nut (1).

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

Table 7 - Position of Top Stem Connector

Actuator Size	Travel		"X" Actuator 87		"X" Actuator 88	
	in	mm	in	mm	in	mm
10	0.8	20	5.12	130.0	4.62	117.3
10	1.5	38	5.44	138.2		
16	0.8	20	8.00	203.2	7.02	178.3
16	1.5	38	8.50	228.6		
16	2.0	51	9.28	235.7		
16	2.5	63.5	9.50	241.3		
23	0.8	20	8.25	209.5		
23	1.5	38	8.62	218.9		
23	2.0	51	9.12	231.6		
23	2.5	63.5	9.59	243.6		

Type 51/52/53 Cylinder Actuators

Connecting Double Acting (Model 51) (Figures 10 & 11)

- Install actuator on the valve body with drive nut.
- Connect manual loading panel tubing to the Top Plate (17).
- Apply required air pressure through the manual loading panel to completely extend the actuator stem.
- Reconnect manual loading panel tubing from the Top Plate (17) to the Yoke (1), which is integrated into the bottom plate connection.
- Retract the actuator stem either pneumatically or with a handwheel approximately .1" (2mm) using the visual stroke scale as shown in Figure 7.

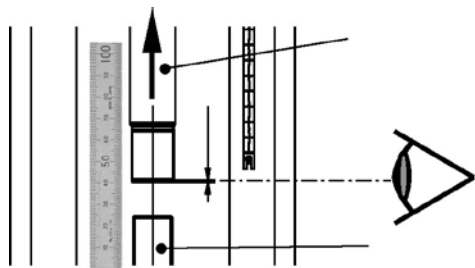


Figure 7 - 51/52/53 Cylinder Actuator

- 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.

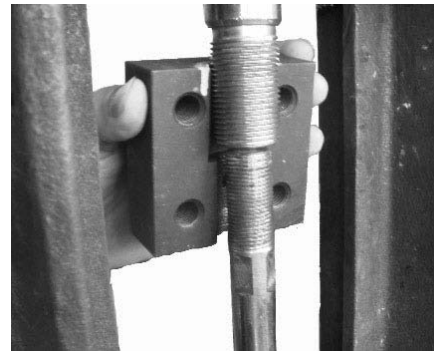


Figure 8 - 51/52/53 Cylinder Actuator

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

Connecting Air to Extend (Model 52) (Figure 9)

- Install actuator on the valve body with drive nut.
- Connect manual loading panel tubing to the top plate (17).
- Apply required air pressure through the manual loading panel to completely extend the actuator stem.
- Extend the actuator stem either pneumatically or with a handwheel approximately .1" (2mm) using the visual stroke scale as shown in Figure 7.
- 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.

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

Connecting Air to Retract (Model 53) (Figure 10)

- Install actuator on the valve body with drive nut.
- Connect manual loading panel tubing to the yoke (1), which is integrated into the bottom plate connection.
- Retract the actuator stem either pneumatically or with a handwheel approximately .1" (2mm) using the visual stroke scale as shown in Figure 7.
- 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.

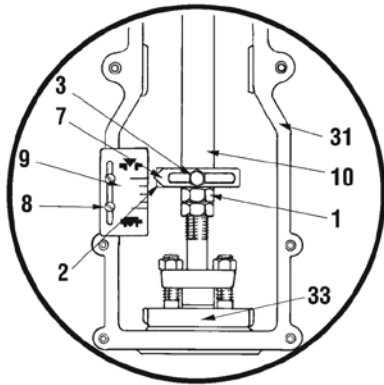
5. Assemble and tighten Indicator Arm (23), Spring Lock Washers (25), and Hexagon Bolts (24).
6. Line up the indicator plate (26), with Indicator arm (23) and check actuator for proper operation.

Parts Reference For Spring Diaphragm Actuators - Type 87/88 Multispring

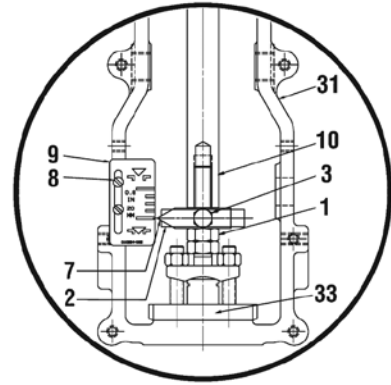
Table 8 - 87/88 Actuator Parts List

Item No.	Description
1	Hex Nut
2	Stem Connector, Bottom
3	Cap Screw, Hex Head
4 ⁽¹⁾	Stem Connector, Top
5 ⁽¹⁾	Cap Screw, Socket Head
6 ⁽¹⁾	Connector Insert
7	Pointer
8	Screw, Pan Head
9	Scale, Travel
10	Actuator Stem
31	Yoke, Machining
32 ⁽¹⁾	Lock Nut
33	Yoke Nut

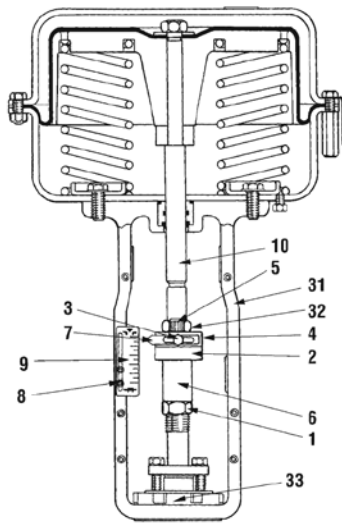
1. Not provided for Size 6 Actuator



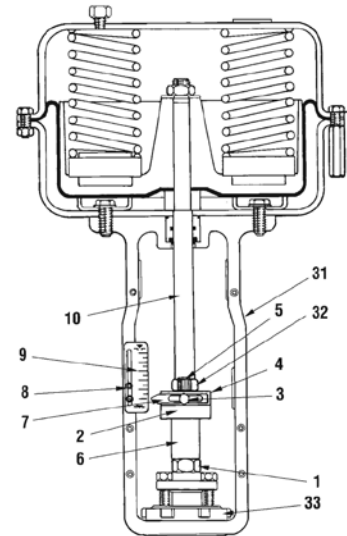
Type 87 Air to Close
No. 6



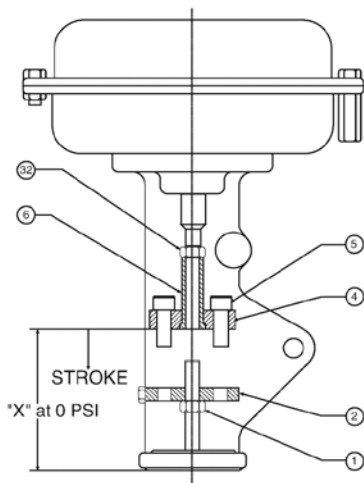
Type 88 Air to Open
No. 6



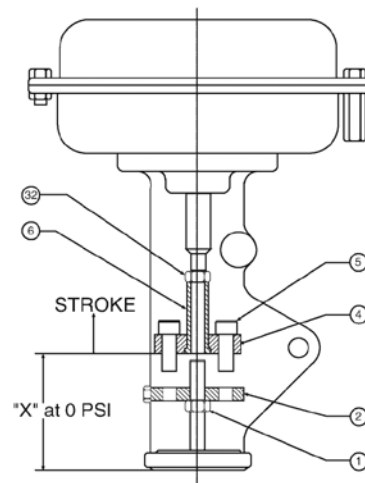
Type 87 Air to Close
No. 10-16-23



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



Model 87 Actuator
Air to Extend (Close)

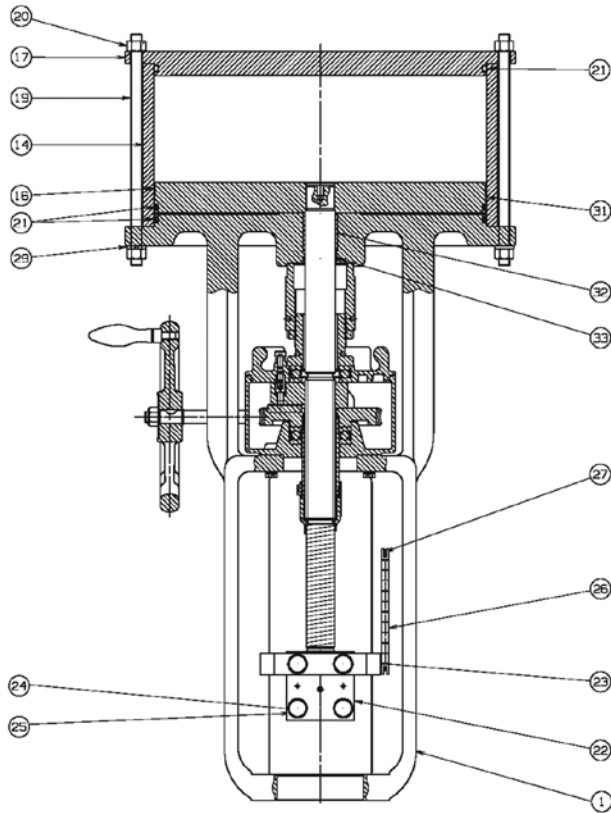


Model 88 Actuator
Air to Retract (Open)

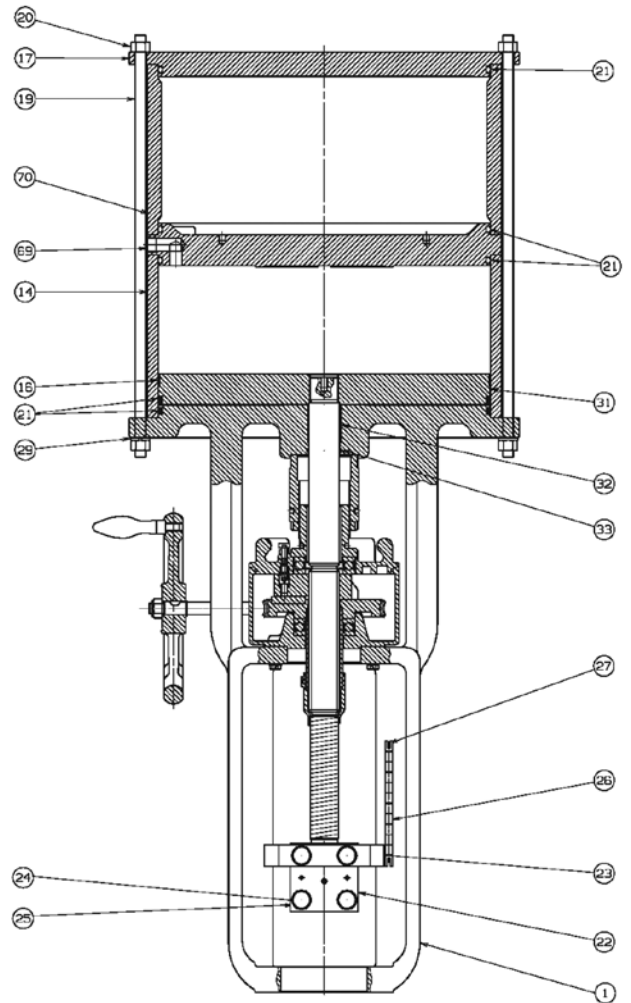
Figure 9: 87/88 Actuators

Table 7 - Models 51/52/53 Actuators Parts List

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 set screw
5	Hexagon socket head cap screw	28	Exhaust pipe	51	Guide key
6	Spring lock washer	29	Spring lock washer	52	Worm gear
7	Spring tube	30	Plug	53	Spacer tube
• 8	Guide bushing 3	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	Hand wheel 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)
• Recommended Spare Parts				70	Volume chamber tube

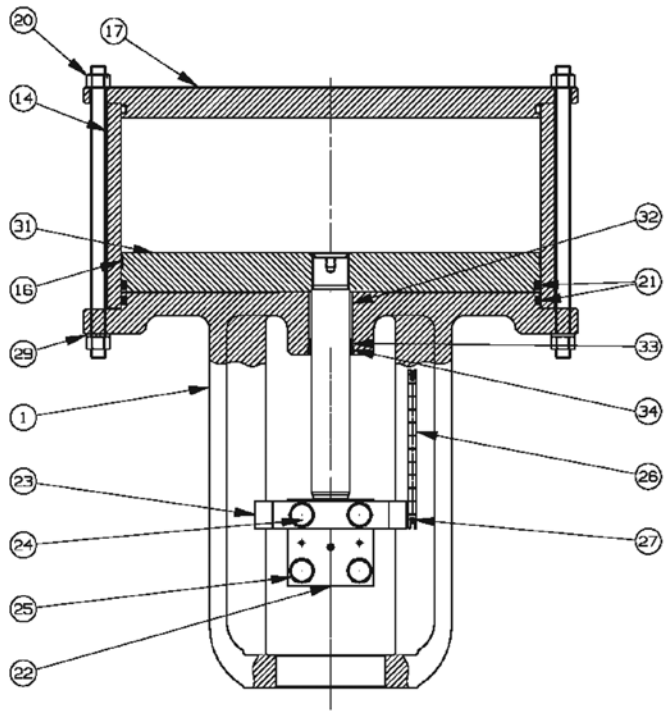


**Model 51 Double Acting
With handwheel without volume chamber**

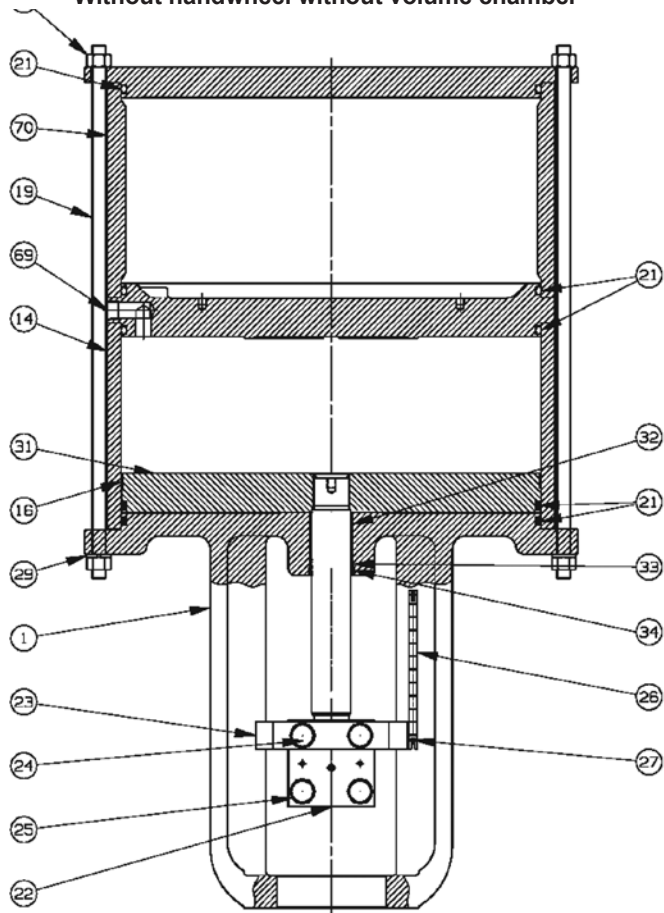


**Model 51 Double Acting
With handwheel with volume chamber**

Figure 10: Model 51 Actuator

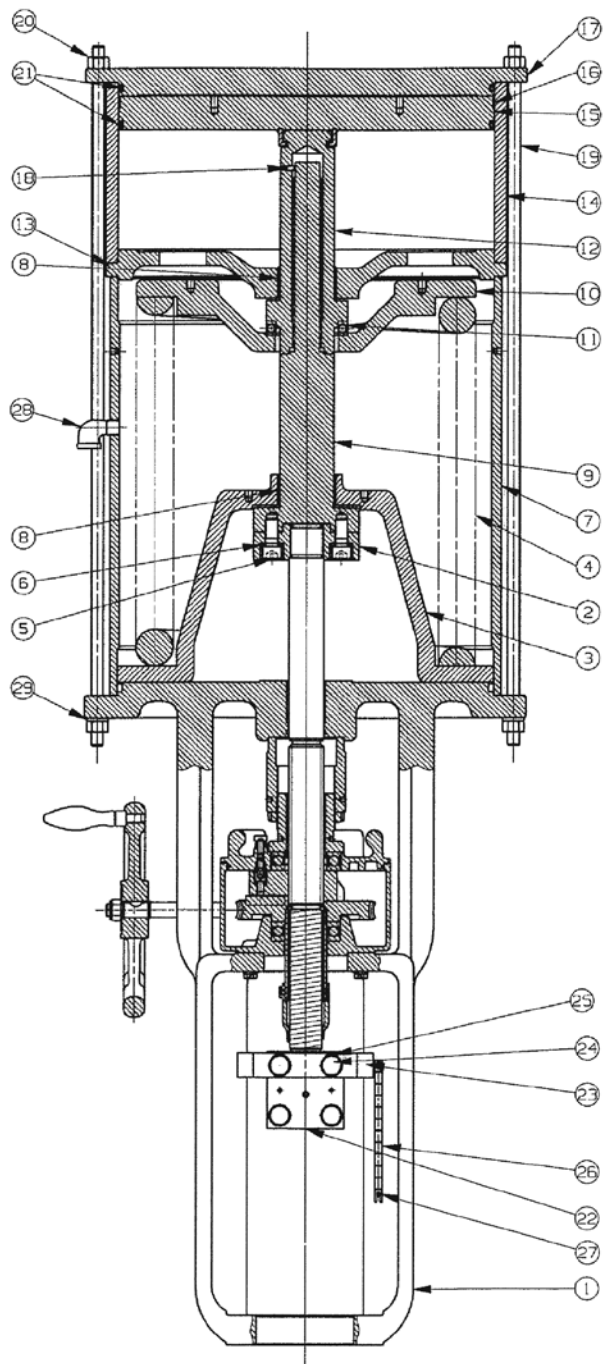


**Model 51 Double Acting
Without handwheel without volume chamber**

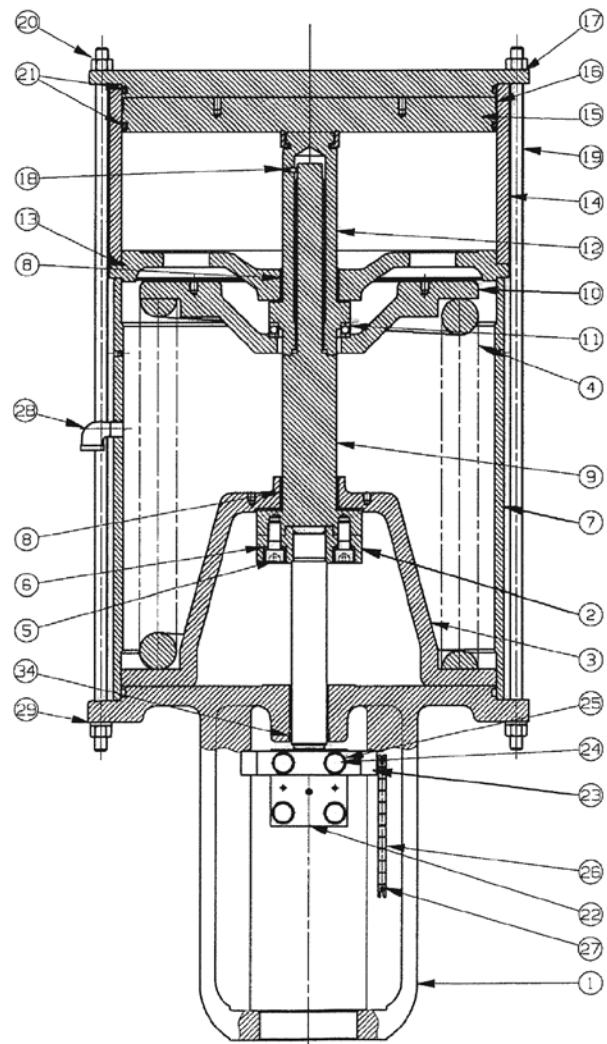


**Model 51 Double Acting
Without handwheel with volume chamber**

Figure 11 - Model 51 Actuator

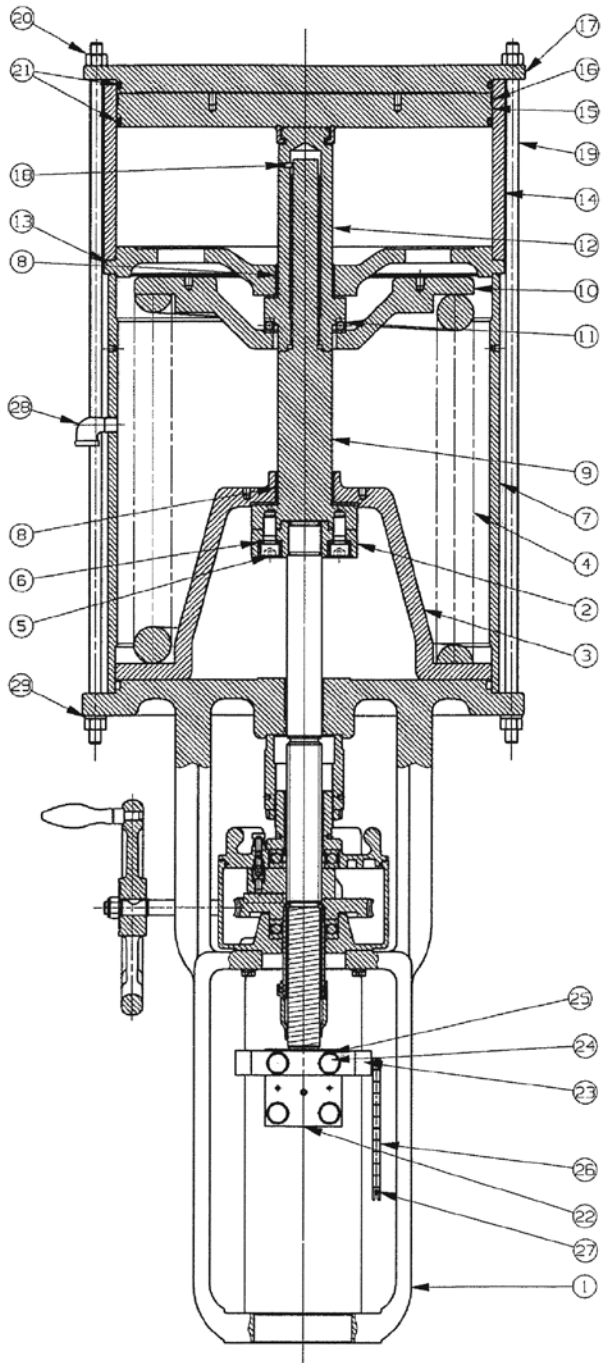


Model 52
Air to extend with handwheel

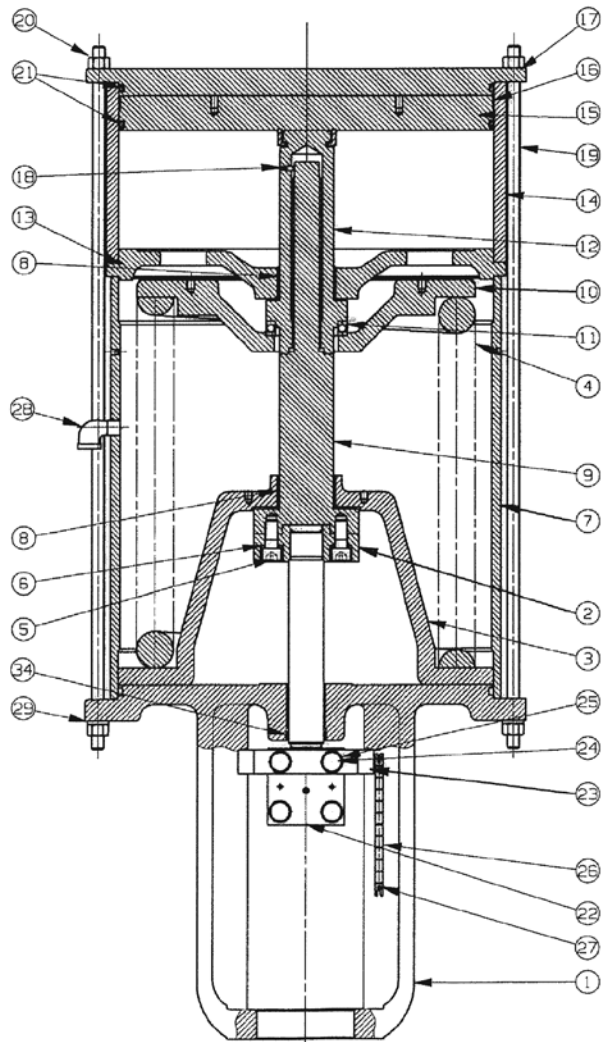


Model 52
Air to retract without handwheel

Figure 12 - Model 52 Actuator



Model 53
Air to extend with handwheel



Model 53
Air to retract without handwheel

Figure 13: Model 53 Actuator

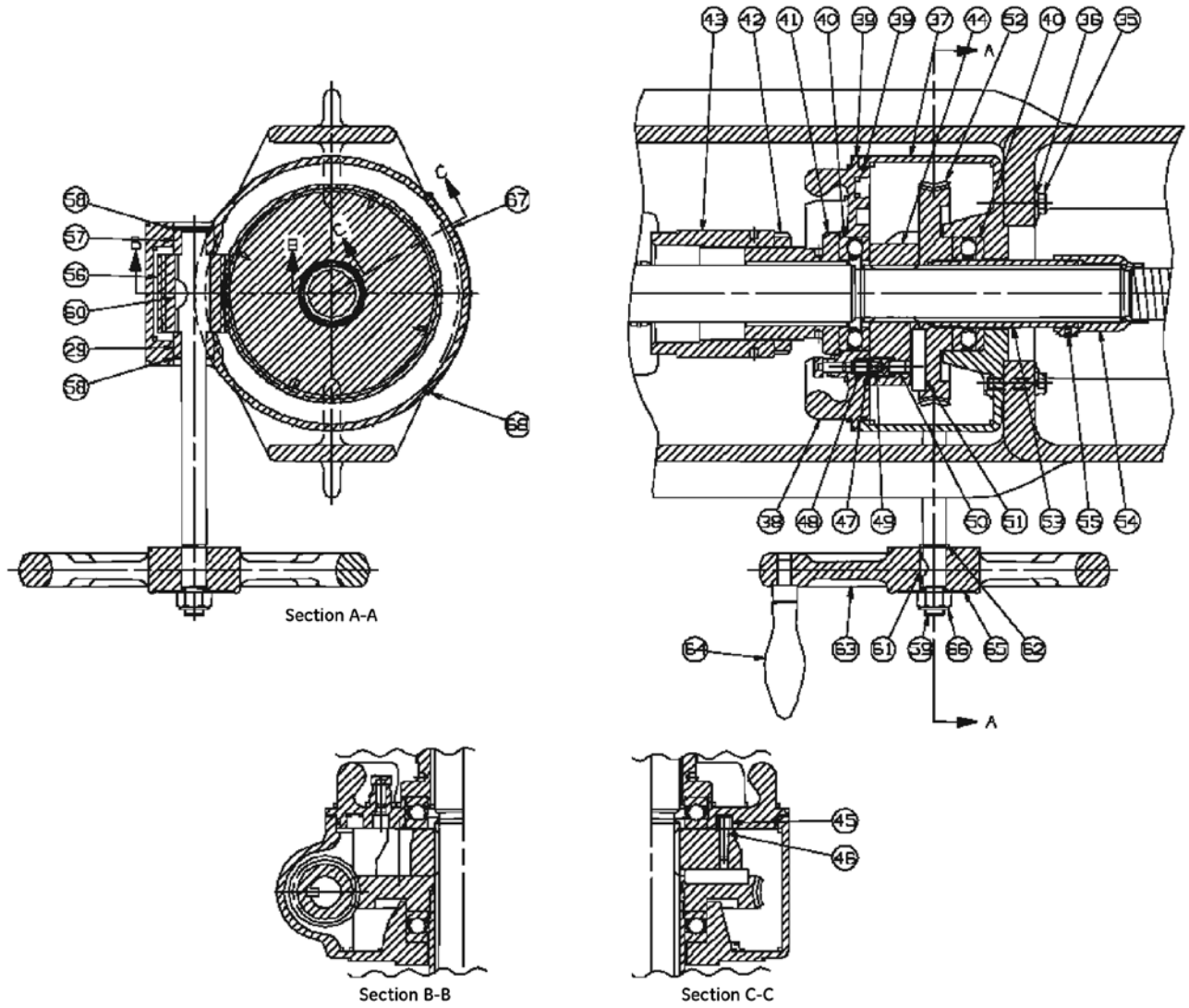


Figure 14: CM, DM handwheel - Typical for models 51/52/53

Body Sub Assembly

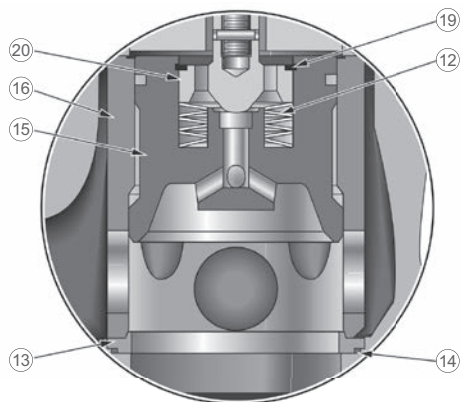


Figure 15 - 41405 Trim: 2" to 4"

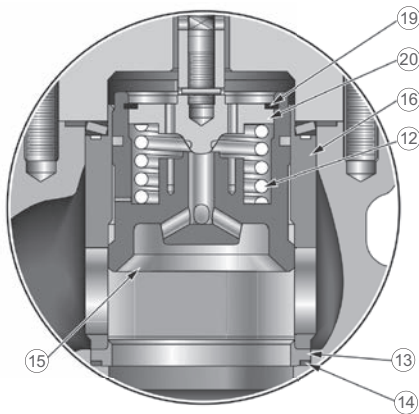


Figure 16 - 41405 Trim: 6" to 18"

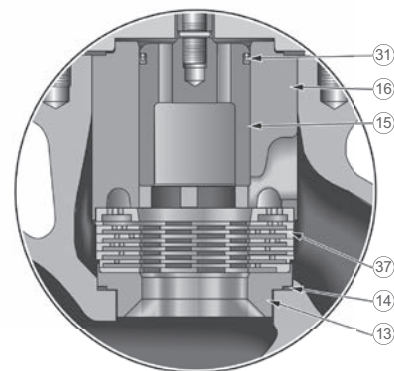
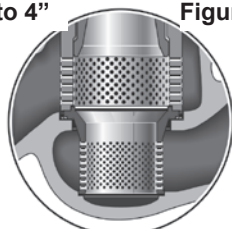


Figure 17 - Internal parts of VRT anticavitation valves – 41375 type

Figure 18 - Internal parts of pilot plug valve – 41405 type



Diffuser Option

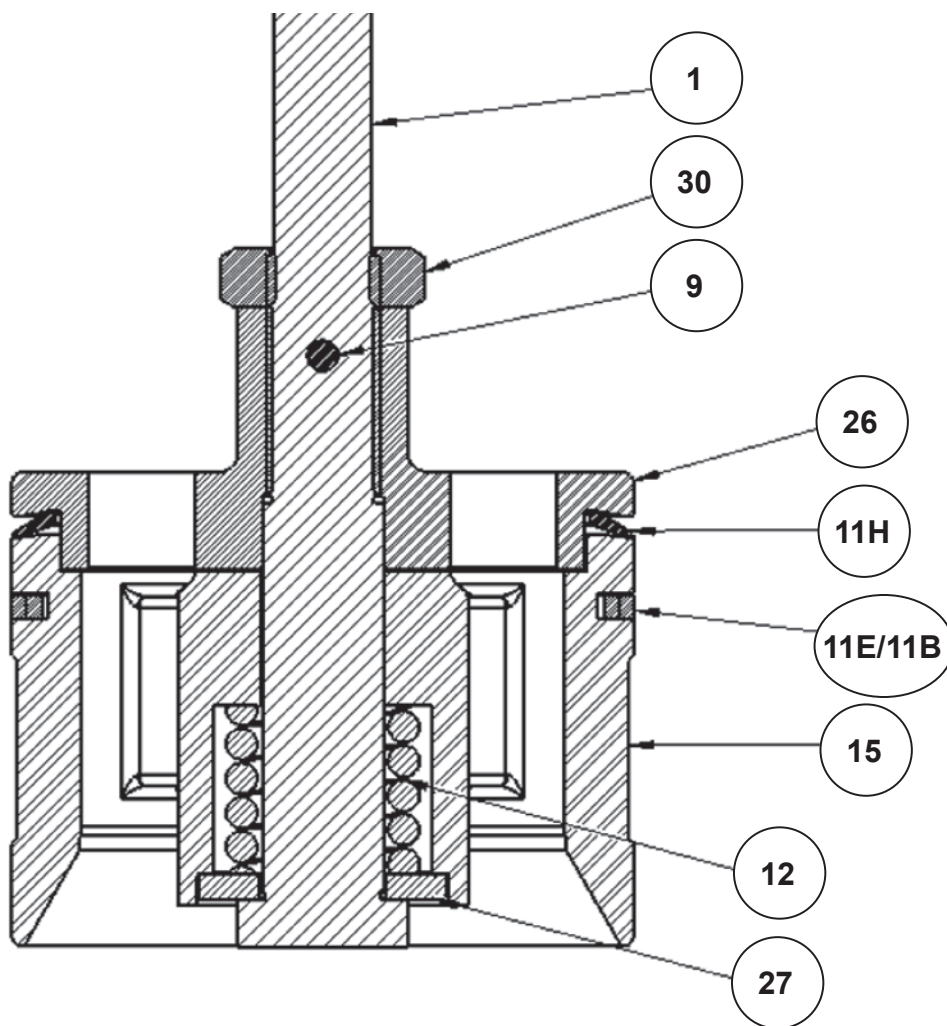


Figure 19 - HTS plug assembly

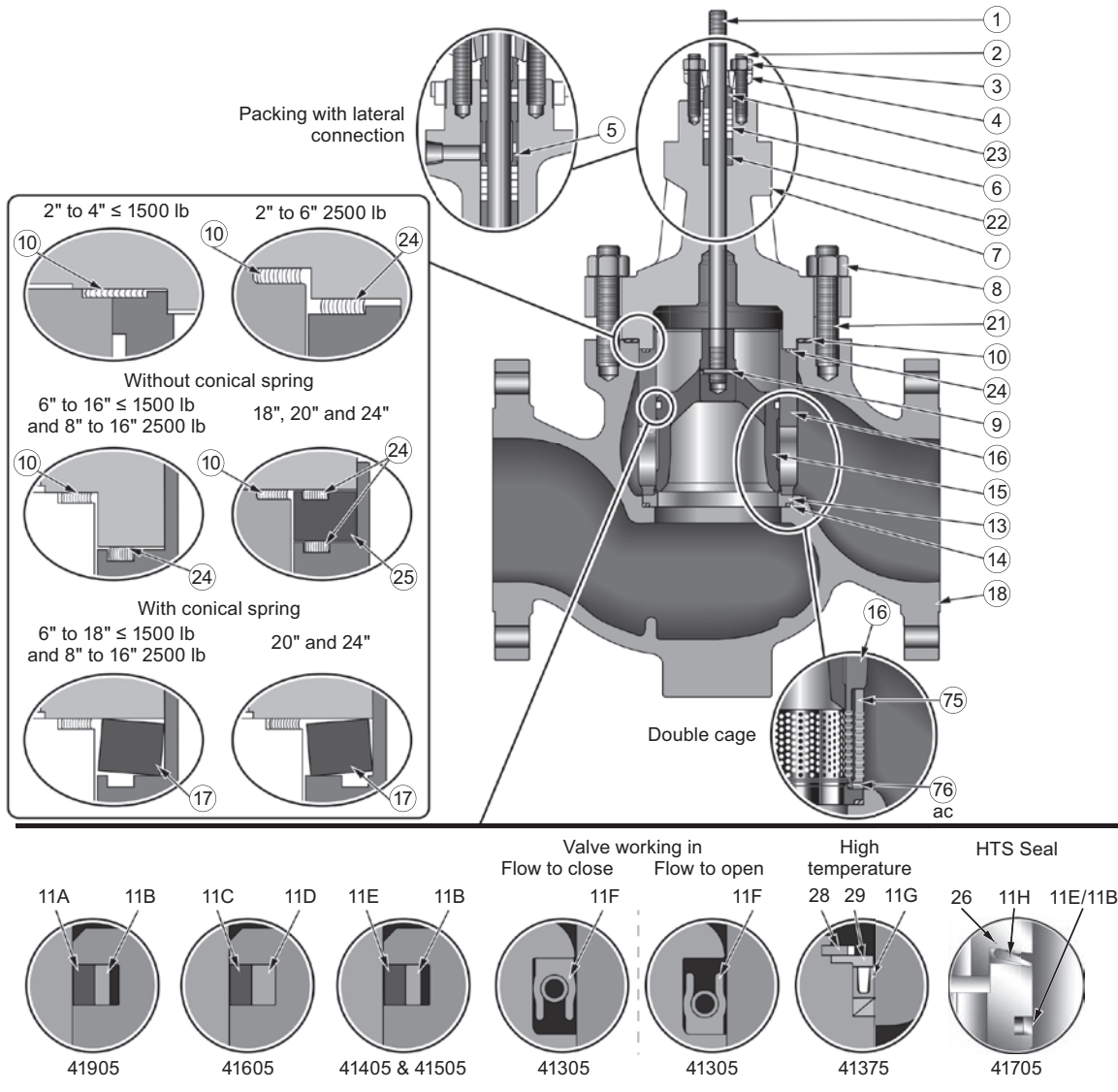


Figure 20 - General Assembly and Bill of Materials

Parts Reference					
Ref.	Designation	Ref.	Designation	Ref.	Designation
	1 Valve plug stem	▲ ● 11F	Tec seal		24 Cage Gasket
	2 Packing flange stud	○ 11G	Seal ring and backup ring		25 Cage washer
	3 Packing flange nut		11H HTS seal		26 Upper plug
	4 Packing flange	❖	12 Spring (or spring washers set)		27 Spring washer
	5 Packing spacer		13 Seat/diffuser seat	○	28 Retaining ring
●	6 Packing	●	14 Seat ring gasket	○	29 Retaining ring
	7 Bonnet		15 Valve plug		30 Jam nut
	8 Valve body nut		16 Cage		37 Stack
●	9 Plug stem pin	◆	17 Spring washer		50 Washer (body nuts)
●	10 Body gasket	❖	18 Valve body		75 Double cage
□	11A Graphite seal ring		19 Retaining ring		76 Pin
□	11B Metallic ring	❖	20 Auxiliary pilot plug		
★	11C U PTFE seal ring		21 Valve body stud		
★	11D Elastomer seal ring		22 Guide bushing		
■	11E Metallic seal ring		23 Packing follower		

❖ On 41405 series valves only	● Recommended spare part	▲ On 41305 series valves only
◆ On 6" to 24" valves sizes only (150 to 600 mm)	□ On 41905 series valves only	○ On 41375 high temperature valves only
★ On 41605 series valves only	■ On 41405/505 Series valves only	

Appendix A

41005 API-6A Series High Pressure Valves

1. General

1.1 Scope

The following instructions are designed to guide the user through the installation and maintenance of the 41005 API 6A Series valves for all sizes and for high working pressures (ie 10K PSI and 15K PSI).

For 41005 API 6A Valve 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.

1.2 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.

1.3 After Sales Service

Baker Hughes offers it clientele an After Sales Service comprising highly qualified technicians, for the operation, maintenance and repair of its equipment. To benefit from this service, contact our local representative or the After Sales Service whose email address is given at the end of this document.

1.4 Spare Sparts

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.

The recommended spare parts are indicated in the parts list included in this Appendix in table 11.

1.5 Actuator and Other 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. The instruction manuals to be used for standard actuators are 31188 for 51/52/53 Pneumatic piston actuators, and 19530 for types 87/88.

1.6 Warranty

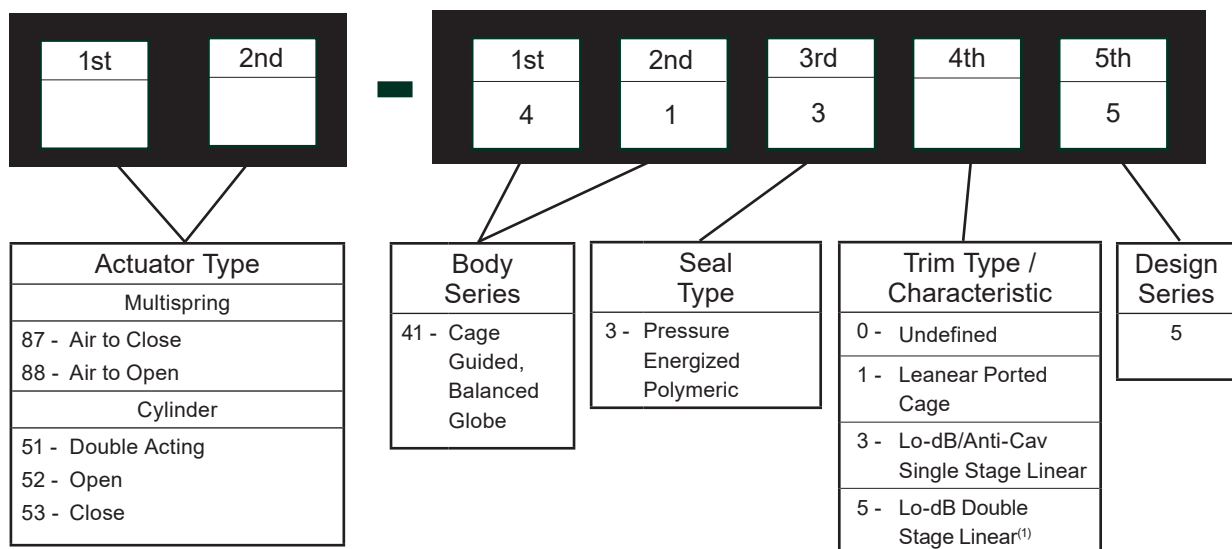
Refer to General terms beginning on page 6 of the Manual.

41005 API 6A should be closed for a short period only. There is a risk of damage for trim parts for long period of closing.

41005 API 6A valves are designed as control valves, not as isolating valves.

If 41005 are used as isolating valve, internal parts damage will not be covered by warranty.

41005 API 6A Numbering System



(1) Lo-dB Double stage option is not available for 10" API 6A valves.

2. Installation

2.1 Cleanness of Piping

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

2.2 Isolating By-Pass Valve

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

2.3 Heat Insulation

In case of heat insulated installation, do not insulate the valve bonnet and take protection measures related to personal safety.

2.4 Hydraulic Test and Cleaning of Lines

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 damages or destroying of seal rings could result.

2.5 Flow Direction

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

3. Disassembly

3.1 Removal of Actuator (Figures 15 and 16)

Access to the internal components of the body should be accomplished with the actuator removed. To carry out this operation, follow the instructions below and refer to the specific actuator instructions, reference 19530 for a type 87/88 actuator and 31188 for type 51/52/53 actuator.

3.1.1 Disconnection of instruments

Disconnect all mechanical couplings between the positioner and the other instruments on the one hand and the valve stem/actuator stem coupling on the other hand.

3.1.2 Plug stems screwed into the actuator stem

In the case of air-to-retract actuators, apply sufficient air pressure on the diaphragm to retract the stem completely. Loosen the counter-nut, unscrew the stem.

CAUTION

During this operation, make sure that the plug does not turn when it is seated. If the plug travel is very small and there is a large amount of plug stem inside the actuator, it may be necessary to remove the yoke nut and lift the actuator so that the plug is not touching the seat.

3.1.3 Stems attached with a stem connector

In the case of air-to-retract actuators, apply sufficient air pressure on the diaphragm to retract the stem completely.

Loosen the screws and remove the stem connector.

3.1.4 Removal of actuator

Disconnect all the ingoing and outgoing air and electrical connections from the actuator. Loosen the yoke nut or attachment screws and lift the actuator, making sure that the concentricity and/or the thread of the bonnet is not damaged.

3.2 Opening of the Pressurized Chamber (Figures 17, 18 and 19)

DANGER

Prior to disassembly, vent the process pressure and isolate the valve if necessary.

Note: The valve must always be reassembled with new packing rings and gaskets; before disassembly, make sure that the appropriate parts are available.

- A. Remove the packing flange nuts (B221) then remove the packing flange/follower (B219).

- B. Check that the exposed part of the valve plug stem (B150) is clean enough for the bonnet (B003) to be removed easily.
- C. Remove the body stud nuts (B014).
- D. By means of a Lifting Lug secured instead of the actuator, lift the bonnet (B003) up and separate it from the valve body (B001). During this operation, the valve plug stem (B150) must be pushed downwards so that the valve plug remains in the valve body (B001).
- E. Remove the the body gasket (B015).
- F. In the case of type 41305 valve, remove the valve plug stem (B150) and valve plug (B112) assembly from the cage by pulling the valve plug stem upward, then remove the cage (B107).
- G. Remove the trim retainer (B105) followed by the cage (B107) and the seat ring gasket (B103) from the valve body (B001).
- H. Remove the packing (B207, B208), and the packing bushing (B203) from the bonnet (B003).

3.3 Disassembly of Valve Plug Stem

The valve plug stem is screwed and pinned into the valve plug (B112).

To dismount the stem, the valve plug must be held as indicated below, taking care not to damage the guiding surfaces; the plug stem pin (B903) is then removed. By means of flats or using a nut and counter-nut on the end of the stem, unscrew the stem taking care not to apply a bending moment which could deform it.

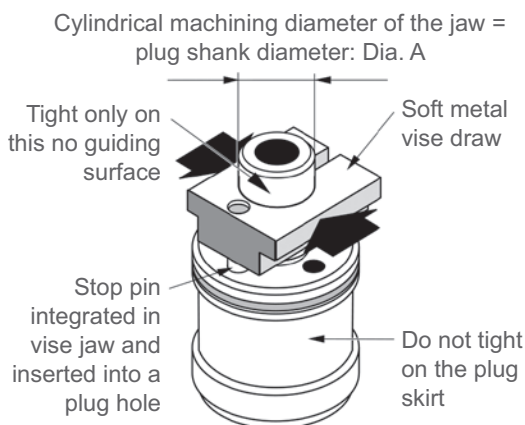


Figure 1 - Valve Plug Stem

4. Maintenance and Repair

4.1 Preliminary Controls

Before reassembly, check parts and the materials for conformity to the bill of material call out. Inspect inside of body (B001), Bonnet (B003), Cages (B107, B110) and plug (B112) for cleanliness.

Remove any foreign matter and clean the gasket surfaces. Inspect body (B001), Bonnet (B003), Cages (B107, B110), gaskets (B103, B108, B118, B015), plug (B112), plug stems (B150), and bushings (B203) for nicks, scratches, burrs, sharp corners, etc., on sealing and sliding surfaces including packing box.

Important:
During assembly, care must be exercised to prevent damage to these parts.

Since 41005 API 6A are high pressure valves, ensure there is no damage to the sealing surfaces. Performance of gaskets and seal are strongly linked to surface roughness.

4.2 Packing Box

Prior to assembly the packing:

- Ensure there are no nicks or scratches on the stem and packing box inside diameter packing area.

Violation of any of these requirements is cause for stem or packing box rejection

Tightness of the packing box is obtained by compression of the packing rings (B207) and anti-extrusion rings (B208). Compression must be achieved by evenly tightening the packing flange nuts (B221) on the packing flange (B219). Periodical retightening of the packing flange nuts is required to maintain tightness.

Make sure that the packing is not over tightened as this could prevent smooth operation of the valve.

If a leak persists after the packing has been compressed to a maximum, the packing needs to be changed.

4.2.1 PTFE Based packing

- A. Unscrew and remove the packing flange nut (B221) and packing flat washer (B921a)
- B. Lift the packing flange (B219) up along the valve stem
- C. Extract and remove the packing rings (B207) and anti-extrusion rings (B208), taking care not to damage the sealing surface of the packing box lantern or the valve plug stem.
- D. Replace the packing rings, with the cut in each ring placed about 120° from the next, pressing them down one at a time and respecting the table below

Table 1 - PTFE Based Packing

N.D. mm (in.)	Stem Size (in.)	Number of Packing Rings	Number of anti-extrusion rings
80 (3")	25.4 (1")	4	2
100 (4")	25.4 (1")	4	2
150 (6")	28.56 (1"1/8)	5	2
200 (8")	31.75 (1"1/4)	4	2
250 (10")	31.75 (1"1/4)	4	2

- E. Install Packing studs (B220)
- F. Install the guide bushing (B203) in the bottom of the packing box.
- G. Install packing set (B207 and B208)
- H. Assemble Packing flange/follower (B219)
- I. Screw the packing flange nuts (B221) by hand
- J. Check that the valve plug (B112) moves freely
- K. Gradually apply torque values indicated in table 3. Pay attention to keep an even gap between the stem (B150) and packing flange/follower (B219) when torquing. There must be no contact between the stem (B150) and the packing flange/ follower (B219).

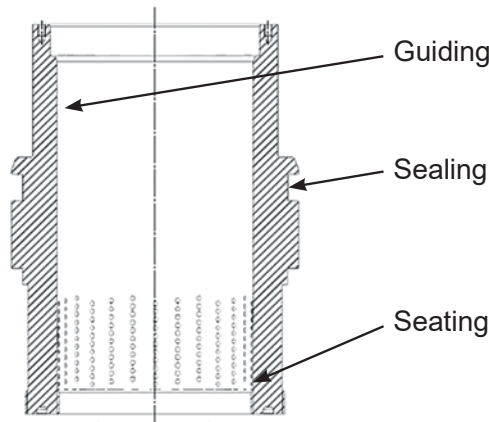


Figure 2 - Cage Guiding, Sealing & Seating Surfaces

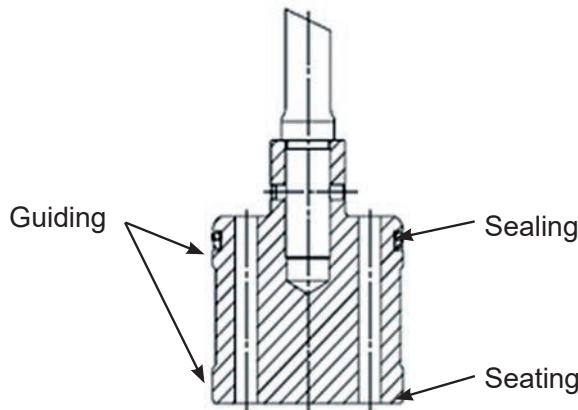


Figure 3 - Plug Guiding, Sealing & Seating Surfaces

Table 2 - Torque Values

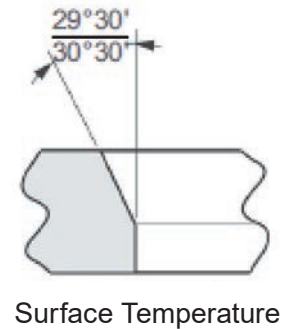
Description	Stem Size (inch)	1	1"1/8	1"1/4
	Valve Class	10K/15K	10K/15K	10K/15K
	Bolt Thread size	1/2"-13UNC-2A	1/2"-13UNC-2A	5/8"-11UNC-2A
	Bolt number	4	4	4
Packing studs	Torque [N.m]	82	69	151
	Torque [ft-lb]	61	51	111

4.3 Repair of Parts

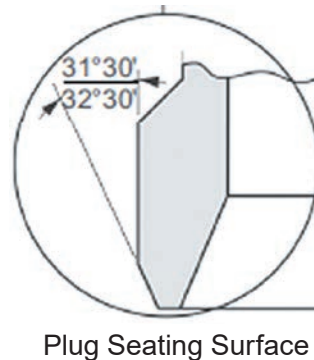
Before re-assembly, the parts must be carefully examined in order to eliminate any scratched, worn or damaged parts.

4.3.1 Guiding Surfaces

The guiding surfaces of the cage and valve plug, the guide bushing, and the guiding surfaces of the plug stem and packing box must be checked. Otherwise, the part must be replaced as soon as possible (see paragraph "Spare parts").



Surface Temperature



Plug Seating Surface

4.3.2 Seating Surfaces

Inspect all seating surfaces per Figures 2 and 3 which represents all plug and seat types.

The cage (B107), plug (B112) seating surfaces must be completely free of dents, wear and scratches.

If valve plug (B112) or cage (B107) seating surfaces show signs of slight deterioration, they can be touched up on a lathe.

For all valve types, when dressing up critical surfaces, no more than 0.25 mm (0.010") of metal must be removed in the case of an 80 or 100 mm (3" or 4") valve, and no more than 0.4 mm (0.015") in the case of a 150 to 250 mm (6" to 10") valve. Make sure that the seating angle indicated in Figures 2 and 3 is respected.

If a slight defect exists on any of the above seating surfaces, lapping can be envisaged, in which case the following must be respected:

1. Spread a fine layer of high-quality sealing compound on the seating surface.
2. Put the cage (B107) in the body, noting the angle.
3. Assemble the valve plug (B112) and Stem (B150)
4. Assemble the bonnet (B003) and its guide bushing (B203)
5. Place an appropriate tool on the valve plug stem (B150) to turn it
6. Lap by slightly rotation the valve plug (B112) in alternative directions. After several rotation, lift the valve plug (B112), turn it 90°, and start again.
7. Lapping can be repeated but must be limited as much as possible so that the cage (B107) seating area remains sufficiently narrow to guarantee tightness.
8. Disassemble the parts, clean them and put them back, respecting the initial angle.

4.3.3 Gasket seating surfaces

Gasket seating surface must be free of dents, scratches and corrosion; otherwise, they will need to be repaired.

4.3.4 Seal Rings and gaskets

Seat ring gaskets (B103), lips seals (B108 & B118), Body gasket (B015) must always be changed after disassembly.

4.3.5 Valve Plug and Plug Stem

If the valve plug (B112) needs to be changed, then the stem must also be completely changed to guarantee correct pinning of the assembly. If only the valve plug stem (B150) is changed, then the valve plug (B112) can be reused.

5. Valve Reassembly

5.1 Pinning the Valve Plug Stem

The valve plug (B112) and stem (B150) assembly consist of a stem threaded into the valve plug and pinned in place.

If the valve plug (B112) needs to be replaced, it is recommended using a new stem.

The hole of the original pin in an old stem often prevents satisfactory results being obtained and can seriously impair the mechanical strength of the stem-valve assembly.

Assembly is carried out as follows:

5.1.1 Tightening of the plug stem

To carry out this operation, the valve plug must be prevented from moving by holding the plug shank with an appropriate tool.

Screw two nuts on to the end of the new plug stem and lock them together. Screw the valve plug stem solidly into the plug, checking that the reference mark is level with the end of the plug shank.

If the stem has flats, apply a torque "T" using a wrench of dimension "E" (see Table 3).

5.1.2 Drilling the pin hole (Figure 3 and Table 4)

Note: For this operation, it is recommended clamping the valve plug-stem assembly by the plug shank to avoid damaging the guiding surfaces; particular care must be taken so that the pin hole goes through the valve plug axis.

If the valve plug (B112) is new, drill a hole of diameter "C" at a distance "D" from the end of the valve plug (B112); choose the diameter "C" from the table according to the type of pin used (metric or English pin). If the hole is already drilled in the valve plug (B112), use the hole as a guide to drill through the valve plug stem (B150).

5.1.3 Pinning

By means of a hammer, introduce the pin (B903) into the hole. Complete the pinning operation, taking care to ensure that the pin (B903) is recessed by the same amount at both sides.

Using a ball tooling and hammer, caulk the pin hole edge of the plug (B112).

Place the assembly in the soft jaw chuck of a lathe to check alignment of the two parts; correct any alignment defects.

Table 3 - Pinning and Stem Torque Values

Pinning and Stem Torque Values								
Valve Plug Stem Diameter B	Diameter A	Metric pin, Diameter C	Anglo-Saxon pin Diameter	F	D	Distance X	E	Torque T
mm (inch)	mm (inch)	mm	inch	mm (inch)	mm (inch)	mm (inch)	mm (inch)	N.m (Ft. lbs)
25.4 (1.00)	42.0 (1.65)	8	5/16	40.0(1.57)	28 (1.1)	16.0(.63)	30 (1"1/4)	250 (184)
28.56(1.125)	42.0 (1.65)	8	5/16	40.0(1.57)	47.5 (1.87)	16.0(.63)	36 (1"3/7)	250 (184)
31.75 (1.250)	58.0 (2.28)	8	5/16	40.0(1.57)	70.0 (2.76)	32.0 (1.26)	40 (1"5/8)	800 (590)

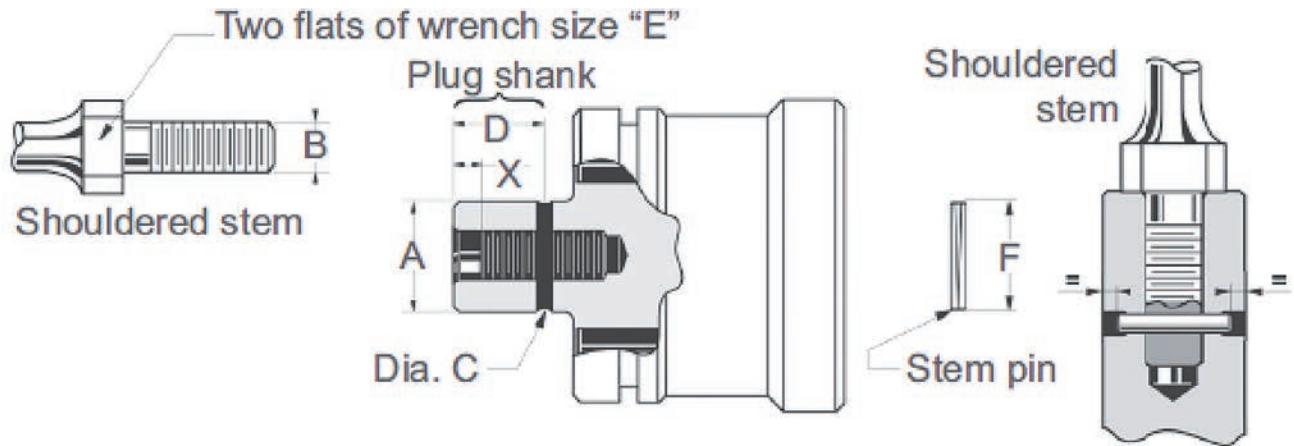


Figure 4 - Valve Plug & Stem Pinning

5.2 Assembly of Spring-energized Seal Ring

These valves have spring-energized seal rings maintained expanding by a spring.

Installation of the high-pressure lip seal is like that of the standard lip seal with the exception that it requires additional force due to the added stiffness of the seal. In addition to requiring more force, care must be taken not to damage the lip of the seal during the installation. See Figures 5, 6, 7 and 8..

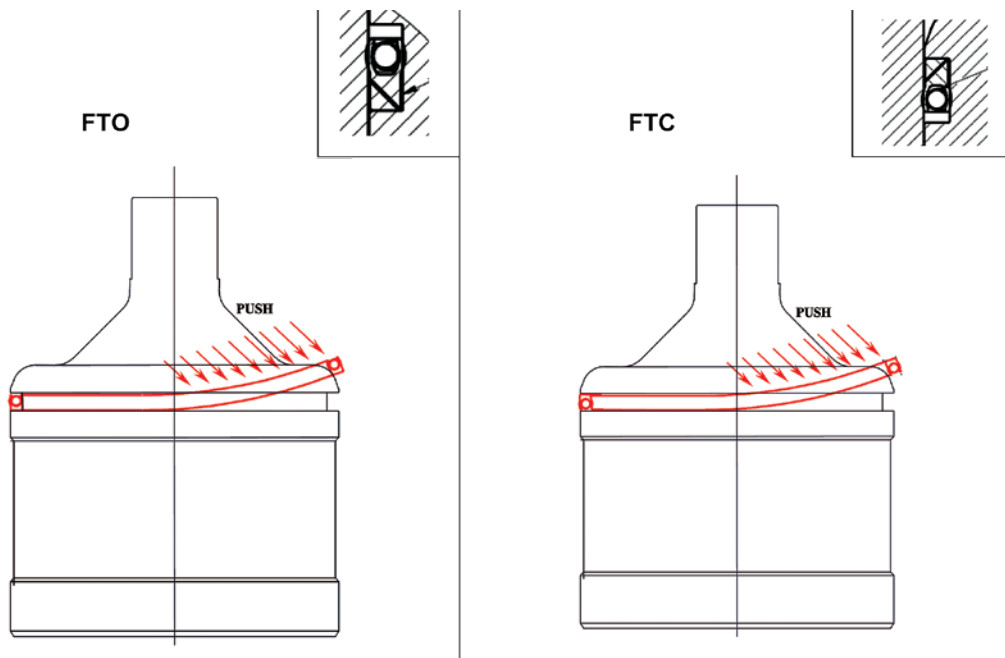


Figure 5 - Plug Balanced Seal Mounting

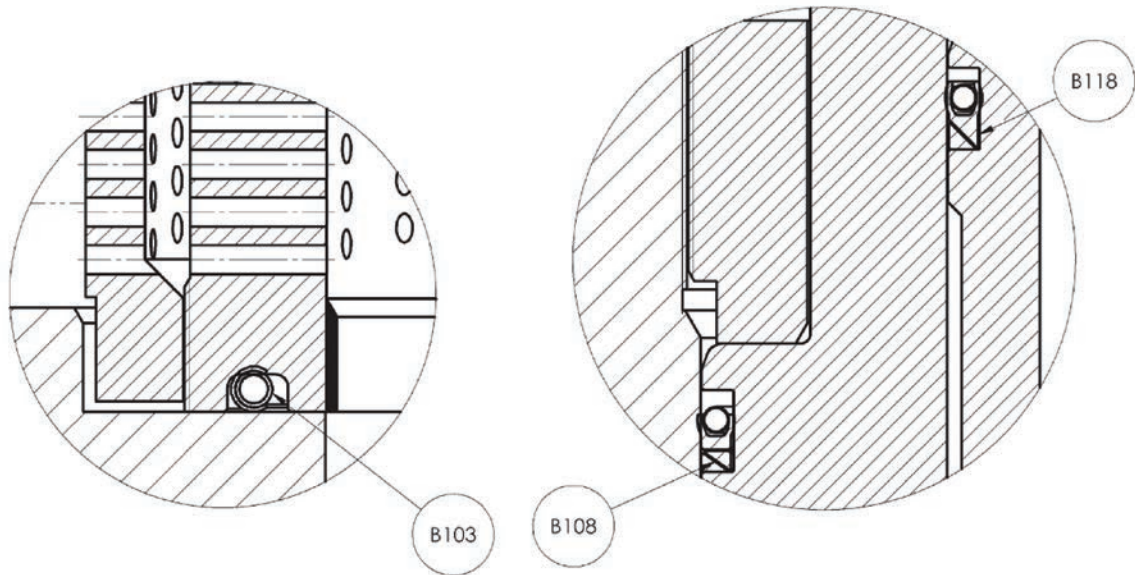


Figure 6 - Flow To Open Seals and Gasket Mounting

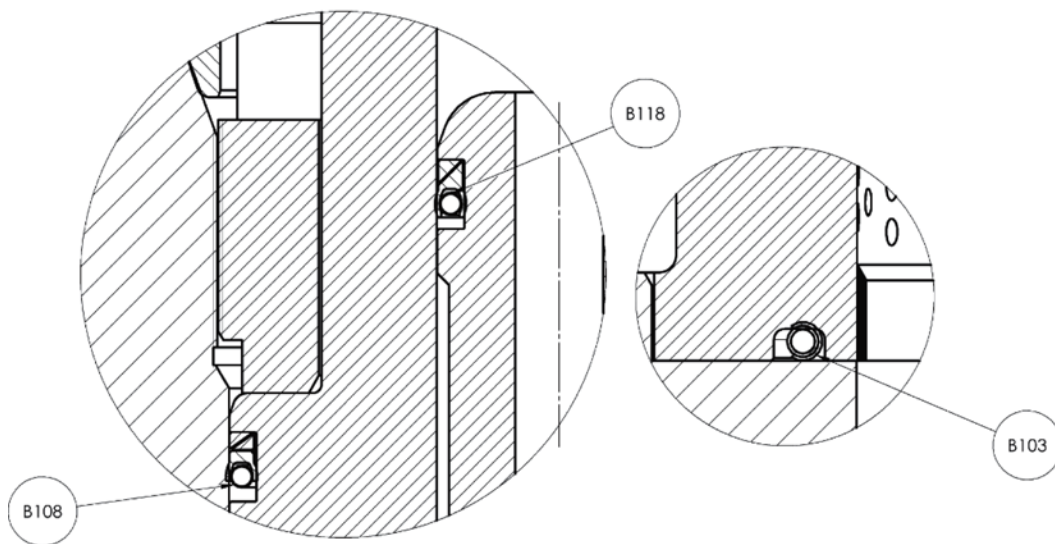


Figure 7 - Flow To Close Seals and Gasket Mounting

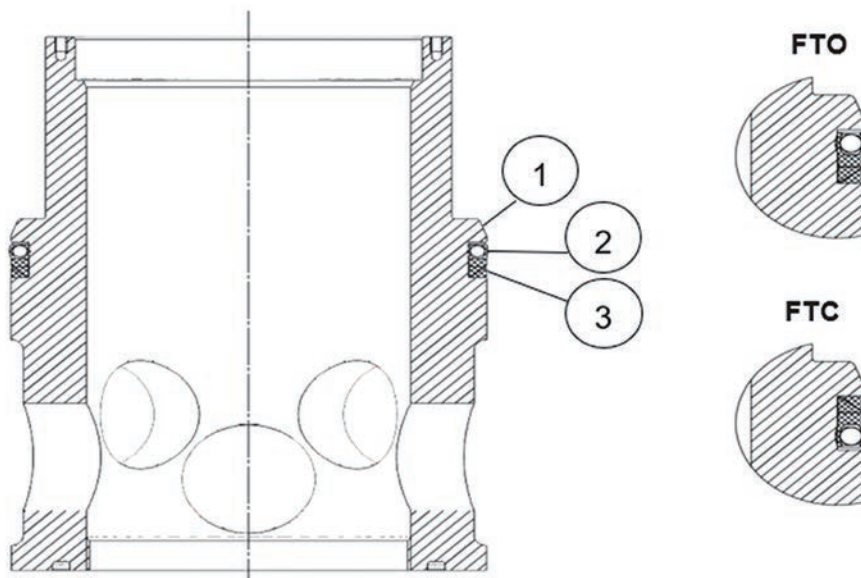


Figure 8 - Principle Diagram of the Cage Lip Seal Mounting

To insert rings into groove:

1. Lubricate the entry chamber.
2. Place the ring over the conical top of the plug so that the lips of the ring face to the pressure (see Figures 7 and 8).

CAUTION

Assemble the direction of radial rings (B108 and B118) on the plug and on the cage (see Figures 6 and 7). Flow tends to open; the open side is in the top. Flow tends to close: the open side is in the bottom.

3. Slip the ring into the groove (without spinning it) as shown in Figure 8. This operation can be facilitated by heating the ring. The temperature of the ring should not exceed 180°C (356°F).
4. Keep the ring retained until it returns to room temperature and goes back in place within the groove. Clamping with a collar (SERFLEX type) will help to properly position the ring.

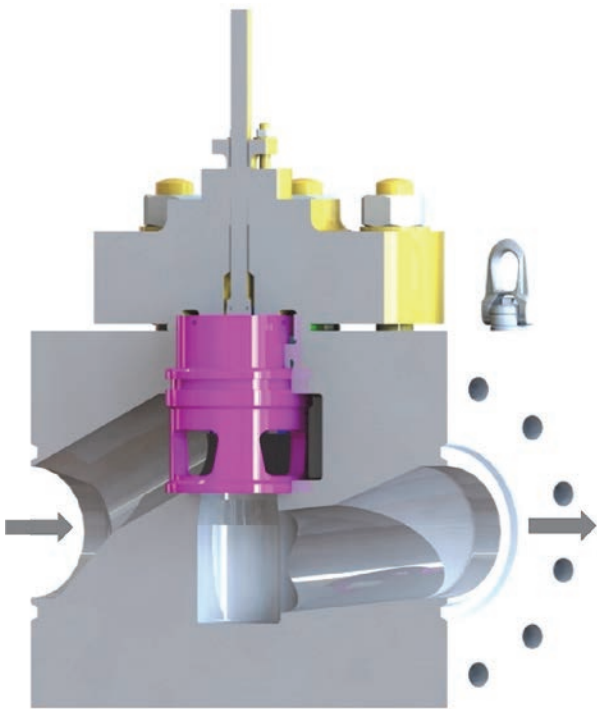


Figure 9 - Flow To Close Direction

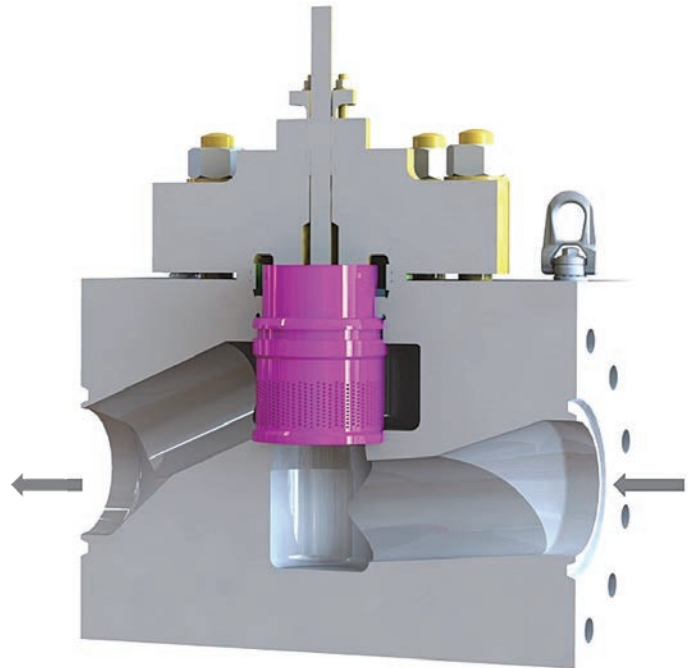


Figure 10 - Flow To Open Direction

5.3 Assembly of the Parts Inside the Valve Body

Proceed as follow:

1. Preliminary Controls : refer back to section 5.1
2. Mount the cage (B107)
3. In case of double cage TRIM 41355 API 6A see Table 4, assembly as Figure 11
 - a. Put the inner cage (13) upside down
 - b. Screw the outer cage (B110) and the inner cage (B107) at the torque value as per Table 4.
 - c. Screw Sets screws (B914) to the outer cage (B110)

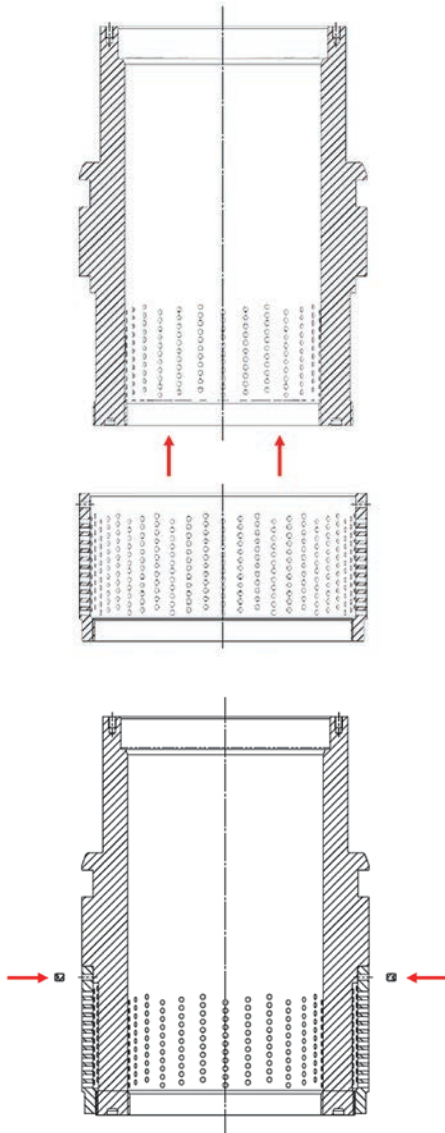


Figure 11 - Exploded View of 41355 API 6A Trim

Table 4 - Torque Value for 41355 API 6A Trim

Description	Valve Size (inch)	3	4	6	8	10 ⁽¹⁾
	Valve Class	10K/15K	10K/15K	10K/15K	10K/15K	10K/15K
Outer/Inner	Thread size	4"1/2-16UN-2B	5"5/8-16UN-2B	6"3/8-16UN-2B	8"1/2-16UN-2B	N/A
	Torque [daN.m]	276	396	414	750	N/A
	Torque [ft-lb]	2036	2921	3053	5532	N/A

1. 41355 option is not available for 10" API 6A 41005 valves

5.4 Assembly of the Bonnet

1. Check that the packing ring (B207), anti-extrusion rings (B208) and the guide bushing (B203) have been removed from the bonnet (B003).
2. Make sure that the body gasket (B015) is fitted in the Body (B001) and the Bonnet (B003) groove.
3. Position the bonnet (B003) above the valve, so that the packing flange studs (B220) are perpendicular to the flow direction of the valve.
4. Lower the bonnet (B003) onto the valve stem (B150) and push it down carefully until it goes into the valve body studs (B002) and takes up its correct position.
5. Make sure that the valve plug (B112) operates freely, for the 41305 valves take in account the friction force of the plug seal ring (B118).
6. No need to lubricate the stud thread as it is coated with PTFE. During the body nut tightening, take care that the plug stays in contact with the seat ring. For 41300 Series, it can be necessary to apply a constant force on the plug stem (B150) to achieve and maintain this contact.
7. Screw on the body stud nuts (B014) by hand. Tighten the nuts lightly and evenly so that the internal parts are held in place. The face of the bonnet (B003) should be parallel to the upper face of the body (B001).
8. Slide the guide bushing (B203) onto the valve plug stem (B150) and let it drop to the bottom of the packing box housing.

5.5 Tightening of Body Studs

Alignment of internal parts:

In order to achieve perfect alignment of the cage (B118) and the valve plug (B112), a force must be applied to the plug stem (B150) during tightening of the bonnet (B003) which results in correct relative positioning of the two parts.

The force can be applied with the pneumatic actuator as follows:

Place the actuator on the valve bonnet (B003) by means of the yoke nut (B017) or attachment screws (B915) and connect the valve plug stem (B150) to the actuator stem.

CAUTION

During this operation, make sure that the plug does not turn when it is seated. If the plug travel is very small and there is a large amount of plug stem inside the actuator, it may be necessary to remove the yoke nut and lift the actuator so that the plug is not touching the seat.

Align the internal parts as follows:

1. In the case of air-to-extend actuators, supply air to the actuator at the maximum pressure indicated on the serial plate and in the case of spring-to-extend actuators, do not supply air to the actuator, so that the optimum positioning of the valve plug (B112) and cage (B107) can be obtained.
2. Single bolting circle: in all the case, mount the nuts in order to indicate by the Figures 12 and 13 and screw them by successive, uniform and progressive levels. Make sure that the bonnet's face stays parallel at the body one, up to the torque value given in table 5 and 6 are reached.

! WARNING

Due to the use of metal body gasket(B015), the body (B001) and the bonnet (B003) will NEVER be in metal/metal contact.

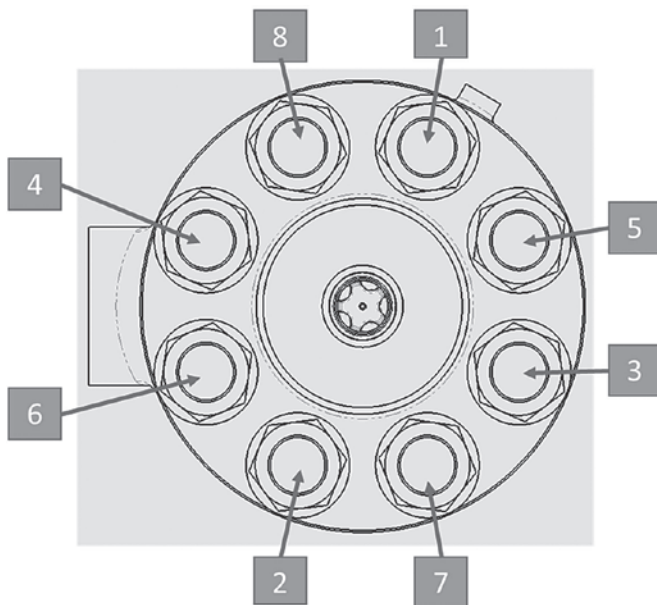


Figure 12 - Torque Sequence Single Bolting Circle 8 Bolts

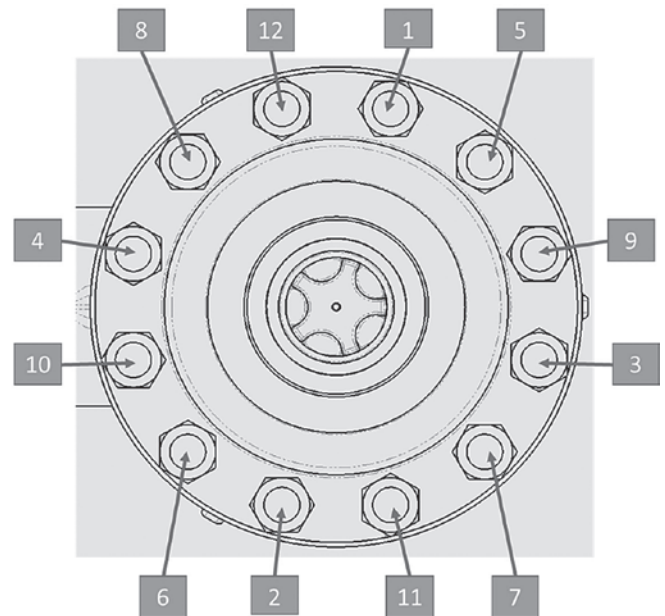


Figure 13 - Torque Sequence Single Bolting Circle 12 Bolts

Table 5 - Torque Requirements Body/ Bonnet 10K Valves

	Valve Size (inch)	3	4	6	8	10
	Valve Class	10K	10K	10K	10K	10K
Stud Material	Bolt Thread size	1"3/4-8UN-2A	1"1/2-8UN-2A	1"3/4-8UN-2A	1"7/8-8UN-2A	2"-8UN-2A
	Bolt quantity	8	8	8	12	12
Body studs B7M /L7M	Torque [daN.m]	150	90	149	185	225
	Torque [ft-lb]	1106	664	1099	1364	1660
	Max Torque[daN.M]	164	101	164	202	250
	Max Torque[ft-lb]	1210	745	1210	1490	1844
Body studs B7/ L7	Torque [daN.m]	195	120	195	240	295
	Torque [ft-lb]	1438	885	1438	1770	2176
	Max Torque[daN.M]	215	132	215	266	325
	Max Torque[ft-lb]	1586	974	1586	1962	2397

Table 6 - Torque Requirements Body/ Bonnet 15K Valves

Description	Valve Size (inch)	3	4	6	8	10
	Valve Class	15k	15k	15k	15k	15k
Stud Material	Bolt Thread size	1"7/8-8UN-2A	1"3/4-8UN-2A	2"1/4-8UN-2A	2"1/4-8UN-2A	2"1/2-8UN-2A
	Bolt number	8	8	8	12	12
Body studs B7M /L7M	Torque [daN.m]	185	150	226	330	450
	Torque [ft-lb]	1364	1106	1667	2434	3319
	Max Torque[daN.M]	202	164	250	360	500
	Max Torque[ft-lb]	1490	1210	1844	2655	3688
Body studs B7/ L7	Torque [daN.m]	240	195	296	430	595
	Torque [ft-lb]	1770	1438	2183	3172	4388
	Max Torque[daN.M]	266	215	326	470	650
	Max Torque[ft-lb]	1962	1586	2404	3467	4794

6. Actuation

Refer to Actuation Section 7 of standard Manual.

7. API 6A Body Sub-Assembly Cross Section

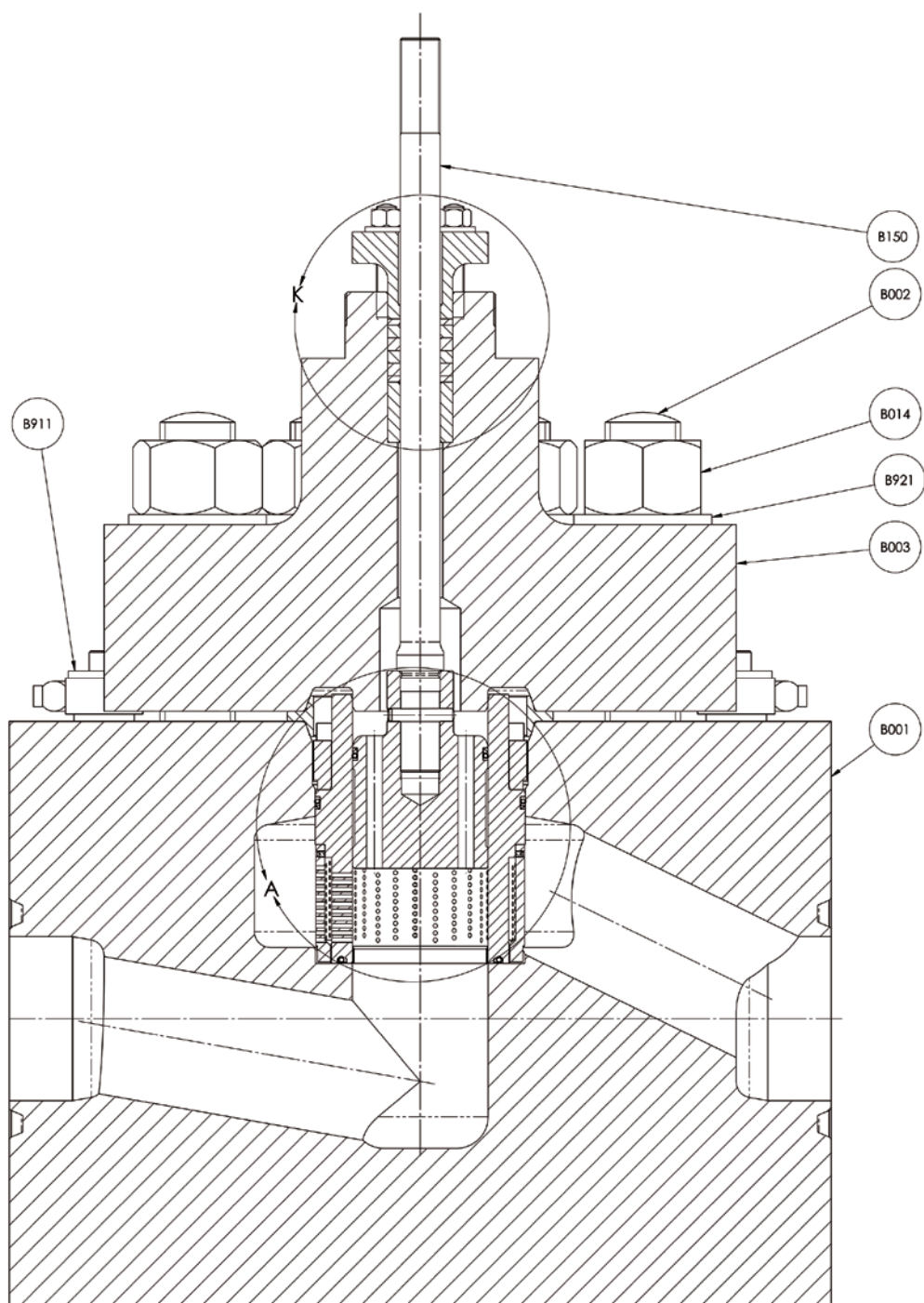


Figure 14 - Cross Sectional View of 41005 API 6A Design

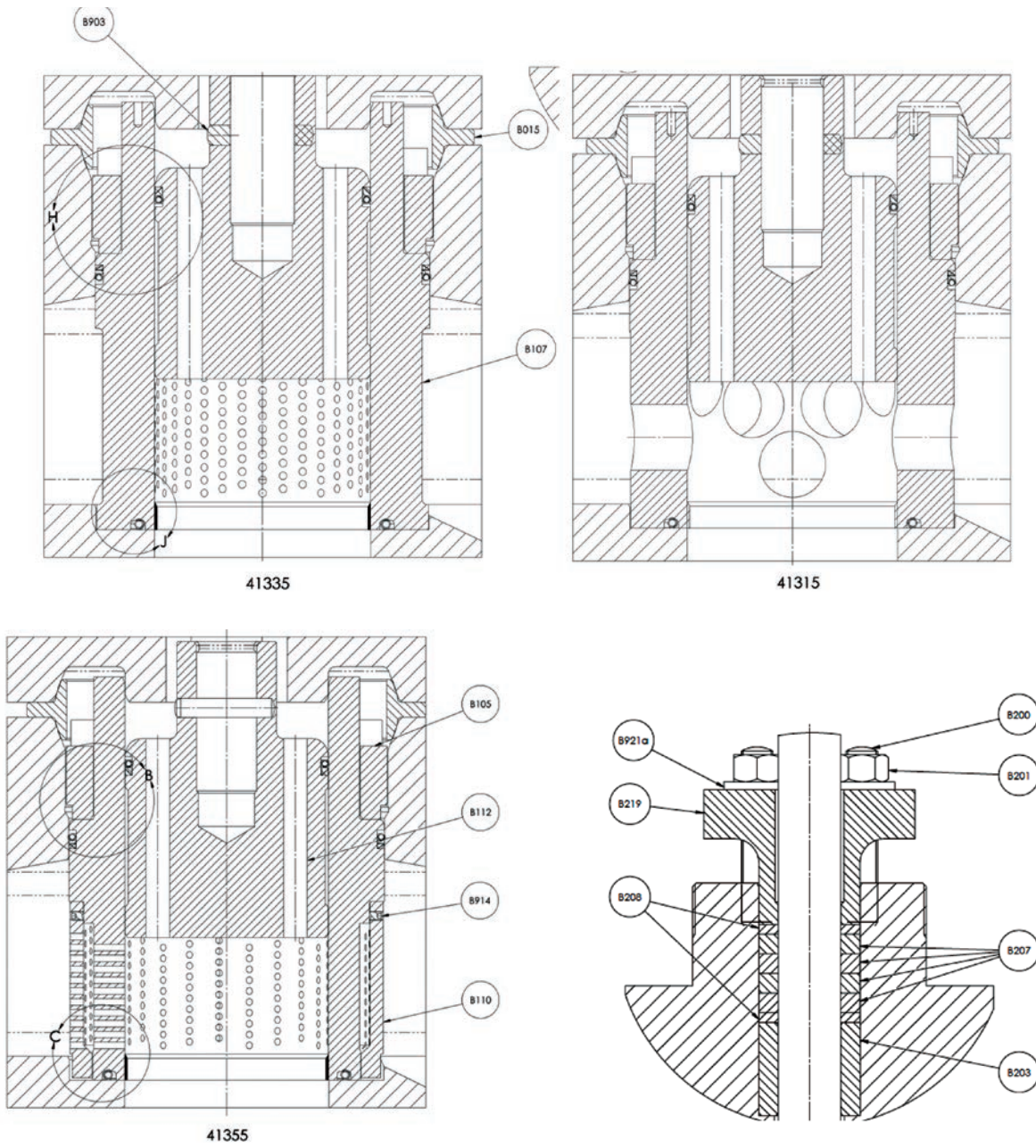


Figure 15 - Trim Type and Packing Detail

Table 11 - Parts Reference and Spare Part Code

Ref. No.	Spare Part Code	Valve Body S/A Part Description	Rev. No.	Spare Part Code	Valve Body S/A Part Description
B001	N	VALVE BODY	B150	W	PLUG STEM
B002	N	BODY STUD	B203	W	PACKING BUSHING
B003	N	VALVE BONNET	B207	C	PACKING RINGS
B014	N	BODY NUTS	B208	C	ANTI-EXTRUSION RINGS
B015	C	BODY GASKET	B219	N	PACKING FLANGE/FOLLOWER
B017	N	DRIVE NUT NOT REPRESENTED	B220	N	PACKING STUD
B103	C	SEAT RING GASKET	B221	N	PACKING NUT
B105	N	TRIM RETAINER	B903	W	PLUG PIN
B107	W	CAGE	B911	N	LIFTING LUG
B108	C	CAGE GASKET	B915	N	YOKE/BONNET SCREWS NOT REPRESENTED
B110	W	OUTER CAGE	B914	C	CAGE SET SCREW
B112	W	PLUG	B921	N	BODY PLAIN WASHER
B118	C	PLUG BALANCED SEAL	B921a	N	PACKING PLAIN WASHER

Part Codes:

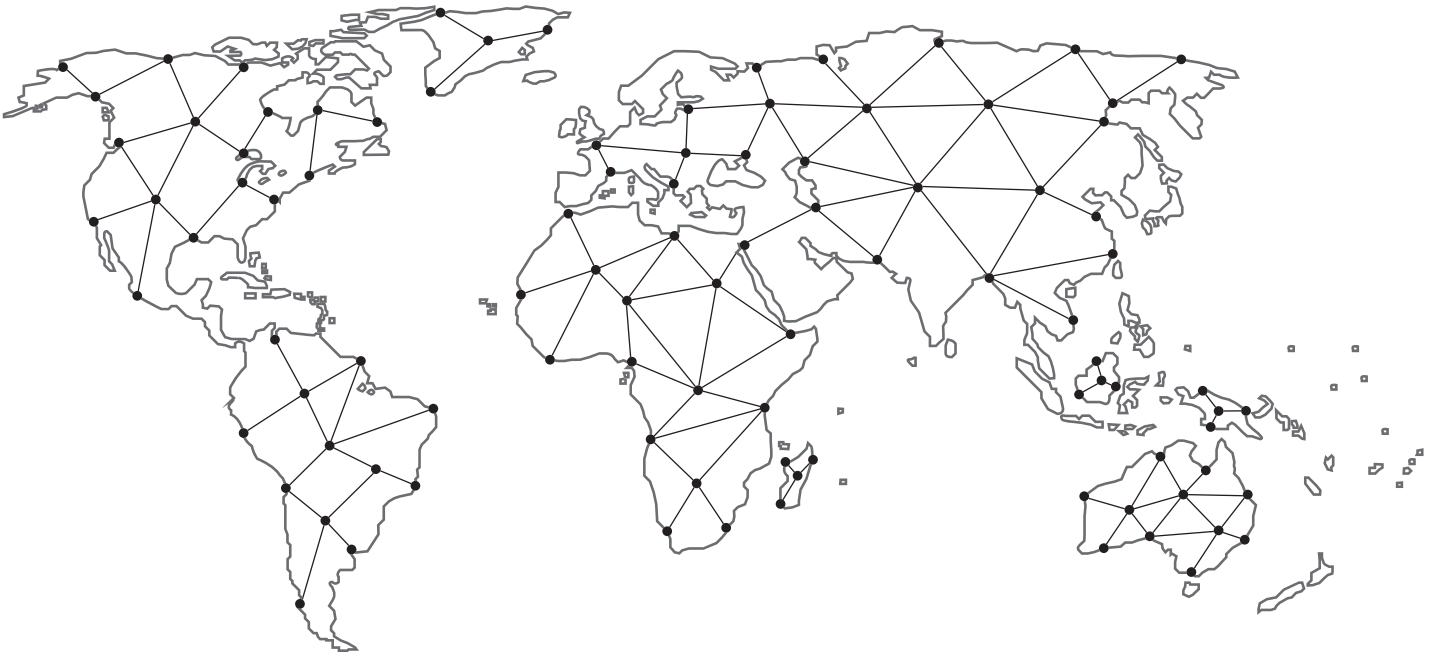
C = Consumable

W = Wear Parts

N = Not a Spare Part

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