Installation, Operation,
Maintenance Instructions

Spring Cylinder Linear Actuators

CAUTION :

1. Use pressure relief valves for high pressure piping.
2. Use explosion proof valves/accessories for dangerous media piping.
3. Use fire safe valves for piping where chances of fire by external means.
4. Use seismic proof valves where chances of earthquake are frequent.
5. Check whether location of the valve mounting is of the same service/application as specified on the marking plate.

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GENERAL INFORMATION

These instructions are designed to assist in installation, troubleshooting, and servicing of Mascot spring cylinder actuators. The manual should be thoroughly reviewed by Product users and maintenance personnel before performing any operation on the actuator. Additional features (such as hand wheels, limit stops, fail-safe systems, limit switches, etc.) are covered in a separate instructions cover. The appropriate installation operation and maintenance instructions for installing, maintaining, troubleshooting, calibrating, and operating Mascot positioners should be referred to.

Please follow the instructions as presented. This will help prevent any possible mishaps and injuries. Do not modify this product or substitute nonfactory parts. Do not use maintenance procedures other than the prescribed ones, otherwise the performance will be adversely affected and also will be hazardous to personnel and equipment. This will also cause the existing warranties to be null and void.

WARNING : When working on this, or any process control product, the standard industry safety practices must be followed. Personal protective and lifting devices must be used as warranted.

Unpacking

During the unpacking of the actuator, the packing list should be checked against the receipt of materials. Detailed list describing the actuator and the accessories are provided in each shipping container.

1. For the actuator to be lifted from the shipping container, the lifting straps are to be positioned and hoisted to avoid damage to the tubing and mounted accessories. Use the lifting ring for lifting - whenever provided. Please do not attach a lifting ring on larger actuators (size 300 and larger). It is better to use lifting straps through the yoke legs.

   WARNING : During lifting of an actuator with lifting straps through the yoke legs,one must have in mind that the center of gravity may be above the lifting point and support must be given to prevent the actuator from rotating. Serious injury to personnel or damage to nearby equipment can take place if proper attention is not paid to this factor.
2. On observation of damage during transit, shipper should be contacted immediately.
3. The Mascot representative is always at your service whenever needed.

Installation

Before installation, ensure that there is adequate overhead space for the actuator to permit comfortable removal from the valve body and for proper maintenance when needed.

Table 1 is provided for reference:

NOTE : *In case of actuator being attached to a valve body assembly, Maintenance Instructions 1 for overhead clearances should be referred to.*

Table 1: Overhead Clearance for Disassembly

Actuator Size	Minimum Clearance
25	6 inches
50	8 inches
100,200,300 400,500,600	9 inches

1. Connections for the air supply and instrument signal air lines are marked on the positioner. Connect the air lines accordingly. The cylinder and positioner are suitable for 150 psi air supply. The air regulator is not needed till the supply exceeds 150 psi.

   NOTE : *There are certain cases where air supply needs to be limited to 100 psi rather than 150 psi. For such cases, a sticker is pasted near the upper air port on the cylinder which will indicate the same.*

   WARNING : Injury to personnel or damage to equipment can result if supply pressure exceeds the recommended limit.
2. It is recommended to have an air filter on the supply line.
3. Ensure all air connections to be free of leaks. Soap solution can be used for this purpose.

MAINTENANCE

Maintenance should be carried out twice annually. The preventative maintenance steps are listed below. Maintenance can be done with the actuator in service and, in some cases, without interrupting service. Refer to the "Disassembly and Reassembly" section if an internal problem is suspected with the actuator.

1. Observe the actuator for damage due to corrosive fumes and process drippings.
2. For any areas of severe oxidation, cleaning of the valve needs to be done, followed by painting.
3. When possible, stroke valve and verify functioning for smooth, full-stroke operation.

   WARNING : Keeping clothing and body parts away from the rotating disc and the seat when operating the valve can avoid any possible serious injuries.
4. Ensure secure fastening of positioner mounting bolts, linkage and stem clamp.
5. Ensure secure fastening of all accessories, brackets and associated bolting.
6. Remove air supply and observe actuator for correct fail-safe action - If possible.
7. Rubber bellows should be checked for wear.
8. Around the cylinder retaining ring, the adjusting screw and the lower actuator stem bushing, spray soap solution to check for air leaks through the O-rings and gasket.
9. The actuator stem should be free from dirt or foreign material.
10. In case an an air filter is present, if necessary, check and replace cartridge.

DISASSEMBLY AND REASSEMBLY

Disassembling the Actuator

Refer to Figures 1 thru 5 to disassemble the cylinder actuator:

1. The air supply should be shut off. Remove actuator as per Maintenance Instructions 1 if actuator is installed on a Mascot valve.

   WARNING : Line needs to be depressurized to atmospheric pressure and all fluids should be drained before resuming work on the valve. Serious injury can be in case of non-compliance.
2. All tubing to be disconnected. Stem clamp and stem bellows should be removed from the actuator stem.

3. Spring compression should be relieved completely by removal of the adjusting screw. Adjusting screw gasket to be removed from the adjusting screw.

   CAUTION : To turn the adjusting screw, only a wrench should be used on the flats of the screw and not a screwdriver or bar.

   WARNING : Special attention is to be paid while removing the cylinder ring. It is very necessary that the spring compression is relieved before further disassembly. If not relieved, the cylinder could fly off the yoke when removing the cylinder retaining ring, and a serious personal injury may result.

4. With the help of two screwdrivers, remove the cylinder retaining ring from the groove at the base of the cylinder. One screwdriver is to be inserted in slot found in the ring and pry the ring from the groove. The other screwdriver should be used to help take the ring out of the cylinder groove.

5. The cylinder needs to be pulled off the yoke and piston. The O-ring might give some resistance.

   WARNING : Air pressure should not be used to remove the cylinder because the cylinder could fly off the yoke and a serious personal injury may result.

6. In case of heavyduty spring designs that have a spring cap (see Figure 4), the spring cap and cap O-ring needs to be removed from the cylinder.

7. In case of air-to-retract configurations, for cleaning and inspection the spring(s) and spring button (see Figures 1, 3 and 5) need removal. The actuator stem locknut needs to be removed and slide the piston and stem spacer off the actuator stem. With heavyduty spring designs, the spring guide also needs removal.

   Note : *Two springs, one inside the other are present in the dual, heavy-duty spring configuration (Figure 3). Both springs are to be removed during this step.*

   For air-to-extend configurations, slowly loosen and remove the actuator stem locknut being certain the piston follows stem locknut up the actuator stem and does not bind on the actuator stem. The actuator stem locknut, spring button, piston, spring and stem spacer needs to be removed.

   WARNING : Personal injury may occur if the spring force is not completely relieved before removing actuator stem locknut.

8. The piston O-ring, piston stem O-ring and yoke O-ring should be removed.

9. The actuator stem O-ring should be removed.

   NOTE : *It is not necessary to remove the bushing to replace the actuator stem O-ring as the actuator stem bushings are pressed into the yoke.*

10. Use appropriately sized press to push bushings out of the yoke - If stem bushings are worn or damaged.

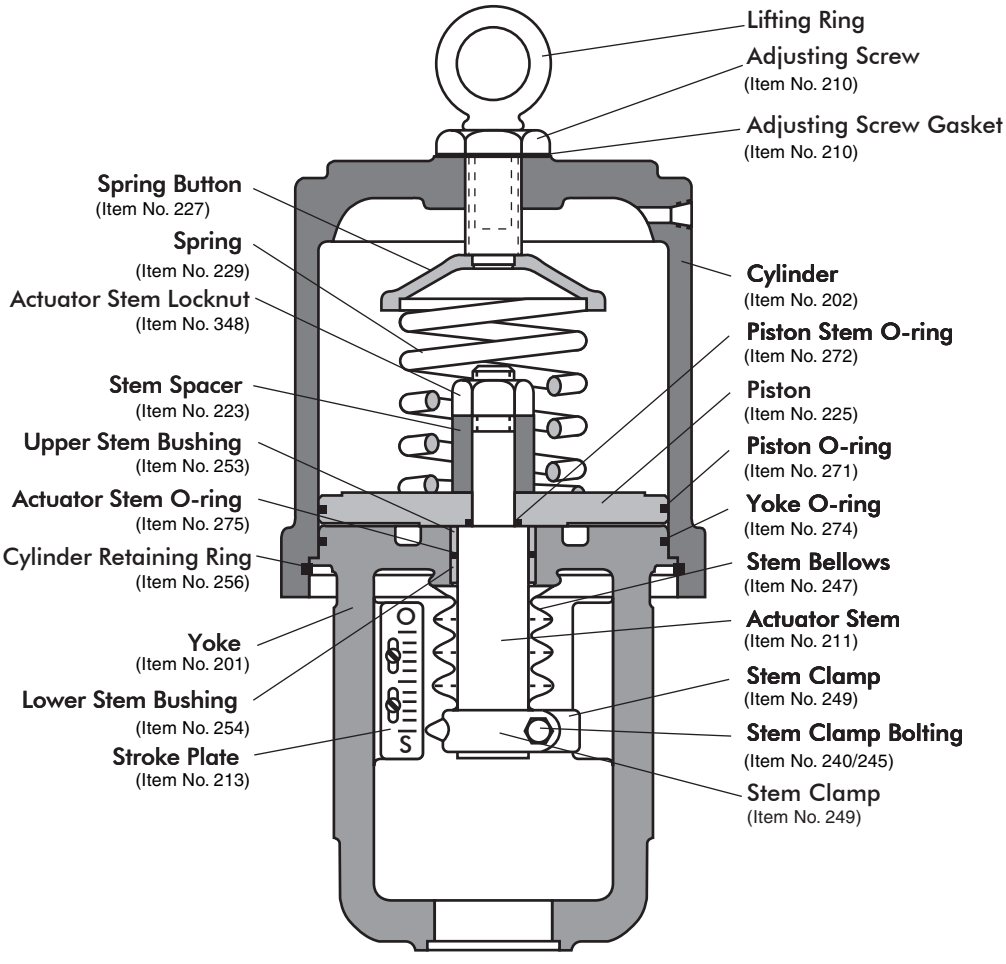

Figure 1 : Air-to-retract Cylinder Actuator

Note : Item numbers correspond to bill of material of Actuator. Please refer to it for specific part numbers.

Reassembling the Actuator

Refer to Figures 1 thru 5 for reassembling the cylinder actuator:

1. It is necessary to replace all O-rings. The new rings should be lubricated, while most O-rings should be lubricated with a silicone lubricant (Dow Corning 55M or equivalent). (Silicone O-rings must be lubricated with Magnalube-G lubricant or equivalent. Silicone lubricant cannot be used on silicone O-rings.)
2. Ensure all internal parts are thoroughly cleaned before initiating the assembly. Silicone lubricant should be used to lubricate cylinder wall.
3. In case the stem bushings have been removed, the outside of the replacement bushings should be lubricated. A new lower stem bushing needs to be pressed into the actuator stem bore in the yoke until it bottoms out. The upper stem of the bushing needs to be pressed into the bore until it is flush with the top of the yoke (Presented in Figures 1 or 2).
4. The actuator stem O-ring and yoke O-ring should be replaced.
5. The piston, piston stem O-ring, and stem spacer on the actuator stem need to be reassembled according to the proper air-action (presented in either Figure 1 or 2). Replace the piston O-ring. In air-to-extend configurations, the spring button needs to be stored under the actuator stem locknut. The locknut needs firm tightening.

   NOTE : *The spring guide must be first inserted under the actuator stem locknut (presented in Figures 3 and 4)in case of heavy-duty spring designs.*
6. In case of air-to-extend configurations, the spring needs to be placed under the piston and through the yoke, the actuator stem needs to be inserted. Be careful that the actuator stem O-ring or gall the stem and stem bushings are not pinched. In the case of air-to-retract configurations, the actuator stem needs insertion through the yoke and the spring(s) and spring button placement has to be above the piston.
7. In heavy-duty spring designs using spring caps, the cap O-ring should be replaced and the spring cap needs to be installed in the cylinder (Refer Figure 4).
8. While making sure that the yoke is pushed deeply enough into the cylinder to allow the cylinder retaining ring to be installed, install the cylinder. Be careful not to scar or cut the yoke O-rings and piston.
9. By feeding it in a little at a time, insert again the cylinder retaining ring until it snaps into place. Tap the retaining ring lightly in the groove, using a hammer and drift punch, to ensure its proper seating.

   WARNING : The cylinder retaining ring needs to be firmly in place. If not, the cylinder is likely to fly off when under pressure, and cause serious personal injury. Care needs to be exercised with the square edges of the retaining ring during installation. They should not be pinched or cut fingers on the

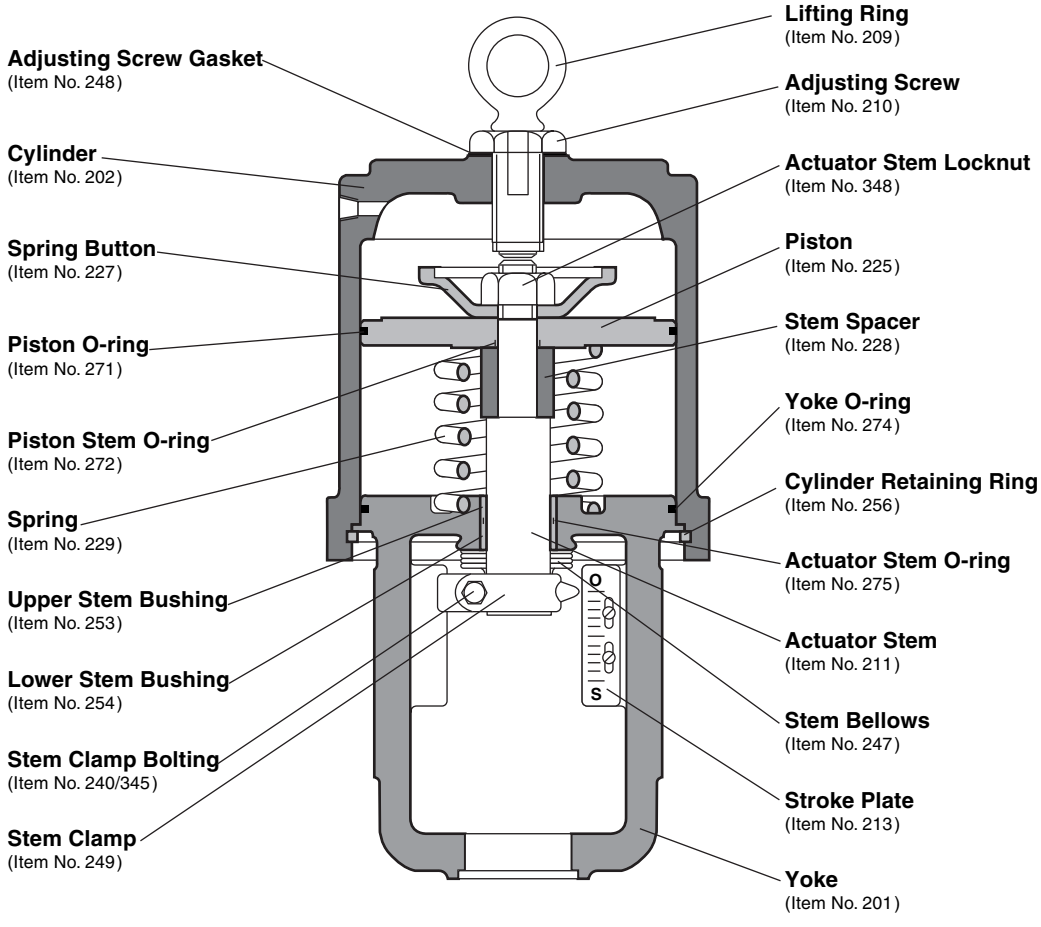

Figure 2 : Air-to-extend Cylinder Actuator

Note : Item numbers correspond to bill of material of Actuator. Please refer to it for specific part numbers.

10. Reinstall the adjusting screw using a new adjusting screw gasket.

    NOTE : *In case of air-to-retract configurations, ensure that the hole in the spring button is centered directly under the adjusting screw hole in the cylinder.*

11. The adjusting screw should be tightened only enough to provide an air seal with the gasket. Overtightening is to be strictly avoided.

12. The stem bellows and stem clamp to be reinstalled.

    NOTE : *For assuring maximum clamping strength, during installing the stem clamp, make sure the stem clamp bolting is perpendicular to one of the slots machined into the actuator stem.*

13. Air is to be applied over the piston. Bring the stem clamp to point at the "closed" position of the stroke indicator plate, the stem clamp bolting is to be tightened.

    NOTE : *In case of an actuator being installed on a Mascot valve, the Maintenance Instructions 1 will help for right engagement of plug stem thread.*

14. Tubing, supply and signal lines need to be reconnected.

Reversing the Air-action

When changing the air action from air-to-retract to air-to extend, or vice versa, Figures 1, 2 or 5 need to be referred to:

NOTE : *Heavy-duty spring actuators are not reversible.*

1. While disassembling the actuator, do it according to the guidelines in section "Disassembling the Actuator".
2. In case of air-to-retract action, reassemble the actuator with the stem spacer and spring button over the piston.
3. In case of air-to-extend action, reassemble with spring and stem spacer below the piston and with the spring button stored above the piston.
4. While reassembling the actuator, follow the guidelines in the section "Reassembling the Actuator".
5. Reversing of the positioner must also be done. The appropriate positioner maintenance instructions need to be referred.

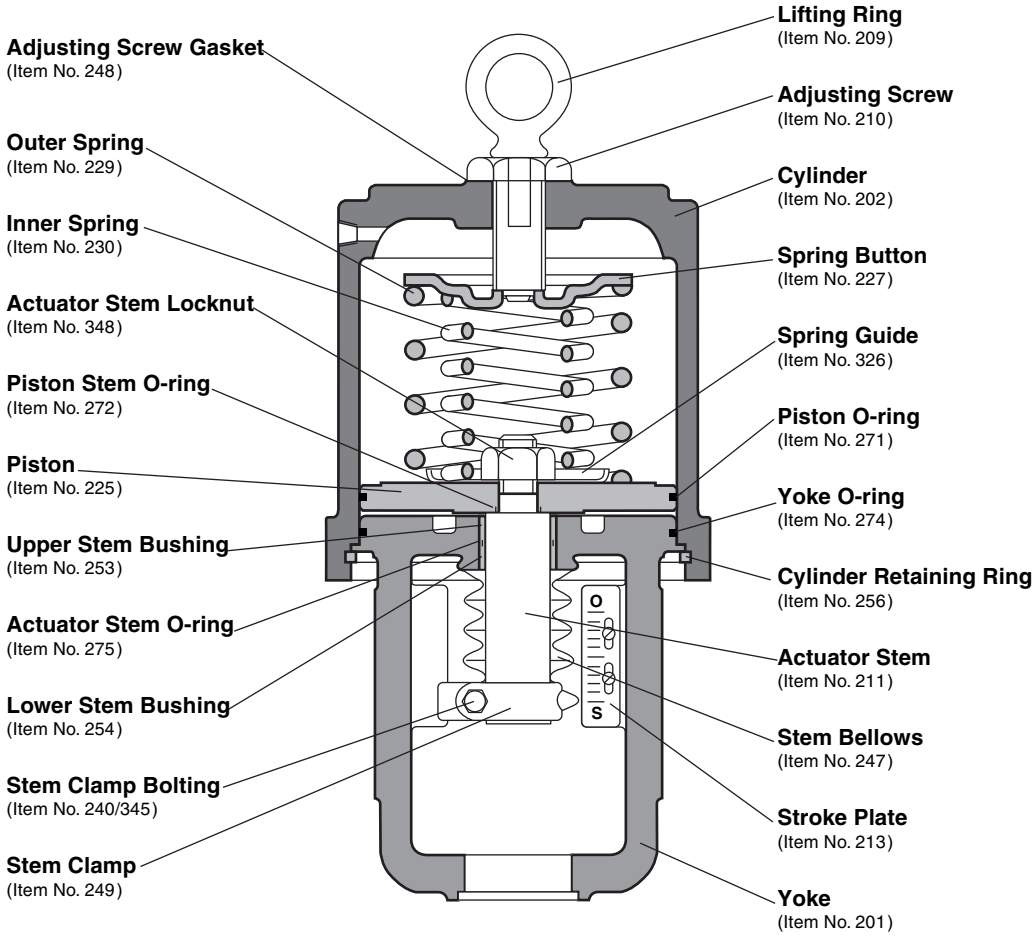

Figure 3 : Dual-Sprring Cylinder Actuator

Note : Item numbers correspond to bill of material of Actuator. Please refer to it for specific part numbers.

Troubleshooting

Problem	Probable Cause	Corrective Action
High air consumption or leakage	1. Leaks in the air supply or instrument signal system 2. Malfunctioning positioner 3. Leaks through O-rings or adjusting screw gasket	1. Tighten connections and replace any leaking lines 2. Refer to appropriate positioner maintenance bulletin 3. Replace O-rings or gasket
Actuator does not move to fail position upon loss of air supply pressure	1. Air pressure in cylinder not venting because of faulty positioner 2. Spring failure 3. Internal valve problem	1. Refer to appropriate positioner maintenance bulletin 2. Replace spring 3. Refer to valve's maintenance bulletin
Jerky or sticking stem travel	1. Insufficient air supply pressure 2. Unlubricated cylinder wall 3. Worn or damaged stem bushings 4. Improperly assembled spring 5. Internal valve problem	1. Check air supply and any filters or regulators; check for leaking O-rings 2. Lubricate cylinder wall with silicone lubricant 3. Check actuator stem for damage; replace actuator stem O-ring, and stem bushings, if necessary 4. Disassemble actuator and check cylinder and piston for damage; reassemble actuator correctly 5. Refer to valve's maintenance instructions.

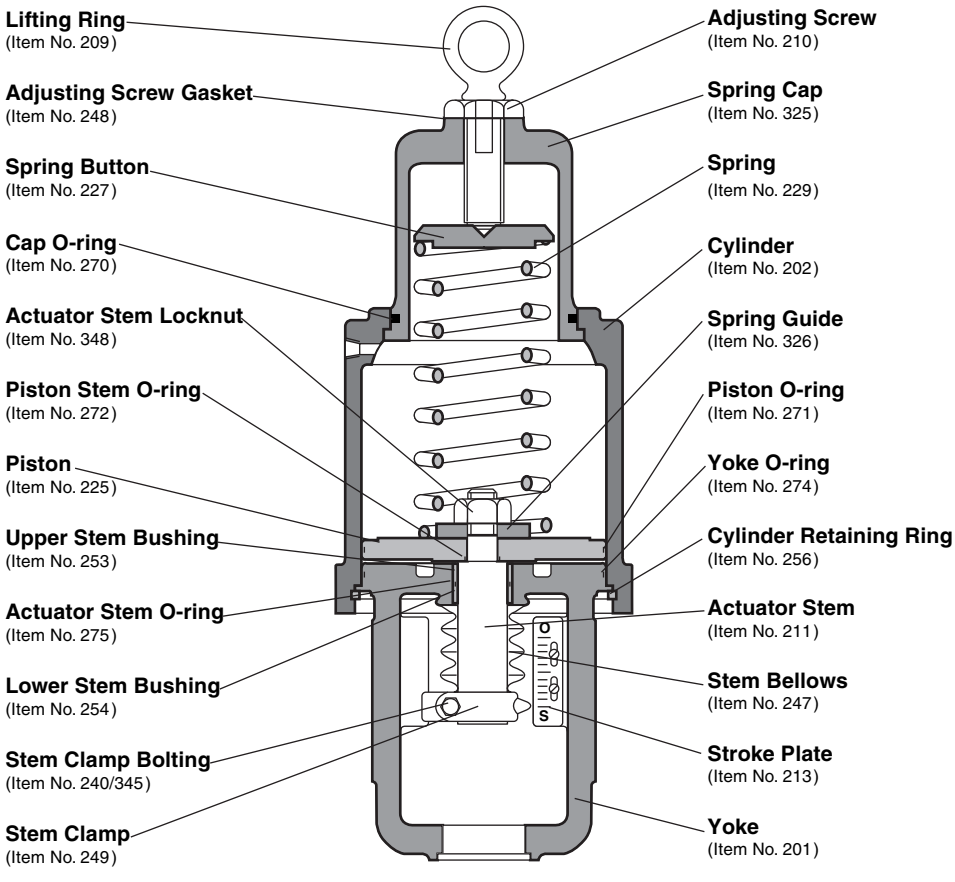

Figure 4 : Cap-Spring Cylinder Actuator

Note : Item numbers correspond to bill of material of Actuator. Please refer to it for specific part numbers.

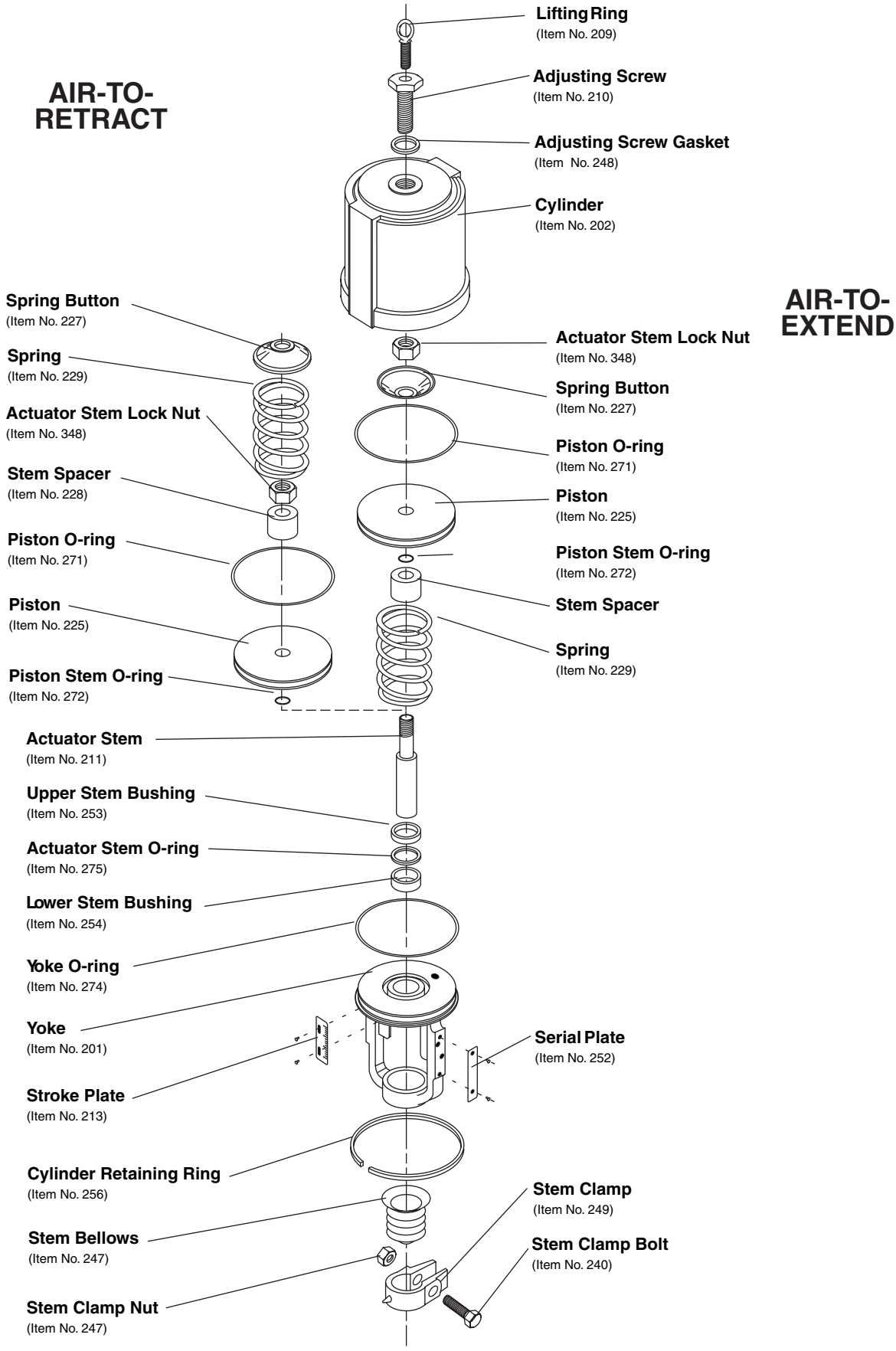

Figure 5 : Exploded view - Actuator Assembly

Note : Item numbers correspond to bill of material of valve. Please refer to it for specific part numbers.

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