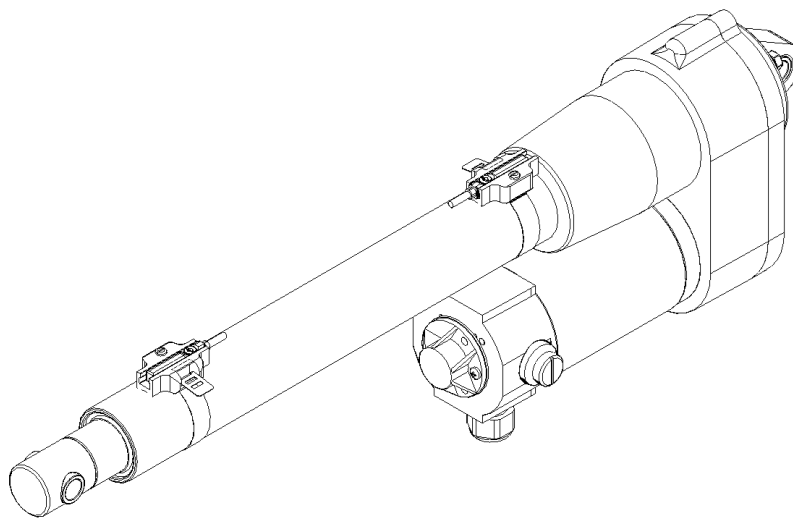




LINEAR ACTUATORS

UAL 0 – UBA 0

Installation, operation and maintenance manual



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Read this manual before installing, operating or maintaining this actuator. Failure to follow safety precautions and instructions could cause actuator failure and result in serious injury, death or property damage.

This manual provides important information on how to work with the actuator safely and efficiently. The manual is part of the device, must always be kept in the device's direct proximity and should be available for personnel to read at any time. Failure to comply with the installation, use and maintenance instructions indicated in this manual will result in immediate termination of the warranty conditions of the actuator and completely relieve Servomech S.p.A. from any liability for damage caused to persons and / or property.

Servomech S.p.A. it does not assume direct or indirect responsibility for an improper use of the actuator, not respecting the performances of the actuator declared in the catalogs.

The manufacturer will not be liable for damage to the actuator or the equipment into which the actuator has been installed resulting from:

- disregarding this manual
- unintended use
- employment of untrained personnel
- unauthorized conversions
- technical modifications
- manipulation or removal of the screws on the device
- use of unapproved spare parts

The aforementioned conditions are therefore not contemplated and entail the immediate termination of the guarantee and the immediate decay of any responsibility on the part of Servomech S.p.A.

Servomech S.p.A. reserves the right to make changes to the actuators and this manual without giving any notice.

LINEAR ACTUATORS UAL/UBA 0

Installation, operation and maintenance manual

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1 MODELS COVERED BY THIS DOCUMENT

The present manual is referred to following products:

Acme screw linear actuators: UAL 0

Ball screw linear actuators: UBA 0

2 IDENTIFICATION OF THE MANUFACTURER AND THE PRODUCT

2.1 Identification of the manufacturer

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2.2 Description of the product

For all the technical characteristics of the product (performance, features, dimensions) refer to the technical catalog.

Main actuator components:

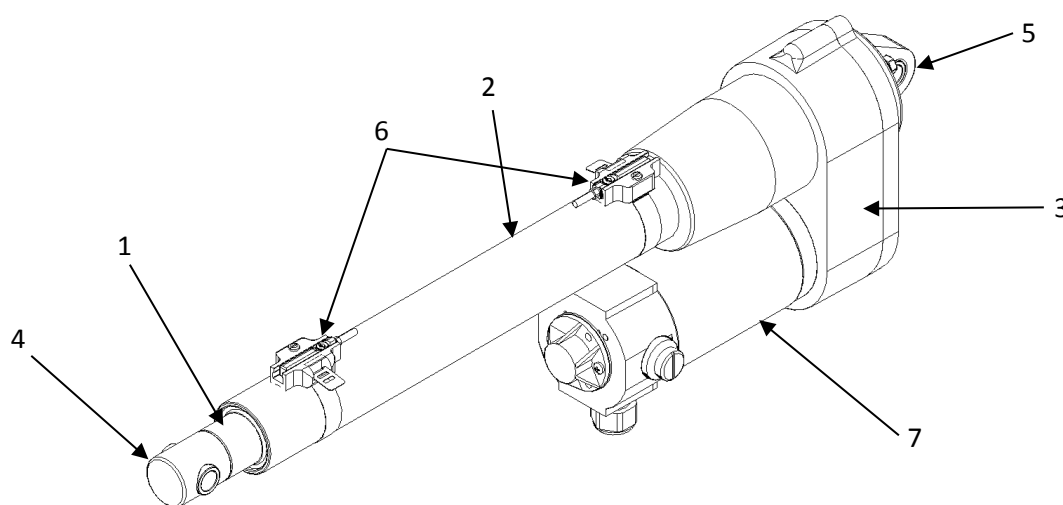


Figura 2.1 – Linear actuator components

- 1) Push rod
- 2) External tube
- 3) Belt drive housing
- 4) Rod end
- 5) Rear hinge
- 6) Magnetic limit switches FCM
- 7) DC electric motor

2.3 Identification of the product

Every LINEARMECH linear actuator is provided with a product label, as shown below, which allows the product identification and gives technical information about the product.



	
Servomech S.p.A. Bologna - ITALY	
Code:	<input type="text"/>
Descr:	<input type="text"/>
B/N:	<input type="text"/> (wk/year): <input type="text"/>

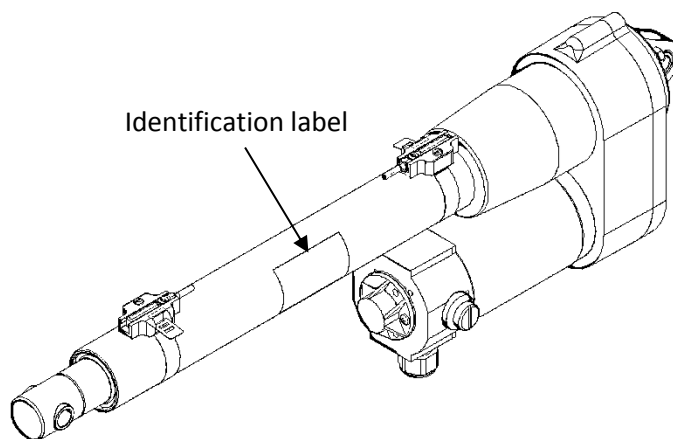
Figure 2.2 –Product identification label

On the actuator label following data are printed:

- CODE: article code;
- DESCR: product description (the mining of symbols and their sequence are indicated on the catalogue);
- B/N: production batch number (gives the full traceability of products);
- WK/YEAR: week and year of manufacturing of the product.

2.4 Identification label position

Following pictures show label positioning on actuator.



3 TRASPORT AND HANDLING

- ⚠ It is recommended to pay attention and care during the handling and transport of linear actuators not to damage mechanical parts and / or accessories and to prevent risks for the personnel in charge of this activity.
- The packaging must be lifted and moved with care and in a safe way.
- For lifting and transporting the linear actuator, the push rod must be in retracted position.
- Lift the actuator from the housing and outer tube, supporting the motor during transport.
- DO NOT lift the actuator only from the push rod and / or the motor.
- ⚠ In the case of UBA 0 actuators, the ball screw inside the actuator is NOT self-locking. Never lift the linear actuator upright from the push rod as the actuators could be back driven by its own weight.

In case of doubt, consult SERVOMECH S.p.A. to get the appropriate information and prevent any kind of damage!

4 USE RESTRICTION

The information contained in this chapter provides important prescriptions for operating safely during all phases of the product's life.

Not knowing or not complying with these provisions can generate dangerous situations that could cause damage to equipment and risks for the safety of persons.

4.1 *Intended use*

Actuators are used to perform very different functions within machines. It is the responsibility of the machine builder to design the application in compliance with the laws in force in the specific sector and in the field of safety, in compliance with the requirements provided in the product catalog and in this manual.

- ⚠ ACTUATORS ARE ELECTRIC AXIS, WHATEVER DRIVER OR CONTROL WILL BE USED: THE SELECTION OF THE PRODUCT AS STROKE, SPEED, TYPE OF LIMIT SWITCHES, MOTOR AND BRAKE, MUST BE DONE ACCORDING TO THE BEHAVIOR EXPECTED, IN FUNCTION OF THE TYPE OF CONTROL CHOSEN AND THE STATIC AND DYNAMIC BEHAVIOR OF THE SYSTEM IN WHICH THE ACTUATOR IS PLACED!

The actuators have been designed and built to operate mobile parts of various types, shapes and construction, in the ways and within the limits set out in the descriptions and tables of the technical data in the catalog and in this user manual.

The actuators are designed to work with a purely axial applied load.

They must be subjected to the loading and speed conditions specified in the catalog.

Modification of parts of the actuator or replacement of components with different and non-original parts is not permitted. The replacement of components with original spare parts is carried out only by Servomech S.p.A.

Any different use is to be considered improper and therefore potentially dangerous for the safety of the operators, as well as such as to void the contractual guarantee.

In the event of particular processing requirements, we recommend consulting our sales department.

Every modification must be authorized by Servomech S.p.A. with written documents.

- ⚠ ANY OTHER USE OUTSIDE THAT THAT JUST DESCRIBED IS NOT PERMITTED BY SERVOMECH S.p.A.

4.1.1 Use restrictions

Actuators can not be used for unforeseen applications.

Any utilization of this device beyond its intended purpose may lead to potentially hazardous situations.

Therefore:

- Strictly adhere to all safety precautions and instructions in this operating manual.
- Do not allow this device to be subjected to weather conditions, strong UV rays, corrosive or explosive air media as well as other aggressive media (*).
- Do not modify, retool or change the structural design or individual components of the actuator.
- Never use the device outside of the technical application and operational limits.

(*) – THE USE OF THE ACTUATOR IN ABOVE CONDITIONS MUST BE PREVIOUSLY DECLARED AND AGREED WITH SERVOMECH, SINCE A SPECIAL EQUIPMENT OF THE PRODUCT MUST BE PROVIDED.

4.1.2 Standard operating conditions

The actuator must be used in an environment whose conditions comply with the provisions of Servomech S.p.A. The works necessary for obtaining and maintaining that conditions are in charge of the owner and, where applicable, are in charge of the end user.

The actuator must be installed and used indoor only, in dry area with environmental conditions as specified below:

- Temperature range +0°C ÷ +40°C
- Relative atmospheric humidity 5% ÷ 85%
- No build up of condensation

Linear actuator must be installed and used in a room with a constant illumination of 500lux at least, complying the norm UNI EN 1837:2009, or complying specific norms related to specific application fields.

- ⚠ THE USE OF THE ACTUATOR IN DIFFERENT CONDITIONS THAN JUST DESCRIBED MUST BE PREVIOUSLY DECLARED AND AGREED WITH SERVOMECH, SINCE A SPECIAL EQUIPMENT OF THE PRODUCT MUST BE PROVIDED.

4.1.3 Thermal limit

The actuator duty cycle permissible F_u [%] is the maximum working time expressed in percentage that the actuator can perform during the reference time period of 10 minutes, under rated load stated in the catalogue at ambient temperature 25°C, without risk of internal parts overheating.

$$F_u[\%] = \frac{\text{Max working time over 10 min}}{10 \text{ min}} \times 100$$

Actuator	F_u [%]
UAL 0	15
UBA 0	100

- ⚠ For the proper operation of acme screw linear actuator (UAL 0) do never exceed the permissible duty cycle limit.

4.2 Personnel requirements / Qualifications

This manual must be made available to the personnel in charge of installation, start up and use of the actuator. It is the responsibility of the machine builder:

- use personnel with the necessary qualifications for the installation and commissioning of the actuator;
- periodically check the qualification of the assigned personnel;
- check that the personnel in charge are aware of the contents of this manual.

5 STORAGE

- Do not store outside.
- Storage should be dry and dust-free.
- Keep away from any aggressive media.
- Protect from UV radiation.
- Avoid mechanical vibrations.
- Storage temperature: 0 to +50 °C.
- Relative atmospheric humidity: max. 95% (no build up of condensation).

6 INSTALLATION

The operations described in the paragraphs of this chapter provide both electrical and mechanical connections of the actuator, as well as the execution of test motions at reduced speed and motor torque or with small displacement steps.

6.1 Safety warnings

- ⚠ **MOTORS CANNOT BE CONNECTED DIRECTLY TO THE ELECTRICITY GRID. A PROPER CIRCUITS AND DEVICES FOR MOVEMENT MANAGEMENT ON BOTH DIRECTIONS IS REQUIRED. STROKE END LIMIT SWITCHES (MICROSWITCHES OR SENSORS) MUST BE CONTROLLED TO BE SURE THE LINEAR MOVEMENT OF THE ACTUATOR (DUE TO THE OPERATION OF THE MOTOR OR TO THE INERTIA OF THE MOVING PARTS) STOPS BEFORE TO REACH THE MECHANICAL STROKE END LIMITS. IN CASE THIS HAPPENS, THE ACTUATOR CAN BE LOCKED AND THE INTERNAL COMPONENTS CAN BE DAMAGED.**
- ⚠ **WHEN THE MOTORS MUST BE POWERED BY A CONVERTER (ELECTRIC DRIVE), THIS MUST BE CHOSEN BY QUALIFIED PERSONNEL.**
- ⚠ **IN CASE THERE ARE INVOLVED ELECTRONIC DRIVE AND CONTROL DEVICES ON THE ACTUATOR MOVING CONTROL, REFER TO MANUALS FOR ALL THE NECESSARY INFORMATION AND CORRECT INSTALLATION AND MAINTENANCE OF THE PRODUCT.**
- ⚠ **BEFORE TO PROCEED TO THE ELECTRIC CONNECTION, MAKE SURE THE SUPPLY VOLTAGE IS TURNED OFF.**
- ⚠ **BEFORE TO TURN-ON THE MOTOR, MAKE SURE THE ELECTRIC CONNECTIONS ARE TIGHTENED AND STABLE.**
- ⚠ **CHECK POWER SUPPLY CABLES NOT TO BE DAMAGED DURING THE COMMISSIONING. POWER SUPPLY CABLES MUST BE OUT OF HEAT SOURCES AND MOVING ORGANS.**
- ⚠ **DURING FUNCTIONING ARE PRODUCED MAGNETIC, ELECTRIC AND ELECTROMAGNETIC FIELDS. THIS MAY BE DANGEROUS FOR PEOPLE THAT USE CARDIAC STIMULATOR (PACEMAKER), IF NOT SUFFICIENT DISTANCE.**
- ⚠ **DO NOT DISCONNECT ANY CONNECTION DURING OPERATION OR IN PRESENCE OF SUPPLY VOLTAGE.**
- ⚠ **BEFORE TO TURN-ON THE MOTOR, MAKE SURE THE MECHANICAL CONNECTIONS OF THE ACTUATOR REMAIN TIGHTENED AND STABLE, ALSO DURING THE OPERATION.**

- ⚠ DURING THE COMMISSIONING, UNEXPECTED MOVEMENT OF THE MOTOR MAY BE CAUSED BY:
- WIRING ERRORS
 - MOUNTING ERRORS
 - DAMAGES ON POWER SUPPLY CABLES
 - HARDWARE OR SOFTWARE ERRORS
 - DRIVER PARAMETERS ERRORS
 - OPERATION IN CONDITIONS OUTSIDE THE SPECIFICATIONS PROVIDED BY THE CATALOG AND THIS MANUAL
- ⚠ MAKE SURE THE SAFETY PROTECTION OF THE MACHINE (MECHANICAL AND ELECTRICAL) ARE ACTIVE.
- ⚠ DURING OPERATION, TEMPERATURE OF THE EXTERNAL SURFACE OF MOTORS CAN REACH HIGH TEMPERATURES. HOT SURFACES ON ACTUATOR CAN CAUSE BURNS AND SHOULD NOT BE TOUCHED.
- ⚠ DO NOT FASTEN OR PLACE NEAR THE MOTOR THERMO SENSITIVE COMPONENTS: DAMAGES MAY OCCUR.

6.2 FCM magnetic stroke limit switches

The magnetic stroke end switches FCM allow to limit the actuator stroke length avoiding to reach the extreme positions (mechanical stop) and preventing damage. Using more switches it is also possible to set intermediate positions along the actuator stroke length.

The stroke end switches must be fixed on the external tube and are activated by a toroidal magnetic field independently of their angular position.

- ⚠ The magnetic reed switches can work only if connected to a control circuit to activate electric relay.
- ⚠ Do not connect the reed switches in series between the power supply and the electric motor.
- When using more contact reeds for intermediate positions, it shall be considered that the same reed switch can give the signal in 2 different positions, depending on the actuator motion which can be retracting or extending.

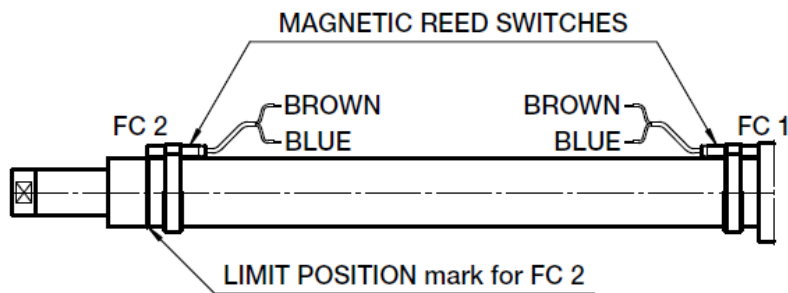


Figure 6.1 – FCM magnetic stroke limit switches

FCM magnetic limit switches are supplied already fixed on extreme stroke positions L_c and L_a (see Fig. 6.6):

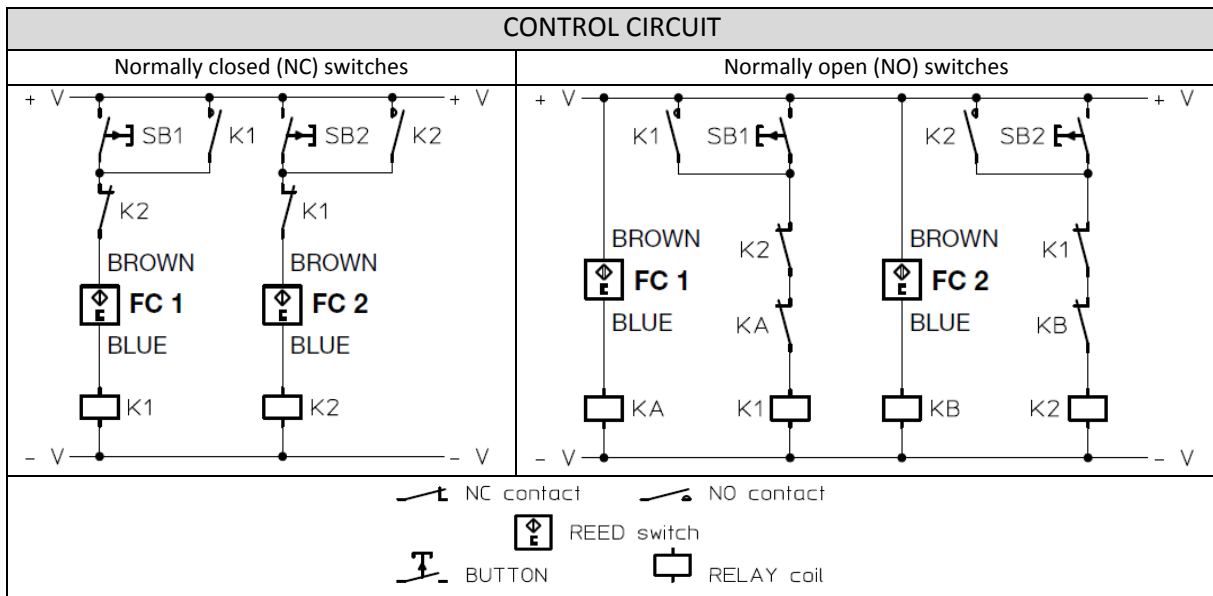
- RETRACTED ACTUATOR (L_c) position: FC 1 reed switch fixed on the tube up to the actuator housing.
- EXTENDED ACTUATOR (L_a) position: FC 2 reed switch fixed on the limit marked on the outer tube.

The position of the reed switches can be adjusted by changing the fixing clamp position on the tube:

- Release the screw on the fixing clamp (do not release the fixing screw of the reed sensor)
- Move the fixing clamp on the tube to the desired position (do not exceed the maximum range L_c ... L_a)
- Fix the screw of the clamp.

- ⚠ DO NOT SET THE FC 2 SWITCH POSITION OVER THE LIMIT MARK ON THE TUBE.
- ⚠ DO NOT TRAVEL OVER THE STROKE LIMIT SWITCHES POSITIONS, AVOIDING TO REACH MECHANICAL STOP AND PREVENTING DAMAGE TO THE INTERNAL COMPONENTS OF THE ACTUATOR.

The MAGNETIC LIMIT SWITCHES must be connected to the electric control circuit as shown in the following WIRING DIAGRAM:



REED SWITCHES – TECHNICAL FEATURES		
Contact	NC	NO
Switching output	Reed	
Supply voltage	$5 \div 120 \text{ V AC/DC }^{(1)}$	$5 \div 230 \text{ V AC/DC }^{(2)}$
Voltage drop	$\leq 0.35 \text{ V}$	
Continuous current	$\leq 100 \text{ mA (AC)}$	
Switching capacity	$\leq 6 \text{ W}$	
Protection class	II	
Enclosure rating	IP 65	
Sensor housing material	Plastic	
Clamp material	Stainless steel, Zinc cast	
Outlet	Multicore PVC cable $2 \times 0.12 \text{ mm}^2$ length 2 m	
Wiring		

(1) Main fuse $F < 0.8\text{A}$ IEC60127-2 sheet 1

(2) Main fuse $F < 0.5\text{A}$ IEC60127-2 sheet 1

6.3 Rotary encoder EH38

Encoder EH38 – TECHNICAL FEATURES	
Transducer type	Optical encoder, incremental, bi-directional
Resolution	100 or 500 pulses per revolution
Output	PUSH-PULL 2 channels (A and B, phase difference 90°) channel ZERO
Input voltage	8 ÷ 24 V DC
No-load current	100 mA
Max commutable current	50 mA
Cable length	1.3 m

The EH38 encoder must be connected to the electric control circuit as shown in the following WIRING DIAGRAM:

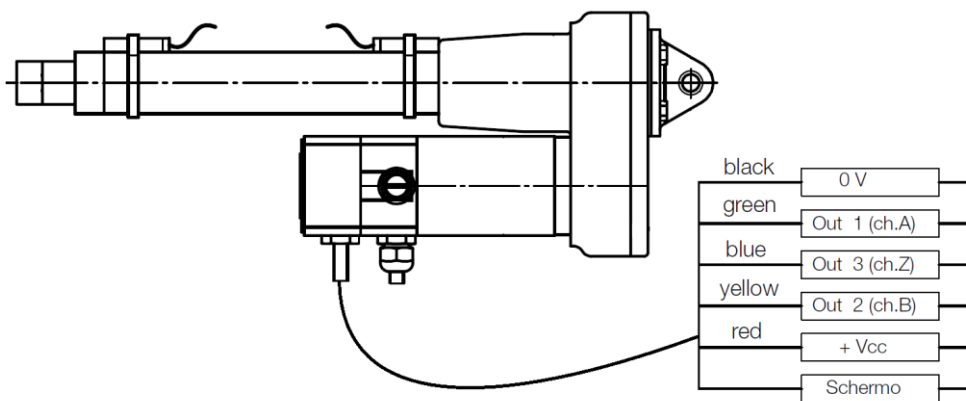


Figure 6.2 – Encoder EH38

Following table shows n° of pulses for 1 mm of stroke, for each size and ratio:

N° of pulses for 1 mm of stroke		Encoder resolution	
		100 ppr	500 ppr
UAL 0	RV1	25	125
	RN1	50	250
	RV2	12	62
	RN2	25	125
UBA 0	RV1	20	100
	RN1	40	200
	RV2	10	50
	RN2	20	100

6.4 Electric motor wiring

Connect the motor to the power unit of the plant or to the driver according to the following wiring diagrams, related to the motor type:

- (a) DC motor without brake
- (b) DC motor with DC brake separately powered

In case of brake motor:

- the brake is NORMALLY CLOSED (NEGATIVE action). When the power supply is switched off, the brake is engaged. The brake opens only when power is supplied;
- the brake is wired separately, make sure that the correct voltage is used;

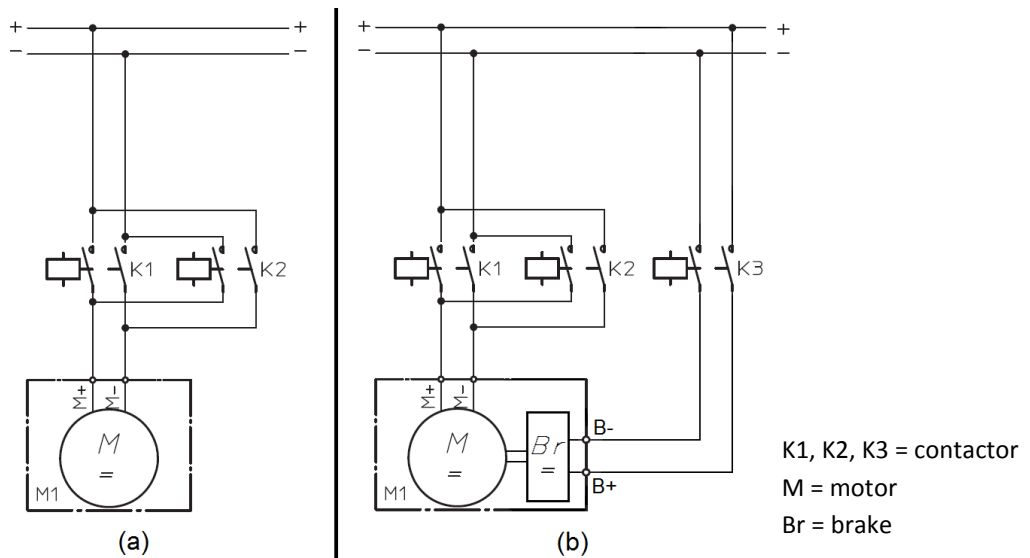


Figure 6.3 – Electric wiring diagrams to power supply of DC motor

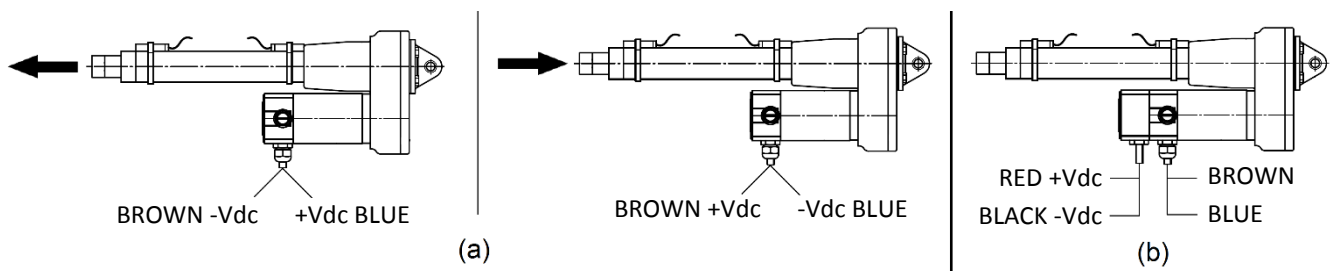


Figure 6.4 – Electric wiring of DC motor

Check if the push rod shifting direction is compatible to the indications on the control unit, by powering the electric motor on VERY BRIEFLY.

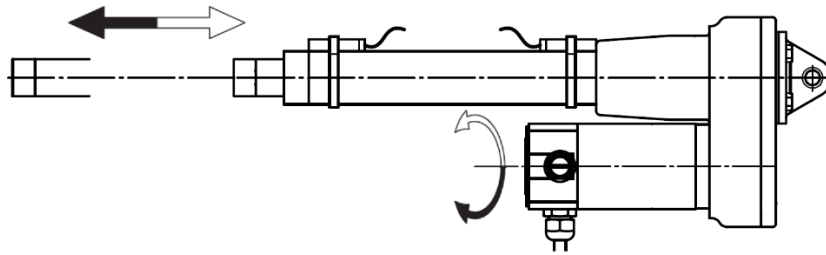


Figure 6.5 – Push rod shifting directions

If the push rod shifting directions are not compatible: invert contacts of the two motor supply cables.

6.5 Linear actuator installation

- ⚠ THE BALL SCREW LINEAR ACTUATOR UBA 0 IS NOT SELF-LOCKING. BEFORE TO APPLY ANY AXIAL LOAD ON THE PUSH ROD, LOCK THE INPUT SHAFT OR USE THE MOTOR BRAKE.
- ⚠ ALL MECHANICAL AND ELECTRICAL PROTECTION MUST BE INSTALLED AND ACTIVATED TO PREVENT DAMAGE TO PERSONS OR PROPERTY.

- Check that all plant fixing elements are well machined and cleaned, and that they fit the dimensions of the actuators fixing elements they have to be fixed to.
- If the length of the actuator have to be changed (push rod more retracted or extended) during installation, power the motor with limited speed and torque values, in order to avoid possible damages in case of a mechanical stop is reached.
- It is possible to manually screw/unscrew the push rod to change the length of the actuator.
- In case of actuators with bellow protection (B): DO NOT TWIST THE BELLOW.

⚠ DO NOT SET THE LENGTH OF THE ACTUATOR OVER ITS EXTREME VALUES:

- “Lc” = RETRACTED ACTUATOR
- “La” = EXTENDED ACTUATOR

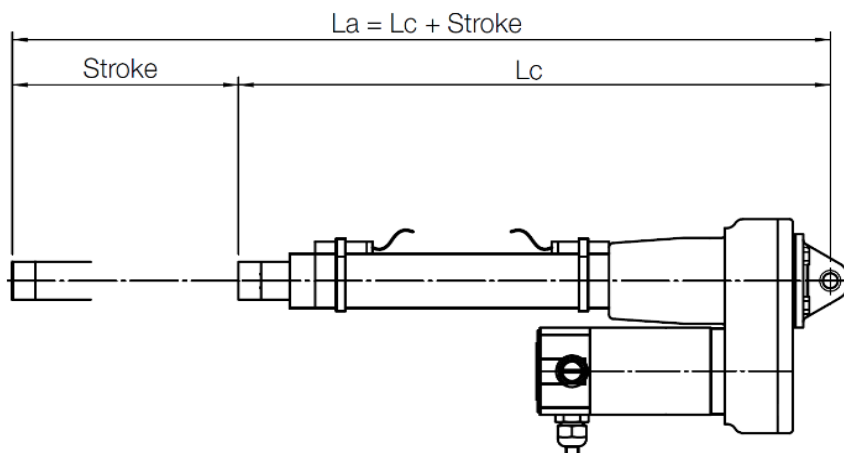


Figure 6.6 – “Lc” and “La” dimensions

Dimensions “Lc” and “La” are indicated in the technical catalogue of the product.

- Fit the actuator to the plant in order to have ONLY axial load applied to the actuator.
- Check the correct alignment between front and rear pins: they must be PARALLEL.
- Check the correct alignment between the actuator and the moving parts.

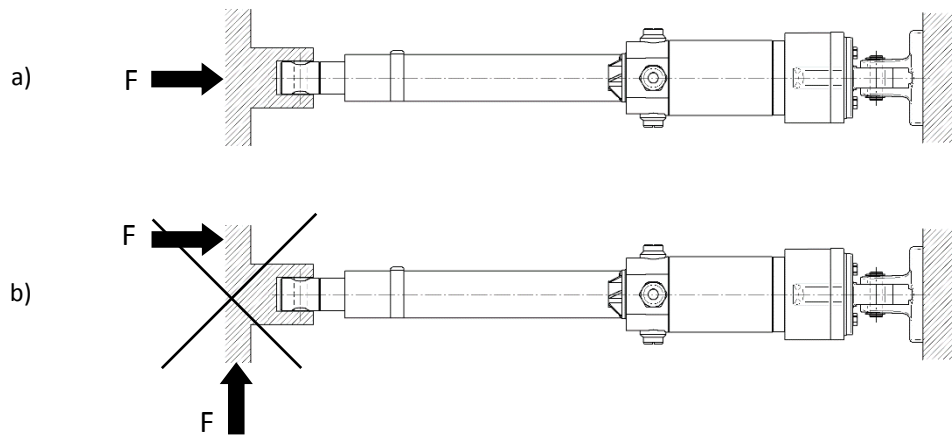


Figure 6.7 – Load on actuator: a) correct; b) not correct

⚠ RIGHT WORKING OF THE ACTUATOR AND PLANT CANNOT BE GUARANTEED IF SIDE OR NOT AXIAL LOAD ARE APPLIED TO THE ACTUATOR.

6.6 Installation of rod end fitting elements

- ⚠ To install a mounting element on the rod end threaded bore (BA), use a wrench flat on the rod end to counterhold the locking torque.
- Fix the threaded element with Loctite 270.
- To unmount the element, heat the threaded area to unlock it.
- Unscrew the fitting element counterholding the torque with a wrench flat on the rod end.

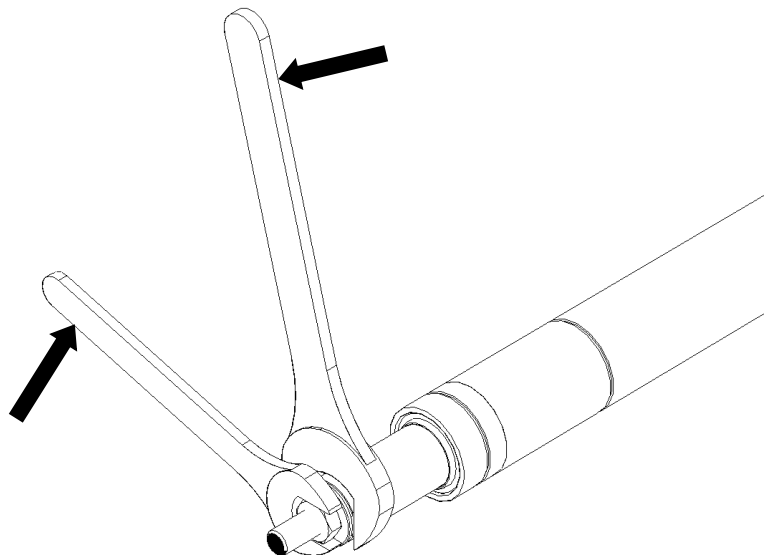


Figure 6.8 – Installation of rod end fitting element

7 COMMISSIONING AND USE

LINEARMECH linear actuators are supplied lubricated and ready to be used. Before to start commissioning and activation, the following checks must be carried out:

Shifting direction check

- Check if the push rod shifting direction is compatible to the indications on the control unit, by powering the electric motor on VERY BRIEFLY. If not, see Section 6.4.

⚠ TO ALLOW THE TRANSLATION OF THE ROD END, THE PUSH ROD ROTATION MUST BE REACTED BY USING EXTERNAL GUIDES.

Check of extreme working positions

- Check if the extreme dimensions of the actuator “Lc” and “La” (see Fig. 6.5) are compatible with extreme positions of the plant component that has to be moved.
- Measure the initial length of the actuator, then run the actuator GRADUALLY from the control unit, in order to reach the plant to its more distant extreme position.
- Check continuously the current actuator length during the motion.
- Repeat the same procedure for the other extreme position.

⚠ TO AVOID DAMAGES, DO NOT TRAVEL OVER THE EXTREME STROKE VALUES Lc and La!

⚠ DO NOT REACH STROKE END MECHANICAL STOP!

Commissioning

At this stage it is possible to start commissioning:

- Carry out one complete working cycle, without load, adjusting the previously set limit switch positions if necessary (see Sections 6.2).
- Carry out some complete working cycles, increasing gradually the load, until full load is reached.

⚠ FOR ACME SCREW LINEAR ACTUATOR **UAL 0**: DURING COMMISSIONING, DO NEVER EXCEED THE MAX ALLOWED DUTY CYCLE FOR THE LINEAR ACTUATOR **30% OVER 10 MIN** TIME PERIOD AT 25°C ENVIRONMENT. ANY ABUSE OF SUCH DUTY CYCLE CAN CAUSE OVERHEATING AND UNINTENTIONAL PREMATURE DAMAGING!

8 LUBRICATION

LINEARMECH linear actuators UAL/UBA 0 are supplied lubricated, with lubricants indicated in the table below.

ACTUATOR	BEARINGS	LINEAR DRIVE
UAL 0	Grease (NLGI 2 DIN 51818): ENI Grease SM 2 Also suitable: SHELL Gadus S2 V220D 2 (NLGI 2) MOBIL Mobilgrease XHP 222 Special (NLGI 2) FUCHS Renolit FLM 2 (NLGI 2)	Grease (NLGI 2 DIN 51818): ENI Grease SM 2 Also suitable: SHELL Gadus S2 V220D 2 (NLGI 2) MOBIL Mobilgrease XHP 222 Special (NLGI 2) FUCHS Renolit FLM 2 (NLGI 2)
UBA 0	Grease (NLGI 1 DIN 51818): LUBCON Thermoplex ALN 1001 Also suitable: FUCHS Renolit DURAPLEX EP 2 (NLGI 2) AGIP Grease AC 1 (NLGI 1) MOBIL Mobilgrease FM 101 (NLGI 1) KLUBER Klubersynth UH1 14-151 (NLGI 1)	Grease (NLGI 1 DIN 51818): LUBCON Thermoplex ALN 1001 Also suitable: FUCHS Renolit DURAPLEX EP 2 (NLGI 2) AGIP Grease AC 1 (NLGI 1) MOBIL Mobilgrease FM 101 (NLGI 1) KLUBER Klubersynth UH1 14-151 (NLGI 1)

Table 8.1 – Lubricants

- ⚠ DO NOT USE LUBRICANTS DIFFERENT FROM THOSE ABOVE MENTIONED.
- ⚠ DO NOT MIX INCOMPATIBLE GREASES.
- ⚠ IF DIFFERENT LUBRICANT SHOULD BE USED, PLEASE CONTACT SERVOMECH BEFORE PROCEED.
- ⚠ IN CASE OF CUSTOM PRODUCT EXECUTION, THE LUBRICANTS COULD BE DIFFERENT FROM THE STANDARD ABOVE.

9 MAINTENANCE

LINEARMECH linear actuators UAL/UBA 0 are long-life lubricated and do not require any further relubrication.

Maintenance tasks to be carried out monthly are described below:

- Visual inspections of actuator conditions.
- Cleaning of dirty parts of the actuator.
- Check of electric power supply and signal cables.

In case of lubricant leakage or malfunctions, contact SERVOMECH.