



**LESLIE
CONTROLS, INC.**

A Division of CIRCOR International, Inc.

12501 Telecom Drive, Tampa Florida 33637

**INSTALLATION, OPERATING,
AND MAINTENANCE INSTRUCTIONS
PARTS LIST**

9/0.5.0 Rev.2

Formerly D-10236

LESLIE CLASS K-MAX

TABLE OF CONTENTS

ROTARY CONTROL VALVES

1" - 8"

ANSI CLASS 150 - 600

DIN 16 - 40

INTRODUCTION	ii
DESCRIPTION	ii
INSTALLATION	A1
MOUNTING POSITION	A1
CLEANING	A1
FLANGED VALVE INFORMATION	A1
FLANGELESS VALVE INFORMATION	A1
GASKETS	A1
BOLTS	A1
SUPPLY AIR CONNECTIONS	A1
OPERATION	A1
SYSTEM FLUSH	A1
START-UP	A1
PACKING	A1
MAINTENANCE	A3
LUBRICATION	A3
ADJUSTMENTS	A3
PACKING REPLACEMENT	A3
VALVE DISASSEMBLY	A5-A6
VALVE REASSEMBLY	A6-A7
SEAT RING LAPPING	A7
VALVE REMOVAL FROM PIPELINE	A7
ACTUATOR REMOVAL FROM VALVE	A7
TROUBLESHOOTING	A8-A9
CODE SELECTION CHART	A10
PARTS LIST	A11-A12
ILLUSTRATION INDEX	
Figure 1 - Actuator Mounting Positions	A2
Figure 2 - K-Max Parts Identification	A4
Figure 3 - Packing Component Stackup	A5
Table A - K-Max Seat Retainer Torques	A6
Figure 4A & 4B - Dimensions & Parts List	A11
Figure 5 - Valve Seat Retainer Wrench	A13

DIAPHRAGM ACTUATORS ON K-MAX CONTROL VALVES

MODELS 40, 55 AND 85

DESCRIPTION	B14
AIR SUPPLY	B14
LUBRICATION	B14
OPEN AND CLOSED POSITION STOP ADJUSTMENTS	B14
SPRING-TO-CLOSE ACTUATORS	
CLOSED STOP ADJUSTMENT	B14
OPEN STOP ADJUSTMENT	B15
SPRING-TO-OPEN ACTUATORS	
CLOSED STOP ADJUSTMENT	B15
OPEN STOP ADJUSTMENT	B15
SIZE 40 ACTUATOR	
REMOVAL	B15
INSTALLATION	B16
SIZE 55 AND 85 ACTUATORS	
REMOVAL	B16
INSTALLATION	B16
SPRING ASSEMBLY REPLACEMENT	B17
DIAPHRAGM REPLACEMENT	B18
REVERSING THE ACTION	B18
CHANGING MOUNTING POSITIONS	B19
PARTS LIST	B21
ILLUSTRATION INDEX	
Figure 1- Vibration Support & Disassembly Studs	B14
Figure 2A- Size 40 Actuator Cutaway	B15
Figure 2B- Size 55/85 Actuators-Reverse Action	B15
Figure 3- Size 40 Actuator/Spring-To-Close Mode	B16
Figure 4- Coupling Clamp Screws	B17
Figure 5- Actuator Mounting Positions	B17
Figure 6- Link Arm Position	B19
Figure 7- Stub Shaft Position	B19
Figure 8- Parts Identification for 55 & 85 Actuator	B20
Figure 9- Exploded Drawing of 55 & 85	B21
Figure 11- DR 40 Actuator Assembly	B22

LESLIE CLASS K-MAX

INTRODUCTION

The K-MAX Rotary Control valve utilizes state-of-the-art technology in both design and construction. It will provide dependable, trouble free service provided the application is correct and the valve is installed and maintained to Leslie specifications. Each valve is fully tested and inspected at the factory to ensure compliance to customer specifications.

A copy of these instructions should be made available to the personnel responsible for the installation and maintenance of this equipment. Refer to the data plate attached to the valve and the applicable sales bulletin for information regarding materials of construction and product limitations.

DESCRIPTION

The K-MAX Rotary Control Valve is a high performance rotary Control valve designed to meet an wide range of applications. It features an eccentric plug that rotates into a self-aligning orbital seat ring to achieve extremely tight shut off. The K-MAX valve is also offered with reduced trim options to match maximum flow capacity (C_v) to the application.

The plug is attached to a splined shaft which is rotated by a lever linked to the diaphragm stem of the actuator. Valve action is available as either air-to-open or air-to--close and is field reversible. The inherent linear flow characteristic can be changed to equal percentage or custom characteristic by simply changing the positioner cam.

The body is designed to ANSI Class 600 standards and is available with flangeless tie rod construction. Optional slip-on flanges are available in ANSI Classes 150 and 300; integral cast flanges are available in ANSI Classes 150, 300 and 600.

INSPECTION

This equipment has been adequately packaged and protected for shipping; however, due to improper handling, the possibility of damage in transit exists. When the valve arrives at its final destination, it should be carefully inspected for damage and equipment malfunction.

STORAGE

Units should be stored in a clean, cool and dry location and should be protected from dirt, chips, dust and insects or other nesting animals.

REPLACEMENT PARTS

It is recommended that one set of Recommended Spare parts be inventoried for each valve size and type. Recommended Spare Parts are identified on the Assembly Drawing.

Replacement parts can be ordered from your local Leslie representative. The factory address is listed on the back of this Instruction Manual.

When ordering parts please include the valve size and valve number from the data plate. Also include the Assembly Drawing Number, Part Name, Balloon Number and Quantity as shown on the Assembly Drawing.

LESLIE SERVICE

Leslie service personnel are available to start up and repair our products. Leslie can also train your personnel to do this work. Contact the Leslie representative nearest you for details.

I. INSTALLATION

This installation section has been broken down into subsections that present a wide range of installation related requirements.

A. MOUNTING POSITION

Normal valve installation is in the flow-to-open mode of operation. (see Figure 1, Page A2)

The valve actuator can be mounted in any position to work around the existing pipeline. (See Actuator Instruction Manual). Horizontal stem orientation is preferred, with the plug opening upward. (see Figure 1, Page A2)

B. CLEANING

Before the valve is installed, ensure that it is free of foreign material which may have been introduced during handling.

Clean the pipeline of all debris such as loose weld spatter, scale, oil, grease or dirt.

Clean the valve and pipe mating surfaces and always use new, clean gaskets to ensure a leak proof fit.

C. FLANGED VALVE INFORMATION

Valve flanges conform to ANSI B16.5, Pipe Flanges and Flanged Fittings specifications.

Support the piping near the valve so strain on the flanges is minimized. Tighten the bolts with a criss-cross pattern. Do not use the flange bolts to draw the pipeline flanges into contact with the valve flanges.

D. FLANGELESS VALVE INFORMATION

For flangeless valves, install the lower tie rods to provide a cradle to support the valve while installing the remaining tie rods. Make sure that flange gasket is centered on both ends of the valve to assure a proper face seal. Tighten the nuts with a criss-cross pattern.

E. GASKETS

Dimensions are specified in ANSI B16.5, Pipe Flanges and Flanged Fittings.

F. BOLTS

Bolting specifications can be found in ANSI B16.5, Pipe Flanges and Flanged Fittings.

G. SUPPLY AIR CONNECTIONS

Valves with positioners - Connect supply air to the positioner supply port. See the Positioner Instruction manual for proper identification.

Valves without positioners - Connect supply air to the actuator supply port.

Supply air should be clean, dry and oil free and must not exceed the maximum rating of the actuator spring; see the data plate affixed to the actuator spring case.

WARNING

DO NOT PLACE HANDS, FINGERS OR OBJECTS INTO VALVE PORTS DURING OPERATION CHECK.

II. OPERATION

Connect a regulated air line to the actuator and pressurize to operate the valve through its full stroke. If it does not operate smoothly, the packing gland clamp nuts may be too tight and are causing the packing to bind on the valve shaft.

After the supply air pressure is released, observe the valve position. The valve should be in the open position for direct acting or in the closed position for the reverse acting. If the actuator fails to return to the correct position, check for obstacles that may be jammed between the plug and seat.

A. SYSTEM FLUSH

It is recommended that the piping system be flushed prior to initial start-up. Debris in the pipeline could damage valve or associated components.

Make sure all valves are open during the flushing operation.

WARNING

THIS VALVE IS A PRESSURE VALVE. LINE PRESSURE MUST BE COMPLETELY RELIEVED BEFORE REMOVING THE VALVE MOUNTING BOLTS FROM THE PIPELINE OR BEFORE REMOVING THE ACTUATOR FROM AN INSTALLED VALVE. FAILURE TO RELIEVE PRESSURE MAY RESULT IN PERSONAL INJURY.

B. START-UP

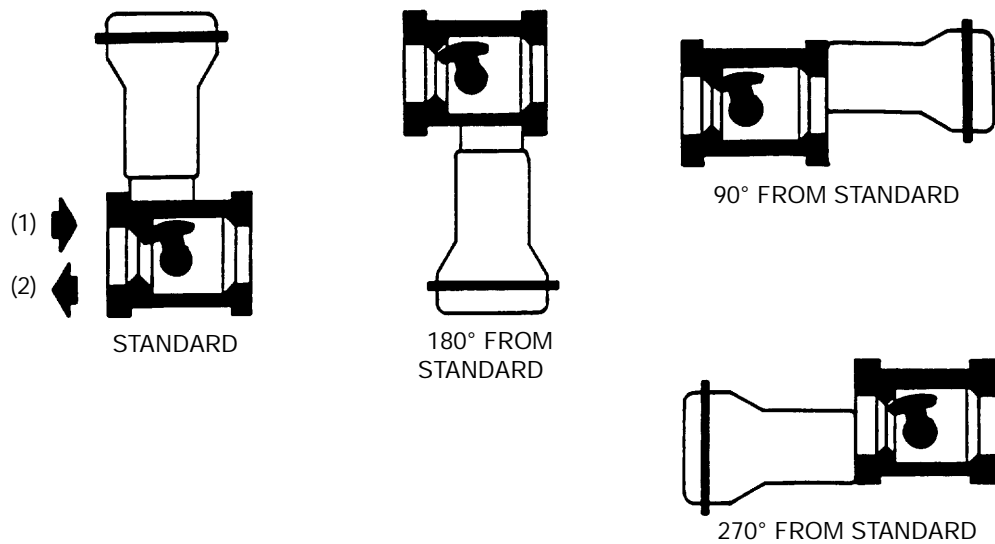
Check the following items prior to placing the valve in service at either the initial installation or after a valve assembly rebuild.

C. PACKING

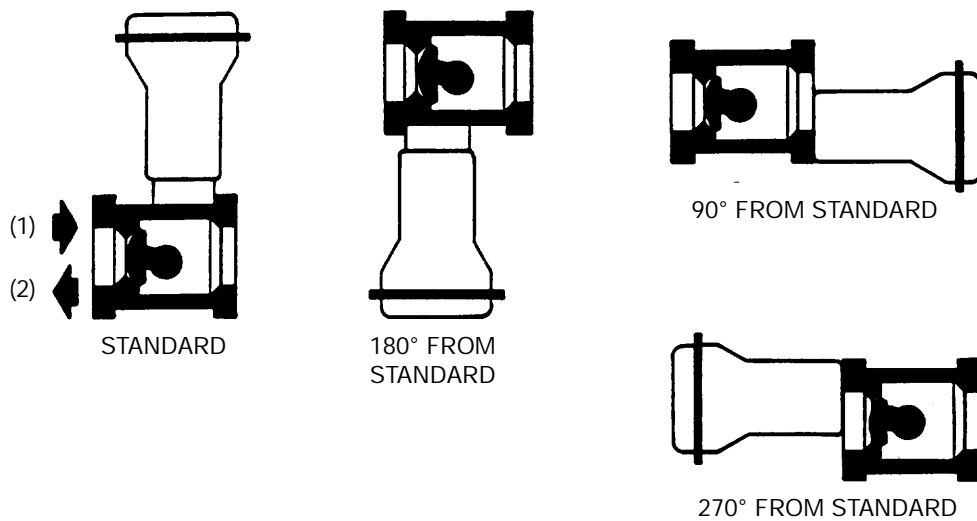
Tighten the packing gland clamp nuts finger tight plus 1/2 turn. After the valve is pressurized to full operating pressure, check for packing leakage and tighten the packing gland clamp nuts if necessary.

ACTUATORS ARE IN THE FOREGROUND. VALVE BODIES ARE BEHIND THE ACTUATORS.

DIRECT ACTING ACTUATORS (SPRING-TO-OPEN)



REVERSE ACTING ACTUATORS (SPRING-TO-CLOSE)



- (1) FLOW TENDING TO OPEN VALVE - PREFERRED FOR VALVES WHICH MUST FAIL OPEN
(2) FLOW TENDING TO CLOSE VALVE - PREFERRED FOR VALVES WHICH MUST FAIL CLOSED
-

ACTUATOR MOUNTING POSITIONS
FIGURE 1

WARNING

UNLESS OTHERWISE SPECIFIED THIS VALVE HAS BEEN LUBRICATED AT THE FACTORY WITH LITHIUM AND SILICONE BASED LUBRICANTS THAT MAY NOT BE COMPATIBLE WITH YOUR FLOW MEDIA. ENSURE LUBRICANT COMPATIBILITY PRIOR TO START-UP. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY AND/OR EQUIPMENT DAMAGE.

III. MAINTENANCE

Some periodic maintenance of this product is required as specified in the following subsections.

A. LUBRICATION

This valve has been lubricated at the factory with lithium and silicone based lubricants. Ensure lubricant to flow media compatibility prior to start-up. If lubricant is not compatible with flow media, disassemble the valve and lubricate with flow media compatible lubricants.

This valve does not require routine maintenance lubrication. Lubrication is necessary only when valve has been disassembled to inspect or replace components.

After the supply air pressure is released, observe the valve position. The valve should be in the open position for direct acting or in the closed position for the reverse acting. If the actuator fails to return to the correct position, check for obstacles that may be jammed between the plug and seat.

B. ADJUSTMENTS

If packing leakage occurs, turn the packing gland clamp nuts clockwise only until packing leakage stops; do not continue turning after leakage stops. If packing leakage cannot be stopped by turning the packing gland clamp nuts clockwise, the packing must be replaced.

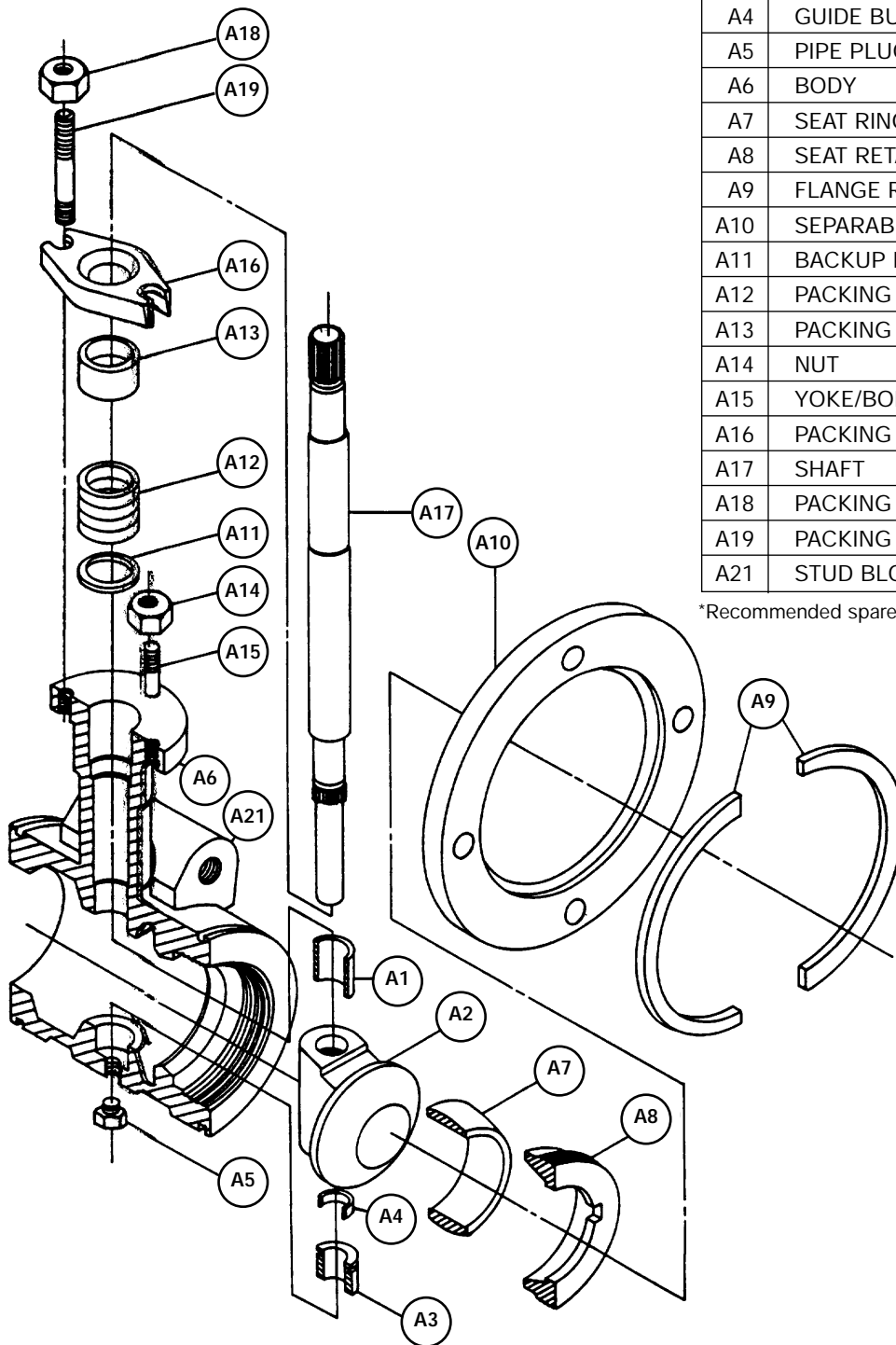
After the supply air pressure is released, observe the valve position. The valve should be in the open position for direct acting or in the closed position for the reverse acting. If the actuator fails to return to the correct position, check for obstacles that may be jammed between the plug and seat.

C. PACKING REPLACEMENT

During this procedure, you may come in contact with process fluids, wear adequate protection to protect yourself from the process fluid.

See Figure 2, Page A4 for parts identification.

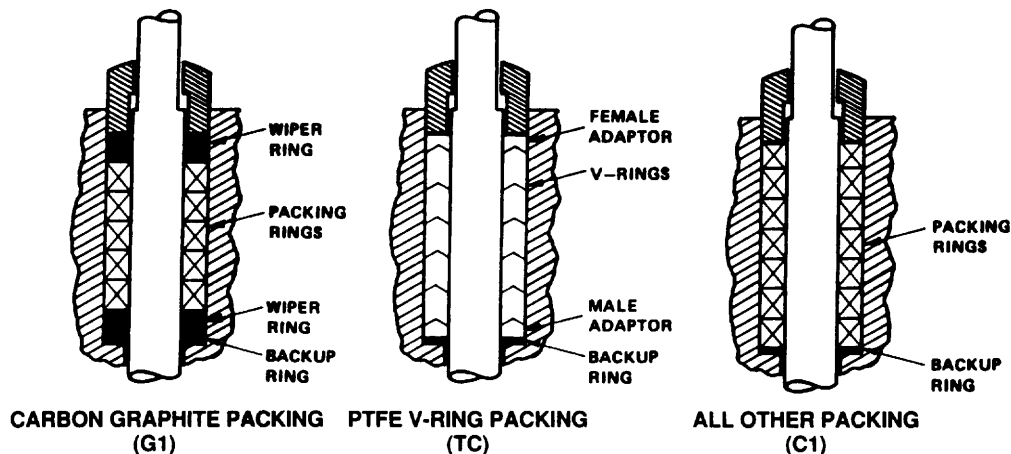
1. Depressurize and drain the process line.
2. Remove the actuator from the valve as described in the ACTUATOR REMOVAL Section of the Actuator Instruction manual.
3. Slowly and evenly remove the two nuts holding the packing gland clamp in place.
4. Remove the two nuts that secure the actuator yoke (shown in Figure 9, Ref. B32) to the valve body, then lift the yoke and packing gland clamp off the valve. Leaving the ball bearing in the yoke.
5. Slide the gland off the valve shaft.
6. Remove and discard the packing from the valve body. It is not necessary to remove the metal backup ring in the bottom of the packing chamber. Ensure that the shaft and packing bore are clean and smooth. If a scarred shaft or packing bore are present, replace the damaged parts.
7. Slide the new packing, one piece at a time, down the valve shaft and into the packing chamber. Use the sequence shown in Figure 3, Page A5. Use the packing gland to seat each packing ring one at a time. Be sure to use a compatible lubricant with each piece of packing as required.
8. Slide the gland and packing gland clamp down the valve shaft until the gland contacts the packing.
9. While holding the packing gland clamp inside of the actuator yoke (not shown in Figure 2, Page A4), slide the packing gland clamp and yoke onto the valve shaft so the slots in the packing gland clamp slide over two of the studs. Install yoke nuts and tighten.
10. Screw packing nuts onto the studs to hold the packing gland clamp down; tighten the nuts finger tight plus 1/2 turn. They will be re-tightened after the valve is pressurized.
11. Mount the actuator on the valve as described in the ACTUATOR INSTALLATION Section of the Actuator Instruction Manual.
12. After the valve is pressurized, turn the gland clamp nuts clockwise only until packing leakage stops; do not continue turning after leakage stops. If packing leakage cannot be stopped by turning the gland clamp nuts clockwise, the packing must be replaced.



PARTS LIST FOR K-MAX VALVE	
NO.	PART NAME
A1	UPPER GUIDE BEARING
A2	PLUG
A3	LOWER GUIDE BEARING
A4	GUIDE BUSHING (3' THRU 8" VALVES)
A5	PIPE PLUG
A6	BODY
A7	SEAT RING
A8	SEAT RETAINING RING
A9	FLANGE RETAINING RINGS
A10	SEPARABLE FLANGES
A11	BACKUP RING
A12	PACKING
A13	PACKING GLAND
A14	NUT
A15	YOKE/BODY STUD
A16	PACKING GLAND CLAMP
A17	SHAFT
A18	PACKING NUT
A19	PACKING STUD
A21	STUD BLOCK (FLANGELESS VALVES)

*Recommended spare parts.

K-MAX PARTS IDENTIFICATION
FIGURE 2



PACKING COMPONENT STACKUP
FIGURE 3

WARNING

THIS VALVE IS A PRESSURE VESSEL. LINE PRESSURE MUST BE COMPLETELY RELIEVED BEFORE REMOVING THE VALVE MOUNTING BOLTS FROM THE PIPELINE OR BEFORE REMOVING THE ACTUATOR FROM AN INSTALLED VALVE. FAILURE TO RELIEVE PRESSURE MAY RESULT IN PERSONAL INJURY.

D. VALVE DISASSEMBLY

For your safety it is important that safety equipment be worn when repairing this valve. The safety equipment must be adequate to protect you from the process fluid.

1. Depressurize and drain the process line and valve.
2. Shut off the electrical power (units equipped with switches, pilot valves or electronic positioners) and the supply air to the valve assembly. Disconnect the air lines and wiring from the unit
3. Remove the valve assembly from the pipeline as described in the VALVE REMOVAL FROM PIPELINE Section of this manual.
4. If your valve is equipped with any accessories (i.e., positioner, switches, etc.), remove them from the actuator before proceeding.
5. Remove the actuator from the valve as described in the ACTUATOR REMOVAL Section of the Actuator Instruction Manual.
6. Remove the packing clamp nuts. See Figure 2, Page A4 for component identification.

7. Remove the two nuts that secure the actuator yoke (not shown in Figure 2, Page A4) to the valve body, then lift the yoke and packing gland clamp off the valve.
8. Slide the packing gland off the valve shaft.
9. Unscrew the seat ring retainer. A seat retainer wrench can be fabricated using the dimensions shown in Figure 5 on page A13. For 6" and 8" valves, insert screws in the holes in the seat ring retainer, hook a pry bar on the screws and unscrew the retainer.

WARNING

FAILURE TO USE THE PROPER TOOL ON THE SEAT RING RETAINER CAN DESTROY THE RETAINER AND/OR MAY RESULT IN PERSONAL INJURY.

10. Remove the seat ring from the valve cavity.
11. Pull the shaft out of the body. It may be necessary to remove the pipe plug from the bottom of the valve body and drive the shaft from the bottom.
12. Pull the plug out of the valve body.
13. Remove the pipe plug from the bottom of the valve body if it was not removed in Step 11.
14. If the upper guide bearing does not come out with the shaft, push it into the valve body cavity from the top.
15. Remove the lower guide bearing by inserting two flat screwdriver tips in the bearing groove and prying the bearing out; exercise care to avoid damage to the seat pocket area of the body.

16. Remove the packing and backup ring from the valve body.
17. Thoroughly clean and inspect the valve components. Replace all damaged parts.

E. VALVE REASSEMBLY

NOTE: When a hard (all metal) seat ring is to be the seat ring it should be lapped. Perform the steps in the SEAT RING LAPPING Section of this Instruction Manual before beginning REASSEMBLY. (See page A7).

1. Coat the inside and outside diameters of the lower guide bearing with a lubricant, then install it in the valve body.
2. Coat the inside and outside diameters of the upper guide bearing with a lubricant, then install it on the valve shaft.
3. Coat the valve shaft splines with a lubricant.
4. While holding the plug inside the body, push the shaft and upper guide bearing into place.
5. Slide the backup ring and the new packing down the valve shaft and into the packing chamber in the sequence shown in Figure 3, Page A5, being sure to use the proper lubricant if required. Then slide the packing gland into place.
6. While holding the packing gland clamp inside the actuator yoke (with ball bearings), slide the packing gland clamp and yoke together onto the valve shaft so the slots in the packing gland clamp slide over two of the studs.
7. Secure the yoke to the valve with two nuts.
8. Screw nuts on the studs to pull the packing gland clamp down; tighten the nuts finger tight plus 1/2 turn. They will need to be re-tightened after the valve is pressurized.
9. For valves with service temperature of 400°F or greater, a .005 inch gap between the plug and bottom bushing should be adjusted, using a feeler gauge and the set screws on top of the yoke. For all other valves snug set screws to remove any gap between bearings and plug. Plug should rotate freely in either case.
10. If the pipe plug was removed, coat the threads with flow media compatible pipe compound and reinstall.
11. Lightly lubricate the beveled edge of the seat ring, then apply a lubricant to a 1/4" wide band around the circumference along both edges of the set ring O.D.
12. Place the seat ring into the body with the beveled edge against the plug.
13. Coat the seat ring retainer threads with an anti-seize compound, then install it in the body. Tighten only finger tight.

14. Open and close the plug to align the seat to the plug and body seating surfaces in the body. Leave the plug in the closed position with the seat ring having both plug contact and body contact.
15. Tighten the seat ring retainer to the torque specified in Table A.
16. Open the valve until the plug does not contact the seat.
17. Re-torque the seat ring retainer per Table A.

VALVE SIZE	SEAT RETAINER TORQUE (ft. lbs.)
1	75
1.5	85
2	100
3	120
4	250
6	450
8	600

**K-MAX SEAT RETAINER TORQUES
TABLE A**

18. The seat ring retainer should rotate less than 20 degrees after initial torquing (Step 16); retainer movement greater than 20 degrees may indicate problems that could result in seat leakage.
19. Mount the actuator on the valve as described in the Actuator Installation Section of the Actuator Instruction Manual.

WARNING

REVERSE ACTUATORS - APPLY AIR TO THE ACTUATOR TO OPEN AND HOLD THE PLUG POSITION BEFORE REMOVING THE SEAT RETAINER.

20. Test the seat by applying low pressure (50 PSIG) to the seat side of the body with the valve in the closed position. If seat leakage occurs, remove the retainer and seat ring from the body and begin the reassembly procedure at Step 11 or lap the plug/seat as described in the following seat ring lapping section. If leakage persists after several disassembly/reassembly sequences, contact your local Leslie/K & M representative.
21. Thoroughly clean the valve to the standard dictated by your process flow media.

22. Install the accessories removed in Step 4 of the DISASSEMBLY Section of this instruction.
23. Install the valve in the pipeline and connect the permanent pneumatic and electrical connections.
24. Process pressure and flow may now be restored.
25. After the valve is pressurized, turn the packing gland small clamp nuts clockwise only until packing leakage stops; do not continue turning after leakage stops. If packing leakage can not be stopped by turning the packing gland clamp nuts clockwise, the packing must be replaced.

F. SEAT RING LAPPING

To ensure a tight shutoff, the seat ring should be hand lapped to both the body and the plug on metal to metal seated valves only. Closely adhere to the following procedure to ensure tight shutoff.

WARNING

DO NOT LAP NICKEL PLATED PLUGS.

1. Apply a band of lapping compound approximately 1/4" wide to the outer circumference of the seat ring beginning with the edge that contacts the valve body.
2. Place the seat ring in the body, then (with light hand pressure) move the seat ring in an orbital motion for approximately 30 seconds.
3. Remove the seat ring and wipe off the lapping compound.
4. Check the seat ring plug for a continuous 'lap band'. This appears as a dull "gray" finish on the surface of the plug.
5. If the 'lap band' is incomplete on either the seat ring or body, repeat steps 1 through 4.
6. Coat the seat ring beveled I.D. with lapping compound.
7. With the plug removed from the body, place the plug and seat ring together in approximately the seated position.
8. Move the seat ring against the plug in an orbital motion for approximately 30 seconds.

F. SEAT RING LAPPING, CONTINUED

9. Separate the seat ring and plug, then wipe off the lapping compound.
10. Check the seat ring and plug for a continuous 'lap band'.
11. If the 'lap band' is incomplete on either the seat ring or plug, repeat Steps 6 through 10.
12. Once continuous lap bands have been achieved on all applicable surfaces, thoroughly clean the seat ring, body and plug to remove all traces of the lapping compound.

G. VALVE REMOVAL FROM PIPELINE

It is necessary to remove the valve from the pipeline to inspect or replace the trim components.

For your safety it is important that safety equipment be worn when repairing this valve. The safety equipment must be adequate to protect you from the process line medium.

1. Relieve pipeline pressure and drain the portion of the system where the valve is located.
2. Turn off the supply air and/or electricity to the actuator or positioner, then disconnect the piping and/or wiring from the valve assembly.
3. Support the valve assembly to prevent slippage or rotation, then remove the flange bolts or tie rods.
4. Remove the valve assembly from the pipeline.
5. Remove the gaskets from the valve and pipeline flanges. Always use new gaskets when re-installing the valve.
6. Clean the flange surfaces with a wire brush to remove all gasket particles to ensure a leakproof fit when the valve is reinstalled.

H. ACTUATOR REMOVAL FROM VALVE

Detailed steps on how to remove the actuator from the valve are in the ACTUATOR REMOVAL Section of the Actuator Instruction Manual

TROUBLESHOOTING

The following list identifies problems with some suggestions as to what may be causing the problem. Refer to the applicable sections of the Valve, Actuator and Positioner Instructions for detailed procedures on repairing or replacing components.

IF...	THEN...
Excessive flow through valve when closed	<p>Low supply air pressure to direct acting actuator. Check air supply and adjust as necessary.</p> <p>Diaphragm, supply air or instrument air leak on direct acting actuators.</p> <ol style="list-style-type: none"> 1. Check all air connections with a water and soap mixture for leaks. Tighten or reduce as necessary. 2. Remove actuator to bench and check for stroke with bench air. If no stroke, replace diaphragm. <p>Improperly adjusted positioner. Recalibrate.</p> <p>Debris in valve interfering with plug movement. Clean and recalibrate.</p>
Insufficient flow through valve when open	<p>Low supply air air pressure to reverse acting actuator. See above.</p> <p>Diaphragm, supply air or instrument air leak on reverse acting actuators.</p> <ol style="list-style-type: none"> 1. Check all air connections with a water and soap mixture for leaks. Tighten or reduce as necessary. 2. Remove actuator to bench and check for stroke with bench air. If no stroke, replace diaphragm. <p>Improperly adjusted positioner. Recalibrate.</p> <p>Debris in valve interfering with plug movement. Clean and recalibrate.</p>
Jerky Actuator Motion	<p>Valve or trim improperly sized. Consult Plant Engineer.</p> <p>Valve shaft packing is too tight. Loosen packing nuts.</p> <p>Low air pressure to actuator. Check air supply and adjust as necessary.</p> <p>Improperly calibrated positioner. Recalibrate.</p>
Actuator does not move to fail-safe position upon loss of air pressure	<p>Valve shaft packing is too tight. Loosen packing nuts.</p> <p>Debris in valve interfering with plug movement. Clean and recalibrate.</p> <p>Positioner faulty or improperly adjusted. Remove, replace, recalibrate.</p>
High air consumption	<p>Ruptured diaphragm in actuator or positioner. Replace diaphragm.</p> <p>Leak in supply air system. Replace tubing and fittings.</p>

TROUBLESHOOTING, CONTINUED

IF...	THEN...
Actuator does not respond to changes in Instrument Signal	<p>Ruptured diaphragm in actuator or positioner. Replace and recalibrate.</p> <p>Loss of supply air pressure. Restore.</p> <p>Valve shaft packing is too tight. Loosen packing nuts.</p> <p>Debris in valve interfering with plug movement. Clean and recalibrate.</p> <p>Positioner faulty or improperly adjusted. Recalibrate.</p>
Valve not controlling flow properly	<p>Flow and pressure conditions in flow system have changed. Consult Plant Engineer.</p> <p>Malfunctioning controller, recalibrate or repair controller.</p> <p>Valve shaft packing is too tight. Loosen packing nuts.</p> <p>Valve or trim improperly sized. Consult Plant Engineer.</p> <p>Positioner faulty or improperly adjusted. Recalibrate or replace.</p> <p>Incorrect positioner cam selection. Consult Plant Engineer.</p>
Leakage through packing	<p>Worn packing. Replace packing.</p> <p>Loose gland clamp nuts. Tighten until leak stops.</p> <p>Pitted or scratched packing area in valve. Replace valve body and packing.</p> <p>Pitted, scratched or worn valve shaft. Replace shaft and packing.</p>

Code Selection Chart

Class	Material	Valve Size	End Conn.	Valve Rating	Trim Material	Trim Factor	Shutoff Class	Packing	Flow Direction	Actuator	Spring	H.O.D.	Actuator Bolting	
K	R	C	2	W	1	S	1	4	T	C	B	6	N	2
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Class - Position 1 & 2 KR
Material - Position 3 C = Steel WCB S = 316 SS A = Alloy 20 H = Hast-C T = Titanium
Valve Size - Position 4 0 = 1" 1 = 1½" 2 = 2" 3 = 3" 4 = 4" 6 = 6" 8 = 8"
End Connection - Position 5 W = Wafer L = CS separable flanges* S = SS separable flange F = Integral flanges
Valve Rating - Position 6 1 = ANSI 150 2 = ANSI 300 3 = ANSI 600
Trim Material - Position 7 S = Std 316 SS P = Partial Stellite F = Full Stellite A = Alloy 20** H = Hast C** T = Titanium R = 316/TFE***

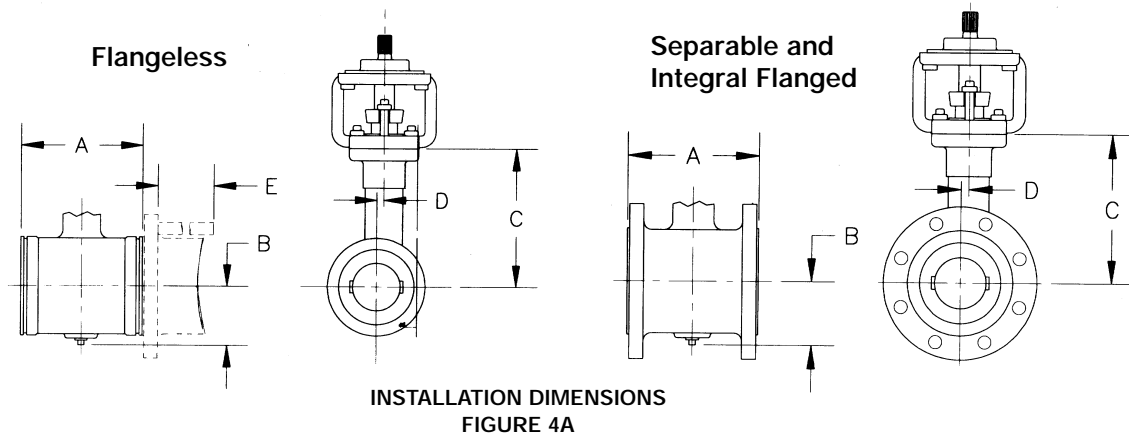
* Separable flanges available in 1" - 6", ANSI 150-300 only.

** Optional in 316 & CS valves.

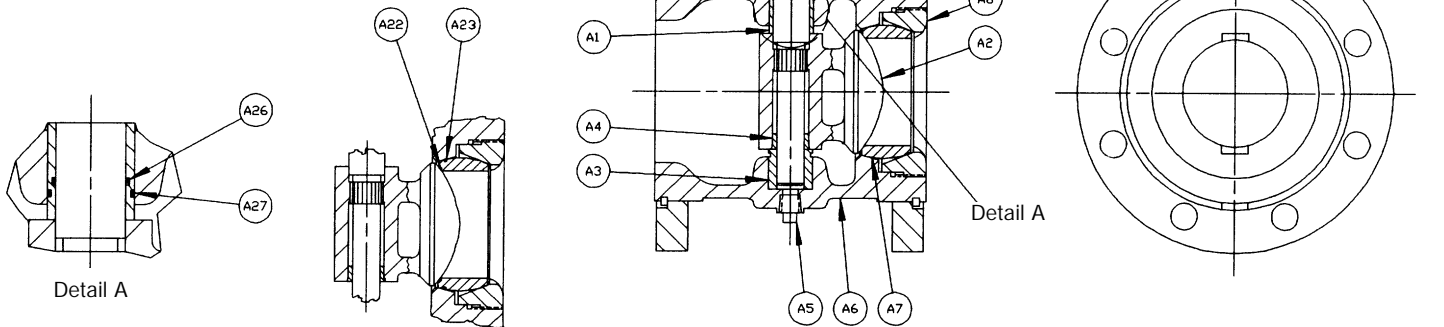
*** Use code 6 for shutoff classification. TFE seats 1" - 2" Full Cv only.

Trim Factor - Position 8 1 = Full 6 = 0.6 4 = 0.4 2 = 0.2
Shutoff - Position 9 Classification (per FCI 70.2) 4 = Class IV, Standard 5 = Class V, Optional 6 = Class VI, soft seat only
Packing - Position 10 T = Teflon-Chevron G = Grafoil
Flow Direction - Position 11 O = Flow to Open C = Flow to Close
Actuator - Position 12 A = DR-40-D B = DR-40-R C = DR55-D D = DR-55-R E = DR-85-D F = DR-85-R G = DR-145-D H = DR-145-R N = None/bare stem***
Spring - Position 13 2 = 20 3 = 35 6 = 60 (Standard)
H.O.D. - Position 14 N = No H = Handwheel J = HandJack
Actuator Bolting - Position 15 2 = Stainless Steel

***Yoke kit required for third party actuation.



Valve Size	Dimensions - Inches (mm)				
	A	B	C	D	E
1 (25)	4 (102)	27/16 (62)	47/16 (113)	5/32 (4.06)	7.62 (194)
1.5 (40)	4 1/2 (114)	23/4 (69.8)	51/8 (130)	1/4 (6.35)	8.75 (222)
2 (50)	4 7/8 (124)	2 13/16 (71.4)	47/8 (124)	7/32 (5.59)	9.12 (232)
3 (80)	6 1/2 (165)	39/16 (90.4)	53/4 (146)	5/16 (7.87)	11.50 (292)
4 (100)	7 5/8 (194)	4 (102)	7 (178)	7/16 (11.2)	13.38 (340)
6 (150)	9 (229)	5 1/16 (129)	9 9/16 (244)	1 1/16 (16.8)	15.75 (400)
8 (200)	9 9/16 (243)	6 (152)	11 (279)	7/8 (22.4)	17.75 (438)



PARTS IDENTIFICATION
FIGURE 4B

Parts List

Ref. No.	Description	Material	Qty	1"	1.5"	2"	3"	4"	6"	8"
A1 *	Upper Guide Bearing	BMtl CS	1	KM11140146	KM11140148	KM11140150	KM11140152	KM11140152	KM11140154	KM11140154
A1 *	Upper Guide Bearing	BMtl S2	1	KM11192604	KM11192605	KM11192606	KM11192607	KM11192607	KM11192608	KM11192608
A1 *	Upper Guide Bearing	BMtl HC	1	KM11199622	KM11199623	KM11199624	KM11199625	KM11199625	KM11199626	KM11199626
A1 *	Upper Guide Bearing	BMtl T3	1	KM1216042	KM5000730	KM1207967	KM1203953	KM1203953	KM1203629	KM1203629
A2 *	Plug: Full 316 No Stel	S2-N	1	KM1202473	KM1202477	KM1202481	KM1202485	KM1202489	KM1202493	KM1202497
A2 *	Plug: Full 316 Part. S	S2-P	1	KM1202501	KM1202502	KM1202503	KM1202504	KM1202505	KM1202506	KM1202507
A2 *	Plug: Full 316 Full St	S2-F	1	KM1202501	KM1202502	KM1202503	KM1202504	KM1202505	KM1202506	KM1202507
A2 *	Plug: Full Hastelloy	HC-N	1	KM1202476	KM1202480	KM1202484	KM1202488	KM1202492	KM1202496	KM1202500
A2 *	Plug: Full Titanium	T3-N	1	KM5000208	Consult Leslie	KM1219430	KM1205155	KM1203954	—	—

* Recommended spare parts

* Always reference serial number when ordering parts

* Consult factory for o-ring type guide bushings, Ref. A1 & A3.
Also for Teflon-insert seating Ref. A23.

Ref. No.	Description	Material	Qty	1"	1.5"	2"	3"	4"	6"	8"
A3 *	Lower Guide Bearing	BMtl CS	1	KM1140136	KM1140138	KM1140140	KM1140142	KM1140142	KM1140144	KM1140144
A3 *	Lower Guide Bearing	BMtl S2	1	KM1192599	KM1192600	KM1192601	KM1192602	KM1192602	KM1192603	KM1192603
A3 *	Lower Guide Bearing	BMtl HC	1	KM1199628	KM1199629	KM1199630	KM1199631	KM1199631	KM1199632	KM1199632
A3 *	Lower Guide Bearing	BMtl T3	1	KM1216056	KM5000731	KM1207971	KM1203956	KM1203956	KM1203630	KM1203630
A4 *	Bushing (Plug)	Trim CS	1	—	—	—	KM1147238	KM1147238	KM1147241	KM1147241
A4 *	Bushing (Plug)	Trim S2	1	—	—	—	KM1147238	KM1147238	KM1147241	KM1147241
A4 *	Bushing (Plug)	Trim HC	1	—	—	—	KM1147239	KM1147239	KM1147242	KM1147242
A4 *	Bushing (Plug)	Trim T3	1	—	—	—	KM1203957	KM1203957	KM1203632	Consult Leslie
A5	Pipe Plug	BMtl CS	1	KM1192699	KM1192699	KM1192699	KM1192699	KM1192699	KM1192699	KM1192699
A5	Pipe Plug	BMtl S2	1	KM1192698	KM1192698	KM1192698	KM1192698	KM1192698	KM1192698	KM1192698
A5	Pipe Plug	BMtl HC	1	KM1190387	KM1190387	KM1190387	KM1190387	KM1190387	KM1190387	KM1190387
A5	Pipe Plug	BMtl T3	1	KM1203633	KM1203633	KM1203633	KM1203633	KM1203633	KM1203633	KM1203633
A6	Body (W1,W2,W3,L1,L2)	BMtl CS	1	KM1199301	KM1199302	KM1199303	KM1199304	KM1199303	KM1199306	KM1199307
A6	Body (W1,W2,W3,L1,L2)	BMtl S2	1	KM1199439	KM1199440	KM1199441	KM1199442	KM1199443	KM1199444	KM1199445
A6	Body (W1,W2,W3,L1,L2)	BMtl HC	1	KM1199561	KM1199562	KM1199563	KM1199564	KM1199565	KM1199566	KM1199567
A6	Body (W1,W2,W3,L1,L2)	BMtl T3	1	KM5000225	KM5000022	KM1207972	KM1215100	KM1206349	KM1203635	Consult Leslie
A6	Body (F1)	BMtl CS	1	KM1199308	KM1199309	KM1199310	KM1199311	KM1199312	KM1199313	KM1199314
A6	Body (F1)	BMtl S2	1	KM1199446	KM1199447	KM1199448	KM1199449	KM1199450	KM1199451	KM1199452
A6	Body (F1)	BMtl HC	1	KM1199575	KM1199576	KM1199577	KM1199578	KM1199579	KM1199580	KM1199581
A6	Body (F1)	BMtl T3	1	KM5000749	Consult Leslie	Consult Leslie	KM5000398	KM5000400	Consult Leslie	Consult Leslie
A6	Body (F2)	BMtl CS	1	KM1199322	KM1199323	KM1199324	KM1199325	KM1199326	KM1199327	KM1199328
A6	Body (F2)	BMtl S2	1	KM1199460	KM1199461	KM1199462	KM1199463	KM1199464	KM1199465	KM1199466
A6	Body (F2)	BMtl HC	1	KM1199589	KM1199590	KM1199591	KM1199592	KM1199593	KM1199594	KM1199595
A6	Body (F2)	BMtl T3	1	Consult Leslie	Consult Leslie	KM5000396	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie
A6	Body (F3)	BMtl CS	1	KM1199336	KM1199337	KM1199338	KM1199339	KM1199340	KM1199341	KM1199342
A6	Body (F3)	BMtl S2	1	KM1199473	KM1199474	KM1199475	KM1199476	KM1199477	KM1199478	KM1199479
A6	Body (F3)	BMtl HC	1	KM1199603	KM1199604	KM1199605	KM1199606	KM1199607	KM1199608	KM1199609
A6	Body (F3)	BMtl T3	1	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie
A7 *	Seat Ring: Full 316 No Stel.	S2-N	1	KM1203101	KM1203121	KM1203142	KM1203164	KM1203186	KM1203208	KM1203230
A7 *	Seat Ring: Full 316 P. Stel.	S2-P	1	KM1203102	KM1203122	KM1203144	KM1203166	KM1203188	KM1203210	KM1203232
A7 *	Seat Ring: Full 316 F. Stel.	S2-F	1	KM1203102	KM1203122	KM1203144	KM1203166	KM1203188	KM1203210	KM1203232
A7 *	Seat Ring: Hastelloy	HC-N	1	KM1203105	KM1203125	KM1203150	KM1203172	KM1203194	KM1203216	KM1203238
A7 *	Seat Ring: Titanium	T3-N	1	Consult Leslie	KM5000024	KM1207724	KM1210492	KM1203960	KM5000084	Consult Leslie
A7 *	Seat Ring: .6 No Stellite	S2-N	1	KM1203106	KM1203126	KM1203151	KM1203173	KM1203195	KM1203217	KM1203239
A7 *	Seat Ring: .6 Part. Stellite	S2-P	1	KM1203107	KM1203127	KM1204787	KM1204793	KM1204799	KM1204805	KM1204811
A7 *	Seat Ring: .6 Full Stellite	S2-F	1	KM1203107	KM1203127	KM1204788	KM1204794	KM1204800	KM1204806	Consult Leslie
A7 *	Seat Ring: .6 Hastelloy	HC-N	1	KM1203110	KM1203130	KM1203154	KM1203176	KM1203198	KM1203220	KM1203243
A7 *	Seat Ring: .6 Titanium	T3-N	1	KM5000745	Consult Leslie	KM5000854	KM1215803	KM5000395	KM1203636	Consult Leslie
A7 *	Seat Ring: .4 No Stellite	S2-N	1	KM1203111	KM1203131	KM1203155	KM1203177	KM1203199	KM1203221	KM1203244
A7 *	Seat Ring: .4 Part. Stellite	S2-P	1	KM1203112	KM1203132	KM1204785	KM1204791	KM1204797	KM1204803	KM1204809
A7 *	Seat Ring: .4 Full Stellite	S2-F	1	KM1203112	KM1203132	KM1204786	KM1204792	KM1204798	KM1204804	Consult Leslie
A7 *	Seat Ring: .4 Hastelloy	HC-N	1	KM1203115	KM1203135	KM1203158	KM1203180	KM1203202	KM1203224	KM1203248
A7 *	Seat Ring: .4 Titanium	T3-N	1	KM5000746	Consult Leslie	KM1207974	KM1205158	KM5000083	KM5000085	Consult Leslie
A7 *	Seat Ring: .2 No Stellite	S2-N	1	KM1203116	KM1203136	KM1203159	KM1203181	KM1203203	KM1203225	KM1203249
A7 *	Seat Ring: .2 Part. Stellite	S2-P	1	KM1203117	KM1203137	KM1204783	KM1204789	KM1204795	KM1204801	KM1204807
A7 *	Seat Ring: .2 Full Stellite	S2-F	1	KM1203117	KM1203137	KM1204784	KM1204790	KM1204796	KM1204802	Consult Leslie
A7 *	Seat Ring: .2 Hastelloy	HC-N	1	KM1203120	KM1203140	KM1203162	KM1203184	KM1203206	KM1203228	KM1203255
A7 *	Seat Ring: .2 Titanium	T3-N	1	KM5000747	Consult Leslie	KM1219434	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie
A8	Seat Retaining Ring	Trim-S2	1	KM1139636	KM1139640	KM1139644	KM1139648	KM1139652	KM1139656	KM1199350
A8	Seat Retaining Ring	Trim-HC	1	KM1201697	KM1201696	KM1201693	KM1201692	KM1201694	KM1201695	KM1199617
A8	Seat Retaining Ring	Trim-T3	1	KM5000748	KM5000313	KM1208950	KM1205160	KM1203962	KM5000855	Consult Leslie
A9	Flange Retaining Ring	Standard	4	KM1139629	KM1139630	KM1139631	KM1139632	KM1139633	KM1139634	—
A9	Flange Retaining Ring	Option S	4	KM1155019	KM1155041	KM1155419	KM1155078	KM1155089	KM1155146	—
A10	Separable Flanges (L1)	Standard	2	KM1140101	KM1140104	KM1140107	KM1140110	KM1140113	KM1140116	—
A10	Separable Flanges (L1)	Option S	2	KM1151699	KM1195975	KM1195976	KM1159874	KM1195977	KM1195978	—
A10	Separable Flanges (L2)	Standard	2	KM1200133	KM1200134	KM1200135	KM1140111	KM1140114	KM1140117	—
A10	Separable Flanges (L2)	Option S	2	KM1200136	KM1200137	KM1200138	KM1154189	KM1195984	KM1195985	—
A11	Back-Up Ring	Trim-S2	1	KM1139687	KM1139687	KM1139687	KM1139688	KM1139688	KM1139689	KM1139689
A11	Back-Up Ring	Trim-HC	1	KM1139690	KM1139690	KM1139690	KM1139691	KM1139691	KM1139692	KM1139692
A11	Back-Up Ring	Trim-T3	1	KM1207977	KM1207977	KM1207977	KM1203964	KM1203964	KM1203639	KM1203639
A12*	Packing Set	TC	1	KM83000057	KM83000057	KM83000057	KM83000002	KM83000002	KM83000020	KM83000020
A12	Packing Set	G1	1	KM83000058	KM83000058	KM83000058	KM83000019	KM83000019	KM83000029	KM83000029
A13	Gland	Trim-S2	1	KM1199369	KM1199369	KM1199369	KM1199370	KM1199370	KM1199371	KM1199371
A13	Gland	Trim-HC	1	KM1199619	KM1199619	KM1199619	KM1199620	KM1199620	KM1199621	KM1199621
A13	Gland	Trim-T3	1	KM1207979	KM1207979	KM1207979	KM1204060	KM1204060	KM1206326	KM1206326
A14	Nut (Steel)		2	KM1147010	KM1147010	KM1147010	KM1141512	KM1141512	KM1141512	KM1141512
A14	Nut (316 SST)		2	KM1155548	KM1155548	KM1155548	KM1144321	KM1144321	KM1144321	KM1144321
A15	Stud (Steel)		2	KM1140219	KM1140219	KM1140219	KM1140220	KM1140220	KM1140221	KM1140221
A15	Stud (316 SST)		2	KM1192587	KM1192587	KM1192587	KM1192588	KM1192588	KM1192589	KM1192589
A16	Gland Clamp (Steel)		1	KM1139759	KM1139759	KM1139759	KM1139760	KM1139760	KM1139761	KM1139761
A17*	Shaft	Trim-S2	1	KM1199351	KM1199352	KM1199353	KM1199354	KM1199355	KM1206246	KM1206249
A17*	Shaft	Trim-HC	1	KM1199430	KM1199431	KM1199432	KM1199433	KM1199434	KM1206247	KM1206250
A17*	Shaft	Trim-T3	1	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie
A18	Packing Nut (316 SST)		2	KM1155548	KM1155548	KM1155548	KM1144321	KM1144321	KM1144321	KM1144321
A19	Packing Stud (316 SST)		2	KM1139762	KM1139762	KM1139762	KM1139763	KM1139763	KM1139764	KM1139764
A21	Stud Block (W1)	WCB	1	N/A	N/A	N/A	N/A	KM1199360	KM1199363	KM1199366
A21	Stud Block (W2)	WCB	1	N/A	N/A	KM1199358	KM1199359	KM1199361	KM1199364	KM1199367
A21	Stud Block (W3)	WCB	1	N/A	N/A	KM1199358	KM1199359	KM1199362	KM1199365	KM1199368
A22	O-Ring (PTFE Seat Seal †	PTFE	1	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie
A23	O-Ring (PTFE Seat Seal †	PTFE	1	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie	Consult Leslie
A26	O-Ring (Viton)	M1	1	KM1151557	KM1151557	KM1151557	KM1151563	KM1151563	KM1156484	KM1156484
A26	O-Ring (Kalrez)	M2	1	KM1203420	KM1203420	KM1203420	KM1203422	KM1203422	KM1203424	KM1203424
A27	O-Ring (Viton)	M1	1	KM1151560	KM1151560	KM1151560	KM1151566	KM1151566	KM1151636	KM1151636
A27	O-Ring (Kalrez)	M2	1	KM1203421	KM1203421	KM1203421	KM1203423	KM1203423	KM1203425	KM1203425

† Not Shown

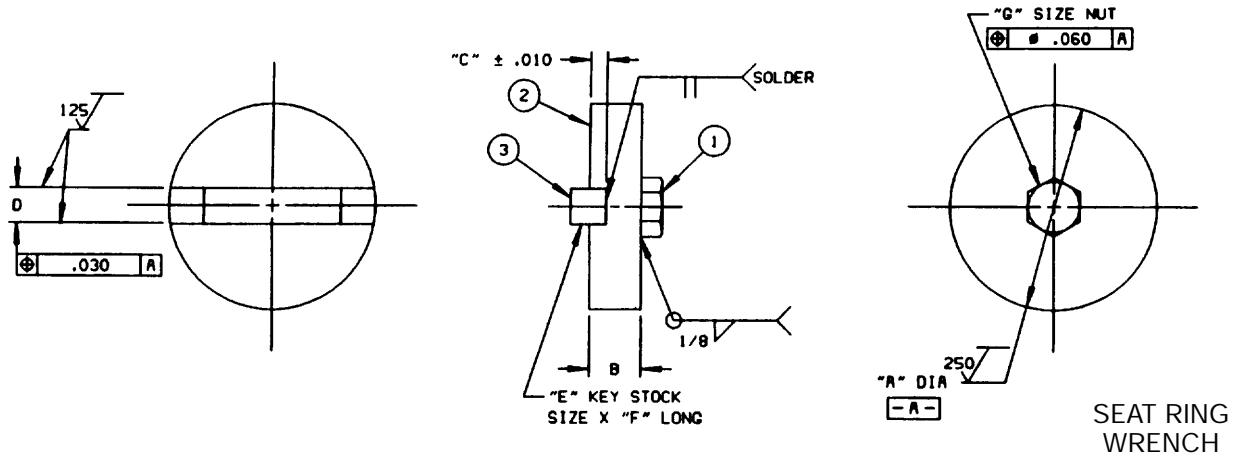
*Recommended spare parts

DRAWING NUMBER	VALVE SIZE	DIMENSIONS						
		A	B	C	D	E	F	G
A-27099-1	1	1-3/16	1	.200	$\frac{.187}{.188}$	3/16 x 3/8	$\frac{.850}{.840}$	1/2
A-27099-2	1-1/2	1-1/2	5/8	.200	$\frac{.187}{.188}$	3/16 x 3/8	$\frac{1.225}{1.215}$	1/2
A-27099-3	2	2-1/2	5/8	.200	$\frac{.437}{.438}$	7/16 x 7/16	$\frac{1.660}{1.650}$	5/8
A-27099-4	3	3-3/8	5/8	.250	$\frac{.624}{.625}$	5/8 x 5/8	$\frac{2.380}{2.370}$	5/8
A-27099-5	4	4-1/2	3/4	.250	$\frac{.624}{.624}$	5/8 x 5/8	$\frac{3.315}{3.305}$	5/8

NO.	PART NAME	MATERIAL	QTY.
1	NUT	CARBON STEEL UNPLATED	1
2	DISC	CARBON STEEL ANSI 1018	1
3	KEY STOCK	M2 TOOL STEEL	1

NOTE:

1. COAT FINISHED PART WITH BLACK PAINT.



VALVE SEAT RETAINER WRENCH
FIGURE 5

LESLIE MODELS 40, 55, AND 85 DIAPHRAGM ACTUATORS ON K-MAX CONTROL VALVES

DESCRIPTION

The Leslie Rotary Diaphragm Actuator is designed for the Leslie K-MAX rotary control valves. It can be used for on-off or modulating applications in either the Spring-To-Open or Spring-To-Close mode of operation. Action can be changed easily in the field without additional parts required.

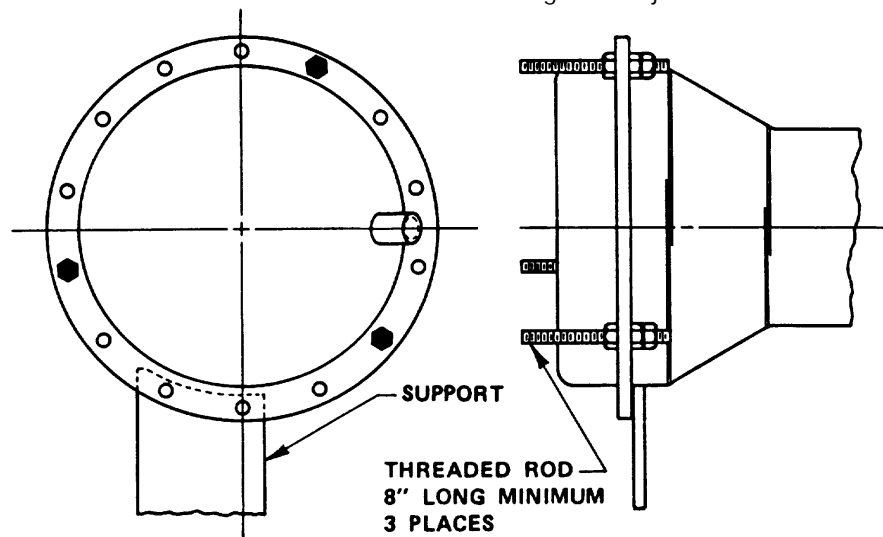
WARNING

THIS ACTUATOR CONTAINS A COMPRESSED SPRING. THE POTENTIAL FOR PERSONAL INJURY EXISTS DURING THE DISASSEMBLY / REASSEMBLY PROCESS. CAREFULLY FOLLOW THESE INSTRUCTIONS TO ENSURE YOUR SAFETY.

CAUTION

STOP PIPELINE FLOW BEFORE REMOVING THE ACTUATOR FROM THE VALVE. FLOW IN THE PIPELINE WITH THE ACTUATOR REMOVED FROM THE VALVE MAY CAUSE THE VALVE TO SLAM SHUT. THIS COULD RESULT IN PERSONAL INJURY AND/OR SYSTEM DAMAGE.

Note: For high vibration applications, it is important to support the diaphragm end of the actuator by the pipeline to prevent actuator damage. Figure 1 shows the recommended method of attaching the support to the actuator.



VIBRATION SUPPORT & DISASSEMBLY STUDS
FIGURE 1

AIR SUPPLY

The supply pressure to the actuator must not exceed 60 psig. The spring rating is either 20 psi, 35 psi or 60 psi and is specified on the label affixed to the diaphragm cover.

LUBRICATION

This actuator has been lubricated at the factory and does not require additional lubrication.

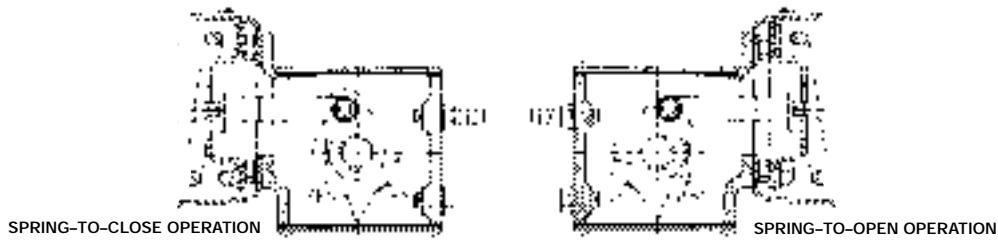
OPEN AND CLOSED POSITION STOP ADJUSTMENTS

The procedure for adjusting the open and closed position stops depends upon the actuator action. See the appropriate following section for your actuator.

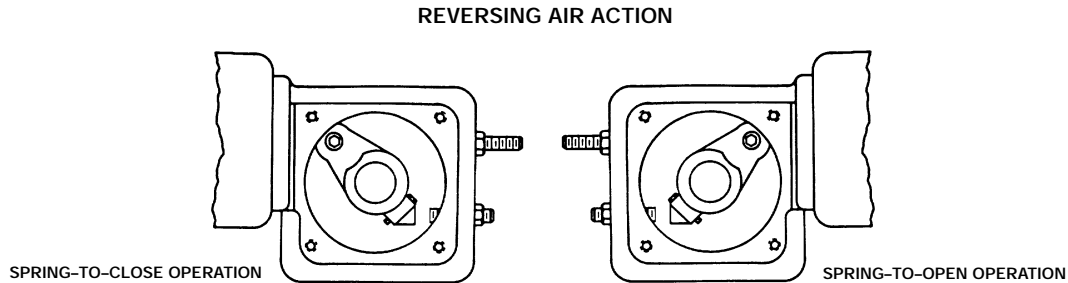
SPRING-TO-CLOSE ACTUATORS: CLOSED STOP ADJUSTMENT

This adjustment is not required on valves with metal seats.

1. Relieve the air pressure to the diaphragm.
2. Loosen the jam nut on the closed stop adjusting screw (see the Exploded Assembly on the last page of this Instruction for parts identification).
3. Turn the closed stop adjusting screw in or out until the valve is in the closed position. See the Instruction Manual for the valve to determine the correct closed position for that product line. It will be easier to turn the adjusting screw if slight air pressure is applied to the diaphragm; relieve the air pressure to check the adjustment.
4. Tighten the jam nut to lock the adjusting screw in place.



SIZE 40 ACTUATOR CUTAWAY
FIGURE 2A



SIZE 55 & 85 ACTUATORS-REVERSE ACTION
FIGURE 2B

OPEN STOP ADJUSTMENT

1. Apply and maintain maximum supply pressure to the diaphragm. The supply pressure must not exceed the spring rating of the actuator.
2. Loosen the jam nut on the open stop adjusting screw.
3. Turn the open stop adjusting screw in or out until the valve is in the open position. It will be easier to turn the adjusting screw if air pressure to the diaphragm is relieved; reapply air pressure to check the adjustment.
4. Tighten the jam nut to lock the adjusting screw in place.
5. Relieve the air pressure to the diaphragm.

SPRING-TO-OPEN ACTUATORS: CLOSED STOP ADJUSTMENT

The valve seat acts as the closed stop. Do not engage the closed stop unless shutoff is not desired.

ACTUATOR REMOVAL OF SIZE 40 ACTUATOR

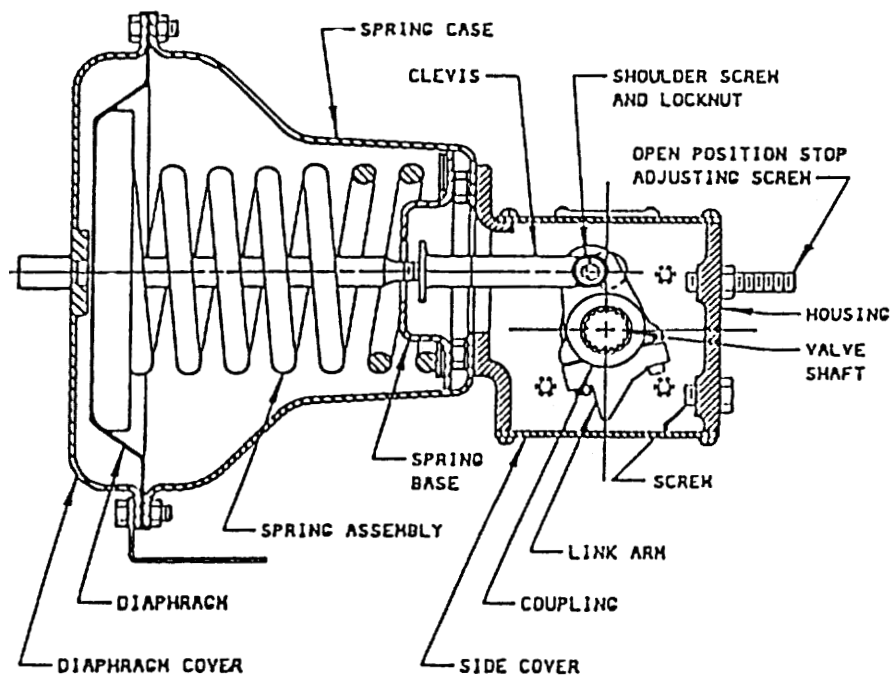
To remove the diaphragm Actuator properly and safely from a Leslie K-Max Control valve, carefully follow this procedure.

1. Stop pipeline flow. Pipeline flow must be stopped before actuator disassembly to prevent flow system damage and/or personal injury.
2. Scribe coinciding lines on the actuator and valve to ensure correct alignment during actuator Installation.
3. Remove the two side covers from the actuator. See Figure 2 for parts Identification.

4. Remove the pointer screws and pointer.
5. Remove the top cover from the actuator.
6. Apply air pressure to the diaphragm until the shoulder screw in the link arm lines up with the 5/8" hole in the top of the housing.
7. Remove the shoulder screw and lock nut from the link arm.
8. Turn off the supply pressure to the actuator assembly, then disconnect the supply line from the actuator.
9. Remove the two screws holding the link arm halves together and remove the link arm.
10. Remove the two coupling-clamp screws and nuts (one screw goes in from each side of the housing as shown in Figure. 4) and remove the coupling clamp.
11. Remove the four bolts securing the actuator to the yoke.
12. Slide the actuator off the coupling.
13. Slide the coupling off the valve shaft.

ACTUATOR INSTALLATION OF SIZE 40 ACTUATOR

1. Turn the valve shaft counterclockwise until the valve is In the closed position.
2. Install the link arm halves on the coupling.
3. Place the link arm coupling assembly on the valve shaft as shown in Figure 4, Page B17. The position of the link arm coupling is dependent upon actuator action and the mounting position of the actuator on the valve.



SIZE 40 ACTUATOR SHOWN IN THE SPRING-TO-CLOSE MODE OF ACTUATION
(ACTUATOR SHOWN WITH TOP COVER AND POINTER REMOVED)
FIGURE 3

4. Remove the two socket head screws holding the link arm halves together and remove the link arm from the coupling.

5. Slide the actuator over the coupling until it sets on the yoke¹ then secure it in place with four bolts.

6. Install the coupling clamp on the coupling. The screws must be installed from opposite sides of the housing as shown in Figure 4, Page B17.

ACTUATOR REMOVAL OF SIZE 55 & 85 ACTUATOR

To remove the Diaphragm Actuator properly and safely from a Leslie valve, carefully follow this procedure.

1. Stop pipeline flow. Pipeline flow must be stopped before actuator disassembly to prevent flow system damage and/or personal injury.

2. If the unit is equipped with a positioner or switches, turn off the pneumatic and electrical supplies to these accessories and remove them from the actuator.

3. Remove the two pointer screws and the pointer.

4. Apply approximately 10 psi air pressure to the diaphragm, then remove the cast housing cover. Removal or installation of the housing cover without pressure on the diaphragm is very difficult and could result in damage to the actuator or valve.

5. Remove the shoulder screw from the link arm.

6. Relieve the air pressure to the diaphragm.

7. Disconnect the actuator piping.

8. Remove the four screws securing the actuator to the mounting adaptor, then lift the actuator from the adaptor.

9. Loosen the two screws clamping the link arm to the valve shaft, then remove the link arm.

ACTUATOR INSTALLATION OF SIZE 55 AND 85 ACTUATOR

1. Set the valve in the closed position. The valve-closed position is described in the Valve instruction.

2. Slide the link arm onto the shaft in the position shown in Figure 5, Page B19.

3. Tip the actuator slightly to get it over the link arm, then set the actuator on the mounting adaptor.

4. Secure the actuator to the adaptor with four bolts.

5. Position the link arm so its top edge is approximately 3/16" below the top edge of the actuator housing as shown in Figure 6, Page B19.

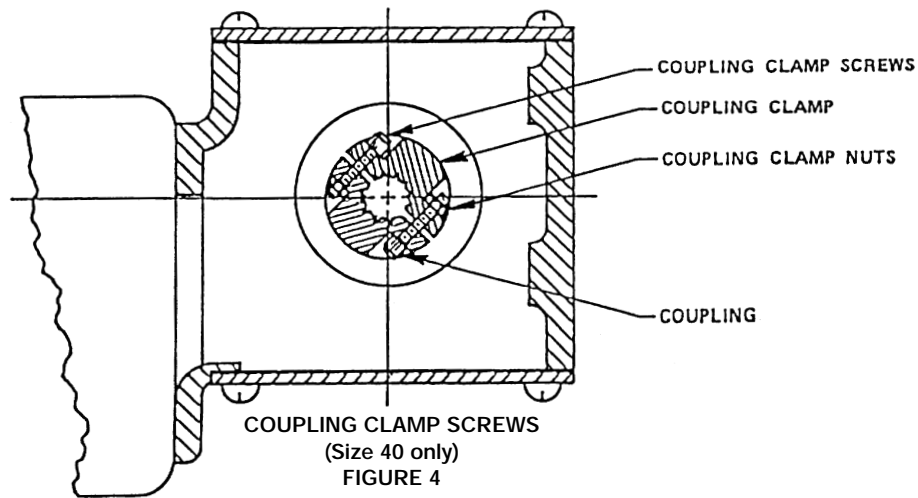
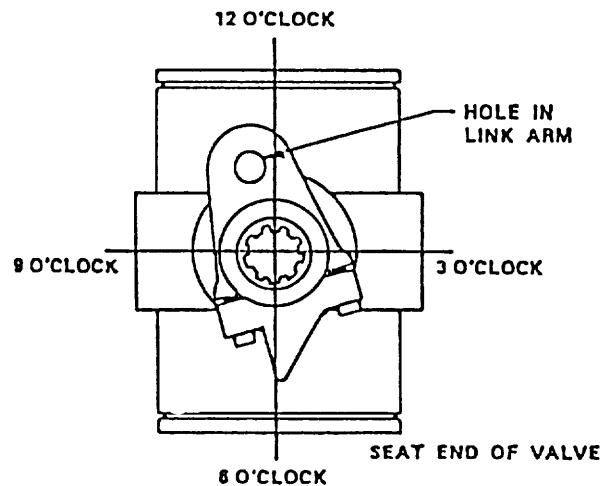
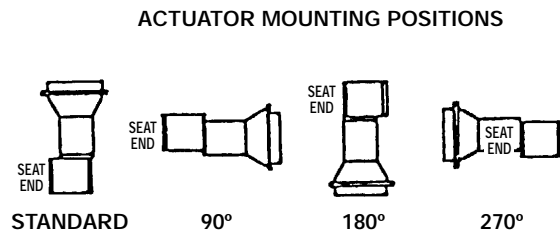


FIGURE 4

6. Connect the actuator piping.
7. Apply air pressure to the diaphragm to slide the rod end into the link arm slot; secure the rod end in place by installing the shoulder screw.
8. Apply the minimum amount of air pressure necessary to stroke the actuator so the link arm just contacts the stop.
9. Position the stub shaft as shown in Figure 4. Turn the stub shaft only, not the link arm.
10. Tighten the screws to clamp the link arm to the valve shaft.
11. Make sure the stub shaft O-ring is in place, then place the gasket and cover on the housing.



ACTUATOR ACTION	MOUNTING POSITION	POSITION OF HOLE IN LINK ARM IN RELATIONSHIP TO SEAT END OF VALVE
DIRECT	Standard	1 Tooth Counterclockwise from 6 o'clock
DIRECT	90°	1 Tooth Counterclockwise from 9 o'clock
DIRECT	180°	1 Tooth Counterclockwise from 12 o'clock
DIRECT	270°	1 Tooth Counterclockwise from 3 o'clock
REVERSE	Standard	1 Tooth Counterclockwise from 12 o'clock
REVERSE	90°	1 Tooth Counterclockwise from 3 o'clock
REVERSE	180°	1 Tooth Counterclockwise from 6 o'clock
REVERSE	270°	1 Tooth Counterclockwise from 9 o'clock

CORRECT POSITION OF LINK ARM ON VALVE SHAFT
FIGURE 5

12. Relieve the pressure to the diaphragm.
13. Attach the pointer to the stub shaft.
14. Install any accessories removed.
15. Check the open and closed position stops and readjust if necessary.
16. Pipeline flow may now be restored.

SPRING ASSEMBLY REPLACEMENT

WARNING

THIS ACTUATOR CONTAINS A COMPRESSED SPRING. THE POTENTIAL FOR PERSONAL INJURY EXISTS DURING THE DISASSEMBLY/REASSEMBLY PROCESS. CAREFULLY FOLLOW THESE INSTRUCTIONS TO ENSURE YOUR SAFETY.

1. Stop pipeline flow. Pipeline flow must be stopped before actuator disassembly to prevent flow system damage and/or personal injury.
2. Remove the two pointer screws and the pointer.
3. Apply approximately 10 psi air pressure to the diaphragm, then remove the cast housing cover. Removal or installation of the housing cover without pressure on the diaphragm is very difficult and could result in damage to the actuator or valve.
4. Remove the shoulder screw from the link arm.
5. Relieve the air pressure to the diaphragm.
6. Disconnect the actuator piping.
7. Remove three of the bolts that fasten the diaphragm cover to the spring case. Equally space the bolts as shown in Figure 1.
8. For size 40 actuators, use 1/4" threaded rod, 3" long. For size 55 and 85 actuators, use 3/8" threaded rod, 8" long. Install the threaded rod about in each of the three holes, then install and tighten nuts on each end of the rods. Refer to Figure 1, PAGE B14.
9. Remove the remaining diaphragm cover bolts.
10. Slowly and evenly back out the nuts on the threaded rod until all the spring pressure is relieved, then remove the nuts and diaphragm cover.
11. Remove the rubber diaphragm.
12. Pull the spring assembly out of the spring case.

UNDER NO CIRCUMSTANCE IS THE SPRING ASSEMBLY TO BE DISASSEMBLED. DISASSEMBLY COULD RESULT IN PERSONAL INJURY.

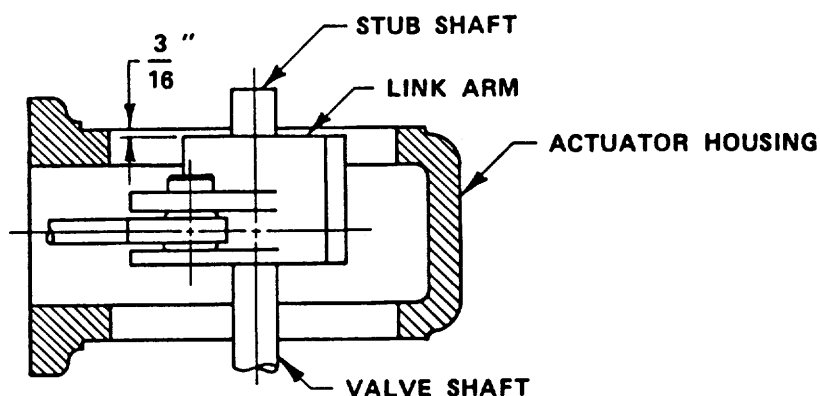
13. Remove the rod end from the old spring assembly and screw it into the new spring assembly until about 1/4" of threads remain showing.
14. Slide the new spring assembly into the spring case so the two pins in the spring fit into the two holes in the housing.
15. Place the diaphragm on the spring case, then set the diaphragm cover on the diaphragm.
16. Fasten the spring case, diaphragm and diaphragm cover together using bolts and nuts, in the reverse of the removal sequence described in 7,8,9,10 above. Place the CAUTION tag under one of the bolts.
17. Connect the actuator piping.
18. Apply air pressure to the diaphragm to slide the rod end into the link arm slot; secure the rod end in place by installing the shoulder screw.
19. Make sure the stub shaft O-ring is in place, then place the gasket and cover on the housing.
20. Relieve the pressure to the diaphragm.
21. Attach the pointer to the stub shaft.
22. Check the open and closed position stops and readjust if necessary.
23. Pipeline flow may now be restored.

DIAPHRAGM REPLACEMENT

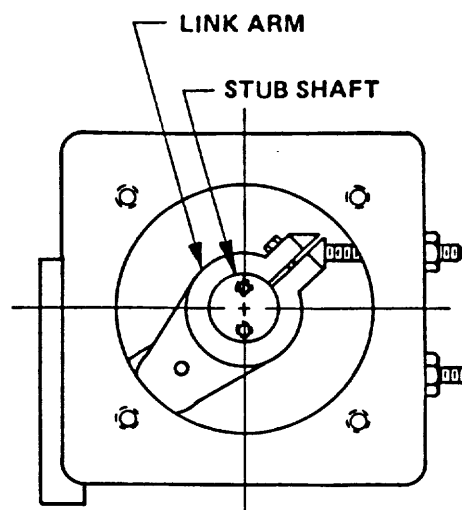
1. To disassemble, follow Steps 1 thru 11 in the REPLACING THE SPRING ASSEMBLY Section of this Instruction.
2. To reassemble, follow Steps 15 thru 23 in the REPLACING THE SPRING ASSEMBLY Section of this Instruction.

REVERSING THE ACTION

1. Stop pipeline flow. Pipeline flow must be stopped before actuator disassembly to prevent flow system damage and/or personal injury. Refer to Figure 2, Page B15.
2. Remove the two pointer screws and the pointer.
3. Apply approximately 10 psi air pressure to the diaphragm, then remove the cast housing cover. Removal or installation of the housing cover without pressure on the diaphragm is very difficult and could result in damage to the actuator or valve.
4. Remove the shoulder screw from the link arm.
5. Relieve the air pressure to the diaphragm.
6. Disconnect the actuator piping.
7. Remove the actuator from the adaptor.
8. Loosen the two cap screws on the link arm.
9. Mark the position of the link arm on the shaft. Remove the link arm, rotate it 180 degrees from its previous position, then reinstall it on the valve.



LINK ARM POSITION
FIGURE 6



STUB SHAFT POSITION
FIGURE 7

10. Turn the actuator upside down from its previous position and fasten it in place. The housing face that faced away from the valve will now be bolted to the bonnet.

11. Position the link arm on the valve shaft so its edge is about 3/16" below the top edge of the actuator housing as shown in Figure 6, Page B19.

12. 55 and 85 actuators: Position the stub shaft as shown in Figure 7, B19. Turn only the stub shaft, not the link arm.

13. Tighten the two cap screws in the link arm.

14. Connect the actuator piping.

15. Apply air pressure to the diaphragm to slide the clevis into the linkarm (40) or the rod end into the link arm slot (55-85); secure the rod end in place by installing the shoulder screw.

16. Make sure the stub shaft O-ring is in place, then place the gasket and cover on the housing.

17. Relieve the pressure to the diaphragm.

18. Attach the pointer to the stub shaft.

19. Check the open and closed position stops and readjust if necessary.

20. Pipeline flow may now be restored.

CHANGING MOUNTING POSITIONS

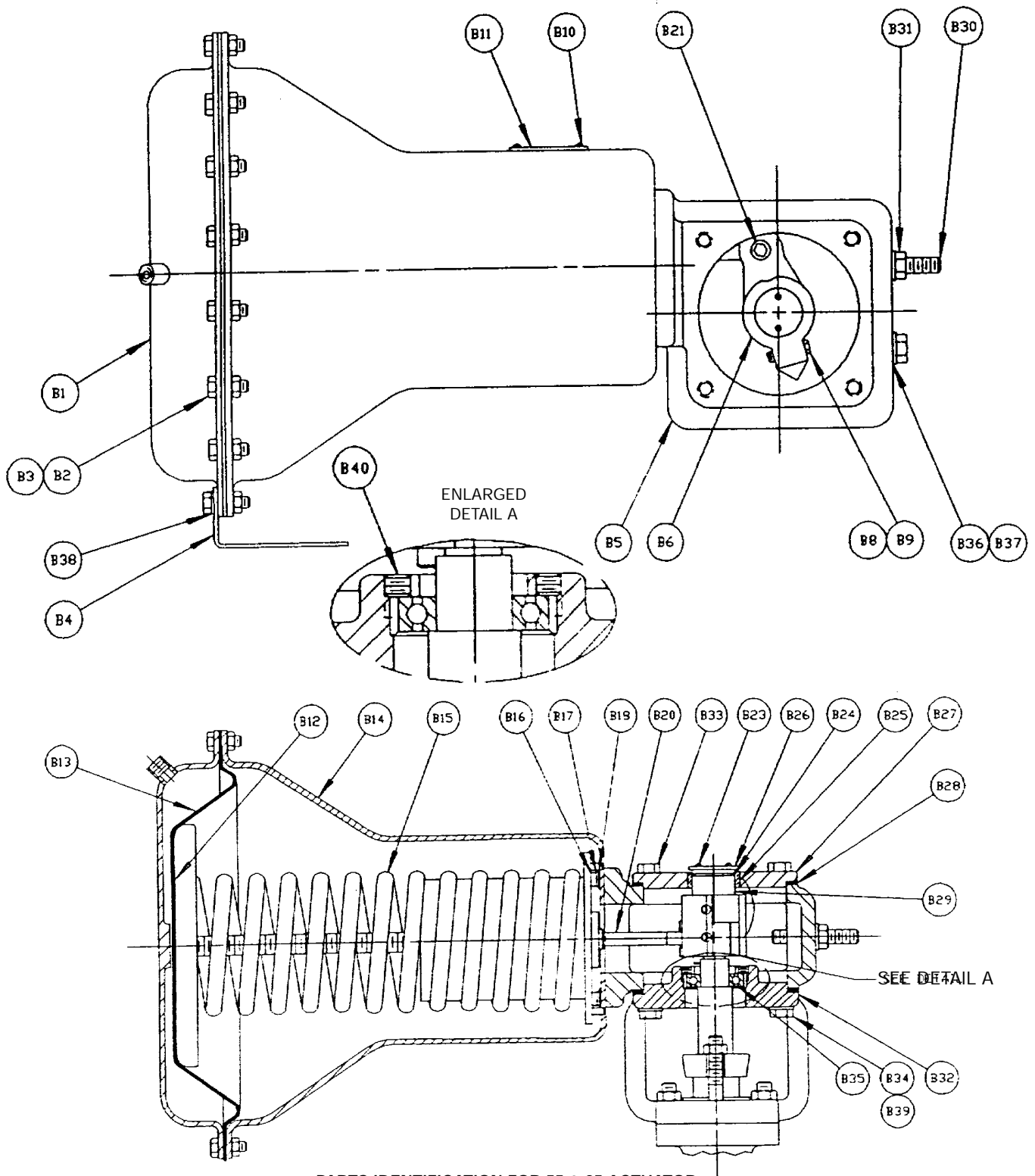
The actuator may be mounted in any of four positions: standard, 90 degrees, 180 degrees or 270 degrees from standard around the valve stem. In the 90 and 270 degree positions, the diaphragm housing may not clear the pipeline. Be sure to determine this clearance before attempting to change the mounting position.

1. Disassemble the actuator as described in Steps 1 thru 8 of the REVERSING THE ACTION Section of this Instruction.

2. Remove the link arm. Orient the link arm as described in the Table (Figure 5, Page B17). Reinstall it on the shaft.

3. Set the actuator on the adaptor in the desired position, then fasten in place.

4. Reassemble the actuator as described in Steps 12 thru 20 of the REVERSING THE ACTION Section of this Instruction.

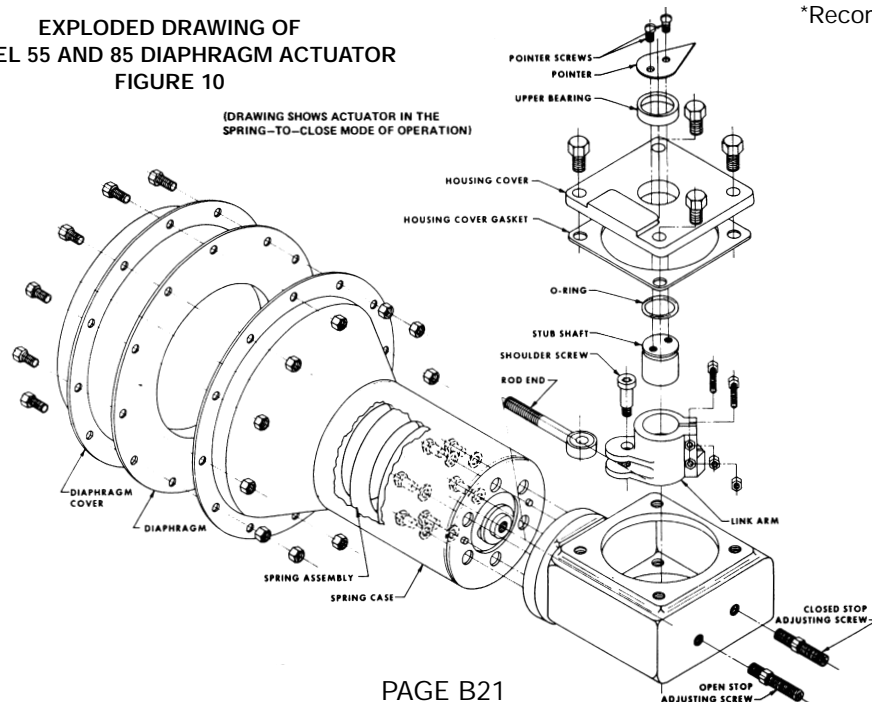


PARTS IDENTIFICATION FOR 55 & 85 ACTUATOR
FIGURE 8

K-MAX - ACTUATOR PARTS

55 ACTUATOR				85 ACTUATOR			
REF	PART #	DESCRIPTION	QTY PER VALVE	REF	PART #	DESCRIPTION	QTY PER VALVE
B01	KM1204998	COVER ASSY DIAPH LIN/ROT	1	B01	KM1105195	COVER ASSY DIA85	1
B02	KM1008224	SCR HX HD 3/8-16X1 18-8	14	B02	KM1008224	SCR HX HD 3/8-16x7/8 316	16
B03	KM1031950	NUT HX 3/8-16 T316	14	B03	KM1008224	NUT HEX 3/8-16 316SS	16
B04	KM1012920	TAG BRASS RED CAUTION	1	B04	KM1012920	TAG BRASS RED CAUTION	1
B05	KM1111114	HOUSING DIAPH S5&85	1	B05	KM1111114	HOUSING DIAPH 55&85	1
B06	KM1140372	LINKARM	1	B06	KM1140373	LINKARM	1
B08	KM1046647	SCR HX HD 3/8-16X1-1/4 G5	2	B08	KM1046647	SCR HX HD 3/8-16x1-1/4 G5	2
B09	KM1000085	NUT HX 3/8-16 STL ZP	2	B09	KM1000085	NUT HX 3/8-16 STL ZP	2
B10	KM1141194	SCR DR U6 X 1/4	2	B10	KM1141194	SCR DR UE X 1/4	2
B11	KM1186847	DATA PLATE K-MAX BRASS	1	B11	KM1186847	DATA PLATE K-MAX BRASS	1
B12	KM1105228	LABEL CAUTION DIA	1	B12	KM1105228	LABEL CAUTION DIA	1
B13	KM1093469	DIAPHRAGM 55	1	B13*	KM1093470	DIAPHRAGM 85	1
B14	KM1204999	CASE SPRING DIA ACT 55	1	B14	KM1205604	CASE SPRING DIA ACT85	1
B15(A)	KM1141584	ASSY,SPRG,DR55,20PSI"	1	B15(A)	KM1141582	SPRING ASSY DIAPH 85,20 PSI	1
B15(B)	KM1141583	ASSY,SPRG,DR55,35PSI	1	B15(B)	KM1205611	SPRING ASSY DIAPH 85,35 PSI	1
B15(C)	KM1140351	ASSY,SPRG,DR55,60 PSI	1	B15(C)	KM1140350	SPRING ASSY DIAPH 85,60 PSI	1
B16	KM1002018	SCR SOCHD 3/8-16X1 C36	6	B16	KM1002017	SCR SOCHD 3/8-16X3/4 C36	6
B17	KM1004901	WASHER LOCK SPR 3/8 ZP	6	B17	KM1004901	WASHER LOCK SPR 3/8 ZP	6
				B18	KM1002510	WASHER F A 3/8 W EP	6
B20	KM1105216	BRG ROD END	2	B20	KM1105216	BRG ROD END	1
B21	KM1037834	SCR SHLD 1/2X3/8-16X1	1	B21	KM1037834	SCR SHLD 1/2X3/8-16X1	1
B23	KM1001955	SCR RH SL 10-24X1/2 HP	2	B23	KM1001955	SCR RH SL 10-24X1/2 ZP	2
B24	A74277	ORNG, BUNAN, -028	1	B24*	A74277	ORNG, BUNAN, -028	1
B25	KM1051666	BRG SLV 1.503X1.754X1/2	1	B25*	KM1051666	BRG SLV 1.503X1.754X1/2	1
B26	KM1122260	POINTER DR55/8B	1	B26	KM1122260	POINTER DR55/85	1
B27	KM1140371	COVER, HSG DIA 55/85	1	B27	KM1140371	COVER, HSG DIA 55/85	1
B28	KM1110889	GSKT DIA ACT HOUS COVER	2	B28*	KM1110889	GSKT DIA ACT HOUS COVER	2
B29	KM1211328	STUB SHAFT	1	B29	KM1211328	STUB SHAFT	1
B30	KM5000513	SCR STSOC 1/2-13X2-3/4 18-8	1	B30	KM1105217	SCR STSOC 1/2-13x2 3/4 FLZ	2
B31	KM1031949	NUT HX JAM 1/2-13 316	1	B31	KM1105227	NUT HX HVY JAM 1/2-13 HP	2
B32	RM1140346	YOKE DIAPH 55	1	B32	KM1140347	YOKE DIAPH 85	1
B33	KMI000267	SCR HX HD 1/2-13X1 ZP	4	B33	KM1000267	SCR HX HD 1/2-13X1 ZP	4
B34	KM1000269	SCR HX HD 1/2-13X1-1/2 ZP	4	B34	KM1000269	SCR HX HD 1/2-13X1-1/2 ZP	4
B35	KM1140353	BRG BALL 25MMX52MMX15MM	1	B35*	KM1140356	BRG BALL 40MMX80MMX18MM	1
B36	KM1000266	SCR HX HD 1/2-13X3/4 ZP	1	B36	KM1000266	SCR HEX HD 1/2-13X3/4 ZP	1
B37	KM1031657	WASHER LOCK SPR 1/2 18-8	1	B37	KM1004921	WASHER LOCK SPR 1/2 ZP	1
B38	KM1048344	WASHER F A 3/8 N 18-8	1	B38			
B39	KM10002505	WASHER LK EXT T 1/2 ZP	4	B39	KM1002505	WASHER LK EXT T 1/2 ZP	4
B40	KM1071706	SCR STLK 3/8-16X1/2 KN18	2	B40	KM1071706	SCR STLK 3/8-16X1/2 KN18	2

EXPLODED DRAWING OF
MODEL 55 AND 85 DIAPHRAGM ACTUATOR
FIGURE 10



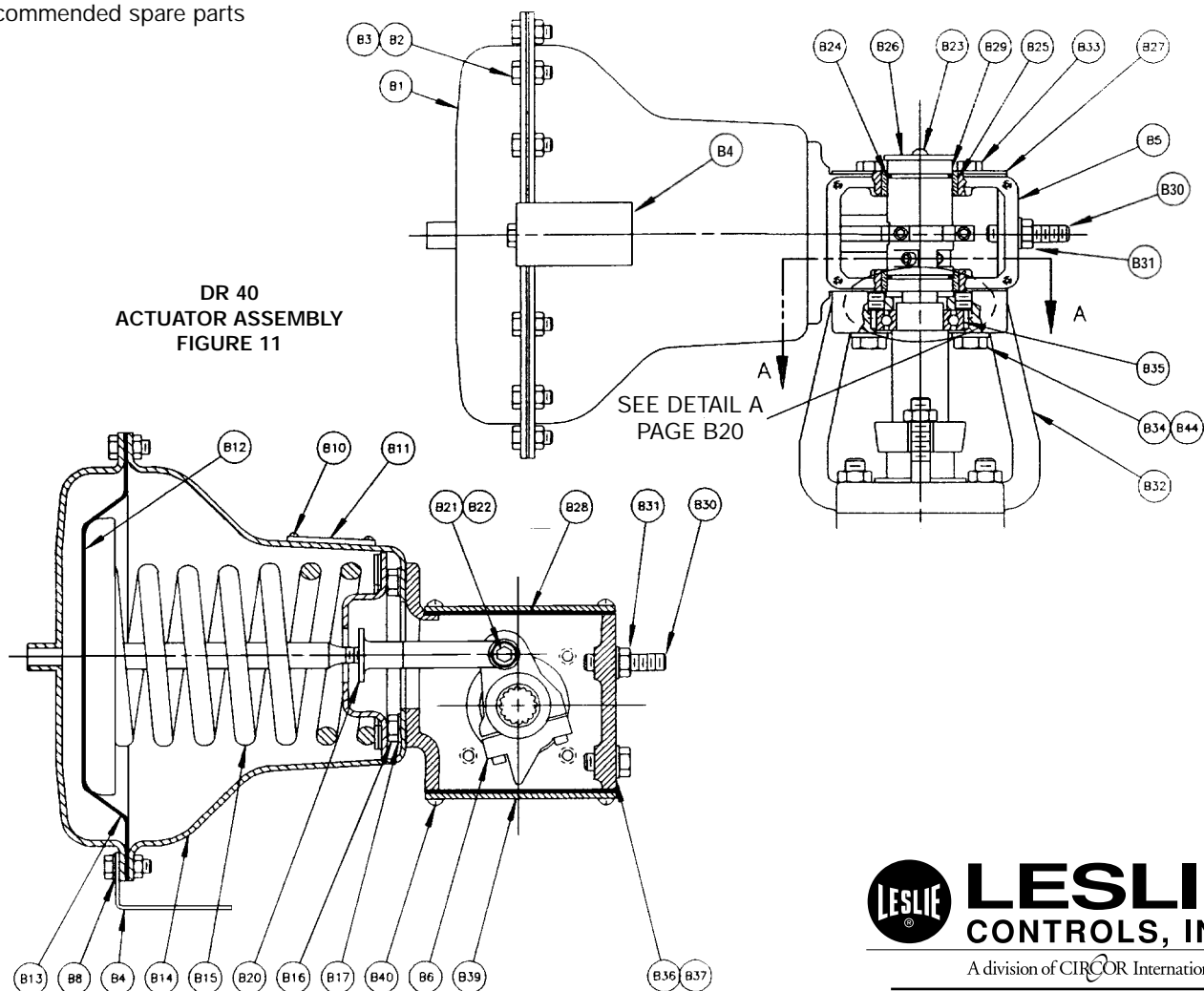
*Recommended spare parts

K-MAX - ACTUATOR PARTS

40 ACTUATOR

REF	PART NUMBER	DESCRIPTION	QTY PER VALVE	REF	PART NUMBER	DESCRIPTION	QTY PER VALVE
B01	KM1181042	COVER ASSY 40 DIR	1	B24*	A74277	ORNG, BUNA-N	2
B02	KM1047749	SCR HX HD 5/16-18X3/4 18	14	B25	KM1117666	BRG SLV, 1. 503X1 . 754x3/8	2
B03	KM1031951	NUT HX. 5/16-18 T316	14	B26	KM1115425	POINTER DR40	1
B04	KM1012920	TAG BRASS RED CAUTION	1	B27	KM1125523	COVER TOP K&M	1
B05	KM1203537	HOUSING DIAPH 40	1	B28*	KM1115423	GSKT SIDE 40	2
B06	KM1126777	LINK ARM FAB DR40	1	B29	KM1161649	COUPLING DIAPH 40	1
B08	KM1082262	WASHER F A 5/16 N 18-8	14	B30	KM1174401	SCR STSOC 3/8-16X2 PL 316	1
B10	KM1141194	SCR DR U6 X 1/4	2	B31	KM1031983	NUT HEX JAM 3/8-16 316	1
B11	KM1186847	DATA PLATE K-MAX BRASS	1	B32	KM1140345	YOKE DIAPH 40	1
B12	KM1105228	LABEL CAUTION DIA	1	B33	KM1000225	SCR HX HD 3/8-16 X _ ZP	4
B13*	KM1179431	DIAPHRAGM 40 BUNA N	1	B34	KM1000230	SCR HX HD 3/8-16 X 1 _ ZP	4
B14	KM1206053	CASE SPRING 40	1	B35*	KM1140352	BRG BALL 20MMX47MMX14MM	1
B15(A)	KM1204960	SPRING ASSY DR40 20 PSI	1	B36	KM1029034	SCR HX HD 3/8-16x1/2 18-8	1
B15(B)	KM1204962	SPRING ASSY DR40 35 PSI	1	B37	KM1188887	WASHER LOCK SPR 3/8 18-8	1
B15(C)	KM1204959	SPRING ASSY DR40 60 PSI	1	B39	KM1115422	COVER SIDE 40	2
B16	KM1203538	SCR HX HD 5/16-18x 5/8 G5	6	B40	KM1143167	SCR RH SL 10-24x3/8 18-8	8
B17	KM1015064	WASHER LOCK SPR 5/16 ZP	6	B41	KM1020386	SCR SOCHD 10-24X3/4 C36	4
B21	KM1117540	SCR SHLD 3/8x5/16-18x3/4	1	B42	N47138	NUT, HEX. ,S300F,10-24	2
B22	KM1000144	NUT HEAVY LOCK THIN 5/16-18	1	B43	KM1115432	CLAMP CPLG DIAPH 40	1
B23	KM1056545	SCR RH SL 10-24X1/4 ZP	2	B44	KM1004901	WASHER LOCK SPR 3/8 ZP	4
				B45	KM1071706	SCR STLK 3/8-16X1/2 KN18	2

*Recommended spare parts



LESLIE
CONTROLS, INC.

A division of CIRCOR International, Inc.

12501 Telecom Drive, Tampa, Florida 33637
Ph: (813) 978-1000 • Fax: (813) 978-0984
www.lesliecontrols.com