

rotork®

Keeping the World Flowing
for Future Generations



LH/S range

Installation, commissioning
and maintenance manual

Single-acting hydraulic actuators



Contents

Section	Page	Section	Page
1. Introduction	03	11. Removal from valve	10
2. Standards and regulations	03	12. Operation	11
3. General information	04	12.1 Description	11
4. Health and safety	05	12.2 Manual override	12
4.1 Residual risks	05	12.3 Linear stroke setting	15
4.2 Thermal risks	05	12.4 Hydraulic power supply	16
4.3 Noise	05	12.5 Hydraulic connections	16
4.4 Health risks	05	12.6 Electrical connections	16
4.5 Mechanical risks	05	12.7 Start up	17
5. Labels and nameplates	05	13. Dismantling and disposal	18
6. Operating limits	06	14. Rotork sales and service	18
6.1 Allowed fluid types	06	15. Periodic maintenance	19
6.2 Expected lifetime	06	16. Troubleshooting	20
6.3 Tightening torque chart	06	17. Grease and hydraulic oil specification	21
7. Handling & lifting	07	17.1 Grease	21
7.1 Handling	07	17.2 Hydraulic oil	22
7.2 Lifting recommendations	07	18. Dismantling and disposal	25
7.3 Lifting instructions	07		
8. Storage	08		
9. Long-term storage	08		
10. Installation on valve and earthing	09		
10.1 Preliminary actions	09		
10.2 Instructions	09		
10.3 Assembly configurations	10		

This manual contains important safety information. Please ensure it is thoroughly read and understood before installing, operating or maintaining the equipment.

Rotork reserves the right to modify, amend and improve this manual without notice.

Rotork is not responsible for damage or injury caused by the failure to observe the instructions contained herein.

The name Rotork is a registered trademark. Rotork recognises all registered trademarks. Published and produced in the UK. POLJB0726. © Rotork 2026 all rights reserved. Rotork reserves the right to amend and change specifications without prior notice. For the latest version visit [rotork.com](https://www.rotork.com)

1. Introduction

This manual is produced to enable a competent user to install, operate, adjust, inspect, maintain, dismantle and dispose Rotork LH/S series actuators.

Work safety implies the observance of all the safety warnings and instructions contained herein.

All Rotork actuators are tested prior to dispatch. Project documentation is shipped with the actuator.

Up-to-date general information on Rotork products is available on our website www.rotork.com.

In this manual, warning indications are represented by icons, according to ISO 7010 Safety Signs:



Generic danger



Hand crush/pinch point



Electrocution



Explosive material



Toxic substance

Customer service

For technical assistance, please contact Rotork customer service:

E-mail: rfs.international@rotork.com

Rotork, Via Padre Jacques Hamel, 138B, Porcari, Lucca, 55016, IT. Tel: +39 0583-222-1

Rotork plc, Brassmill Lane, Bath, UK. Tel +44 (0)1225 733200

When contacting customer service, specify the serial number and the actuator model.

This information is visible on the nameplate located on the adapter spool (See Section 5). Customer service can then quickly identify the supplied actuator.

Rotork offers a vast range of services, such as preventive maintenance, revision of actuators or training.

2. Standards and regulations

Actuators destined for European member states and for the United Kingdom have been designed, built and tested according to the quality control system, in compliance with the EN ISO 9001:2015 and with the following regulations/directive and standards:

- 2006/42/EC: Machinery Directive (MD)
- S.I. 2008 No. 1597: The Supply of Machinery (Safety) Regulations 2008
- 2014/68/EU: Pressure Equipment Directive (PED)
- S.I. 2016 No.1105: Pressure Equipment (Safety) Regulations 2016 (PE(S)R)
- 2014/34/EU: Directive for safety equipment and systems to be used in potentially explosive atmospheres (ATEX)
- S.I. 2016 No. 1107: The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016
- 2014/30/EU: Electromagnetic Compatibility Directive (EMC)
- S.I. 2016 No. 1091: Electromagnetic Compatibility Regulations 2016
- BS EN ISO 12100: Machinery Safety Directive
- BS EN 60079-14: Explosive atmospheres - Part 14: Electrical installations design, selection and erection
- BS EN 1127-1: Explosive atmospheres - Explosion prevention and protection - Basic concepts and methodology
- BS EN ISO 80079-36: Non Electrical equipment for explosive atmospheres - Basic methods and requirements
- BS EN ISO 80079-37: Non-electrical equipment for explosive atmospheres - Non-electrical type of protection construction safety "c", control of ignition "b", liquid immersion "k"
- IEC 60079-46: Explosive atmospheres - Part 46: Equipment assemblies
- BS EN ISO 7010: Safety Signals
- BS EN 13445: Unfired Pressure Vessel

3. General information

This manual is produced to enable a competent user to install, operate and maintain the Rotork LH/S single-acting actuator.

The mechanical installation must be carried out as outlined in this manual and in accordance with any relevant national standard codes of practice.

Maintenance and operation must be carried out in accordance with the National Legislation and Statutory Provisions relating to the safe use of this equipment, applicable to the site of installation.

Any inspection or repair in a hazardous area must not be undertaken unless it conforms to National Legislation and Statutory Provisions relating to the specific hazardous area.

Only Rotork-approved replacement parts should be used. Under no circumstances should any modification or alteration be carried out on the equipment, as this could invalidate the conditions under which its certification was granted.

Only trained and experienced operators can install, maintain and repair Rotork actuators. Work undertaken must be carried out in accordance with instructions in this manual. The user and those persons working on this equipment must be familiar with their responsibilities under any statutory provisions relating to the health and safety of their workplace.

Operators must always wear appropriate Personal Protective Equipment (PPE) in line with the existing plant regulations.

Appropriate usage

Rotork LH/S range actuators have been specifically developed to automate quarter-turn valves, such as ball valves, butterfly valves or plug valves installed on pipelines for oil & gas transport and distribution.

⚠ Improper use can damage the equipment or cause dangerous situations for health and safety. Rotork declines any responsibility for damage to people and/or objects resulting from the use of the equipment for applications different from those described in the present manual.

⚠ Hazardous area usage: Only use devices approved for hazardous area use. These devices will have an EX type label fixed to them. Before installation and operation in a potentially explosive atmosphere, read and follow the information and instructions on the EX label and any additional EX instructions in the documentation received with the device.

IECEx certification

The IECEx EUT 25.0021X Certificate of Conformity (CoC) only covers non-electrical actuators described here. Any kind of assembly created by the end user or electrical accessories are not covered by this CoC.

The end user must follow special conditions for safe use detailed in document PUB010-046.

IECEx marking of LH actuators is as follows:

Ex h IIC T5 Gb

Ex h IIIC T100°C Db

Tambient down to -40°C, up to +100°C

Please refer to the actuator IECEx nameplate.

4. Health and safety

Before installing the equipment, verify it is suitable for the intended application. If unsure consult Rotork.

4.1 Residual risks

Residual risks resulting from equipment risk evaluation performed by Rotork.

4.2 Thermal risks

Risk	Hot/cold surface during normal operation (RES_01).
Preventive measures	Operators should wear protective gloves.

4.3 Noise

Risk	Noise >85 dB during operation (RES_05).
Preventive measures	Operators must wear ear protections. Operators must not stand near the equipment during operation.

4.4 Health risks

Risk	Pressurised fluid ejection during normal operation (RES_02).
Preventive measures	All fittings must be properly sealed. All fixing clamps must be correctly tightened and sealed.
Risk	Risk of intoxication (according to the type of medium utilised) (RES_06).
Preventive measures	Operators must use PPE and any other equipment (breathing apparatus) based on the type of supply medium.

4.5 Mechanical risks

Risk	Uncontrolled movement (remote operation) (RES_03). (This risk is applicable only for actuators provided with control panel).
Preventive measures	Ensure that the actuator cannot be operated remotely. Prior to starting, remove the hydraulic supply, vent all pressure vessels, and remove electrical power.
Risk	Presence of moving parts (centre body, valve adapter) (RES_04)
Preventive measures	Do not perform start-up or test the actuator if the cylinder tube is removed.
Risk	Loss of stability with possible parts projection (RES_08).
Preventive measures	Do not disassemble the actuator in case of malfunctioning. Follow instructions in the present manual and contact Rotork.
Preventive measures	Foresee periodic maintenance procedure to verify tightening.
Risk	Presence of potential energy (RES_10) during dismantling.
Preventive measures	Do not disassemble the actuator during dismantling. Follow instructions in the present manual and contact Rotork.

5. Labels and nameplates

The following label is applied externally to the actuator:

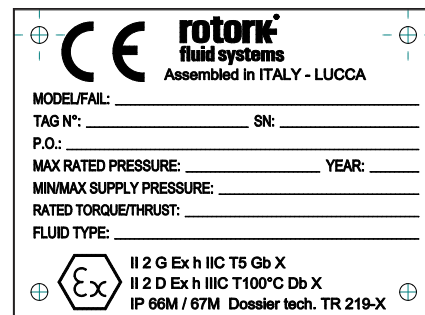


Fig 5.1 Actuator ATEX label

EX type of protection: constructional safety "c".

T5 temperature class is provided even if the actuator has no internal heat source. The maximum actuator temperature is near the environmental or exercise fluid temperature, whichever is the greater. The normal operating temperature range is -30 to +100 °C (-22 to +212 °F). The temperature range is specified within the project-specific technical documentation. Special applications out of the normal range are available upon request.

EX plate does not indicate the maximum environmental and/or exercise fluid temperature; this information is reported within the project-specific technical documentation.

For CE (PED) marked actuator the following label is also used:

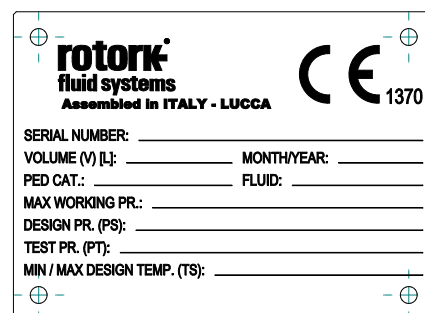


Fig 5.2 Actuator PED label

Label removal is not allowed.

6. Operating limits

- Temperature: -30 to +100 °C (-22 to +212 °F) for standard applications, with NBR seals.
-20 to +100 °C (-4 to +212 °F) for PED applications, with NBR or FKM seals.
-40 to +100 °C (-40 to +212 °F) for low temperature applications, PED or not, with fluorosilicone seals.
-60 to +100 °C (-76 to +212 °F) for ultra-low temperature applications, with fluorosilicone seals.
- Design pressure: Up to 207 barg. Other design pressure options, available upon request.
- Operating pressure: Up to design pressure.

⚠ Do not use the equipment outside its operating limits. Verify the operating limits on the nameplate.

Prevent external surface temperature to reach the ignition point in potentially explosive environments.

The actuator surface temperature is strictly dependent on the temperature of the process fluid used and by the irradiation's conditions. The end-user must check the surface temperature of the assembly, so that this cannot go over the minimum gas ignition's temperature, which classifies the area with the explosion's risk.

Dust and debris accumulated on the actuator will slow down its cooling and contribute to the increase of its external temperature.

⚠ Do not use the actuator in presence of naked flames.

6.1 Allowed fluid types

LH/S actuators are designed to be operated with hydraulic oil ISO 4406 class 17/15/12.

6.2 Expected lifetime

The expected lifetime is at least 25 years, in normal service conditions and with planned maintenance.

6.3 Tightening torque chart

RECOMMENDED TIGHTENING TORQUE (Class 8.8 bolts)		
Bolt size	Nm	lbf.ft
M6	8.5	6
M8	20	15
M10	40	30
M12	55	40
M14	110	81
M16	220	162
M20	430	317
M22	425	313
M24	585	431
M27	785	579
M30	1250	921
M33	1400	1030
M36	1750	1290

⚠ This tightening torque table is not applicable to Section "Valve assembly". When installing actuator on the valve, tighten bolts or nuts of the connecting stud bolts to the correct torque, in accordance with the size and material characteristics of the bolts installed by the customer.

7. Handling & lifting

7.1 Handling

The actuator is supplied packed on pallets suitable for normal handling. Handle the actuator with care to avoid damaging the actuator assembly. Never stack pallets.

⚠ Only trained and experienced personnel should attempt to handle/lift the actuator

7.2 Lifting recommendations

Lift the actuator using the double chain slings; harness the actuator as shown in Figure 7.2. Adjust the chains to keep the actuator in vertical position.

- The lifting device and the sling must be suitably rated for the actuator weight and dimensions
- The sling must be in a good state at all times, to prevent injuries and/or accidents. Do not use damaged sling
- The sling must not be shortened with knots or bolts or any other makeshift device; hooks that make part of the slings should always be used for shortening
- For lifting purposes, use only suitable lifting tools
- Do not drill holes, weld eye bolts or add any other type of lifting device on the actuator external surface
- Do not lift the actuator and valve combination with the actuator lifting lugs. Only lift the actuator/valve assembly using the valve lifting lugs
- Avoid pulls or abrupt movements during lifting. Avoid pushing the load
- During lifting operations, do not handle the slings and/or the actuator

⚠ Do not step underneath suspended load.

7.3 Lifting instructions

NOTE: Actuator weight, dimensions and the centre of gravity are contained within the documentation supplied for the specific job. Personnel operating the actuator or parts of it must consult all the documentation before performing any operations.

For non-vertical actuator orientation, please consult project specific documentation before lifting.

- Prior to lifting the actuator, remove electrical power and vent all pressure vessels (if present)
- Angle β must be between 0° and 45° as shown in Figure 7.1

⚠ The actuator must remain vertical; balance the load. Use only main lifting lugs.

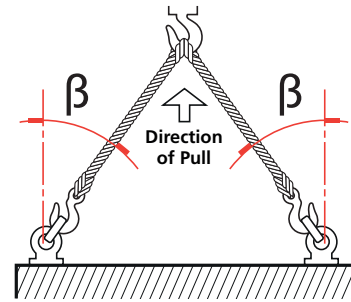


Fig 7.1 Lifting angle



Fig 7.2 Actuator lifting

8. Storage

Rotork actuators have been fully tested before leaving the factory.

In order to keep the actuator in good condition until installation, at least the following measures are recommended:

- Check presence and assembling of dust plugs
- Store in a dry, well-aired place. Avoid long-term direct exposure to sunlight
- Keep the actuator on shipping pallet until installation

 **Never put the actuator directly on the ground.**

- Actuator must be positioned with the centre body cover upwards
- Protect the valve coupling area (adapter flange and coupling joint, etc.) with rust preventive oil e.g. Mobilarma LT or equivalent
- Protect against weather action, covering the actuators with appropriate polyethylene sheets
- Check the actuator condition every six months and verify the above protection measures remain in place

 **Remove packaging only at the installation time.**

 **Actuator vent ports must be protected with polyethylene sheet to prevent water ingress during storage.**

9. Long-term storage

If long term storage is necessary, further operations must be carried out to maintain the actuator in a good working condition:

- Replace the plastic plugs with metal plugs
- Store in a dry, well-aired place. Avoid longterm direct exposure to sunlight
- Stroke the actuator every 12 months

IMPORTANT – The hydraulic power unit, the hydraulic pipe and the fitting used for operating the actuator must be flushed and cleaned to ISO 4406 Class 17/15/12 prior to connecting to the actuator.

- Cycle the actuator with a hydraulic oil supply, ISO 440, CLASS 17/15/12 as minimum cleanliness level, to the working pressure indicated on the name plate
- Cycle the actuator with all the existing controls (i.e. two complete strokes - one open, one closed) at least 5 times
- Cycle the actuator fitted with hydraulic manual override by means of the override for 4 complete strokes
- Disconnect the hydraulic and electric (if present) supply from the actuator, and carefully close all the threaded connections of the actuator
- Remove electrical components covers (if present) to ensure control terminals are clean and free from oxidation and humidity. Reassemble the covers
- In case of storage for over 12 months prior to installation, it is recommended to operate the actuator to verify correct operation

10. Installation on valve and earthing

Before proceeding, read and understand the Health and Safety information.

Note: The valve should be properly secured prior to performing the following operations according to instructions provided by the Valve Manufacturer.

⚠ Prior to performing any operations check the operating drawings and TAG numbers.

Consult Rotork for any additional information.

10.1 Preliminary actions

⚠ Verify the EX classification of the actuator is compatible with the plant zoning. Refer to actuator nameplate. The end user shall guarantee the valve earthing and the equal voltage potential between the valve and the actuator.

- The centreline of the cylinder is usually perpendicular to the centreline of the associated pipe work
- Ensure all fasteners are adequately tightened, to avoid loosening during operation, considering the vibrations induced by the dynamics of the pipeline
- Piping used to provide power to the actuator must be free from contaminants and debris. Ensure tubing runs are adequately fastened and supported to minimize repetitive stress induced the dynamics of the pipeline. Ensure there are no leaks from any gas connections. Tighten as required

10.2 Instructions

The actuator assembly on valve can be performed using an adapter and a coupling joint between the actuator and the valve.

The assembly position of the actuator must be in accordance with the actuator design, plant requirements and the valve model.

Installation must be performed by qualified personnel.

⚠ Hands must be kept away from the coupling area.

To assemble the actuator onto the valve, proceed as follows:

- Actuator is supplied in the fail position (for single-acting). Set the valve in the right position per the actuator fail position. Check the position of the actuator by means of the actuator stem position or on the limit switch box (if present)
- The actuator is supplied with the spool piece installed – do not remove it
- Clean the valve and actuator coupling flanges, removing anything that might prevent electrical connection and adherence to the actuator flange interface: grease and paint residuals must be completely removed, if present
- Place the valve in a vertical position

Standard coupling is constituted by the following standard parts (see Fig 10.1):

- Actuator side joint
- Coupling clamp
- Ring
- Screws

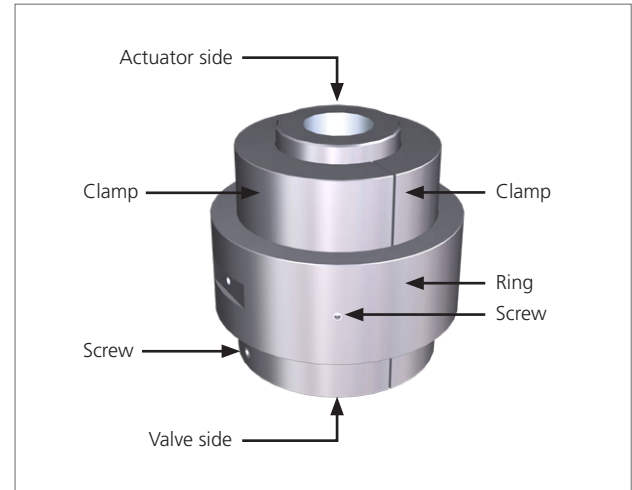


Fig 10.1 Standard coupling parts

- Fasten the actuator side joint on the actuator stem
- Fasten the valve side joint on the valve stem
- Lift the actuator according to instructions in section 7
- Place the ring on the actuator stem holding it with the hand and lower the actuator on the valve – the two joints are now in touch
- Place the two clamps on the joints
- Lower the ring in position and fasten all the screws
- Clean and degrease the coupling bolts, stud bolts, nuts and the threads on adapter spool bottom flange (if stud bolts are not installed). Apply a thin layer of thread sealing product (Loxseal 55.03 or equivalent Loctite 243) on threaded connection
- Tighten bolts or nuts between actuator spool piece and valve top flange to the correct torque, in accordance with the size and material characteristics of the LH bolts installed by the customer

⚠ Support the actuator until fully installed and fixing bolts are correctly tightened.

- Check for possible damage to the paint-work and repair if necessary, according to painting specification

⚠ Attention: End user should verify the electrical correctness of coupling, performing a standard continuity test between actuator and valve.

10. Installation on valve and earthing *continued*

10.3 Assembly configurations

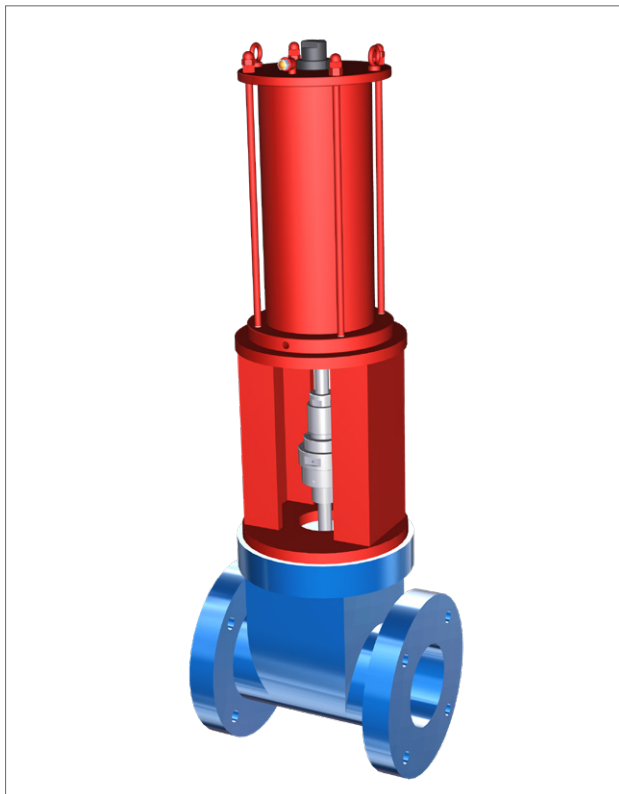


Fig 10.2 Actuator/valve assembling example

11. Removal from valve

The end user is in charge of removing the actuator from the valve.

⚠ Removal shall be performed only by qualified staff, wearing/using appropriate personal protection devices.

⚠ Do not remove the actuator if the valve is blocked in the intermediate position. Contact Rotork customer service.

To disassemble the actuator from the valve, proceed as follows:

- Cut off electrical power supply
- Cut off pneumatic supply
- Release any pressure from the control group
- Remove the supply pipes from the actuator
- Remove control and signal lines from electric components (if any)
- Sling the actuator in line with the instructions given in section 7
- Unscrew bolts or nuts from the stud bolts fixing the actuator to the valve
- Lift and remove the actuator from the valve

12. Operation

The following instructions must be followed and integrated into end user safety program when installing and using Rotork products. Read and save all instructions prior to installing, operating and servicing this product.

Follow all warnings, cautions and instructions marked on and supplied with the product.

Install equipment as specified in Rotork installation instructions and as per applicable local and national codes of practice. Connect all products to the proper hydraulic supply line.

When replacement parts are required, ensure that the qualified service technician uses only replacement parts specified by Rotork.

Substitutions will invalidate any hazardous area certification and may result in fire, electrical shock, other hazards or improper operation.

12.1 Description

The LH/S range actuators are hydraulic single-acting, spring-return actuators specifically designed to operate gate or globe valves.

Actuator design characteristics are shown on the data plate attached to the actuator itself.

These actuators can be assembled in a 'spring down' (LH/SD) or in a 'spring up' (LH/SU).

Model LH/SD: oil retracts the actuator stem; spring extends it.

Model LH/SU: oil extends the actuator stem; spring retracts it.

These actuators can be fitted with an emergency manual override suitable to operate the actuator in the event of fluid supply failure. This device is of hydraulic type, operated using a hydraulic hand pump.

Valve Gate Action	Actuator version	
	LH/SD	LH/SU
Direct Acting	Fail Close	Fail Open
Reverse Acting	Fail Open	Fail Close

The main components of these units are the following (See Figure 12.1):

- A **hydraulic cylinder**, made of carbon steel.

The cylinder tube is electroless nickel-plated internally, to assure perfect dynamic seal, corrosion resistance and low friction. Carbon steel piston with dynamic floating seal and guide sliding rings allow for friction reduction which avoid sticking, even after long standstill periods.

A chromium-plated piston rod ensures a perfectly dynamic seal, corrosion resistance and low friction. The piston rod is supported by bushing made of bronze and Teflon to reduce friction and to guarantee a long operating life.

- A **spring cartridge** consisting of an enclosure containing a frame assembled spring package that prohibits the spring from extending beyond a pre-set length. The container allows safe installation and removal of the whole cartridge assembly.
- An **adapter spool** open type made in carbon steel, with bottom flange machined according to the valve flange. Spool is removable from the cylinder. The open adapter allows for easy visual position indication and is suitable for installing a limit switch box, junction box etc.
- A **connecting joint** made of nickel-plated carbon steel for mating the actuator piston rod to the valve stem.

An optional coupling, with hammer blow effect that facilitates release of wedge gate valves, is available upon request.

Upon request, LH/S range actuators can be equipped with additional accessories (mechanical travel stoppers, limit switch boxes, positioners, position transmitters, etc.).

Use only control devices supplied by Rotork.

⚠ Installation of any accessory on the bare actuator must preserve the actuator ingress protection level.

⚠ Installation must be performed according to IEC 60079-14 and the end user must follow special conditions for safe use detailed in document PUB010-046.

⚠ The IECEx EUT 25.0021X Certificate of Conformity (CoC) only covers non-electrical actuators described here. Any kind of assembly created by the end user or electrical accessories are not covered by this CoC.

The end user must follow special conditions for safe use detailed in document PUB010-046.

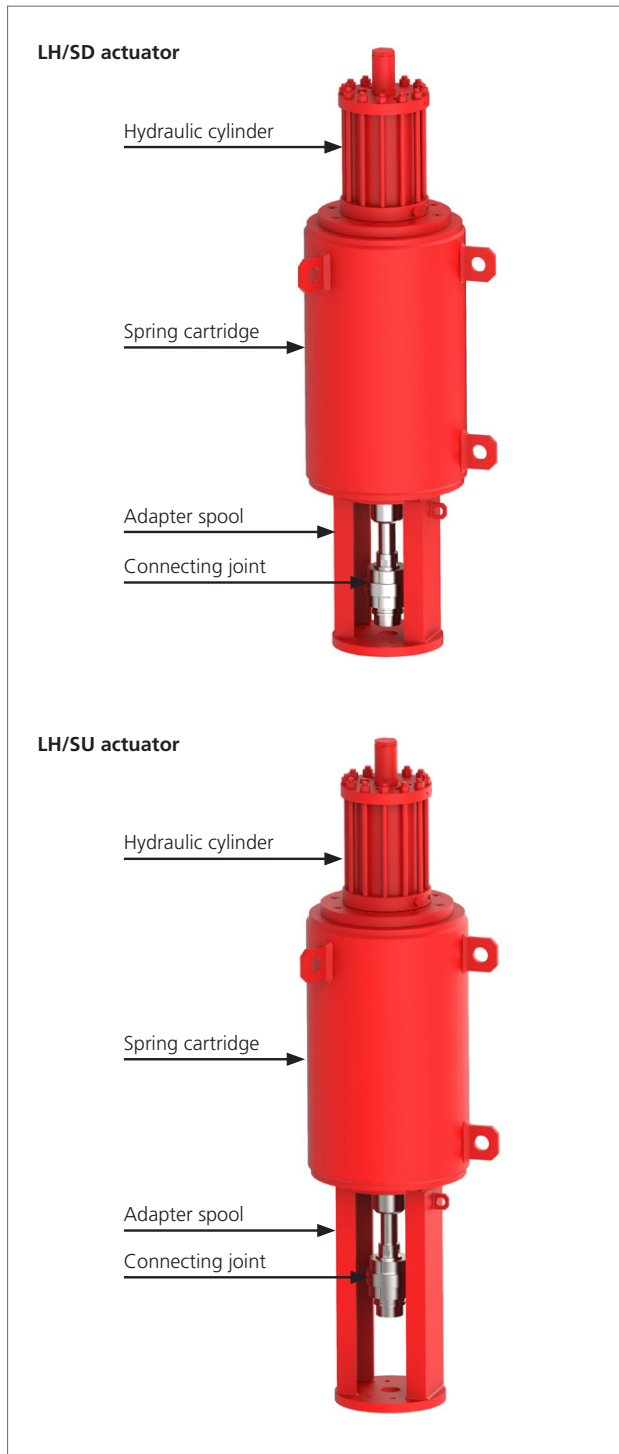


Fig 12.1 LH/S Actuator basic components

12.2 Manual override

The LH/S range actuator can be fitted with a hydraulic manual override (HPA type) suitable to operate the valve in case of fluid supply failure.

⚠ A maximum operating time of the manual override of 24 hours, for maintenance or testing, is recommended.

Note: The use of manual override is not recommended in SIL applications. If it is necessary, strictly follow instructions reported in this paragraph.

Description

Refer to Fig 12.2. The unit consists of two main components:

- The pump/tank assembly (1, 3, 4, 5)
- 3/2 Local/remote selector valve (present in the proximity of the actuator hydraulic cylinder supply port)

The hand pump (1) supplies high-pressure fluid to the hydraulic cylinder that will stroke the actuator and compress the spring.

The local/remote selector valve is used to select between remote/manual operation.

Installation

The oil tank must be installed in a vertical position with respect to the floor. The fill port/breather, on the top of the pump tank, must be turned upward to avoid any oil discharge from the fill port/breather of the tank.

Note: Before starting-up the actuator with a hydraulic override, check if the plug, on the top of the pump tank, has been replaced with a breather to prevent oil discharge from the tank during shipment.

If not, replace the plug with the breather.

Proper oil level) is approximately 25 mm (1") below the fill/breather port.

Oil level should be checked with the tank in a vertical position and with the actuator in fail position (spring decompressed).

Filling procedure

- Remove the oil supply to the actuator so that the spring decompresses
- Position the local/remote selector valve for manual operation
- Remove the breather located in the left rear corner on the top of the tank
- Verify if the oil level in the tank is regular. In case the tank of the manual override has been supplied without oil, fill it up from the fill port/breather (2.5) up to 25 mm (1") below the port

Important: Do not exceed this fluid level.

- Position the local/remote selector valve for manual operation
- Close the stop valve (5) and verify that the manual holding valve (4) is open
- Install the pump lever and operate the pump to compress the spring until the actuator reaches the end of stroke
- Ensure the oil level in the tank does not drop below the intake tube
- Let the cylinder under pressure for three to five minutes, so that all air is exhausted and the oil settles down
- Slowly open the stop valve (5) by turning the valve handle counter-clockwise to allow the spring release until the actuator reaches the original position
- Repeat the pump operation procedure two to three times
- Reinstall the tank breather and return the pump handler to the storage holder

Operation with hydraulic pump

To operate the actuator with the hydraulic override it is necessary to operate the local/remote selector valve in the manual position (switch position), open valve (4) and close valve (5).

Operate hand pump (1) to stroke the actuator and spring compresses.

When the actuator has reached the desired operating position, it can be locked by closing valve (4).

Open valves (5 & 4) until the spring releases and actuator reaches the original position.

To return the actuator to remote control, move valve handle (4) in the remote position.

Important: For the correct operation of the manual override, move valves (4) and (5) in the fully open position, before placing the local/remote selector valve in remote position, in order to discharge cylinder oil into the tank. This will prevent the draining of the tank. After that, the selector valve can be put in the remote position.

⚠ After each use, verify that the manual override has been disengaged before returning to remote operation.

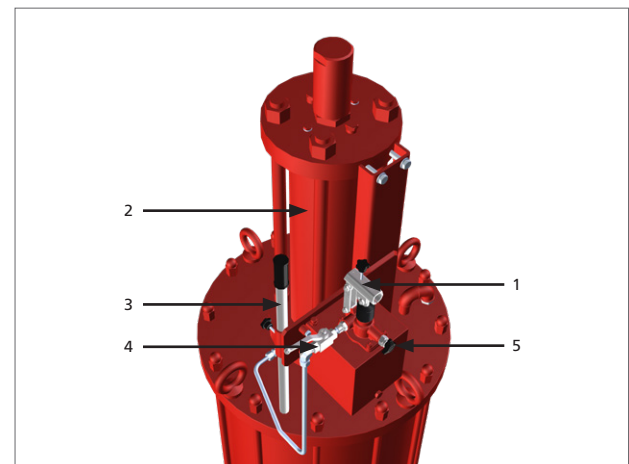
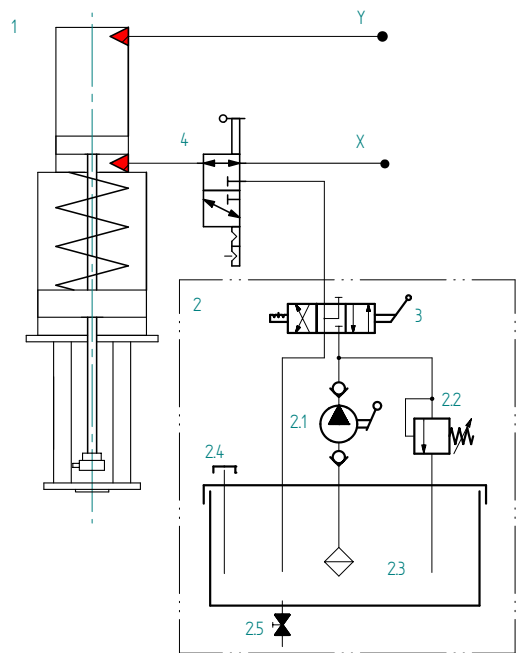


Fig 12.2 Type HPA manual override



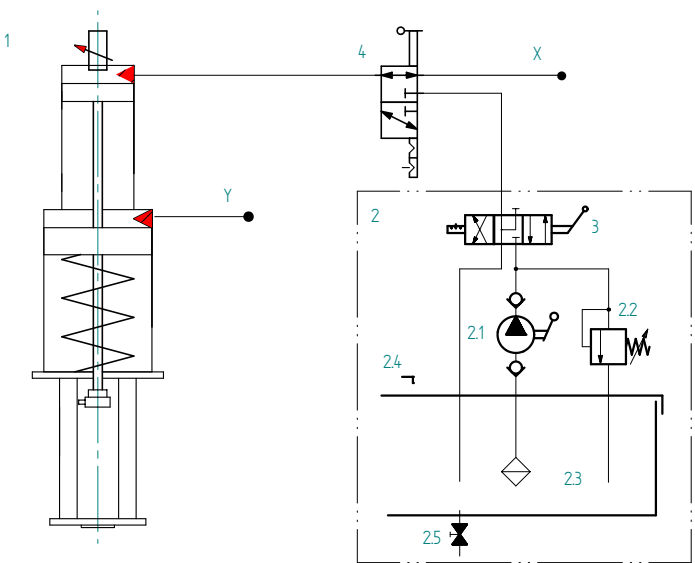
- TABLE A - 3/2 MANUAL VALVE (POS 4) - OPERATING POSITIONS -		
POSITION	VALVE CONFIGURATION	DESCRIPTION
1		- MANUAL OVERRIDE ENABLED - HYDRAULIC HAND PUMP OPERATED TO OPEN/CLOSE VALVE/ACTUATOR - REMOTE OPERATION EXCLUDED
2		- NORMAL POSITION FOR REMOTE OPERATION - MANUAL OVERRIDE EXCLUDED

Description

1. Single-acting hydraulic actuator spring-down
2. Hydraulic manual override assembly
 - 2.1 Hand pump
 - 2.2 Relief valve (factory set)
 - 2.3 Oil tank
 - 2.4 Fill port/breather
 - 2.5 Drain plug
3. Manual holding valve
4. 3/2 Local/remote selector valve

X - Hydraulic supply connection
Y - Hydraulic return

Fig 12.3 HPA type Manual override operating diagram for LHISD actuator



- TABLE A - 3/2 MANUAL VALVE (POS 4) - OPERATING POSITIONS -		
POSITION	VALVE CONFIGURATION	DESCRIPTION
1		- MANUAL OVERRIDE ENABLED - HYDRAULIC HAND PUMP OPERATED TO OPEN/CLOSE VALVE/ACTUATOR - REMOTE OPERATION EXCLUDED
2		- NORMAL POSITION FOR REMOTE OPERATION - MANUAL OVERRIDE EXCLUDED

Description

1. Single-acting hydraulic actuator spring-up
2. Hydraulic manual override assembly
 - 2.1 Hand pump
 - 2.2 Relief valve (factory set)
 - 2.3 Oil tank
 - 2.4 Fill port/breather
 - 2.5 Drain plug
3. Manual holding valve
4. 3/2 Local/remote selector valve

X - Hydraulic supply connection
Y - Hydraulic return

Fig 12.4 HPA type Manual override operating diagram for LHISU actuator

12.3 Linear stroke setting

⚠ Certain valves incorporate their own stops. For such valves, it is recommended that the actuator stop bolt positions coincide with the valve stop position.

Contact the valve manufacturer to set the valve mechanical stops.

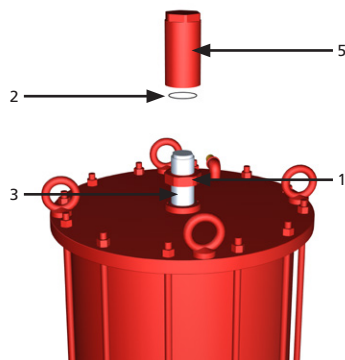
⚠ An incorrect setting of linear stroke could cause damages to actuator, valve and/or to personnel.

⚠ During the angular stroke setting procedure, an oil leakage from the stop bolt is expected.

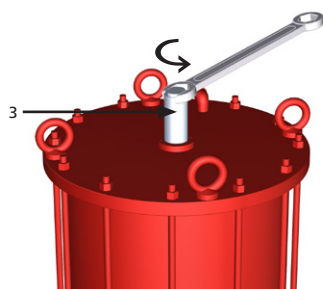
Single-acting actuator, type 1 and type 2, cylinder stop bolt setting

Perform the following operations as first setting.

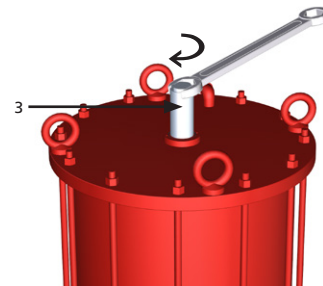
Adjust the stop bolt located in the end flange of the cylinder as follows:



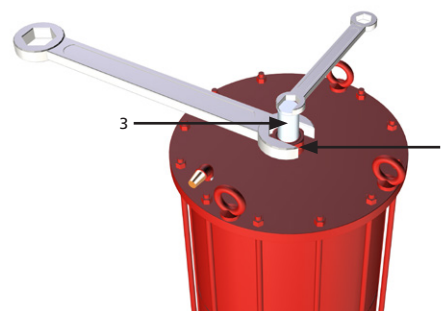
- A. Verify the absence of pressure
- B. Remove cap nut (5) and O-ring (2)
- C. Loosen stop nut (1)
- D. Slowly pressurize the cylinder to detach stop bolt from piston



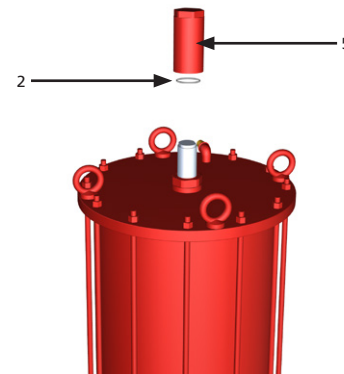
- E. With the help of a suitable size wrench, rotate the stop bolt (3) counter clockwise to increase the stroke
- F. Remove the pressure
- G. Verify the newly obtained position with one stroke
- H. Repeat operations E to G, until the desired stroke is obtained



- I. With the help of a suitable size wrench, rotate the stop bolt (3) clockwise to decrease the stroke
- J. Remove the pressure
- K. Verify the newly obtained position with one stroke
- L. Repeat operations I to L, until the desired stroke is obtained



- M. Hold the stop bolt (3) with a wrench and carefully tighten the stop nut (1)



- N. Re-position the O-ring (2) and verify it is correctly positioned. Tighten cap nut (5)

NOTE: for some cylinder sizes o-rings (2) are replaced by seal washers - the above procedure is applicable as well.

12.4 Hydraulic power supply

Verify allowed supply pressure range on actuator label.

 **Verify the medium composition. Contact Rotork to check the compatibility with the supply medium.**

12.5 Hydraulic connections

Preliminary operations:

- A. Verify sizes of pipes and fittings per applicable plant specifications
- B. Clean the inside of the connection pipes by washing them with a suitable detergent and by blowing air into them
- C. The connecting pipes must be properly shaped and fixed to prevent stress or loosening of threaded connections

NOTE: For tapered-thread fluid connections, apply a thin layer of thread sealing product (Loxal 56-14 or equivalent) to ensure a good seal.

 **Connect the hydraulic power source in accordance to the applicable operating diagram, please refer to specific job for details.**

12.6 Electrical connections

 **Check electrical components' supply voltage, before start-up.**

 **Access to live electrical conductors is forbidden in hazardous areas unless done under a special permit. Otherwise, all power must be isolated and the unit moved to a non-hazardous area for repair.**

 **Prevent electrostatic charges in potentially explosive areas.**

Electrical connection can be performed as follows:

- Remove the power supply
- Remove the plastic protection plugs from the cable entries
- Use only appropriately-certified reduction fittings, cable glands, fittings and explosionproof cables
- The cable glands must be tightened in the threaded inlets, to guarantee the waterproof and explosion protection
- Pay attention to the correct installation of the O-rings of the cable glands to prevent water and debris infiltration inside electric components
- The size of the electric supply cable must be per the electric power demand
- Insert the connection cables through cable glands and perform assembly per the cable gland manufacturer's instructions
- Connect the cable wires to the terminal blocks in accordance with the applicable wiring diagram
- Electric connections must be made by using rigid conduits and trailing cables to prevent mechanical stresses in the cable entries
- On the unused entries of the junction box, replace the plastic plugs with approved metal plugs, to guarantee sealing and comply with explosion safety protection codes
- Assemble the covers of the electric components, paying attention to seals
- Once connections have been completed, check electrical components' functionality

 **Actuator and electrical components must be protected from electrical sparks, lightning, magnetic or electro-magnetic fields, at user's care.**

 **Installation must be performed according to IEC 60079-14 and the end user must follow special conditions for safe use detailed in document PUB010-046.**

12.7 Start up

During the start-up of the actuator, it is necessary to check if:

- The medium supply pressure is as prescribed
- The feed voltage values of electrical components (solenoid valves coils, limit switches, pressure switches etc., if applicable) are as prescribed
- Actuator controls such as remote control, local control, emergency control etc. (if applicable) work properly
- Input remote signals are correct
- The setting of control unit components is per the plant requirements
- Hydraulic connections show no leakage. If necessary, tighten fittings
- The painted parts have not been damaged during transport, assembling or storage operations. Otherwise remove presence of rust and repair the damaged parts following the applicable painting specifications
- Actuator and all its parties work as expected
- Operating time is in accordance with requirements

 **The end user must guarantee equal voltage potential between the valve and the actuator and provide appropriate grounding. The final user shall indicate and maintain the grounding connections on the actuator.**

13. Dismantling and disposal

Prior to dismantling the actuator, check if any of its parts are still under pressure.

For single-acting actuator

 **The spring cartridge module contains potential energy due to compressed elastic elements.**

After removing the spring cartridge from the centre body, the spring cartridge must be returned to the manufacturer's plant, upon agreement with Rotork.

 **Grease and oil must be disposed of safely in accordance with the local environmental laws and regulations.**

- Dismount the actuator, separate and divide the various parts and components per the type of material
- Dispose of the pieces of steel, cast iron and aluminium alloys as metal scraps
- Dispose of the rubber, PVC, resins etc. separately, in accordance with the existing national and regional regulations
- Electric components are to be separately disposed of on specialized disposal sites

Actuators manufactured after 1993 do not contain asbestos or its by-products.

14. Rotork sales and service

If your Rotork actuator has been correctly installed and sealed, it will give years of trouble-free service. Should you require technical assistance or spares, Rotork guarantees one of the highest levels of service in the flow control industry. Contact your local Rotork representative or the factory directly at the address on the nameplate, quoting the actuator type and serial number.

Some actuators have a special spare parts list. Refer to the project-specific documentation for further details.

15. Periodic maintenance

Rotork recommends performing the following checks to help comply with the rules and regulations of the country of final installation:

⚠ Remove pressure before proceeding with maintenance operations, discharge any accumulators or tanks (if present), except where otherwise indicated.

Periodic maintenance schedule

MAINTENANCE ACTIVITY	PERIODICITY		REFERENCE
	Months	Years	
Visual check of external components and control groups	6*	*	Refer to job documentation for maintenance tasks.
Verify welding. In case of anomalies contact Rotork	6*	*	
Breather cleaning	6*	*	
Check hydraulic connections for leaks. Tighten pipe fittings as required	-	1*	
Cleaning	-	1*	
Visual check of painting. Verify absence of damages. Repair if necessary per painting specification	-	1*	
Functional test	-	1*	
Functional test by manual override	-	1*	
Check electrical components (if present) and grounding connections	-	1*	
Check threaded connections (bolts, studs and nuts) with valve. If necessary tighten to the recommended torque, in accordance with the size and the characteristics of the fastener material installed by the customer		1*	
Single-acting actuator hand pump oil replacement (if present)	-	5*	
Double-acting actuator hand pump oil replacement (if present)	-	5*	
Hydraulic cylinder and centre body seals replacement (single- and double-acting actuator)	-	5*	

(*) The time between maintenance tasks will vary depending on the medium and service conditions. Refer to End User Plant Preventive Maintenance Program for specific task periodicity.

For functional safety applications refer to safety manual.

Specific maintenance could be necessary for specific application. Refer to job documentation for maintenance tasks.

16. Troubleshooting

ID	FAILURE	POSSIBLE CAUSES	CORRECTIVE MEASURES
1	Erratic movement	• Irregular supply of operating medium	• Check operating medium for consistent supply pressure and correct as necessary.
		• Worn parts	• Dismantle. Visually inspect for significant wear. Actuator replacement may be required.
		• Faulty control panel equipment (if present)	• Contact Rotork customer service.
		• Faulty pipeline valve	• Consult the valve manufacturer's documentation.
2	Incorrect valve position	• Incorrect signal from limit switches (if present)	• Check limit switch position.
		• Fault of pipeline valve	• Consult the valve manufacturer's documentation.
3	Insufficient valve stroke	• Insufficient air supply to produce the stroke	• Increase air supply flow
		• Debris left in the cylinder during maintenance	• Disassemble the cylinder module to remove debris. Reassemble the cylinder. Refer to job documentation for maintenance tasks.
4	Leakages from cylinder	• Worn seals	• Disassemble the cylinder module and replace the seals. Reassemble the cylinder. Refer to job documentation for maintenance tasks.
5	Loss of power	• Inadequate supply pressure	• Ensure that the supply pressure is above the minimum operating pressure of the actuator and that the output thrust produced at supply pressure exceeds the required valve thrust.
		• Incorrect speed control settings	• Adjust the speed controls to increase or decrease the flow.
		• Cylinder exhaust port blocked	• Remove and clean the exhaust port silencer.
		• Pipe work blocked, crushed or leaking	• Examine the pipework for blockages, crushed pipes or leakages. Clear or replace as necessary.
		• Fault of control panel equipment (if present)	• Contact the Rotork customer service.
		• High valve torque or sizing	• Consult the valve manufacturer's documentation.
		• If occurs from the hydraulic cylinder	• Disassemble the cylinder module and replace worn/damaged parts (piston, piston rod). Reassemble the cylinder. Refer to job documentation for maintenance tasks.
		• If occurs from the spring cartridge	• Replace the spring pack assembly.

For other problems please contact Rotork customer service.

⚠ In case of spring pack damages, DO NOT DISASSEMBLE. The damaged spring pack has to be completely substituted with a new one.

17. Grease and hydraulic oil specification

In general, there is no need to lubricate the actuator because its mechanism is lubricated for life. This is the standard grease specification for Rotork linear actuators. If an alternative was specified and/or supplied, please refer to the job-specific documentation, which is available upon request.

17.1 Grease

The following grease is used by Rotork to lubricate the sliding components of the linear actuators for the temperature range -30 to +100 °C (-22 to +212 °F).

Manufacturer:	FUCHS
Trade name: Colour:	CEPLATTYN BL WHITE WHITE
NLGI grade:	1-2
Viscosity of oil at 40 °C (104°F) (DIN 51562-1):	300 mm²/s
Service temperature: Drop point (ISO 2176):	-50 to +160 °C (-28 to +320 °F) +220 °C (428 °F)
TIMKEN test	45 lbs

Lubricate the sliding components, of the linear actuators using the following grease or equivalent for temperature range -60 to +100 °C (-76 to +212 °F).

Manufacturer:	Mobil
Trade name:	MOBILTHEMP® SHC100TM
NLGI grade:	2
Colour:	Clear brown
Penetration, density, viscosity Worked penetration at 25 °C (ASTM D 217): Viscosity of oil at 40 °C (104 °F) (ASTM D445):	280 100 CSt
Temperature Drop point (ASTM D 2265):	>260 °C
Load-carrying capacity, wear protection, service life Four ball tester (ASTM D 2266) Weld load (ASTM D 2596) Corrosion protection (ASTM D6138)	0.4 mm >200 0

17. Grease and hydraulic oil specification *continued*

17.2 Hydraulic oil

This is the standard oil specification for hydraulic cylinders working at temperature range -20 to +100 °C (-4 to +212 °F) for EX and non-EX application.

Manufacturer:	FUCHS
Trade name:	RENOLIN ZAF 32 MC
Kinematic viscosity, ISO 3104: -20 °C (-4 °F) 0 °C (+32 °F) +40 °C (+104 °F) +100 °C (212 °F)	1,528 mm ² /s 282 mm ² /s 32 mm ² /s 6.25 mm ² /s
Viscosity index ISO 2909:	149
Density +15 °C (59 °F), DIN 51 757	840 kg/m ³
Copper corrosion, ISO 2160, degree of corrosion	1-100 A 3, 1-100 A 24
Steel corrosion ISO7120, degree of corrosion: - procedure A: distilled water - procedure B: salt water	0 0
FZG A/8, 3/90, failure load stage, ISO 14635-1	>12
Pour point, ISO 3016	-45 °C (-49 °F)
Flash point, ISO 2592	+220 °C (+428 °F)

Equivalent oil to be used:

Manufacturer:	MOBIL
Trade Name:	DTE 10 EXCEL 32
ISO Viscosity Grade:	32
Viscosity, ASTM D 445 cSt @ 40 °C cSt @ 100 °C	32.7 6.63
Viscosity Index, ASTM D 2270	164
Brookfield Viscosity ASTM D 2983, cP @ -20°C	1090
Brookfield Viscosity ASTM D 2983 cP @ -30°C	3360
Brookfield Viscosity ASTM D 2983 cP @ -40°C	14240
Tapered Roller Bearing (CEC L-45-A-99), %Viscosity Loss	5
Density 15° C, ASTM D 4052, kg/L	0.8468
Copper Strip Corrosion, ASTM D 130, 3 hrs @ 100 °C	1B
Rust Characteristics, ASTM D 665B	Pass
FZG Gear Test, DIN 51534, Fail Stage	12
Pour Point, °C, ASTM D 97	-54
Flash Point, °C, ASTM D 92	250
Foam Sequence I, II, III, ASTM D 892, ml	20/0
Dielectric Strength, ASTM D877, kV	49
Acute Aquatic Toxicity (LC-50, OECD 203)	Pass

An alternative oil may have been specified for your application. Please refer to the job-specific documentation.

17. Grease and hydraulic oil specification *continued*

This is the standard oil specification for hydraulic cylinders working at temperature range -40 to +100 °C (-40 to +212 °F) for EX and non-EX application.

Manufacturer:	FUCHS
Trade name:	PLANTOLUBE POLAR 15 S
Kinematic viscosity, ISO 3104: -20 °C (-4 °F) +40 °C (+104 °F) +100 °C (+212 °F)	174 mm ² /s 15 mm ² /s 4.1 mm ² /s
Viscosity index ISO 2909:	199
Density +15 °C (+59 °F), DIN 51 757	899 kg/m ³
Copper corrosion, ISO 2160, degree of corrosion	1-100 A 3
Steel corrosion ISO7120, degree of corrosion: - procedure A: distilled water - procedure B: salt water	0 0
FZG A/8, 3/90, failure load stage, ISO 14635-1	>12
Pour point, ISO 3016	-48 °C (-54.4 °F)
Flash point, ISO 2592	+156 °C (+312.8 °F)
Foam sequence I - III, ASTM D 892: +24 °C (+75.2 °F), immediately / after 10 min +93.5 °C (+203.3 °F), immediately / after 10 min +24 °C (+75.2 °F) after 93.5 °C (203.3 °F), immediately / after 10 min	20/0 ml 30/0 ml 10/0 ml

Equivalent oil to be used:

Manufacturer:	MOBIL
Trade Name:	DTE 10 EXCEL 15
ISO Viscosity Grade:	15
Viscosity, ASTM D 445 cSt @ 40 °C cSt @ 100 °C	15.8 4.07
Viscosity Index, ASTM D 2270	158
Brookfield Viscosity ASTM D 2983 cP @ -40 °C	2620
Tapered Roller Bearing (CEC L-45-A-99), %Viscosity Loss	5
Density 15 °C, ASTM D 4052, kg/L	0.8375
Copper Strip Corrosion, ASTM D 130, 3 hrs @ 100 °C	1B
Pour Point, °C, ASTM D 97	-54
Flash Point, °C, ASTM D 92	182
Foam Sequence I, II, III, ASTM D 892, ml	20/0
Dielectric Strength, ASTM D877, kV	45
Acute Aquatic Toxicity (LC-50, OECD 203)	Pass

17. Grease and hydraulic oil specification *continued*

This is the standard oil specification for hydraulic cylinders working at temperature down to -60 °C (-76 °F) for non-EX applications.

Manufacturer:	MOBIL
Trade name:	UNIVIS HVI
ISO viscosity grade:	32
Viscosity, ASTM D 445 cSt @ 40 °C (104 °F) cSt @ 100 °C (212 °F)	13.5 5.3
Viscosity index, ASTM D 2270	404
Kinematic viscosity @ -40 °C (-40 °F), ASTM D 445	371 cST
Copper strip corrosion, ASTM D 130	1A
Pour point, ASTM D 97	-60 °C (-76 °F)
Flash point, ASTM D 92	101 °C (214 °F)

This is the standard oil specification for hydraulic cylinders working at temperature range -60 to +90 °C (-76 to +194 °F) for EX application.

Manufacturer:	TECCEM
Trade name:	SynTop 1003 FG
ISO viscosity grade:	3
Viscosity, ASTM D 445 cSt @ -40 °C (-40 °F) cSt @ -55 °C (-67 °F) cSt @ 40 °C (104 °F)	73 2.6 3.2
Pour point, ASTM D 97	-88 °C (-126 °F)
Flash point, ASTM D 92	140 °C (284 °F)
Density 20 °C (68 °F), kg/L	0.86

An alternative oil may have been specified for your application. Please refer to the job specific documentation.

18. Dismantling and disposal

Rotork actuators are designed and built to provide a long life. At the end of their operative life, they will have to be removed from the valve and subsequently disposed of.

 **Prior to dismantling the actuator, depressurise the system, if still under pressure. The actuator shall be in a fail position, at end of the spring stroke, spring relaxed (actuator position can be verified by checking the position indicator). Verify if the hydraulic accumulator (if applicable) is depressurised, otherwise slowly open the drain valve and discharge the oil from the accumulator. Use the gas charging and testing devices to release any remaining.**

 **The spring pack contains potential energy due to compressed elastic elements. After removing the springs pack unit from the actuator (refer to job documentation for maintenance tasks), the spring pack unit has to be returned to the manufacturer's plant, upon agreement with Rotork.**

 **Collect the grease and the oil during dismantling to avoid disposal of pollutants in the environment; the discarded material is to be disposed in accordance with the local environmental laws and regulations.**

- Actuators are built-in modules and this facilitates dismantling
- Dismount the actuator and separate the various sections and components according to the type of material
- Dispose of the pieces of steel, cast iron and aluminium alloys as metal scraps
- Dispose of the rubber, PVC, resins etc. separately, in accordance with the existing national and regional regulations
- Electrical components are to be separately disposed of on specialised disposal sites
- Actuators manufactured after 1993 do not contain asbestos or its by-products



Contact us now

mail@rotork.com

www.rotork.com

PUB020-016-00

Issue 07/26