



# USER INSTRUCTIONS

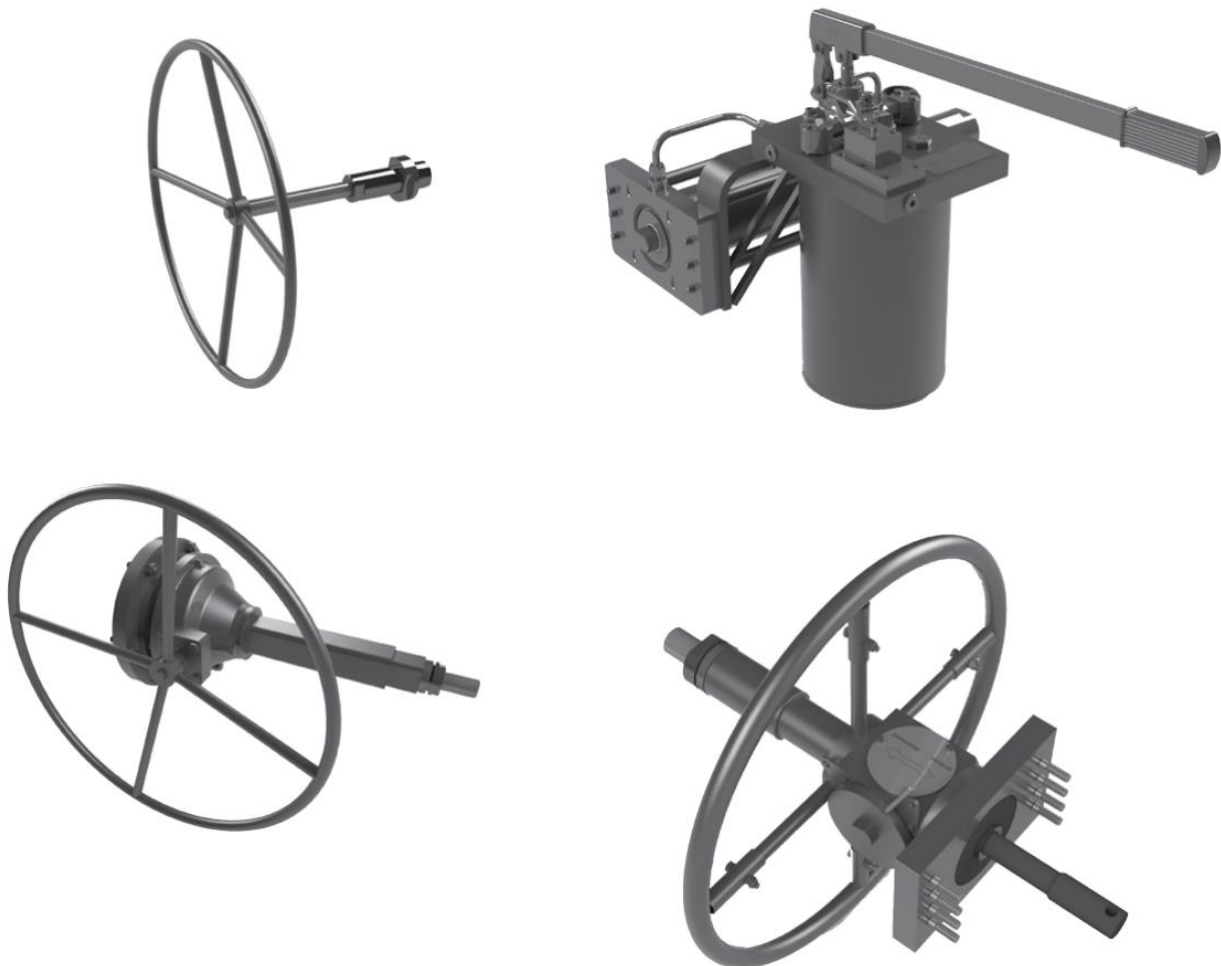
*Mechanical and Hydraulic Manual Overrides*

*Installation*

*Operation*

*Maintenance*

FCD LFENIM0004-01-A4-04/21





Limitorque Fluid Power Systems

# USER INSTRUCTIONS

## Mechanical and Hydraulic Manual Overrides

Doc. Number: FCD LFENIM0004-01-A4-04/21

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# 1 STANDARD INFORMATION

## 1.1. USING FLOWSERVE VALVES, ACTUATORS AND ACCESSORIES CORRECTLY

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



**NOTE:** The following instructions are related to manual overrides installed on actuators produced by Flowserve Limatorque Fluid Power Systems, and they are intended to be used together with the Installation, Operation, Maintenance instructions applicable to each specific actuators series.

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. This manual shall be used in conjunction with any other instruction, document, checklist with the actuator the accessories are installed onto, also related to single equipment or parts of actuator itself.

## 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. GENERAL USAGE**

For mechanical and hydraulic manual overrides that are installed on actuator, it is the end user’s responsibility to guarantee that the ambient temperature is in accordance with actuator nameplate indications.



**WARNING:** Do not exceed the minimum and maximum allowable temperatures indicated on the actuator nameplate. Additional factors like the valve and pipe temperatures, sun direct exposure and other environmental conditions shall be considered, not to exceed the temperature range.

**Hydraulic OIL required for Hydraulic Cylinder**

***For Temperature Conditions***

***-20 °C to +100 °C***

Supply Oil Characteristics*	
Flashpoint COC [°C]	192
Density at 15 °C [kg/l]	0,857
Viscosity at 40 °C [mm <sup>2</sup> /s]	22
*Suggested Oil = AGIP ARNICA 22 or equivalent	

***For Low Temperature Conditions***

***-60 °C to +100 °C***

Supply Oil Characteristics*	
Flashpoint Pensky Martin Closed Cup [°C]	104
Relative Density at 15,6 °C	0,87
Viscosity at 40 °C [mm <sup>2</sup> /s]	14,1
Viscosity at -54 °C [mm <sup>2</sup> /s]	1450
Pourpoint [°C]	< -60
*Suggested Oil = SHELL AEROSHELL FLUID 41 or equivalent	



**WARNING:** It is recommended to use, for hydraulic manual overrides, the type of oil listed in the present IOM (tables on the left)

Periodically check that the oil is in good condition and clean. The cleanliness level is minimum NAS 1638 Class 8 – ISO 4406 19/17/14.

The oil level inside the oil tank must be between 1/4 and 3/4 of total tank capacity during all the actuator stroking positions (oil level may change according to actuator stroking position on some actuators models).




**WARNING:** oil levels lower or higher than the one indicated above, can bring to system malfunction and damages.

Use recommended oil for very small additions (typically not required), in case you need to do the complete filling of the hydraulic manual override please ask to your Flowserve representative to give you the dedicated Operative Instruction.



**NOTE:** for the recommended lubricants and other Maintenance instructions follow par.4 of the present IOM.

For different conditions, contact your local Flowserve representative.

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### 1.4. PROTECTIVE CLOTHING

Flowserve products are often used in dangerous applications (e.g., extremely high pressures, dangerous, flammable, combustible, 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 equipment (protective clothing, gloves, glasses, etc.).

### 1.5. QUALIFIED PERSONNEL

Only qualified personnel should perform installation, operation or maintenance activities. Qualified personnel are people who, on account of their training, experience, 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.

### 1.6. SPARE PARTS

Use only Flowserve brand 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 in storage for long periods, check them for corrosion or deterioration before usage.

### 1.7. SERVICE/REPAIR


To avoid 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 as outlined in this instruction manual could drastically affect performance and be hazardous to personnel and equipment, and may void existing warranties.

In addition to 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).

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## **1.8. STORAGE**

In many cases Flowserve products are manufactured from stainless steel. Products not manufactured from stainless steel are typically provided with surface treatments or 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 and its accessories are installed on the plant, it is necessary to follow a few rules during the storage period:

- 1.8.1.** Flowserve products must be stored adequately in a clean, dry environment.
- 1.8.2.** 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.
- 1.8.3.** If the storage is outdoors, or if long-term storage is necessary, (more than four months), the plastic protection plugs must be replaced with metal plugs, because the plastic plugs are not weatherproof, whereas the metal ones guarantee weatherproof protection.
- 1.8.4.** The actuator with its mechanical or hydraulic manual override, must be placed on a wooden pallet, in order to not damage the coupling base and to prevent other surfaces from resting on the ground.

In case of long-term storage (more than four months), additionally it is important to periodically operate the actuator and its accessories.

## **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. 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**

- 1.10.1.** Each delivery includes a packing slip. When unpacking, check all delivered actuators and accessories using this packing slip.
- 1.10.2.** Report transportation damage to the carrier immediately.

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**1.10.3.** In case of discrepancies, contact your nearest Flowserve location.

**1.10.4.** If necessary, retouch minor damage to the paint coating which may have occurred during transport or storage.



**WARNING:** Ensure that the addendum “ATEX/PED/Machinery Directive Safety Manual - LPS-LDG-LGO-LHS-LHH Actuators” (doc. LFENEU000A) accompanies this manual, when the actuator is under one (or more) of the following European Directives:

- 2006/42/EC - Machinery Directive
- 2014/34/EU - ATEX Directive
- 2014/68/EU - PED Directive

If this addendum is not available to you, please contact Flowserve.



**NOTE:** When the actuator on which the manual override is installed has SIL requirements according to IEC 61508, ensure that the “Functional Safety Manual” of Your actuator series accompanies this manual and is referred to for equipment usage.

# 2 MECHANICAL MANUAL OVERRIDES

Mechanical Manual Overrides on LFPS heavy duty and compact actuators provide an economical and durable method for manually operating the actuators. LFPS Mechanical Overrides are designed in accordance with EN 12570 Standard. The manual force to operate the actuator shall not exceed the values stated in EN 12570, when measured at the outermost point of the handwheel.

LFPS Mechanical Manual Overrides are available in the following versions:

- Enclosed Jackscrew (-JS)
- Not Enclosed Jackscrew (-JL)
- Bevel gear (-BG)

They are designed and standardized depending on the Actuators series, however special versions are available upon request.



**CAUTION:** prior to operating an actuator by means of manual overrides, be sure to remove the pressure inside the cylinder and that the cylinder has been vented to atmosphere through the venting ports. Ensure that all vent valves are in vent position. The number of vent valves varies by actuator and control schematic types.

## 2.1. Enclosed Jackscrew Manual Override (-JS)

The Enclosed Jackscrew is a direct operating handwheel, which means that a rotating screw can be fitted either on the cylinder side (single-acting actuators LPS series and LPC series) or on the scotch-yoke housing (double-acting actuators LPS series). The rotation of the hand-wheel in clockwise (CW) or counterclockwise (CCW) directions will cause the consequent rotation of the scotch-yoke mechanism and the stem of the valve which the actuator is fitted on.

The Enclosed Jackscrew has a totally enclosed and protected design, with no externally exposed threads or moving parts, which makes this manual override suitable for severe and saline environmental conditions.

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Figure 1 – Enclosed Jackscrew Manual Override for Double-Acting Actuators (left) and Single-Acting Actuators (right)

The Enclosed Jackscrew option is available for the LPC single-acting, LPS-15 and LPS-20 single-acting and double-acting versions.

### 2.1.1. Installation - Travel-Stop Bolts Adjustment Enclosed Jackscrew Override Installed on Single and Double Acting Actuators.

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, according to Flowserve valve manufacturer recommendations.

The Enclosed Jackscrew manual override (-JS) has a travel-stop adjustment in one direction: valve open direction (in double-acting LPS, single acting fail-open LPS/ LPC) or valve close direction (in single-acting fail close LPS/LPC). The travel stop adjustment in the opposite direction must be performed in accordance with the IOM of the actuator.

The +/- 5 degrees 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:

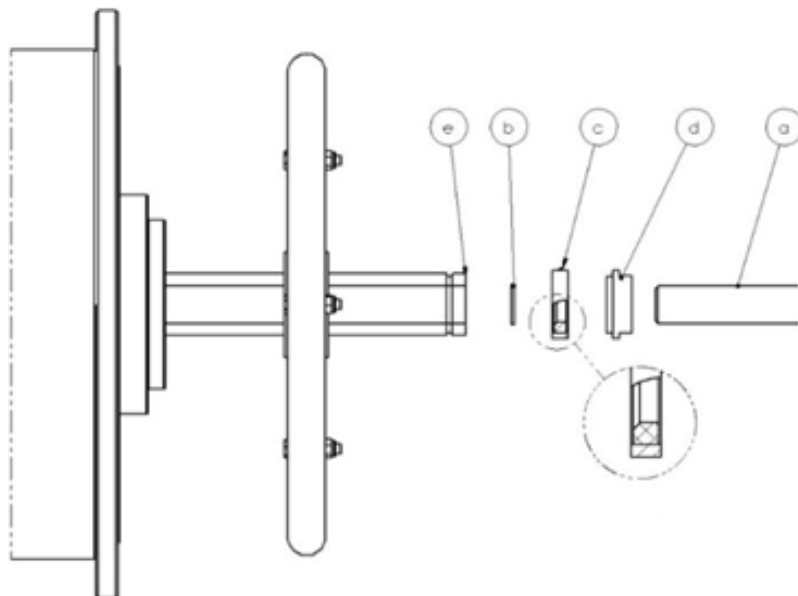
If necessary in order to facilitate unscrewing of the stopper bolt and only for spring return actuator, feed the pneumatic cylinder from the air connection port placed on the tail flange (the flange where the manual override is installed) at minimum necessary pressure (starting from 0 barg and increasing the pressure slowly up to max 2 barg in order to facilitate unscrewing);



**DANGER:** Always make a check in order to have a safety engagement of the stopper bolt in the female thread during this operation. In case of need to fully remove the travel stop, it is mandatory do not have pressure inside the cylinder in order to avoid any possible risk for the operators.



**NOTE:** the following procedure can be applied even for the adjustment of the stop bolt installed on the manual override for LPS double acting actuators.



2.1.1.1 Using appropriate wrench, hold still the stopper bolt (a) and using a second screw, unscrew the stopper nut (d).

2.1.1.2 Fully remove the stopper nut (d).

2.1.1.3 Fully remove the gasket ring (c), (if present in your version) and the o-ring (b).

2.1.1.4 Manually screw or unscrew the stopper bolt in the female thread (e), using appropriate wrench, until desired position has been reached. Do not use automatic devices (e.g. electric/air screwier, etc...).

2.1.1.5 Manually slip the new o-ring (b) in front of its seat (e), taking attention to not make cuts in it because of stopper sharp threads.



**NOTE:** Do not use stopper nut (d) or gasket ring (c) to drag the o-ring (b) on its seat;

2.1.1.6 Screw the gasket ring (c) (if present in your version) against the flange of manual override (e);



**NOTE:** If the flange (e) presents a chamfer mount the gasket ring (c) with the flat side in contact with the flange (e); otherwise mount the gasket ring (c) with the chamfer in contact with the flange (e);

2.1.1.7 Screw the stopper nut (d);

2.1.1.8 Using appropriate wrench, hold still the stopper bolt (a) and using a second screw, tighten the stopper nut (d).



**NOTE:** Always replace the O-Ring (b) during travel stop adjustment.

2.1.1.9 Pneumatically stroke the actuator several times to assure proper operation. The stem adaptor should not bind during operation. If the actuator is equipped with limit switches, positioners or other accessories, adjust them at this time.

## 2.1.2. Operation – Enclosed Jackscrew Override Installed on Single-Acting Actuator



*Figure 2 – LPS Single-Acting with Enclosed Jackscrew Override*

### 2.1.2.1 Manual Operation




**CAUTION:** prior to operating an actuator by means of manual overrides, be sure to remove the pressure inside the cylinder and that the cylinder has been vented to atmosphere through the venting ports. Ensure that all vent valves are in vent position. The number of vent valves varies by actuator and control schematic types.

To manually operate the override:

2.1.2.1.1 Remove the supply pressure inside the actuator's cylinder, vent the cylinder ports.

2.1.2.1.2 For LPS series:

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- a. Operate the handwheel clockwise (CW) to close the valve (both on a fail close actuator, and on a fail open actuator).
- b. Operate the handwheel counterclockwise (CCW) to open the valve (both on a fail close actuator, and on a fail open actuator).

2.1.2.1.3 For LPC series:

- a. Operate the handwheel clockwise (CW) to close the valve (LPC actuator fail close) or to open the valve (LPC actuator fail open).
- b. Operate the handwheel counterclockwise (CCW) to open the valve (LPC actuator fail close) or to close the valve (LPC actuator fail open).

NOTE: The spring constantly loads the screw, and it returns the actuator to fail safe position when the jackscrew is retracted (for LPS series: rotating clockwise (CW) on a fail close actuator and rotating counterclockwise (CCW) on a fail open actuator; for LPC series: rotating clockwise (CW)).

**2.1.2.2 Restoring Automatic Operation**

To restore the automatic operation:

2.1.2.2.1 Operate the handwheel in order to completely retract the jackscrew and lock the position with the safety lock (1).

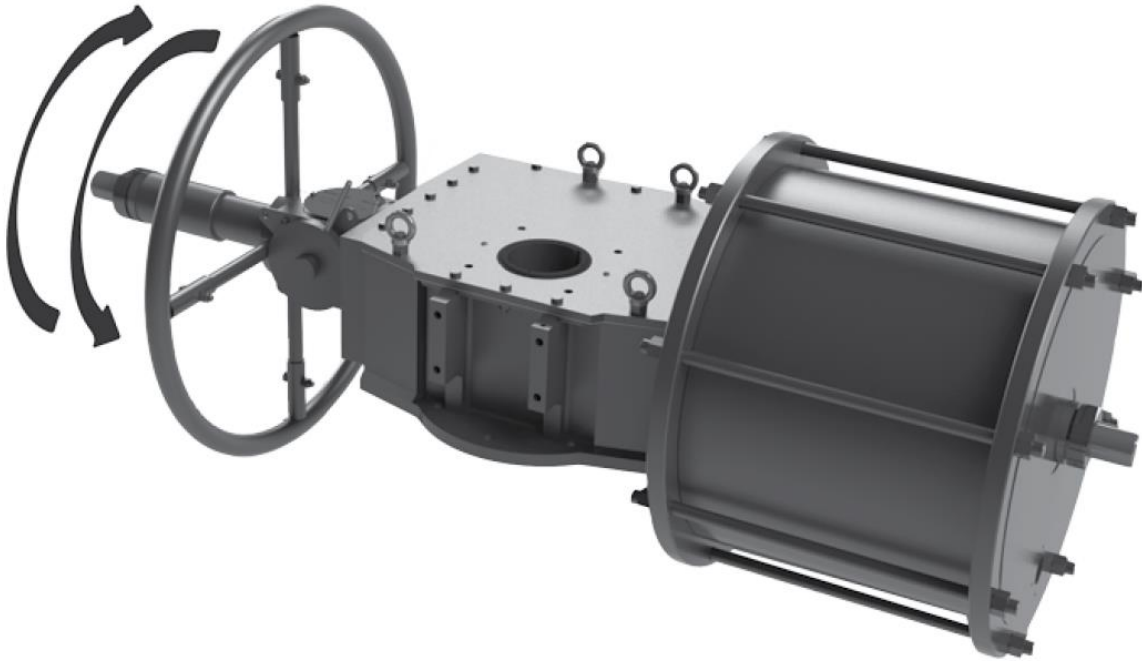
2.1.2.2.2 Restore the supply pressure inside the actuator’s cylinder.

2.1.2.2.3 Operate actuator normally with supply pressure.

2.1.2.2.4 Check that the actuator is able to reach the fully close position in case of fail close actuator or the fully open position in case of fail open actuator. It is possible to check the fully stroked position by viewing the position indicator or limit switches, if fitted. If the actuator is not able to fully stroke in fail-safe direction, verify that the jackscrew has been totally retracted, rotating it as described in step 2.1.2.2.1.

(1) The safety lock is only available upon request. Please contact your local Flowserve Limitorque Representative for more information.

### 2.1.3. Operation – Enclosed Jackscrew Override Installed on Double-Acting Actuator



*Figure 3 – LPS Double-Acting with Enclosed Jackscrew Override (Declutchable)*

#### 2.1.3.1 Manual Operation



**CAUTION:** prior to operating an actuator by means of manual overrides, be sure to remove the pressure inside the cylinder and that the cylinder has been vented to atmosphere through the venting ports. Ensure that all vent valves are in vent position. The number of vent valves varies by actuator and control schematic types.

To manually operate the override:

2.1.3.1.1 Remove the supply pressure inside the actuator's cylinder, and vent the cylinder ports.

2.1.3.1.2 Rotate the lever on the manual override from "DISENGAGED" to "ENGAGED" position (see Figure 4).

2.1.3.1.3 Operate the handwheel clockwise (CW) to close the valve.

2.1.3.1.4 Operate the handwheel counterclockwise (CCW) to open the valve.

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Figure 4 – Detail of LPS Double-Acting with Enclosed Jackscrew Override (Declutchable)

### 2.1.3.2 Restoring Automatic Operation

To restore automatic operation:

2.1.3.2.1 Operate the handwheel in order to move the valve to the desired position.

2.1.3.2.2 Rotate the lever on the manual override to the “DISENGAGED” position, lock it with the safety lock (1).

2.1.3.2.3 Restore the supply pressure inside the actuator cylinder.

2.1.3.2.4 Operate actuator normally with supply pressure.

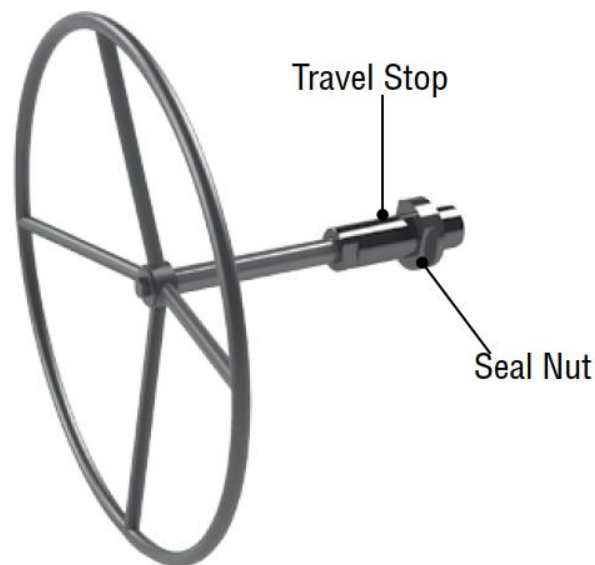
2.1.3.2.5 Check that the actuator is able to reach the fully closed and open position.

(1) The safety lock is only available upon request. Please contact your local Flowserve Limitorque Representative for more information.

## 2.2. Not Enclosed Jackscrew Manual Override (-JL)

The Not Enclosed Jackscrew is a direct operating handwheel, which means that a rotating screw can be fitted either on the cylinder side (single-acting actuators LPS/LPC series, double-acting actuators LPC series) or on the scotch-yoke housing (double-acting actuators LPC series). The rotation of the handwheel in clockwise (CW) or counterclockwise (CCW) directions will cause the consequent rotation of the scotch-yoke mechanism and the stem of the valve which the actuator is fitted on.

The Not Enclosed Jackscrew is a simple manual override solution, consisting of a rotating and simultaneously sliding externally-exposed screw, provided with handwheel.



*Figure 5 – Not Enclosed Jackscrew Manual Override*

The Not Enclosed Jackscrew option is available for the following models of LPS and LPC pneumatic actuator series:

- LPS-15 and LPS-20 single-acting versions
- LPC single-acting and double-acting versions

### 2.2.1. Installation – Travel-Stop Bolts Adjustment Not Enclosed Jackscrew Override Installed on LPS/LPC Single Acting Actuators and LPC Double Acting Actuators

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 Not Enclosed Jackscrew manual override (-JL) has travel-stop adjustment in one direction: valve open direction (in single acting fail-open) or valve close direction (in single-acting fail close). The travel stop adjustment in the opposite direction must be performed in accordance with the IOM of the actuator. For LPC Double Acting Actuators, manual override -JL have travel-stop in both directions.

The +/- 5 degrees 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:

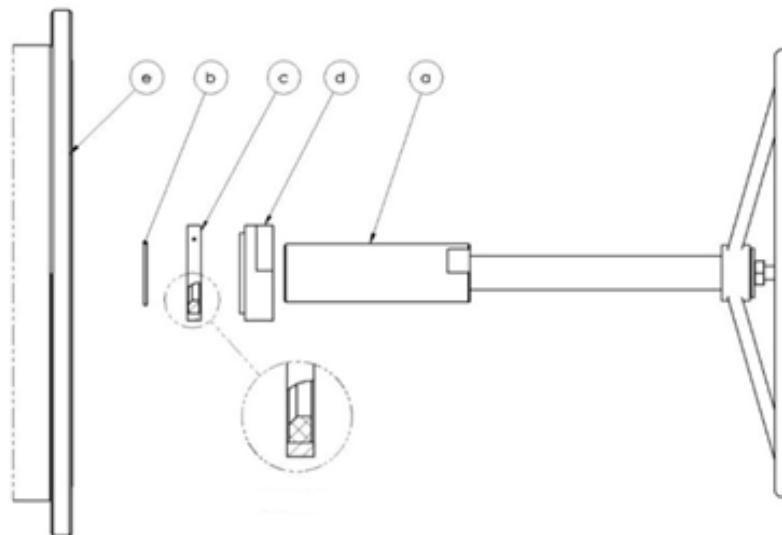
If necessary in order to facilitate unscrewing of the stopper bolt and only for spring return actuator, feed the pneumatic cylinder from the air connection port placed on the tail flange (the flange where the manual override is installed) at minimum necessary pressure (starting from 0 barg and increasing the pressure slowly up to max 2 barg in order to facilitate unscrewing);



**DANGER:** Always make a check in order to have a safety engagement of the stopper bolt in the female thread during this operation. In case of need to fully remove the travel stop, it is mandatory do not have pressure inside the cylinder in order to avoid any possible risk for the operators.



**NOTE:** the following procedure can be applied even for the adjustment of the stop bolt installed on the manual override for double acting actuators (LPC).



2.2.1.1 Using appropriate wrench, hold still the stopper bolt (a) and using a second screw, unscrew the stopper nut (d).

2.2.1.2 Fully remove the stopper nut (d).

2.2.1.3 Fully remove the gasket ring (c), (if present in your version) and the o-ring (b).

2.2.1.4 Manually screw or unscrew the stopper bolt in the female thread (e), using appropriate wrench, until desired position has been reached. Do not use automatic devices (e.g. electric/air screwier, etc...).

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2.2.1.5 Manually slip the new o-ring (b) in front of its seat (e), taking attention to not make cuts in it because of stopper sharp threads.



**NOTE:** Do not use stopper nut (d) or gasket ring (c) to drag the o-ring (b) on its seat;

2.2.1.6 Screw the gasket ring (c) (if present in your version) against the flange of manual override (e);



**NOTE:** If the flange (e) presents a chamfer mount the gasket ring (c) with the flat side in contact with the flange; otherwise mount the gasket ring (c) with the chamfer in contact with the flange;

2.2.1.7 Screw the stopper nut (d);

2.2.1.8 Using appropriate wrench, hold still the stopper bolt (a) and using a second screw, tighten the stopper nut (d).



**NOTE:** Always replace the O-Ring (b) during travel stop adjustment.

2.2.1.9 Pneumatically stroke the actuator several times to assure proper operation. The stem adaptor should not bind during operation. If the actuator is equipped with limit switches, positioners or other accessories, adjust them at this time.

## 2.2.2. Operation – Not Enclosed Jackscrew Override Installed on LPS/LPC Single-Acting Actuator

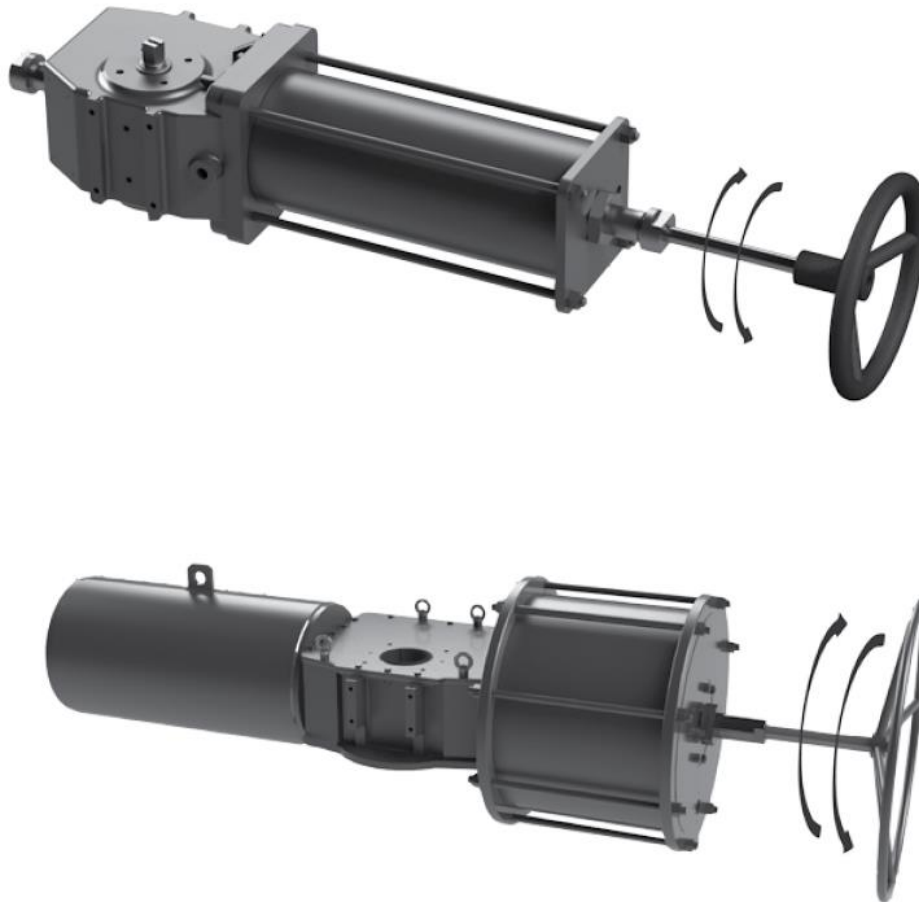


Figure 6 – LPS/LPC Single-Acting with Not Enclosed Jackscrew Override

### 2.2.2.1 Manual Operation



**CAUTION:** prior to operating an actuator by means of manual overrides, be sure to remove the pressure inside the cylinder and that the cylinder has been vented to atmosphere through the venting ports. Ensure that all vent valves are in vent position. The number of vent valves varies by actuator and control schematic types.

To manually operate the override:

2.2.2.1.1 Remove the supply pressure inside the actuator's cylinder, vent the cylinder ports.

2.2.2.1.2 For LPS series:

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- a. Operate the handwheel clockwise (CW) to close the valve (both on a fail close actuator, and on a fail open actuator).
- b. Operate the handwheel counterclockwise (CCW) to open the valve (both on a fail close actuator, and on a fail open actuator).

#### 2.2.2.1.3 For LPC series:

- a. Operate the handwheel clockwise (CW) to close the valve (LPC actuator fail close) or to open the valve (LPC actuator fail open).
- b. Operate the handwheel counterclockwise (CCW) to open the valve (LPC actuator fail close) or to close the valve (LPC actuator fail open).

NOTE: The spring constantly loads the screw, and it returns the actuator to fail safe position when the jackscrew is retracted (for LPS series: rotating clockwise (CW) on a fail close actuator and rotating counterclockwise (CCW) on a fail open actuator; for LPC series: rotating clockwise (CW)).

#### 2.2.2.2 Restoring Automatic Operation

To restore automatic operation:

2.2.2.2.1 Operate handwheel in order to retract the jackscrews completely and lock the position with the safety lock (1).

2.2.2.2.2 Restore the supply pressure inside the actuator's cylinder.

2.2.2.2.3 Operate actuator normally with supply pressure.

2.2.2.2.4 Check that the actuator is able to reach the fully closed position in case of fail close actuator or the fully open position in case of fail open actuator. It is possible to check the fully stroked position by mean of visual position indicator or limit switches if fitted. In case the actuator is not able to fully stroke, verify that the jackscrew has been totally retracted, rotating it as described in first step.

(1) The safety lock is only available upon request. Please contact your local Flowserve Limitorque Representative for more information.

### 2.2.3. Operation – Not Enclosed Jackscrew Override Installed on Double-Acting LPC Actuator

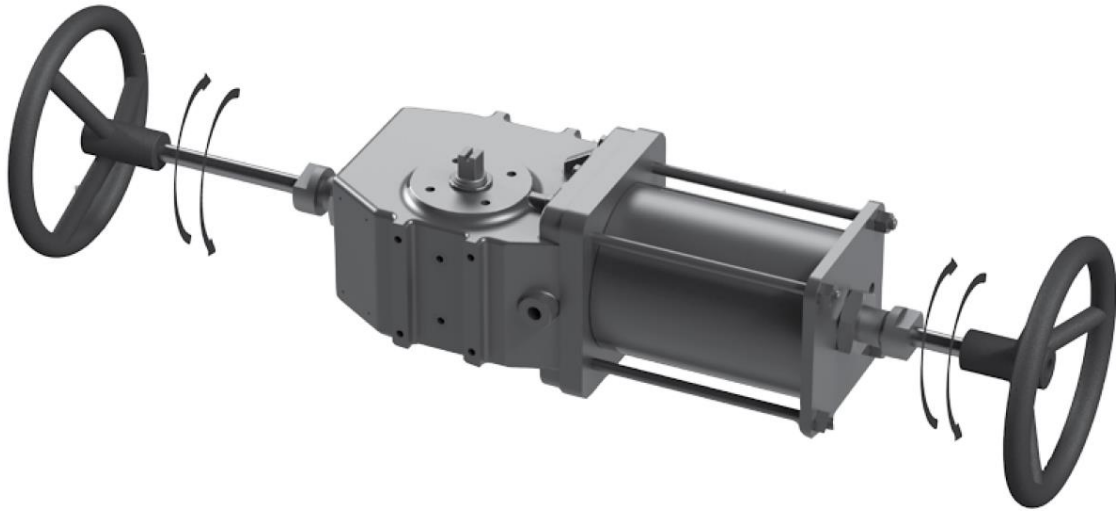


Figure 7 – LPC Double-Acting with Not Enclosed Jackscrew Override

#### 2.2.3.1 Manual Operation



**CAUTION:** prior to operating an actuator by means of manual overrides, be sure to remove the pressure inside the cylinder and that the cylinder has been vented to atmosphere through the venting ports. Ensure that all vent valves are in vent position. The number of vent valves varies by actuator and control schematic types.

To manually operate the override:

2.2.3.1.1 Remove the supply pressure inside the actuator's cylinder, vent the cylinder ports.

2.2.3.1.2 To open the valve, make sure that jackscrew installed on the scotch-yoke housing side is completely retracted by rotating the relevant handwheel clockwise (CW). Then, operate the handwheel on the cylinder side in counterclockwise (CCW) direction.

2.2.3.1.3 To close the valve, make sure that jackscrew installed on the cylinder side is completely retracted by rotating the relevant handwheel clockwise (CW). Now operate the handwheel on the scotch-yoke housing side counterclockwise (CCW) direction.

### 2.2.3.2 Restoring Automatic Operation

To restore automatic operation:

2.2.3.2.1 Operate both handwheels clockwise (CW) in order to retract both jackscrews completely, lock the position with the safety lock (1).

2.2.3.2.2 Restore the supply pressure inside the actuator's cylinder.

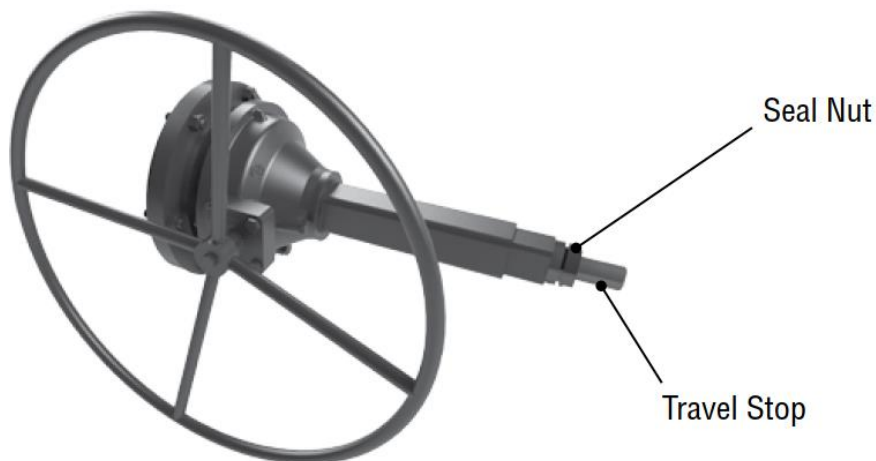
2.2.3.2.3 Operate actuator normally with supply pressure.

2.2.3.2.4 Check that the actuator is able to reach the fully closed position in case of fail close actuator, or the fully open position in case of fail open actuator. It is possible to check the fully stroked position by seeing the position indicator or limit switches, if fitted. In case the actuator is not able to stroke fully, verify that the jackscrew has been totally retracted by rotating it as described in step 2.2.3.2.1.

(1) The safety lock is only available upon request. Please contact your local Flowserve Limitorque Representative for more information.

## 2.3. Bevel Gear Manual Override (-BG)

Bevel Gear overrides consists of a bevel gearbox system mounted on the end flange of the actuator pneumatic cylinder.



*Figure 8 – Bevel Gear Manual Override*

The Bevel Gear override option is available for LPS-15, LPS-20, LPS-25 and LPS-30 single-acting versions.

**2.3.1. Installation – Travel-Stop Bolts Adjustment Not Enclosed Jackscrew Override Installed on LPS/LPC Single Acting Actuators and LPC Double Acting Actuators**

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 Bevel Gear manual override (-BG) has travel-stop adjustment in one direction: valve open direction (in single acting fail-open) or valve close direction (in single-acting fail close). The travel stop adjustment in the opposite direction must be performed in accordance with the IOM of the actuator.

The +/- 5 degrees 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:

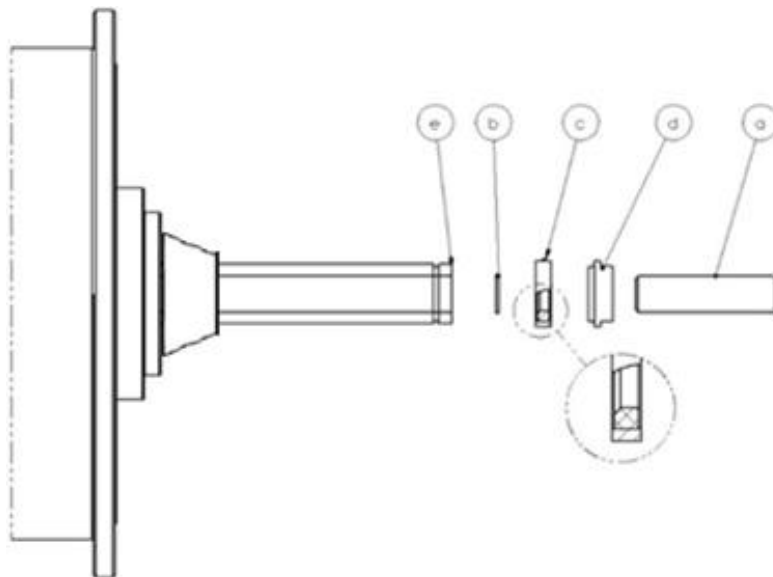
If necessary in order to facilitate unscrewing of the stopper bolt and only for spring return actuator, feed the pneumatic cylinder from the air connection port placed on the tail flange (the flange where the manual override is installed) at minimum necessary pressure (starting from 0 barg and increasing the pressure slowly up to max 2 barg in order to facilitate unscrewing);



**DANGER:** Always make a check in order to have a safety engagement of the stopper bolt in the female thread during this operation. In case of need to fully remove the travel stop, it is mandatory do not have pressure inside the cylinder in order to avoid any possible risk for the operators.



**NOTE:** the following procedure can be applied even for the adjustment of the stop bolt installed on the manual override for double acting actuators.



2.3.1.1 Using appropriate wrench, hold still the stopper bolt (a) and using a second screw, unscrew the stopper nut (d).

2.3.1.2 Fully remove the stopper nut (d).

2.3.1.3 Fully remove the gasket ring (c), (if present in your version) and the o-ring (b).

2.3.1.4 Manually screw or unscrew the stopper bolt in the female thread (e), using appropriate wrench, until desired position has been reached. Do not use automatic devices (e.g. electric/air screwier, etc...).

2.3.1.5 Manually slip the new o-ring (b) in front of its seat (e), taking attention to not make cuts in it because of stopper sharp threads.



**NOTE:** Do not use stopper nut (d) or gasket ring (c) to drag the o-ring (b) on its seat;

2.3.1.6 Screw the gasket ring (c) (if present in your version) against the flange of manual override (e);



**NOTE:** If the flange (e) presents a chamfer mount the gasket ring (c) with the flat side in contact with the flange; otherwise mount the gasket ring (c) with the chamfer in contact with the flange;

2.3.1.7 Screw the stopper nut (d);

2.3.1.8 Using appropriate wrench, hold still the stopper bolt (a) and using a second screw, tighten the stopper nut (d).



**NOTE:** Always replace the O-Ring (b) during travel stop adjustment.

2.3.1.9 Pneumatically stroke the actuator several times to assure proper operation. The stem adaptor should not bind during operation. If the actuator is equipped with limit switches, positioners or other accessories, adjust them at this time.

### 2.3.2. Operation – Enclosed Jackscrew Override Installed on Single-Acting Actuator

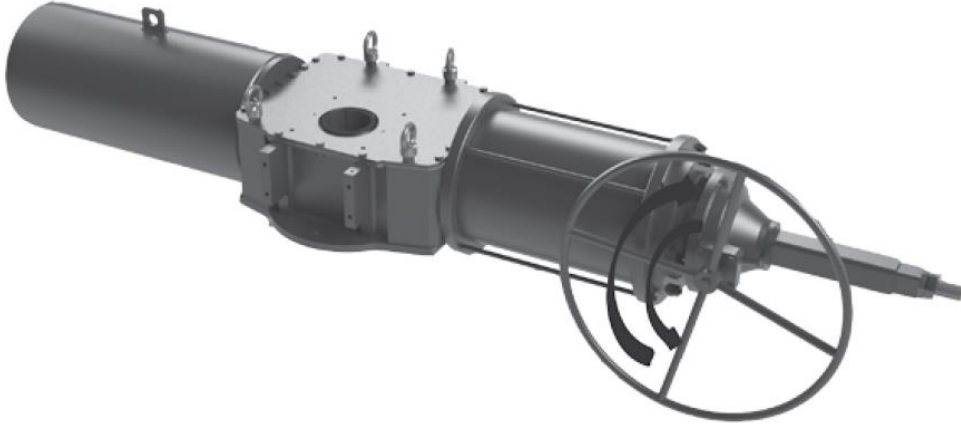


Figure 9 – LPS Single-Acting with Bevel Gear Override

#### 2.3.2.1 Manual Operation



**CAUTION:** prior to operating an actuator by means of manual overrides, be sure to remove the pressure inside the cylinder and that the cylinder has been vented to atmosphere through the venting ports. Ensure that all vent valves are in vent position. The number of vent valves varies by actuator and control schematic types.

To manually operate the override:


2.3.2.1.1 Remove the supply pressure inside the actuator's cylinder, vent the cylinder ports.

2.3.2.1.2 Operate the handwheel clockwise (CW) to close the valve (both on a fail close actuator and on a fail open actuator).

2.3.2.1.3 Operate the handwheel counterclockwise (CCW) to open the valve (both on a fail close actuator and on a fail open actuator).

NOTE: The spring constantly loads the screw, and it returns the actuator to fail safe position when the jackscrew is retracted (rotating clockwise (CW) on a fail close actuator and rotating counterclockwise (CCW) on a fail open actuator).



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### 2.3.2.2 Restoring Automatic Operation

To restore automatic operation:

2.3.2.2.1 Operate the handwheel in order to completely retract the jackscrews (rotating clockwise (CW) on a fail close actuator and rotating counterclockwise (CCW) on a fail open actuator) and lock the position with the safety lock (1).

2.3.2.2.2 Restore the supply pressure inside the actuator's cylinder.

2.3.2.2.3 Operate actuator normally with supply pressure.

2.3.2.2.4 Check that the actuator is able to reach the fully closed position in case of fail close actuator or the fully open position in case of fail open actuator. It is possible to check the fully stroked position by seeing the position indicator or limit switches, if fitted. In case the actuator is not able to fully stroke, verify that the jackscrew has been totally retracted, rotating it as described in step 2.3.2.2.1.

(1) The safety lock is only available upon request. Please contact your local Flowserve Limitorque Representative for more information.

# 3 HYDRAULIC MANUAL OVERRIDES

Hydraulic Manual Overrides of LFPS heavy duty actuators provides a low-effort and high-thrust compact sized override for manually operating the actuator. The LFPS Hydraulic Manual Overrides are designed in accordance with EN 12570 and the manual operation shall be completed with a force applied to the lever that does not exceed values stated in EN 12570.



**CAUTION:** prior to operating the actuator by means of manual overrides, be sure to remove the pressure inside the cylinder and that the cylinder has been vented to atmosphere through the venting ports. Ensure that all vent valves are in vent position. The number of vent valves varies by actuator and control schematic types.



**CAUTION:** prior to operating the actuator by means of manual overrides or by means of pressurized fluid, be sure to verify that breathing plug, that is provided with the actuator, is properly installed on tank (temporary plugs can be sometime installed on the tank instead of breathing plug for reasons related with shipment and in these cases they have to be substituted with breathing plug in order to avoid serious damages of the system for improper use). In case of doubts, please ask to your Flowserve representative the dedicated operative instruction.

### 3.1. Hydraulic Hand Pump Manual Override (-HP)

The hydraulic override consists of a power pack with hand-lever-operated high pressure pump connected with stainless steel tubing to a hydraulic cylinder.

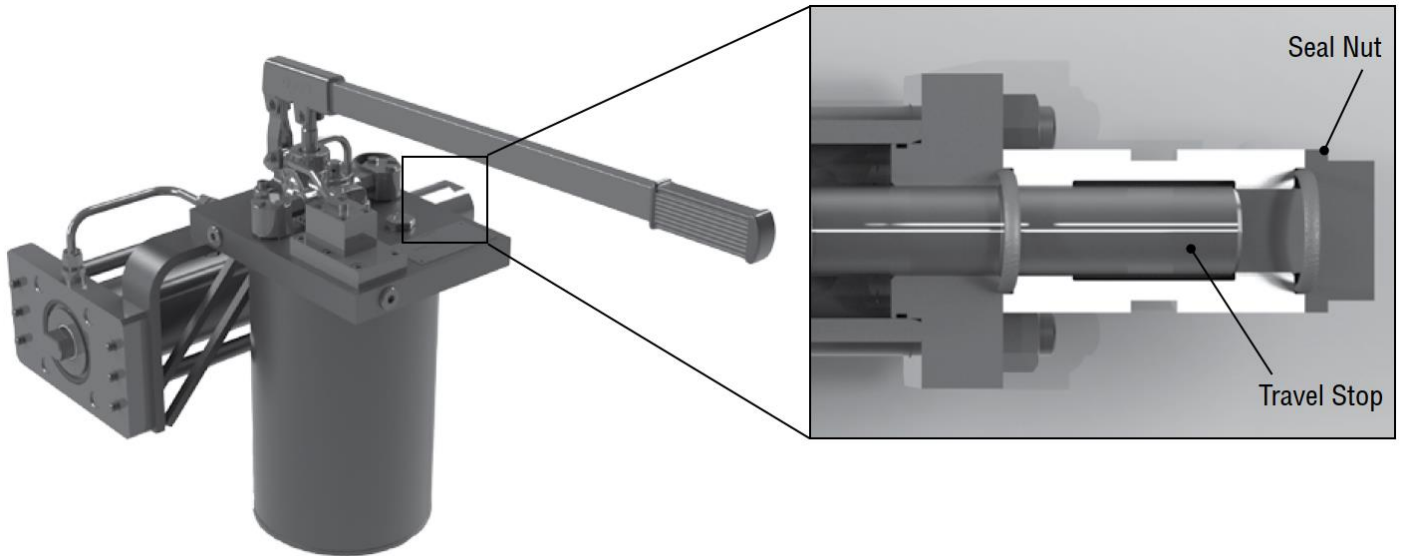


Figure 10 – Hydraulic Hand Pump Manual Override

The Hydraulic Hand Pump Manual Override option is available for all models of the LPS Pneumatic and LHS Hydraulic Actuators series, both single-acting and double-acting versions.

#### 3.1.1. Installation –Travel-Stop Bolts Adjustment Hydraulic Hand Pump Override

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 Hydraulic Hand Pump manual override (-HP) has travel-stop adjustment in one direction: valve open direction (in LPS/LHS single-acting fail open and in LPS double acting) or valve close direction (in LPS/LHS single-acting fail close and LHS double acting). The travel stop adjustment in the opposite direction must be performed in accordance with the IOM of the actuator.

The +/- 5 degrees 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:

##### 3.1.1.1 Loosen the seal nut with a proper wrench (Figure 10).

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3.1.1.2 While keeping the seal nut stationary, screw or un-screw the travel-stop (Figure 10) bolt using a proper Allen key.

3.1.1.3 Tighten the seal nut.

3.1.1.4 Stroke the actuator several times to assure proper operation. The stem adaptor should not bind during operation. If the actuator is equipped with limit switches, positioners or other accessories, adjust them at this time.

### 3.1.2. Operation – Hydraulic Hand Pump Override Installed on LPS Single-Acting Actuator

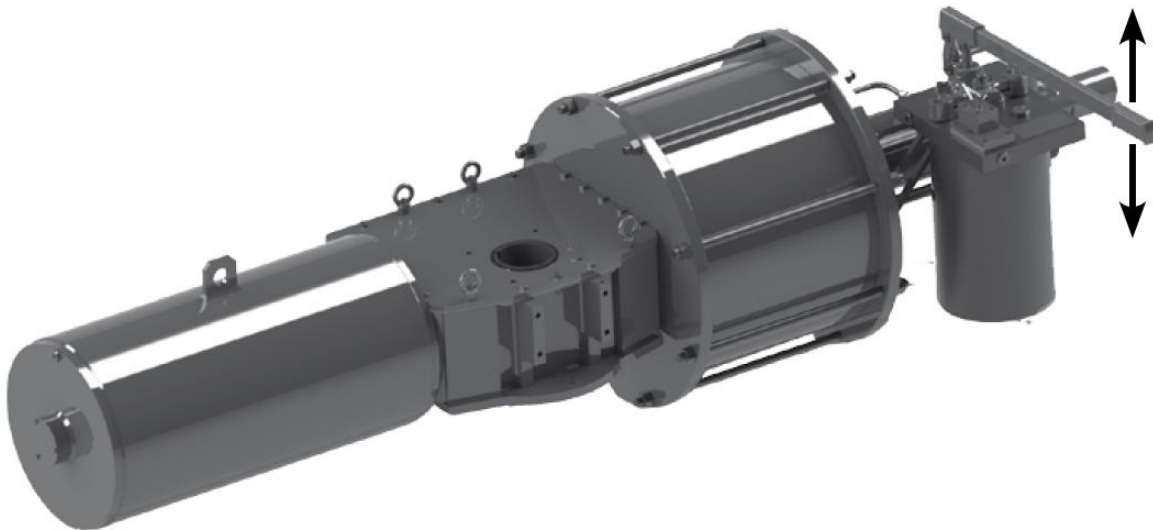


Figure 11 – Hydraulic Hand Pump Manual Override Installed on Single-Acting Actuator

#### 3.1.2.1 Manual Operation



**CAUTION:** prior to operating an actuator by means of manual overrides, be sure to remove the pressure inside the cylinder and that the cylinder has been vented to atmosphere through the venting ports. Ensure that all vent valves are in vent position. The number of vent valves varies by actuator and control schematic types.

To manually operate the override:

3.1.2.1.1 Remove the supply pressure inside the actuator's pneumatic cylinder and vent the cylinder ports.

3.1.2.1.2 Referring to the schematic diagram (Figure 12), switch the manual stop valve SV1 in "MANUAL" position, as shown in the nameplate located close to the manual isolation valve (Figure 13).

3.1.2.1.3 If an additional stop valve SV2 is installed, make sure it is in the open position.

3.1.2.1.4 To compress the spring, operate the PMP manual hand pump, acting on the lever (Figure 13).

3.1.2.1.5 After the manual stroke of the actuator in the direction to compress the spring, close the manual valve SV2 (if it is installed) whenever it is requested to keep the spring compressed for long time.

3.1.2.1.6 To release the spring from the compressed position, open the manual valve SV2 (if it is present) and switch slowly the manual stop valve SV1 in "AUTOMATIC" position, as shown in the nameplate located nearby (Figure 13).

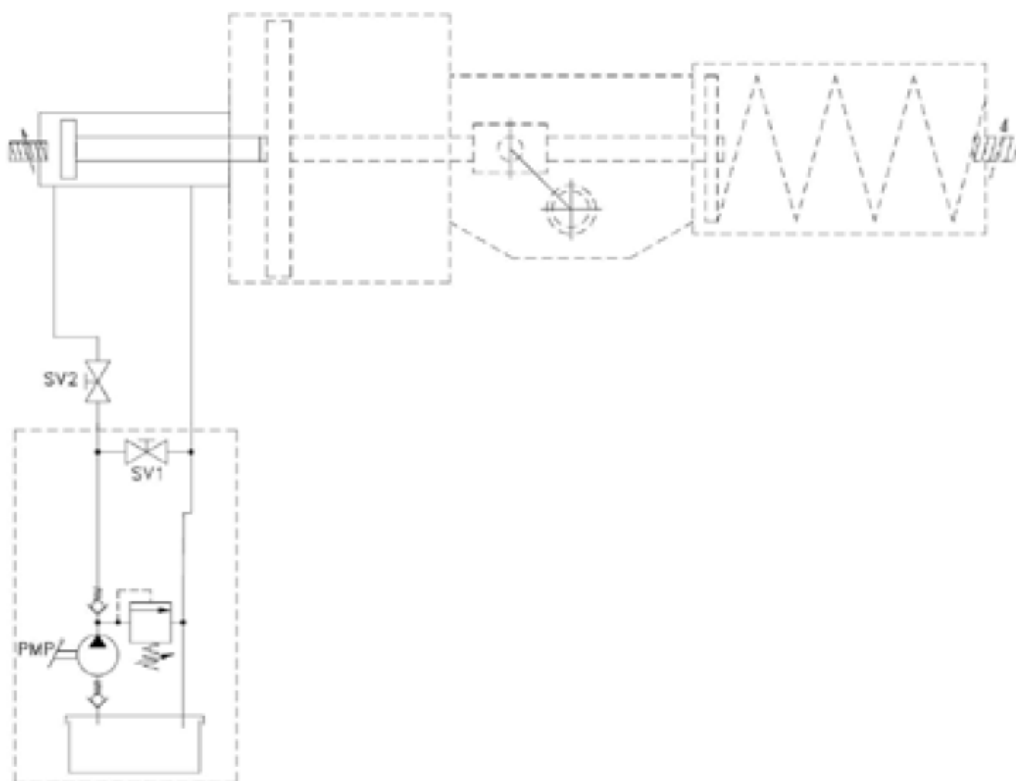


Figure 12 – Hydraulic Diagram LPS Single-Acting Actuator with Hydraulic Override

### 3.1.2.2 Restoring Automatic Operation

To restore automatic operation:

3.1.2.2.1 Open and keep open the manual stop valve SV2 (if it is installed), and switch slowly the SV1 manual stop valve in "AUTOMATIC" position, as shown in the nameplate located nearby (Figure 13).

3.1.2.2.2 Restore the supply pressure inside the actuator's pneumatic cylinder.

3.1.2.2.3 Operate actuator normally with the supply pressure.

3.1.2.2.4 Check that the actuator is able to reach the fully closed position in case of fail close actuator or the fully open position in case of fail open actuator. It is possible to check the fully stroked position by mean of visual position indicator or limit switches, if fitted.

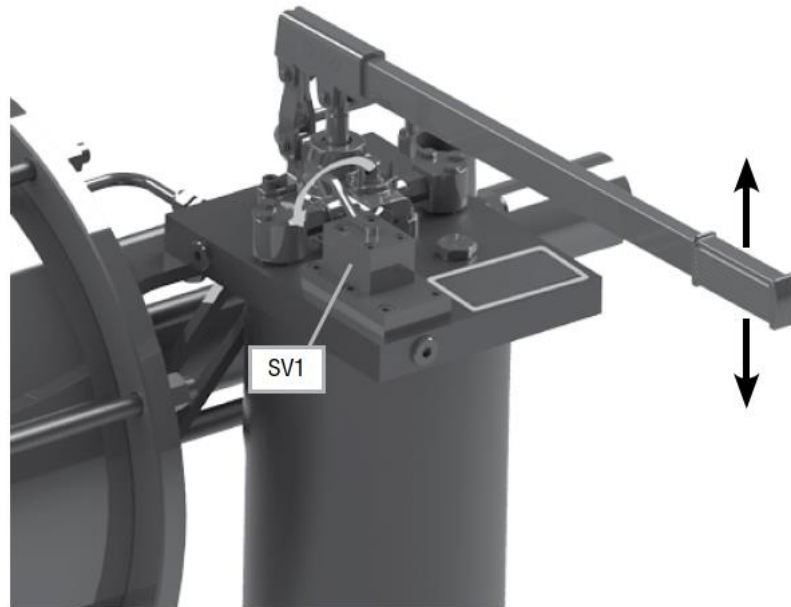


Figure 13 – Details of Hydraulic Hand Pump Manual Override for Single-Acting Actuator

### 3.1.3. Operation – Hydraulic Hand Pump Override Installed on LPS Double-Acting Actuator

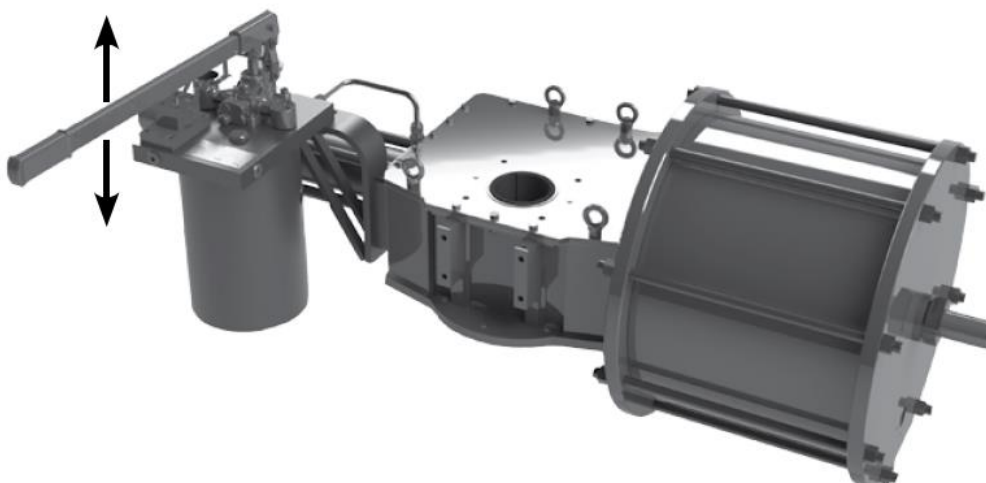


Figure 14 – Hydraulic Hand Pump Manual Override Installed on Double-Acting Actuator

**3.1.3.1 Manual Operation**



**CAUTION:** prior to operating an actuator by means of manual overrides, be sure to remove the pressure inside the cylinder and that the cylinder has been vented to atmosphere through the venting ports. Ensure that all vent valves are in vent position. The number of vent valves varies by actuator and control schematic types.

To manually operate the override:

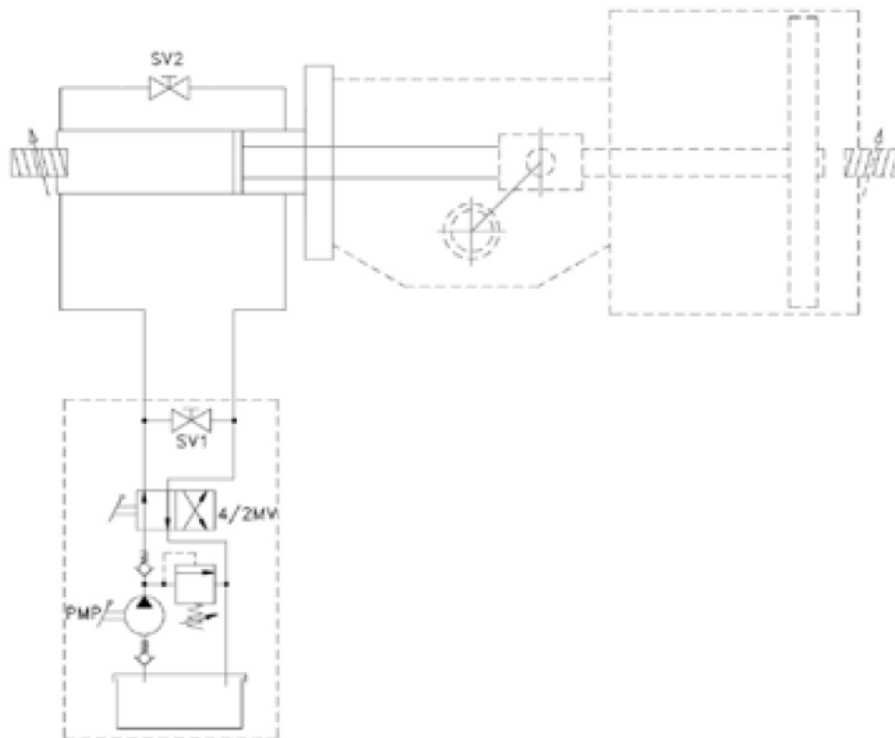
3.1.3.1.1 Remove the supply pressure inside the actuator’s cylinder and vent the cylinder ports.

3.1.3.1.2 Referring to the schematic diagram (Figure 15), switch the manual stop valve SV1 in “MANUAL” position, as shown in the nameplate located nearby (Figure 16).

3.1.3.1.3 Close the additional manual isolation valve SV2 (if it is installed).

3.1.3.1.4 To stroke the actuator in the close direction, switch the manual selector (4/2MV) to the CLOSE position indicated on its nameplate and operate the PMP manual hand pump, acting on the lever (Figure 14).

3.1.3.1.5 To stroke the actuator in the open direction, switch the manual selector (4/2MV) to the OPEN position indicated on its nameplate and operate the PMP manual hand pump, acting on the lever (Figure 15).



*Figure 15 – Hydraulic Diagram of LPS Double-Acting Actuator with Hydraulic Override*

**3.1.3.2 Restoring Automatic Operation**

To restore automatic operation:

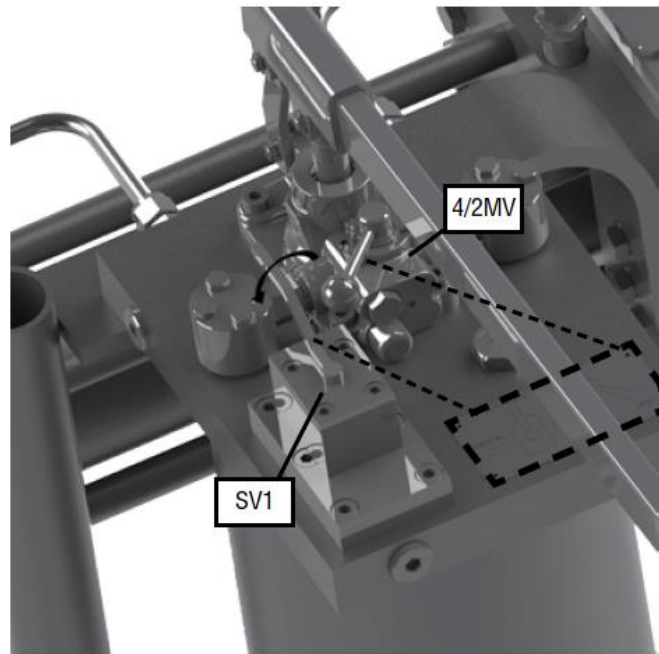
3.1.3.2.1 Switch the manual stop valve SV1 in the “AUTOMATIC” position, as shown in the nameplate located nearby (Figure 16).

3.1.3.2.2 Open and keep open the manual isolation valve SV2 (if it is installed).

3.1.3.2.3 Restore the supply pressure inside the actuator’s pneumatic cylinder.

3.1.3.2.4 Operate actuator normally with supply pressure.

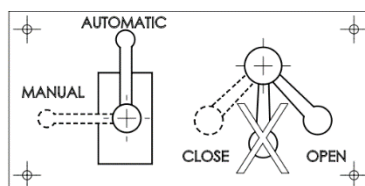
3.1.3.2.5 Check that the actuator is able to reach the fully closed and open position. It is possible to check the fully stroked position by viewing the position indicator or limit switches, if fitted.



*Figure 16 – Details of Hydraulic Hand Pump Manual Override for Double-Acting Actuator*



**WARNING:** before to operate the actuator normally with supply pressure, make sure that the manual selector (4/2MV) is switched in to the CLOSE or OPEN position. Do not operate the actuator in automatic condition if the manual selector (4/2MV) is in a intermediate position.





### 3.1.4. Operation – Hydraulic Hand Pump Override Installed on LHS Single-Acting Actuator



Figure 17 - Hydraulic Hand Pump Manual Override Installed on LHS Single Acting Actuator

#### 3.1.4.1 Manual Operation



**CAUTION:** prior to operating an actuator by means of manual overrides, be sure to remove the pressure inside the cylinder and that the cylinder has been vented to atmosphere through the venting ports. Ensure that all vent valves are in vent position. The number of vent valves varies by actuator and control schematic types.

To manually operate the override:

3.1.4.1.1 Remove the supply pressure inside the actuator's hydraulic cylinder.



**CAUTION:** Before proceeding be sure that the hydraulic pressure inside the actuator's cylinder has been removed and the actuator is in fail position.

3.1.4.1.2 With reference to the schematic diagram (Figure 18), switch the manual selector MS in manual position "M" and switch the manual valve SV1 in "MANUAL" position, as shown in the nameplate located nearby.

3.1.4.1.3 If an additional stop valve SV2 is installed, make sure it is in the open position.

3.1.4.1.4 To compress the spring, operate the PMP manual hand pump, acting on the lever (Figure 17).

3.1.4.1.5 After the manual stroke of the actuator in the direction to compress the spring, close the manual valve SV2 (if it is installed) whenever it is requested to keep the spring compressed for long time.

3.1.4.1.6 To release the spring from the compressed position, open the manual valve SV2 (if it is present) and switch slowly the manual stop valve SV1 in "AUTOMATIC" position, as shown in the nameplate located nearby.

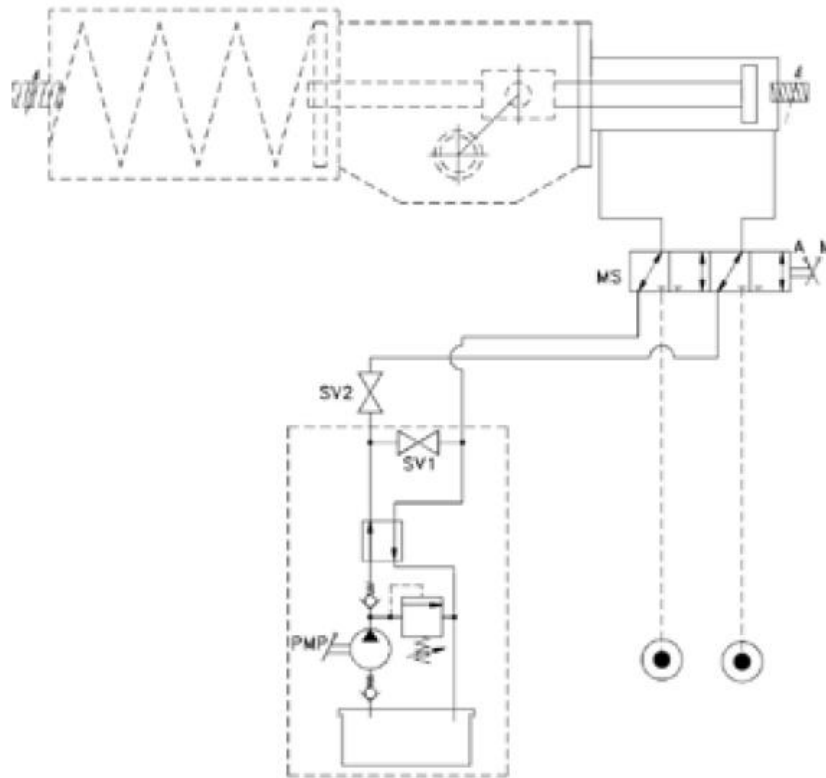
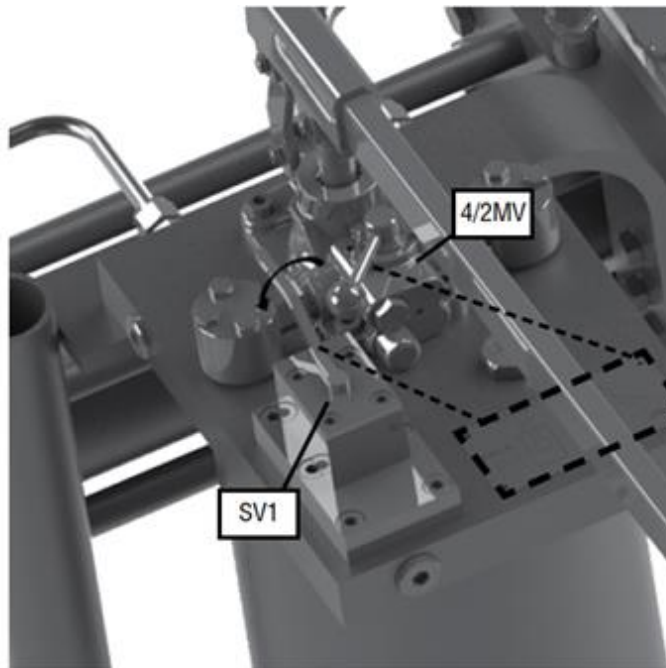


Figure 18 – Hydraulic Diagram of Manual Override for LHS Single Acting

### 2.1.4.2 Restoring Automatic Operation

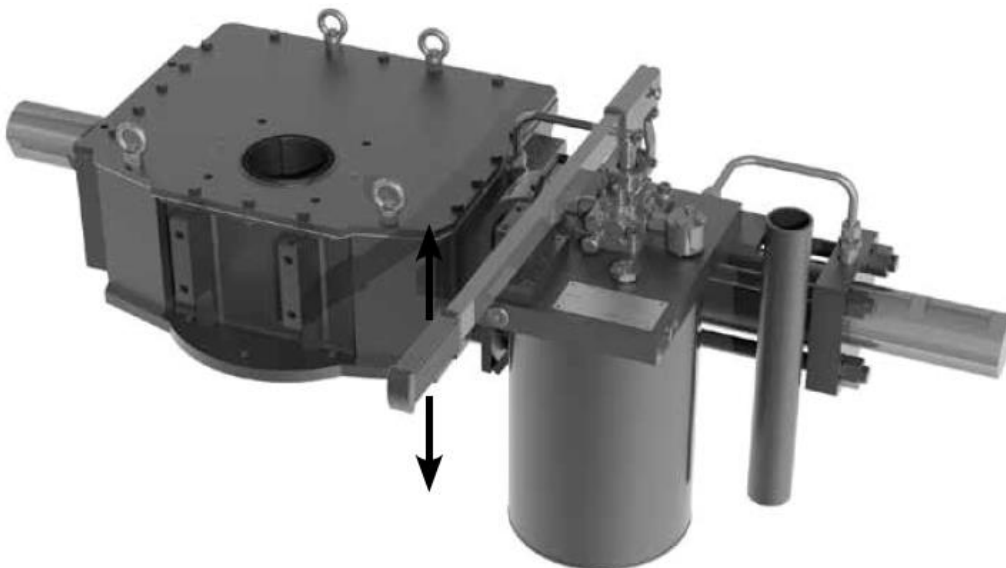
To restore automatic operation:

- 3.1.4.2.1 Open and keep open the manual stop valve SV2 (if it is installed), and switch slowly the SV1 manual stop valve in “AUTOMATIC” position.
- 3.1.4.2.2 Switch the manual selector MS in automatic position “A”.
- 3.1.4.2.3 Restore the supply pressure inside the actuator’s hydraulic cylinder.
- 3.1.4.2.4 Operate actuator normally with the hydraulic supply pressure.
- 3.1.4.2.5 Check that the actuator is able to reach the fully closed position in case of fail close actuator, or the fully open position in case of fail open actuator. It is possible to check the fully stroked position by viewing the position indicator or limit switches, if fitted.



*Details of Hydraulic Hand Pump Manual Override for Double-Acting Actuator*

### 3.1.5. Operation – Hydraulic Hand Pump Override Installed on LHS Double-Acting Actuator



*Figure 19 – Hydraulic Hand Pump Manual Override installed on LHS Single Acting Actuator*

**3.1.5.1 Manual Operation**



**CAUTION:** prior to operating an actuator by means of manual overrides, be sure to remove the pressure inside the cylinder and that the cylinder has been vented to atmosphere through the venting ports. Ensure that all vent valves are in vent position. The number of vent valves varies by actuator and control schematic types.

To manually operate the override:

3.1.5.1.1 Remove the supply pressure inside the actuator’s hydraulic cylinder.



**CAUTION:** Before proceeding be sure that the hydraulic pressure inside the actuator’s cylinder has been removed.

3.1.5.1.2 Referring to the schematic diagram (Figure 20), switch the manual selector MS in manual position “M” and switch the manual stop valve SV1 in “MANUAL” position, as shown in the nameplate located nearby.

3.1.5.1.3 To stroke the actuator in the close direction, switch the manual selector (4/2MV) to the CLOSE position indicated on its nameplate and operate the PMP manual hand pump, acting on the lever (Figure 19).

3.1.5.1.4 To stroke the actuator in the open direction, switch the manual selector (4/2MV) to the OPEN position indicated on its nameplate and operate the PMP manual hand pump, acting on the lever (Figure 19).

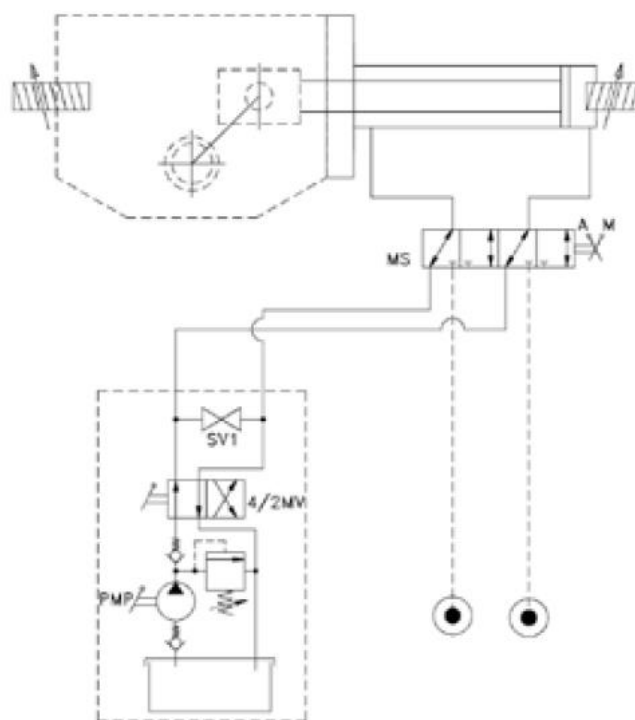



Figure 20 – Hydraulic Diagram of Manual Override for LHS Double Acting

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### 2.1.5.2 Restoring Automatic Operation

To restore automatic operation:

3.1.5.2.1 Switch the manual stop valve SV1 in the “AUTOMATIC” position, as shown in the nameplate located nearby.

3.1.5.2.2 Switch the manual selector MS in automatic position “A”.

3.1.5.2.3 Restore the supply pressure inside the actuator’s hydraulic cylinder.

3.1.5.2.4 Operate the actuator normally with hydraulic supply pressure.

3.1.5.2.5 Check that the actuator is able to reach the fully closed and open position. It is possible to check the fully stroked position by mean of visual position indicator or limit switches, if fitted.

# 4 MAINTENANCE INSTRUCTIONS

Mechanical and hydraulic manual overrides of LFPS heavy duty actuators are designed to offer the greatest ease of operations of assembly, disassembly and maintenance. Maintenance and disassembly do not require special equipment.

Mechanical and hydraulic manual overrides of LFPS heavy duty actuators are designed for emergency use in the case in which the pressure supply medium is not available.

## **4.1. MANUAL OVERRIDE ORDINARY MAINTENANCE**

If the manual overrides operation happens infrequently, it is recommended to perform the following steps periodically:

1. When it is possible, carry out a few openings and closings operations by manual overrides, checking that the actuator operates correctly.
2. Check the paint coating. If some areas are damaged due to accidental events, retouch them according to the paint specifications.
3. For the Hydraulic Override, ensure there are no leaks in the hydraulic connections. If leaks are present, tighten the pipe fittings.
4. For the Hydraulic Override, it's suggested to check the level of the oil in the tank using the proper level indicator installed near the lever of the pump. See also par. 1.3 for further details.
5. For the Not-Enclosed Jack Screw Override, clean the screw, removing sand, powder, and any other solid particles before operating it.

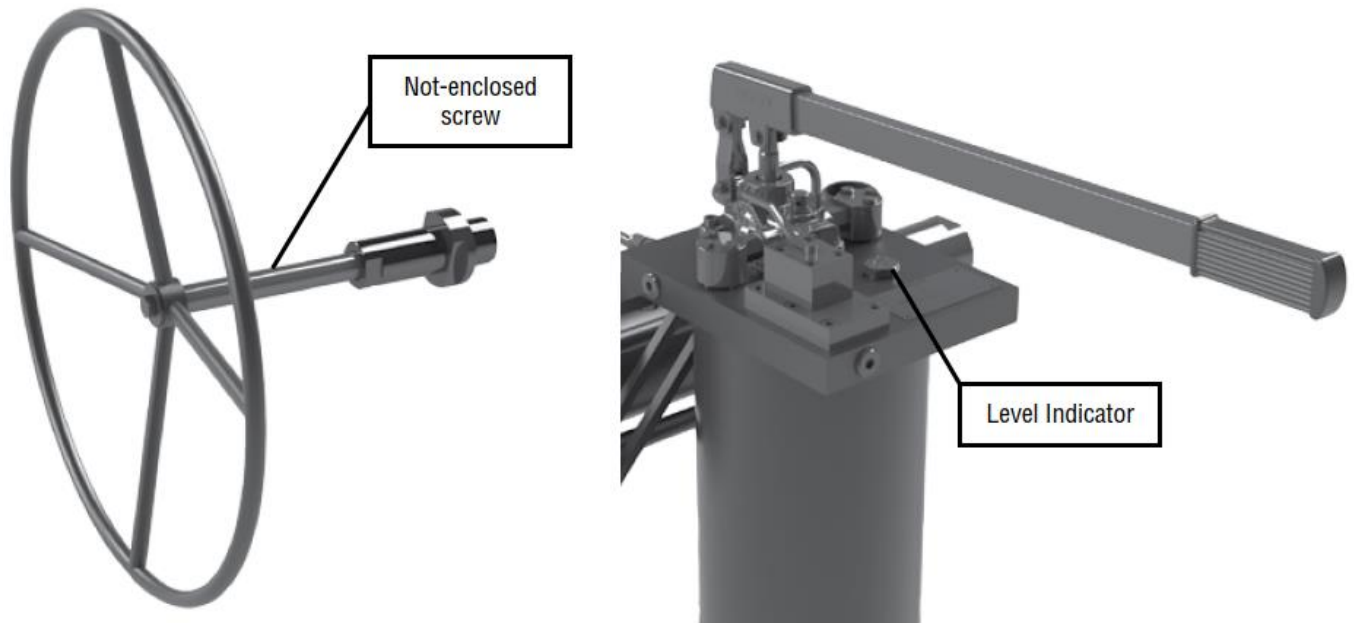


Figure 21 – Detail of Not-Enclosed Jackscrew and Hand Pump Assembly

## 4.2. MANUAL OVERRIDE EXTRAORDINARY MAINTENANCE

In case of extraordinary maintenance, or in case of scheduled preventive maintenance, involving the removal and reassembling of manual override components, refer to the Service kits reported in following paragraphs and ask to your Flowserve representative a dedicated Operative Instruction.

The actuator, including manual override, is furnished pre-lubricated, with a sufficient amount of lubricants for its entire life cycle. However, during scheduled maintenance or in case of extraordinary maintenance, when necessary, it is possible to lubricate the components for which lubrication is foreseen, using greases having characteristics in accordance to Tables reported here below.



**CAUTION:** Never apply any type of lubricant or grease on the threads of the Not Enclosed Screw in order to avoid deposits of sand, powder and any other solid particles and to seize up the normal override mechanism.



**WARNING:** Only use the recommended type of lubricants that are in the present IOM.



Limitorque Fluid Power Systems

## USER INSTRUCTIONS

Mechanical and Hydraulic Manual Overrides

Doc. Number: FCD LFENIM0004-01-A4-04/21

Revision: 01

Date: 04 / 2021

### For Temperature Conditions

-29 °C to +100 °C

Grease Characteristics*	
Worked Penetration [dmm]	280
Dropping Point ASTM [°C]	190
Viscosity at 40 °C [mm <sup>2</sup> /s]	100

\*Grease Suggested: AGIP MUP2 or equivalent

### For low Temperature Conditions

-60 °C to +100 °C

Grease Characteristics*	
Worked Penetration [dmm]	296
Dropping Point ASTM [°C]	260+
Viscosity at -40 °C [mm <sup>2</sup> /s]	1150

\* Grease Suggested: AEROSHELL7 or equiv.

### For high Temperature Conditions

-29 °C to +160 °C

Grease Characteristics*	
Worked Penetration [dmm]	280
Dropping Point ASTM [°C]	290
Viscosity at 40 °C [mm <sup>2</sup> /s]	220

\* Grease Suggested: ENI GREASE LCX2/220 or equivalent

### For all Temperature Conditions

-60 °C to +100 °C

Oil for O-Rings and cylinder internal parts lubrication*	
Flashpoint [°C]	198
Density [kg/m <sup>3</sup> ] at 15°C	1074
Viscosity at 40 °C [mm <sup>2</sup> /s]	222

\* Oil Suggested: SHELL OMALA S4WE220 or equivalent

For different conditions, contact your local Flowserve representative.



**NOTE:** for the recommended hydraulic oils to be used as supply fluids and other important recommendations, follow par. 1.3 of the present IOM.

## 4.3. HYDRAULIC MANUAL OVERRIDE CYLINDER MAINTENANCE

The hydraulic cylinder maintenance mainly consists in the replacement of those parts that may degrade over time for aging, even in the absence of faults. These components are the O-rings and the sliding elements of the piston.

The substitution of cylinder components not subjected to aging (or of the whole cylinder) is not expected over the entire actuator life. However, accidental events may result in damage to these components. In these cases, proceed as described in the following steps.

The maintenance for replacing components degrading for aging can be performed in the field without the need to remove the whole cylinder from the actuator.



**DANGER:** Do not attempt this maintenance operation with cylinder under pressure.

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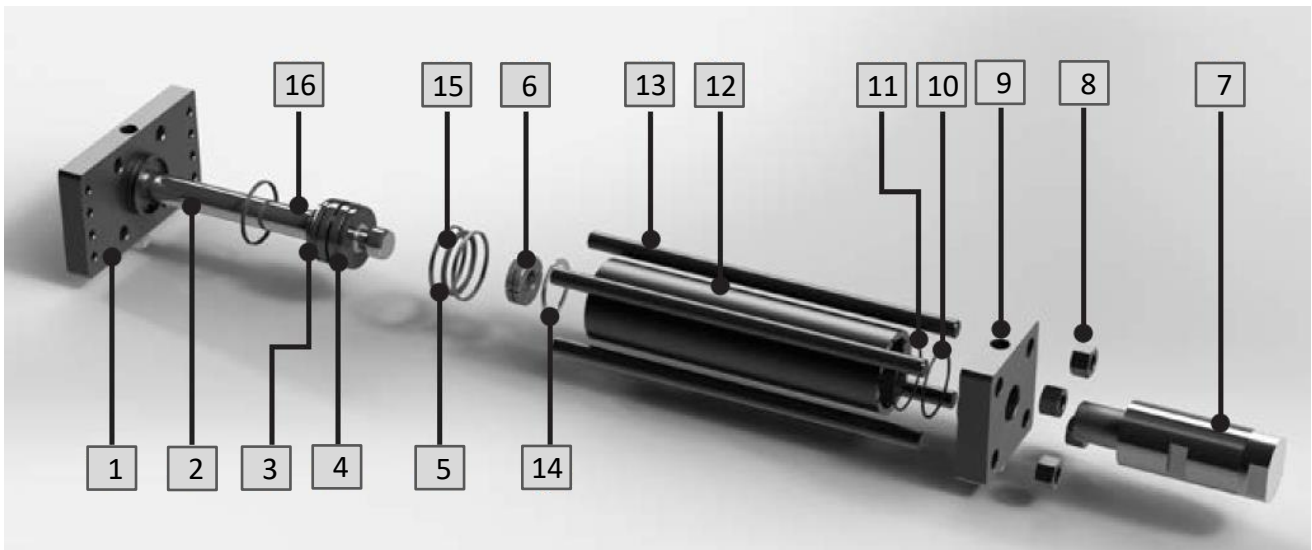


Figure 22: Exploded View of Hydraulic Cylinder

Num	Description	Qty	Spare
1	Cylinder Head Flange	1	
2	Piston Rod	1	
3	O-Ring	1	X •
4	Piston	1	
5	Tape Guide	2	X •
6	Split Ring	1	
7	Stop Bolt Assembly	1	
8	Hex Nut (High)	4**	

Num	Description	Qty	Spare
9	Cylinder End Flange	1	
10	O-Ring	2	X •
11	Anti-extrusion Ring	2	X •
12	Tube	1	
13	Tie Rod	4**	
14	Spiral Retaining	2	
15	Piston seal	1	X •
16	Split Ring	1	

X Maintenance spare parts

• Spare parts that can be replaced without removing the actuator from the valve

\*\* Variable number depending on model



**WARNING:** Before performing any maintenance operation on the cylinder it's mandatory to remove the pressure inside the cylinder itself. Make sure that the hydraulic connection ports of the cylinder are disconnected. Also make sure that all hydraulic supplies to the actuator control unit and all power supplies are disconnected. Make sure that the actuator is in the fail position.



**WARNING:** Use the hydraulic cylinder only for the intended function it has been designed for.



**NOTE:** During the maintenance operations inside the cylinder it's suggested to have a visual check of its internal parts, in order to guarantee their integrity.

Perform the following steps:

- 4.3.1.** Unscrew and remove the travel stop of the hydraulic cylinder. For removing the stop, refer to the indications given in paragraph 3.1.1.
- 4.3.2.** Remove at least two of the tie rods (13) positioned on the upper part of the cylinder by unscrewing the nuts on the sides of the end flange and of the head flange (or unscrewing the tie rods from the head flange if threaded into the flange.) This operation provides two free holes to be used for lifting the end flange (9). Screw two male eyebolts in these two holes and connect the end flange to a lifting system. Care should be taken to choose a lifting system suitable for the weight of the cylinder. Refer to the weight table shown in Table 7. Remove all other tie rods (13), following the same procedure described herein. Then remove the end flange (9) from the tube (12).
- 4.3.3.** Finally, remove the tube (12). Take care not to scratch or dent the honed and plated inner surface of the tube. Remove the O-rings (10) from the head flanges; remove the O-ring of the piston (15) and finally the guide tapes (5) from the piston. Clean all surfaces of piston and flanges in contact with these components with rag and solvent. Brush the O-ring grooves with a light oil film and install the new O-rings. Spread a thin layer of grease on the bottom of the guide tape grooves and install the new guide tapes (5). Clean the internal surface of the tube (30) and lubricate with a protective oil film.
- 4.3.4.** Reassemble the parts of the cylinder with the reverse procedure as described from point 4.3.1 to 4.3.3. The tie rods should be tightened using a torque wrench, alternating between opposite holes, applying a torque according to Table 9. Readjust the stops as instructed in paragraph 3.1.1.



**NOTE:** After the maintenance steps described above, stroke the actuator manual override a few times to check for proper operation.



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#### 4.4. SERVICE KITS

Spare Parts of both Mechanical and Hydraulic Manual Overrides are listed in the tables below. Spare parts are only supplied upon request. For spare part and any other additional detailed instruction, please contact your local Flowserve Limatorque Representative.

*Table 1 – Spare Parts of Enclosed Jack Screw Manual Override Installed on Single-Acting Actuator*

NUMBER	DESCRIPTION	QTY.		NUMBER	DESCRIPTION	QTY.	
1	LOCKING FLANGE	1		11	ROTATION WASHER	1	x •
2	POWER SCREW NUT	1		12	BUSHING	1	
3	TRAPEZOIDAL SCREW	1		13	SOCKET SCREW	1	
4	SLIDING BLOCK	1		14	HOUSING	1	
5	WASHER	1	x •	15	HANDWHEEL	1	
6	O-RING	1	x •	16	STOPPER	1	
7	O-RING	1	x •	17	RING	1	
8	PIN	2		18	GASKET	1	x •
9	AXIAL NEEDLE ROLLER	1	x •	19	END NUT	1	
10	AXIAL NEEDLE ROLLER	1	x •	20	PIN	1	

*Table 2 – Spare Parts of Enclosed Jack Screw (Declutchable) Manual Override Installed on Double-Acting Actuator*

NUMBER	DESCRIPTION	QTY.		NUMBER	DESCRIPTION	QTY.	
1	BOTTOM DISK	1		16	REDUCTION	1	
2	CENTRAL BODY	1		17	LEVER	1	
3	AXIAL NEEDLE ROLLER	2	x •	18	TRAPEZOIDAL SCREW	1	
4	LOCKING FLANGE	1		19	STOP BOLT CAP	2	
5	O-RING	1	x •	20	O-RING	2	x •
6	NIPPLE	1		21	O-RING	1	x •
7	CAM DISK	1		22	GRUB SCREW	1	
8	PLATE	1		23	WASHER	4	
9	O-RING	1	x •	24	HANDWHEEL	1	
10	SOCKET SCREW	10		25	STOPPER	1	
11	POWER SCREW NUT	1		26	RING	1	
12	POWER SCREW NUT	1		27	GASKET	1	x •
13	PIN	2		28	END NUT	1	
14	SCREW	1		29	PIN	1	
15	O-RING	1	x •				

X Maintenance spare parts

- Spare parts that can be replaced without removing the actuator from the valve

\*\* Variable number depending on model

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Table 3 – Spare Parts of Not Enclosed Jack Screw Manual Override

NUMBER	DESCRIPTION	QTY.		NUMBER	DESCRIPTION	QTY.	
1	SOCKET SCREW	1		7	POWER SCREW STOPPER	1	x •
2	BUSHING	1		8	GASKET NUT ASSEMBLY	1	x •
3	ROTATION WASHER	1	x •	9	HANDWHEEL	1	
4	ROTATION WASHER	1	x •	10	WASHER	1	
5	O-RING	1	x •	11	HEX SCREW	1	
6	TRAPEZOIDAL SCREW	1	x •				

Table 4 – Spare Parts of Bevel Gear Manual Override

NUMBER	DESCRIPTION	QTY.		NUMBER	DESCRIPTION	QTY.	
1	LOCKING FLANGE	1		14	O-RING	1	x •
2	GEARBOX	1		15	O-RING	1	x •
3	POWER SCREW NUT	1		16	INNER BUSHING	1	x •
4	HOUSING	1		17	OUTER BUSHING	1	x •
5	KEY	2		18	CLOSING BUSHING	1	
6	SOCKET SCREW	4		19	O-RING	1	x •
7	TRAPEZOIDAL SCREW	1		20	PIN	2	
8	ROTATION WASHER	1	x •	21	HANDWHEEL	1	
9	ROTATION WASHER	1	x •	22	STOPPER	1	
10	BUSHING	1		23	RING	1	
11	SOCKET SCREW	1		24	GASKET	1	x •
12	SLIDING BLOCK	1		25	END NUT	1	
13	O-RING	1	x •	26	PIN	1	

Table 5: Spare Parts of Hydraulic Manual Override: Hydraulic Cylinder Assembly

NUMBER	DESCRIPTION	QTY.		NUMBER	DESCRIPTION	QTY.	
1	CYLINDER HEAD FLANGE	1		9	CYLINDER END FLANGE	1	
2	PISTON ROD	1		10	O-RING	2	X •
3	O-RING	1	X •	11	ANTI-EXTRUSION RING	2	X •
4	PISTON	1		12	TUBE	1	
5	TAPE GUIDE	2	X •	13	TIE ROD	4**	
6	SPLIT RING	1		14	SPIRAL RETAINING RING	2	
7	STOP BOLT ASSEMBLY	1		15	PISTON SEAL	1	X •
8	HEX NUT (HIGH)	4**		16	SPLIT RING	1	

X Maintenance spare parts

• Spare parts that can be replaced without removing the actuator from the valve

\*\* Variable number depending on model

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Table 6 – Spare Parts of Hydraulic Manual Override: Hydraulic Pump Assembly

NUMBER	DESCRIPTION	QTY.		NUMBER	DESCRIPTION	QTY.	
1	PUMP TANK END FLANGE	1		16	MANIFOLD MOUNTING VALVE	1	
2	PUMP TANK TUBE	1		17	INNER HEXAGON PLUG PACKING RING	3	
3	BASE PLATE	1		18	WASHER	2	
4	PUMP FITTING MALE	2		19	INNER HEXAGON PLUG PACKING RING	1	x •
5	PUMP ELBOW FITTING	2		20	PLUG	1	
6	THREADED ROD	2		21	SOCKET SCREW	4	
7	BALL VALVE ADAPTOR	1		22	STRAIGHT FITTING	1	
8	PUMP DRAIN FITTING	1		23	PIPE	1	
9	SOCKET SCREW	6		24	HOSE CLIP	1	
10	O-RING	2	x •	25	RILSAN PIPE	1	
11	O-RING	1	x •	26	O-RING	2	x •
12	O-RING	4	x •	27	FEMALE PLUG	2	x •
13	O-RING	1	x •	28	HAND PUMP	1	
14	O-RING	1	x •	29	O-RING	1	x •
15	HEX SCREW	6		30	BRACKET	1	

X Maintenance spare parts

- Spare parts that can be replaced without removing the actuator from the valve

\*\* Variable number depending on model



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#### ACTUATOR SIZE

		15	20	25	30	35	40	50
HYDRAULIC CYLINDER SIZE	050	10 (22)	12 (26)	-	-	-	-	-
	055	12 (26)	14 (31)	-	-	-	-	-
	060	16 (35)	18 (40)	-	-	-	-	-
	065	21 (45)	26 (57)	-	-	-	-	-
	075	21 (46)	28 (61)	34 (75)	-	-	-	-
	080	23 (50)	27 (60)	37 (81)	41 (91)	-	-	-
	085	25 (54)	29 (63)	39 (85)	44 (97)	-	-	-
	090	27 (59)	32 (70)	40 (89)	44 (98)	-	-	-
	100	-	36 (79)	45 (100)	60 (133)	-	-	-
	110	-	38 (85)	48 (105)	68 (150)	121 (267)	-	-
	120	-	50 (111)	63 (139)	78 (172)	128 (283)	-	-
	130	-	-	89 (196)	88 (194)	143 (315)	138 (305)	-
	140	-	-	92 (204)	91 (201)	150 (330)	148 (327)	-
	145	-	-	96 (212)	93 (204)	155 (342)	154 (339)	-
	150	-	-	-	95 (208)	161 (354)	159 (351)	-
	160	-	-	-	97 (214)	171 (376)	170 (374)	-
	170	-	-	-	101 (222)	180 (397)	230 (507)	-
	180	-	-	-	-	203 (448)	263 (579)	318 (701)
	200	-	-	-	-	241 (530)	390 (860)	338 (745)
	220	-	-	-	-	264 (582)	429 (946)	377 (831)
240	-	-	-	-	280 (617)	449 (990)	468 (1032)	
250	-	-	-	-	-	488 (1075)	501 (1105)	
260	-	-	-	-	-	507 (1118)	551 (1215)	
280	-	-	-	-	-	552 (1216)	585 (1290)	
290	-	-	-	-	-	-	620 (1367)	
300	-	-	-	-	-	-	655 (1444)	
320	-	-	-	-	-	-	690 (1521)	
340	-	-	-	-	-	-	725 (1598)	
350	-	-	-	-	-	-	760 (1676)	

Table 7: Hydraulic cylinders weights [kg (lb)] – (the weight does not include the oil that has to be removed before disassembling)

Screws	Torque [Nm]
M3	1,1
M4	2,5
M5	5,0
M6	8,6
M8	21
M10	42
M12	72
M14	116
M16	180
M18	250
M20	354
M22	487
M24	609

Screws	Torque [Nm]
M27	901,0
M30	1222,0
M33	1660,0
M36	2131,0
M39	2766,0
M42	3414,0
M45	4273,0
M48	5161,0
M52	6646,0
M56	8277,0
M60	10283,0
M64	12373,0

Table 8: Tightening Torques for Screws Class 8.8 or ASTM A193 B7 /A320 L7 with metric coarse thread, without application of threads Lubricant, screwed in steel components (IMPORTANT: Tie Rods Excluded)



**CAUTION:** In case of screws made of materials differing from the ones indicated in caption (e.g. stainless steel) don't refer to Table 8. Please contact Flowserve for the correct tightening torques to be applied.

Tie Rods Diameter	Torque [Nm]
M12	60
M16	135
M20	280
M24	470
M27	750
M30	1000
M33	1280
M36	1650

Table 9: Tightening Torque Table for Hydraulic Cylinder Tie Rods, without application of Threads Lubricant.







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