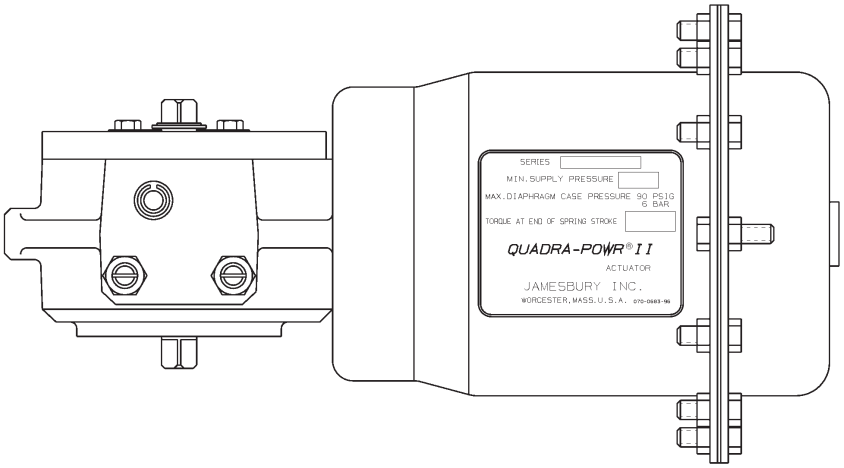
jamesbury

Quadra-Powr® II
Spring-Diaphragm Actuators

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.
Addresses and phone numbers are printed on the back cover.
See also www.metso.com/valves for the latest documentation.

SAVE THESE INSTRUCTIONS!

1. GENERAL

This instruction manual contains important information regarding the installation, operation and troubleshooting of the *Jamesbury Quadra-Powr* II spring-diaphragm actuators. This unique spring-diaphragm actuator designed for rotary valves provides safe, smooth and reliable valve actuation at minimal pressures and up to 100 psi (6.9 BAR). Please read these instructions carefully and save them for further reference.

1.1 WARNING:

KEEP HANDS AND CLOTHING AWAY FROM THE VALVE PORTS AT ALL TIMES.

DO NOT ATTEMPT TO DISASSEMBLE THE SPRING CARTRIDGE. DISASSEMBLY OF THE SPRING PACKAGE MAY RESULT IN SERIOUS PERSONAL INJURY. IF MAINTENANCE IS REQUIRED, THE ENTIRE ACTUATOR MUST BE RETURNED TO *JAMESBURY.*

SHUT-OFF AND BLEED ALL SUPPLY LINES BEFORE INSTALLATION OR SERVICING. DO NOT REMOVE DIAPHRAGM CASING HEX HEAD SCREWS (25 & 27), NUTS (29) OR DIAPHRAGM CASING (15) WHILE ACTUATOR IS PRESSURIZED.

BEFORE INSTALLING THE VALVE AND ACTUATOR, BE SURE THAT THE INDICATOR POINTER ON TOP OF THE ACTUATOR (AND THE IDENTIFICATION PLATE IN FEMALE ACTUATORS) ARE CORRECTLY INDICATING THE VALVE POSITION. FAILURE TO ASSEMBLE THESE PRODUCTS TO INDICATE THE CORRECT VALVE POSITION COULD RESULT IN PERSONAL INJURY.

AN ACTUATOR MUST BE SIZED ACCURATELY FOR PROPER OPERATION. REFER TO INFORMATION ON ACTUATOR END OF STROKE TORQUES AND THE APPROPRIATE VALVE BULLETIN FOR OPERATING TORQUES.

WHEN SERVICING A VALVE ACTUATOR ASSEMBLY,THE BEST PRACTICE IS TO REMOVE THE ENTIRE ASSEMBLY FROM SERVICE. IF THE ACTUATOR IS REMOVED FROM THE VALVE, IT SHOULD BE REMOUNTED ON THAT SAME VALVE AFTER SERVICING IS COMPLETED.THE ACTUATOR MUST BE READJUSTED FOR PROPER OPEN AND CLOSE POSITION EACH TIME IT IS REMOUNTED.

ACTUATORS ARE NOT TO BE LIFTED USING THE 3/8" NPT IN THE DIAPHRAGM CASING. HANDLING OF THE ACTUATOR IS ACCOMPLISHED BY USING TWO M10 EYE NUTS SCREWED ONTO THE TWO HEX HEAD SCREWS (25) ON THE DIAPHRAGM CASING (15),THAT ARE FACING THE OPPOSITE DIRECTION OF THE OTHER FASTENERS. FOR THE QP6, USE FOUR M10 EYE-NUTS. **(ACTUATOR WEIGHT: SEE TABLE 1.**)

1.2 Handling *Quadra-Powr* II Actuators

Handling of the actuator is to be accomplished by using two M10 eye-nuts screwed onto the two hex head screws (25), which are facing the opposite direction of the other fasteners. For the QP6 use four M10 eye-nuts.

TABLE 1

Handling *Quadra-Powr* II Actuators

Actuator Series	Approximate Weight Lb. (kg)
QP1	23 (10)
QP2	42 (19)
QP3	72(33)
QP4	117 (53)
QP5	235 (107)
Qp6	520 (235)

2. INSTALLATION

1. Check to see that the position indicator on the actuator is assembled correctly for the desired failure mode, either spring-to-close or spring-to-open. In the springto- close mode, the actuator will cycle clockwise to close upon loss of pressure. In the spring-to-open mode, the actuator will cycle counterclockwise to open upon loss of pressure.
2. If the actuator is not set up in the configuration desired, remove the four hex head screws (33), indicator plate (12), indicator pointer (24), and remount them on the opposite mounting surface. In the female actuators, the fastener identification plate shows the failure mode of the actuator.

SPRING-TO-CLOSE
In this mode the actuator will cycle clockwise to close upon loss of pressure

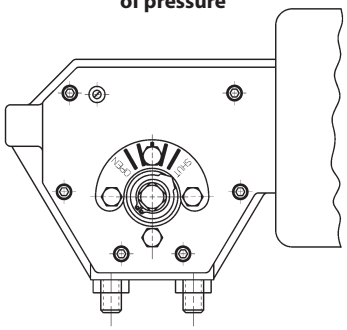


Figure 1

SPRING-TO-OPEN
In this mode, the actuator will cycle counterclockwise to open upon loss of pressure

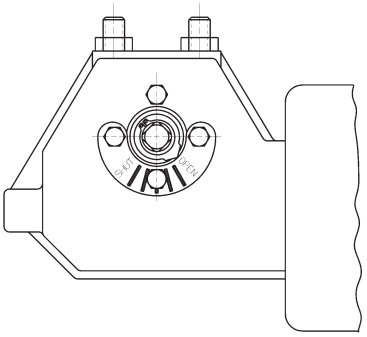


Figure 2

3. Mount the actuator to the valve following the directions in the AMI (Actuator Mounting Instructions) or valve IMO.

4. Connect a regulated air supply to the 3/8" NPT fitting in the diaphragm casing (15). *QP6 has a 3/4" NPT air supply connection. **CAUTION:** The maximum operating pressure is 100 psi (6.9 BAR).

5. Adjust the stop screws (19) by releasing the jam nut (23) and turning. Stops can only be adjusted when driver arm (3) is off the stop screws being adjusted. (Maximum rotation adjustment ±5°.) Be sure to retighten jam nut (23).

2.1 Operation

The operating pressure, output torque and drive type is determined by the actuator designation. Maximum operating pressure is 100 psi (6.9 BAR). (**See Table 2**)

Actuator designation example: QP4C/34 is a series QP4 spring diaphragm actuator that has a 60 psi (4.1 BAR) spring, an end of stroke output torque of 200 FT•LBS (272 N•m) and uses a 34mm spline to drive the valve.

Before operating make sure all tapped holes in the body which are not being used are resealed with plastic caps.

TABLE 2

Actuator Series	Spring Version	Operating Pressure In psi (BAR)	End of Spring Stroke Torque In FT•LBS (N•m)	Drive Type
QP1	C	60 (4.1)	25 (34)	14 - 14mm Spline M - 9/16" Square
QP2	A B C D	20* (1.4) 40 (2.8) 60 (4.1) 80 (5.5)	11 (15) 38 (52) 57 (77) 74 (100)	14 - 14 mm Spline 18 - 18 mm Spline 25 - 25 mm Spline M - 9/16" Square
QP3	A B C D	20* (1.4) 40 (2.8) 60 (4.1) 80 (5.5)	26 (35) 76 (103) 114 (155) 146 (198)	18 - 18 mm Spline 25 - 25mm Spline 34 - 34 mm Spline M - 3/4" Square
QP4	B C D	40 (2.8) 60 (4.1) 80 (5.5)	153 (207) 229 (310) 294 (399)	25 - 25 mm Spline 34 - 34 mm Spline M - 1" Square
QP5	B C D	40 (2.8) 60 (4.1) 80 (5.5)	305 (414) 458 (621) 587 (796)	34 - 34 mm Spline M - 1" Square
QP6	B C D	40 (2.8) 60 (4.1) 80 (5.5)	527 (716) 818 (1112) 1076 (1463)	45 - 45 mm Spline

* For Direct Control Applications

3. MAINTENANCE

Before working on a *Quadra-Powr* II actuator, note that all fasteners except socket head shoulder screw (8) are metric.

Although Metso's *Jamesbury* actuators are designed to work under severe conditions, proper preventative maintenance can significantly help to prevent unplanned downtime and in real terms reduce the total cost of ownership. Metso recommends inspecting actuators at least every five (5) years. The inspection and maintenance frequency depends on the actual application and process condition. Standard replacement of "soft" parts in *Quadra-Powr* II actuators consists of items numbered 6, 14, 31, 62 and 64. See **REPAIR KITS/SPARE PARTS** Section.

1. When replacing the diaphragm use caution and be sure the air supply is disconnected. Back off nuts (29) from the hex head screws (25) or (27),holding the diaphragm casing and spring housing together until the nuts are flush with the hex head screw ends.Do not remove the nuts completely from the hex head screws. If tension still exists on the hex head screws, then the spring package is not properly contained. Stop disassembly: retighten nuts and return the actuator to the factory. If the spring package proves to be intact remove the nuts (29) and remove the hex head screws (25) or (27).

2. Lift off diaphragm casing (15) and diaphragm (14).

3. Inspect the inside of both the diaphragm casing (15) and the spring housing (32) for any rough spots or foreign matter which may cause abrasion to the diaphragm. Check the plastic guide buttons (64) inserted to the diaphragm retainer. Replace the ones which have been worn out.

4. Place the new diaphragm (14) on the diaphragm retainer (10). Place the diaphragm casing (15) on the spring housing (32) and line up all the holes. Do not pinch or stretch the diaphragm.

5. Insert hex head screws (25) or (27) in all holes. Do not force the hex head screws through the diaphragm. Install nuts (29) on screws and tighten uniformly using the standard practice of tightening diametrically opposite bolts in sequence with the torque requirements from (**Table 3**).

3.1 Disassembly

When disassembly of the actuator is required for maintenance, remove the actuator to a clean well lit area. Handling of the actuator is accomplished by using two (2) M10 eye-nuts screwed on to the two hex head screws (25), that are facing the opposite direction of the other fasteners holding the diaphragm casing (15), and spring housing (32) and lifting the actuator by the eye-nuts, not the 3/8" NPT or 3/4" NPT in the diaphragm casing (15). For the QP6 use four M10 eye-nuts.

Prior to disassembling the actuator, obtain the following tools: two (2) M10 wrenches,preferably one being a ratchet, one (1) hex (Allen) wrench, 3mm for QP1, 5mm for QP2, 3 and 4, 6mm for QP5, 10mm for QP6, one (1) screwdriver, one (1) plastic faced mallet.

NOTE: When disassembling the QP6 DO NOT remove the socket shoulder screw (8) AND the diaphragm casing (15) at the same time. Either the socket shoulder screw (8) or the diaphragm casing (15) must be in place while working on the other.

1. Remove the cover (5) by removing six socket cap screws (21) on QP1 - 5, eight socket cap screws on the QP6. If the cover cannot be removed, tap it with a plastic hammer to break the adhesion of the paint between the body and cover joint.

2. Use air pressure to remove spring preload by partially stroking the actuator. If the diaphragm (14) is ruptured, replace as instructed in the previous section.

3. To remove the socket shoulder screw (8) (or socket cap screw in QP1) that holds the clevis (7) to the driver arm (3), first apply some heat to the lower arm to loosen the Loctite® on threads of the socket shoulder screw.

4. Slowly increase air pressure until the driver arm (3) moves slightly off the stop screw (19). Remove the socket shoulder screw (8).

5. Slowly relieve the air pressure in the actuator. The clevis (7) should be set against the spring retainer (30), and positioned symmetrically about the slot in the spring housing.

6. Shut off and bleed the air pressure to zero. Disconnect the air lines.

7. Remove the hex head screws (25) and (27), and hex nuts (29) holding the diaphragm casing and spring housing together.

8. Lift off the diaphragm casing (15), diaphragm (14) and diaphragm retainer (10). Inspect the diaphragm and guide buttons (64) for signs of wear, rupture or mechanical damage.

9. Inspect the inside of both the diaphragm casing and spring housing, as well as the outside of the diaphragm retainer for any rough spots or foreign matter which may cause abrasion of the diaphragm.

10. Lift the entire spring cartridge out of the unit.

WARNING: DISASSEMBLY OF THE SPRING PACKAGE SHOULD NOT BE ATTEMPTED. SPECIAL EQUIPMENT IS REQUIRED. DISASSEMBLY OF THE SPRING PACKAGE MAY RESULT IN SERIOUS PERSONAL INJURY.IF MAINTENANCE IS REQUIRED SHIP THE ENTIRE ACTUATOR TO *JAMESBURY*.

It is usually not necessary to remove the spring housing (32) from the body (1). However, if removal is required, heat must be used to loosen the Loctite. When reassembling, the information in (**Table 3**), torque and Loctite recommendations must be met. All fasteners should use Loctite 271 on the threads. Inspect and clean all components.

Good practice dictates that all bearings should be removed and replaced. See the **SERVICE KIT** section of this IMO for the proper actuator series repair kit number.

3.2 Assembly

To aid assembly, spread light oil or grease on the outside diameter of the new bearings.

1. Press driver arm bearings (6) into the body (1) and covers (5).This is best done in an arbor press, but a vise could be used if care is taken not to damage the bearing. Driver arm bearings are to be pressed in until they are flush or 0.015 in.(0.38 mm) below the body counterbore or the inside cover surface. Press clevis bearings (62) into the clevis (7).

2. Apply grease (Molykote GN grease) to inside of bearings for the driver arm, but not for the clevis. The shoulder screw (8) barrel needs to be greased instead.

3. Place the thrust bearing (31) into the counterbore in the body of QP2-QP6 actuators. Slide the other thrust bearing onto the trunnion of the driver arm (3). In the case of QP1, assemble the lower cover (5) using the socket flat head screws (21). Slide the thrust bearings onto the driver arm at each end. Place the driver in the body.

4. Apply a good grade of grease to the O.D. of the outer spring (43). Lower the spring cartridge into the spring housing (32). Make sure that the spring package is not resting on the hex head cap screws (38) which hold the spring housing and body together.

5. Place the diaphragm retainer (10) with the new guide buttons on the diaphragm plate (65).The orientation of the diaphragm retainer should be such that the guide button must be contacting the spring housing. Place the new diaphragm (14) on the diaphragm plate. Put the diaphragm casing (15) on and line up all the holes. Do not pinch or stretch the diaphragm.

6. Insert the hex head bolts (25) and (27) in all holes, (four are reversed for handling on the QP6; two are reversed on QP1 - QP5). Do not force the bolts through the diaphragm. Install nuts (29) and tighten uniformly using the standard practice of tightening diametrically opposite bolts in sequence. Follow (**Table 3**) for tightening torques.

7. Connect a regulated air supply to the pressure port and slowly increase the air pressure until the holes in the clevis and driver arm are aligned. Turn clevis a few degrees, if required, to align holes.

8. Apply Loctite 271 on the threads of the shoulder screw. Insert it through the driver arm and clevis. Tighten per (**Table 3**).

(continued on page 7)

TABLE 3

Torque Requirements

Required Tightening Torques In FT•LBS (N•m) For Various Fasteners

	QP1	QP2	QP3	QP4	QP5	QP6
Nuts for Hex Head Screws thru Diaphragm Casing (29)	18 (24)	18 (24)	18 (24)	18 (24)	18 (24)	16 (22)
Socket Head Cover Screws (21)	15 (21)	15 (21)	15 (21)	15 (21)	33 (21)	33 (21)
Socket Head Shoulder Screw (8)	35 (48)	55 (75)	132 (179)	132 (179)	132 (179)	215 (292)
Nuts on Actuator Rod (74)	55 (74)	55 (75)	88 (119)	132 (176)	176 (239)	215 (292)
Hex Head Screws between Body and Spring Housing (38)	—	18 (24)	30 (40)	30 (40)	55 (75)	55 (75)
Nuts for Socket Head Screws between Body and Spring Housing (39)	5 (7)	—	—	—	—	—

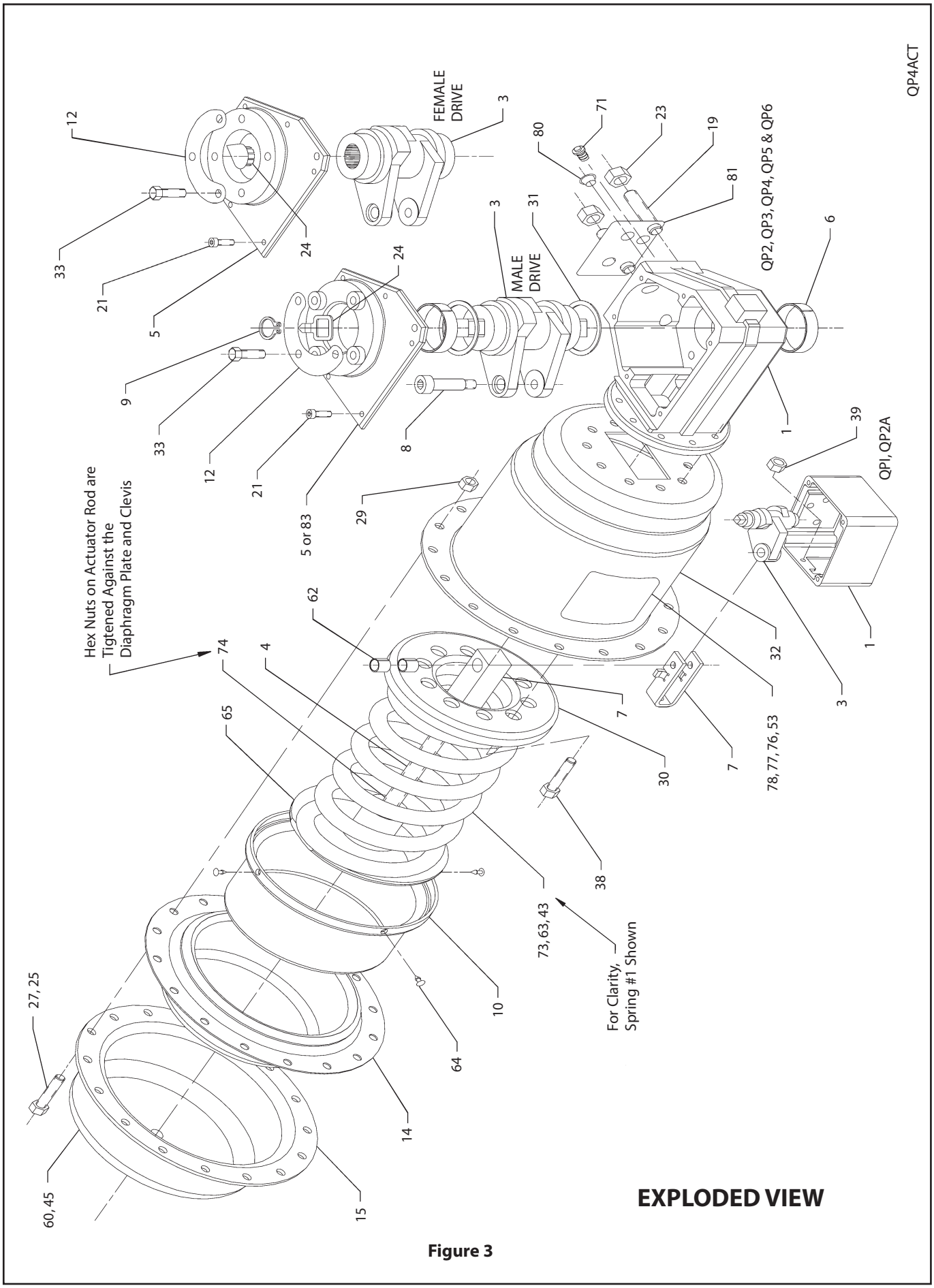

QP4ACT
FEMALE DRIVE
MALE DRIVE
QP2, QP3, QP4, QP5 & QP6
QPI, QP2A
Hex Nuts on Actuator Rod are Tigtened Against the Diaphragm Plate and Clevis
For Clarity, Spring #1 Shown
EXPLODED VIEW

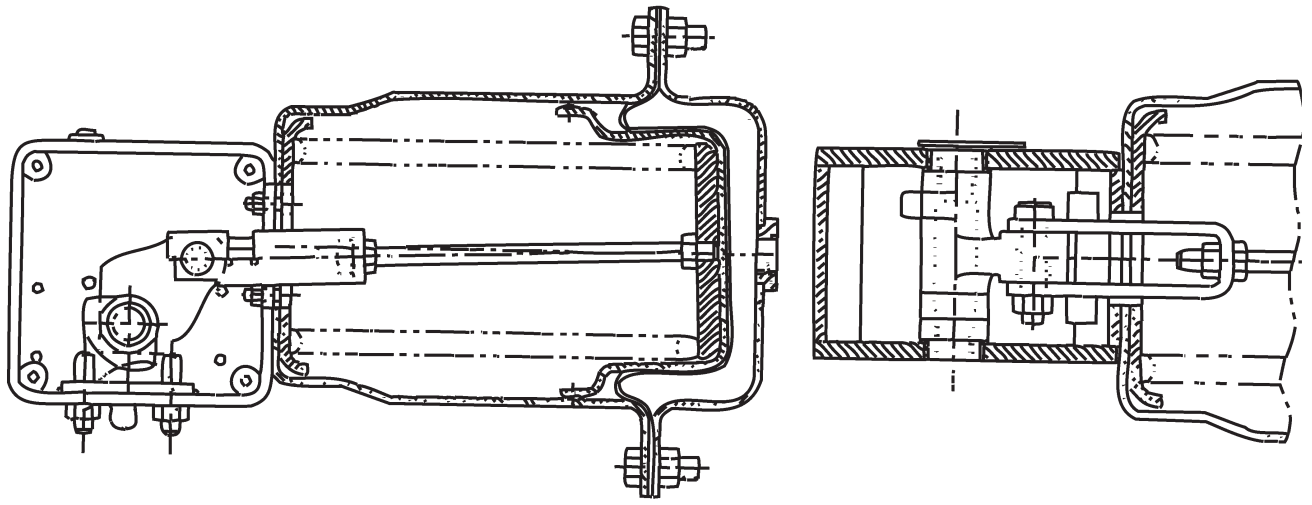
Figure 3

PARTS LIST AND BILL OF MATERIALS

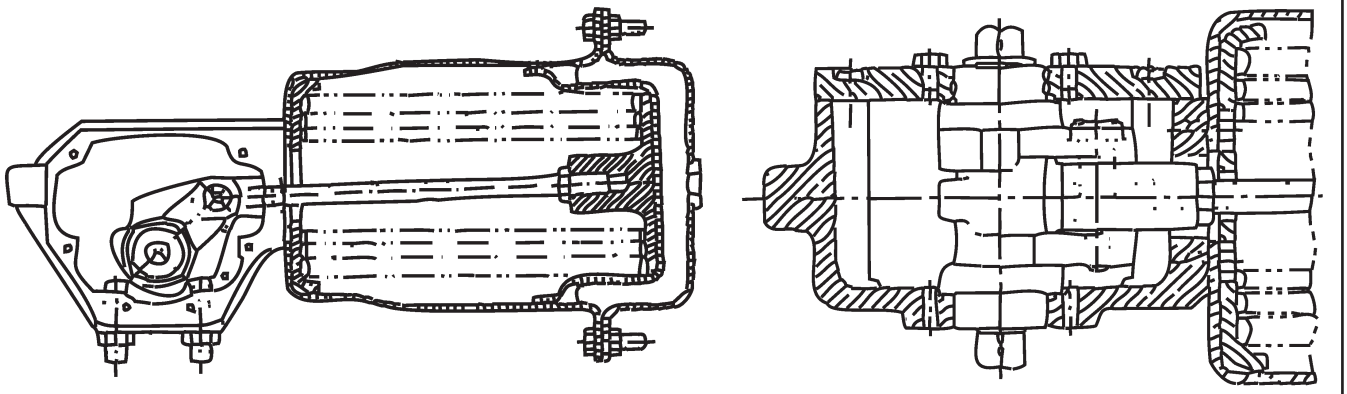
Bills Of Materials And Parts

Item	Part Name	QP1C/14 QP1C/M QP2A/14 QP2A/M	QP2D/14 QP2D/18 QP2D/25 QP2D/M	QP3D/18 QP3D/25 QP3D/34 QP3D/M	QP4D/25 QP4D/34 QP4D/M	QP5D/34 QP5D/M	QP6D/45
1	Body	1	1	1	1	1	1
3	Driver Arm	1	1	1	1	1	1
4	Actuator Rod	1	1	1	1	1	1
5	Cover	1	1	1	1	1	1
6	Bearing-Driver Arm	2	2	2	2	2	2
7	Clevis	1	1	1	1	1	1
8	Socket Head Shoulder Screw	1	1	1	1	1	1
9	Retaining Ring*	1	1	1	1	1	1
10	Diaphragm Retainer	1	1	1	1	1	1
12	Indicator Plate	1	1	1	1	1	1
14	Diaphragm	1	1	1	1	1	1
15	Diaphragm Casing	1	1	1	1	1	1
19	Slotted Set Screw	2	2	2	2	2	2
21	Socket Cap Screw	8	6	6	6	6	8
23	Hex Jam Nut	2	N/A	2	2	2	2
24	Indicator Pointer	1	1	1	1	1	1
25	Hex Head Cap Screw	2	2	2	2	2	2
27	Hex Head Cap Screw	6	10	10	14	22	32
29	Centerlock Hex Nut	8	12	12	16	24	36
30	Spring Retainer	1	1	1	1	1	1
31	Thrust Bearing	2	2	2	2	2	2
32	Spring Housing	1	1	1	1	1	1
33	Cap Screw	4	4	4	4	4	4
38	Cap Screw	4	4	6	10	10	8
39	Hex Nut	4	N/A	N/A	N/A	N/A	N/A
43	Spring #1	1	1	1	1	1	1
45	Caution Plate	1	1	1	1	1	1
53	Identification Tag	1	1	1	1	1	1
60	Caution Plate	1	1	1	1	1	1
62	Clevis Bearing	2	2	2	2	2	2
63	Spring #2	N/A	1	1	1	1	1
64	Guide Buttons	4	4	4	4	4	8
65	Diaphragm Plate	1	1	1	1	1	1
71	Relief Vent	1	1	1	1	1	1
73	Spring #3	2	1	1	1	1	1
74	Hex Jam Nut	2	4	2	2	2	2
76	Series Tag	1	1	1	1	1	1
77	Driver Tag	1	1	1	1	1	–
80	Plug	1	1	1	1	1	1
81	Name Plate**	1	1	1	1	1	1
83	Cover	1	N/A	N/A	N/A	N/A	N/A

* IN MALE ACTUATORS ONLY.
** IN FEMALE ACTUATORS ONLY.
NOTE: SPRING VERSION C DOES NOT HAVE ITEM 73.
SPRING VERSION A AND B DO NOT HAVE ITEMS 63 AND 73.



QP1C-QP2A Actuators
Figure 4



QP Actuators
Figure 5

9. Back off the nut (74) against clevis (7). Apply Loctite 271 on the threads of the actuator rod. Tighten nut against clevis by applying torque from (**Table 3**), as the nut is being tightened, firmly hold the clevis with a wrench, since the unsupported driver arm may tend to tip over.
10. Slowly release air pressure. Assemble cover by using the socket head screws (21). Apply tightening torque per (**Table 3**).
11. Install the indicator pointer (24) if this was previously disassembled. In female actuators make certain that the indicator points to the inscribed line in the driver arm. In male actuators, hold the indicator pointer in place with a retaining ring (9). **NOTE:** Refer to Installation instructions for spring-to-close or spring-to-open configuration.

4. ACCESSORIES

Quadra-Powr II actuators can be locked in the spring uncompressed mode.Refer to IMO-30 for more information.

Quadra-Powr II actuators can easily be reworked to have 100% adjustability in air stroke.Consult factory if this feature is desired.

Quadra-Powr II actuators are designed with one or two accessory mounting pads; ISO and *Jamesbury* standard. Refer to Figure "6". Consult *Jamesbury* linkage manual for accessory linkage kits.

5. REPAIR KITS/SPARE PARTS

SERVICE KITS		
Model	**Complete**	**Diaphragm**
Series QP1 Actuator	RKQ-54	RKQ-59
Series QP2 Actuator*	RKQ-55	RKQ-60
Series QP3 Actuator	RKQ-56	RKQ-61
Series QP4 Actuator	RKQ-57	RKQ-62
Series QP5 Actuator	RKQ-58	RKQ-63
Series QP6 Actuator	RKQ-64	RKQ-66
Series QP7 Actuator	RKQ-65	RKQ-67

* Note: QPZA uses Complete Kit RKQ-81 and Diaphragm Kit RKQ-60.

We recommend that actuators be directed to our service centers for maintenance. The service centers are equipped to provide rapid turn-around at a reasonable cost and offer new actuator warranty with all reconditioned actuators.

NOTE: When sending goods to the service center for repair, do not disassemble them. Clean the actuator prior to shipping.

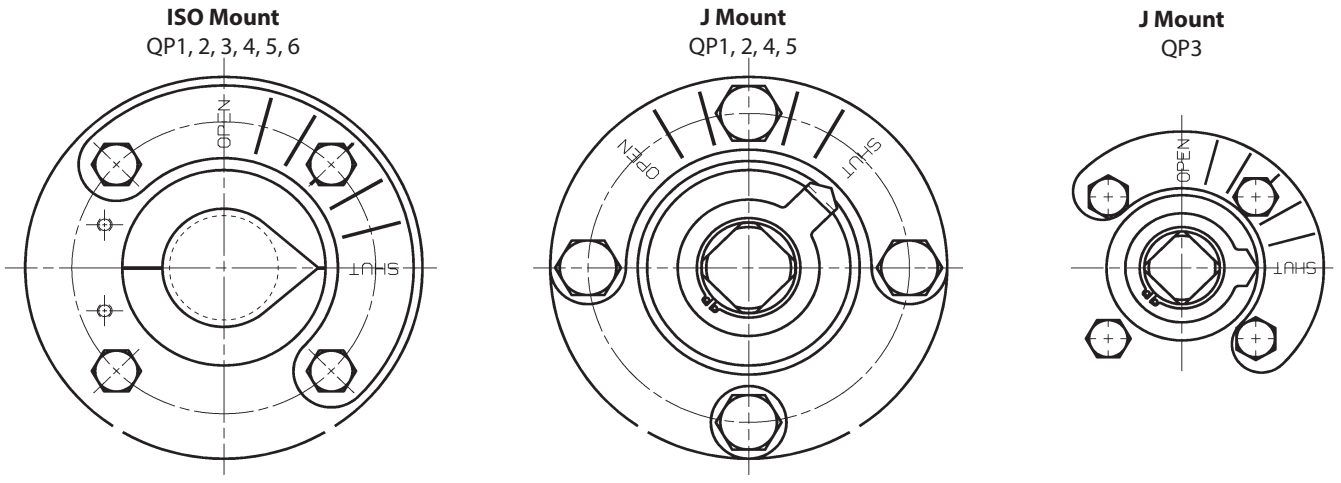
For further information on spare parts and service or assistance visit our web-site at **www.metso.com/valves**.

NOTE: When ordering spare parts, always include the following information:

a. Actuator catalog code from label,

b. If the valve is serialized – the serial number (from identification plate)

c. From **Figure 3**, the ballooned part number, part name and quantity required



QP1C-QP2A Actuators
Figure 6

Metso Flow Control Inc.

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