Installation, Operation and Maintenance Manual
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Hytork XL Pneumatic Actuator

HYTORK™

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Section 1: Important Safety Procedures

Table 1. Applicable Models

XL 26	XL 281	XL 2586
XL 71	XL 426	XL 4581
XL 131	XL 681	-
XL 186	XL 1127	-
XL 221	XL 1372	-

Hytork XL actuators are only intended for use in large-scale fixed installations excluded from the scope of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2).

Installation, adjustment, putting into service, use, assembly, disassembly and maintenance of the actuator is strictly reserved to qualified personnel.

Before installation, operation and maintenance, read the relevant sections of:

- This manual
- Hytork XL Safety Guide (DOC.SG.HX.1)

⚠ CAUTION

- Always disconnect the air and electrical supplies before carrying out any form of maintenance on an actuator.
- When removing any ball valve or plug valve assemblies from a pipe system, isolate the piping system on which the actuator is installed and relieve any media pressure that may be trapped in the valve cavities before removing the actuator for maintenance.
- Always contain the spring tension with Hytork retractor rods as explained in Section 9, Disassembly Procedure. Follow instructions for using the retractor rod carefully. Only Hytork manufactured or approved retractor rods are to be used for spring removal. As with any threaded tool that is frequently used retractor rods should be checked to ensure that the threads are not worn or damaged in any way and greased regularly. Any damaged or worn rods must not be used and must be destroyed.
- Never attempt to “BLOW OUT” the pistons or the end caps from the actuator body by using air pressure.
- Never turn the stop screws completely out when the actuator is under pressure.

Numbers in brackets (#) refer to parts on the exploded view drawing (refer to Section 15, Figure 13). All Hytork XL spares kits are supplied with SAFEKEY assemblies (13/14) cut to an exact length which will fit the circumference of the end cap (21) when fully assembled into the actuator.

Any shortened SAFEKEY must not be used.

If in doubt, contact Emerson or your local Hytork Stocking Distributor. Read the relevant sections carefully before continuing.

NOTE:

- Failure to follow proper storage guidelines will void warranty.
- Warehouse storage: Hytork actuators should be stored in a clean, dry warehouse, free from excessive vibration and rapid temperature changes. Actuators should not be stored on any floor surface.
- On site storage: Hytork actuators should be stored in a clean, dry warehouse, free from excessive vibration and rapid temperature changes. Prevent moisture or dirt entering the actuator. Plug or seal both air connection ports.

⚠ WARNING

- Use lifting equipment as required by national or local legislation.
- Use lifting straps to lift the assembly of actuator and valve.
- Do not attach lifting straps to only the actuator, to lift the assembly of actuator and valve.

Table 2. Weight of Actuators

Model	Double-Acting		Spring-Return with S80 Springs	
	kg	lb	kg	lb
XL26	1.39	3.06	1.53	3.37
XL71	2.39	5.27	2.78	6.13
XL131	3.90	8.60	4.76	10.49
XL186	4.77	10.52	5.45	12.02
XL221	6.19	13.65	7.76	17.11
XL281	7.02	15.47	9.90	21.83
XL426	7.30	16.10	12.50	27.56
XL681	8.80	19.40	22.50	49.60
XL1127	22.00	48.50	36.00	79.37
XL1372	27.00	59.52	46.60	102.73
XL2586	46.00	101.41	79.00	174.16
XL4581	83.00	182.98	142.00	313.05

Section 2: ATEX Instructions for Use in (Potential) Explosive Areas

2.1 Intended Use

The Hytork XL series pneumatic actuators are a Group II category 2 equipment and intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapors, mists or by air/dusts are likely to occur. Therefore, it may be used in (ATEX) classified Zones 1, 2 (Gases) and/or 21, 22 (Dust).

2.2 Safety Instructions

1. Actuator assembly, disassembly and maintenance is allowed only in absence of explosive mixture.
2. Prevent entry of explosive mixtures into the actuator. We suggest utilizing a solenoid with a “breather” function on spring-return actuators when used in potentially explosive atmospheres.
3. The plastic position indicator caps are approved for ATEX gas group IIB areas.
   - In areas where ATEX gas group IIC requirements apply, the plastic indicator for actuator sizes XL26 to 281 is approved for use.
   - In areas where ATEX gas group IIC requirements apply, do not use the plastic position indicator cap for actuator sizes XL426 up to XL4581, to avoid build up of static electricity.
4. In order to avoid increasing dust explosion risk, periodically clean dust deposits from all equipment.
5. When equipment is installed in a hazardous area location (potentially explosive atmosphere), prevent sparks by proper tool selection and avoiding other types of impact energy.
6. Proper care must be taken to avoid generation of static electricity on the non-conductive external surfaces of the equipment (e.g. rubbing of surfaces, etc.).
7. Hytork XL actuators do not have an inherent ignition source due to electrostatic discharge, but explosion hazard may be present due to the discharge of static electricity from other valve assembly components.
   - To avoid personal injury or property damage, make sure that the valve is grounded to the pipeline before placing the valve assembly into service.
   - Use and maintain alternate shaft-to-valve body bonding, such as a shaft-to-body bonding strap assembly.
8. The paint protection must not exceed 200 µm if the actuator is used in a group IIC atmosphere. For group IIA or IIB atmospheres, the paint protection must not exceed a thickness of 2 mm / 0.08 in.

⚠ WARNING

The actuator's surface temperature is dependent upon process operating conditions. If the actuator's surface temperature exceeds the acceptable temperature for the hazardous area classification, it can catch fire or in worst case can explode causing personal injury and property damage. To avoid an increase of instrumentation and/or accessory surface temperature due to process operating conditions, ensure adequate ventilation, shielding, or insulation of these actuator components installed in a potentially hazardous or explosive atmosphere.

2.3 Temperature Range for (Potential) Explosive Areas

Table 3. Actuator Model Classification According to Maximum Surface Temperature

Temperature			Valid for actuator model
Ambient range	ATEX class	TX (ATEX surface temperature)	
-20 to +75 °C	T6	85 °C / 185 °F	Standard temperature models
-20 to +80 °C	T5	90 °C / 194 °F	
-20 to +80 °C	T1 to T4	90 °C / 194 °F	
-20 to +75 °C	T6	85 °C / 185 °F	High temperature models
-20 to +90 °C	T5	100 °C / 212 °F	
-20 to +120 °C	T1 to T4	130 °C / 266 °F	
-40 to +75 °C	T6	85 °C / 185 °F	Low temperature models
-40 to +80 °C	T5	90 °C / 194 °F	
-40 to +80 °C	T1 to T4	90 °C / 194 °F	
-20 to +250 °C for 2 hours	T2	260 °C / 500 °F	Tunnel application models

NOTE:
The specified values are valid with this condition:
— Maximum working frequency of the actuator is 1 Hz at a maximum of 50 cycles per hour and at maximum load.

Section 3: Operating Media, Pressures and Temperatures

3.1 Operating Media

1. Use clean, dry or lubricated air or inert gas.
2. Maximum pressure: 8 bar / 116 psi.

NOTE:
On applications where the spring stroke of single acting actuators is pneumatically operated, the maximum pressure is 6.5 bar / 95 psi.

3. Dew point 10 K below operating temperature.
4. For subzero applications take appropriate measures.

3.2 Operating Temperature Range

Using standard seals and grease the operating temperature range is -20 to +100 °C / -4 to +212 °F as is indicated on the product label. Other medias and temperatures may be used but consult your local Hytork supplier for confirmation as to suitability.

Section 4: Actuator to Valve Installation

The pinion drive, coupling device and valve stem should be centered and concentric to prevent any side loading to the pinion radial bearing and valve stem seat area. Ensure that the coupling shaft to be operated is a tight but free sliding fit into the female drive in the actuator pinion (19).

4.1 Bi-directional Travel Stops

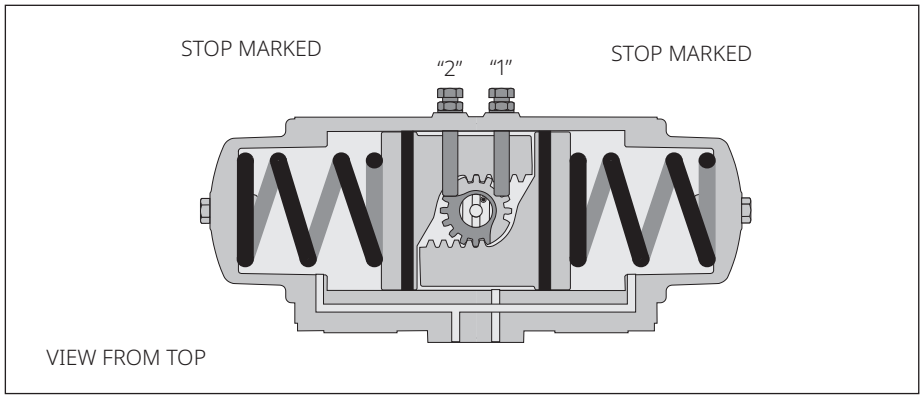
Hytork XL actuators have two travel stops (22, 23 and 24) for setting accurately the travel and the open and closed positions. XL2586 and XL4581 can be fitted with the optional bottom stop block for setting the travel.

The actuator has a factory set stroke of 90°. The adjustable stroke range of the actuator is:

- at closed (0°) position: -3° to +7°
- at open (90°) position: -83° to +93°

NOTE:
If the actuator is assembled for reverse operation, instead of standard operation, Stop "1" will adjust the "open" position and stop "2" the "closed" position (refer to Figure 1).

Figure 1. Travel Stops



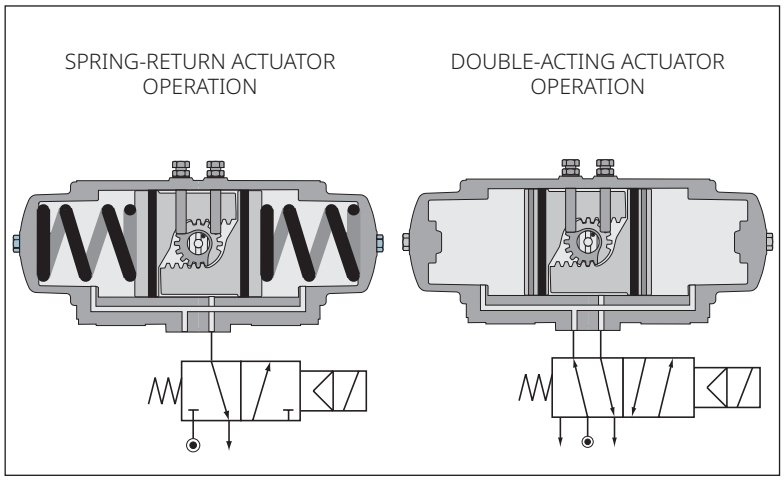
4.2 Travel Stop Adjustment Procedure

1. Operate valve/actuator assembly to the open position.
2. Remove air supply.
3. Slacken locknut (24) on the “closed” stop (Marked “2” in Figure 1).
4. Turn the “closed” stop clockwise to reduce or counterclockwise to increase the travel.
5. Tighten the lock nut.
6. Connect air and check that the position is correct. If not, repeat from step 2.
7. Operate valve/actuator assembly to the “closed” position.
8. Remove air supply.
9. Adjust “open” travel stop (Marked “1” in Figure 1) as from step 3 to 6.

Section 5: Piping Instructions

All actuators can be either piped with solid or flexible tubing with the solenoid valve mounted remotely from the actuator or by mounting a NAMUR designed solenoid valve DIRECTLY onto the NAMUR mounting pad on the side of the actuator (refer to Figure 2).

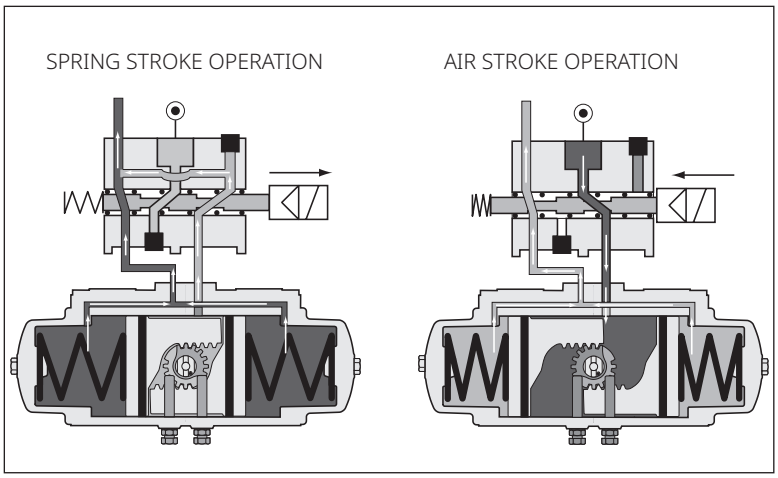
Figure 2. Solenoid Operation



Section 6: Solenoid Valves on Spring-Return Actuators

It is recommended that on spring-return actuators, the Hytork "CATS" solenoid valves are used. These valves are specially designed to prevent contamination of the internals of the actuator by dirt from the atmosphere. This increases the working life of the actuator which reduces down time and maintenance periods (refer to Figure 3).

Figure 3. Hytork "CATS" Solenoid Valve



Section 7: Position Feedback

All position feedback or positioning accessories that comply to the VDI/VDE 3845 (NAMUR) standard, can be mounted easily on top of Hytork XL actuators. To access the pinion top, remove the position indicator.

Section 8: Spares Recommendations

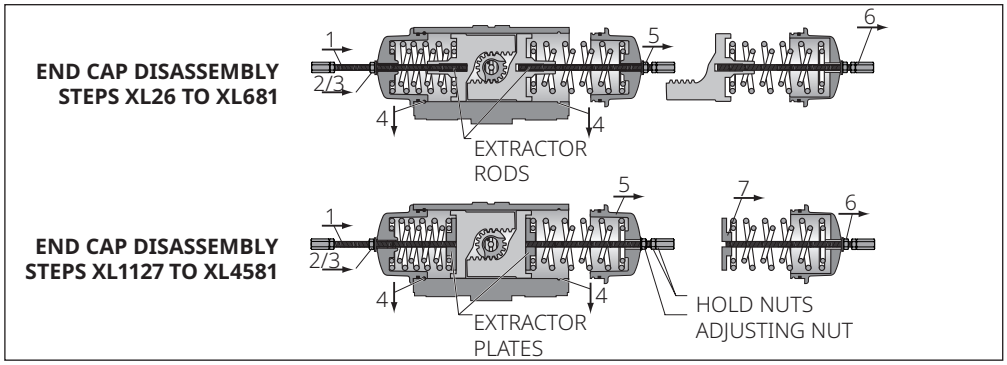
When disassembling and carrying out maintenance work on the XL actuator, a Hytork spares kit must be used to replace all O-rings, DURASTRIP bearings, washers etc. This kit is available from Emerson or its Stocking Distributors.

Section 9: Disassembly Procedure

9.1 End Cap and Springs Disassembly on Spring-Return Actuators

1. Release locking nuts (24) and remove both travel stops (22) and thread seals (23) or O-rings (23a).
2. Remove the indicator (7) from the top of the pinion (19) For XL26 to XL221 use an allen key size 4 mm. For the larger sizes, the indicator can by pulled from the pinion top.
3. Remove both sealing bolts (28) and O-ring (29) from the end caps (21).
4. Place both the Hytork retractor rods through the hole in the end caps and screw the rods into:
   - For XL26 to XL 681 the pistons (20).
   - For XL1127 to XL4581 the retractor plate (20a, refer to Figure 4) until travel is stopped (DO NOT OVERTIGHTEN) and take care the nut and washer being free of the end cap face.
5. Turn back the rod 1/2 turn.
6. Screw the adjusting nut and washer by hand clockwise down the retractor rod until they come up against the face of the end cap.
7. Prevent the “hold-nuts” to rotate by one wrench. Use another wrench, to screw both adjusting nuts half turn at a time (refer to Figure 4) clockwise down the rods until the end cap loosens (Maximum; approximately two complete turns).
   This draws the:
   - For XL26 to XL681 the pistons (20).
   - For XL1127 to XL4581 the retractor plate (refer to Figure 4) to the end caps (21) and compresses the springs. This spring-compression, releases the spring force and unlocks the SAFEKEY for removal.
8. Rotate the caps to ensure that the springs are retracted; if the cap will not turn easily, a gentle tapping with a plastic hammer against the endcap will loosen the end cap.
9. Unscrew the two slotted SAFEKEYS (13/14), and gently pull each SAFEKEY from the body. If the SAFEKEY resists removal, gently tap the end cap with a soft hammer to assist release.
10. When both SAFEKEYS have been removed, use a wrench to rotate the pinion, driving the pistons (20) apart until they partially push the end caps from the body.
    - For XL26 to XL681 the Pistons (20), springs and end cap will come out.
    - For XL1127 to XL4581 the retractor plate (20a), springs and end cap will come out.
11. To keep the spring pack assembly intact (refer to Figure 4), leave the retractor rod in place. To disassemble the spring pack, unscrew the adjusting nut on the retractor rod relieving the spring force, while preventing the rod from turning with a wrench on the hold nuts.

Figure 4. End Cap Disassembly



9.2 Changing Spring Sets on XL26 to XL681

If only the springs set of the actuator has to be changed, perform steps 1 to 9. These steps can be performed at both end caps simultaneously or at one end cap only. After step 9, unscrew the adjusting nut on the retractor rod relieving the spring force while preventing the rod from turning with a wrench on the hold nuts.

9.3 End Cap Disassembly on Double-Acting Actuators

Remove the SAFEKEY as described previously. The retractor rod is not required for double-acting actuators. Remove the end caps by pulling them free from the body keeping them square to the end face of the body (11).

9.4 Piston Disassembly

Rotate the pinion using a wrench to drive the pistons apart and remove from the body by pulling the pistons.

9.5 Pinion Disassembly

Remove the snap ring (Circlip) (6), thrust washer (25) and DURASTRIP thrust bearing (5) from the top of the pinion and CAREFULLY push the pinion from the body through the bottom. Take care that the pinion does not damage the pinion bores on removal.
If necessary, remove any burrs, etc. from the top of the pinion before removal.

Carefully remove pinion top bearing (9) from the body.

9.6 Inspection

Clean and examine all parts for damage and wear. Emerson recommends O-rings, DURASTRIP bearings, SAFEKEYS, washers, etc. are replaced using a Hytork XL spares kit.

Section 10: Assembly Instructions

10.1 Grease Instructions

NOTE:
Check the product coding on the actuator's product labels to define which type of grease to use.

Table 4. Recommended Grease

Standard Temperature -20 to +80 °C / -4 to +176 °F or High Temperature -10 to +120 °C / +14 to +250 °F	
Current Grease	**Formerly Called**
Castrol High Temperature	Castrol LMX
Rocol Sapphire Premier	Sapphire HI-TEMP 2
Castrol Spheerol EPL 2	BP Energrease LS-EP2
Total Ceran XM 220	Total Ceran WR2
Low Temperature: -40 to +80 °C / -40 to +176 °F	
Castrol Optitemp LG2	
SKF – LGLT 2	
FUCHS – Renolit Unitemp 2	

Table 5. Grease Instructions

Part	Section of Part	Amount of Grease
O-rings		
A	Completely	Light film
Housing Parts		
B	Piston bore	Light film
C	Top pinion bore	Light film
D	Bottom pinion bore	Light film
Piston Parts		
E	O-ring and bearing groove	Light film
F	Rack teeth	Half the teeth depth full with grease
G	Piston bearing	Light film on outside
H	Piston rack bearing strip	Light film
J	Pinion bottom and O-ring groove	Light film
K	Pinion top and O-ring groove	Light film
L	Gear teeth	Half the teeth depth
M	Pinion top bearing	Light film (inside and out)
N	Pinion bottom bearing	Light film (inside and out)

10.2 Pinion Assembly

1. Lightly grease all O-rings, O-ring grooves, bearing grooves and pinion.
2. Assemble the top pinion bearing (9) to the pinion, ensuring that the recess openings are facing away from the gear form, then assemble items (8), (17) and (18).
3. Lightly grease the pinion bores in the body (11) and insert the pinion being careful not to damage the O-rings.

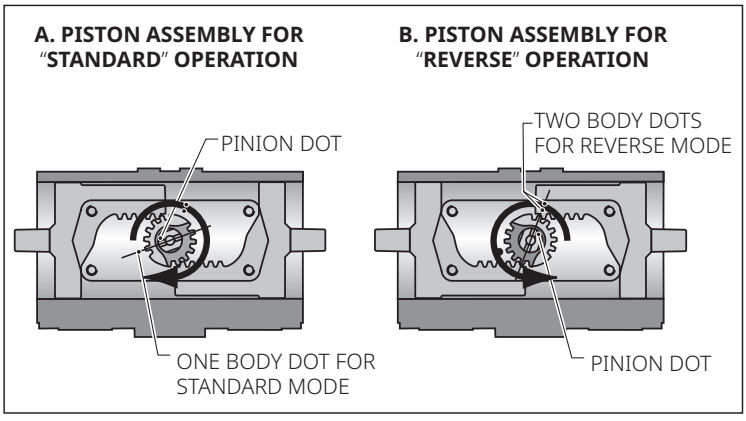
NOTE:
The snap ring (Circlip) (6) has one side with bevelled edges which must go DOWN onto the thrust washer (25); the square edge side must face UPWARDS.

4. When the pinion is in place, install the DURASTRIP thrust bearing (5), thrust washer (25) and the snap ring (Circlip) (6) into the narrow groove at the top of the pinion (ensuring the snap ring fits properly into the groove).
5. Only open the snap ring (Circlip) (6) enough to just clear the pinion diameter as opening too far will damage the snap ring. If damage occurs replace with a new part.

10.3 Alignment of Pinion for Correct Piston Assembly

Standard rotation is clockwise with the pistons moving towards each other (when viewed from above the slot at the top of the pinion, refer to Figure 5).

Figure 5. Pinion Alignment



10.4 Piston Assembly

10.4.1 Clockwise Rotation

(Pistons moving inwards, refer to Figure 5 [A]).

1. Align the pinion by lining up the center of the NAMUR slot in the top of the pinion with the single dot on the body. The top of the pinion is marked with a single identification dot to indicate the correct orientation of the stop faces.
2. Lightly grease all piston grooves, gear form and piston O-rings (4) and fit the O-ring (4) and wear ring (3) to the piston.
3. Fit the bearing block (10) to the back of the piston.
4. Grease the actuator body bore.
5. Insert the pistons into the bore, ensuring the piston racks line up with the pinion gear (the part number in the front face of the piston must be lined up parallel to the pinion).
6. Push both pistons together until they are both in contact with the pinion, so that when the pinion is rotated clockwise the pistons are drawn together. When the pistons are together and the racks are correctly engaged with the pinion, the top pinion drive flats should be at right angles to the axis of the body.

10.4.2 Counterclockwise Rotation

(Pistons moving inwards, refer to Figure 5 [B]).

Align the NAMUR slot in the top of the pinion with the two dots on the body and assemble the pistons so that the pinion rotates counterclockwise as the pistons are drawn together.

10.5 Travel Stop Assembly

(Refer to Figure 1)

1. With the pistons together, screw in the CLOSING (cast identity number 2) travel stop (22), complete with locking nut (24) and thread seal (23), until it comes into contact with the pinion stop face.
2. Rotate the pinion through 90ø only, driving the pistons apart and screw in the OPENING (cast identity number 1) travel stop (22), complete with locking nut and thread seal, until it comes into contact with the pinion stop face. For individual position requirements, see Section 4.

10.6 End Cap Assembly on Double-Acting Actuators

1. Install the SAFEKEY O-ring seals (12) to the SAFEKEY heads (13).
2. Lightly grease the end cap O-rings (2), the end cap grooves and the ends of the body bore.
3. Taking one of the end caps install its O-ring and insert it into the Body.
4. Holding the SAFEKEY close to the entry hole (cast identity letter C or D) to prevent kinking, insert the SAFEKEY into the hole and gently push into place.
5. With the SAFEKEY head in contact with the body, tighten with a screw driver to gently compress the O-ring and create a pressure seal.
6. Repeat the operation for the other end cap.
7. With the pistons together, mount the position indicator (7) to the top of the pinion.

10.7 Spring-Return Actuators

10.7.1 Spring Set Adjustments

The actual selection of the correct spring set can be done by either referring to the torque charts given in the literature on Spring-Return actuators or by consulting your local Hytork representative. After selecting the appropriate spring set, arrange the springs as indicated below (refer to Table 6).

Table 6. Spring Rating Chart

Spring Set	Side of Actuator	Outer	Inner
S40	Left	S20	-
	Right	S20	-
S50	Left	S30	-
	Right	S20	-
S60	Left	S30	-
	Right	S30	-
S70	Left	S20	S20
	Right	S30	-
S80	Left	S20	S20
	Right	S20	S20
S90	Left	S30	S20
	Right	S20	S20
S1C	Left	S30	S20
	Right	S30	S20

Spring color coding:

- S20 Inner = Green
- S20 Outer = Pink
- S30 Outer = Brown

10.7.2 Installing the Spring and End Cap

1. For XL1127 to XL4581 place the retractor plate on top of the piston.
2. Insert the springs (26/27) into the face of the piston and then the end cap onto the springs.
3. Pass the correct Hytork retractor rod through the end cap (refer to Figure 4) and screw it into:
   - For XL26 to XL681 the pistons (20)
   - For XL1127 to XL4581 the retractor plate
4. Line up the end cap so that the safety symbol is correctly positioned for easy reading.
5. Prevent the “hold-nuts” to rotate by one wrench. Use another wrench, to screw the adjusting nut on the Hytork retractor rod in until the end cap is completely engaged in the body.
6. It will be necessary to push the end cap into the body to overcome the O-ring compression.
7. When the end caps are in place and the SAFEKEYS fitted correctly, remove the Hytork retractor rods and replace the sealing bolts (28) and seals (29).

Figure 6. SAFEKEY Dimensions

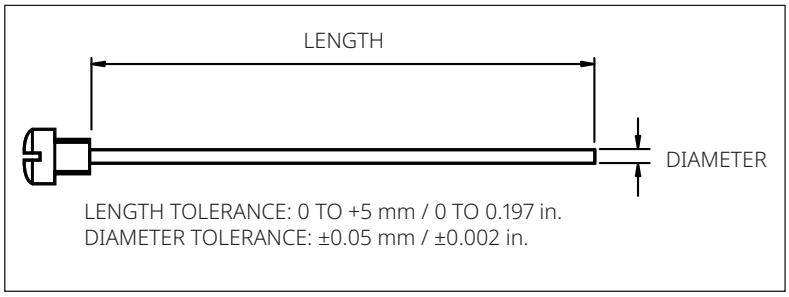


Table 7. SAFEKEY Dimensions

Model	mm		in.	
	Length	Diameter	Length	Diameter
XL26	157	3.175	6.18	0.125
XL71	217	3.175	8.54	0.125
XL131	267	3.175	10.51	0.125
XL186	282	3.175	11.1	0.125
XL221	317	3.175	12.48	0.125
XL281	367	3.175	14.45	0.125
XL426	377	3.175	14.84	0.125
XL681	437	3.175	17.2	0.125
XL1127	517	3.175	20.35	0.125
XL1372	572	3.175	22.52	0.125
XL2856	707	3.175	27.83	0.125
XL4581	937	4.978	36.89	0.196

Figure 7. Retractor Rod Dimensions

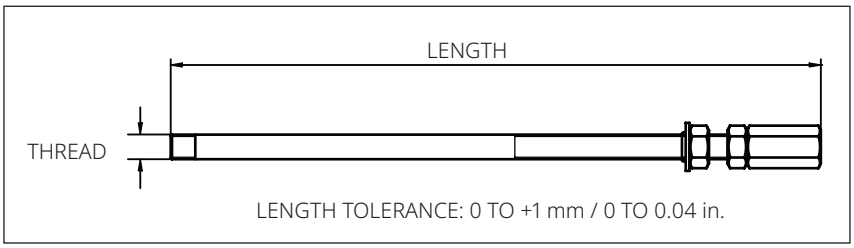


Table 8. Retractor Rod Dimensions

Model	Thread	Length	
		mm	in.
XL26	1/4-20 UNC	215	8.46
XL71	1/4-20 UNC	215	8.46
XL131	1/4-20 UNC	215	8.46
XL186	1/4-20 UNC	215	8.46
XL221	5/16-18 UNC	225	8.86
XL281	M10	210	8.27
XL426	M8	278	10.94
XL681	M12	363	14.29
XL1127	M12	416	16.38
XL1372	M12	416	16.38
XL2856	M20	500	19.69
XL4581	M20	600	23.62

Section 11: Bottom Mounted Stop Block

11.1 The Hytork Solution

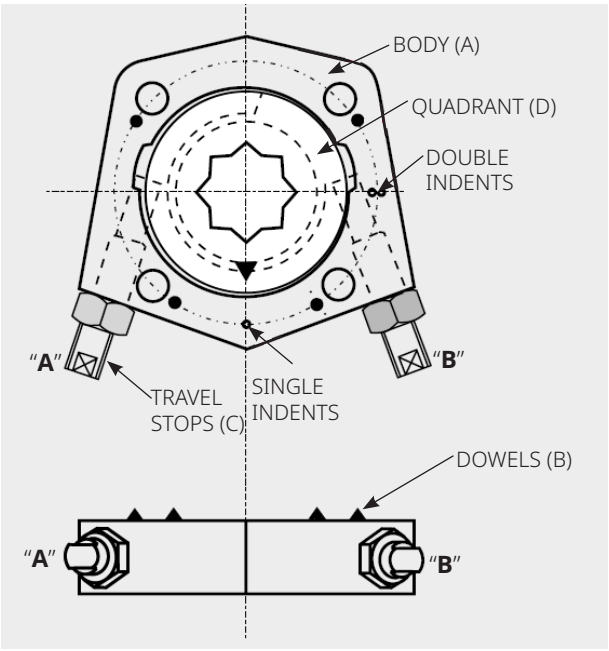
On the larger sizes of actuators, the adjustment is obtained by the addition of a simple stop block that fits under the actuator. The actuator is manufactured with overtravel to give -3° to +93° of movement and the bottom mounted stop block provides the required adjustment of 10° at each end of the travel.

11.2 Basic Stop Block Assembly

1. Place the stop block body (refer to Figure 8, [A]) onto a flat clean surface with the shallow recess on the underside with the two tapped holes facing towards you.
2. Place a small drop of loctite 222 on each of the four (4) dowel pins (refer to Figure 8, [B]) and push them, with the points facing upwards, into the location holes next to the four through holes that are used for fixing the block to the actuator. The dowel pins must be pushed until they bottom in the location holes which will leave the points projecting above the face of the block.
3. Assemble the lock nuts onto the stop bolts (refer to Figure 8, [C]), before screwing them into the block. Screw the stop bolts into the two tapped holes in the block (the plain turned ends of the stops go into the tapped holes) until the ends are just visible in the center recess. If they protrude, they will not allow the stop quadrant (refer to Figure 8, [D]) to be fitted.
4. Lightly grease the face of the recess in the block with LS2 grease or any lithium-based grease. Fit the stop quadrant to the adaptor with the arrowhead that is cast into the quadrant pointing towards the single indent drilled into the block face. This single indent is on the center line of the block between the stops and should be nearest to you (refer to Figure 8).
5. Screw in the right hand stop bolt “B” (refer to Figure 8) until it starts to move the quadrant; then back off one complete turn and lightly tighten the lock nut.
6. Rotate the quadrant until the arrowhead points towards the double indent. Screw in the left hand stop bolt “A” (refer to Figure 8) until it starts to move the quadrant then back off one complete turn and lightly tighten the lock nut.

The basic assembly of the stop block is now complete and ready for fitting to the actuator/valve package.

Figure 8. Bottom Mounted Stop Block Assembly



11.3 General Notes When Fitting to Valves

There are three configurations that may be encountered when fitting actuators, with travel stops, to valves and they require two methods of assembly. Double-acting and fail-safe clockwise actuators use the same method while the fail-safe counterclockwise actuators use a different method. The direction of travel is when viewing the pinion shaft from above the actuator at the slotted end of the pinion drive shaft.

11.3.1 Double-Acting

Double-acting actuators use pressurized air to drive the pinion shaft in alternate directions to open and close the valve.

11.3.2 Standard Configuration Fail-Safe Clockwise

Air power between the pistons rotates the pinion in a counterclockwise direction. When the air pressure is removed the springs drive the actuator pinion clockwise. This is normally to close the valve but can also be used to open the valve on air failure if required.

11.3.3 Reverse Action Fail-Safe Counterclockwise

Air power between the pistons rotates the pinion in a clockwise direction. When the air pressure is removed the springs drive the actuator pinion counterclockwise.

11.4 Actuator Conventions for the Normal Position

11.4.1 Double-Acting

For convention purposes, the AT REST or NORMAL (CLOSED) position is when the pistons are together. This is when the air power is supplied to the bottom port "4" next to the solenoid mounting pad.

11.4.2 Spring-Return

On spring-return actuators, the NORMAL (CLOSED) condition is when no air pressure is present and the pistons are together under the force of the springs.

11.5 Assembly to Valves for Standard Rotation Configuration

11.5.1 Double-Acting and Fail-Safe Clockwise

1. Make sure the valve is set in the CLOSED position if it is to Fail CLOSED and in the OPEN position if it is to Fail OPEN.
2. Assemble the mounting bracket to the valve with the open part of the bracket in line with the direction of flow through the valve.
3. Assemble the long shaft adaptor to the valve stem.
4. Take the stop block assembly making sure the arrow cast into the quadrant is facing toward the single indent on the top of the stop block assembly.
5. With the quadrant held in this position, the pointed dowels (refer to Figure 8) facing upwards and the stop bolts facing towards the closed side of the mounting bracket, place the stop block assembly over the square drive shaft of the long shaft adaptor onto the top face of the mounting bracket. The shallow recess is now on the underside next to the bracket.

NOTE:

The dowel pins assembled with pointed end facing towards actuator bottom, gives additional grip between actuator and stop block when securely fastened by the mounting studs.

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6. Lower the actuator onto the adaptor, checking that the actuator is in the NORMAL position (pistons together) with the solenoid mounting face towards you and screw the four (4) fixing studs through the mounting bracket, through the stop block into the actuator base (refer to Figure 9).
7. Ensure that the studs are screwed into the actuator until they bottom in the hole.
8. Fit washers and nuts onto the studs.
9. Using a torque wrench, tighten the studs to a torque of 175 Nm / 130 lbf-ft.
10. Adjust the stop bolts to the desired position.

11.5.2 Stop Adjustment (Fail Closed)

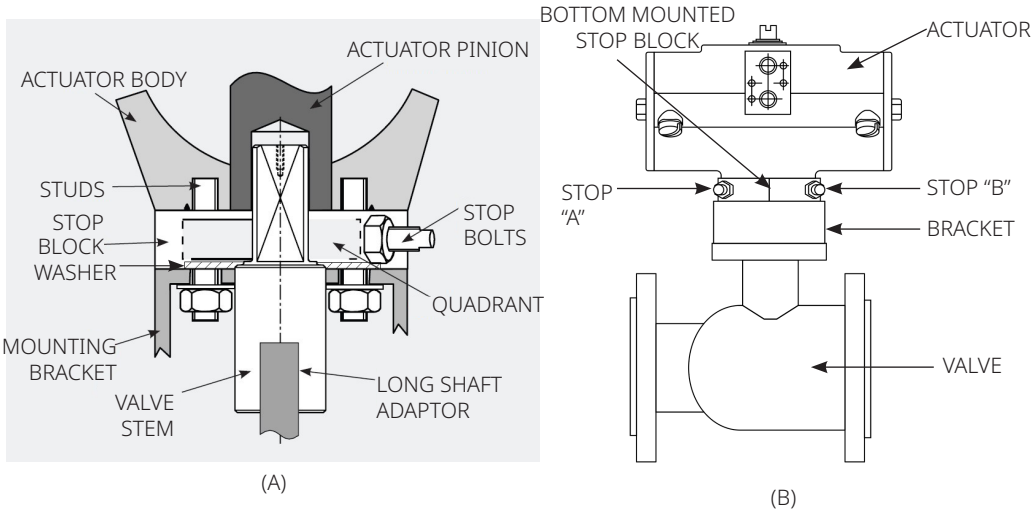
11.5.2.1 Adjustment for the Closed Position

The LEFT hand stop "A" adjusts the CLOSED position. Screw the stop in until it meets the stop face on the quadrant. The actuator and valve can now be set to the desired position by adjusting the stop bolt. When the correct position is reached, tighten up the lock nut against the block face to stop the stop bolt from working loose. The amount of adjustment is -30° to +70°.

11.5.2.2 Adjustment for the Open Position

Open the valve. The RIGHT hand stop "B" (refer to Figure 9) adjusts the OPEN position. Screw the stop in until it meets the stop face on the quadrant. The actuator and valve can now be set to the desired position by adjusting the stop bolt. When the correct position is reached, tighten up the lock nut against the block face to stop the stop bolt from working loose. The amount of adjustment is -30° to +70°.

Figure 9. Stop Block Mounting Arrangement



11.6 Assembly to Valves for Reverse Action Configuration

Double-Acting and Fail-Safe Counterclockwise (usually to Fail Open the Valve):

1. Make sure the valve is in the OPEN position if it is to Fail OPEN and in the CLOSED position if it is to Fail CLOSED.
2. Assemble the mounting bracket to the valve with the open part of the bracket in line with the direction of flow through the valve.
3. Assemble the long shaft adaptor to the valve stem.
4. Take the stop block assembly making sure the arrow cast into the quadrant is facing toward the single indent on the top of the stop block assembly.
5. With the quadrant held in this position, the pointed dowels (refer to Figure 8) facing upwards and the stop bolts facing towards the closed side of the mounting bracket, place the stop block assembly over the square drive shaft of the long shaft adaptor onto the top face of the mounting bracket. The shallow recess is now on the underside next to the bracket.

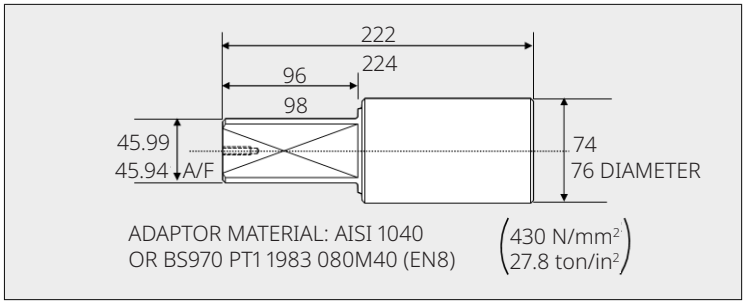
NOTE:
The dowel pins assembled with pointed end facing towards actuator bottom, gives additional grip between actuator and stop block when securely fastened by the mounting studs.

6. Lower the actuator onto the adaptor, checking that the actuator is in the NORMAL position (pistons together) with the solenoid mounting face towards you and screw the four (4) fixing studs through the mounting bracket, through the stop block into the actuator base (refer to Figure 9).
7. Ensure that the studs are screwed into the actuator until they bottom in the hole.
8. Fit washers and nuts onto the studs.
9. Using a torque wrench, tighten the studs to a torque of 175 Nm / 130 lbf-ft.
10. Adjust the Stop Bolts to the desired position.

11.7 Long Shaft Adaptor Dimensions and Materials

It is very important that the drive adaptor is manufactured from the correct strength material and Hytork can provide blank adaptors to the dimensions indicated that only have to be machined for the valve end (refer to Figure 10).

Figure 11. Long Shaft Adaptor Dimensions And Material



11.8 Adjustment of the Bottom Mounted Stop Block

Actuators are in the NORMAL or CLOSED position when the pistons are together. This is under spring load on a fail-safe model or with air pressuring the port “4” (refer to Figure 11) on the actuator body.

Figure 10. NAMUR Solenoid Mounting Details

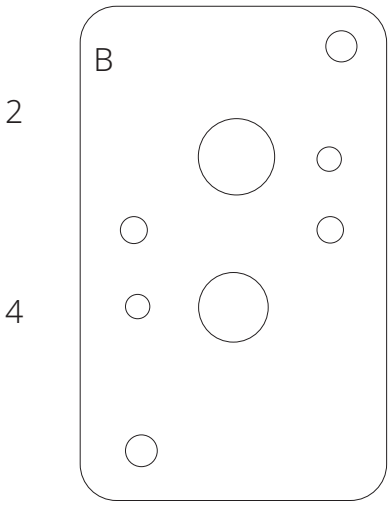


Figure 12. Stop Block Travel Adjustments

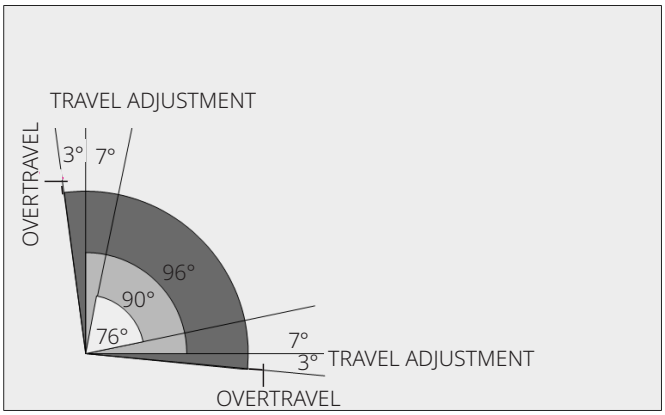


Table 9. Stop Block Travel Adjustment Settings

Actuator Type	Close Bolt	Open Bolt
Double-Acting	B	A
Fail-Safe Clockwise Springs to Close	B	A
Fail-Safe Clockwise Springs to Open	A	B
Fail-Safe Counterclockwise Springs to Close	A	B
Fail-Safe Counterclockwise Springs to Open	B	A

Section 12: Testing the Hytork Actuator

Using compressed air at 5.5 to 7 bar / 80 to 100 psi, check the seal areas with soapy water, ensuring there are no leaks and that the pinion rotates smoothly over its full travel.

Section 13: Retractor Rods

13.1 Spring Removal System Board

Hytork's "SPRING REMOVAL SYSTEM BOARD" contains a full set of retractor rods so that any size of actuator can be disassembled on site.

Standard spare parts kits for XL26 to XL221 contain the required retractor rods. For XL281 to XL4581, separate retractor rod kits are available. These rods are not included in the spare parts kits but are separately available.

Ask your local Hytork representative or Stocking Distributor of Hytork products for details.

⚠ WARNING

- The Hytork retractor rod tools are specially designed for the safe removal of the spring-return end cap modules. Only Hytork manufactured or approved rods are to be used for spring end cap removal.
- As with any threaded tool that is used frequently, retractor rods should be checked to ensure that the threads are not worn or damaged in any way and greased regularly. Any damaged or worn rods must not be used and must be destroyed.
- Retractor rods must be made to the design specification for safety reasons. Emerson cannot take any responsibility for any other design.

Section 14: Service

It is the policy of Emerson to give the best possible service to our customers. We are happy to assist you in any way we can and if you have any questions about Hytork actuators or other Hytork products, please do not hesitate to contact any Emerson Actuation Technologies Center or your local Hytork Stocking Distributor.

Section 15: Parts and Materials

Figure 13. Hytork XL Actuator Parts

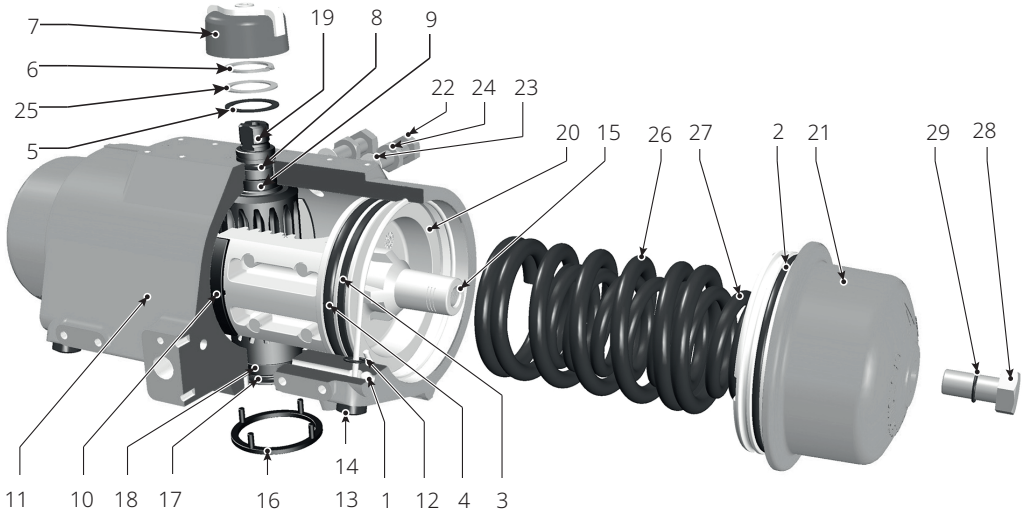


Table 10. Parts and Materials

Pos.	Description	Material	Qty	Note
1	Ball Bearing	Chromium steel	2	-
2	O-ring (End Cap)	* Nitrile	2	-
3	Wear Ring (Piston)	* Acetal M90	2	-
4	O-ring (Piston)	* Nitrile	2	-
5	Thrust Bearing (Circlip)	* Acetal M90	1	-
6	Circlip	* Spring steel	1	-
7	Indicator	Nylon	1	-
7a	Indicator screw	Stainless steel	1	3
8	O-ring (Pinion top)	* Nitrile	1	-
9	Bearing (Pinion top)	* Acetal M90	1	-
10	Bearing block (Piston)	* Acetal M90	2	-
11	Body	Aluminum alloy	1	-
12	O-ring (SAFEKEY)	* Nitrile	2	-
13	SAFEKEY Head	* Grivory	2	-
14	SAFEKEY Wire	* Stainless steel	2	-
15	Thread Insert	Steel	2	-
16	Location Ring	Acetal	1	-
17	O-ring (Pinion bottom)	* Nitrile	1	-
18	Bearing (Pinion bottom)	* Acetal M90	1	-
19	Pinion	Steel	1	-
20	Piston	Aluminum alloy	2	-
20a	Retractor plate	Aluminum alloy	2	1
21	End Cap (DA and SR)	Aluminum alloy	2	2
21a	End Cap DA	Aluminum alloy	2	1
22	Travel Stop	Stainless steel	2	5
23	Thread Seal	* Steel/Rubber	2	3/6
23a	O-ring (Travel Stop)	* Nitrile	2	4
23b	Washer (Travel Stop)	* Stainless steel	2	4
24	Locking Nut	Stainless steel	2	5
25	Thrust Washer (Circlip)	* Stainless steel	1	-
26	Spring Outer	Spring steel	2	-
27	Spring Inner	Spring steel	2	-
28	Sealing Bolt (End Cap)	Steel	2	-
29	O-ring (Sealing Bolt)	* Nitrile	2	-

NOTES:

1. on XL1127 to 4851
2. on XL26 to XL 681
3. on XL26 to XL 221
4. on XL281 to XL 1372
5. on XL26 to XL 1372
6. on XL26/71 equipped with extra nylon washer
7. Items marked with an asterisks (*) are included in the service kits.

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