Control Valve
Operating Manual

SEOJEON VALMAC

SEOJEON VALVE IND. CO.

Ⅰ. GENERAL

1. SCOPE

This manual covers the instructions for 1100 Small Port Single-Seated Control valves, 1100 Top Guided Single-Seated Control Valves, 1300 Pressure Balanced Cage Control Valve, 1320 Pressure-Balanced Anti-Cavitation Cage Control Valves and 1410 Pressure-Unbalanced SIMPAC Single-Seated Control Valves, 5100 Globe Teflon Lined Control Valve.

2. MAJOR COMPONENTS OF CONTROL VALVES

Each control valve is comprised of two major components, namely, a valve body assembly and an actuator, Various combinations of valve body assembly and actuator are available to meet various operation conditions with different valve sizes, pressure ratings, types of connections, types of materials, and actuator sizes.
For the details of specifications, refer to the following Specification Sheets No. Page 01.

1100 Small Port (Single-Seated) Control Valves
1100 Top Guided (Single-Seated) Control Valves
1300 Pressure-Balanced Cage Control Valves
1320 Pressure-Balanced Anti- Cavitations Cage Control Valves
1410 Pressure-Unbalanced SIMPAC (Single-Seated) Control Valves
5100 Pressure-Unbalanced Globe Teflon Lined Control Valves

3. CONSTRUCTION

2-Way globe control valve is divided three separate sections which are main valve, actuator and accessory.

3.1 Main Body

Main valve is to control directly for fluid flow and it is divided by body, seat, port, valve stem, packing gasket and so on.

3.2 Actuator

Actuator is to maintain proper opening condition by receiving air pressure from outside air pressure signal.
Diaphragm, upper & lower case, spring, actuator stem, yoke and so on divided it.

3.3 Accessory

Accessory consists of several other parts to send air pressure signal to actuator for maintaining main valve to be proper location from outside signal, to check valve opening from outside and so on.
Ex) Positioner, Air Set, Solenoid valve, Limit switch, and Lock-up valve and so on.

4. NAME PLATE

A nameplate is posted on each control valve, I indicates the model number, valve size, pressure rating trim

material, date of manufacture and other major specifications of the control valve. Before installing the control valve, make sure that the specifications indicated on the nameplate should conformed with the conditions of service.

II .INSTALLATION

1. MAXIMUM LIFTING OF EYE-BOLTS

The diaphragm case has a pair of lifting eye-bolts. These eye-bolts primarily are to lift the actuator alone. When using the eye-bolts for other purposes, the allowable maximum lifting loads of them as shown in table 1, should Not be exceeded.

Table 1. Maximum Lifting Loads of Eye-bolts.

Actuator	Maximum allowable Lifting load of eyebolts	Actuator weight
500-42	160kg	16kg
500-74	160kg	27kg
500-145	220kg	47kg

Note : The eye bolts may be used to lift the actuator together with its valve body(cast globe valve) of ANSI Class 600. When doing this, be extremely careful so that No shock or other abnormal force is applied to the actuator or the valve body.

2. INSTALLING VALVE IN PROCESS PIPE

[1] Before installing the valve in the process pipe, remove foreign matter (such as scales and welding chips) from both upstream of the process pipe.

[2] The flow arrow on the body must be pointed in the direction of flow.

[3] Care should be exercised to prevent pipe sealing compound from getting into the pipelines. The gaskets should be suitable for the process fluid. 1100 and 1300 high pressure valves employ No. Gaskets since they are welded to the process pipelines.

[4] No. excessive large stress should be conveyed from the process pipe to the valve body. Uniformly tighten the bolts of the process pipe connection flanges. The 1300 high pressure valves have No flanges, since they are welded to the process Pipeline.

[5] Before connecting the air pipes to the actuator and the positioner, blow the pipes to clean them.

[6] Do not install any heating or cooling provisions on the bonnet.

3. ITEM TO BE CHECKED BEFORE STARTING OPERATION

[1] Check that there is No. leak from air piping.

[2] Check that the bolts and nuts of the diaphragm case are mot loose. Standard Tightening torques are as followings :

For 500-42, 500-74 (M 8) : 1200N-cm

For 500-74, 500-145 (M 10) : 2800N-cm

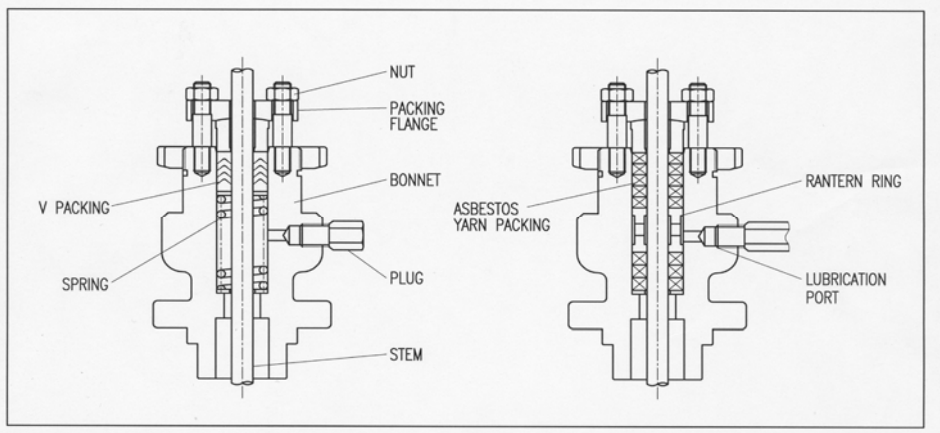
[3] Tighten the packing flange nuts to prevent leakage from the gland packing section. Standard tightening torques are as shown in Table 2.

Table 2. Tightening Torque of Packing Flange Nuts

Unit : N · cm

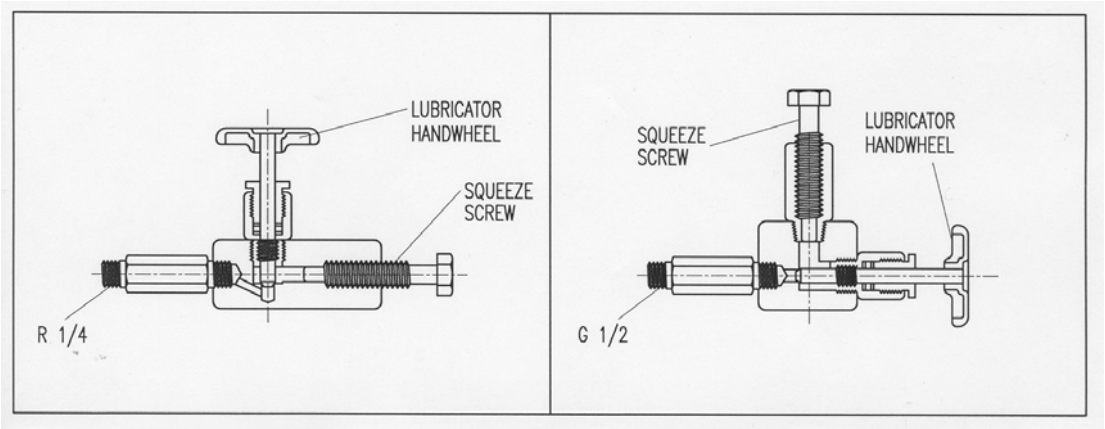
Valve stem Diameter(mm)	Asbestos yarn packing	Metallic filament reinforced asbestos yarn packing	Teflon V-Packing
10	300	700	80
13	500	1200	80
16	800	1800	80
20	1000	2500	80
25	1500	4000	80
30	2000	5000	80

Note : The tightening torques mentioned in the above are only to give you reference values. Tightening torques may vary depending on the type of packing.



[FIG. 1] Teflon V-Packing [Fig. 2] Asbestos Yarn Packing

[4] If the valve is provided with a lubricator as shown in Fig. 3, check whether the bonnet section has been lubricated or Not. To de this, loosen the lubricator hand-wheel and turn the squeeze screw. IF the squeeze screw turns lightly, and grease in the procedure mentioned below, If the squeeze screw turns heavily, this means that grease has been applied.



ANSI Class 600(JIS40K)　　ANSI Class 900 Over(JIS63K)

[Fig.3]　Lubricator

Lubricating procedures

(a) Prepare the grease indicated on the nameplate.

(b) Tightly close the lubricator hand-wheel.

(c) Remove the squeeze screw, apply grease, and set the squeeze screw.

(d) Loosen the lubricator hand-wheel and drive grease by turning of the squeeze screw becomes heavier.

(e) Repeat the procedures of (b), (c) and (d) until turning of the squeeze screw becomes heavier.

[5] Pressurizing the valve, check that there is No. leak from the gasket connection sections between the valve body and process pipe, If leak is found, tighten the nuts. Especially the process fluid temperature of 400℃ or higher, tighten the nuts again after temperature of the valve is up to 400℃ in order to serve for a longer period without immediate maintenance. Standard tightening torques are shown in Table 3.

[6] When a valve used for high temperature service, raise temperature gradually (standard rate is raising is 100℃ per hour) and do not operate the valve when its temperature is raising.

Ⅲ. INSPECTION AND MAINTENANCE

Inspect and service the actuator as follows:

1. Tightening the gland:

   Tighten the gland once per every 6 months. The tightening procedure is given in Section Ⅱ "INSTALLATION"

2. Lubrication the gland:

   Lubricate the gland once per every 6 months. The lubricating procedure is given in Section Ⅱ "INSTALLATION"

3. Check for hunting of valve-Positioner : Refer to Section X "TROUBLESHOOTING"

4. Check for abnormal noise and vibration : Refer to Section X "TROUBLESHOOTING"

Ⅳ. DISASSEMBLY AND ASSEMBLY

This section covers the disassembly and assembly procedures of the actuator for its overhaul or modification.

1. DETACHING ACTUATOR FRON VALVE BODY

[1] Apply to the actuator an air pressure so that the valve stem is at a point of 10%-20% above the fully closed position.

[2] Loosen the clamping bolts of the stem connector, remove the stem connector, and detach the actuator stem from the valve stem.

[3] Remove the clamping nut of the yoke.

[4] Raise the actuator to detach it from the valve body. Precautions : Before detaching the actuator from the valve body installed in the process pipe, be sure to shut down the process fluid and to release the process fluid.

2. DISASSEMBLY AND ASSEMBLY OF VALVE BODY

To disassembly or assemble the valve body, refer to Figs. 4-8 and proceed as described below.
(For handling of the bellows-sealed valves, see Section Ⅸ)

A. Disassembly procedure

[1] Loosen the hex nuts of the packing flange.
[2] Remove to the hex nuts (1) of the bonnet (extension bonnet)
[3] Raise and detach the bonnet from the valve body.

Precautions : If the valve plug comes out together with the bonnet, remove the plug from the bonnet by rotation the plug. When doing this, exercise care not to damage the valve stem.

(4) 1100Series Control Valves

For 1100Series valves, remove the guide ring. The seat ring is threaded to the valve body. To remove the seat ring, special tools are necessary.

1100Series valve has not guide ring, but a guide bushing must be pressed in the bonnet.

For 1300Series 1400Series Control valves, pull out the plug and the cage from the valve body.

For 1300Series valve and other split-cage valves, a seat ring is threaded to the valve body.

To remove the seat ring, special tools are necessary.

B. Inspection

Inspect the disassembled parts for damage. If ant damage is found, replace the parts.

(1) Do Not reuse the removed gland packing. Use fresh packing when assembling the valve.
(2) Check that the seating surfaces of plug, seat ting and cage are Not damaged.
(3) Check that the gasket-contacting surfaces among valve body, bonnet, guide ring and cage are Not damaged. Do Not reuse the removed gasket. Use fresh gasket when assembling the valve.
(4) Check that the plug guide section, the stem, and the guide bushing and cage are Not damaged.

C. Assembly procedure

1.1100 Series & 5100 Series Control Valves

(1) Securely fix the seat ring onto the valve body with threads, using the special tools (optional). For the tightening torques, see Table 4.
(2) Seat & plug on the seat ring. (Refer to the disassembly procedures.)
(3) Put a Sheet of gasket on the valve body side and place the guide ring in manner of covering the plug. (Apply lubricant “Never-size” to the gaskets, except those of the oil-prohibited valves.)
(4) Put the gasket on the guide ring, (Apply lubricant “Never-size” to the gaskets, except those of the oil-prohibited valves.)

(5) Put the bonnet on the valve body and check that the bonnet is correctly mated with he indented section of the valve body. Tighten the nuts uniformly, for the tightening torques. (see Table 5.)

(6) Insert the gland packing as shown in [Fig. 1~2]

Note : When yarn packing sheets are used, overlap sheets in such manner that their cut ends are positioned alternately.

(7) Place the packing follower and packing flange, and tighten the nuts. For the tightening torques, see Table 2.

2. 1300 Series & 1400Series, Control Valves

(1) For an integral cage valve, put a spiral gasket in the valve body. For a split cage valve, securely fix the seat ring onto the valve body with threads using the special tools. (Apply lubricant "Never-seize" to the gaskets, except those of the oil-Prohibited valves.) For the tightening torques of 1300 Valve. See Table 4.

(2) Put the gasket (2) in the valve body.

(3) Put the cage in the valve body.

(4) Put the gasket (1) on the cage.

(5) Put the bonnet on the valve Body check that the bonnet is correctly mated with the indented section of the valve body. Tighten the nuts uniformly. For the tightening torques. See Table 5.

(6) Insert the gland packing as shown in [Fig. 1~2]

Note : When yarn packing sheets are used, overlap sheets in such manner that their cut ends are positioned alternately.

(7) Place the packing follower and the packing flange, and tighten the nuts, For the tightening torques, see Table 2.

Table 3. Seat Ring Tightening Torque

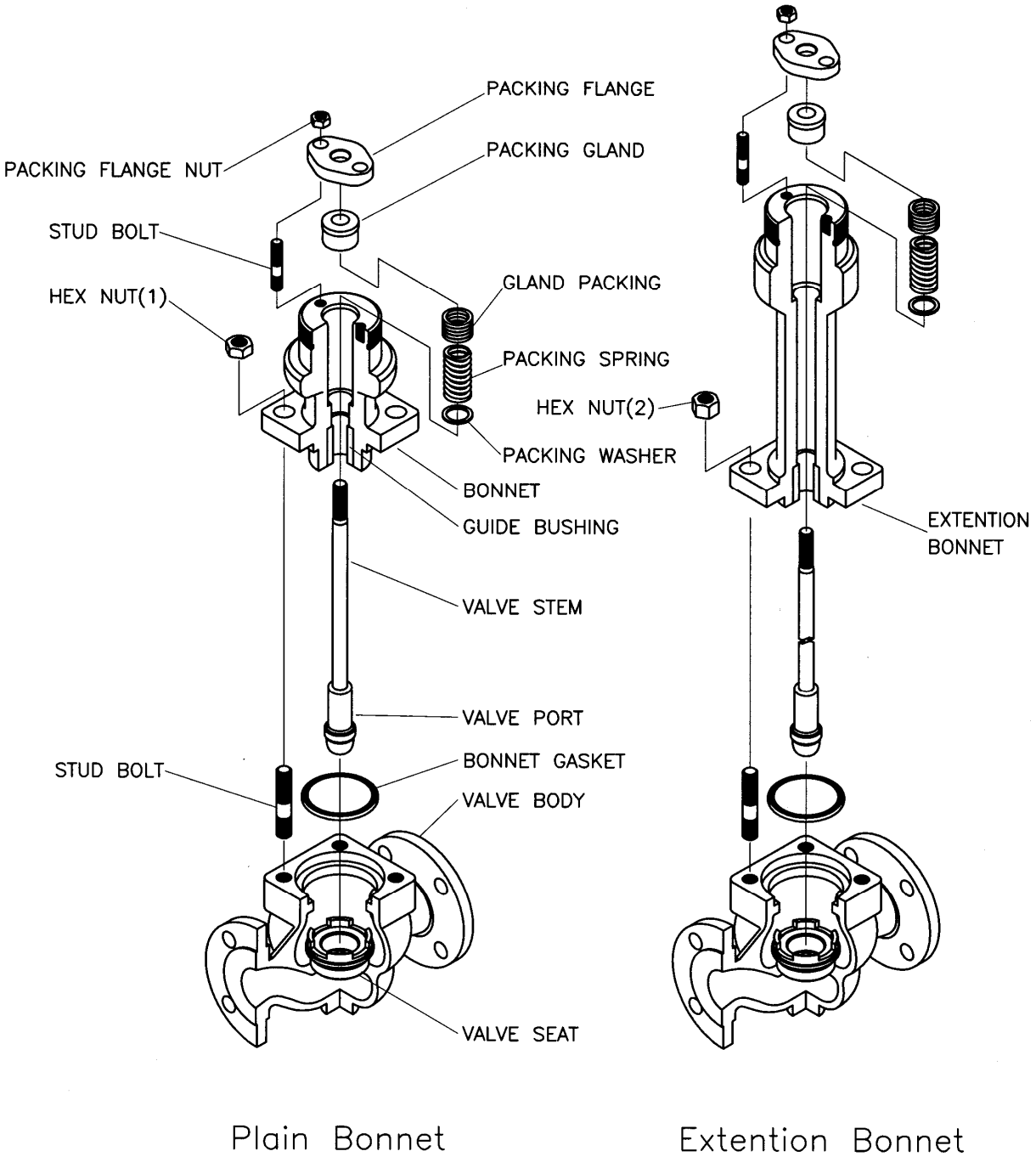
Valve size(mm)	~25	40	50	65	80	100	150	200
Torque(N.m)	180	260	390	520	650	800	1200	1500

Table 4. Seat Ring Tightening Torque of 1300Series And 1100Series Valves

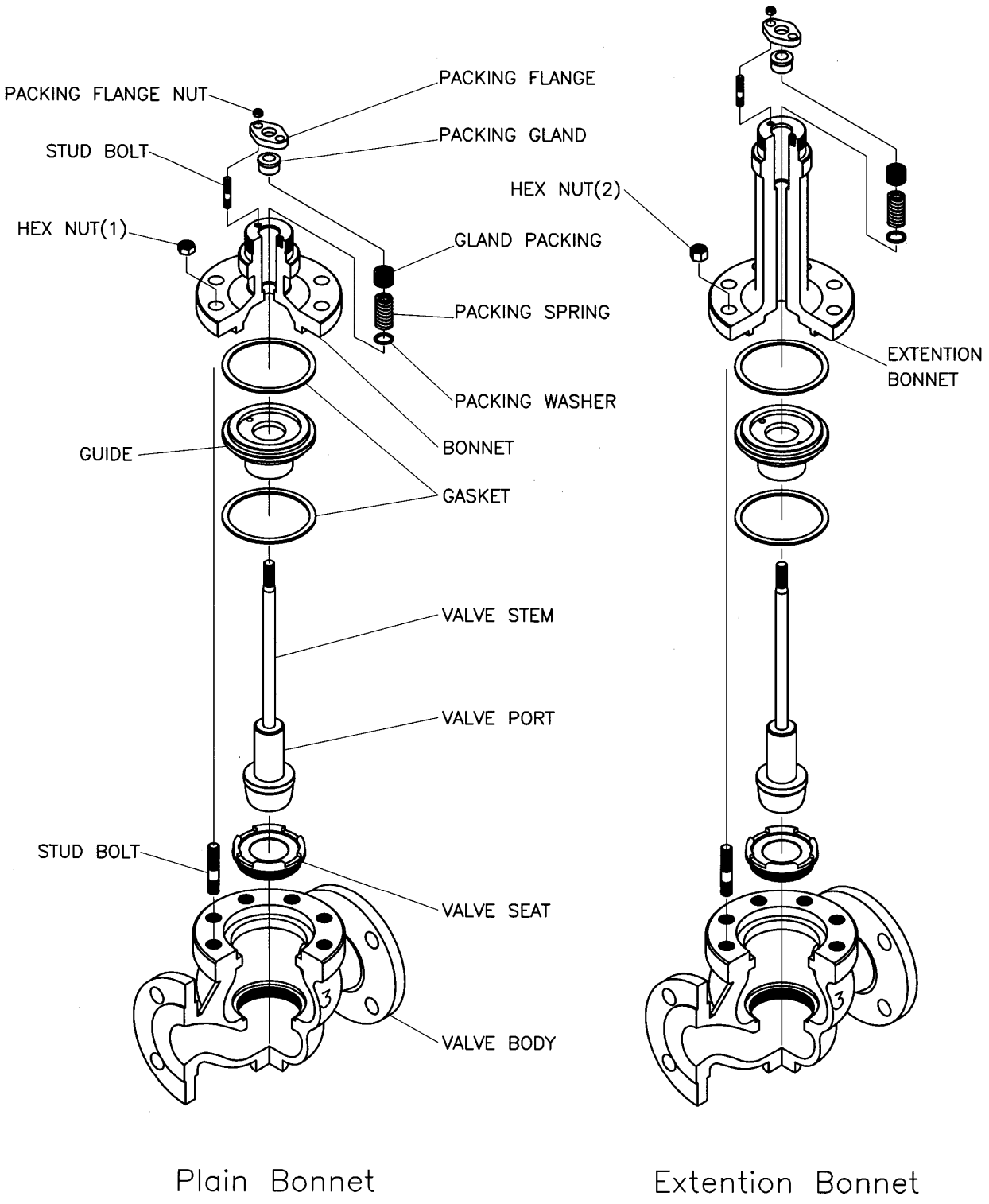
Valve size(mm)	25	40	50	80	100	150	200	80	100	150	200
ANSI Class	900~2500			900~1500				2500			
Torque(N.m)	250	310	570	1100	1800	3750	5500	700	1550	3000	4000

Table 5. Tightening Torque of Bonnet Stud Bolts

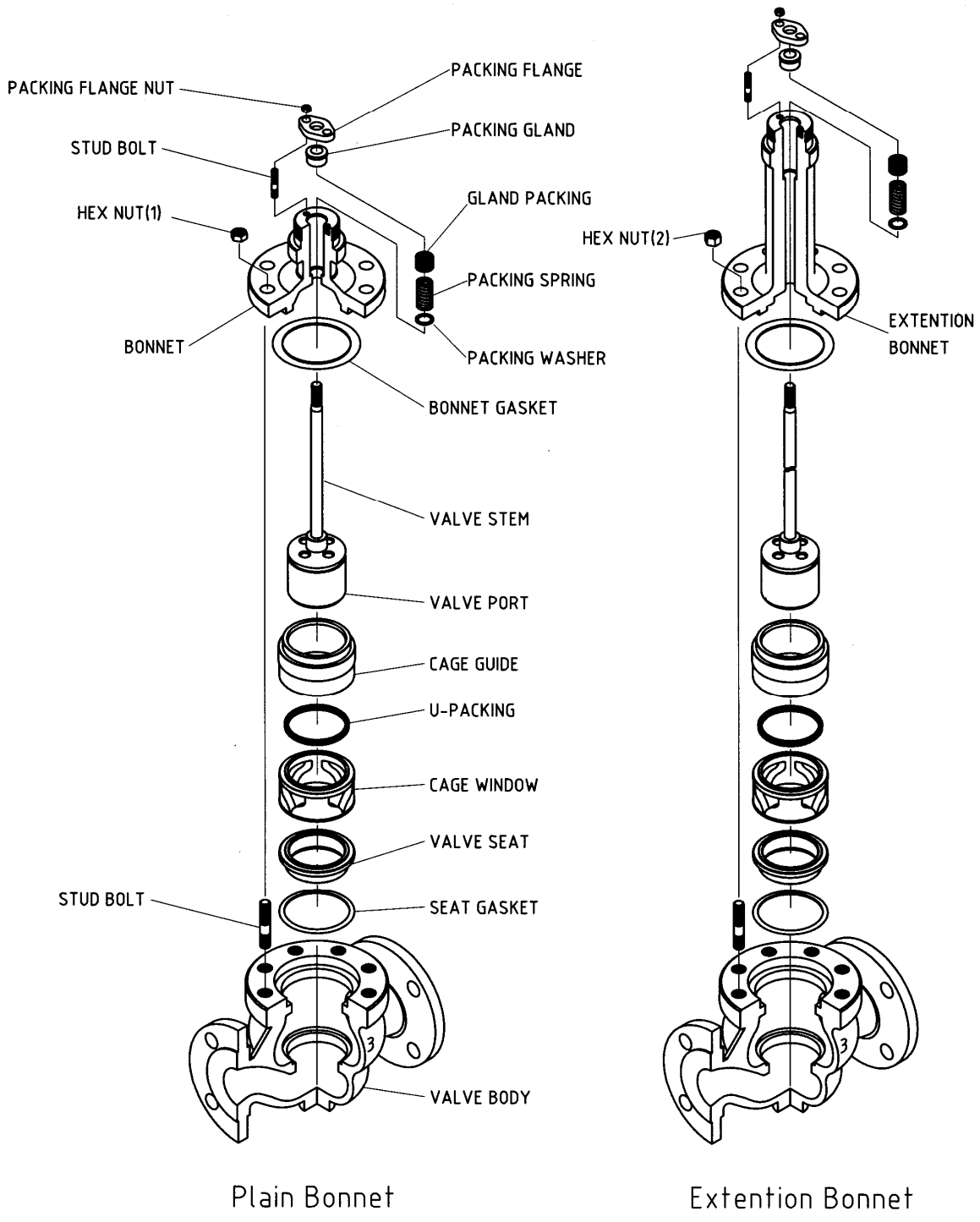
Bolt Size	M12	M16	M20	M22	M24	M27	M30	M33	M36	M39	M42	M45
Torque (N.m)	60	100	150	200	250	350	500	660	850	1000	1200	1400



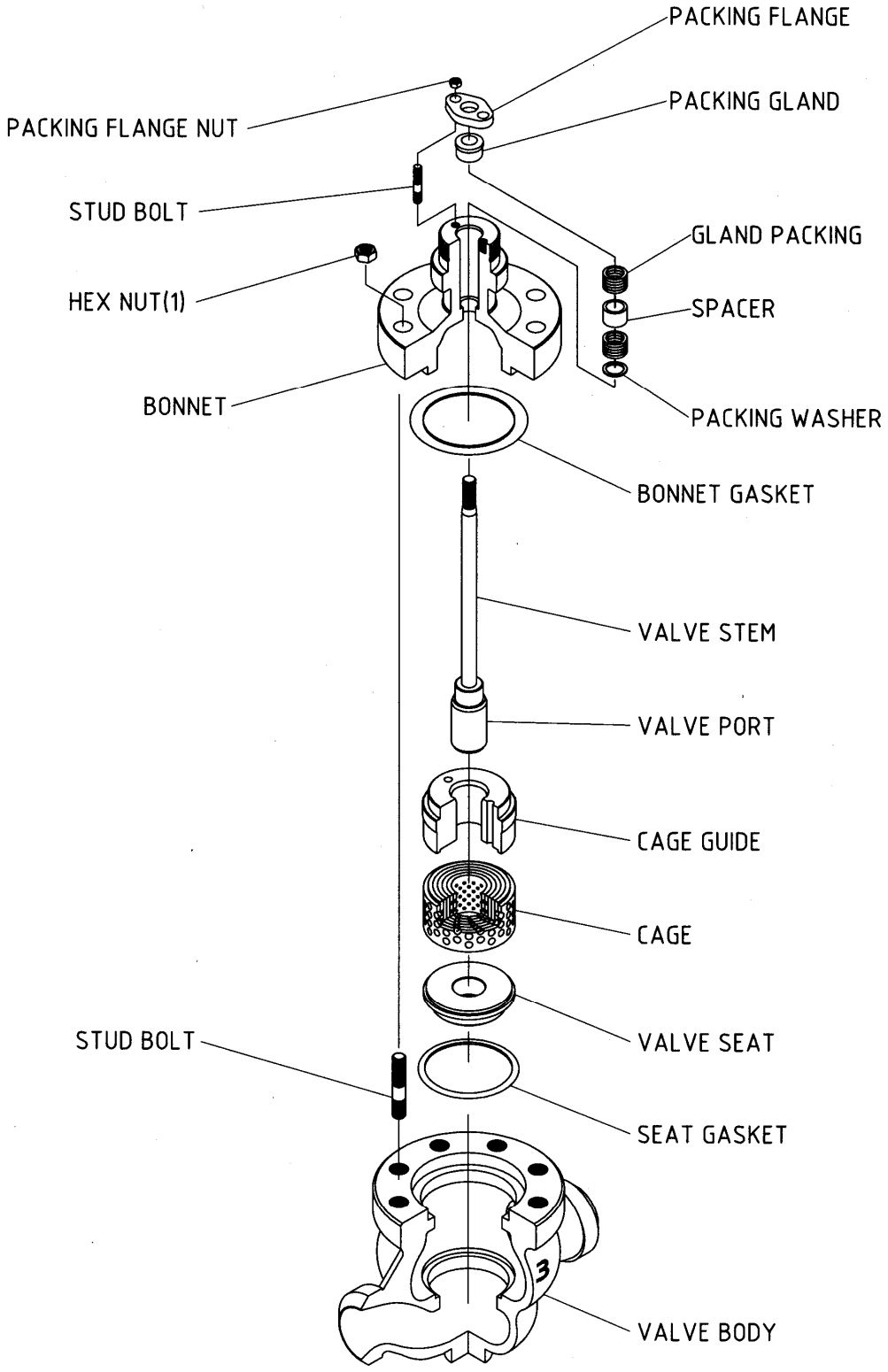
[FIG. 4] 1100Series Small Port (Single-Seated) Control Valve



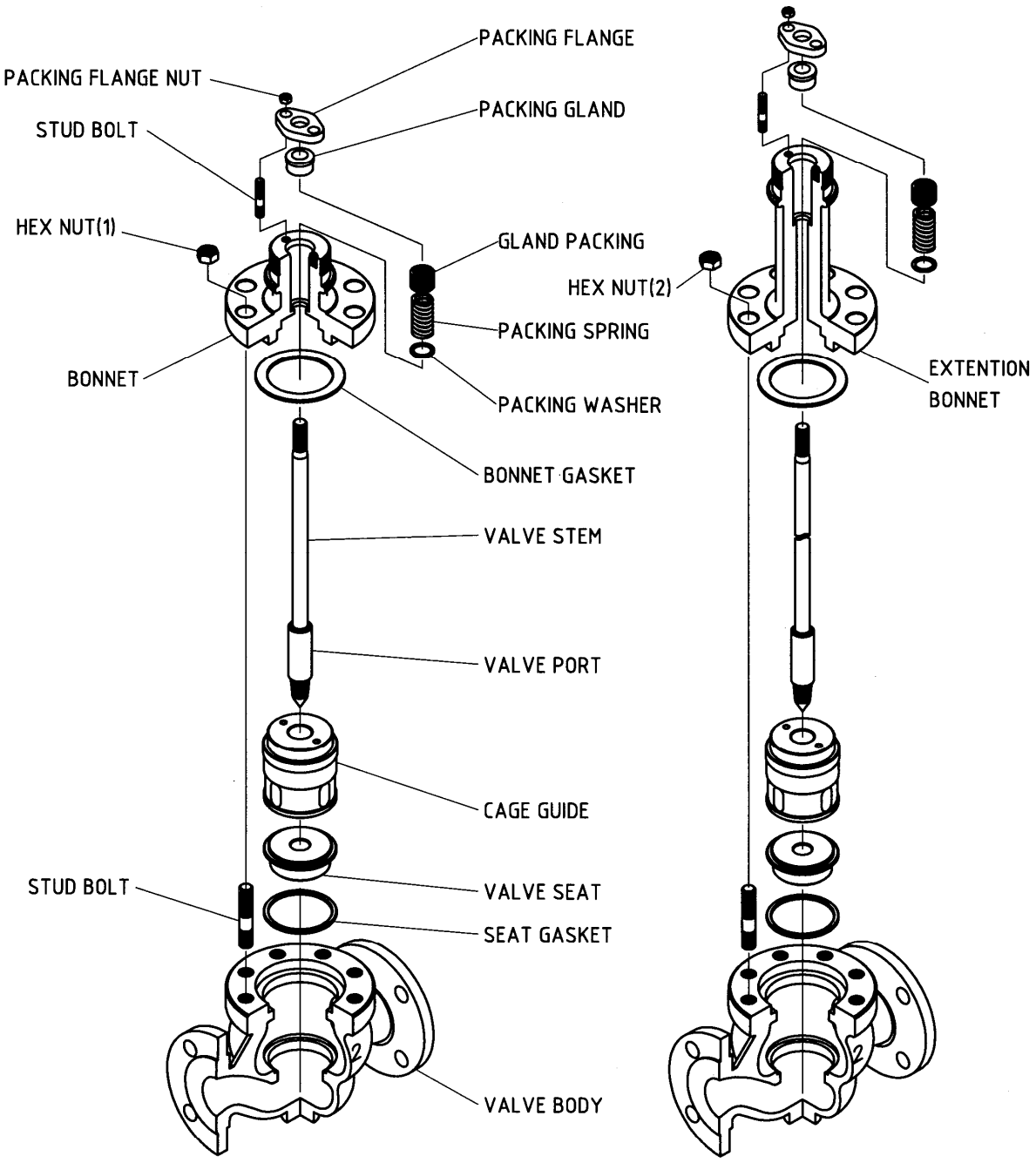
[FIG. 5] 1100Series Top Guide (Single-Seated) Control Valve



[FIG. 6] 1300Series Pressure Balanced Cage Control Valve



[FIG. 7] 1320Series Anti-Cavition Cage Control Valve



[FIG. 8] 1410Series SIMPAC Cage Guide (Single-Seated) Control

3. DISASSEMBLY AND ASSEMBLY OF ACTUATOR

Normally the actuator requires no adjustment. However, it is necessary to adjust the control valve if the valve is disassembled and reassembled for replacing damaged parts or overhaul. This section covers the disassembly and assembly procedures of the actuator for such purposes.

Disassembly

When disassembling the actuator. Keep it in the vertical position. Refer for [Fig.9] Operator's Manual Series 500 Actuator see [Fig. 4-1~7-4], For the tightening torques of Seat Ring and Bonnet Stud Bolts see table 3~5, For the manes of the parts, see [Fig. 4-8].

Note (1) It is recommendable to make locating marks on the top and the bottom diaphragm cases before disassembly. This will help to find easily the air piping connector location.

(2) Store the removed parts in a clean place.

Disassembly procedure

A. Direct acting Actuator

(1) Disconnect the air piping and detach the accessories form the actuator.

(2) Remove the stem connector, the pointer and the lock nut. See [FIG. 9]

(3) Remove the clamping bolts (except the pair of eye bolts) of the diaphragm case.

(4) Loosen evenly and alternately the pair of eye bolts.
(The initial setting of the springs is done by these eye bolts.)

(5) Pull out the actuator stem together with the diaphragm upward.

1. Take out the springs.

B. Reverse Acting Actuator

(1) Disconnect the air piping and detach the accessories form the actuator.

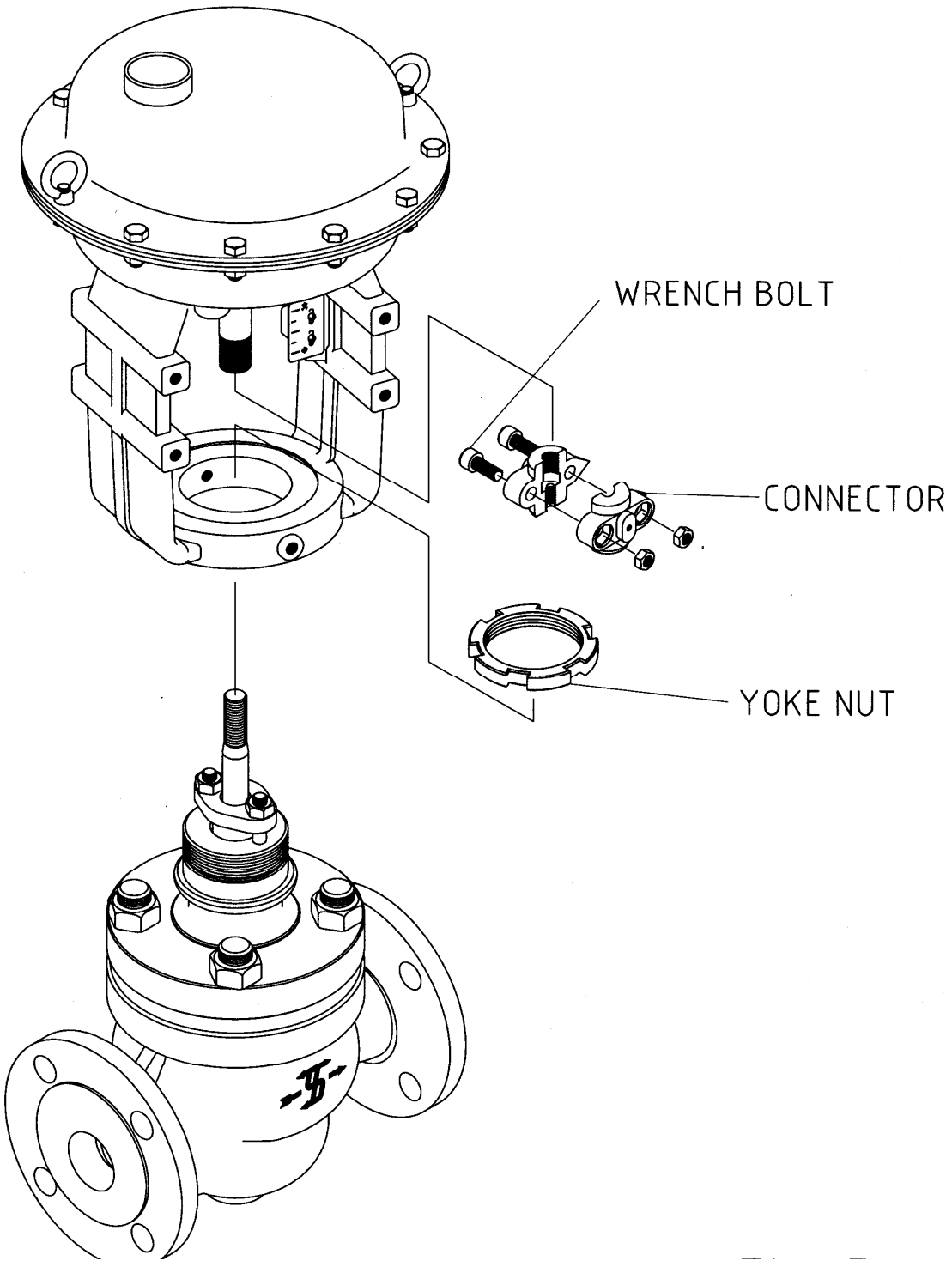
(2) Remove the stem connector, the pointer and the lock nut.

(3) Remove the clamping bolts (Except the pair of eye bolts) of the diaphragm case.

(4) Loosen evenly and alternately the pair of eye bolts.
(The initial setting of the springs is done by these eye bolts.)

(5) Take out the springs.

(6) Pull out the actuator stem together with the diaphragm upward.



[FIG. 9]

V. INSPECTION AND TEST

CONTROL VALVE IS TESTED ITS PERFORMANCE BY HYDRAULIC TEST (SHELL TEST), LEAK TEST, OPERATING TEST AND SO ON.

1. HYDRAULIC TEST

SEOJEON CONTROL VALVE HAS PROCEDURE TO INSPECT LEAKING BY TESTING FOR FIVE MINUTE WITH 1.5 TIMES OF RATED PRESSURE FOLLOWING ANSI B16.34.

THIS TEST IS TO SEND THE RATED SIGNAL TO ACTUATOR OR MAKES MAIN VALVE TO BU FULL OPENED AND CLOSED AND CLOSE THE 2ND STAGE BY USING PROPER EQUIPMENT AND SUPPLY PRESSURIZATION WATER TO 2ND STAGE.

IN THIS TIME, MAKE PROPER SAFE SYSTEM TO DISCHARGE VALVE INSIDE AIR AND CONTINUOUSLY PRESSURIZING AND AFTER MAINTAINING THE TEST PRESSURE AND MEASURING THE TIME AND TEST FOR MINIMUM 5 MINUTE.

CHECK WHETHER ANY CHANGES AFTER HITTING THE VALVE BY USING 200 G SOFT HAMMER.

2. LEAK TEST

SEOJEON CONTROL VALVE HAS PROCEDURE FOR LEAKAGE TEST FOLLOWING ANSI B16.104 / FCI 70.2. THIS TEST WILL CLOSE SEAT PORT BY PRESSING SIGNAL 10% ON NORMAL CLOSE AND SIGNAL 125% ON NORMAL OPEN AND INSTALL PROPER MEASURING INSTRUMENT AT 2ND STAGE. AND THEN PRESS THE REGULATION PRESSURE AT 1ST STAGE AND RECORD 2ND STAGE LEAKING VOLUME AND LAPPING OR IMPROVING THE VALVE IN REGULATION.

3. OPERATING TEST

SEOJEON CONTROL VALVE HAS PROCEDURE FOR OPERATING TEST WHETHER VALVE IS RUNNING PROPERLY WHILE SENDING THE REGULATION SIGNAL TO ACCESSORY.

IT INSPECTS WHETHER VALVE PER SIGNAL MAINTAINS FIXED OPENING CONDITION WHEN REGULATION SIGNAL VOLUME INCREASES. BY THIS TIME, INSPECT ABNORMALITY BY INSPECTING THE SCRATCHING SOUND INSIDE OF THE BODY OR NOISE IN ACTUATOR.

VI. EXAMINATION AND MANAGEMENT

1. PHENOMENON: LEAKING OCCURS TO 2ND STAGE EVEN IF VALVE CLOSES.

1.1 CHECKING THE DESIGNED DATA SHEET AND THE CUSTOMERS SPECIFICATION WHETHER THESE ARE THE SAME. AND THEN BASE N THIS, CORRECT OR MEASURING THE LEAKAGE VOLUME AND DO NEXT STEP.

1.2 IN CASE OF SOME DREGS IN PORT OR SEAT ON FLASHING STAGE AFTER PIPING INSTALLATION, PRESS 50% SIGNAL TO ACTUATOR AND MAINTAIN THE OPENING CONDITION AND REMOVE THE CONNECTING BOLT BETWEEN BODY AND BONNET. AND THEN CLEAN IT AFTER CHECKING INSIDE.

CHECK WHETHER ANYTHING HAPPENS SUCH AS CHOPPED OR SQUEEZED ON THE CONTACT SURFACE OF PORT AND SEAT IN THIS STAGE AND REQUEST AFTER SERVICE TO MANUFACTURER (E.G. PROCESSING OR LAPPING).

1.3 IT CAN BE HAPPENED ON THE CONDITION OF SEAT AND PORT ABRASION DUE TO VALVE TO BE USED FOR LONG. SO REQUEST FOR AFTER SERVICE (OR PROCESSING OR LAPPING).

2. VALVE MAINTAINS NORMAL OPENING CONDITION OR DOES NOT WORKING AT ALL EVEN IF AIR PRESSURE HAS BEEN SUPPLIED.

2.1 CHECK NOISE FROM ACTUATOR AND VALVE BODY AND UNSCREW PACKING NUT LITTLE BIT. UNSCREW YOKE NUT AND CHECK WHETHER TOTAL ASSEMBLY CONDITION IS PARALLEL.

2.2 CHECK THE ACTUATOR VENT HOLE AIR PRESSURE AND IF LEAKING HAPPENS. THEN REPLACE THE DIAPHRAGM AFTER UNSCREW CASE BOLT.

2.3 WHEN PROPER SIGNAL AND VALVE OPENING CONDITION IS NOT HARMONIZED. RE-SETTING OR REPLACE THE POSITIONER. BECAUSE IT CAN BE HAPPENED WHEN POSITIONER LOCKING SYSTEM IS UNSCREWED OR WHEN MAGNET HAS BEEN LOST ITS MAGNET FIELD ON SITE.

VII. OTHERS

1. USE CONTROL VALVE AFTER COMPLETE PIPE FLASHING WHILE INSTALLINGTHE VALVE.

2. AIR PRESSURE TO ACTUATOR MUST BE HIGHER THAN AIR SET SETTING VALVE GENERALLY, HIGHER THAN 5~7 kgf/㎠

3. MAINTAIN THE VERTICAL AND PARALLEL ON ASSEMBLE OR DISASSEMBLE STAGE AND FOR BOLT & NUT, SCREW PROPERLY WITH DIAGONAL DIRECTION.

4. PACKING BOX SHOULD BE FASTENED OR REPLACE WHEN PACKING FLANGE IS TO CLOSE.

5. CAUTION FOR NOT TO PRESS 4.0kgf/㎠ TO ACTUATOR.

6. DO NOT HIT THE GAUGE AND PROTECT INSTRUMENT OUTSIDE FROM FALLING THINGS WHILE OPERATION.

Operator's Manual

Multi Spring Pneumatic Diaphragm Actuator

VM-500 SERIES ACTUATOR

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SEOJEON VALMAC INSTRUCTION MANUAL
MODEL VM-500 SERIES ACTUATOR

TABLE OF CONTENTS

1. Warning and Cautionary Notices

2. General Description

3. Upon Receipt

4.. Disassembly and Assembly of VM-500 Actuator

- 4.1 Removal from Valve Body
- 4.2 Disassembly of Actuator
- 4.3 Assembly of Actuator
- 4.4 Assembly of Actuator of Valve

Figure 4-1. Actuator to Valve Mounting
Figure 4-2. Exploded View (Direct Acting)
Figure 4-3. Exploded View (Reverse Acting)
Figure 4-4. Air Piping Alignment (Direct Acting)
Figure 4-5. Air Piping Alignment (Reverse Acting)
Figure 4-6. Bolts and Nuts of Actuator
Table 4-1. Tightening Torques of Bolts and Nuts
Figure 4-7. Parts List (Direct Acting)
Figure 4-8. Parts List (Reverse Acting)

5. ADJUSTMENT

Figure 5-1. Stem Connector

6. Converting Reverse To Direct And Vise Versa

Figure 6-1. Series 500 Actuator (Reverse to Direct Acting)

7. Top Mounted Handwheel

- 7.1 Operating Instructions
- 7.2 Disassembly Instructions

Figure 7-1. Actuator with Top Hand Wheel (Direct Acting)
Figure 7-2. Actuator with Top Hand Wheel (Reverse Acting)
Figure 7-3. Top Hand Wheel Actuator (Direct Acting)
Figure 7-4. Top Hand Wheel Actuator (Reverse Acting)

1.0 WARNINGS

1.1 All service to any control valve component is to be performed by qualified personnel who have received formal training by the owner and/or SEOJEON VALMAC Co.,Ltd.

1.2 Before servicing any valve components, valve should be isolated from flow with internal pressure and temperature reduced to ambient conditions. Supply air is to be shut off and all pressure removed from the actuator and positioner.

1.3 Actuator contains springs that are under compression with the diaphragm case. To assure safe release of spring compression, eye bolts that retain upper and lower halves of diaphragm case are to be removed last when disassembling diaphragm housing.

1.4 The diaphragm housing is designed to handle maximum air pressure of 70 psig(5 Barg.) with an ambient temperature limit of 150°F(65°C). User is responsible to assure these values are not exceeded.

2. GENERAL DESCRIPTION

The 500 Series Actuator is a multi spring air operated diaphragm type actuator designed for linear action. No internal components exist that require adjustment and as such this actuator should require minimal servicing.

Periodic inspection of diaphragm material, diaphragm plate and spring is recommended. Diaphragm case should be checked for air leakage to assure consistent actuation.

Disassembly and assembly shall be performed as defined in Section 4 of this manual. Refer to Warning Notices given in Section 1 of this manual prior to performing any service work.

The 500 Series Actuator spring action can be “field reversed” without the need for additional parts. For example, a “spring to close” unit can be changed to a “spring to open” operation. Note that change in action can effect safety of process operation which should be fully evaluated and approved by the proper engineering authority. Section 6 of this manual describes this conversion in greater detail.

Optional equipment including top mounted or side mounted hand wheel may be included.

3.0 UPON RECEIPT

3.1 When the actuator and valve are shipped together, consult the valve instructions for proper installation practices. The actuator may be installed vertically or horizontally either above or below the valve.

If the actuator is shipped separately from the valve, refer to Section 4.4 for instructions to mount the actuator to valve.

3.2 Direct Action Actuator (Spring to Open)

For the direct action actuator, the spring tends to retract the actuator stem, and air pressure acting on the diaphragm will extend the actuator stem.

3.3 Reverse Acting Actuator (Spring to Close)

For the reverse-acting actuator, the spring tends to extend the actuator stem, and air pressure acting on the diaphragm will retract the actuator stem.

4.0. Disassembly and Assembly of VM-500 Actuator

Prior to assembly the service technician should become familiar with the components of the actuator. The following drawings apply :

Figure 4-1, Actuator to Valve Mounting
Figure 4-2, Exploded View, Direct Action (Spring to Open)
Figure 4-3, Exploded View, Reverse Action (Spring to Close)
Figure 4-6, Bolts and Nuts of Actuator
Table 4-1, Tightening and Torque Value.

4.1 Removal from Valve Body

The actuator is mounted to the valve by a yoke clamp nut and bolted stem connector. To remove the actuator from the body, perform the following steps.

4.1.1 Isolate the valve from all fluid and air assuring valve internals are at ambient pressure and temperature.

4.1.2 Isolate and bleed off any air in the actuator.

4.1.3A Direct Action (spring to open) – In some cases the stem connection may be made to place a force on the valve when no air is supplied. In order to remove the stem connector, apply a small amount of air to the actuator so that the stem moves slightly toward the closed position. Note the air pressure; maintain the pressure and loosen the bolt(s) on the stem connector. Bleed off air pressure. Remove all air and electrical lines to accessories mounted on actuator. Remove yoke clamp nut. Actuator should now be free to remove from valve. Refer to Fig. 4-1.

4.1.3B Reverse Action (spring to close) – In some cases the stem connection may be made to place a force on the valve when no air is supplied. In order to remove the stem connector, apply a small amount of air to the actuator so that the valve stem moves slightly toward the open position. Note the air pressure; maintain this air pressure and loosen the bolts on the stem connector. Bleed off air pressure. Remove all air and electrical lines to accessories mounted on the actuator. Remove the yoke clamp nut. Actuator should now be free to remove from valves. Refer to Fig. 4-1.

4.2 Disassembly of VM-500 Series Actuator

4.2.1 Remove actuator from valve, Ref. to 4.1

4.2.2 Place actuator in vertical altitude (diaphragm case up)

4.2.3 Remove clamping bolts(do not remove eye bolts) of the diaphragm case. Refer to Warning 1.C.

4.2.4 Loosen evenly and alternately the pair of eye bolts.

4.2.5 Remove upper diaphragm case.

4.2.6A Direct Action (spring to open) – Ref. To Fig. 4-2. Pull out upward actuator rod together with diaphragm. Remove springs.

4.2.6B Reverse Action (spring to close) – Ref. To Fig. 4-3. Remove springs. Pull out upward the actuator rod together with the diaphragm.

4.2.7 Remove lower diaphragm case bolts to access lower bushing and seals.

4.2.8 Inspect diaphragm seals for wear and replace as required.

Notes for Disassembly :

1. The nuts for the eyebolts are made of Alloy steel. Discriminate these nuts from other nuts when assembling the diaphragm case.
2. It is recommended to make locating marks on the top and bottom diaphragm cases before disassembly. This will help you to easily find the air piping connector location.
3. Store the removed parts in a clean place.

4.3 Assembly of VM-500 Series Actuator

4.3.1 Before reassembly, check parts for scrapes, damage, deformation, pealing of paint, wear or other abnormality. Replace as required.

4.3.2 Direct Action Type (Spring to open) (*Note*: refer to fig. 4-6 and Table 4-1 for tightening torque of bolts and nuts.)

a. Fix the bottom diaphragm case and yoke with bolts. Install the diaphragm case and spring plate together.

b. Install the springs on the diaphragm plate(with spring guide).

c. Insert the actuator rod(to which the diaphragm is connected) into the bushing, exercising care not to damage the bushing inside surface or dust seal with the threaded section of the rod. (For example, cover the threaded section with adhesive tape to prevent damaging the bushing.) Set the stopper in parallel with the yoke.

d. Place the top diaphragm case and fix it with the pair of eye bolts. (Note: Set the air piping connection port in the location shown in the illustration. (Fig.4-4). Tighten the pair of eye bolts uniformly by tightening them alternately. The initial setting of the springs is complete by tightening of these eye bolts.

e. Finish clamping the diaphragm case with other clamping bolts than the pair of eye bolts.

f. Connect the air pipe to the air piping connection port of the top diaphragm case

g. After assembly is complete as above, check the following;

1.) Applying an air pressure of 70 psig (5 barg) via the air piping connection port of the top diaphragm case; check the diaphragm periphery for air leak by using soapsuds.

2.) Reset air pressure as defined on Copes-Vulcan Data Sheet.

3.) Check to assure that the actuator operates smoothly for its full stroke. Note: Check this operation by operating the actuator as an independent unit.

4.3.2 Reverse Action Type (Spring to open) (*Note:* Refer to fig. 4-6 and Table 4-1 for tightening torque of bolts and nuts.)

a. Fix the bottom diaphragm case and yoke with the bolts.

b. Insert the actuator rod(to which the diaphragm is connected) into the bushing, exercising care not to damage the bushing inside surface or dust seal with the thread section of the rod. (For example, cover the threaded section with adhesive tape to prevent damaging the bushing.)

c. Make the stopper(in the diaphragm plate) in parallel with the yoke by turning the nut.

d. Install the springs on the diaphragm plate

e. Place the top diaphragm case and fix it with the pair of eye bolts. Set the air vent hole in the location shown in the illustration (Fig. 4-5). Uniformly and alternately tighten the eye bolts. The initial setting of the springs is complete by tightening of these eye bolts.

f. Finish Clamping the diaphragm case with other clamping bolts than the pair of eye bolts.

g. Install the rain cap on the air vent port.

h. Connect the air pipe to the air piping connection port of the bottom diaphragm case.

i. After the assembly is complete as above, check the following:

1.) Applying an air pressure of 70 psig(5 barg) via the air piping connection port of the bottom diaphragm case, check the diaphragm periphery for air leak by using soapsuds.

2.) Reset air pressure as defined on Copes-Vulcan Data Sheet.

3.) Check to assure that the actuator operates smoothly for its full stroke.

4.4 Assembly of Actuator of Valve

4.4.1 Place actuator on bonnet taking care to orient actuator accessories to permit easy access for adjustments.

4.4.2 Screw yoke clamp nut on bonnet to secure actuator to valve. Use steel bar and hammer to engage the cast protrusions of the yoke to apply torque.

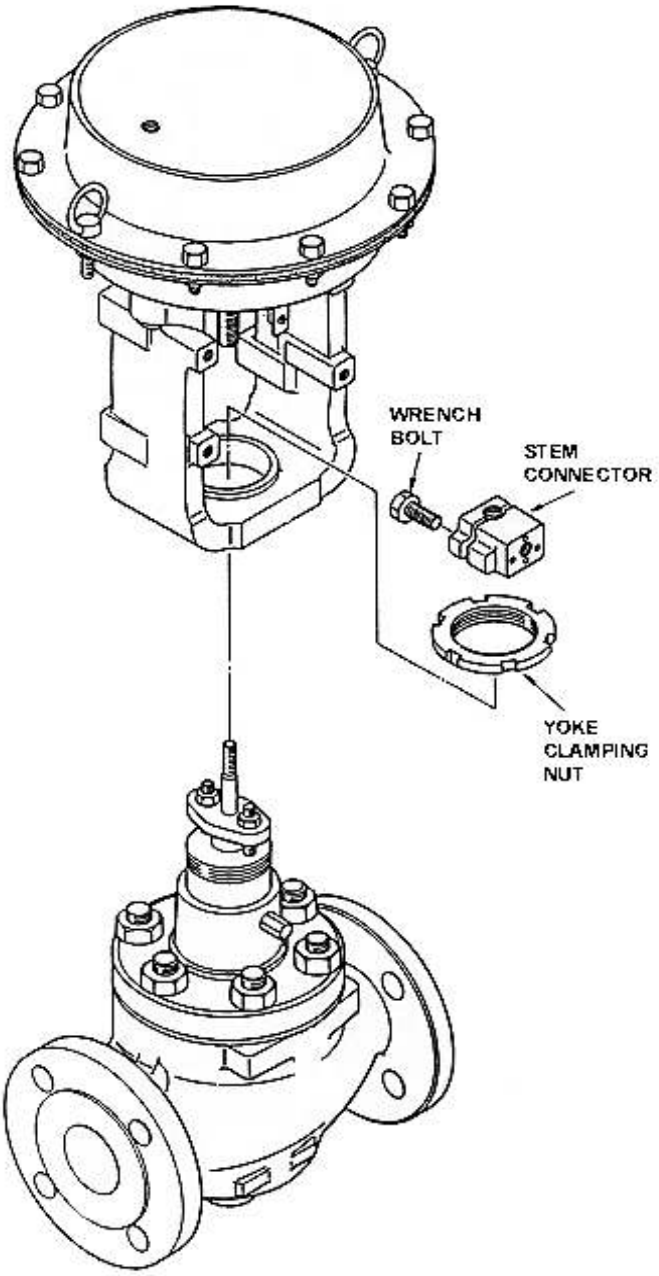


Fig. 4-1 Actuator to Valve Mounting

When disassembling the actuator, keep it in the vertical attitude.

For the tightening torques of bolts and nuts, see Tables 4-1.

For the parts List, see Figs. 4-7 and 4-8.

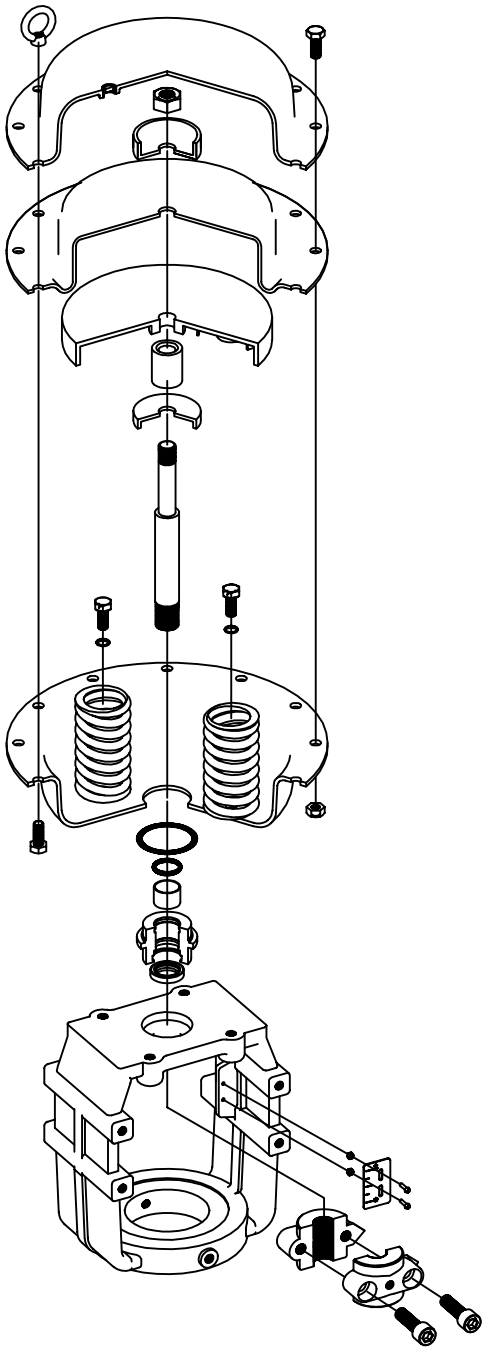


Fig. 4-2 Series 500 Actuator(Direct Action)

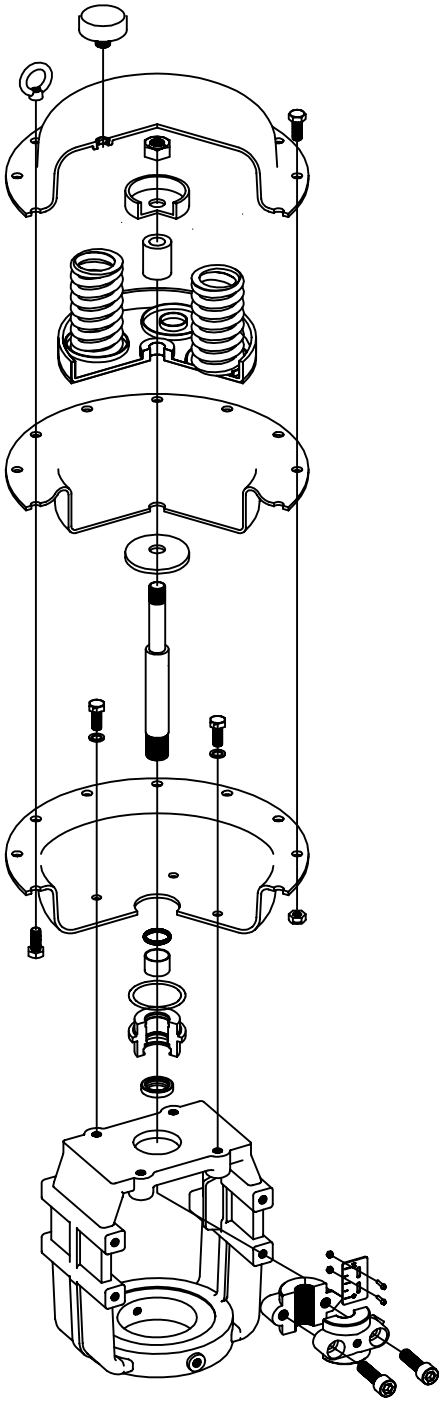


Fig. 4-3 Series 500 Actuator (Reverse Action)

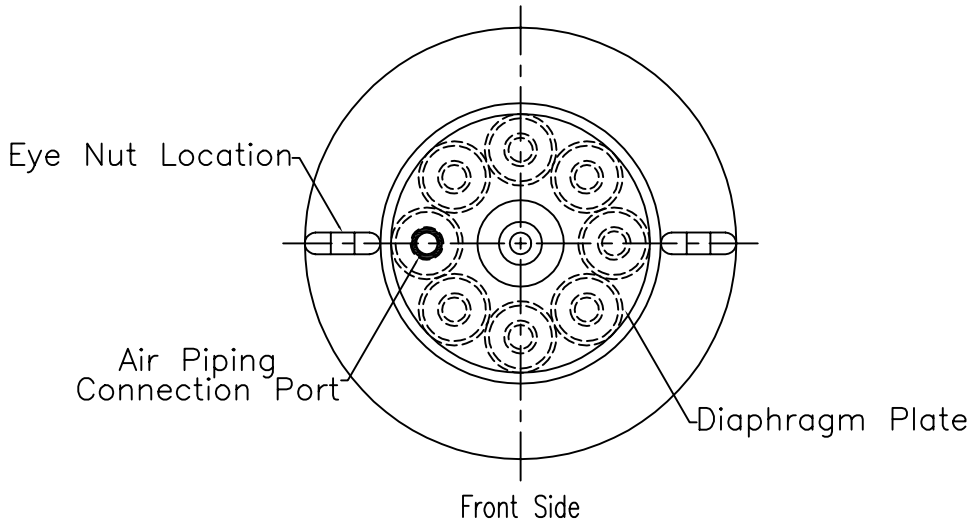


Fig. 4−4. Direction Action Type

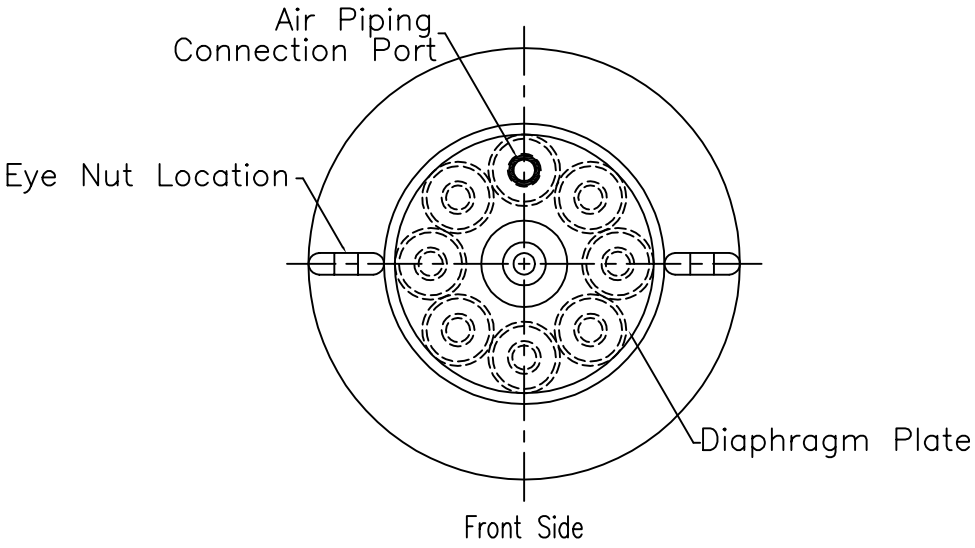


Fig. 4−5. Reverse Action Type

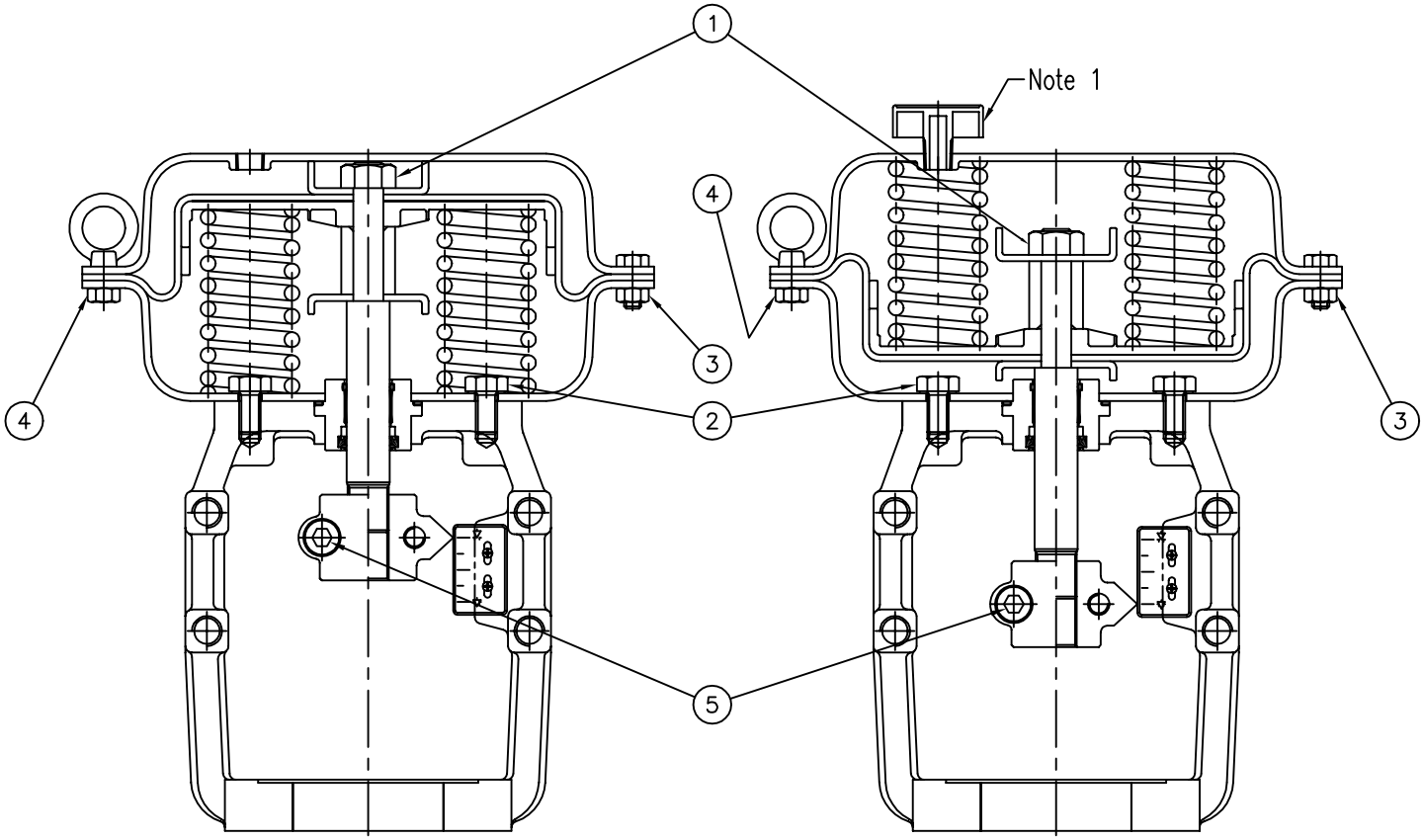


Fig. 4-6. Bolts and Nuts of Actuator

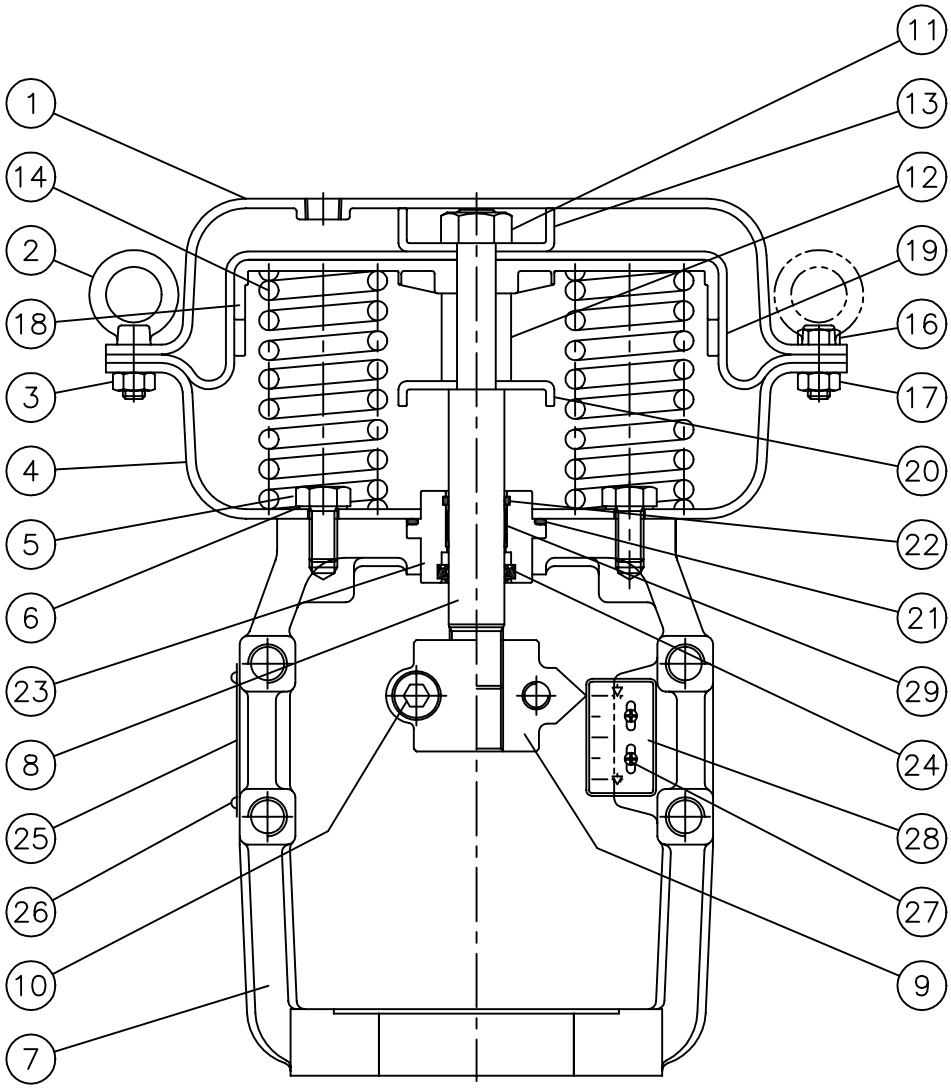
Table 4-1. Tightening Torques of Bolts and Nuts of Actuator

Units : ft-lb (kgf-cm)

NO.	MATERIAL	500-23		500-42		500-74		500-145	
		BOLT SIZE	TORQUE	BOLT SIZE	TORQUE	BOLT SIZE	TORQUE	BOLT SIZE	TORQUE
1	AISI	M14	50 (690)	M14	50 (690)	M16	76 (1,050)	M24	260 (3,600)
2	A 193 Gr. B7	M10	41 (560)	M10	41 (560)	M12	46 (630)	M18	105 (1,450)
3	A 193 Gr. B7	M8	14 (185)	M8	14 (185)	M8	14 (185)	M10	41 (560)
4	A 193 Gr. B7	M8	14 (185)	M8	14 (185)	M8	14 (185)	M10	41 (560)
5	A 193 Gr. B7	M10	41 (560)	M10	41 (560)	M18	105 (1,450)	M18	105 (1,450)

Note 1 : Fix the rain cap of the reverse type of actuator as follows :

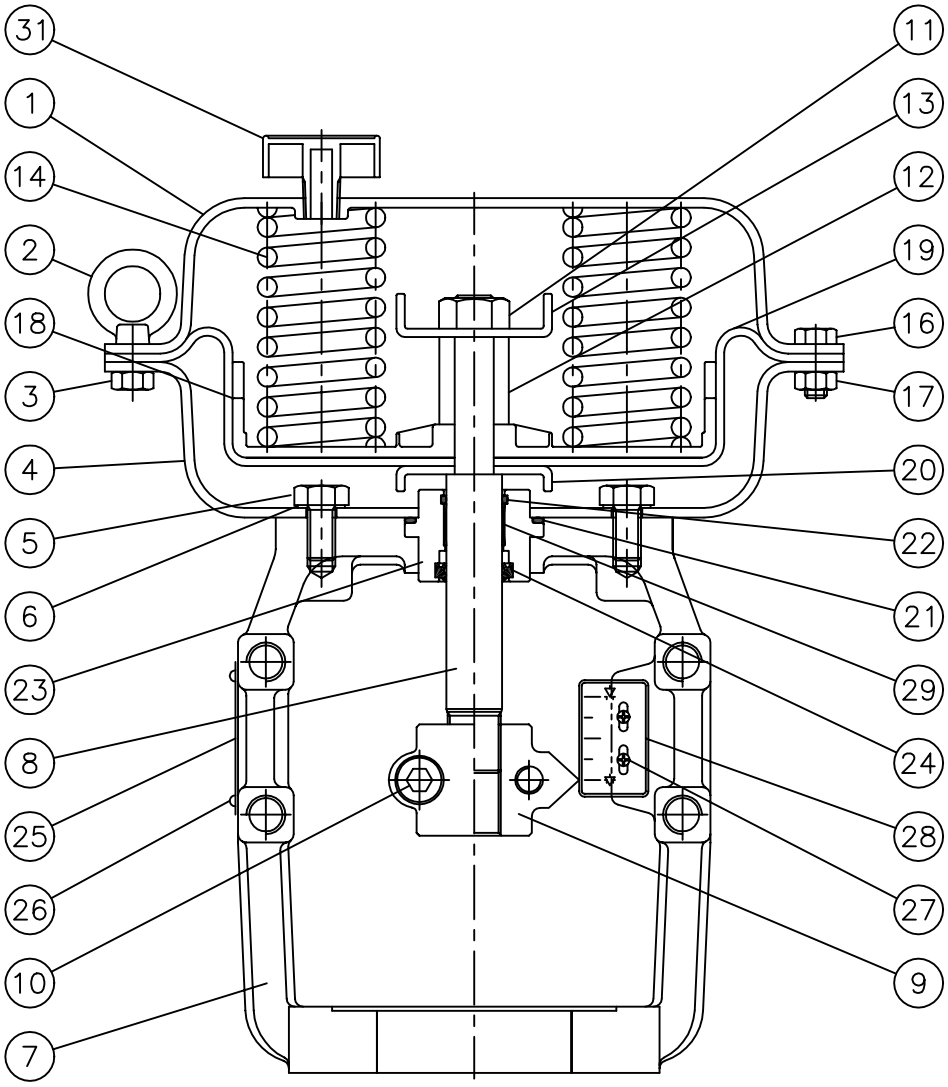
Drive the cap into the diaphragm case until the shoulder(brim) of the cap is brought into contact with the diaphragm case and then drive the cap further into the diaphragm case by half of a turn.



NO.	PART NAME
1	DIAPHRAGM CASE (TOP)
2	EYE BOLT
3	HEX. NUT
4	DIAPHRAGM CASE (BOTTOM)
5	HEX. BOLT
6	SEAL WASHER
7	YOKE
8	ROD
9	STEM CONNECTOR
10	STEM CONNECTOR BOLT
11	HEX. NUT
12	STOPPER COLLAR
13	STOPPER RING
14	SPRING
16	HEX. BOLT

NO.	PART NAME
17	HEX. NUT
18	DIAPHRAGM PLATE
19	DIAPHRAGM
20	DIAPHRAGM RETAINER
21	O-RING
22	O-RING FOR ROD
23	SEAL BOX
24	DUST SEAL
25	WARNING LABEL
26	RIVET
27	TRUS SCREW + NUT
28	SCALE PLATE
29	DU DRY BEARING
31	RAIN CAP

Fig. 4-7. Series 500 Actuator Parts List (Direct Action Type)



NO.	PART NAME
1	DIAPHRAGM CASE (TOP)
2	EYE BOLT
3	HEX. NUT
4	DIAPHRAGM CASE (BOTTOM)
5	HEX. BOLT
6	SEAL WASHER
7	YOKE
8	ROD
9	STEM CONNECTOR
10	STEM CONNECTOR BOLT
11	HEX. NUT
12	STOPPER COLLAR
13	STOPPER RING
14	SPRING
16	HEX. BOLT

NO.	PART NAME
17	HEX. NUT
18	DIAPHRAGM PLATE
19	DIAPHRAGM
20	DIAPHRAGM RETAINER
21	O-RING
22	O-RING FOR ROD
23	SEAL BOX
24	DUST SEAL
25	WARNING LABEL
26	RIVET
27	TRUS SCREW + NUT
28	SCALE PLATE
29	DU DRY BEARING
31	RAIN CAP

Fig. 4-8. Series 500 Actuator Parts List (Reverse Action Type)

5.0 Adjustment Procedure

5.1 As a general rule the 500 Series Actuator requires no adjustment other than the proper alignment and setting of the stroke of the actuator.

5.2 Referring to Figures 1-1 and 5-1, stroke of the actuator is adjusted as follows:

5.2.1 Fix actuator to valve body by securely tightening yoke clamping nut.(Ref. 4.4.2 above)

5.2.2 Connect an adjustable air pressure source(with pressure regulator) to actuator. Note, maximum pressure should not exceed 70 PSIG (5 Barg.). Connections should be on top of diaphragm case for direct action and lower case for reverse action.

5.2.3 Assure valve is properly seated and loosen packing to permit free travel of valve stem.

5.2.4 For Direct Action

5.2.4.1 Slowly apply maximum air pressure to actuator, 70 PSIG (5 Barg.) to fully extend the actuator stem. Repeat this process three time to assure full travel is reached.

5.2.4.2 Assure stroke of actuator stem is equal to or greater than stroke defined on name plate.

5.2.4.3 With actuator stem fully extended, attach stem connector block to actuator and valve stem (valve stem to remain in place per 5.2.3) It is important to assure proper thread engagement is achieved between stem and block.

Securely tighten clamping bolts of stem connector (Ref. to Item 5 on Table 4-1).

5.2.4.4 Reduce air pressure and confirm full stroke of valve is possible.

5.2.5 For Reverse Action

5.2.5.1 Slowly apply maximum air pressure to actuator, 70 PSIG (5 Barg.) to fully retract the actuator stem. Repeat this process three time to assure full travel is reached.

5.2.5.2 Note travel distance of actuator stem during 5.2.5.1 and confirm it is equal to or greater than stroke defined on nameplate.

5.2.5.3 Note position of actuator stem with full air pressure. slowly reduce air pressure measuring change in actuator stem travel. Stop change of air when distance traveled is equal to stroke distance defined on nameplate.

5.2.5.4 Holding this location of actuator stem travel, attach the stem connection block to actuator and valve stem. (Valve stem is to

remain in position per 5.2.3 above).

5.2.5.5 Increase air pressure and confirm travel is equal to value on nameplate.

5.2.5.6 Decrease air pressure to 0 PSIG (0-Barg.); extend actuator stem fully. Gradually increase air pressure and note reading when the stem starts to move. This value should be equivalent to pre-compression value listed on nameplate.

Deficient pre-compression will effect ability to maintain tight shut-off of valve.

If a lower value is obtained repeat process. If lower values continue, consult VALMAC as springs in use may require change out.

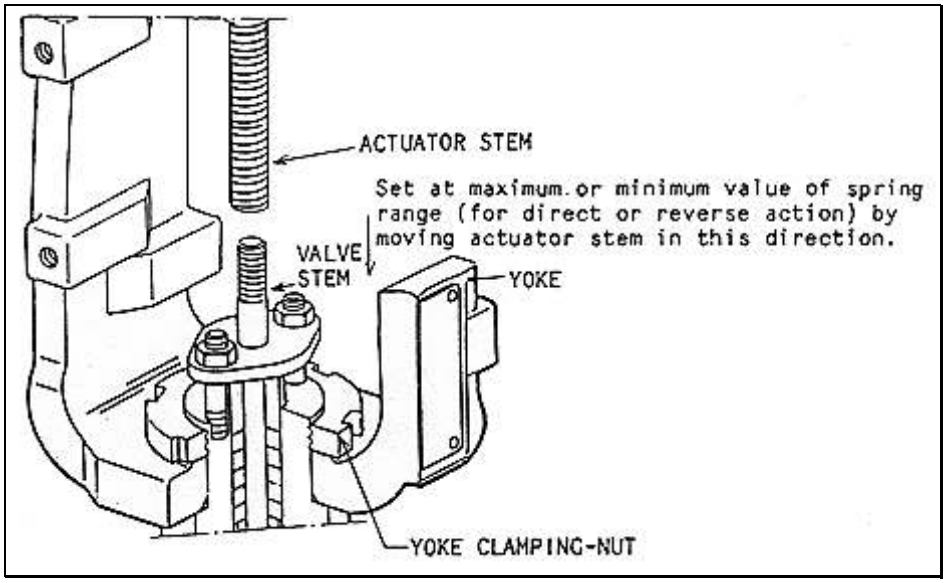


Fig. □-1 □te□ □onnector

□.□ □□□V□□□□□□ o□Actuator Action □□ever□e to □irect Acting

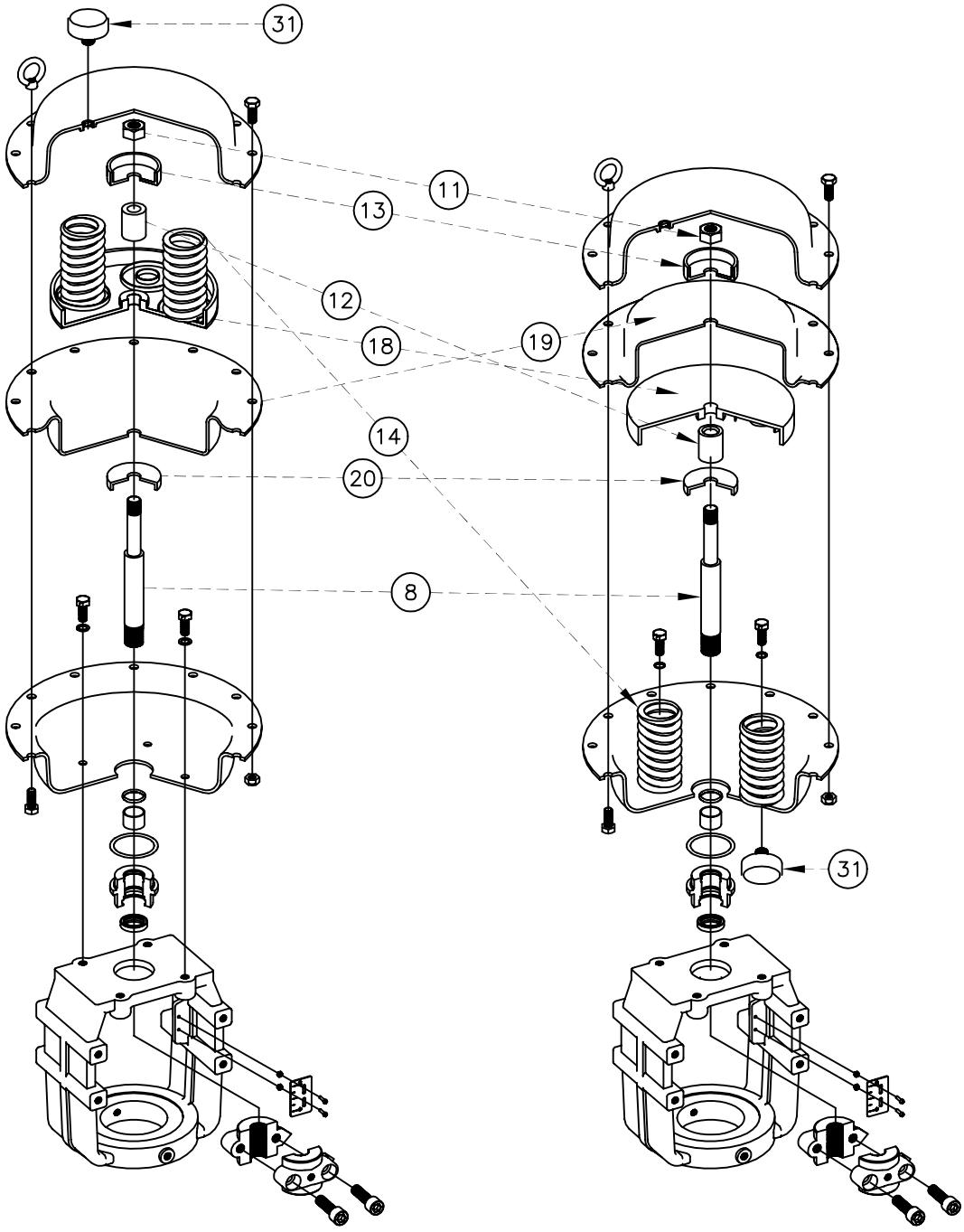
The Model 500 Actuator can be changed in action. The following text defines a change from REVERSE to DIRECT acting.
(Note: For proper valve operation, the spring selection should be reviewed to assure proper seat contact load is provided.)

6.1 Disassembly

A. Remove clamping bolts of diaphragm case; refer to WARNING 1.C.
B. Loosen evenly and alternately the pair of eye bolts.
C. Remove upper diaphragm case.
D. Remove springs(14); pull out upward the actuator rod (8) together with diaphragm(19).
E. Loosen Actuator rod lock nut (11); remove stopper ring(13), diaphragm plate(18), diaphragm.

6.2 Reassembly

A. Install springs in lower diaphragm case. Note: Avoid contact with lower case hex bolt.
B. Place stopper collar(12) on actuator rod(8)
C. Turn diaphragm plate(18) upside down and place on actuator rod(8).
D. Place diaphragm(19) on actuator rod(8).
E. Locate stopper ring(13) a top the diaphragm and tighten actuator rod lock nut(11).
F. Replace top actuator case and bolt closed.
G. Relocate rain cap(31) to lower actuator case.



Note : Part Numbers are as given on Fig. 4–7 & 4–8 Parts List

Fig. 6–1. Series 500 Actuator (Reverse –> Direct Action)

□. □ □□□□□□□□□□ F□□ □□□ □A□□□ □□□□ □F A□□□A□□□ □□ □tional□

□.1 □perating Instructions

To manually operate the actuator, refer to Fig □□1 through Fig. □□4 and proceed as follows:

□.1.1 First, loosen the lock nut (which has a bar□shape handle and which locks the handwheel) and turn the handwheel in the direction indicated by the corresponding arrowhead mark.

As you turn the handwheel clockwise, the actuator stem moves downward regardless of whether the actuator is of the direct action type or reverse action type. The handwheel bears the □S□□T□mark to indicate that the valve is closed as the handwheel is turned clockwise and the □□PEN□mark to indicate that the valve is made open as the handwheel is turned counterclockwise.

□.1.2 For automatic operation of the actuator, fully raise the handwheel if the actuator is of the direct action type of fully lower the handwheel if the actuator is of the reverse action type, and then tighten the lock nut to secure the handwheel in such position.

PRECA□TI□NS: If you forcefully turn the handwheel after it has reached the mechanical stop position, the valve stem may be damaged. Do not turn the handwheel with forces larger that the below□mentioned limits.

Series 500□42	□	ft□lb	(19 kgf)
Series 500□□4	□	ft□lb	(26 kgf)
Series 500□145	□	ft□lb	(41 kgf)

(At the outermost periphery of the handwheel)

□.2 Disassembly and Assembly of Top □andwheel

To disassemble or assemble the top handwheel, refer to Fig. □□1 through □□4 and proceed as described in this section. For disassembly work, keep the actuator in the vertical attitude.

□.2.1 (a) Direct Action type

(1) Disconnect the air piping.

(2) Set the handwheel shaft in the automatic operation position

(fully raise the handwheel shaft).

(3) Remove the top diaphragm case. When doing this, loosen the pair of eye bolts uniformly and alternately, after removing all other clamping bolts of the diaphragm case.

(4) Sufficiently insert the handwheel shaft by turning it and then remove the handwheel and the lock nut. Insert the shaft further and then remove the screw shaft from the housing.

(5) Remove the □ □ring.

To assemble the top handwheel, follow the disassembly procedure in the reverse order.

□2.2 (b) Reverse Action Type

(1) Disconnect the air piping.

(2) Set the handwheel shaft in the automatic operation position (fully lower the hand wheel shaft).

(3) Remove the hand wheel and the lock nut. Insert the shaft into the housing by means of the threading until the threaded sections are disengaged.

(4) Remove the top diaphragm case. When doing this, loosen the pair of eye bolts uniformly and alternately, after removing all other clamping blots of the diaphragm case.

(5) Remove the housing by loosening its clamping screw.

(6) Remove the set screw and then remove the bearing case.

(□) Remove the spring pin and then remove the castle nut.

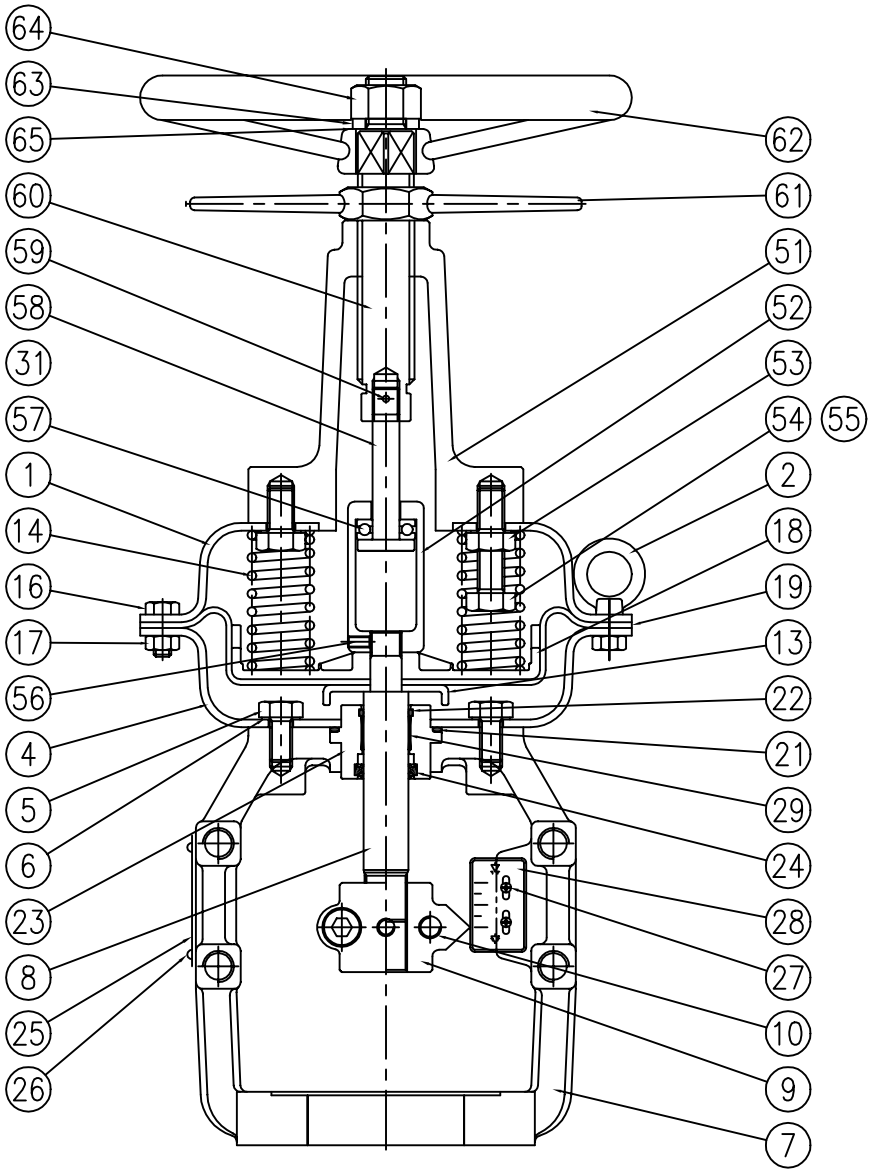
(8) Remove the bearing retainer and then remove the bearing.

To assemble the top hand wheel, follow the disassembly procedure in the reverse order.

□2.3 (c) Inspection After Assembly

(1) Check that the handwheel turns smoothly for the full stroke.

(2) For the direct action type of actuator, check by means of soapsuds that there is no air leak from the connecting section of the top diaphragm case.

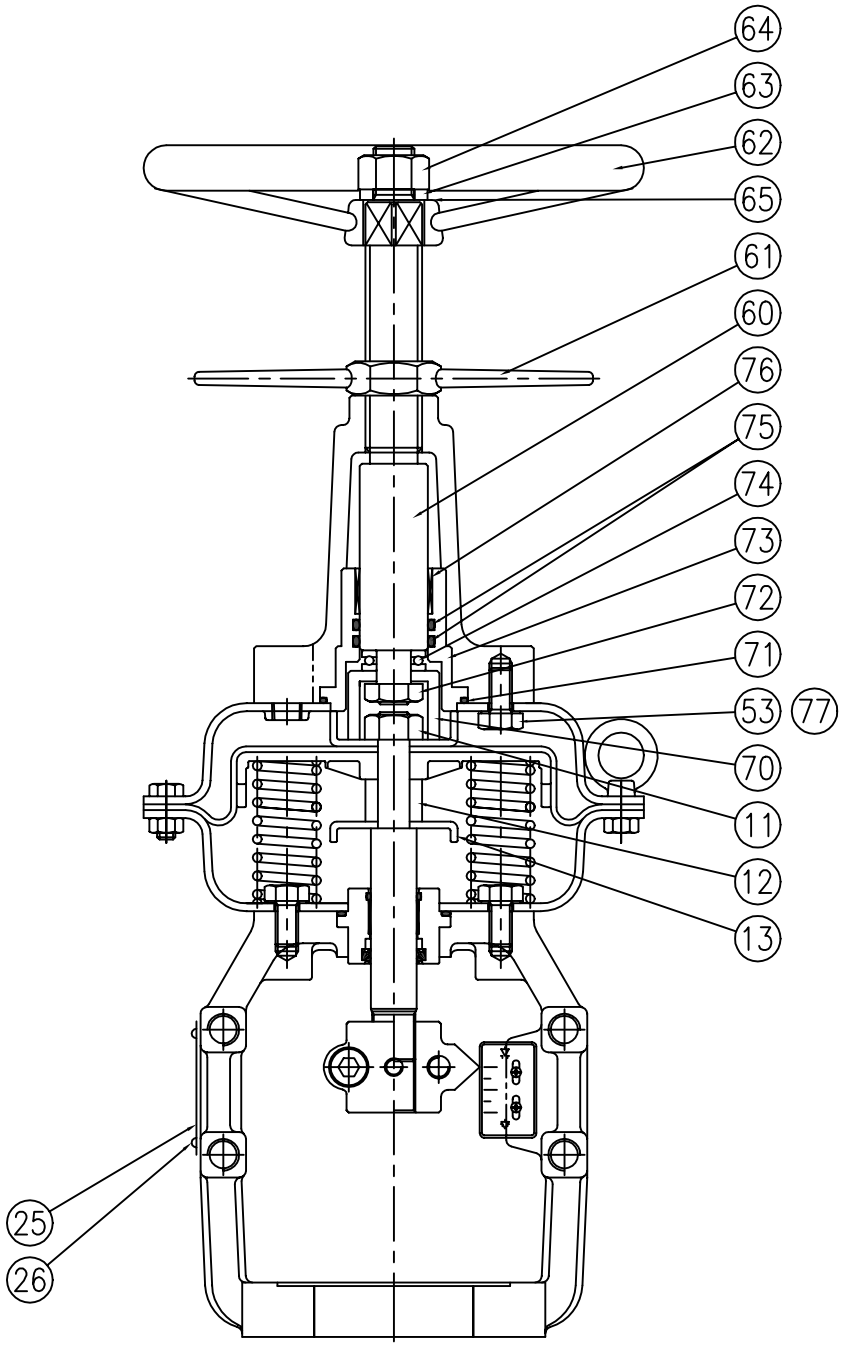


NO.	PART NAME
1	DIAPHRAGM CASE (TOP)
2	EYE BOLT
3	HEX. NUT
4	DIAPHRAGM CASE (BOTTOM)
5	HEX. BOLT
6	SEAL WASHER
7	YOKE
8	ROD
9	STEM CONNECTOR
10	STEM CONNECTOR BOLT
14	SPRING
16	HEX. BOLT
17	HEX. NUT
18	DIAPHRAGM PLATE

NO.	PART NAME
19	DIAPHRAGM
20	DIAPHRAGM RETAINER
21	O-RING
22	O-RING FOR ROD
23	SEAL BOX
24	DUST SEAL
25	WARNING LABEL
26	RIVET
27	TRUS SCREW + NUT
28	SCALE PLATE
29	DU DRY BEARING
31	RAIN CAP
51	HOUSING
52	BEARING CASE

NO.	PART NAME
53	HEX. BOLT
54	HEX. BOLT FOR STOPPER
55	HEX. NUT FOR STOPPER
56	SCREW
57	BEARING
58	BEARING SHAFT
59	SPRING PIN
60	SCREW SHAFT
61	LOCK NUT
62	HANDWHEEL
63	SPRING WASHER
64	HEX. NUT
65	WASHER

Fig. 7-1. Series 500 Actuator With Top Handwheel (Direct Action Type)



NO.	PART NAME
11	HEX. NUT
12	STOPPER COLLAR
13	STOPPER RING
25	WARNING LABEL
26	RIVET
53	HEX. BOLT
60	SCREW SHAFT

NO.	PART NAME
61	LOCK NUT
62	HANDWHEEL
63	SPRING WASHER
64	HEX. NUT
65	WASHER
70	SPRING RETAINER
71	O-RING

NO.	PART NAME
72	HEX. NUT
73	SEAL BOX
74	BEARING
75	O-RING
76	DU-DRY BEARING
77	SEAL WASHER

Fig. 7-2. Series 500 Actuator With Top Handwheel (Reverse Action Type)

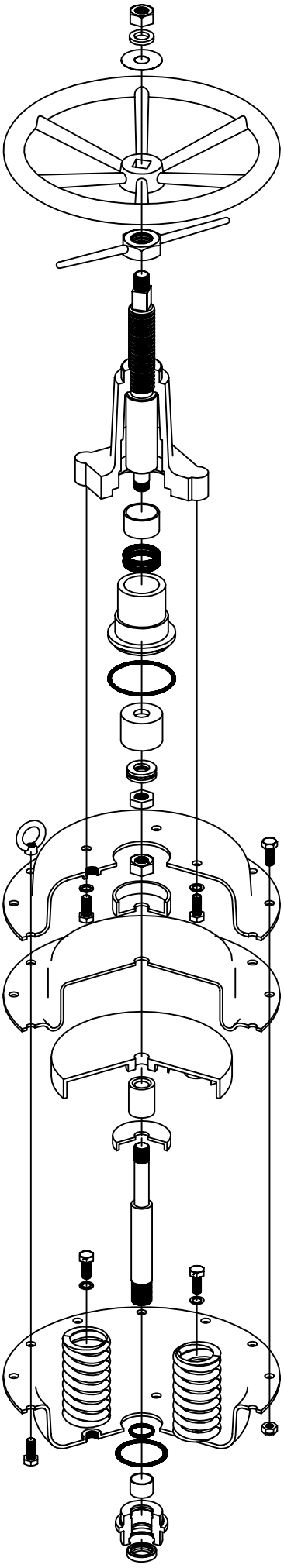


Fig. 7-3 Series 500 Actuator with Top Handwheel
(Direct Action)

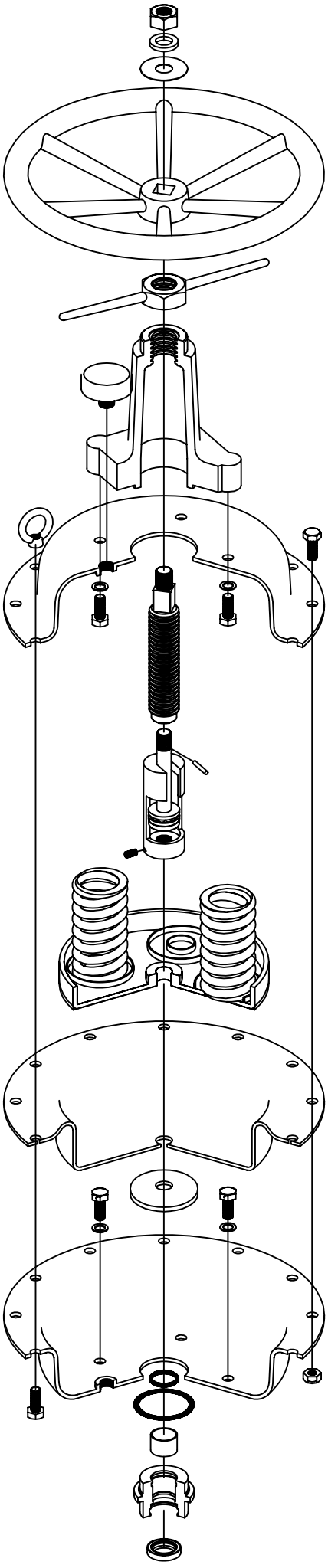


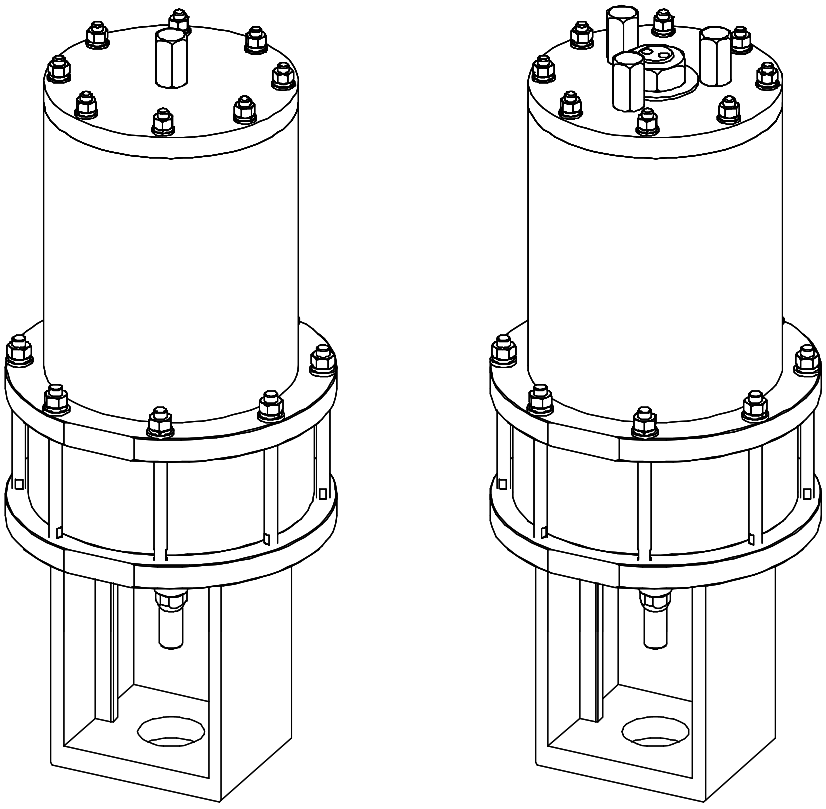
Fig. 7-4 Series 500 Top Handwheel Actuator
(Reverse Action)

Installation & Maintenance

Instructions

SPRING RETURN PNEUMATIC LINEAR ACTUATOR WITH HYDRAULIC MANUAL OVERRIDE

MODEL NO : 900/960 Series



SEOJEON VALMAC CO.,Ltd.

INDEX

SECTION A	Page 3
Introduction	Page 3
SECTION B	Page 4
Checks to be carried out on receiving the actuator	Page 4
Storage	Page 4
Assembling the actuator onto the valve	Page 5
SECTION C	Page 7
Setting of the linear stroke	Page 7
Travel stop screw screwed on the end flange of hydraulic cylinder	Page 7
SECTION D	Page 8
Preparation for start-up	Page 8
a) Pneumatic connections	Page 8
Start-up	Page 8-9
SECTION E	Page 10
Maintenance	Page 10
a) Routine maintenance	Page 10
b) Special maintenance	Page 11
b1) Replacement of pneumatic cylinder seals (see Fig.1 and Fig.2)	Page 11-14
b2) Replacement of hydraulic cylinder seals (see Fig.3)	Page 15-16

NOTES:

SEOJEON VALMAC has taken every care in collecting and verifying the documentation contained in this instruction and operating manual. Nevertheless SEOJEON VALMAC does not provide any guarantees for this instruction manual. SEOJEON VALMAC will not be responsible for any mistakes contained in it or for any damage either accidental or due to the use of this manual. The information herein contained is reserved property of SEOJEON VALMAC and is subject to being modified without notice.

SECTION A

Introduction

900,960 Series spring return pneumatic low-pressure linear actuators, are suitable for the operation of linear valves (globe valves, through conduit gate valves) for ON-OFF and modulating heavy-duty service. The actuator is made up of a pneumatic cylinder, a spring cartridge and a mounting pedestal complete with a joint for the coupling to the valve stem of actuator output stem. The valve is actuated in opening and in closing position by the actuator pneumatic cylinder in one direction and by the spring unit in the other direction. The output thrust of spring unit can be downward or upward according to valve operation requirements (spring to open, spring to close, direct acting valve , reverse acting valve). The spring return pack incorporates up to four spring , fully encapsulated in a factory welded cartridge: this assures safety conditions to personnel and simplifies the assembly. The linear stroke of the valve is adjustable by means of the external mechanical stop and by the adjustment of the coupling of valve stem to actuator joint. The actuator pedestal has a flange with threaded holes to fix the actuator to the valve. The handwheel hydraulic manual override is used to manually operate the actuator in lack of air supply. The handwheel unit consists of a hydraulic cylinder mounted on the end flange of the pneumatic cylinder. The hydraulic control unit consists of: hand pump, hydraulic check valve, oil tank and stop valve.

SEOJEON VALMAC can supply different types of control system following Customer's requirements.

FEATURES

• Electro less nickel-plated and polished cylinder for corrosion resistance and minimum friction.

• Hard chromium plated stainless steel piston rod for corrosion resistance and minimum friction.

• Tropicalized alloy steel cylinder tie rods for maximum corrosion resistance and easy maintenance operation.

• Floating type piston rod seals and piston seals for low hysteresis and high sensitivity preventing sticking problems.

• Piston rod supported by bushing made of bronze with sinterized TEFLON to provide minimal friction and extended service life.

• Stroke adjustment with mechanical travel stop in one direction.

• Stainless steel material is provided on request.

SECTION B

Checks to be carried out on receiving the actuator

1)If the actuator arrives already assembled onto the valve, the settings of the mechanical stop and of the microswitches (if existing) has already been made by the person who assembled the actuator onto the valve. If the actuator arrives separately from the valve, the settings of the mechanical stops and of the microswitches (if existing) must be checked and, if necessary, carried out while assembling the actuator onto the valve.

2)Check that the actuator has not been damaged during transport. If necessary, repair all damages to the paint-coat, etc.

3)Check that the fitted accessories comply with those listed in the order acknowledgement and the delivery note.

Storage

The actuators leave the factory in excellent working conditions and with an excellent finish (these conditions are guaranteed by an individual inspection certificate); in order to maintain these characteristics until the actuator is installed on the plant, it is necessary to observe a few rules and take appropriate measures during the storage period.

1) Make sure that plugs are fitted in the air connections and in the cable entries. The plastic plugs, which close the inlets, do not have a weatherproof function, but are only a means of protection against the entry of foreign matter during transport. If long-term storage is necessary and especially if the storage is outdoors, metal plugs must replace the plastic protection plugs, which guarantee a complete weatherproof protection.

2) If the actuators are supplied separately from the valves, they must be placed onto a wooden pallet so as not to damage the coupling flange to the valve. In case of long-term storage, the coupling parts must be coated with protective oil or grease.

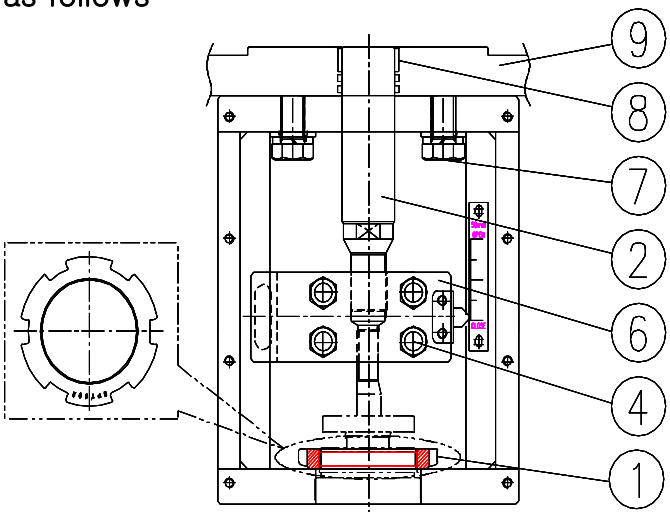
3) In case of long-term storage, it is advisable to keep the actuators in a dry place or to provide at least some means of weather protection. If possible, it is also advisable, to periodically operate the actuator with filtered, dehydrated and lubricated air; after such operations all the threaded connections of the actuator and the valves of the control panel (if existing) should be carefully plugged.

Assembling the actuator onto the valve and lifting instructions

The lifting and handling of the actuator must be done by qualified personnel and in accordance with the laws and regulations in force.

The lifting points must only be used for lifting the actuator, and not the valve/actuator assembly. Avoid the lifted actuator to be hung above the personnel. The actuator must be lifted by way of a suitable lifting apparatus. The weight of the actuators is indicated in the technical documentation attached to the equipment itself.

a) To assemble the actuator onto the valve by bracket with threaded joint proceed as follows



ITEM	DESCRIPTION
1	YOKE NUT
2	ACTUATOR STEM
4	CLAMP BOLT
6	CLAMP
7	COVER BOLT
8	BUSHING
9	COVER

SPRING TO CLOSE ACTUATORS

1) Check that the coupling dimensions of the valve flange and stem, or of the relevant extension, meet the actuator coupling dimensions (valve stem and flange).
2) Lubricate the valve stem with grease in order to make the assembly easier.
3) Clean the valve flange and remove anything that might prevent a perfect adherence to the actuator flange.

4) Connect a sling to the support point of the actuator eyebolt and lift it.
Note: the eyebolt is sized for the lifting of the actuator (NOT ACTUATOR+VALVE). Proper lifting points have to be foreseen for the valve.
5) To make easier the assembly, the valve stem has to be in perfect vertical position.
6) Place the actuator and valve assembled in a vertical line and tighten the yoke nut (1).
7) Actuator connection considers valve stroke (data sheet reference), and connect, and supply pressure air of a former early spring range price to actuator, and increase actuator stem, and use a volt, and fix clamp.

SPRING TO OPEN ACTUATORS

1) Check that the coupling dimensions of the valve flange and stem, or of the relevant extension, meet the actuator coupling dimensions (valve stem and flange).
2) Lubricate the valve stem with grease in order to make the assembly easier.
3) Clean the valve flange and remove anything that might prevent a perfect adherence.
4) Connect a sling to the support point of the actuator eyebolt and lift it.
Note: the eyebolt is sized for the lifting of the actuator (NOT ACTUATOR+VALVE). Proper lifting points have to be foreseen for the valve.
5) To make easier the assembly, the valve stem has to be in perfect vertical position.
6) Place the actuator and valve assembled in a vertical line and tighten the yoke nut (1).
7) Actuator connection considers valve stroke (data sheet reference), and connect, and supply air pressure to actuator like former valve stroke prices, and bring down actuator stem, and use a volt, and fix clamp.

SECTION C

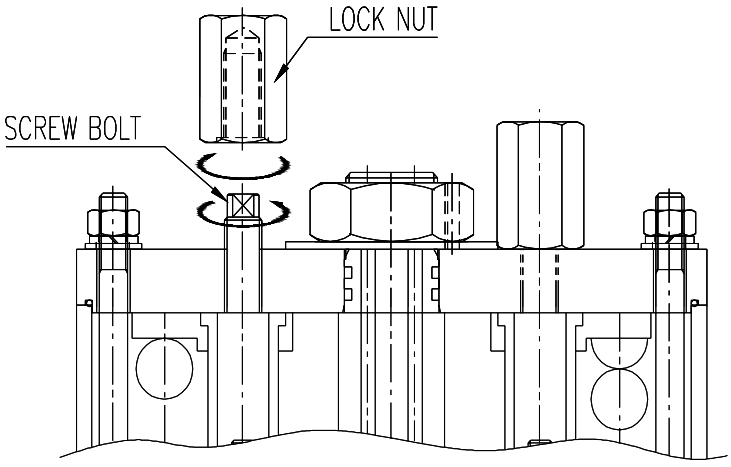
Setting of the linear stroke

It is important that the mechanical stops of the actuator(and not those of the valve) stop the linear stroke at both extreme valve position (fully open and fully closed), except when this is required by the valve operation).

The travel stop screw is screwed into the end flange of the hydraulic cylinder, depending on actuator different configuration(i.e. spring to open or spring to close), or into the end flange of spring cartridge. The setting of the open/closed valve position (upward position) is performed by adjusting the travel stop screw into the end flange that is at the top of actuator . The setting of the open/closed valve position(downward position) is performed by the adjustment of the coupling of valve stem to actuator joint .

For the adjustment of the travel stop screw in the end flange of the cylinder proceed as follows:

1) Unscrew the plug from the cylinder end flange.
2) If the actuator angular stroke is stopped before reaching the end position (fully open or closed), unscrew the stop screw by turning it anticlockwise with an Allen wrench until the valve reaches the correct position.
3) If the actuator angular stroke is stopped beyond the end position (fully open or closed valve), screw the stop screw by turning it clockwise until the valve reaches the correct position.
4) Screw the cap nut into the cylinder end flange.



SECTION D

Preparation for start-up

a) Pneumatic connections

Connect the actuator to the pneumatic feed line with fittings and pipes in accordance to the plant specifications. They must be sized correctly in order to guarantee the necessary airflow for the operation of the actuator, with pressure drops not exceeding the maximum allowable value. The shape of the connecting piping must not cause excessive stress to the inlets of the actuator. The piping must be suitably fastened so as not to cause excessive stress or loosening of threaded connections, if the system undergoes strong vibrations.

Every caution must be taken to ensure that any solid or liquid contaminants, which may be present in the pneumatic pipework to the actuator, are removed to avoid possible damages to the unit or loss of performance.

The inside of the pipes used for the connections must be well-cleaned before use: wash them with suitable substances and blow through them with air or nitrogen. The ends of the tubes must be well deburred and cleaned.

Once the connections are completed, operate the actuator and check that it functions correctly, that the operation times meet the plant requirements and that there are no leakages in the pneumatic connections.

Start-up

During the start-up of the actuator, proceed as follows:

1) Check that the pressure and quality of the air supply (filtering degree, dehydration) are as prescribed. Check that the feeding voltage values of the electric components (solenoid valve coils, microswitches, pressure switches, etc.) are as prescribed.
2) Check that the actuator controls work properly (remote control, local control, emergency controls, etc.)

3) Check that the required remote signals (valve position, air pressure, etc.) are correct.
4) Check that the setting of the components of the actuator control unit (pressure regulator, pressure switches, flow control valves, etc.) meet the plant requirements.
5) Check that there are not leakages in the pneumatic connections. If necessary tighten the nuts of the pipefittings.
6) Remove all rust and, in accordance with the applicable painting specifications, repair paint-coat that has been damaged during transport, storage or assembly.

SECTION E
Maintenance

Important: Before carrying out any maintenance operation, it is necessary to close the pneumatic feed line and exhaust the pressure from the actuator cylinder and from the control unit, to ensure safety of maintenance staff.

a) Routine maintenance

Important: To ensure the guaranteed SIL level, according to IEC 61508, the functionality of actuator must be checked with a maximum interval of one year

900/960 Series actuators have been designed to work for long periods in the severest conditions with no need for maintenance.
It is, however, advisable to periodically check the actuator as follows:

1) Check that the actuator operates the valve correctly and with the required operating times. If the actuator operation is very infrequent, carry out a few opening and closing operations with all the existing controls (remote control, local control, emergency controls, etc.), if this is allowed by the conditions of the plant.
2) Check that the signals to the remote control desk are correct. Check that the air supply pressure value is within the required range.
3) If there is an air filter on the actuator, bleed the condense water accumulated in the cup by opening the drain cock. Disassemble the cup periodically and wash it with diluent; disassemble the filter: if this is made up of a sintered cartridge, wash it with nitrate solvent and blow through with air. If the filter is made of cellulose, it must be replaced when clogged.

4) Check that the external components of the actuator are in good conditions.
5) Check all the paint-coat of the actuator. If some areas are damaged, repair the paint-coat according to the applicable specification.
6) Check that there are no leakages in the pneumatic connections. If necessary tighten the nuts of the pipefittings.

b) Special maintenance

b1) Replacement of pneumatic cylinder seals (see Fig.1 and Fig.2)

If there are leaks in the pneumatic cylinder or a malfunction in the mechanical components, or in case of scheduled preventive maintenance,the actuator must be disassembled and seals must be replaced with reference to the attached sectional drawing and adopting the following procedures.

SPRING TO CLOSE ACTUATORS

Disassembly

Disassemble the screws (13,13-1) and the nuts (17,21) from the pneumatic cylinder end flange.

1) Slide off the end flange (4,1) and the cylinder tube (6,5).

Seals replacement and re-assembly

Prior to reassemble check that the actuator components are in good conditions and clean. Lubricate all the surfaces of the parts, which move in contact with other components, by recommended grease. If the O-Rings must be replaced, remove the existing from the grooves, clean the grooves carefully and lubricate with protective oil or grease film. Assemble the new O-Rings into the grooves and lubricate again.

1) Replace the O-Ring or cylinder gasket (35) of the head flange.
2) Replace the O-Ring (34) and the guide sliding ring (33) of the piston (3).
3) Remove the screw (23) from the head flange (2). Remove the head flange and replace the O-ring (38).
4) Carefully clean the inside of the tube (5) and check that the entire surface, particularly that of the bevels, is not damaged. Lubricate the inside surface of the tube and the bevels at the ends. Slide the tube onto the piston, taking care not to damage the O-Ring, up to about half its length. Since, during this operation the guide-sliding ring of the piston removes the grease film from the tube surface. Complete the axial movement of the tube until it touches the head flange on the cylinder, taking care not to damage the head flange O-Ring (35).
5) Replace the O-Ring or cylinder gasket (35) of the end flange (1).

6) Assemble the end flange by centring it on the inside diameter of the tube, taking care not to damage the O-Ring.
7) Assemble the screws (13,13-1) and the nuts (17,21), tighten to the recommended torque, alternating between opposite corners.

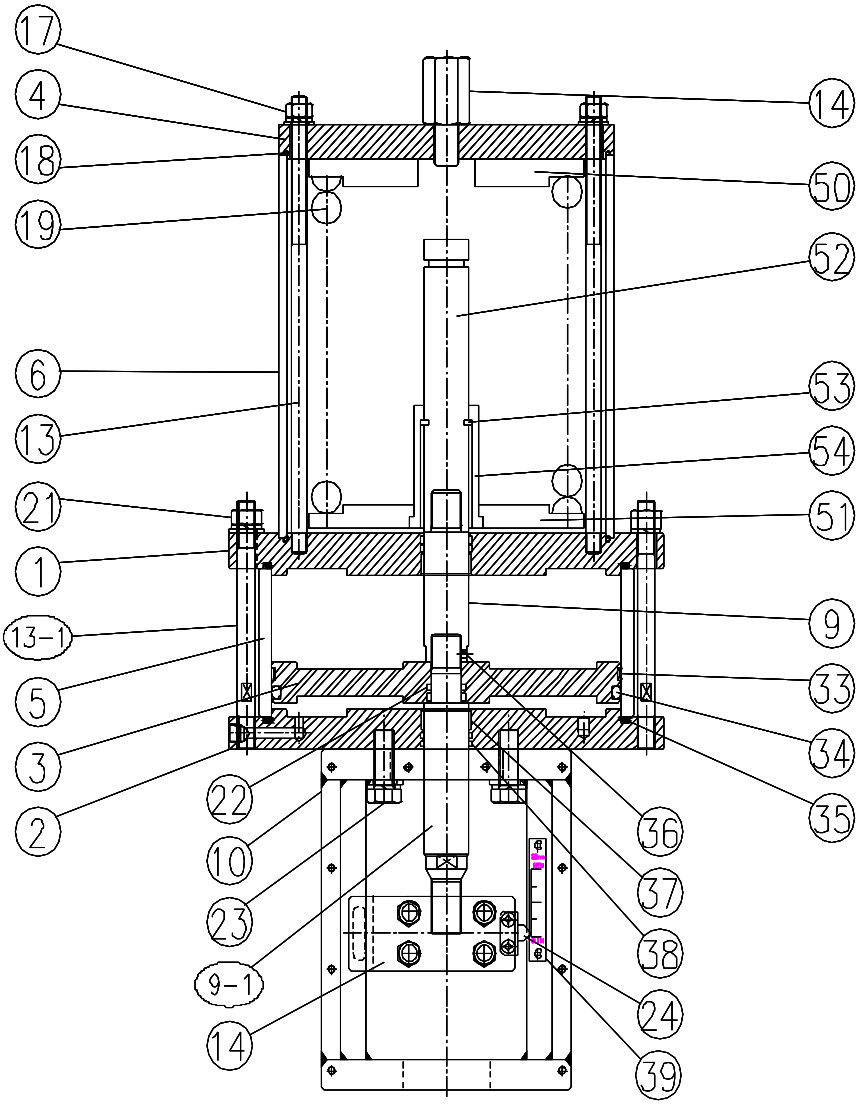
SPRING TO OPEN ACTUATORS

Disassembly

SPRING TO CLOSE ACTUATORS the same order and the decomposition.

AFTER MAINTENANCE OPERATIONS CARRY OUT A FEW ACTUATOR OPERATIONS TO CHECK THAT ITS MOVEMENT IS REGULAR AND THAT THERE IS NO OIL LEAKAGE THROUGH THE SEALS.

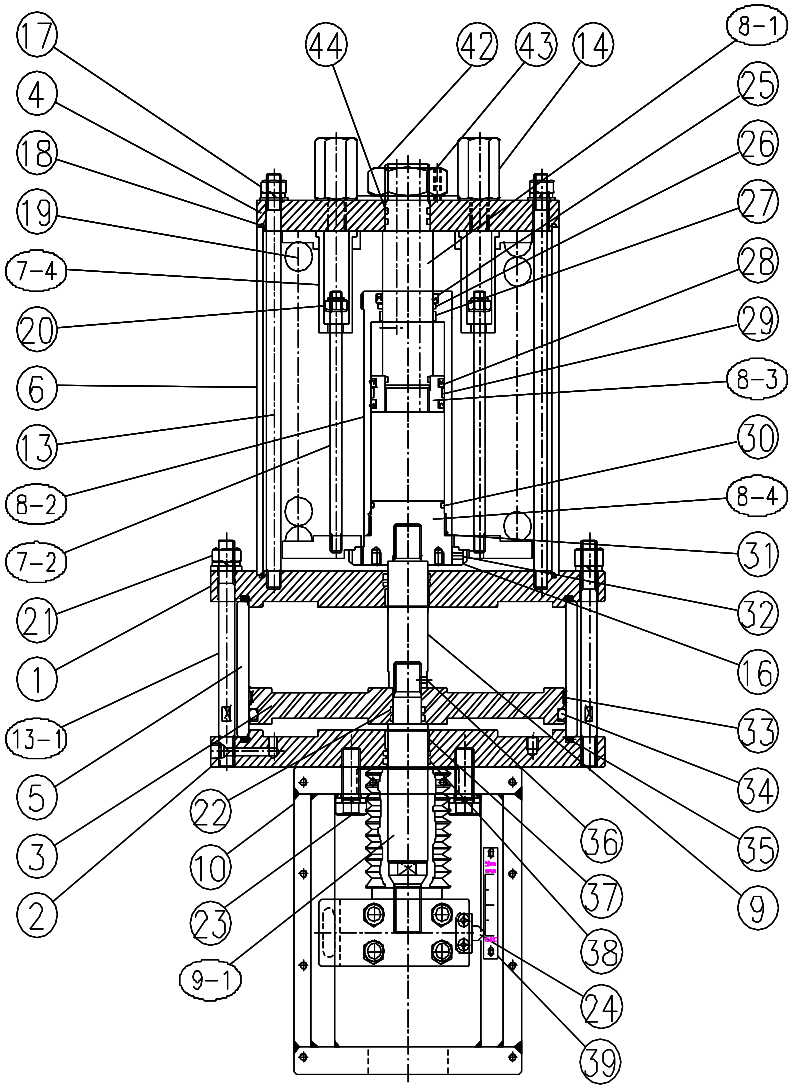
900 Series CYLINDER ACTUATOR.



No.	DESCRIPTION	No.	DESCRIPTION	No.	DESCRIPTION
1	TOP COVER	13-1	STUD BOLT	34	O-RING
2	BOTTOM COVER	14	LOCK NUT & BOLT	35	O-RING
3	PISTON	16	HEX.NUT&S/W&P/W	36	SET SCREW
4	SPRING COVER	17	HEX.NUT&S/W&P/W	37	DU-BEARING
5	CYLINDER	18	O-RING	38	O-RING
6	SPRING CASE	19	SPRING	39	SCALE
9	ACT. STEM-1	21	HEX.NUT&S/W&P/W	50	SPRING PLATE-1
9-1	ACT. STEM-2	22	O-RING	51	SPRING PLATE-2
10	BRACKET	23	HEX.BOLT & S/W & P/W	52	ACT. STEM-3
12	CONNECTOR	24	INDICATOR	53	RETAINER RING
13	STUD BOLT	33	WEAR-RING	54	PISTON ROD GUIDE TUBE

Fig. 1

960 Series CYLINDER ACTUATOR.



No.	DESCRIPTION	No.	DESCRIPTION	No.	DESCRIPTION	No.	DESCRIPTION
1	TOP COVER	9-1	ACT. STEM	23	HEX.BOLT & S/W & P/W	36	SET SCREW
2	BOTTOM COVER	10	BRACKET	24	INDICATOR	37	DU-BEARING
3	PISTON	13	STUD BOLT	25	ROD SEAL	38	O-RING
4	SPRING COVER	13-1	STUD BOLT	26	O-RING	39	SCALE
5	CYLINDER	14	LOCK NUT & BOLT	27	WEAR-RING	40	HEX.BOLT & S/W & P/W
6	SPRING CASE	15	CONNECTOR	28	PISTON SEAL	41	WRENCH BOLT
7-2	STUD BOLT	16	BEARING NUT	29	WEAR-RING	42	HEX.NUT
7-4	STOP HOLDER	17	HEX.NUT&S/W&P/W	30	O-RING	43	SET SCREW
8-1	CYLINDER ROD	18	O-RING	31	O-RING	44	O-RING
8-2	HYDRAULIC CYLINDER	19	SPRING	32	SET SCREW		
8-3	PISTON	20	NYLON NUT	33	WEAR-RING		
8-4	CYLINDER COVER	21	HEX.NUT&S/W&P/W	34	O-RING		
9	ACT. STEM	22	O-RING	35	O-RING		

Fig. 2

b2) Replacement of hydraulic cylinder seals (see Fig.3)

If there are leaks in the hydraulic cylinder or a malfunction in the mechanical components, or in case of scheduled preventive maintenance, the actuator must be disassembled and seals must be replaced with reference to the sectional drawing and adopting the following procedures:

1) Cylinder cover (NO.10) and rotate counter-clockwise to remove.
2) Cylinder Rod (NO.1) and hydraulic cylinders (NO.7) is removed from.

Seals replacement

Prior to reassemble check that the actuator components are in good conditions and clean. Lubricate all the surfaces of the parts, which move in contact with other components, by recommended grease. If the O-ring must be replaced, remove the existing one from its groove, clean the groove carefully and lubricate it with protective oil or grease film. Assemble the new O-ring into its groove and lubricate it with a protective oil or grease film.

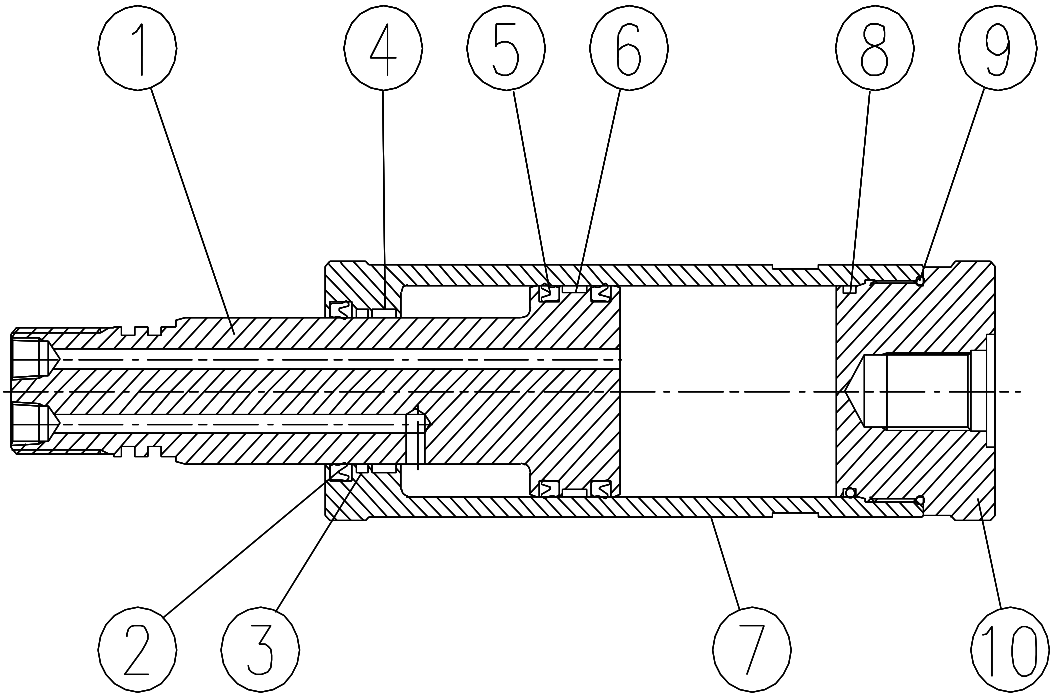
1) Replace the Piston seal (5) of the wear-ring (6).
2) Replace the Rod seal (2) of the O-rings (3).
3) Replace the O-rings (8) of the end cover (10).

Reassemble

1) Cylinder Rod (N0.1) and Greece after the hydraulic cylinder charging (NO.7) to push.
2) Cylinder cover (N0.10) and Greece after charging cylinders rotate clockwise (NO.7 and assemble.

After maintenance operations Carry out a few actuator operations to check that its movement is regular and that there is no air leakage through the seals

960 Series HYDRAULIC CYLINDER.



No.	DESCRIPTION	No.	DESCRIPTION
1	CYLINDER ROD	6	WEAR-RING
2	ROD SEAL	7	HYDRAULIC CYLINDER
3	O-RING	8	O-RING
4	WEAR-RING	9	O-RING
5	PISTON SEAL	10	CYLINDER COVER

Fig. 3

Control Valve or Specioal Valve

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