

Jamesbury™ automated ball valves

Model 451A

Installation, maintenance and
operating instructions

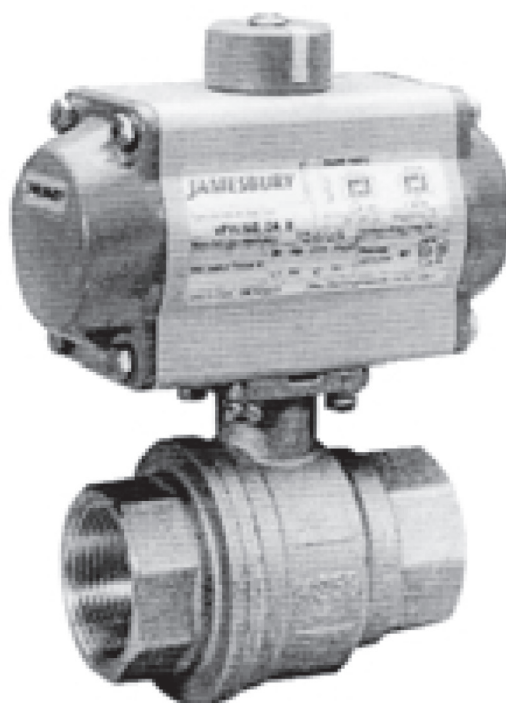


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READ THESE INSTRUCTIONS FIRST!

These instructions provide information about safe handling and operation of the valve.

If you require additional assistance, please contact the manufacturer or manufacturer's representative.

SAVE THESE INSTRUCTIONS!

Addresses and phone numbers are printed on the back cover.

1. GENERAL

This instruction manual contains important information regarding the installation, maintenance, and troubleshooting of the Jamesbury 451A Automated Ball Valve. Please read the instructions carefully and save them for future reference.

WARNING

FOR YOUR SAFETY, IT IS IMPORTANT THAT THE FOLLOWING PRECAUTIONS BE TAKEN PRIOR TO REMOVAL OF THE VALVE FROM THE LINE OR BEFORE ANY DISASSEMBLY.

1. WEAR ANY PROTECTIVE CLOTHING OR EQUIPMENT NORMALLY REQUIRED WHEN WORKING WITH THE FLUID INVOLVED.
2. DEPRESSURIZE THE PROCESS LINE AND CYCLE THE VALVE AS FOLLOWS:
 - A. PLACE THE VALVE IN THE OPEN POSITION AND DRAIN THE LINE.
 - B. CYCLE THE VALVE TO RELIEVE RESIDUAL PRESSURE IN THE BODY CAVITY BEFORE REMOVAL FROM THE LINE.
 - C. AFTER REMOVAL AND BEFORE ANY DISASSEMBLY, CYCLE THE VALVE AGAIN SEVERAL TIMES.
3. SHUT OFF AND BLEED ALL ACTUATOR SUPPLY LINES BEFORE SERVICING. DO NOT REMOVE ACTUATOR END CAPS WHILE THE ACTUATOR IS PRESSURIZED.
4. WHEN INSTALLING OR REMOVING PIPING FROM THE VALVE, PLACE A WRENCH ON THE BODY OR THE BODY CAP NEAREST THE END BEING WORKED. MAKE CERTAIN THE BODY END CAP OF VALVE DOES NOT TURN OUT OF VALVE BODY. BODY CAP IS A RIGHT HAND THREAD.
5. DO NOT ATTEMPT TO DISASSEMBLE THE INDIVIDUAL ACTUATOR SPRING CARTRIDGES. DISASSEMBLY OF THE CARTRIDGE MAY RESULT IN SERIOUS PERSONAL INJURY. IF MAINTENANCE OF THE CARTRIDGE IS NECESSARY, IT MUST BE RETURNED TO VALMET.
6. WHEN ASSEMBLING THE VALVE TO THE ACTUATOR, BE SURE THAT THE INDICATOR ON TOP OF THE ACTUATOR CORRECTLY SHOWS THE VALVE POSITION. FAILURE TO ASSEMBLE THESE PRODUCTS TO INDICATE THE CORRECT VALVE POSITION COULD RESULT IN PERSONAL INJURY.
7. OPERATING THE VALVE/ACTUATOR ASSEMBLY OVER TEMPERATURE AND PRESSURE LIMITS MAY DAMAGE INTERNAL AND EXTERNAL COMPONENTS AND RESULT IN PREMATURE FAILURE. IF A SPRING RETURN ACTUATOR HAS BEEN EXPOSED TO TEMPERATURES ABOVE THE LIMIT, REMOVAL OF THE END CAPS MAY BE DANGEROUS AND THE ACTUATOR SHOULD BE SENT BACK TO VALMET FOR DISASSEMBLY.

2. INSTALLATION/REMOVAL OF VALVE/ACTUATOR ASSEMBLY

2.1 GENERAL

1. Double-acting and spring-return assemblies are sized to operate most efficiently with a minimum of 60 psi (4.1 bar) actuator supply air pressure.

2. Spring-return actuators are supplied in the spring-to-close orientation as shown in (Figure 4). In the spring-to-close mode, the actuator cycles clockwise to close the valve upon loss of pressure. If spring-to-open orientation is desired, follow the disassembly procedure, (Section 5.2.2). Reverse the orientation of pistons, then reassemble following the procedure in (Section 5.2.3).
3. Air can be supplied via the NPT fittings in actuator housing or a Namur® solenoid can be mounted directly to the housing. A regulated air supply is recommended for consistent operation. **CAUTION:** The maximum operating pressure is 116 psi (8 bar).
4. If the valve does not fully open or close, the actuator stops can be adjusted by up to ± 4 degrees by following the directions in (Section 5.2.3.5).

2.2 INSTALLATION

1. Use standard piping practices when installing valves with threaded parts. When tightening the valve to the pipe, be sure to apply the wrench to the valve end closest to the pipe as shown in (Figure 1). Screwed-end valves have NPT threads, (not DrySeal type). To insure a leaktight joint, liberal use of a commercial pipe-joint compound is necessary. (Figure 451A) valves may be installed for flow in either direction, however, it is recommended that the valve be installed with the body cap facing upstream.

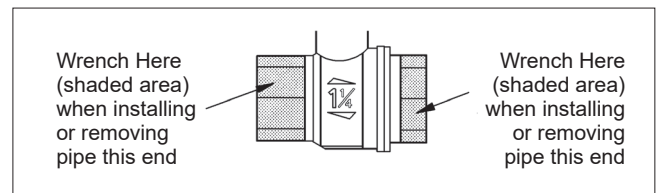


Figure 1. Screwed End Valve

2. Connect a regulated air supply to the air ports in the actuator or mount a solenoid that complies with NAMUR specifications directly to the actuator. The air ports and Namur mounting pattern are shown in (Figure 2). The maximum operating pressure is 116 psi (8 bar).

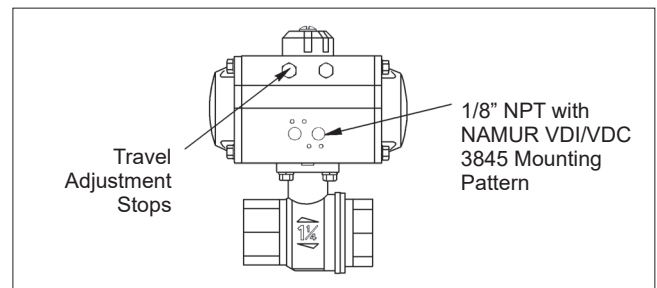
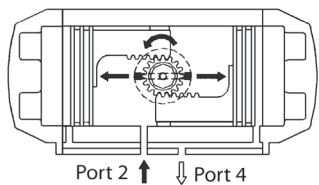
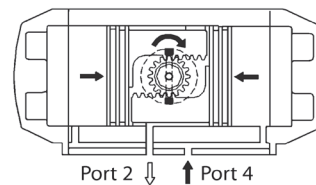


Figure 2. Valve/Actuator Assembly

3. Verify that valve fully seals in the closed position. If it does not, adjust the stops in the actuator following the procedure in (Section 5.2.3.5).

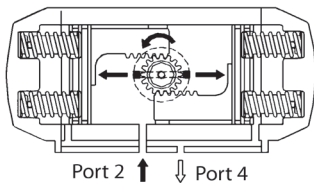


Air supplied to **Port 2** forces pistons apart and toward end positions with exhaust air exiting at **Port 4** (a counterclockwise rotation is obtained).

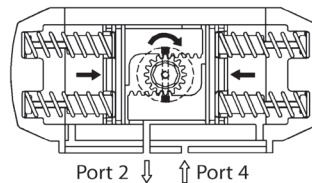


Air supplied to **Port 4** forces pistons toward center with exhaust air exiting at **Port 2** (a clockwise rotation is obtained).

Figure 3. Double-Acting (Top View)



Air supplied to **Port 2** forces pistons apart and toward end position, compressing springs. Exhaust air exits at **Port 4** (a counterclockwise rotation is obtained).



Loss of air pressure allows springs to force pistons toward center position with exhaust air exiting at **Port 2** (a clockwise rotation is obtained).

Figure 4. Spring-Return (Top View) Spring-To-Close

2.3 REMOVAL

- Depressurize the process line and cycle the valve as follows:
 - Place the valve in the open position and drain the process line.
 - Cycle the valve to relieve residual pressure in the body cavity before removal from the line.
- Shut off air supply and bleed all actuator supply lines before servicing. Do not remove actuator end caps while the actuator is pressurized.
- Remove valve from piping. Place wrench on the body or the body cap nearest the end being worked. Make certain the body end cap of valve does not turn out of valve body. Body cap is a right hand thread. Cycle the valve again several times and drain any residual fluid.

3. ASSEMBLY/DISASSEMBLY OF VALVE FROM ACTUATOR

3.1 DISASSEMBLY

The actuator can be removed with the valve in line or with the valve removed from line. To remove the valve from line, follow the steps in (Section 2.3). To remove the actuator from a valve that is in line, follow steps 1 and 2 in (Section 2.3) before proceeding.

- Unscrew the bolts connecting the actuator to the valve and remove.

3.2 ASSEMBLY

The actuator can be installed onto the valve prior to installation of the valve or while the valve is in line.

Make sure that both the actuator and the valve are in the closed position. The actuator shaft will be rotated all the way in the clockwise direction when it is in the closed position.

Align the holes in the valve body with those on the actuator mounting pad. Tighten the bolts evenly

4. TECHNICAL SPECIFICATIONS

4.1 VALVE

- Sealing Capability:** Bidirectional
- Rating:** 400 psi (27.6 bar) CWP
- Temperature Limit:** -4° to 400°F (-20° to 205°C)
- Pipe:** Threaded female compatible with NPT.
- Construction:** Brass body to Din 17660, and UNI 5705-65 specifications.

4.2 ACTUATOR

- Operating Media:** Dry or lubricated air, non-corrosive and inert gas, or a light natural hydraulic oil.
- Air Supply:** 8 bar (116 psi) maximum
- Temperature Limit:** -4° to 175°F (-20° to 80°C)
- Lubrication:** Factory lubricated for the life of the actuator under normal operating conditions.
- Construction:** Suitable for indoors and outdoor use.
- External Travel Stops:** ±4 degrees adjustment on 90-degree stroke.

5. MAINTENANCE OF VALVE AND ACTUATOR

5.1 VALVE

Valves are maintenance-free and replacement valves are available rather than service kits. (Table 1) lists replacement valve figure numbers.

Table 1
Valve Figure Number
1/2" 451A (DN 15)
3/4" 451A (DN 20)
1" 451A (DN 25)
1-1/4" 451A (DN 30)
1-1/2 451A (DN 40)
2" 451A (DN 50)

5.2 ACTUATOR

GENERAL

All VPVL actuator fasteners are metric. Under normal operating conditions, the actuator requires only periodic observation to ensure proper adjustment. Service kits are available to replace seals and bearings (soft parts). These parts are identified in (Figure 21) and listed in (Table 4). (Table 2) lists kit part numbers.

Table 2	
Actuator	Service Kit
VPVL050	RKP-153
VPVL100	RKP-154
VPVL200	RKP-155
VPVL250	RKP 156

ACTUATOR DISASSEMBLY

When disassembly of the actuator is required for maintenance, remove the actuator from the valve. Ensure proper lifting procedures are followed when moving or carrying actuators.

CAUTION: Do not use the M5 VDE/VDI mounting holes or the M6 hole in the pinion for lifting the actuator.

When disassembling VPVL actuators, use caution and be certain that the actuator is free from accessories and the air supply is disconnected. When the actuator is a spring-return unit, make sure that the actuator is in the failed position before disassembling.

1. **Removal of Position Indicator (19, 20) (Figure 5):**
 - a) Remove cap screw if fitted (39).
 - b) Lift position indicator (19) off shaft; it may be necessary to pry gently with a screwdriver.
2. **Removal of Stop Cap Screws (02), (Figure 6):**
 - a) Remove both stop cap screws (02) together with nut (04) and washer (03).
 - b) Remove stop screw o-rings (11) and discard if replacing all soft parts.

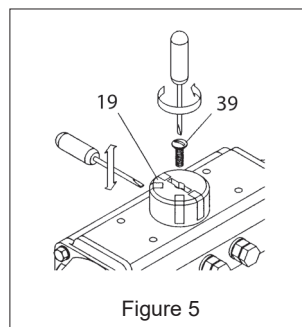


Figure 5

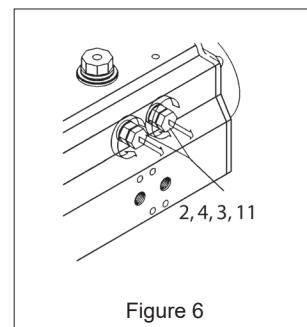


Figure 6

3. End Cap (30, 31) Disassembly, (Figure 7):

- a) Remove the end cap bolts (13) in the sequence shown in (Figure 7).

CAUTION:

WHEN DISASSEMBLING A SPRING RETURN ACTUATOR, THE END CAP (30, 31) SHOULD BE LOOSE AFTER UNSCREWING END CAP BOLTS (13) 4-5 TURNS. IF THERE IS STILL FORCE ON THE END CAP (30, 31) AFTER 4-5 TURNS OF THE END CAP BOLT (13), THIS MAY INDICATE A DAMAGED SPRING CARTRIDGE AND ANY FURTHER DISASSEMBLY SHOULD BE DISCONTINUED. FURTHER DISASSEMBLY OF THE END-CAPS MAY RESULT IN SERIOUS PERSONAL INJURY. RETURN ACTUATOR TO VALMET FOR FURTHER MAINTENANCE.

- b) For spring return actuators, remove spring cartridges (17).
- c) Remove end-cap o-rings (14) and discard if replacing all soft parts.

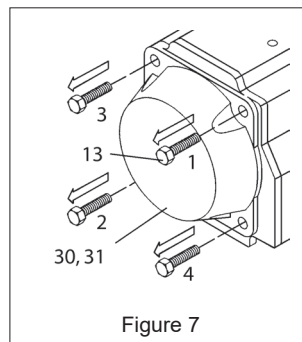


Figure 7

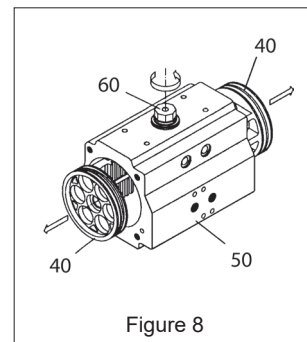


Figure 8

4. Piston (40) Disassembly, (Figure 8):

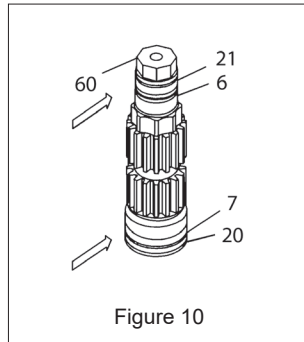
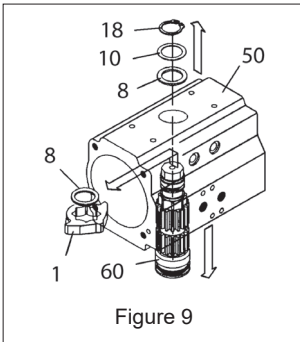
- a) Holding the body (50) in a vice (or similar device), rotate the drive shaft (60) until the pistons (40) are released.

CAUTION:

DO NOT USE AIR PRESSURE TO REMOVE THE PISTONS FROM THE BODY. CLEAN AND INSPECT THE PISTON TEETH FOR SIGNS OF WEAR. REPLACE PISTON IF WEAR SEEMS EXCESSIVE.

- b) Remove piston o-ring seal (16) using a screwdriver. Remove the piston head (15) and piston back (5) bearings. Discard bearings if replacing all soft parts.

5. Drive Shaft (60) and Bearing (6, 7) Disassembly, (Figure 9):



- Remove spring clip (18) carefully, using snapping pliers. Remove external thrust bearing (8) and thrust washer (10).
- Apply downward force to top of drive shaft (60) until it is partially out of the bottom of the body (50) and the octi-cam (1) and internal thrust bearing (8) can be removed. Remove the octi-cam (1) and internal thrust bearing (8). Push the drive shaft (60) completely out of the bottom of the body (50). If the shaft (60) does not move freely, gently tap with a plastic mallet.
- Remove the top and bottom shaft bearings (6, 7) and top and bottom shaft o-rings (21, 22). Discard if replacing all soft parts.

6. Cleaning and inspection.

- When all components are disassembled, those not being replaced should be properly cleaned and inspected for wear prior to re-assembly.

ACTUATOR ASSEMBLY

Prior to assembly, ensure that all components are clean and undamaged.

Note: (Table 3) lists the recommended Valv-Powr® lubricants.

1. Drive Shaft (60) Assembly, (Figures 10 & 11):

- Install the top and bottom shaft bearings (6, 7) and o-rings (21, 22) onto the shaft (60).
- Apply grease to the shaft bearings (6, 7), using a general purpose grease listed in (Table 3). Apply silicone grease to the shaft o-rings (21, 22) using the recommended o-ring-area grease listed in (Table 3).
- Partially insert the shaft (60) into the body (50). Install the octi-cam (1) onto the shaft in the orientation shown in (Figure 11). The edges of the octi-cam (1) should align with the edges of the square in the bottom of the shaft (60). Insert the internal thrust bearing (8) over the octi-cam (1). Fully insert the shaft into the body (50).
- Install the external thrust bearing (8), thrust washer (10), and the spring clip (18).

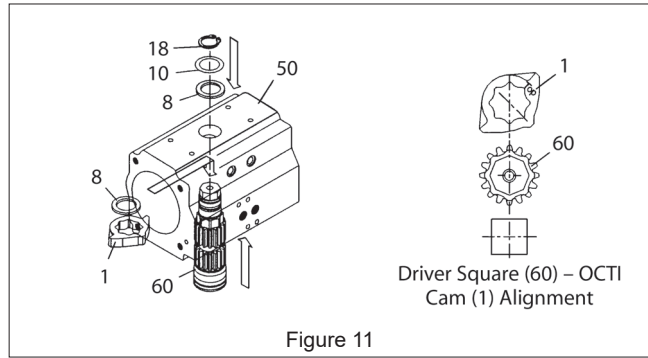


Figure 11

Table 3	
RECOMMENDED VPVL LUBRICANTS	
General Use	Kluber UniGear LA 02 Grease
	Esso (Exxon) Beacon EP2
	Fina Marson EP L2
	Shell Alvania EP2
	Mobilux EP2
	Dyrdene Pyroplex EP2
O-Ring Areas	Oilsum Multiplex
	Dow-Corning Silicone 111

2. Piston (40) Assembly, (Figures 12 through 15):

- Install the piston o-ring seal (16) and the piston head (15) and piston back (5) bearings.
- Apply silicone grease to the internal bore of the body (50) using a recommended o-ring area grease listed in (Table 3). Apply grease to the piston (40) rack teeth using a recommended general-purpose grease listed in (Table 3).
- Hold the body (50) in a horizontal position by inserting the top of the shaft in a vice, or inserting the bottom of the shaft connection into a male drive fitted into a vice as shown by (Figure 12).
- Ensure that the octi-cam (1) is in the correct position as shown by (Figure 13).
- For standard-rotation assembly (clockwise to close) rotate the body (50) 40-45° counter-clockwise (if viewing the bottom of the actuator), or clockwise (if viewing the top of the actuator) as shown in (Figure 14).
- Press the two pistons (40) simultaneously into the body (50) until the piston racks are engaged and rotate the body clockwise (if viewing the bottom of the actuator), or counter-clockwise (if viewing the top of the actuator), until the stroke is completed.
- To ensure that the piston (40) teeth are evenly engaged, fully compress both pistons (40) inward and measure the distance from the edge of the body to the piston (40) face on each side, shown as dimension "A" in (Figure 14). If a different value is obtained on each side, remove the pistons and repeat from step 2d.

- h) Temporarily install the position indicator (19) onto the shaft (60) to determine whether the correct stroke is obtained. Verify that the slot in the top of the position indicator (19) will rotate a minimum of 4° beyond the 90° vertical centerline of the actuator body (50) and a minimum of 4° beyond the 0° horizontal centerline of the actuator body as shown in **(Figure 15)**. If the proper stroke is not obtained, remove the pistons and repeat from step 2d. Once the proper stroke is verified, remove the position indicator (19).

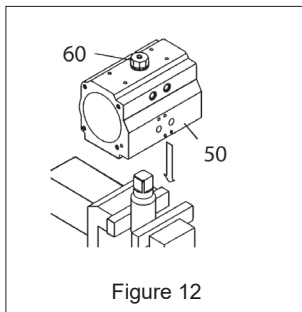


Figure 12

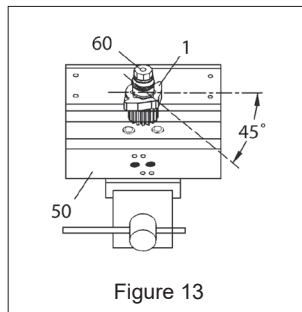


Figure 13

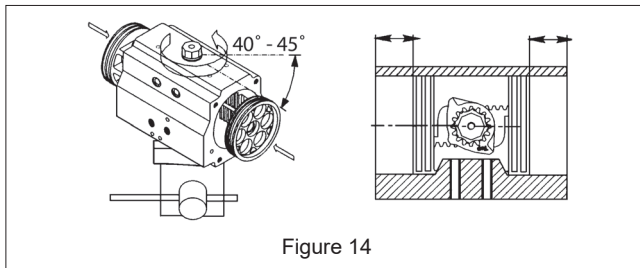


Figure 14

3. End Cap (30, 31) and Spring Cartridge (17) Assembly, (Figures 16 through 18):

Note: In models VPVL 550 through 700 the end caps are symmetrical and use two item (30)s.

- For spring-return actuators, insert the proper quantity of spring cartridges (17) according to the pattern shown in **(Figure 16)** (referring to the total number of springs). Insert spring cartridges (17) as shown in **(Figure 17)**.
- Apply silicone grease to the end-cap o-ring seals, using the recommended o-ring area grease listed in **(Table 3)**. Fit the end-cap o-ring seals (14) into the groove in each end cap (30, 31).
- Fit the end caps (30, 31) onto the body (50), verifying that the o-ring seals (14) remain in the grooves.
- Insert all end-cap screws (13) and hand tighten. Complete tightening by following the sequence indicated in **(Figure 18)**.

4. Assembly of Stop Screws (2) and Stroke Adjustment, (Figure 19):

- Insert the nut (4), washer (3), and o-ring (11) onto the stop screws (2).
- Screw the stop screws (2) into the body (50).

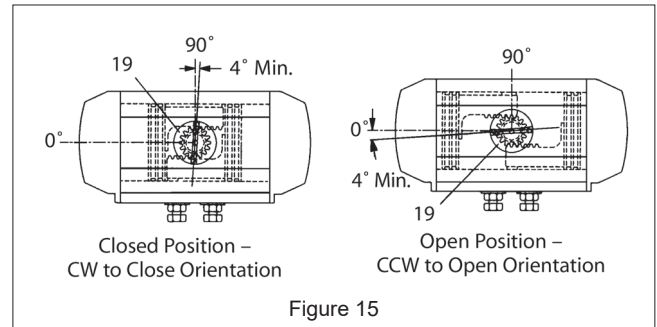


Figure 15

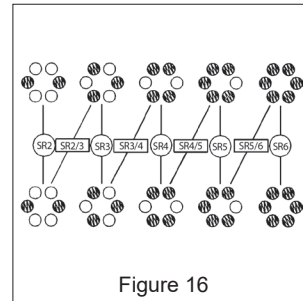


Figure 16

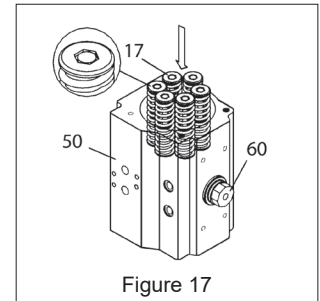
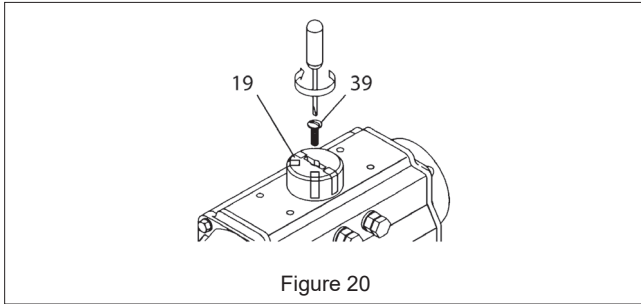
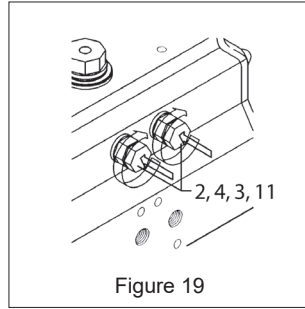
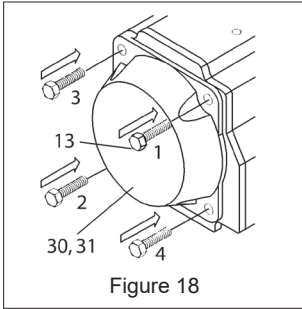


Figure 17

5. External Travel Stop Adjustment, (Figure 19):

The stop adjustment screw (2) to the right controls the clockwise end of travel. The stop adjustment screw (2) to the left controls the counter-clockwise end of travel.

- Cycle the actuator/valve to the clockwise end of travel and measure to determine if the valve is in the proper position. (In most applications this will be fully closed.)
- If the valve is not in the correct clockwise position, turn the right stop adjustment screw (2) IN to reduce actuator travel, or OUT to increase actuator travel.
- When the correct clockwise position is obtained, hold the adjusting screw (2) stationary while tightening the lock nut (4).
- Cycle the actuator/valve to the counter-clockwise end of travel and measure to determine if the valve is in the proper position. (In most applications this will be fully opened.)
- If the valve is not in the correct counter-clockwise position, turn the left stop adjustment screw (2) IN to reduce actuator travel, or OUT to increase actuator travel.
- When the correct counter-clockwise position is obtained, hold the adjusting screw (2) stationary while tightening the lock nut (4).



6. Position Indicator (19, 39) Assembly, (Figure 20):

- a) Fit position indicator (19) on the shaft (60), verifying that it indicates the correct actuator position.
- b) Tighten cap screw (39) to secure the position indicator.

ACTUATOR STORAGE

If the actuators are not for immediate use, the following precautions must be taken for storage:

- a) Store in a dry environment.
- b) It is recommended that the actuator be stored in its original box.
- c) Do not remove the plastic plugs on the air supply ports.

For further information or assistance visit our web-site at www.neles.com.

REPAIR KITS/SPARE PARTS

See (Table 2) for a list of Actuator Service Kits. See (Figure 21) and associated (Table 4) for suggested spare parts for maintenance.

EXPLODED VIEW/PARTS LIST

(Figure 21) is an exploded view of the Actuator assembly. (Table 4) is a list of the parts shown in (Figure 21).

ACTUATOR EXPLODED VIEW

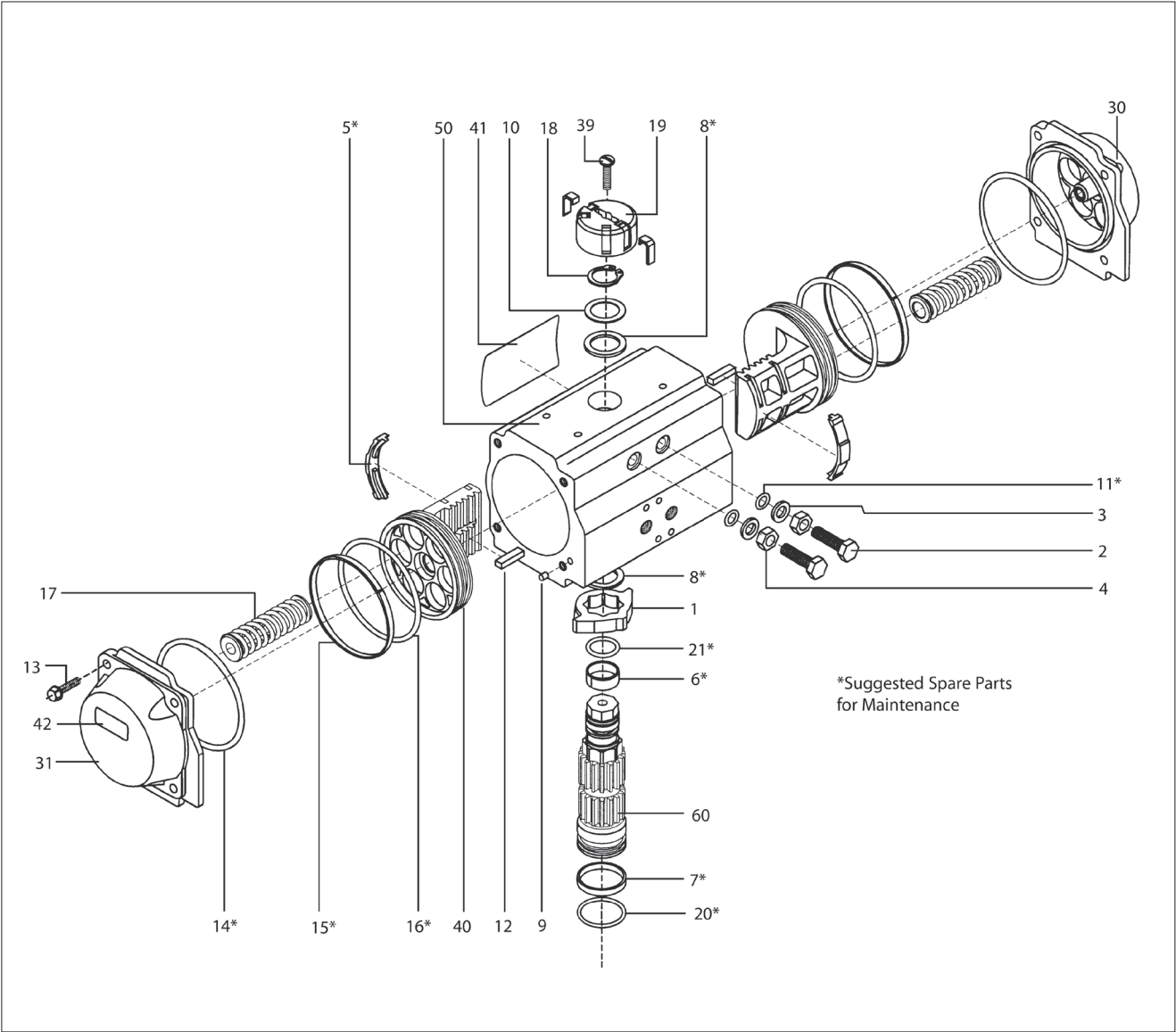


Figure 21

Table 4 – Actuator Parts List For (Figure 21)		
PART NO.	DESCRIPTION	QTY
1	Octi-Cam (Stop Arrangement)	1
2	Stop Cap Screw	2
3	Washer (Stop Cap Screw)	2
4	Nut (Stop Cap Screw)	2
5*	Bearing (Piston Back)	2
6*	Bearing (Pinion Top)	1
7*	Bearing (Pinion Bottom)	1
8*	Thrust Bearing (Pinion)	2
9*	Plug (Transfer Port)	2
10	Thrust Washer (Pinion)	1
11*	O-Ring (Stop Cap Screw Seal)	2
12	Piston Guide	2
13	Cap Screw (End Cap)	8/12/ ¹
14*	O-Ring (End Cap)	2
15*	Bearing (Piston Head)	2
16*	O-Ring (Piston)	2
17	Spring (Cartridge)	min. 4/max.12
18	Spring Clip (Pinion)	1
19	Position Indicator	1
20*	O-Ring (Pinion Bottom)	1
21*	O-Ring (Pinion Top)	1
30	Right End Cap	1 ²
31	Left End Cap	1 ²
39	Cap Screw (Indicator)	1
40	Pistons	2
41	Actuator Identification Label	1
42	End Cap Label	2
50	Body	1
60	Drive Shaft	1

* Suggested spare parts for maintenance.

1. Quantity 8 pieces for models VPVL-050 through 600

Quantity 12 pieces for model VPVL-700

2. Only for model VPVL-500 through 700; right and left end-caps are symmetric.

6. REPAIR KITS/SPARE PARTS

For further information on spare parts and service or assistance visit our web-site at www.neles.com.

Valmet Flow Control Oy

Vanha Porvoontie 229, 01380 Vantaa, Finland.

flowcontrol@valmet.com

Tel. +358 10 417 5000.

www.valmet.com/flowcontrol

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