FLOWSERVE

USER INSTRUCTIONS

LPC Compact Actuator Series
Single Acting & Double Acting

Installation
Operation
Maintenance

FCD LFENIM0002-00-AQ – 07/14

Experience In Motion

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1 Standard Information

1. Using Flowserve Valves, Actuators and Accessories Correctly

1.1 General Usage

The following instructions are designed to assist in unpacking, installing and performing maintenance as required on Flowserve products. Product users and maintenance personnel should thoroughly review this bulletin prior to installing, operating or performing any maintenance.

In most cases Flowserve actuators and accessories are designed for specific applications with regard to medium, pressure and temperature. For this reason they should not be used in other applications without first contacting the manufacturer.

1.2 Terms Concerning Safety

The safety terms **DANGER, WARNING, CAUTION** and **NOTE** are used in these instructions to highlight particular dangers and/or to provide additional information on aspects that may not be readily apparent.

☠ **DANGER:** indicates that death, severe personal injury and/or substantial property damage will occur if proper precautions are not taken.

⚠ **WARNING:** indicates that death, severe personal injury and/or substantial property damage can occur if proper precautions are not taken.

⚠ **CAUTION:** indicates that minor personal injury and/or property damage can occur if proper precautions are not taken.

NOTE: indicates and provides additional technical information, which may not be very obvious, even to qualified personnel.

Compliance with other, not particularly emphasized notes, with regard to transport, assembly, operation and maintenance and with regard to technical documentation (e.g. in the operating instruction, product documentation or on the product itself) is essential, in order to avoid faults, which in themselves might directly or indirectly cause severe personal injury or property damage.

1.3 Protective Clothing

Flowserve products are often used in problematic applications (e.g. extremely high pressures, dangerous, toxic or corrosive media). When performing service, inspection or repair operations always ensure, that the valve and actuator are depressurized and that the valve has been cleaned and is free from harmful substances. In such cases pay particular attention to personal protection (protective clothing, gloves, glasses etc.).

1.4 Qualified Personnel

Qualified personnel are people who, on account of their training, experience and instruction and their knowledge of relevant standards, specifications, accident prevention regulations and operating conditions, have been authorized by those responsible for the safety of the plant to perform the necessary work and who can recognize and avoid possible dangers.

1.5 Other General Requirements for In-Plant Installation

- Pipelines must be correctly aligned to ensure that the valve is not fitted under tension.
- Flowserve can provide a fire protection system. If not expressly agreed, fire protection must be provided by user.

1.6 Spare Parts

Use only Flowserve original spare parts. Flowserve cannot accept responsibility for any damages that occur from using spare parts or fastening materials from other manufacturers. If Flowserve products (especially sealing materials) have been on store for longer periods check these for corrosion or deterioration before using these products.

1.7 Service/Repair

To avoid possible injury to personnel or damage to products, safety terms must be strictly adhered to. Modifying this product, substituting non-factory parts, or using maintenance procedures other than outlined in this instruction could drastically affect performance and be hazardous to personnel and equipment, and may void existing warranties. Between actuator and valve there are moving parts. To avoid injury Flowserve provides pinch-point-protection in the form of cover plates, especially where side-mounted positioners are fitted. These protections are according to Machine Directive 2006/42/EC recommendations. If these plates are removed for inspection, service or repair special attention is required. After completing work the cover plates must be refitted. Apart from the operating instructions and the obligatory accident prevention directives valid in the country of use, all recognized regulations for safety and good engineering practices must be followed.

⚠ **WARNING:** Before products are returned to Flowserve for repair or service, Flowserve must be provided with a certificate which confirms that the product has been decontaminated and is clean. Flowserve will not accept deliveries if a certificate has not been provided (a form can be obtained from Flowserve).

1.8 Storage

In many cases Flowserve products are manufactured from stainless steel. Products not manufactured from stainless steel are typically provided with an epoxy resin coating or with other painting systems agreed with the customer. This means that Flowserve products are well protected from corrosion. Nevertheless, in order to maintain good working conditions and a good finish until the actuator is installed on the plant, it is necessary to follow a few rules during the storage period:

- Flowserve products must be stored adequately in a clean, dry environment.
- Ensure that plastic caps are fitted to protect the pneumatic connections and the cable entries, to prevent the ingress of foreign materials. These caps should not be removed until the product is actually mounted into the system.
- If the storage is outdoor, or if long-term storage (more than four months) is necessary, the plastic protection plugs have to be replaced by metal plugs, because the plastic plugs are not weatherproof function, whereas the metal ones guarantee a weatherproof protection.
- The actuator must be placed on a wooden pallet, in order to not damage the coupling base and avoid that other surfaces other surfaces rest on the ground.

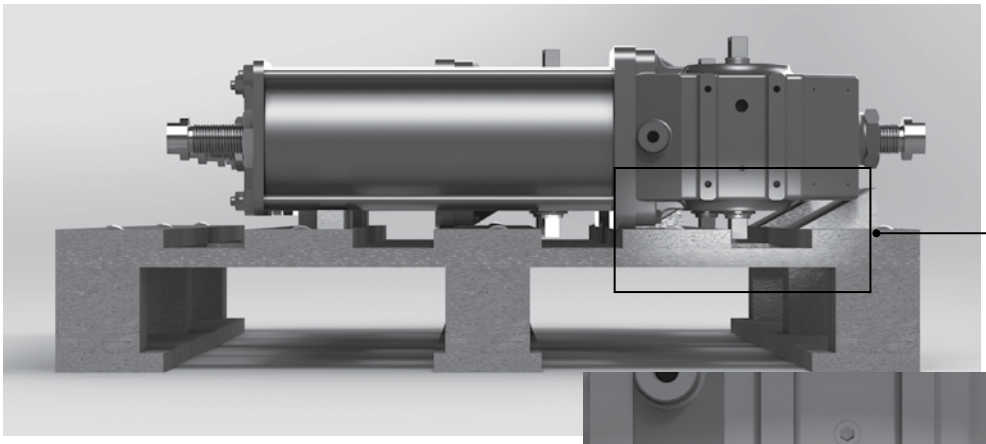


Figure 1: Actuator's Position on the Wooden Pallet

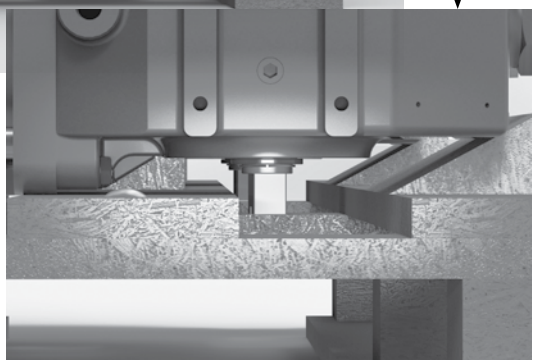


Figure 2: Position of the Output Shaft

In case of long-term storage (more than four months), additionally perform the following measures:

- Coat the coupling parts (spool piece base, flanges, bushings, joints) with protective oil or grease.
- If possible, blank off the spool piece base flange by a protection disk.
- Provide a tarpaulin cover or some other means of protection, especially if the storage is outdoor.
- It is important to periodically operate the actuator with filtered, dehydrated and lubricated air while in a storage.

1.9 Valve and Actuator Variations

These instructions cannot claim to cover all details of all possible product variations, nor can they provide information for every possible example of installation, operation or maintenance. This means that the instructions normally include only the directions to be followed by qualified personnel where the product is being used for its defined purpose. If there are any uncertainties in this respect particularly in the event of missing product-related information, clarification must be obtained via the appropriate Flowserve sales office.

1.10 Unpacking

- Each delivery includes a packing slip. When unpacking, check all delivered actuators and accessories using this packing slip.
- Report transport damage to the carrier immediately.
- In case of discrepancies, contact your nearest Flowserve location.
- If necessary, retouch minor damage to the paint coating which may have occurred during transport or storage.

NOTE: When the actuator has ATEX or SIL requirements, ensure that the “LPC Series Safety Manual” (Functional Safety and SIL Certification) and “LPC Series Safety Extract and Instruction Manual” (Explosive Atmosphere Equipment and ATEX Certification) accompany this manual and are refer to equipment for usage.

2 Installation Instructions

The LPC range of Limitorque Pneumatic Actuators is a robust, lightweight modular scotch yoke design, available in both spring return and double acting configurations, with a torque range up to 1600 Nm (1180 ft-lb); contact factory for lager size. Available with valve interface in compliance with ISO 5211, or customized upon request.

⚠ **WARNING!** Actuator operation/pressure limitations must be in accordance with Technical Bulletin (LFENTB0002-00)

2.1 Valve and Actuator Check

☠ **DANGER:** Before installation check the order no., serial no., and/or the tag no. to ensure that the valve/actuator is correct for the intended application.

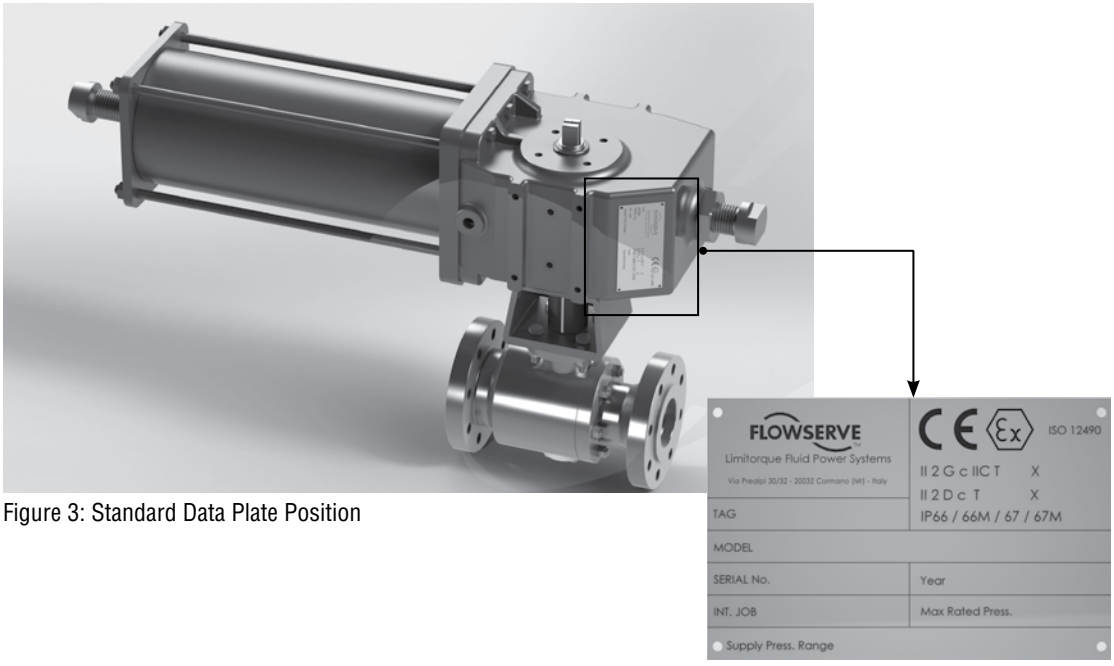


Figure 3: Standard Data Plate Position

Figure 4: Nameplate Sample

Prior to assembly, manually open and close valve (if possible), to ensure freedom of operation. Be sure valve and Limitorque actuator rotate in the same direction and are in the same position (i.e., valve closed, actuator closed). The assembly position of the actuator, with reference to the valve, has to be in accordance with the plant requirements (actuator axis parallel or perpendicular to the pipeline axis).

2.2 Connection With Valve and Mounting Kit

The LPC actuator is usually supplied with the spool piece already assembled. To assemble the actuator onto the valve, perform the following steps:

1. Check the mounting surfaces, the stem adaptor and the spool piece to assure the proper fit. Clean the flange of the valve and spool piece to remove oils and greases since the torque is transmitted by friction. Also remove any rust that may have occurred during the storage.
2. Secure the valve in the closed/open position, if possible, with the stem vertical. Lubricate the valve stem in order to ease the assembly. Place the stem adaptor on the valve stem.
3. Lift the actuator using a proper lifting system. Position the actuator over the valve and lower to engage the stem adaptor to the actuator bore. Continue to lower until the spool piece sits on valve mounting surface. This coupling has to take place without force and only with the weight of the actuator. The mounting bolts (or studs) of the valve should easily fit into the bolt holes of the spool piece without any binding. If needed, turn or stroke the actuator a few degrees and/or adjust the actuator travel-stops.
4. The mounting nuts (or bolts) connecting the base of the spool piece to the valve flange must be evenly tightened according to specific tables, available upon request to Flowserve After Sales Department.

2.3 Travel-stop Bolts and Accessories

All actuated valves require accurate travel-stop adjustments at both ends of the stroke to obtain optimum performance and valve seat life. Adjust the travel-stop bolts of the actuator for the proper open and close valve positions, per valve manufacturer's recommendations.

The LPC actuators have travel-stop adjustments in both the clockwise and counter-clockwise directions. The +/- 5-degree adjustment feature provides shaft rotation from 80 to 100 degrees overall. The adjustment of the travel-stops is performed in accordance with the following steps. Refer to Figure 15.

- Pneumatic cylinder stop (19): Loosen the hex nut (20) with a proper wrench. Screw or unscrew the stop (19), using a proper Allen key, while keeping the hex nut stationary. Tighten the hex nut.
- Housing stop (19): Loosen the hex nut (20) with a proper wrench. Screw or unscrew the stop (19), using a proper Allen key, while keeping the hex nut stationary. Tighten the hex nut.

Adjust the travel stop bolts of the actuator for the proper open and closed valve positions, per valve manufacturer's recommendations. Pneumatically stroke the actuator several times to assure proper operation. If the actuator is equipped with a switch, positioner or other accessories, adjusts them at this time.

2.4 Pneumatic Supply Fluids

To prolong actuator life use only clean, dry pneumatic supply fluids. Lubricated fluids are not required; however, they are recommended, particularly for high cycle applications. Do not use lubricated fluids with positioners, as they may damage the positioner.

2.5 Initial Operation

Before initial operation of the actuator, perform the following checks:

- Check that all electrical supply, control and signal lines are properly connected, by following the dedicated customer procedures.
- Check that the pressure and quality of the supply fluids are as prescribed.
- Check the absence of leaks in the pneumatic connections. If necessary tighten the pipe fittings.

2.6 Fail Open and Fail Close Configuration

The actuator is designed for work in both configurations: fail open and fail close. For conversion from one configuration to the other, refer to next paragraph.

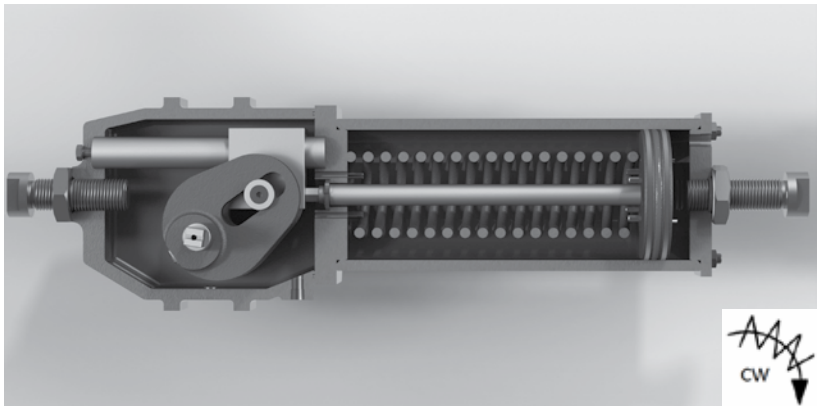


Figure 5: Actuator Configuration: Fail Close – Fail Clockwise – Single Acting

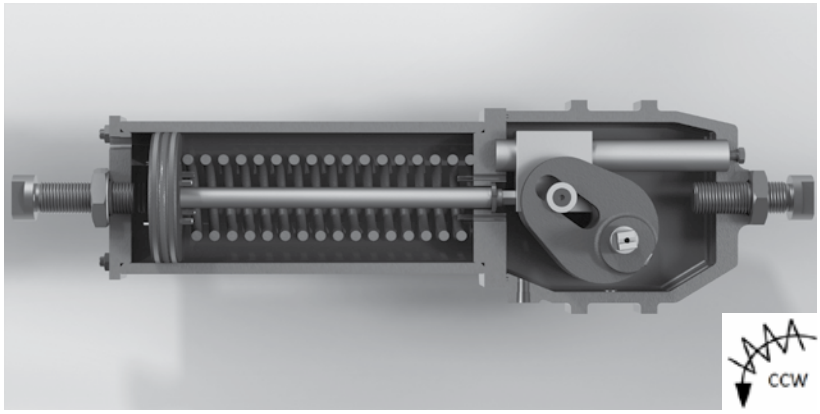


Figure 6: Actuator Configuration: Fail Open – Fail Counter Clockwise – Single Acting

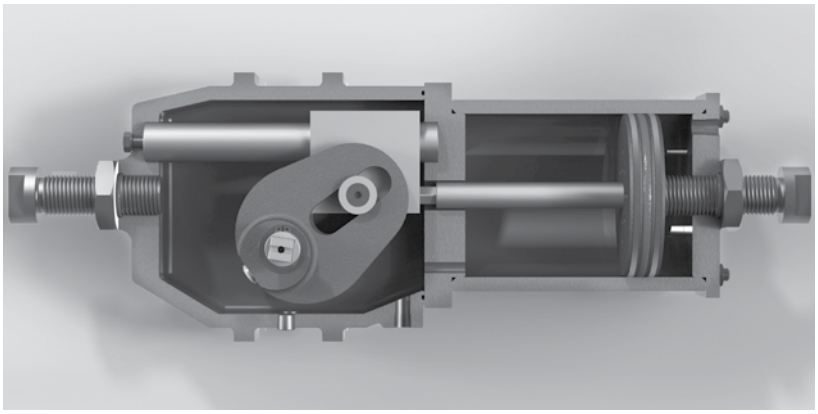


Figure 7: Double Acting Actuator Configuration – Close Position

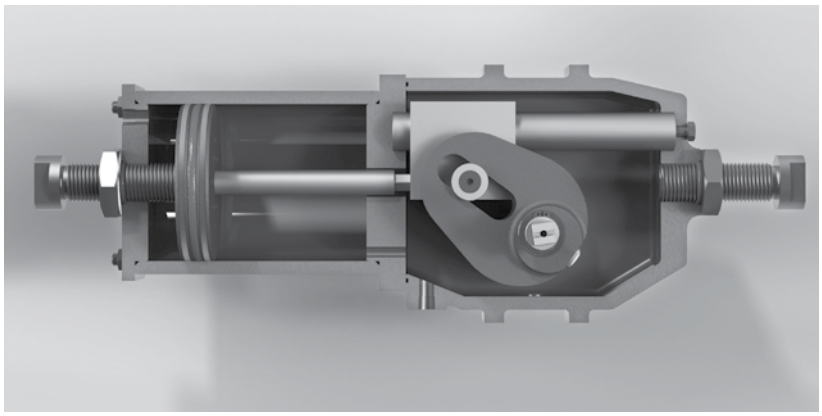


Figure 8: Double Acting Actuator Configuration – Open Position

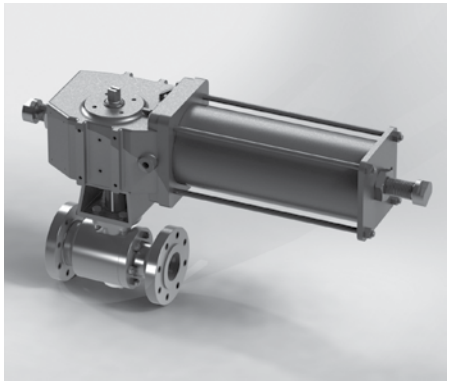


Figure 9: Fail Close Configuration With Valve

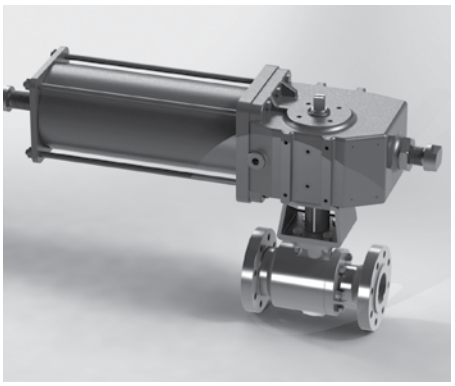


Figure 10: Fail Open Configuration With Valve

3 Field Conversion

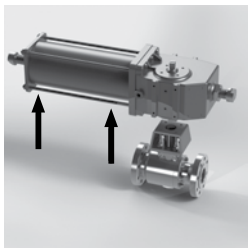
For field conversion from fail open (CCW) to fail close (CW) and vice versa, follow the following steps.

NOTE:
- An additional adapter kit is not required for field conversion
- Disassemble the actuator from the valve before carrying out the conversion

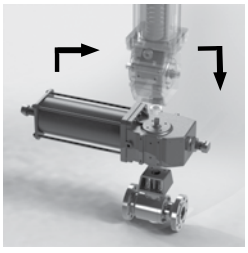
THE ACTUATOR IS DISASSEMBLED FROM THE VALVE

⚠ **WARNING:** Ensure that the pneumatic connection ports of the cylinder are disconnected. Also make sure that all pneumatic supplies to the control unit and all power supplies are disconnected. Finally, make sure that the actuator is in fail position.

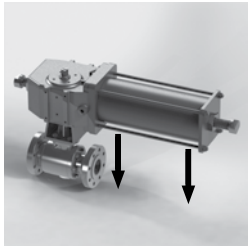
3.0.1 Starting with the actuator in a fail open (CCW) execution, remove the actuator from the valve, keeping the spool adaptor installed onto the valve.



3.0.2 Rotate the actuator.



3.0.3 Reassemble in the new position the actuator onto the spool piece and the valve. Now the actuator is in a fail close (CW) execution. Similar steps will apply for conversion from fail close (CW) to fail open (CCW).



4 Maintenance Instructions

LPC series compact actuators are designed to offer the greatest ease of operations of assembly, disassembly and maintenance. The maintenance and disassembly do not require special equipment or special or large wrenches. Furthermore the joints among the moving parts of the actuator are made exclusively through pins and then not using bolts to be tightened with specific torques.

LPC compact actuators do not need maintenance for a long period, even if they are working in severe condition. The lifetime of these actuators is guaranteed for 25 years with a regular and programmed maintenance operation every five years. However, if the actuator operation happens infrequently, it is recommended to periodically check the actuator by performing the following steps:

- In the plants, where it is possible, carry out a few opening and closing operations, involving all the control unit components, checking that the actuator operates correctly and within the required stroking times.
- Check that all the signals (pneumatic and electric) arriving at the actuator are correct and that the supply fluid pressure is within the required range. Check for the absence of leaks in the pneumatic connections. If necessary, tighten the pipe fittings.
- Check the paint coating. If some areas are damaged due to accidental events, retouch them according to paint procedure supplied along with the actuator documentation.

In case of scheduled preventive maintenance, or following accidental events, refer to the following maintenance instructions regarding the main actuators components (pneumatic cylinder and housing).

4.1 General Disassembly Instructions

1. Disconnect all air and electrical supplies from actuator;
2. If removal of the actuator from valve is necessary, before dismounting the actuator, remove all accessories from actuator.
3. The reference drawings for the instructions reported in the following paragraphs are exploded views of single acting and double acting actuators, included as Figures 15.

4.2 Spring Container and Pneumatic Cylinder Maintenance

The pneumatic cylinder maintenance mainly consists in the replacement of all parts that may degrade in the course of time, even in the absence of faults. These components are the o-rings and the sliding elements of the piston.

NOTE: In the LPC Compact Actuator Series, in single acting execution, the spring is located inside the pneumatic cylinder, as shown in Figures 5 and 6.

⚠ **WARNING:** Ensure that the pneumatic connection ports of the cylinder are disconnected. Also make sure that all pneumatic supplies to the control unit and all power supplies are disconnected. Finally, make sure that the actuator is in fail position, i.e. that it is not locked in a position with the spring compressed by means of locking devices.

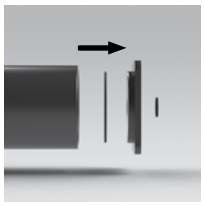
Standard in-field maintenance

Perform the following steps with reference to Figure 15:

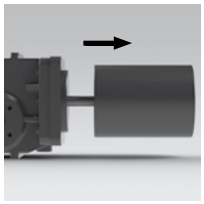
4.2.1 Unscrew and remove the travel stop of the pneumatic cylinder (19). For removing the stop, refer to the indications given in paragraph 2.3.

4.2.2 Remove four tie rods (16) positioned on the cylinder by unscrewing the nuts (18) on the sides of the End Flange and unscrewing the tie rods from the adaptor flange (26).

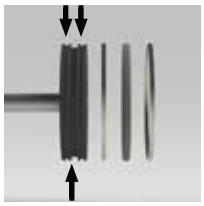
4.2.3 Remove carefully the end flange (23) from the can (17). Remove the two o-ring (21 and 22) from the end flange.



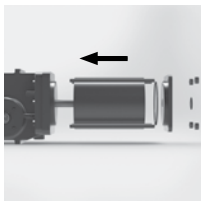
4.2.4 Finally remove the can (17) without damaging or scratching the inner surface.



4.2.5 Remove the o-ring (25) and finally the two guide-tapes (36) from the piston (15). Clean all the surface of piston and flanges in contact with these components with a clean rag and solvent compatible with o-ring material (for information contact Flowserve). Brush the o-rings grooves with a light oil film and install the new o-rings. Spread a thin layer of oil on the bottom of the guide tape grooves and install a new guide tapes. Clean the internal surface of the tube and lubricate with a protective oil film.



4.2.6 Reassemble the parts of the cylinder with reverse procedure as described in points 3.2.1 to 3.2.4. The tie rods should be tightened using a torque wrench, applying a torque in accordance with specific tables, available upon request to Flowserve After Sales Department.



4.2.7 Readjust the travel stops as instructed in paragraph 2.3.

NOTE: After the standard maintenance steps, stroke the actuator a few times to check for normal operation.

4.3 Housing and Scotch Yoke Maintenance

Standard maintenance of the housing may take place in the field.

Standard in–field maintenance

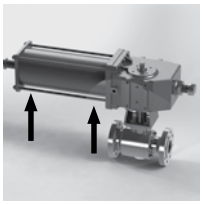
A first standard maintenance is available unscrewing the housing stop bolt (11) and applies a film of grease (with an applicator) directly on the yoke's sliding surface.

NOTE: Take note of the length of the stop bolt before making the standard maintenance and reassemble it at the same length.

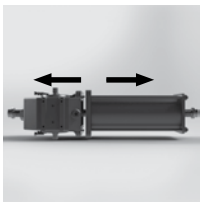
Extensive maintenance

If it is necessary to carry out an extra-maintenance inside the housing, perform the following steps:

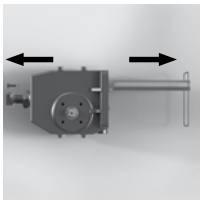
⚠ **WARNING:** Ensure that the pneumatic connection ports of the cylinder are disconnected. Also make sure that all pneumatic supplies to the control unit and all power supplies are disconnected. Finally, make sure that the actuator is in fail position, i.e. that it is not locked in a position with the spring compressed by means of locking devices.



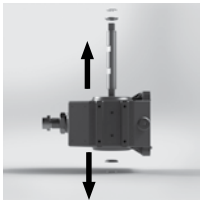
4.3.1 Remove the actuator from the valve.



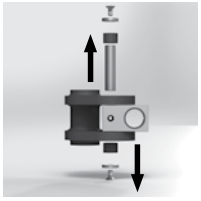
4.3.2 Remove the pneumatic cylinder unscrewing the six screws (29) and unbolting the piston rod (11) to the guide block (13).



4.3.3 Unscrew the screw locates on the left of the housing stop bolt (33), remove the flat washer (32) and remove the guide bar (10). Remove the o-ring (9).



4.3.4 Remove the retaining rings (5), the bushes (4) and the o-rings (31), unscrew the caps (2) and finally unscrew the two bolts (1). Now, pull out the output shaft (28) from the housing (30).



4.3.5 Remove the scotch yoke (3) from the housing, unscrew upper and lower screws (6) and pull out the two washers (7) and roller bearings (8).

4.3.6 Apply a grease film on the slider surface of the yoke wings (3) and the roller bearings (8) (For the grease characteristics refer to Grease Characteristics Table, available upon request to Flowserve After Sales Department). Replace the o-ring (9).

4.3.7 Reassemble the parts of the housing using a reverse procedure as previously described.

5 Troubleshooting

To prevent the actuator from not proper functioning or low performance, first ensure that the installation and the adjustment operations are carried out completely in accordance with this manual.

⚠ **WARNING:** During the activities of identifying faults, it is very important to observe all the regulations and instructions about safety. Read all the paragraphs of this manual concerning maintenance before opening for inspection or starting to repair any actuator components. If in doubt, choose SAFETY FIRST.

You can identify the causes of possible malfunctions with the help of the following table ("troubleshooting table"). If a malfunction cannot be identified and eliminated using the table, Flowserve Service Department should be contacted.

Troubleshooting Table		
Problem	**Possible cause**	**Solution**
The actuator does not move.	Actuator has not been properly installed.	Check that all the pneumatic connections and that all the pneumatic components have been installed correctly, and are in accordance with the actuator operating mode.
		Check that the actuator is properly connected to the valve and that there aren't problems in the mounting kit.
	Supply pressure problems.	Check that the actuator is properly connected to the valve and that there aren't problems in the mounting kit.
	Problems in the control panel (if present).	Check the correct functioning of the control panel. In particular, check all the pneumatic and electric connections.
		Check the correct level of supply voltage for solenoid valves and other electrical/electronic components.
	The valve is blocked.	Check that valve is free to rotate. If necessary disassemble the actuator from the valve.
	Exhaust port(s) obstructed.	Screw cap(s) must be disengaged. Ensure vent ports are free. If not, clean them of any obstructions and clean the dust excluders, if present.
	Problems with lubricants.	Ensure that the actuator is properly lubricated, and that there is no solidified grease among sliding parts or rotating parts. If actuator lubrication is inadequate or improper, apply a uniform lubricant layer. Follow the instructions for cylinder maintenance (par. 4.2). Consult Flowserve for proper oil and grease to be used.

Troubleshooting Table		
Problem	**Possible cause**	**Solution**
The actuator does not move.	A moving part is seized up.	Check if any moving part is blocked. If so, follow the maintenance instructions given in the relevant paragraphs of this manual or in special maintenance operating instructions.
	Leakage of the pneumatic cylinder.	A significant air leak may prevent the actuator from operating. Ensure that there aren't any leaks in the pneumatic cylinder toward the outside. If possible, detect them using a leak finder spray. Check also that there are not leaks across the piston. If leaks are present, follow the cylinder maintenance instructions given in paragraph 3.2.
	The actuator model is not the correct one, or is not suitable for the plant conditions.	Check the actuator nameplate and the plant requirements. If there are mismatches, contact Flowserve Service Department.
	Spring problems (if actuator is a single acting model).	Check the proper functioning of the spring can. If problems are found, contact Flowserve Service Department.
		Perform the following test: disassemble the actuator from the valve and measure the minimum pressure values necessary to move and compress the spring. Compare the measured values with the ones reported on the Testing Certificate. If there are significant differences you should contact Flowserve Service Department.
	A lockout device has been inserted and forgotten in that position.	Disconnect the lockout module.
The valve does not fully perform the stroke, during opening or closing.	The actuator is not correctly adjusted.	As above, check the position of the stoppers in opening and closing direction. If necessary adjust them. Follow the instructions given in paragraph 2.3.
	Exhaust port(s) obstructed.	Screw cap(s) must be disengaged. Ensure vent port are free. If not, clean them of any obstruction and clean the dust excluders, if present.
	Actuator torque lower than required.	In order to do a check it is necessary to perform the following test: disassemble the actuator from the valve and measure the minimum pressure values necessary to move and compress the spring (if the actuator is a single acting model) or the minimum values necessary to move the actuator yoke and perform a stroke (for double acting models). Compare the measured values with the ones reported on the Testing Certificate. If there are significant differences you should contact Flowserve Service Department.
During the stroke the actuator exhibits excessive amounts of backlash.	Some components are excessively worn.	Identify and replace these components, according to the procedure described in the relevant paragrahs of this manual, or in special maintenance operating instructions.
In case of other problems not listed in this table, you should contact Flowserve Service Department.		

6 Disposal of Decommissioned Actuators

Actuators that are to be decommissioned permanently due to a plant closure or for another reason must have the stored energy in the spring neutralized. This can be done in several ways:

- Decommissioning by filling with concrete – following proper removal of the actuator from any hazardous areas, the spring module may be neutralized by cutting a small opening in the end or side of the spring can and filling the spring can with liquid concrete and allowing the concrete to dry. This will eliminate any possibility of spring decompression if it were to be removed from the actuator without following proper procedures.
- Decommissioning by cutting the spring – following proper removal of the actuator from any hazardous areas, the spring module may be neutralized by cutting a small opening in the side of the spring can and accessing the spring coils. The spring coils are then cut using a torch to relieve all compression and stored energy. Care should be taken that the opening in the spring can is sufficiently small to prevent any pieces of the spring from escaping when the spring is cut.

⚠ **WARNING:** Failure to neutralize the spring in the actuator or to follow these instructions could lead to injury to personnel or property damage.

Either method is acceptable to Flowserve although the method outlined in the first point is preferred, as the stored energy in the spring is not suddenly released when the spring is cut. Hence, this is the safest method.

No actions need be taken on any other portions of the actuator to decommission it.

7 Annex

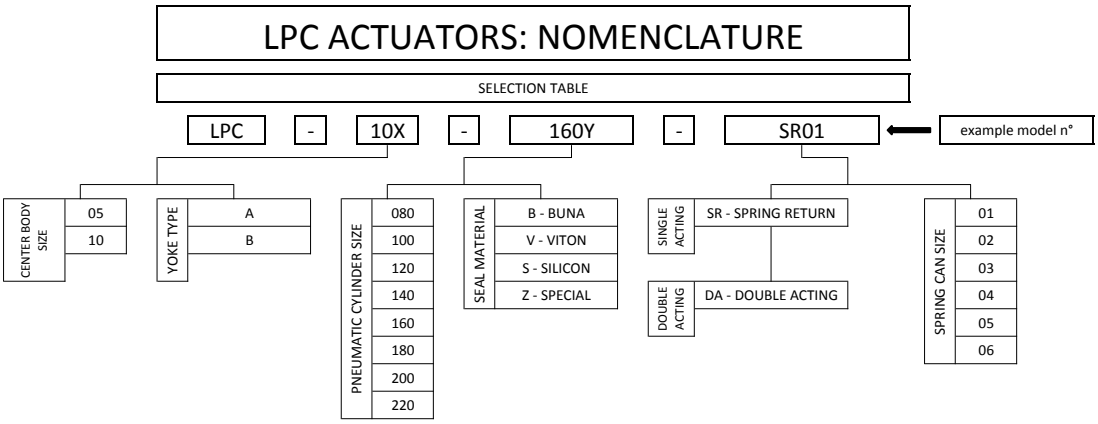
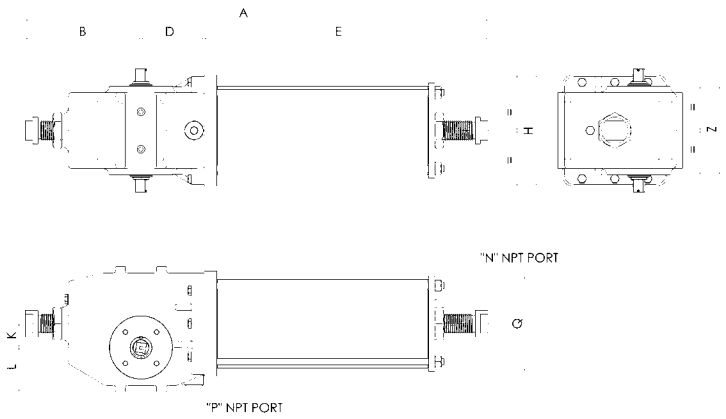


Figure 11: Model Selection Table

Code	Material	Temperature Range	Climate Classification According to IEC60721
B	Buna	Std Temp: -29°C to +100°C (-20°F to 212°F)	Tropical & Arid
V	Viton	Hi Temp: up to +160°C (320°F)	
S	Silicon	Low Temp: down to -40°C (-40°F)	Temperate
Z	Other	Special Applications - Consult Factory	Cold & Polar

Figure 12: Seals Material



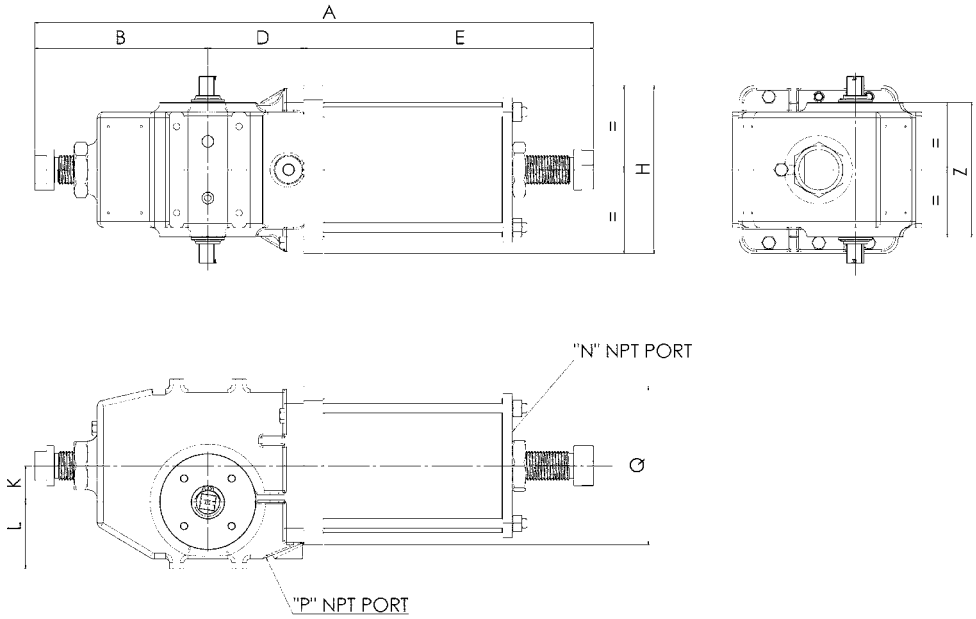
TOLERANCE ±10% TO BE CONSIDERED ON DIMENSIONS

Dimensions mm (in) - Kg (lbs)											
Model	**A**	**B**	**D**	**E**	**K**	**H**	**L**	**Q**	**Z**	**'N' NPT PORT**	**Weight**
LPC-05X-080Y-SR01	716	178	100	438	38	175	69	120	140	1/4"	37
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	4.72	5.51		82
LPC-05X-080Y-SR02	716	178	100	438	38	175	69	120	140	1/4"	38
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	4.72	5.51		83
LPC-05X-100Y-SR01	716	178	100	438	38	175	69	140	140	1/4"	43
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	5.51	5.51		94
LPC-05X-100Y-SR02	716	178	100	438	38	175	69	140	140	1/4"	43
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	5.51	5.51		95
LPC-05X-100Y-SR03	716	178	100	438	38	175	69	140	140	1/4"	44
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	5.51	5.51		96
LPC-05X-120Y-SR01	716	178	100	438	38	175	69	150	140	1/4"	44
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	5.91	5.51		97
LPC-05X-120Y-SR02	716	178	100	438	38	175	69	150	140	1/4"	44
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	5.91	5.51		98
LPC-05X-120Y-SR03	716	178	100	438	38	175	69	150	140	1/4"	45
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	5.91	5.51		99
LPC-05X-120Y-SR04	716	178	100	438	38	175	69	150	140	1/4"	45
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	5.91	5.51		100
LPC-05X-120Y-SR05	716	178	100	438	38	175	69	150	140	1/4"	46
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	5.91	5.51		102
LPC-05X-140Y-SR01	716	178	100	438	38	175	69	165	140	1/4"	47
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	6.50	5.51		104
LPC-05X-140Y-SR02	716	178	100	438	38	175	69	165	140	1/4"	48
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	6.50	5.51		106
LPC-05X-140Y-SR03	716	178	100	438	38	175	69	165	140	1/4"	48
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	6.50	5.51		107
LPC-05X-140Y-SR04	716	178	100	438	38	175	69	165	140	1/4"	49
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	6.50	5.51		108
LPC-05X-140Y-SR05	716	178	100	438	38	175	69	165	140	1/4"	50
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	6.50	5.51		110
LPC-05X-140Y-SR06	716	178	100	438	38	175	69	165	140	1/4"	54
	28.19	7.01	3.94	17.24	1.50	6.89	2.72	6.50	5.51		119
LPC-05X-160Y-SR01	716	178	100	438	38	185	69	185	140	1/4"	53
	28.19	7.01	3.94	17.24	1.50	7.28	2.72	7.28	5.51		117
LPC-05X-160Y-SR02	716	178	100	438	38	185	69	185	140	1/4"	54
	28.19	7.01	3.94	17.24	1.50	7.28	2.72	7.28	5.51		118
LPC-05X-160Y-SR03	716	178	100	438	38	185	69	185	140	1/4"	54
	28.19	7.01	3.94	17.24	1.50	7.28	2.72	7.28	5.51		119
LPC-05X-160Y-SR04	716	178	100	438	38	185	69	185	140	1/4"	55
	28.19	7.01	3.94	17.24	1.50	7.28	2.72	7.28	5.51		120
LPC-05X-160Y-SR05	716	178	100	438	38	185	69	185	140	1/4"	56
	28.19	7.01	3.94	17.24	1.50	7.28	2.72	7.28	5.51		122
LPC-05X-160Y-SR06	716	178	100	438	38	185	69	185	140	1/4"	57
	28.19	7.01	3.94	17.24	1.50	7.28	2.72	7.28	5.51		126

TOLERANCE ±10% TO BE CONSIDERED ON DIMENSIONS

Dimensions mm (in) - Kg (lbs)											
Model	**A**	**B**	**D**	**E**	**K**	**H**	**L**	**Q**	**Z**	**'N' NPT PORT**	**Weight**
LPC-10X-100Y-SR01	844	240	132	472	50	245	105	140	172	1/4"	68
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	5.51	6.77		149
LPC-10X-120Y-SR01	844	240	132	472	50	245	105	165	172	1/4"	72
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	6.50	6.77		159
LPC-10X-120Y-SR02	844	240	132	472	50	245	105	165	172	1/4"	74
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	6.50	6.77		163
LPC-10X-140Y-SR01	844	240	132	472	50	245	105	165	172	1/4"	77
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	6.50	6.77		169
LPC-10X-140Y-SR02	844	240	132	472	50	245	105	165	172	1/4"	79
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	6.50	6.77		174
LPC-10X-140Y-SR03	887	240	132	515	50	245	105	165	172	1/4"	81
	34.92	9.45	5.20	20.28	1.97	9.65	4.13	6.50	6.77		179
LPC-10X-160Y-SR01	844	240	132	472	50	245	105	185	172	1/4"	79
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	7.28	6.77		175
LPC-10X-160Y-SR02	844	240	132	472	50	245	105	185	172	1/4"	81
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	7.28	6.77		178
LPC-10X-160Y-SR03	887	240	132	515	50	245	105	185	172	1/4"	83
	34.92	9.45	5.20	20.28	1.97	9.65	4.13	7.28	6.77		183
LPC-10X-160Y-SR04	887	240	132	515	50	245	105	185	172	1/4"	85
	34.92	9.45	5.20	20.28	1.97	9.65	4.13	7.28	6.77		188
LPC-10X-160Y-SR05	923	240	132	551	50	245	105	185	172	1/4"	87
	36.34	9.45	5.20	21.69	1.97	9.65	4.13	7.28	6.77		192
LPC-10X-180Y-SR01	844	240	132	472	50	245	105	230	172	1/4"	90
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	9.06	6.77		199
LPC-10X-180Y-SR02	844	240	132	472	50	245	105	230	172	1/4"	92
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	9.06	6.77		202
LPC-10X-180Y-SR03	887	240	132	515	50	245	105	230	172	1/4"	93
	34.92	9.45	5.20	20.28	1.97	9.65	4.13	9.06	6.77		206
LPC-10X-180Y-SR04	887	240	132	515	50	245	105	230	172	1/4"	96
	34.92	9.45	5.20	20.28	1.97	9.65	4.13	9.06	6.77		211
LPC-10X-180Y-SR05	923	240	132	551	50	245	105	230	172	1/4"	97
	36.34	9.45	5.20	21.69	1.97	9.65	4.13	9.06	6.77		215
LPC-10X-180Y-SR06	923	240	132	551	50	245	105	230	172	1/4"	99
	36.34	9.45	5.20	21.69	1.97	9.65	4.13	9.06	6.77		219
LPC-10X-200Y-SR01	844	240	132	472	50	245	105	245	172	1/4"	99
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	9.65	6.77		218
LPC-10X-200Y-SR02	844	240	132	472	50	245	105	245	172	1/4"	100
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	9.65	6.77		221
LPC-10X-200Y-SR03	887	240	132	515	50	245	105	245	172	1/4"	102
	34.92	9.45	5.20	20.28	1.97	9.65	4.13	9.65	6.77		226
LPC-10X-200Y-SR04	887	240	132	515	50	245	105	245	172	1/4"	105
	34.92	9.45	5.20	20.28	1.97	9.65	4.13	9.65	6.77		231
LPC-10X-200Y-SR05	923	240	132	551	50	245	105	245	172	1/4"	106
	36.34	9.45	5.20	21.69	1.97	9.65	4.13	9.65	6.77		234
LPC-10X-200Y-SR06	923	240	132	551	50	245	105	245	172	1/4"	109
	36.34	9.45	5.20	21.69	1.97	9.65	4.13	9.65	6.77		241
LPC-10X-220Y-SR01	844	240	132	472	50	245	105	245	172	1/4"	115
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	9.65	6.77		254
LPC-10X-220Y-SR02	844	240	132	472	50	245	105	245	172	1/4"	117
	33.23	9.45	5.20	18.58	1.97	9.65	4.13	9.65	6.77		257
LPC-10X-220Y-SR03	887	240	132	515	50	245	105	245	172	1/4"	119
	34.92	9.45	5.20	20.28	1.97	9.65	4.13	9.65	6.77		261
LPC-10X-220Y-SR04	887	240	132	515	50	245	105	245	172	1/4"	121
	34.92	9.45	5.20	20.28	1.97	9.65	4.13	9.65	6.77		266
LPC-10X-220Y-SR05	923	240	132	551	50	245	105	245	172	1/4"	122
	36.34	9.45	5.20	21.69	1.97	9.65	4.13	9.65	6.77		269
LPC-10X-220Y-SR06	923	240	132	551	50	245	105	245	172	1/4"	124
	36.34	9.45	5.20	21.69	1.97	9.65	4.13	9.65	6.77		273

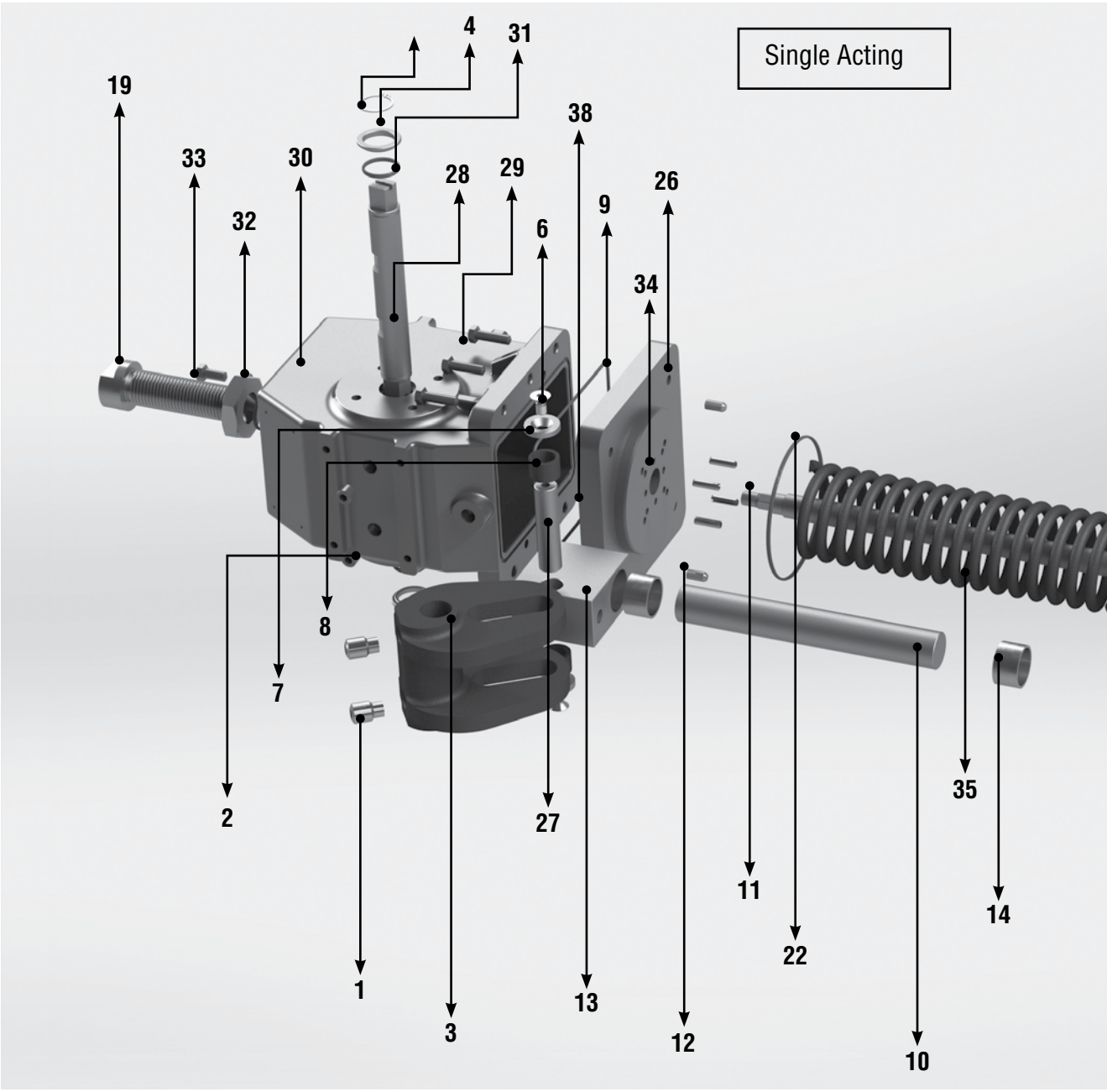
Figure 13: Weights and Dimensions Table – Single Acting – Symmetric and Canted



TOLERANCE ±10% TO BE CONSIDERED ON DIMENSIONS

Dimensions mm (in) - Kg (lbs)												
Model	**A**	**B**	**D**	**E**	**K**	**H**	**L**	**Q**	**Z**	**'N' NPT PORT**	**'P' NPT PORT**	**Weight**
LPC-05X-080Y-DA	568	178	100	290	38	175	69	120	140	1/4"	1/4"	33
	22.36	7.01	3.94	11.42	1.50	6.89	2.72	4.72	5.51			72
LPC-05X-100Y-DA	568	178	100	290	38	175	69	140	140	1/4"	1/4"	39
	22.36	7.01	3.94	11.42	1.50	6.89	2.72	5.51	5.51			87
LPC-05X-120Y-DA	568	178	100	290	38	175	69	150	140	1/4"	1/4"	40
	22.36	7.01	3.94	11.42	1.50	6.89	2.72	5.91	5.51			88
LPC-05X-140Y-DA	568	178	100	290	38	175	69	165	140	1/4"	1/4"	43
	22.36	7.01	3.94	11.42	1.50	6.89	2.72	6.50	5.51			94
LPC-05X-160Y-DA	568	178	100	290	38	185	69	185	140	1/4"	1/4"	47
	22.36	7.01	3.94	11.42	1.50	7.28	2.72	7.28	5.51			103
LPC-10X-100Y-DA	713	250	130	333	50	245	105	140	172	1/4"	1/4"	56
	28.07	9.84	5.12	13.11	1.97	9.65	4.13	5.51	6.77			123
LPC-10X-120Y-DA	713	250	130	333	50	245	105	165	172	1/4"	1/4"	60
	28.07	9.84	5.12	13.11	1.97	9.65	4.13	6.50	6.77			132
LPC-10X-140Y-DA	713	250	130	333	50	245	105	165	172	1/4"	1/4"	63
	28.07	9.84	5.12	13.11	1.97	9.65	4.13	6.50	6.77			138
LPC-10X-160Y-DA	713	250	130	333	50	245	105	185	172	1/4"	1/4"	67
	28.07	9.84	5.12	13.11	1.97	9.65	4.13	7.28	6.77			147
LPC-10X-180Y-DA	713	250	130	333	50	245	105	230	172	1/4"	1/4"	73
	28.07	9.84	5.12	13.11	1.97	9.65	4.13	9.06	6.77			162
LPC-10X-200Y-DA	713	250	130	333	50	245	105	245	172	1/4"	1/4"	75
	28.07	9.84	5.12	13.11	1.97	9.65	4.13	9.65	6.77			165
LPC-10X-220Y-DA	713	250	130	333	50	245	105	245	172	1/4"	1/4"	81
	28.07	9.84	5.12	13.11	1.97	9.65	4.13	9.65	6.77			179

Figure 14: Weights and Dimensions Table – Double Acting – Symmetric and Canted



Number	Description	Qty.
1	Bolt	2
2	Cap	2
3	Scotch Yoke	1
4	Bush	2
5	Retaining Ring	2
6	Screw	2
7	Washer	2

Number	Description	Qty.
8	Roller Bearing	2
9	O-Ring	1
10	Guide Bar	1
11	Piston Rod	1
12	Pin	2
13	Guide Block	1
14	Bushing	2

Number	Description	Qty.
15	Piston	1
16	Tie Rod	4
17	Spring Can	2
18	Hex Nut	4
19	Stop Bolt	2
20	Hex Nut	2
21	O-Ring	2

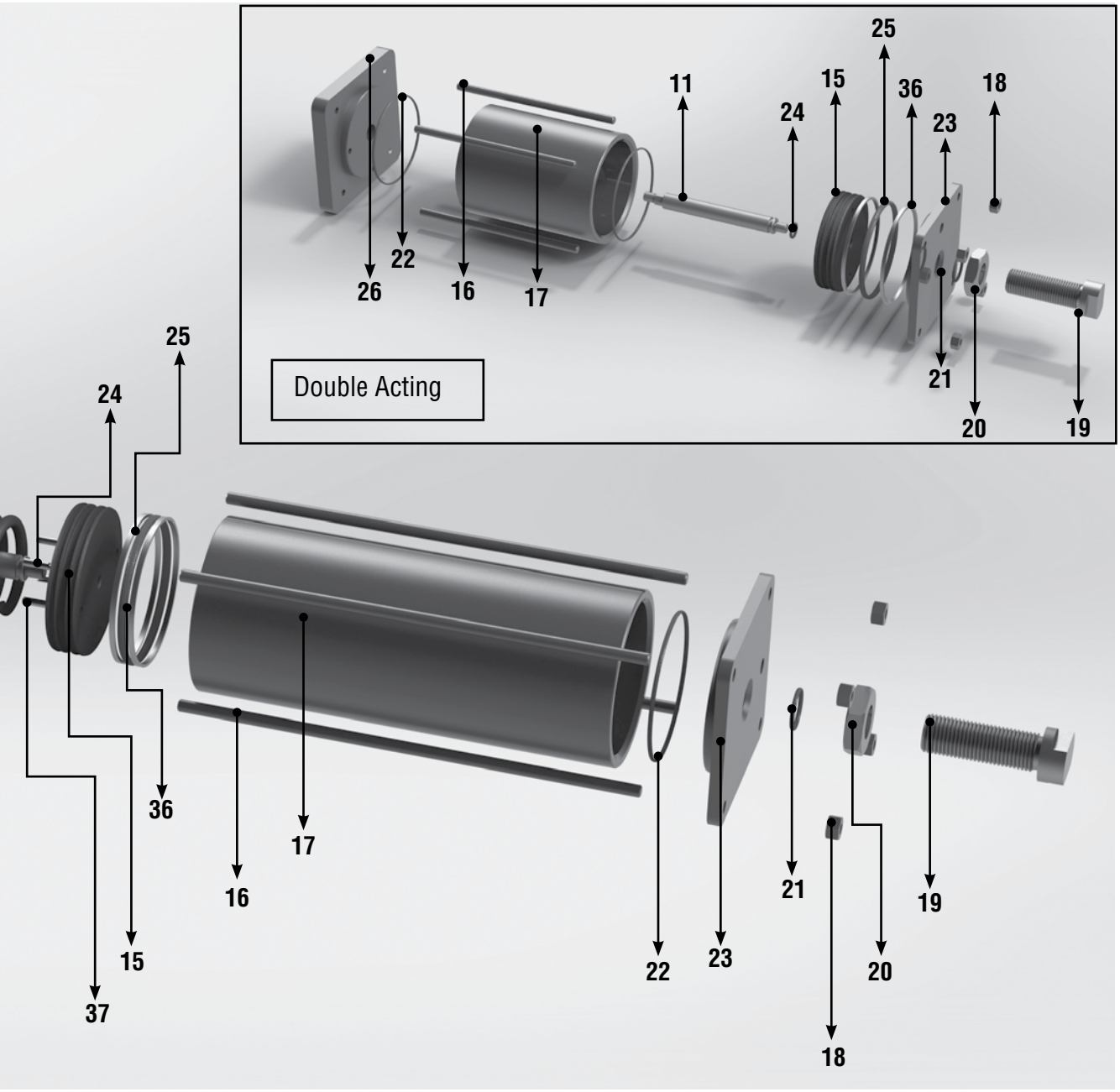


Figure 15: Exploded View

Number	Description	Qty.
22	O-Ring	1
23	End Flange	1
24	O-Ring	1
25	O-Ring	1
26	Adaptor Flange	1
27	Yoke Pin	1
28	Output Shaft	1

Number	Description	Qty.
29	Screw	6
30	Housing	1
31	O-Ring	2
32	Flat Washer	1
33	Screw	1
34	Bushing	1
35	Spring	1

Number	Description	Qty.
36	Guide Ring	2
37	Bar Pin	8
38	Bushing	1

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FCD LFENIM0002-00-AQ 07/14

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