FLOWSERVE

FCD WCAIM2028-01
(Part 15908)

Worcester Controls 10, 15, 20 ACCESS I and 10-40 ACCESS M 39 Actuators Intrinsically Safe

Installation, Operation and Maintenance Instructions

DESCRIPTION

Worcester Controls/McCANNA ACCESS I and M Series 39 actuators are pneumatic quarter-turn valve actuators. The solenoid and limit switches for the ACCESS I are integral to the actuator end cap, while the ACCESS M is a separate factory-mounted enclosure containing the solenoid and limit switches. The design utilizes a double-rack, single-pinion concept, with each rack integrally cast to a piston. Both pistons are supported and centered by large, stainless steel guide rods. In double-acting units, both pistons are pressurized on both strokes of the actuator. Ambient temperature range of ACCESS unit is 0°F minimum to 160°F maximum.

Standard units feature an extended top shaft for manual override capabilities and a completely modular design which allows simple attachment of a variety of accessories. The units feature a control block (with spool valve) which properly directs supply air to the actuator. The control block provides independently adjustable speed control for both opening and closing strokes of the actuator on double-acting units, and for the closing stroke on spring-return units (standard mounting configuration). The units can also be supplied with an air connection block (in place of control block) for when there is no solenoid valve integral with unit.

⚠ WARNING: SERIES 39 ACTUATORS ARE ELECTRO-MECHANICAL DEVICES SUBJECT TO NORMAL WEAR AND TEAR. ACTUATOR LIFE IS DEPENDENT UPON APPLICATION AND ENVIRONMENTAL CONDITIONS. IF APPLIED IN HAZARDOUS SERVICES, SUCH AS BUT NOT LIMITED TO MEDIA TEMPERATURE EXTREMES, TOXINS, FLAMMABLES, OR OTHER SERVICES WHERE IMPROPER OR INCOMPLETE OPERATION COULD PRODUCE A SAFETY HAZARD, IT IS INCUMBENT UPON THE SYSTEM DESIGNER AND THE USER TO PROVIDE PROPER WARNING DEVICES SUCH AS TEMPERATURE SENSORS, OXYGEN SENSORS AND FLOW SENSORS. FLOWSERVE ALSO RECOMMENDS THAT THE INTEGRAL LIMIT SWITCHES BE USED FOR MONITORING AND/OR ELECTRICAL INTERLOCK.

CAUTIONS: When actuator is installed in outdoor conditions, water can enter the exhaust hole(s) of the control block or air connection blocks, and then freeze. Flowserve suggests a cover be used, or mount the actuator such that the block exhaust hole(s) will not fill with water.

Flowserve recommends that all products which must be stored prior to installation be stored indoors, in an environment suitable for human occupancy. Do not store product in areas where exposure to relative humidity above 85%, acid or alkali fumes, radia tion above normal background, ultraviolet light, or temperatures above 120°F or below 40°F may occur. Do not store within 50 feet of any source of ozone.

IMPORTANT: *INCLUDED IN ALL 39 ACTUATOR ACCESSORY AND REPAIR KITS IS A REBUILD/ACCESSORY ADDITION LABEL, WHICH IS TO BE MARKED WITH A PERMANENT MARKER AND THEN APPLIED TO THE ACTUATOR AFTER AN ACCESSORY KIT HAS BEEN INSTALLED OR AN ACTUATOR HAS BEEN REPAIRED.*

All ACCESS M units have four threaded tamper proof plugs installed over the enclosure mounting machine screws. No attempt should be made to remove these plugs. If it becomes necessary to remove enclosure from actuator end cap, consult Flowserve.

INSTALLATION

NOTE: *The Series 39 actuator is normally installed with its major axis parallel to the pipe line (this is mandatory when mounting actuator to 90° V1 diverter/three-way (D44 & T44) valves and CPT valves. The actuator can be oriented above, beside or beneath the valve without affecting its operation.*

Sizes 10–35 Rev. R6 actuators may come with an ISO locating ring used for optional ISO mounting.

A. Determine mode of operation desired (normally open or normally closed) of the valve.

B. Determine desired quadrant for bracket attachment and direction of mounting of actuator (in-line or cross-line).

C. Attach mounting bracket to actuator using four (4) cap screws and lockwashers provided in mounting kit. To avoid any damage to the Series 39 actuator body, ONLY the proper length screws supplied with the mounting kit should be used. For ¼"– 2" top-mount style valves, attach bracket such that bracket nameplate will be to side of valve.

   For mounting to 818/828 Series valves insert ISO locating ring into groove on bottom of actuator before attaching to bracket.

NOTE: *Ring can be permanently held in groove by applying Loctite to ring before inserting in groove.*

D. Attach bracket/actuator assembly to valve as follows:

CAUTION: Ball valves can trap pressurized media in the cavity. If it is necessary to remove any valve body bolts, stem nuts, or remove valve from the line, and if the valve is or has been in operation, make sure there is NO pressure to or in the valve and operate valve one full cycle. However, the valves listed below do not require the removal of any valve body bolts or removal of valve from line in order to mount actuator.

1. Rotate valve ball and stem to position necessary to achieve desired operation. If any valve information is marked on stop plate or handle, it will be necessary to transfer this information to the bracket nameplate

2. For ¼"– 2" 44, and ½"– 2" WK70/WK74, ¼"–1½" 59 and ½"–1½" H71 Series top-mount style valves and ½"– 2" 51/52, ½"–1½" 82/83 Series valves with high-cycle stem packing as standard, remove handle nut, lockwasher, handle, separate stop plate (if any), retaining nut and stop pin(s). Add the two additional Belleville washers with their larger diameter sides touching each other. Add the self-locking nut to the stem and tighten while holding the stem flats with wrench. Tighten until Belleville washers are flat, the nut will "bottom", and then back nut off ⅓ of a turn. The two additional Belleville washers and the self-locking nut are included in the mounting kit.

CAUTION: The self-locking stem nut is difficult to tighten, and must fully flatten Belleville washers before backing off.

For 2" 59, H71, 82/83, and 2½" 45, 82/83 series valves, and valves 3" and larger with square stem, remove handle assembly (if any), retaining nut, stop and stop screws. Replace with valve stem spacer or, if valve has graphite stem packing, with two Belleville washers (except 8", 10" 82/83 and 10" 51/52), and replace retaining nut.

NOTE: *Belleville washers are installed with their larger diameter sides touching each other. Do not use stem spacer when Belleville washers are used. Using a wrench to prevent stem from turning, tighten retaining nut until stem packing is fully compressed or Bellevilles, if used, are fully flattened, then back off nut ⅙ turn. Excessive tightening causes higher torque and shorter seal life.*

NOTE*: Large valves with V51 high-cycle stem packing option installed, identified by two Belleville washers installed and handle assembly, stop and stop screws removed, and 818/828 Series Valves do not require stem area disassembly.*

For ½"– 2" 94 valves, remove handle (if any). Do not remove gland plate or gland bolts.

For 3" and larger 94 and 2" and larger E818/828 valves, remove handle assembly, stop, and spacer (if any). Do not remove gland plate or gland bolts.

For 2" and larger 818/828 valves, remove handle assembly, locking plates and hardware, and stop screw (if any). Do NOT remove stop plate (2"– 6" sizes) or spacer (8" size).

3. Center coupling on valve stem.

4. Lower mounting bracket/actuator assembly over coupling and onto valve, making sure that male actuator shaft engages slot in coupling.

5. Secure bracket to valve using cap screws and lockwashers, or bolts and nuts provided in mounting kit. Tighten securely. For ½"– 2" top mount style valves, bracket nameplate will be to side of valve.

   Install set screws (if any) in the coupling and tighten securely.

6. Determine if mode of operation is as desired; if not:

   a. Double-Acting Actuators - Mount the actuator 90° from normal mounting (see last paragraph in D.6.b for size 25 and larger actuators). On 10–20 sizes, the actuator may also be inverted, yielding the opposite mode.

   b. Spring-Return Actuators - The normal method of mounting is to have the actuator in line with the pipe line and the valve and actuator in the FAIL-CLOSED position.

      For FAIL-CLOSED cross-line operation with 10–20 sizes, invert actuator and cross-line mount actuator to pipe line.

      For FAIL-OPEN in-line operation with 10–20 sizes, invert actuator. (**NOTE:** If in-line coupling is used, actuator does not need to be inverted). Rotate the valve ball and stem 90°, so coupling lines up with actuator shaft. Mount actuator in line with the pipe line. See Electrical Connection Section for proper wiring information.

      For FAIL-OPEN cross-line operation with 10–20 sizes, rotate the valve ball and stem 90°, so coupling lines up with actuator shaft. Mount actuator cross line to pipe line. See Electrical Connection Section for proper wiring information.

      On sizes 25 and larger double-acting and spring-return actuators the output shaft is square. This allows selection of either mode of operation by indexing the coupling (including valve ball and stem) 90° to the actuator shaft, while keeping the actuator in an in-line orientation. Cross-line mounting, if desired, requires a special bracket, except for the 818/828 Series valves.

7. Determine position indication. Buttons on position indicator are set up to show valve closed on in-line mounting, i.e., pistons together in actuator. If different indication is required:

   a) Check which visual indication is required.

   b) Check that indicator, when located on actuator shaft, will show correct indication.

   c) To change indication, push out (remove) red and white buttons and reassemble in opposite positions (this step is only necessary on 10–20 sizes).

   d) Locate indicator on actuator shaft flats. Press firmly until location nibs snap into recess on actuator shaft.

AIR SUPPLY AND ELECTRICAL INSTALLATION

A. 1. Air Supply:
The Series 39 Actuator is factory lubricated. For optimum operation, the use of filtered and lubricated air is recommended.

2. Air Supply Pressure:
Intrinsically Safe versions of double-acting actuators require 40–100 psig supply air. Spring-return actuators require 80–100 psig supply air. Spring-return actuators can also be set up to operate on supply air pressures ranging from 40–80 psig by using fewer springs. See "Rebuilding Instructions", Spring-Return Actuator, for proper number and location of springs for reduced supply air pressures.

3. Air Supply Connection:
Connect air supply to ¼" NPT connection on control block. For units with no integral solenoid valve, air connection block has two ¼" NPT connections for inlet air (only one used for spring-return units).

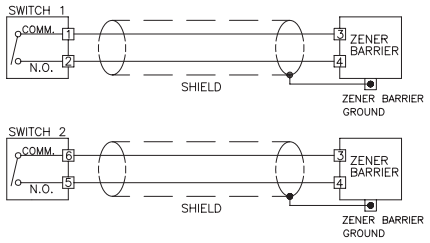
4. Recommended Tubing Sizes:
In order to provide sufficient flow of supply air to the Series 39 actuator, the following tubing sizes are recommended:

Actuator Size	Runs Up To 4 ft. Long	Runs Over 4 ft. Long
10, 15, 20, 25	⅛"	¼"
30 and larger	¼"	⅜"

5. Air Consumption:
The following chart shows the amount of pressurized (80 psig) air consumed per stroke in cubic feet. To determine the total amount of air consumed per complete cycle for double-acting actuators, simply add the volumes for both the opening and closing strokes together; for spring-return units, the total volume of air consumed is the volume shown for the opening stroke.

	Actuator Size							
Stroke	**1039**	**1539**	**2039**	**2539**	**3039**	**3339**	**3539**	**4039**
Open	.04	.08	.16	.28	.43	.65	.90	1.26
Close	.05	.09	.17	.30	.47	1.10	1.27	1.43

Figure 1



6. Electrical Supply:
Make electrical connections in accordance with the wiring diagram on the inside of cover or appropriate wiring diagram in Section B.4.

7. Switch Ratings: 1 amp, 125 VAC

B. ELECTRICAL CONNECTION:
The intrinsically safe versions of the ACCESS I and ACCESS M will be intrinsically safe when connected through CSA Certified zener barriers rated 28 volts DC maximum, 300 ohms minimum (for SW-1 and SW-2 only; refer to paragraph 4 of this section for intrinsically safe wiring of solenoid), as shown in the wiring diagrams (Figure 2) below.

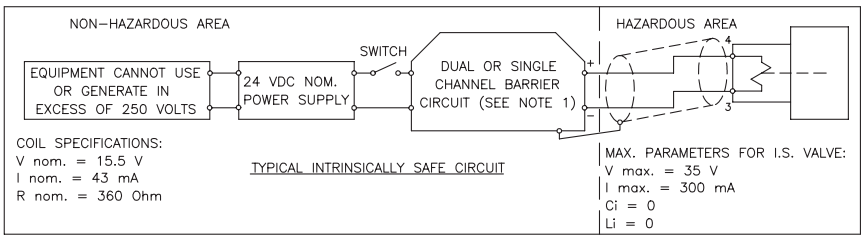
***IMPORTANT**: Shielded cable must be used for each intrinsically safe circuit (Switch circuits and solenoid circuit) and for zener barriers, the shield must be connected to a zener barrier ground.*

1. The "standard" mounting configuration of the 39 actuator to the valve is in-line, fail-closed. In this configuration, SW-2, as described in the wiring diagram and part 3, will give indication when the actuator is in the closed position, or CW limit of rotation. SW-1 gives indication of the open position, or CCW limit of rotation (refer to the appropriate wiring diagram in figure 2).

   ***NOTE**: The CW or CCW rotation of the actuator shaft is determined when viewing the actuator from the nameplate side of the actuator while being able to read the nameplate from left to right.*

2. Fail open configuration for sizes 10–20 may be obtained by either inverting the actuator, using in-line coupling, or mounting the actuator cross-line. For sizes 25 and larger the coupling (including valve ball and stem) must be indexed 90° to the actuator shaft. Refer to Installation Section D.6.b. In these cases, SW-1 and SW-2 indication will be reversed from the above but actuator rotation will vary, depending on which fail-open mounting is used, and wiring shall be done per the appropriate wiring diagram in figure 3.

Figure 2



3. Switches have been factory adjusted, but should be rechecked after installation. Adjustment is as follows:

   a) Switch adjustment for “standard” mounting:
   With actuator mounted in “standard” mounting configuration (see Step 1) set actuator in full-closed position with the adjustment screw near its loose limit. Adjust closed position switch SW-2 (see Wiring Diagram) by tightening the adjustment screw until switch contacts click. Then tighten adjustment screw one additional turn. With air supply to actuator, energize solenoid, if applicable, cycle to the full-open position and adjust open position switch SW-1 in the same manner.

   b) Switch adjustment for FAIL-OPEN mounting:
   With actuator mounted in FAIL-OPEN mounting configuration (see Step 2) set actuator in full-open position with the adjustment screw near its loose limit. Adjust open position switch SW-2 (see Wiring Diagram) by tightening the adjustment screw until contacts click. Then tighten adjustment screw one additional turn. With air supply to actuator, energize solenoid, if applicable, cycle to the full-closed position and adjust closed position switch SW-1 in the same manner as SW-2.

4. Wiring instructions for solenoid and/or limit switches:
   The Intrinsically Safe solenoid valve used in the ACCESS is designed to operate on power levels compatible with Intrinsic Safety requirements. They are Factory Mutual (FM) approved for Class I, II and III Groups A, B, C, D, E, F, and G applications. Entity Approval #OT4A6.AX (NFPA 493; July 19, 1990).

***NOTE 1**: For barrier interconnection, refer to maximum barrier output parameters as referenced on the specific barrier Installation drawing. Connect as follows:*

a) V max > Voc of single or Vt of dual channel barrier.

b) I max > Isc of single or It of dual channel barrier

c) Ci + field wiring < Ca of single or dual channel barrier

d) Li + field wiring < La of single or dual channel barrier

For current and wattage values at various input voltages see table below.

Input Voltage	Current	Wattage
15.5 VDC	43 mA	.7
24 VDC	68 mA	1.63
35 VDC	95 mA	3.3

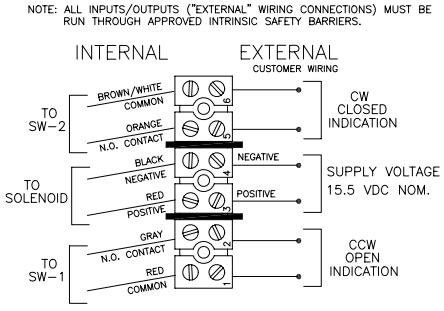
Make electrical connections in accordance with the appropriate wiring diagram on inside of cover or the appropriate diagram in figure 3:

***NOTE 2**: Installation of Intrinsically Safe Systems is to be done in accordance with Canadian Electrical Code, Part 1 and National Electrical Code, Chapter 1.*

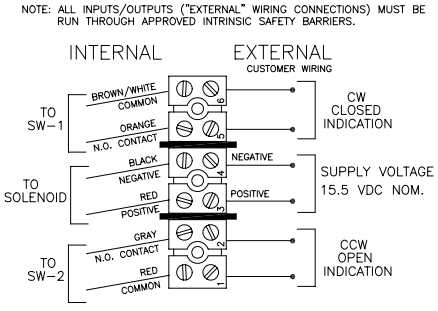
DEFINITIONS:

Ca-Maximum Allowed Capacitance
Ci-Maximum Internal Capacitance
I max-Maximum Input Current
Isc-Maximum Output Current
La-Maximum Allowed Inductance
Li-Maximum Internal Inductance
Voc-Maximum Output Voltage
V max-Maximum Input Voltage
Vt-Voltage Total

Figure 3

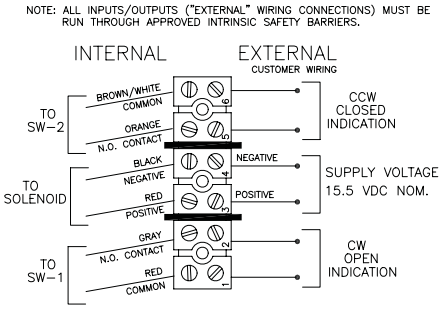


FAIL-CLOSED
(Sizes 10–40 in-line operation)
(Sizes 25–40 cross-line operation)

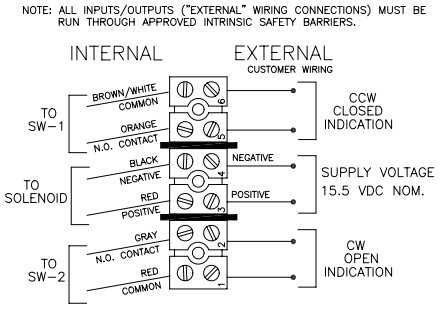


FAIL-OPEN
(Sizes 10–20 in-line, inverted operation)

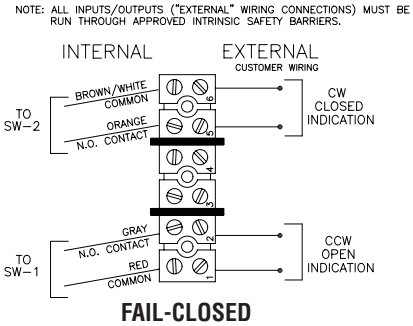
Figure 3 continued



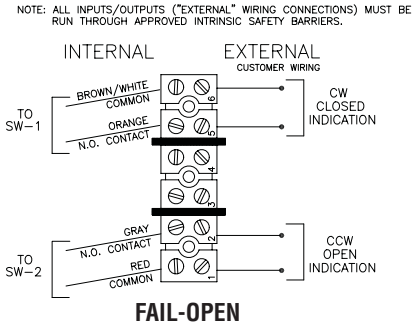
FAIL-CLOSED
(Sizes 10–20 cross-line, inverted operation)



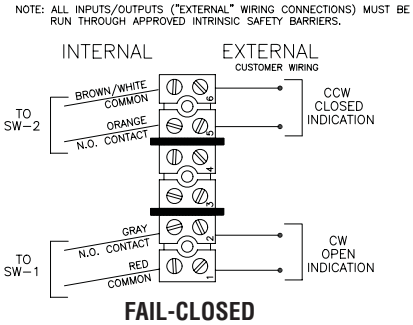
FAIL-OPEN
(Sizes 10–20 cross-line operation,
or with in-line coupling)
(Sizes 25–40 in-line operation)



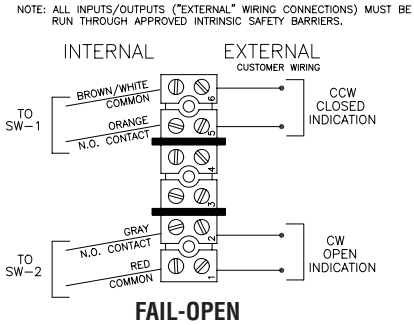
FAIL-CLOSED
(Sizes 10–40 in-line operation)
(Sizes 25–40 cross-line operation)
No solenoid



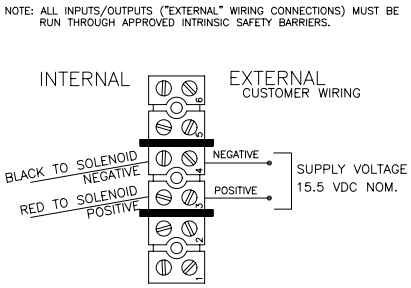
FAIL-OPEN
(Sizes 10–20 in-line, inverted operation)
No solenoid



FAIL-CLOSED
(Sizes 10–20 cross-line,
inverted operation)
No solenoid



FAIL-OPEN
(Sizes 10–20 cross-line operation,
or with in-line coupling)
(Sizes 25–40 in-line operation)
No solenoid



SOLENOID/NO SWITCHES

***NOTE 3**: The wiring diagrams shown in figure 3 are for specific actuator positions/operations. For switch indications of other positions/operations the actuator should be operated, and SW-1 and SW-2 checked to verify which switch will give the desired indication.*

5. Place the lubricated O-ring down over the threaded section of the housing onto the machined shoulder. The cover must be threaded onto housing tightly for proper performance. The assembly is now complete.

NOTE: *For units with a metal cover, a light coat of grease (such as a #1 grease) shall be applied to the cover threads. A minimum of ⅓ the circumference of the threads to be lubricated.*

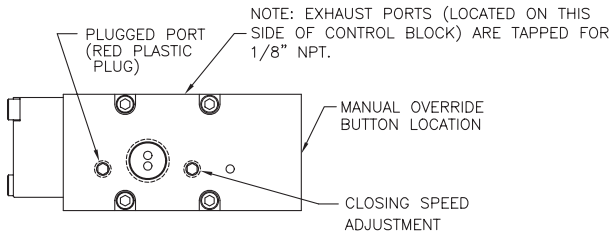
OPERATION

A. Double-Acting with Control Block - Air is supplied to the ¼" NPT port on the block. When the solenoid is energized, the spring-loaded plunger is withdrawn, allowing the supply air to shift the spring-loaded spool within the block, which opens the supply path to the center chamber of the actuator. Air from the end chambers of the actuator is allowed to pass through the block and exhaust to atmosphere.

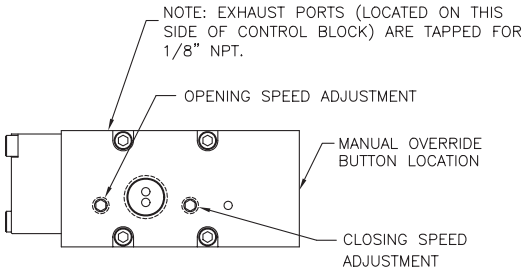
When the solenoid is de-energized, the spring-loaded plunger blocks the flow of air to the spool seal within the block and the spool spring shifts the spool within the block to a position which opens the supply path to the end chambers of the actuator. Air from the center chamber of the actuator is allowed to pass through the block and exhaust to the atmosphere.

The actuator is electrically fail-safe. That is, it will reurn to its de-energized position upon electrical failure.

Figure 4



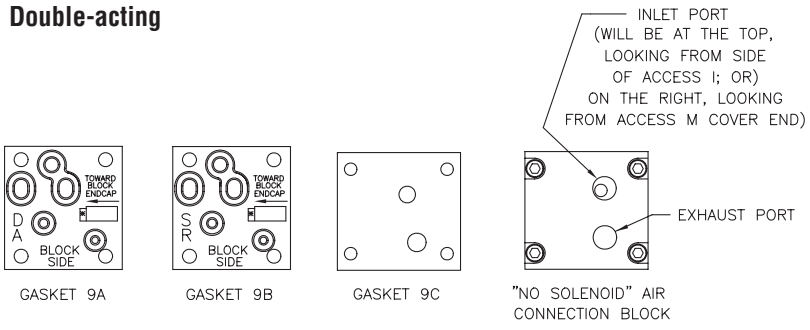
Spring-return



Double-acting

Figure 5

Double-acting



The unit has two independently adjustable speed control screws which can be used to adjust the speed of operation for the opening and/or closing stroke (see figure 4). If the speed control screws are too tight, the unit will fail to operate.

NOTE: *Speed control screws are shipped from the factory in the full-open position.*

B. Spring-Return with Control Block - Air is supplied to the ¼" NPT port on the block. When the solenoid is energized, the spring-loaded plunger is withdrawn, allowing the supply air to shift the spring-loaded spool within the block, which opens the supply path to the center chamber of the actuator. Air from the end chambers of the actuator is allowed to pass through the block and exhaust to atmosphere.

When the solenoid is de-energized, the spring-loaded plunger blocks the flow of air to the spool within the block and the spring-loaded spool returns to a position which allows air from the center chamber of the actuator to pass through the block and exhaust to atmosphere as the actuator is cycled by the springs in the end chambers of the actuator. The end chambers are exhausted to atmosphere at all times.

The actuator is fail-safe. That is, it will return to its de-energized position upon electrical or pneumatic failure.

The unit has one speed control screw, which can be used to adjust the speed of operation for the closing stroke (on a FAIL-CLOSED unit) or opening stroke on a fail open unit, and one port plugged with a red plastic plug (see figure 4). If the speed control screw is too tight, the unit will fail to operate.

Note*: Speed control screws are shipped from factory in the full-open position.*

CAUTIONS: If converting a double-acting actuator to a spring-return actuator or vice-versa, be sure the correct control block gasket is used and properly installed (see figure 5 and actuator exploded view). Do not apply any grease to gasket, it must be installed dry.

Be sure red plastic plug is installed in plugged port (see figure 4) for spring-return actuators.

C. Double-Acting with No Solenoid and No Control Block - Air is supplied to the ¼" NPT port on the air connection block to the center chamber of the actuator through a remotely mounted four-way solenoid (or similar supply system). The other ¼" NPT port on the air connection block to the end chambers is exhausted through solenoid (or similar supply system). When solenoid is de-energized (energized) supply air is now supplied to end chambers and center chamber is simultaneously exhausted through solenoid.

D. Spring-Return with No Solenoid and No Control Block - Air is supplied to the ¼" NPT port on the air connection block to the center chamber of the actuator through a remotely mounted solenoid (or similar supply system). The other ¼" NPT port on the air connection block is the exhaust port for the end chambers and may be exhausted to atmosphere or through customer's system.

When the remotely-mounted solenoid (or similar supply system) blocks the supply air to the center chamber of the actuator, a means must be supplied to exhaust this chamber and the actuator is cycled by the springs in the end chambers.

E. Stroke Times
For stroke times of the ACCESS I and ACCESS M Series 39 actuators with solenoid and control block, consult factory. Times will be measured in seconds and will represent average times under 50% load conditions with an air supply pressure of 80 psig. Times will be per stroke for double-acting actuators. For spring-return actuators, the opening stroke times may be slightly longer; stroke times for the closing (spring) stroke will be dependent upon the number of springs used.

Cycle times for customer air supply systems will be dependent upon customer equipment.

F. Manual Operation
In the event of air failure, the ACCESS I and ACCESS M Series 39 actuators can be cycled manually. This is accomplished by applying a wrench to the exposed top shaft of the actuator and turning it in the desired direction.

⚠ WARNING: Care must be taken to ensure that the actuator is not operated automatically while manual operation is being performed.

If a routine cycle check is to be performed on an actuator with a control block, the actuator can be cycled manually by shifting the spool valve within the control block. This can be done by pushing the override button in the control block (see figure 4 on page 6 for location of button). Care must be taken to hold the spool valve in the desired position until the actuator has cycled. Provided the air supply is still on, the actuator will cycle to its original position as soon as the manually applied pressure on the override button is released.

MAINTENANCE

CAUTION: The actuator must be isolated both pneumatically and electrically before any maintenance activity is begun.

Periodic checks should be performed to make certain that all fasteners remain tight. Care should be taken when tightening the end cap retaining bolts since these fasteners are METRIC. All other fasteners are UNIFIED IMPERIAL.

All actuators are supplied with sufficient lubrication for their normal working life. If required, recommended lubrication for all standard actuators is a #1 grease.

Depending upon the conditions under which the actuator must work, such as extended-duty, non-compatible operating media or abnormal operating conditions, periodic replacement of internal seals is recommended. Repair kits containing all necessary seals can be obtained through any authorized Flowserve Worcester/McCANNA Controls distributor.

On spring-return actuators, the springs may need replacement after extended duty since springs may fatigue and break. SPRINGS SHOULD ALWAYS BE REPLACED IN COMPLETE SETS. Spring kits are available through any authorized Worcester/McCANNA distributor.

SPARE PARTS

The following are recommended spare parts which should be kept on hand for Series 39 pneumatic actuators:

Repair Kit(s) - Kits contain all necessary seals, bearings and instructions.

Spring Kit(s) - For spring-return actuators.

TROUBLESHOOTING

BEFORE DISASSEMBLING ACTUATOR FOR ANY REASON, CONSULT REBUILDING INSTRUCTIONS CONTAINED IN FOLLOWING SECTION.

A. If actuator does not function, check to ascertain:
   1. That valve is free to rotate. This can be done as described above in Manual Operation.
   2. That actuator is the correct size.
   3. That speed control screws or exhaust ports are not blocked.
   4. That correct voltage is supplied to solenoid.
   5. That sufficient air supply is available at inlet to control block. Inlet pressure to control block should be at least 40 psig for double-acting, 80 psig for spring-return (unless a reduced spring complement is installed (fewer springs)). When checking supply pressure, place gage in line at control block inlet and monitor gage for unexpected pressure drops.

B. If proper voltage and air pressure have been verified and valve is free, proceed as follows:
   1. Turn on signal voltage. Check solenoid for clicking sound.
   2. If no sound is detected, remove air pressure and turn off signal voltage.
      a) Carefully unscrew solenoid and solenoid stem from end cap.
      b) Reapply signal voltage and observe solenoid plunger. If it does not retract, replace solenoid.
   3. Manually override control block. If correct operation is not obtained, replace the control block.
   4. If control block and solenoid are operating correctly, proceed to Section C below.

C. If the actuator functions but exhibits leakage, or power loss accompanied by leakage, proceed as follows:

   1. Check voltage. Voltage must be within 10% of the specified voltage (low voltage will cause leakage out of the back of the solenoid and burn out of the coil).

   2. Check air supply. Be certain that no sharp air pressure drops occur as unit is cycled. Loss of air pressure can cause incomplete shifting of the spool valves, which results in bypass leakage and substantial actuator torque losses.

   3. If air supply and voltage are adequate, proceed as follows:

      a) If leak is at solenoid exhaust port, replace the solenoid.

      b) If leak occurs at exhaust ports in the block itself, the trouble will be in either the spool valve in the block, or at one of the piston seals of the actuator. A leaking piston seal will usually leak on either cycle.

         If the block is replaced and leakage continues from the exhaust port, remove the actuator from the valve, disassemble (per Rebuilding Instructions below) and check the following:

      1) Make sure that all internal porting is free and clear of any obstructions. End caps, guide rods and the piston with hole are air-transporting components.

         NOTE: *The most common problem encountered on 39 actuators is the improper replacement of the piston with hole, relative to seals in end caps. (See Step 5)*

      2) Make certain that the actuator has lubrication, and that there is no solidified grease between the pinion and the piston racks.

         a) If actuator has no lubrication, apply generous amount of a #1 grease.

         b) If solidified grease between the pinion and the piston racks is present, clean, dry, regrease and reassemble.

      3) Verify that actuator pinion shaft and/or pistons are not bound. If bound, reassemble per Rebuilding Instructions.

      4) If unit exhibits excessive amounts of backlash, check teeth on piston racks for wear. If worn, replace piston assemblies.

      5) In spring-return actuators, check for misplaced or broken springs. If springs are broken, check body bore for scoring.

         a) If springs are broken, replace springs. SPRINGS SHOULD ALWAYS BE REPLACED IN COMPLETE SETS.

         b) If body bore is scored, replace it. Also, replace piston O-rings (contained in repair kit).

      6) If actuator is free, valve is free and control block (if used) is shifting air properly, reassemble the actuator and retest. If unit still fails to operate, consult Flowserve.

REBUILDING INSTRUCTIONS

NOTE: *For identification of all numbered parts discussed below, consult exploded view of actuator.*

After actuator has been repaired, mark rebuild label accordingly and apply to actuator.

ACTUATOR DISASSEMBLY

1. Disconnect the air supply and electrical service to the actuator.
2. Remove the actuator and its mounting bracket from the valve. (See Caution note.)

CAUTION: Ball valves can trap pressurized media in the cavity. Isolate the piping system in which the actuator/valve assembly is mounted and relieve any pressure on the valve. For all the valves listed in Installation Section D, the actuator bracket can be removed without loosening or removing any valve body bolts.

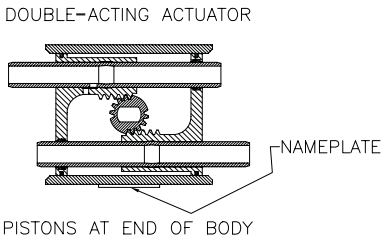
3. Remove the actuator bracket from the actuator to begin repair. (Note orientation of removed bracket for easy reassembly.)
4. It is not necessary to remove the control block (7A) or air connection block (7B) to rebuild actuator. However, if it becomes necessary to remove the block, begin by removing the block bolts (7D). Use care to retain the block gasket (9A, 9B or 9C).
5. Each end cap (5A & 5B) is aligned onto the body (1) over a "foolproof pin". This ensures that the end caps can only be assembled to their respective end of the actuator. Remove all four metric screws (5C) from and remove both end caps. Remove the two bearings (6A) and O-rings (15A and 15B) from each end cap.

CAUTION: If the actuator is a spring-return model, first remove two end cap screws diagonally opposite each other, then lubricate the threads and under the head. Replace the screws and repeat procedure for the other two screws. Do this for each end cap, as this will aid reassembly. Now uniformly loosen all four end cap screws on each end cap two to three turns at a time, in sequence, to relieve preload of the springs. On larger actuators with springs use caution when removing end caps. End cap screws are long enough to allow springs to relieve before disengaging.

After the screws are removed, gently pry off each end cap, being careful not to damage the end cap O-rings.

6. The two piston guide rod (4) assemblies can now be removed from each end of the body and disassembled by removing the piston set screws (12). Do not interchange piston guide rods (4) and their respective piston (3). For sizes 10–20 Rev. R6 actuators, each guide rod and piston may be press fitted together (do not use set screws) and cannot be disassembled. (To assist reassembly, mark the body with a line on the side from which the guide rod using the through-hole is removed). Remove all O-rings (15B and 15C) and bearings (6B) from pistons (3).
7. The shaft (2A) on sizes 10–20 can only be removed after piston assemblies are taken out. Remove the position indicator (17) (if any), the shaft clip (15F) (not a reusable part!) (see Note) and the stainless steel washer from the top of shaft. Then remove the shaft through the larger opening in the bottom of the body. The top bearing (15G) and the O-ring (15D) can now be removed. Remove the two stainless steel washers (10–35 sizes only) and thrust bearing (10) from the top of the shaft, the O-ring (15E), and bearing (15H) from the bottom end.

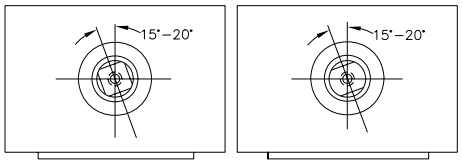
Figure 6



IMPORTANT: *Note the relative location of the shaft teeth and the piston assembly's rack teeth. The above figure is viewed when looking at the top of the actuator.*

Figure 7

ALIGNMENT OF SHAFT AT REASSEMBLY
(PISTONS AT END OF BODY)

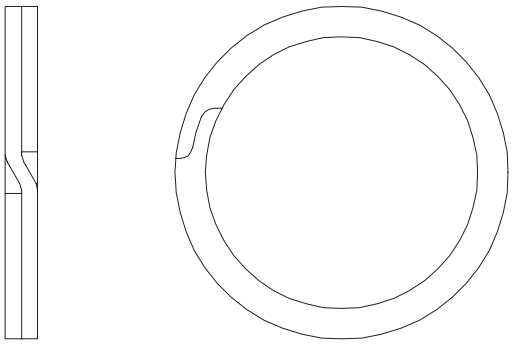


IMPORTANT: *Align gear teeth on the shaft per Figure 6.*

NOTE: *For size 40 model, only a single stainless steel washer is used and thrust-bearing (10) is not used.*

Sizes 25-40 have an anti-ejection ring (15J). This ring does not have to be removed and it may or may not be included in repair kits.

NOTE: *Some actuators may be using a spiral ring type shaft clip as shown below.*



To remove this clip, engage the lower end of the ring with a flat blade screwdriver. Using another flat blade screwdriver push the top end of the clip in the opposite direction. As the clip I.D. expands lift the clip from the shaft. The installation of a new clip would be the above steps in reverse and ensuring that the edges of the clip are properly seated in the shaft groove.

ACTUATOR REASSEMBLY

1. Be sure the actuator surfaces are clean and free of grit and scratches. If the inside walls of the body are scored, or the guide rod surfaces are scratched, the actuator will leak after rebuilding. New parts should be obtained from the factory. Light tracking, barely detectable to touch, is acceptable.

2. All rebuilding kit O-rings and bearings may now be installed. Lubricate the standard actuator thoroughly with a #1 grease. Apply a light film of grease to all O-rings. ***NOTE:*** *"High-temperature" actuators and O-rings must be lubricated with Dow Corning #7 or other equivalent high temperature silicone or graphite base grease. (Note that kits also contain some parts for earlier revisions of actuators which will not be needed.)*

3. Replace the two split-ring style bearings (6A) and one guide rod O-ring (15B) in each end cap.

   Replace the split-ring style bearing (6B) and guide rod O-ring(s) (15B) into I.D. groove(s) in each piston (3). Install O-rings (15C) onto pistons.

4. Replace O-ring (15E) and bearing (15H) (10–40 sizes only) on the bottom of shaft. On the top of the shaft add the two stainless steel washers (10–35 sizes only) with the thrust bearing (10) between them.

   NOTE: *For size 40 model only, a single stainless steel washer is used and thrust bearing (10) is not used. Locate the top bearing (15G) and O-ring (15D) into the body. For sizes 10–35 Rev. R6 actuators, top bearing (15G) is flat, the same as and interchangeable with thrust bearing (10). Replace the shaft through the larger opening in the bottom of the body.*

   For sizes 25 through 40 actuators, replace anti-ejection ring (15J) in its groove on the shaft (2B), if removed.

5. Very carefully align the piston guide rod assemblies inside the body. Keep the pistons square to the body. (This is very important in the 30 39 actuator where steel set screws can cause internal body damage if the piston assemblies "cock" inside the actuator body.)

   IMPORTANT: *One piston guide rod assembly has a through-hole drilled in it. It can be easily located by looking down the ends of both guide rods. This piston assembly must be reassembled, with its respective guide rod, opposite the nameplate on the body, as it was removed.*

6. Align the shaft so that the teeth on the shaft will "pick-up" the piston assembly's rack teeth when turning the top extension of the shaft clockwise (CW). (See Figure 6.)

   IMPORTANT: *Proper 90° rotation can only be ensured if the shaft teeth begin to mesh with the piston assembly's teeth at the "proper tooth" between these meshing gear pairs. (See Figure 6.)*

7. To ensure proper meshing of teeth, move the shaft 15 to 20 degrees counter-clockwise (CCW) from its normal position when the piston assemblies are located at the body ends (See Figure 7).

   NOTE: *The "normal position" of the shaft on 10-20 sizes is when the top flats are parallel to the main axis of the actuator body. On the 25-40 sizes the teeth of the shaft will be on the left side of the actuator when viewed from the ends of the actuator. (See Figure 6.)*

8. With the piston assemblies in the body, gently push each piston into the body. Turn the top shaft extension clockwise (CW). Do not allow the pistons to "cock".

   At the proper point of engagement between the shaft and piston assemblies, both piston assemblies will move toward the center of the body when turning the top shaft extension of the actuator clockwise (CW).

9. Once the shaft and pistons are properly engaged, ensure that smooth movement and full closed operation can occur without moving the pistons out of the actuator body. This is important!

10. Install O-ring (15A) into and replace the actuator end caps, (5A and 5B), noting that the "foolproof" pin between the body and end cap mates properly. For spring-return actuators, see spring installation section before installing end caps.

    NOTE: *When installing the end cap O-rings, use a small amount of a general purpose lubricant, such as petroleum jelly, to hold them in place for ease of assembly and to avoid having them fall and get pinched.*

11. Replace the stainless steel washer over the top shaft extension.

12. ***VERY IMPORTANT:*** *Install the NEW shaft clip (15F) into its mating groove on the top shaft extension. (The removed shaft clip is not to be reused.)*

    Place the numbered side up on the shaft clip and be certain the clip is fully seated in its groove. See Note in Step 7 of Actuator Disassembly for installation of spiral ring type shaft clip (which newer rebuilding kits will contain).

    If control block (7A) or air connection block (7B) was removed:

    Properly insert appropriate gasket (9A, 9B or 9C) between control block or air connection block and end cap (see figure 4 and actuator exploded view), and attach block securely to end cap. Do not apply any grease to gasket, it must be installed dry.

13. Replace position indicator (17) (if any). See Section D.7 in Installation Section for proper installation and to determine position indication.

14. Mark Rebuild/Accessory Addition Label, if included in repair kit, and apply to actuator.

SPRING-RETURN ACTUATOR

1. **IMPORTANT:** When less than the standard number of springs are used in each end cap, these springs should be positioned according to the air supply figures below.

Size 10–40

70 psi - 8 springs - 4 per end cap	Remove center spring
60 psi - 8 springs - 4 per end cap	Remove center spring
50 psi - 6 springs - 3 per end cap	Use 3 on a diagonal
40 psi - 4 springs - 2 per end cap	Use 2 in opposite corners

The values listed below are for standard and less than the standard air pressure as required per the ordering code.

NOTE: *Maximum Operating Pressure Does Not Change.*

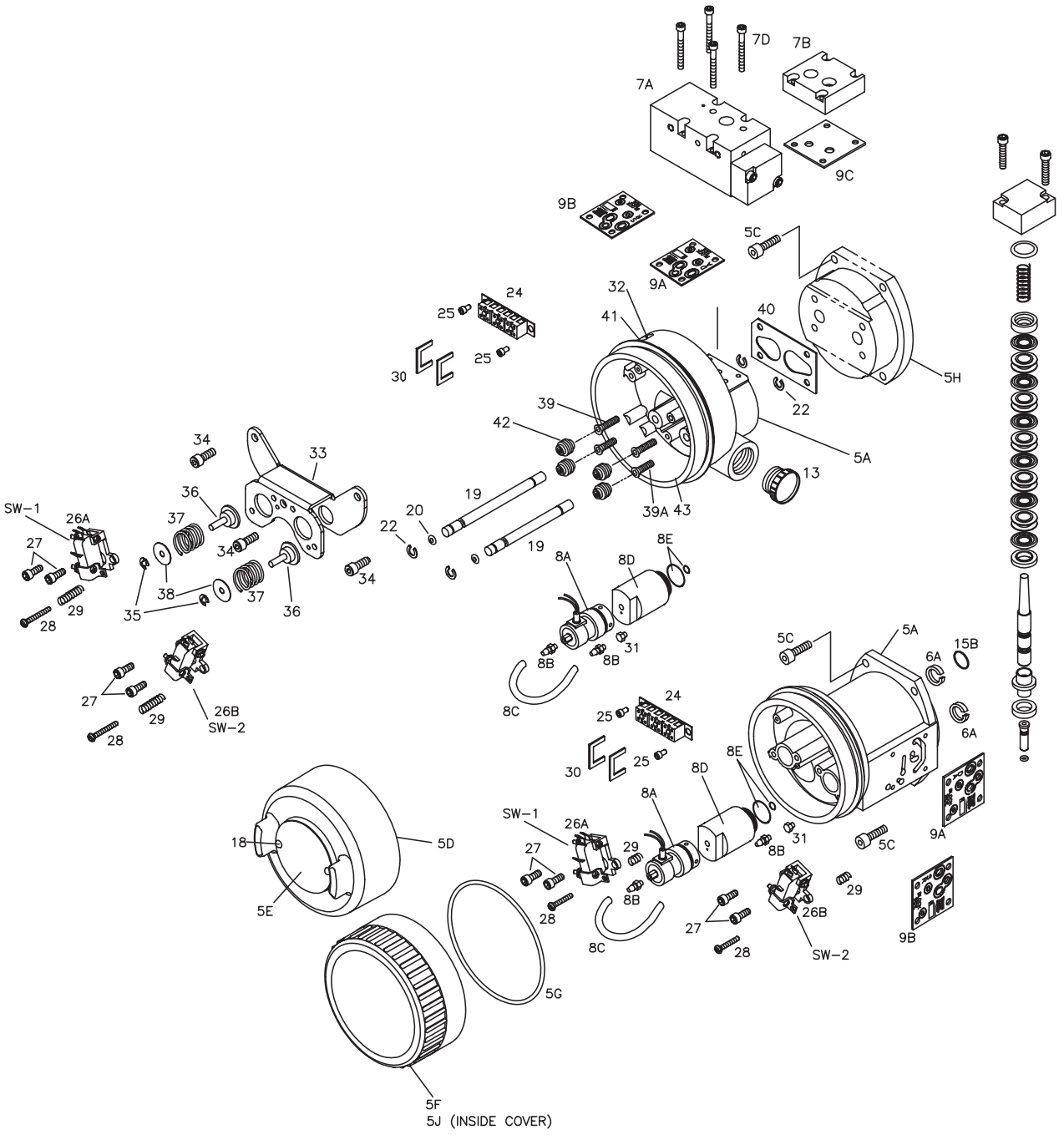
Ordering Code	4	5	6	7	( )
Supply Pressure (psi)	40	50	60	70	80

Actuator Size	End of Spring Torque (in-lb)				
10	35	55	75	75	95
15	65	105	145	145	185
20	125	195	265	265	335
25	210	330	450	450	575
30	340	535	730	730	920
33	680	1,070	1,460	1,460	1,850
35	850	1,330	1,815	1,815	2,300
40	1,500	2,240	2,980	2,980	3,740

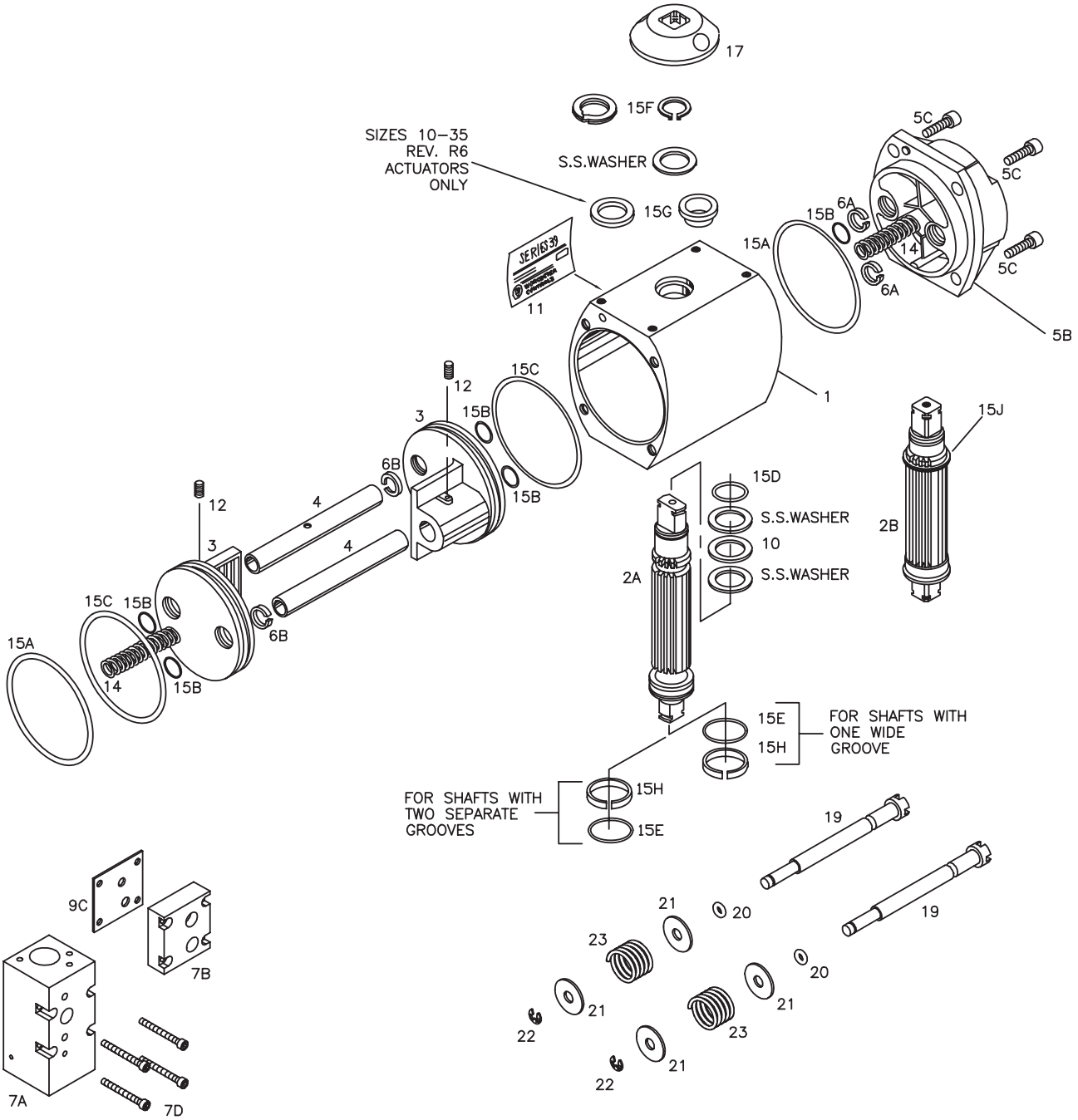
2. If a spring-return actuator is being repaired due to a failed spring, REPLACE all the springs in this actuator, as well as any other parts which may have been damaged.
3. When replacing the springs in a spring-return actuator, place the springs in the end cap pocket after thoroughly lubricating each spring. Be generous with lubricant!
4. With the springs pointing up and the end cap on a solid surface, place the actuator body over the springs and the proper end cap. (Each end cap can only be mounted to just one end of the actuator body, as there is a “foolproof” pin in the end cap which aligns with a hole in the body.)
5. Force the body down and begin by engaging two end cap screws (5C) by hand through the end cap. Take each end cap screw up in SMALL and EQUAL turns. Once the end cap is temporarily secured to the body, turn the actuator over to its normal position and uniformly take up the four end cap screws. Uniformly load all the springs to prevent any spring from buckling.

   IMPORTANT: *Locating nibs are permanently cast into the sizes 25 through 40 actuator piston face. The actuator springs must fit over these locating nibs on the piston face. Care in following the above instructions will ensure the proper alignment of the spring in the actuator body — proper contact with the piston face and end cap.*
6. In a similar manner, as in the previous steps, replace the springs in the other end of the actuator body.

ACCESS M EXPLODED VIEW



ACCESS I AND 39 ACTUATOR EXPLODED VIEW



PARTS LISTING

ITEM	QTY.	DESCRIPTION	ITEM	QTY.	DESCRIPTION
1	1	Actuator Body	12	2	Piston Set Screws (if any)
2A	1	Shaft (10-2039)	13	1	Conduit Plug – Not Shown on ACCESS I
2B	1	Shaft (25-4039)	14	Varies	Springs – See Table on page 11
3	2	Pistons	15A	2	End Cap O-Rings
4	2	Guide Rods	15B	6	Guide Rod O-Rings
5A	1	ACCESS I End Cap or ACCESS M Enclosure	15C	2	Piston O-Rings
5B	1	End Cap	15D	1	Top Shaft O-Ring
5C	8	End Cap Screws (Metric)	15E	1	Bottom Shaft O-Ring
5D	1	Cover “Z”	15F	1	Shaft Clip
5E	1	Caution Nameplate “Z”	15G	1	Top Pinion Bearing
5F	1	Cover “W”	15H	1	Bottom Pinion Bearing
5G	1	O-Ring – Cover	15J	1	Anti-Ejection Ring (Sizes 25–40)
5H	1	ACCESS M Endcap	16	1	Wiring Diagram – Not Shown
5J	1	Caution/Wiring Label “W”	17	1	Position Indicator
6A	4	Cap Bearing (Split-Ring Style)	18	2	Drive Screw
6B	2	Piston Bearing (Split-Ring Style)	19	2	Probes
7A	1	Control Block Assembly	20	2	O-Rings – Probe
7B	1	Air Connection Block (No Solenoid)	21	4	Washers – Probe (ACCESS I only)
7C	-	Not Used	22	2	Retaining Clips – Probe (4 for ACCESS M)
7D	4	Block Bolts	23	2	Spring – Probe (ACCESS I only)
8A	1	Solenoid Assembly	24	1	Terminal Strip
8B	2	Solenoid Exhaust Port Fittings	25	2	Mounting Screws – Terminal Strip
8C	1	Solenoid Exhaust Tubing	26A	1	Limit Switch Assembly – left
8D	1	Solenoid Adapter	26B	1	Limit Switch Assembly – right
8E	2	O-Rings	27	4	Mounting Screws – Limit Switch
9A	1	Gasket – Control Block (Double-Acting)	28	2	Switch Adjustment Screw
9B	1	Gasket – Control Block (Spring-Return)	29	2	Switch Adjustment Spring
9C	1	Gasket – Air Conn. Block (No Solenoid)	30	2	Terminal Strip Dividers
10	1	Thrust-bearing	31	1	Exhaust Port Plug (If No Solenoid)
11	1	Nameplate			

To order proper parts, please specify the actuator size, model, and revision number. Use the standard nomenclature listed above.
The rebuilding kits include Items 15A through 15H, 6A and 6B, 10, and S.S. washers. Color of some replacement parts, such as bearings, may vary from the parts removed.

ADDITIONAL PARTS LISTING (For ACCESS M only)

ITEM	QTY.	DESCRIPTION	ITEM	QTY.	DESCRIPTION
32	2	Drive Screws	38	2	Flat Washer – Switch
33	1	Bracket-Switch	39	2	Upper Mounting Screw – Enclosure (1⅛" Long)
34	3	Mounting Screws – Switch Bracket	39A	2	Lower Mounting Screw – Enclosure (1" Long)
35	2	Retaining Ring – Switch	40	1	Gasket
36	2	Button – Switch	41	1	Nameplate
37	2	Spring – Switch	42	4	Threaded Tamper Proof Plug

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