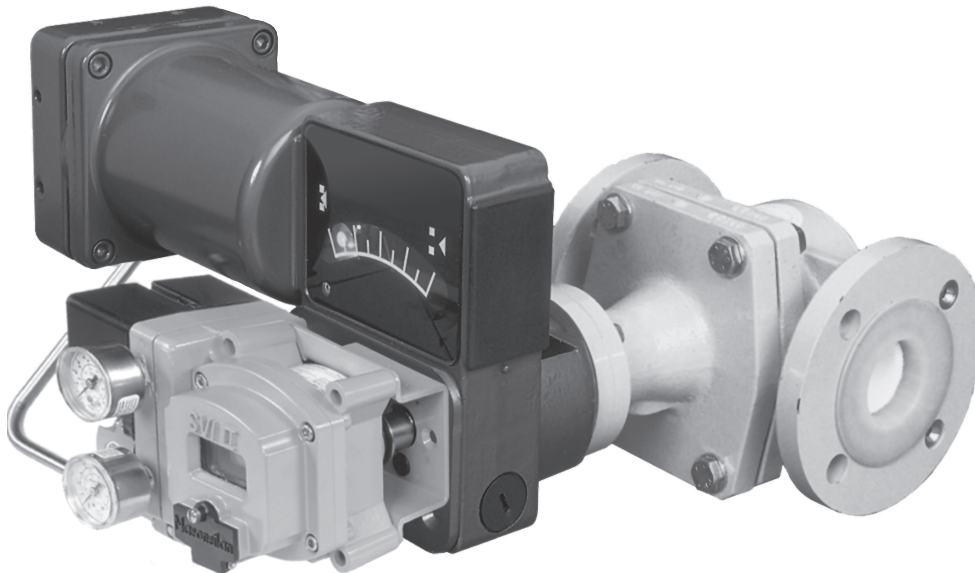


MasoneilanTM 31000 Series

Eccentric Rotary Control Valve with PFA Liner

Instruction Manual (Rev.D)



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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 31000 Series Valve, and do not apply for other valves outside of this product line.

Useful Period

The current estimated useful life period for the 31000 Series Valve is 25+ years. To maximize the useful life of the product, it is essential to conduct annual inspections, routine maintenance and ensure proper installation to avoid any unintended stresses on the product. The specific operating conditions will also impact the useful life of the product. Consult the factory for guidance on specific applications if required prior to installation.

Warranty

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

Note: Prior to installation:

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

1. Introduction

The following instructions are designed to assist maintenance personnel in performing most of the maintenance required on the 31000 Series valve and, if followed carefully will reduce maintenance time.

Spare Parts

When performing maintenance always use Masoneilan replacement parts. Parts are obtainable through your local Baker Hughes Representative or sales office. When ordering parts, always include Model and Serial Numbers shown on serial plate.

The use of the assembly tools is recommended to simplify disassembly and reassembly work. These are listed in Figures 2 and 3 and can be obtained from Baker Hughes Masoneilan parts department.

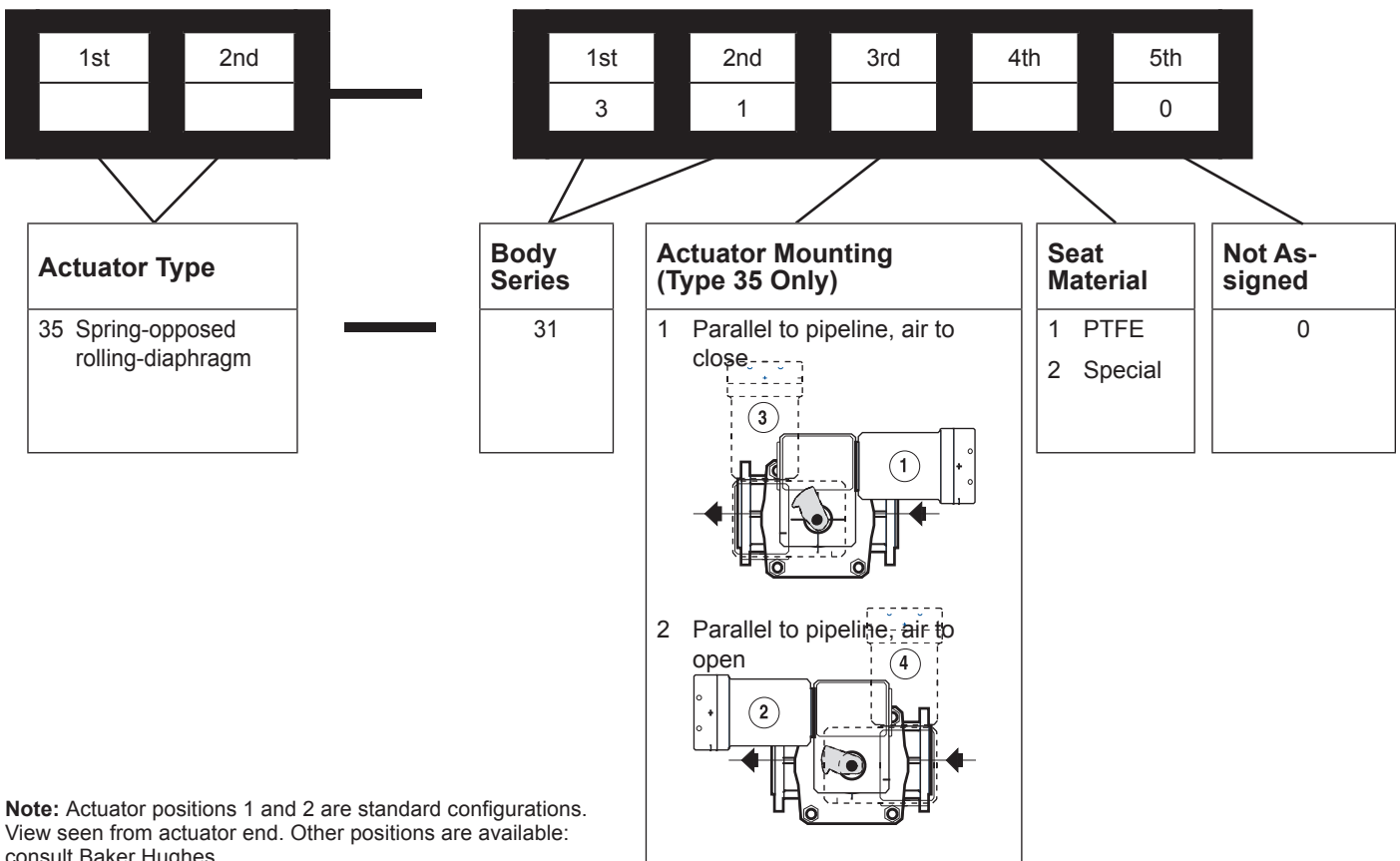
Service

Baker Hughes has highly skilled service technicians available to assist you in the operation, start-up, maintenance and repair of our valves and component parts. Contact your nearest Baker Hughes Representative or sales office.

Training

Baker Hughes regularly holds training programs to train customer service and instrumentation personnel in the operation, maintenance and application of our control valves and instruments. To participate in one of these training sessions contact your local Baker Hughes Representative.

Numbering System



Note: Actuator positions 1 and 2 are standard configurations. View seen from actuator end. Other positions are available: consult Baker Hughes.

2. General

The statements and information given in these operating instructions apply to all sizes in the 31000 Series control valves. The model number, size and rating of the valve are shown on the serial plate. Refer to numbering system hereafter to identify the valve model.

3. Principle of Operation

The concept of the 31000 Series is based on the proven rotating plug principle:

- The valve plug, which forms one unit with the valve shaft, can rotate eccentrically in a free flow design, flanged valve body. The seating surface of the plug has the shape of a segment of a sphere.
- The midpoint of the spherical seating surface lies eccentrically to the axis of the shaft so that there is no contact between seat and plug even when the valve is only partially opened. Wear is reduced to a minimum.
- Excellent sealing in the seat/plug closure is achieved by the use of PTFE and PFA, provided as a standard feature on the 31000 Series. The seat is fixed in the valve body through its conical outside shape. The plug shaft is connected to the actuator with the help of a lever. The actuator is operated by means of a rolling diaphragm with opposing spring.

4. Unpacking

Unpack valves and accessories carefully to avoid damage. The control valves are packed in a clean state and the valve openings are sealed with protective caps. The caps provide protection against dirt and damage and should not be removed until the valve is being fitted into service.

5. Installation

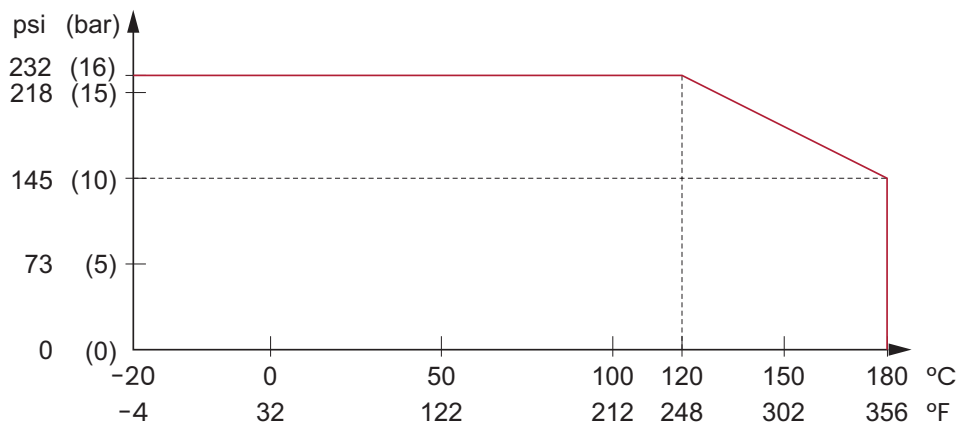
Before installing the valve, clean all piping carefully, removing all dirt, grease, oil and other residues. The sealing surfaces between control valve and piping must be cleaned carefully and checked to ensure they are tightened properly. Flange gaskets should not be used.

CAUTION

The valve must be fitted in the line so that the flow is through the valve body in the direction of the arrow marked on the housing. The arrow corresponds to flow to close direction. All 31000 Series control valves must be fitted in this manner since flow assists in closing the plug.

CAUTION

31000 Series valves are designed with a maximum operating pressure of 232 psi (16 bar), this limit is set by the lining. The bodies are available in different sizes in accordance with DIN and ANSI standards. Before fitting the control valve, the plant operator should ensure that the maximum pressure the valve body will be subjected to will not exceed the allowed value. Refer to the diagram below.



Pressure/Temperature Diagram

6. Disassembly

CAUTION

Control valves, which have been in service should be thoroughly cleaned before disassembly. Residues present inside the valve can be harmful to health.

Note: All parts which come in contact with flow are constructed of PTFE or PFA in standard versions of the 31000 Series. Particular care must be taken when handling these parts since they can be easily damaged.

CAUTION

Prior to disassembly of the control valve, ensure that the valve body has been depressurized. Accessories (positioner, airset etc.) must be removed.

6.1 Actuator Disassembly (Figure 5a and 5b)

1. Remove the rear and front covers (118 & 121) of the actuator by releasing the screws (119). If necessary screw out the handwheel (141) after removing the Truarc ring (138) and washer (139).
2. Move the actuator to its intermediate position with compressed air.
3. Remove the indicator (154), clevis pin clip (122) and clevis pin (124), release the lever cap screw (137).
4. Depressurize the spring barrel. If the valve is not supplied with a positioner, remove screw (127) and shaft cover (126).
5. Remove the yoke screws (19) (Figure 1) and lift off the complete actuator unit and lever (135).

6.2 Valve Body Disassembly (Figures 1, 2, and 4)

1. Remove screws (17) and washers (18) and take off the actuator connecting flange (12). In the case of models with safety packing (Figure 4), remove the disk springs (24), upper packing box ring (23), packing rings (21) and base ring (20).
2. Release the packing follower (9) using the packing tool (Figure 2).
3. Remove the body bolt (14, 15, 16). The bonnet (2) can now be lifted off when the plug is in the fully open position. To remove the plug (3), carefully pull downwards.
4. Remove the packing follower (9) together with the O-rings (10 and 11), disk springs (8), lower packing box ring (7) and packing (6).
5. Carefully push the seat ring (4) from the valve outlet side into the inside of the body and remove; also remove the O-ring (5) from the body (1).

Check all parts for condition and degree of wear.

CAUTION

Once the packing (6), has been dismantled, it must not be reused. To ensure satisfactory sealing of the shaft, use only new, original packings from the manufacturer. It is strongly recommended that the complete packing (6) including O-rings (10 and 11) and seat Oring (5) be replaced each time the valve is disassembled. When valves have safety packing (21), the replacement of the packing rings and O-rings (25 and 26) is also required.

7. Reassembly

7.1 Valve Body S/A Reassembly (Figures 1 to 4)

1. Insert the seat O-ring (5) into the body groove.
2. Slide in the seat ring (4) from the inside of the body into the outlet side of the body with the shoulder of the seat facing the body outlet port. Place the body on a bench. Put it where its seat side flange contacts the cleaned surface of the bench. Take care not to damage the sealing surface. The inlet flange must be at the top. Using the seat assembly tool, press the seat through the flange opening on the opposite side until it seats securely on the shoulder. Remove the tool after fitting.

Note: Refer to Figure 3 for the reference number of the seal ring fitting tool.

3. Insert the plug (3) into the bottom guiding bore of the body.
4. Place the bonnet (2) over the plug shaft onto the body and handtighten the bolting (14, 15, 16).

5. To insert the packing into bonnet (2), screw the guide tube into the body (Figure 2) up to the stop. Insert the complete packing (6) via the shaft end of the shaft into the guide tube until the packing has been fully inserted. It is essential that the packing is aligned in accordance with the detail drawing, (Figures 1 and 4).
6. Insert the lower packing box ring (7) and using the assembly tool (Figure 2) slide the packing into the bonnet up to the stop. The packing is correctly positioned when the lower edge of the groove of the assembly tool reaches the top of the guide tube.
7. Insert the seven disk springs (8) in accordance with Figures 1 and 4 and unscrew the guide tube (Figure 2).
8. Insert the O-rings (10 inner, 11 outer) into the grooves of the packing follower (9) and screw the packing follower in up to its stop using the assembly tool (Figure 2).

If the control valve is equipped with a safety packing, insert the base ring (20), three packing rings (21), upper packing box ring (23) and three disk springs (24) in accordance with Figure 4.

9. Insert the wiper ring (13) into the actuator connecting flange (12). When the actuator connecting flange has the grooves option, the relevant O-rings (25 inner, 26 outer) are to be inserted.
10. Slide the actuator connecting flange over the plug shaft and secure it to the bonnet with screws (17) and washers (18).
11. After the assembly of the shaft seal has been completed, tighten the bonnet bolts (14, 15, 16) to the required torques given below in accordance with the nominal valve size.

Valve Size	Required Torques	
	N.m	Ft. Lb
1" (25 mm)	18	14
2" (50 mm)	25	19
3" (80 mm)	35	26

7.2 Actuator Reassembly (Figures 5a, 5b & 6)

The assembly and setting of the actuator is made much easier if the spring barrel (103) is first removed from the actuator yoke (134). This is accomplished by removing the screws (101 and 102).

1. Insert the shaft bearing (125) and the grommet (129) into the yoke (134).
2. Turn the plug to its closed position, hold the lever (135) in position inside the yoke housing and slide the latter along with the lever over the plug shaft.

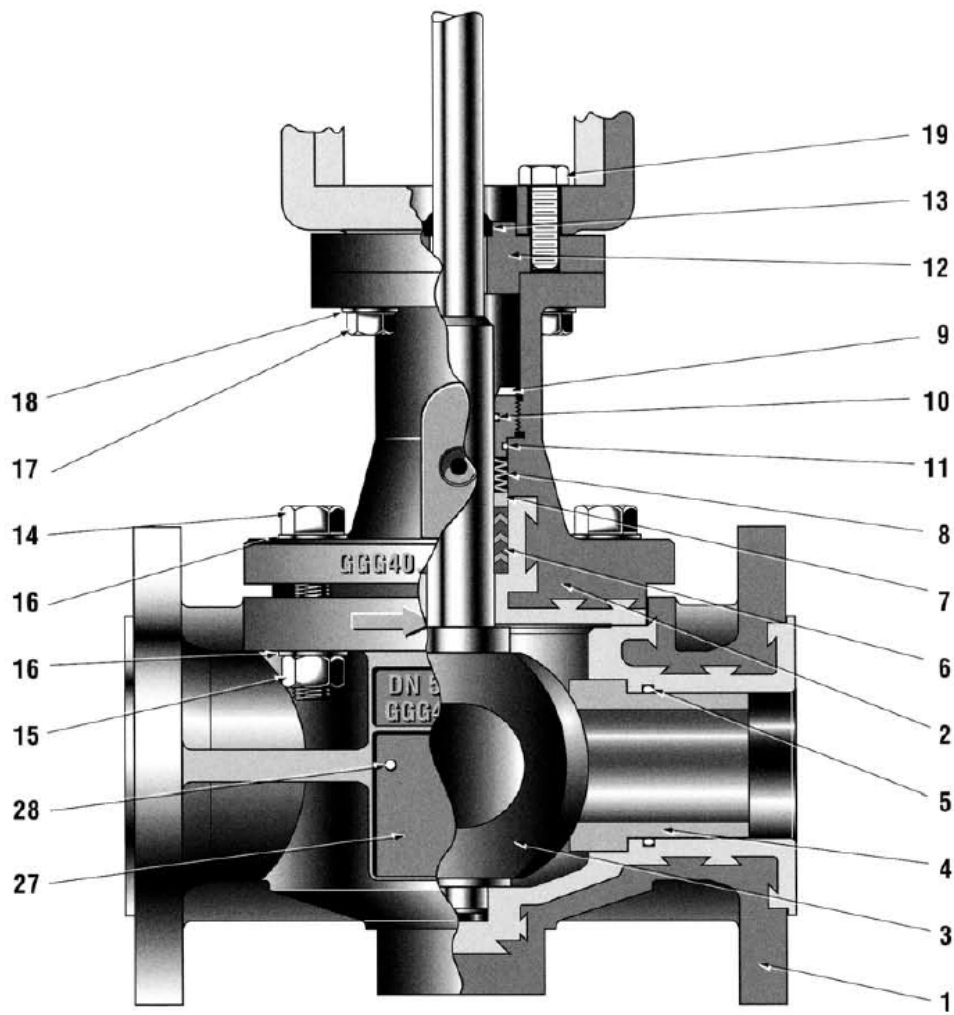


Figure 1

Section View of the 31000 Series
Eccentric Rotary Control Valve

Ref	Qty	Description	Ref	Qty	Description	Ref	Qty	Description
1	1	Body	•10	1	O-ring	19	4	Hexagon Head Cap Screw
2	1	Bonnet	•11	1	O-ring	20	1	Base Ring ⁽¹⁾
3	1	Plug/Shaft	12	1	Actuator Connecting Flange	•21	1	Packing (3 Rings) ⁽¹⁾
4	1	Seat Ring	13	1	Wiper Ring	23	1	Upper Packing Box Ring ⁽¹⁾
•5	1	O-ring	14	4	Hexagon Head Cap Screw	24	3	Disc Spring ⁽¹⁾
•6	1	Packing	15	4	Hexagon Nut	•25	1	O-ring ⁽¹⁾
7	1	Lower Packing Box Ring	16	8	Washer	•26	1	O-ring
8	7	Disc Spring	17	4	Hexagon Head Cap Screw	27	1	Serial Plate
9	1	Packing Follower	18	4	Washer	28	2	Grooved Pin

• Recommended Spare Part

⁽¹⁾ Refer to Figure 4

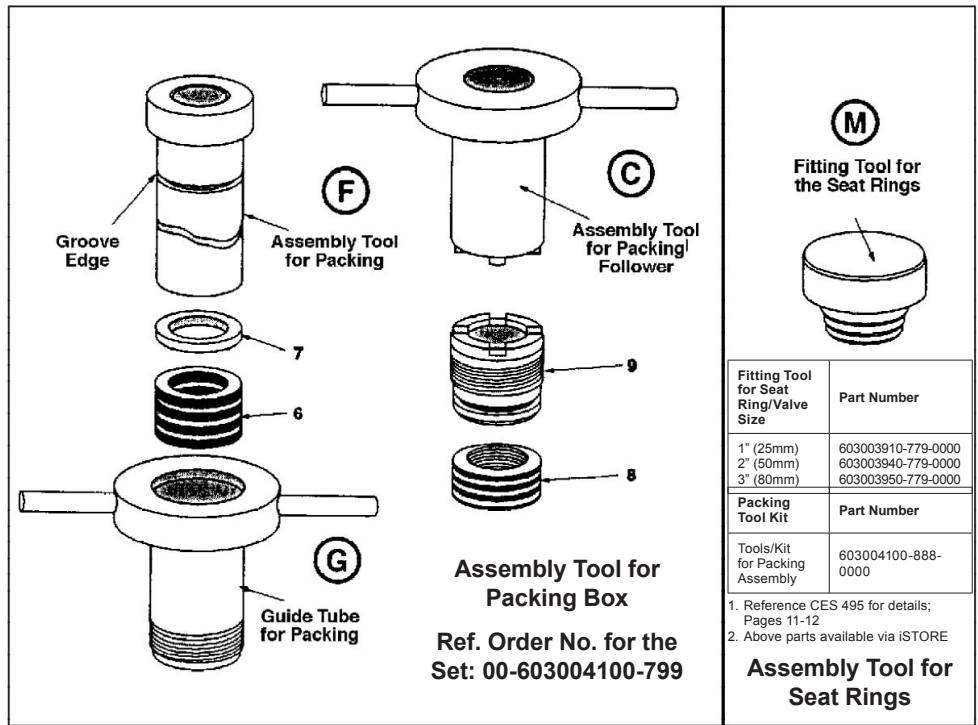


Figure 2

Figure 3

NOTE: Carefully place the valve lever (135) on to the splines so that its free end reaches as near as possible (this depending on the splines of the plug shaft) to the housing wall of the yoke (Figure 6 distance approximately 28 mm). The position of the plug (3) should not be allowed to change during this process.

3. Secure the yoke to the valve body with screws (19) (Figure 1).

7.3 Setting the Actuator (Figures 6, 7, 8)

The actuator setting depends on the required fail-safe position of the valve (see Step 1).

Since the seat and plug are of soft materials, the lever (135) must be set so that the valve produces the required tightness. The handwheel or adjusting tool (Figure 6), can be used as an aid.

The selected tool is screwed until the plug is brought into the closed position. The tightness of the seat/plug seal can be checked using an appropriate method with the handwheel or adjusting tool being tightened until the required tightness is obtained.

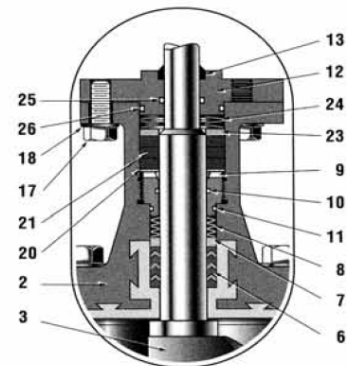


Figure 4

Section View of the Safety Packing

1. Actuator Settings

A. Valve closed on air failure (Air to open) (Figure 7)

- a. Determine the position of the lever at which the valve reaches the required tightness and measure the "D" distance from the contact surface of the spring barrel on the yoke to the beginning of the hole for the clevis pin in the lever (135).
- b. The clevis (100) can now be adjusted so that the distance from the beginning of the hole for the clevis pin to the contact surface for the yoke is 1 to 2 mm less than the previously measured "D" distance.
- c. Remove the handwheel or setting tool and secure the spring barrel with the screws (101) and washers (102).

CAUTION

It is essential that the instructions for setting the actuator be carefully followed. An incorrect setting will lead to wear of seat or plug.

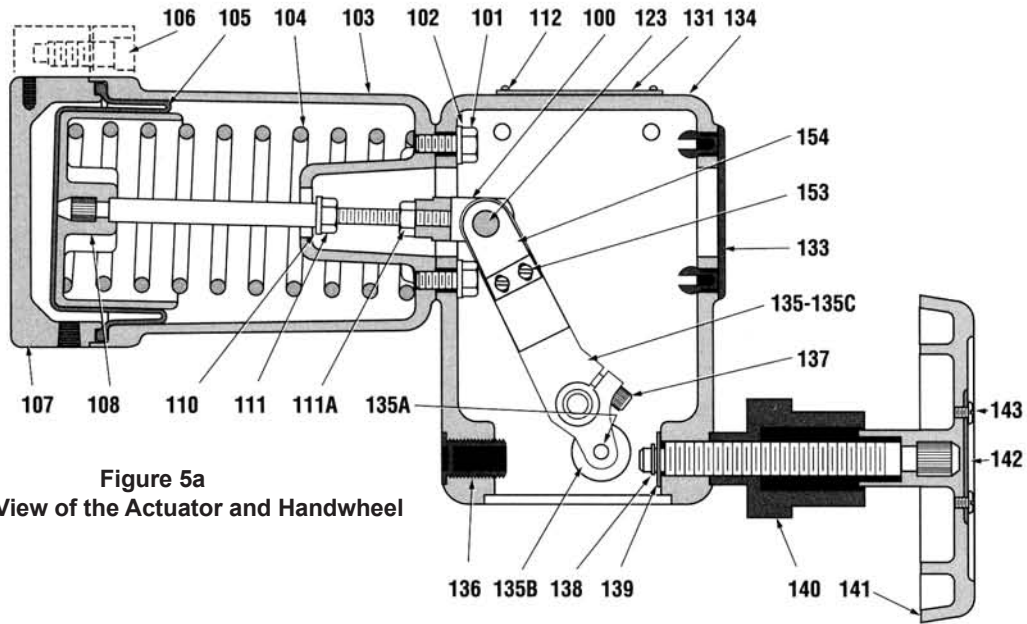


Figure 5a
Section View of the Actuator and Handwheel

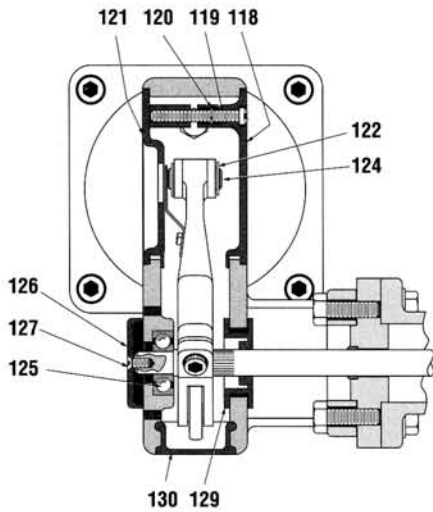


Figure 5b
Section View of the Actuator Yoke and Handwheel

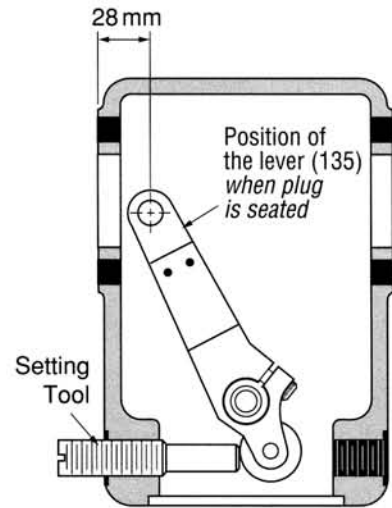


Figure 6

Ref	Qty	Description	Ref	Qty	Description	Ref	Qty	Description
100	1	Clevis	119	2	Cover Screw	135	1	Lever
101	2	Cap Screw	120	2	Screw Retainer	135A	1	Roller Bearing Pin
102	2	Lockwasher	121	1	Front Cover	135B	1	Roller
103	1	Spring Barrel	122	2	Clevis Pin Clip	135C	1	Lever Bearing
104	1	Spring	123	1	Indicator Dot	136	1	Handwheel Thread Plug
•105	1	Diaphragm	124	1	Clevis Pin	137	1	Lever Cap Screw
106	4	Cap Screw	125	1	Shaft Bearing	138	1	Handwheel Truarc Ring
107	1	Diphragm Case	126	1	Shaft Cover	139	1	Handwheel Washer
108	1	Piston/Actuator Stem	127	1	Cover Screw	140	1	Handwheel Lock
110	1	Washer	129	1	Grommet	141	1	Handwheel
111	1	Locknut	130	1	Bottom Cover	142	1	Direction Plate
111A	1	Locknut	131	1	Serial Plate	143	2	Screw
112	2	Plate Screw	133	1	Boss Cover	153	2	Indicator Screw
118	1	Rear Cover	134	1	Yoke	154	1	Indicator

• Recommended Spare Part

B. Valve open on air failure (Air to close) (Figure 8)

- a. When the lever has reached the position corresponding to the required tightness, measure the “D” distance from the contact surface of the spring barrel on the yoke to the beginning of the hole for the clevis pin in the lever (135).
 - b. Supply air to the actuator so that the actuator stem moves out fully. Set the clevis (100) so that the distance from the beginning of the hole for the clevis pin to the contact surface for the yoke is 1 to 2 mm greater than the previously measured “D” distance.
 - c. Remove the handwheel or setting tool and secure the spring barrel with screws (101) and washers (102).
2. Move the actuator to an intermediate position, align the lever and the clevis holes, insert the clevis pin (124) and fit the clevis pin clips (122).
 3. Tighten the locknut (111A).
 4. Press the lever (135) against the shaft bearing (125) and tighten the lever cap screw (137).
 5. Secure the indicator (154), screw in the handwheel (141) if necessary and install the washer (139) and truarc ring (138). Lock handwheel in neutral position. Install the remaining covers (118, 121, 130 and 133).

7.4 Eliminating Seat Leakage During Operation

If leakage between seat and plug is found during operation, it can be eliminated in most cases by adjusting the actuator. Supply air to put the valve at mid travel, remove the clevis pin (124) and slide the lever (135) out of the clevis (100).

A. If the valve is closed on air failure (Air to open)

After loosening the locknut (111A), screw the clevis (100) in by one full revolution.

B. If the valve is open on air failure (Air to close)

After loosening the locknut (111A), screw the clevis (100) out by one full revolution.

After refitting the clevis pin, check the tightness between seat and plug. If the necessary tightness has not been reached, repeat Step A or B as required.

If adequate tightness cannot be achieved by adjusting the actuator, the seat and plug should be checked for wear. Tightness between seat and body must also be checked.

8. Seat Ring Replacement

To check the seat and plug for wear or to replace the seat ring, perform the following steps:

1. Bring the plug into its fully open position (if the valve is closed on air failure, supply air to the actuator to fully open the plug).
2. Remove the bonnet bolting (14, 15, 16), turn the bonnet (2) clockwise up to the stop on the body flange, and in this position, carefully remove it from the body.

The seat ring (4) and plug (3) can now be checked for wear and the seat ring replaced if necessary. The procedures for disassembly and reassembly were described in detail in Sections 6 & 7.

CAUTION

The plug can be replaced only after the complete valve body S/A has been disassembled. Refer to Section 6.2.

9. Assembly Tools

The operation of fitting the packing and adjusting the actuator require the use of special tools. In addition these tools reduce the risk of sealing elements being damaged during assembly. The tools can be obtained as a complete set from Baker Hughes parts department and are suitable for all valve sizes (refer to Figure 2).

Fitting tools for the seat rings are available in accordance with the valve size (refer to Figure 3).

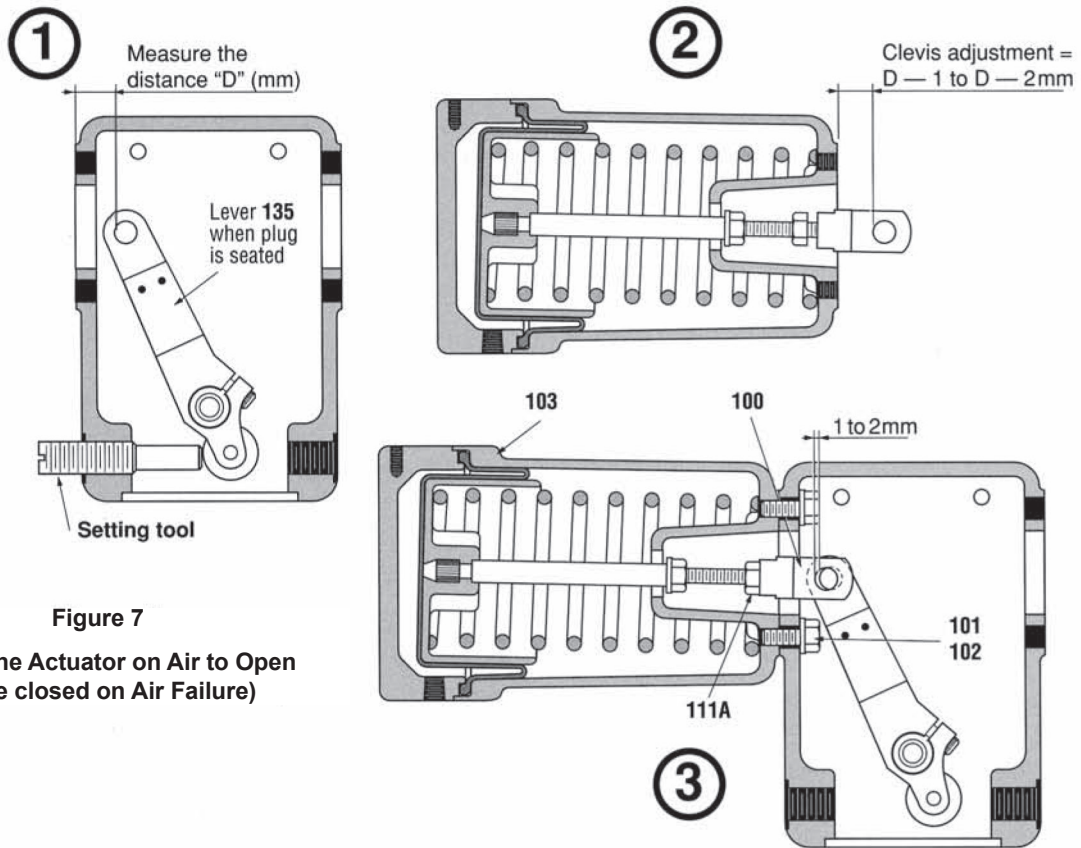


Figure 7
Setting the Actuator on Air to Open
(Valve closed on Air Failure)

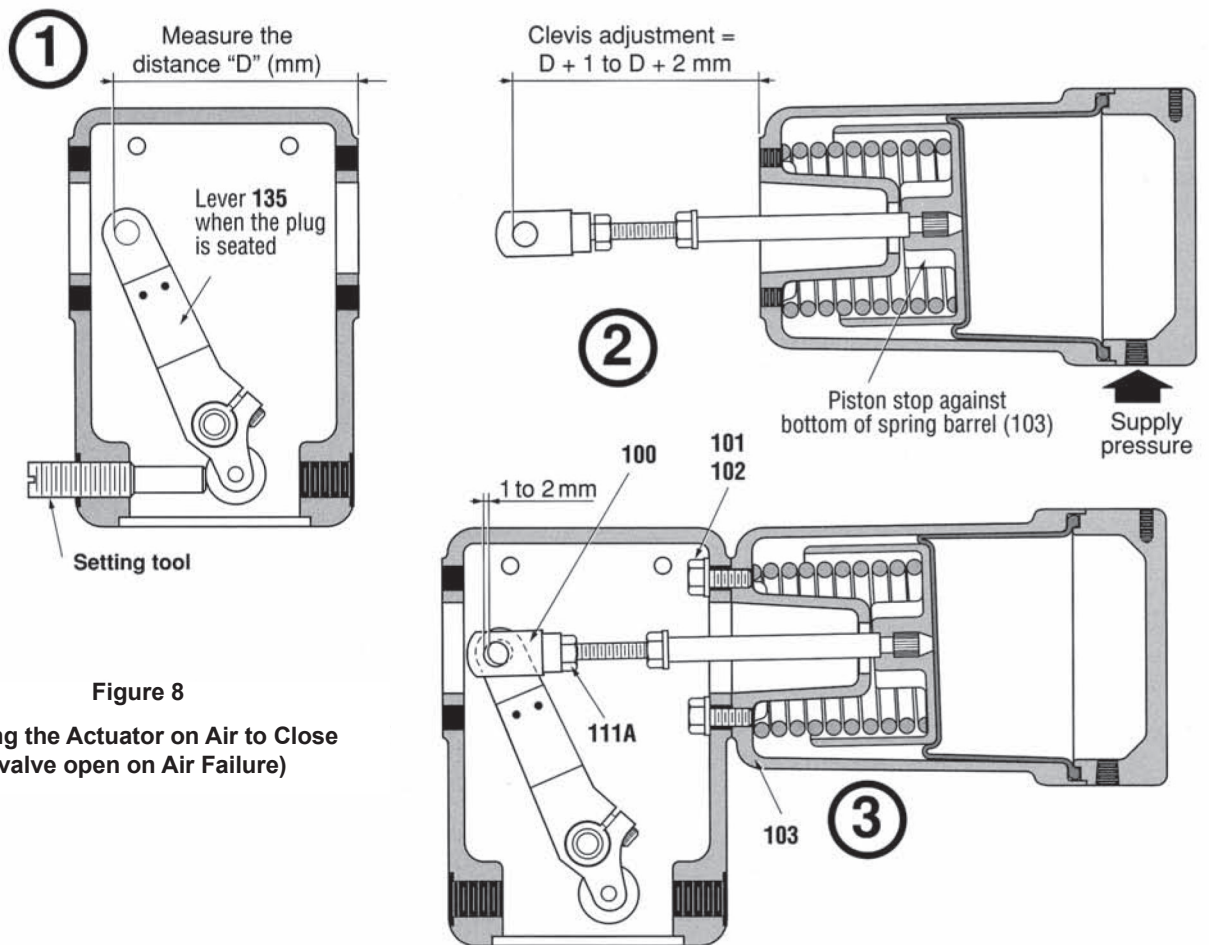


Figure 8
Setting the Actuator on Air to Close
(valve open on Air Failure)

Notes

Notes

Notes

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