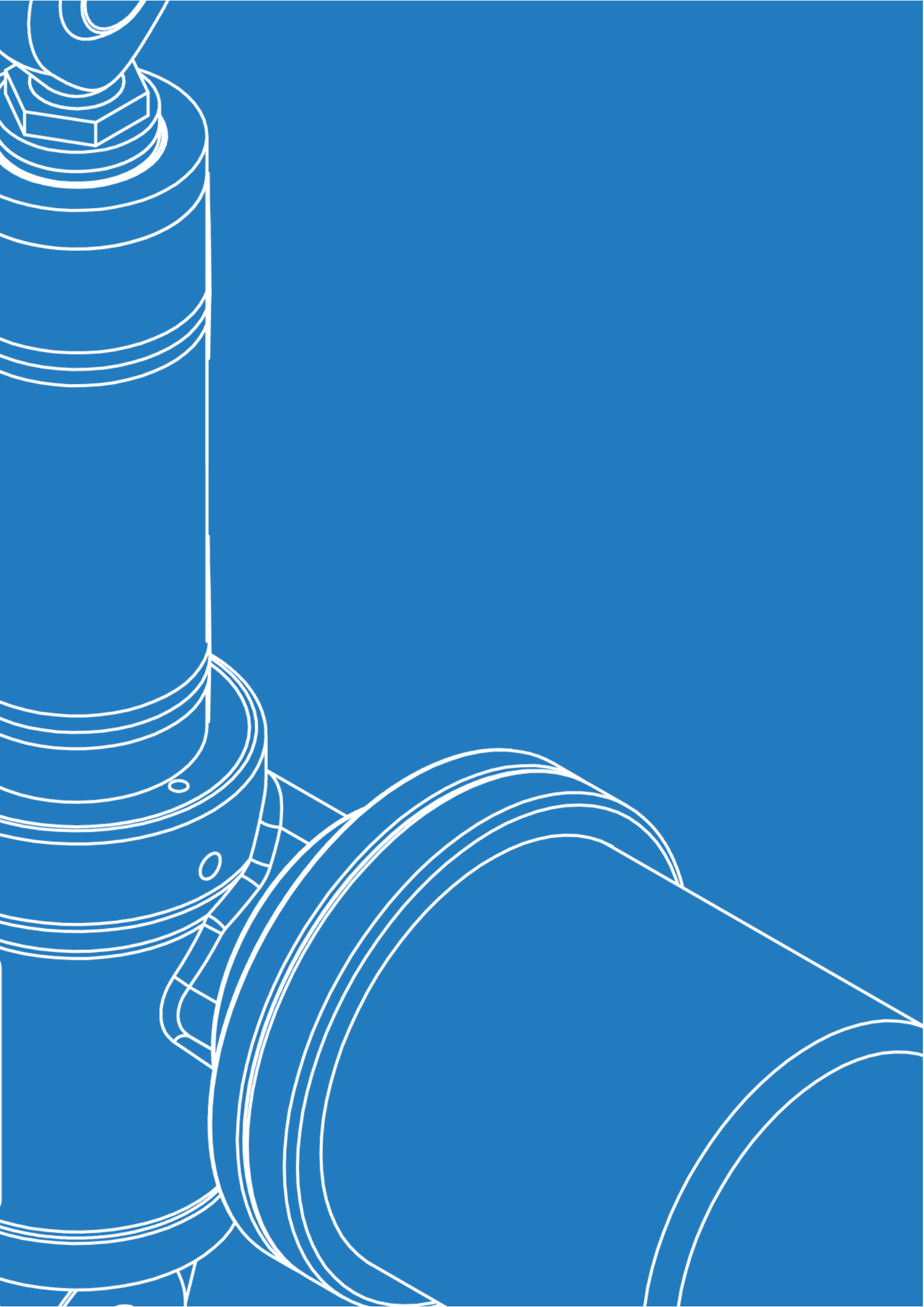


LINEAR ACTUATOR

2.1 MANUFACTURING FEATURES

Input drive: worm gear, geometric design for high performance.
Low angular backlash. Worm in case hardened steel 20 MnCr 5, with thread and input shafts ground. Helical wormwheel in bronze CuSn12-C.
Housing: designed and manufactured in monobloc form to obtain a compact body able to sustain heavy axial loads and high machining accuracy. High quality materials are used:

Castings in hardened aluminium alloy AC-AlSi10Mg T6.
Castings in spheroidal graphite cast iron EN-GJS-500-7 (UNI EN 1563).

Acme screw:

ISO trapezoidal thread ISO 2901 ... ISO 2904.
Material: Steel C 43 (UNI 7847).
Rolled or whirled.
Subjected to straightening, to ensure accurate alignment in operation.
Max. pitch error + 0.05 mm over 300 mm length.

Bronze nut:

ISO trapezoidal thread ISO 2901 ... ISO 2904.
Material: bronze EN 1982 – CuAl9-C (1-start thread).
Material: bronze EN 1982 – CuSn12-C (multiple start thread)
Max. axial backlash for new nut (0.10 ... 0.12) mm

Outer tube:

Material: aluminium alloy EN AW-6060 thick cold-drawn tube anodized ARC 20 (UNI 4522/66) inner diameter tolerance ISO H9
Steel St 52.2 (DIN 2391) cold-drawn tube inner diameter tolerance ISO H10 ... H11

Bearings:

On motor axis: radial ball bearings or taper roller bearings
On actuator axis: angular contact ball bearings or taper roller bearings, to avoid axial backlash and to assure high push-pull load capacity.

Front attachment:

Standard – with threaded hollow bore, in stainless steel AISI 303 or steel C 43 (UNI 7847)

Rear bracket:

In aluminium alloy for EP6, EP10
In spheroidal graphite cast iron for EP25, EP50, EP100
Pin in stainless steel AISI 303

Electric stroke length limit device ASW:

Electric switches activated by a shaped sleeve, for EP25, EP50, EP100

Magnetic stroke end switches FCM:

Magnetic switches activated by a magnetic ring, for EP6, EP10

Proximity stroke end switches FCP:

Proximity switches activated by the nut, for EP25, EP50, EP100

GENERAL WARNING

Actuators and gear boxes are devices meant to be installed into larger machines therefore **they cannot be considered as safety devices**.

INSTALLATION, USE, MAINTENANCE AND WASTE GUIDELINES

Mecmot recommendations:
Actuators and gear boxes being installed by qualified and authorised technicians
Electrical connections done by qualified personnel; during installation main electric power supply shall be turned off so to run safely all these operations (wearing also protection suits, gloves and glasses)
Actuators and gear boxes need very few maintenance operations: Cleaning and eventually greasing (according to instruction manuals)
Scheduled inspections to working actuator or gear box in order to detect in time possible problems: in case of doubts contact Mecmot.
IIf something wrong is detected do not try to fix it without Mecmot's technical advise: its after-sales dept. Will be at your complete disposal to solve it out.
All products are delivered with proper packing, according to customer needs and goods dimensions / weight. We recommend a safe product handling, using for example forklifts, safety belts...
Package, as well as the actuators themselves, shall be disposed / wasted according to laws in force in the user's Country.

INTRODUCTION

Linear actuators are independent systems used to obtain linear movements: Basically, they are made up by an electric motor, rotating a lead screw directly or by means of a gearbox.
A nut is then allowed to move along the lead screw carrying in and out a push rod connected to the nut itself.
Load shall be axial only, but it can be tensile or pushing, no matter what push rod direction is. Actuators can work both with or without load. Self-locking or not self-locking behaviour depend on the gearing ratio and load value. In any case, self-locking is always possible with additional components.
According to type of actuator and driving / control system used with it, we can have a simple ON / OFF device (pushing and / or pulling or aservo-mechanism.
Electric actuators main advantages towards pneumatic and hydraulic ones are basically following:
they can easily stop in intermediate positions all along their stroke, the power consumption happens only while the actuator is working (not necessary to keep it in position for example), the power supply is clean and easy to find, with no need of tubes.
Thus, wirings on applications frameworks will be easier to build and no dluids (i.e.oil) can accidentally be spared. This last feature is necessary in food and textile environments.

ACTUATOR MAIN COMPONENTS

Linear actuators consist in an electric motor directly connected to lead-screw / nut or by means of a worm gearbox, a belt / pulleys system or planetary gearings (1 or 2 stages).
The system turns out to be a rigid chain.

Running against mechanical stops causes serious damages to actuator's internal parts!

Actuators can host diffrent kinds of motors: AC theree or single phase, with brake, inverter-friendly DC, brushless and stepper-motors.
Many options are available such as second shafts, manual brake release and so on.
Selection of motor performances (torque, speed, service...) is done according to duty cycle requested to actuators.

Linear actuator

GEAR-BOXES

Two kinds of gear-boxes are basically used on actuators too:
Steel worm-screw (1 or 2 stages) and plastic or bronze worm-wheel's material is chosen according to needed main performances such as low noise, lifetime, reduced backlash.

LEAD SCREW

Basically steel made and featuring cold-rolled profile, they are coupled with bronze or plastic polymer in order to grant safety and sturdiness against loads.

PUSH ROD

Push rods can be aluminium made for actuators whose loads are low, thick chrome-plated steel for those who stand high loads or stainless steel for special applications like in food industries.

ACTUATOR AND GEAR BOX APPLICATION FIELDS

Actuators and gear boxes can be used in several fields and various machineries. To give an example of how different can be the applications needing actuators we can list a few like: adjusting brushes height in floor-sweeping machines, positioning blades for wood-cutting machines, textile industries, paint and chemical plants, medical equipment (diffrent movements in X-ray machines) equipments for disable / aged people, solar panels, etc..

PARAMETERS FOR ACTUATOR OR GEAR BOX SELECTION PROCESS

The mainfeatures for actuator or gear box selection are:
Load dynamics (load trend along stroke)
Speed (linear speed trend along stroke)
Duty cycle
Environmental conditions
Stroke lenght
Power supply
Output rpm (gear box)
Output torque (gear box)
The configuration we get will be self-locking or non-self-locking according to its global efficiency.

LOAD AND LINEAR SPEED

These two parameters shall be evaluated both separately and together since they may effect each other during actuator working cycle, especially if additional elements like inertial phenomena, vibrations...are involved.
For example, if an heavy load has to be moved with changing speeds involving sharp accelerations and slowdowns, inertial load has to be added to physical load, thus affecting actuator choice.
In these cases please contact our Technical Dept.
Temperature working range can also be widened using special materials for some of the actuator components, special lubricants and seals (the same happens for aggressive environments). Of Course under-rating of actuator and duty cycle must also be taken under consideration.
In general, ball-screw units are non-self-locking therefore additional devices, such as brakes, can be necessary to lock actuators.

Duty cycle and environmental conditions

These parameters also need to be analyzed as linked together.
Duty cycle is defined as percentage rate between on-time and idle-time, on a timeframe of 5 min.
Environment is mainly related to temperature and occasional aggressive agents affecting materials (humidity, dust, acids...) Standard actuators duty cycle is rated in S3-30%, at 30°C ambient temp.
Working temperature range allowed for standard actuators is 10°C / +60°C.
However duty cycle can be raised building up high-efficiency actuators featuring ball-screws and planetary gearboxes, or over sizing the actuator whose ratings will therefore become higher.
Temperature working range can also be widened using special materials for some of the actuator components, special lubricants and seals (the same happens for aggressive environments.) Of course under- rating of actuator and duty cycle must also be taken under consideration.
In general, ball-screw units are non-self-locking therefore additional devices, such as brakes, can be necessary to lock actuators.

Linear actuator

ACTUATOR WORKING STROKE

This feature (standard each 50 mm step) shall be chosen taking under consideration:
-Limits tied to high rotation speeds of internal lead screw and to its own weight (in case the actuator is mounted horizontally).
-Limits linked to lead screw length to avoid buckling problems.
Actuator shall than perform its job within its nominal stroke: while designing application / framework, 10mm extra-stroke on both stroke-ends (in and out) shall be included to decrease possibility of going at mechanical stroke.
Running against actuator's mechanical stops causes serious damages to its internal components! In case of strokes 20 times longer than lead screw diameter, 150 mm extra stroke shall be included in the design of the actuator so that, when push rod is completely extracted, it has still 150mm more to go: this will give more stiffness to the unit preventing radial backlash.
Excessive radial backlashes lead to side-forces on actuator's axis, thus unexpected wear and lubricant loss, non regular workouts.

POWER SUPPLY

To choose a suitable actuator it is important to start finding out which kind of electric power supply is available. Not all actuators are prepared for all voltages.

SELF-LOCKING

There is not a sharp thereshold between self locking and non self locking conditions, because this feature is affected by gears wear, type of load, presence of vibrations, mounting position etc... When in doubt the only way of being sure of actuator behaviour is testing it on the application. When actuator is not self-locking, its positioning precision and repeatability features are lower: in this case, some additional elements are required, such as brakemotors, control/feedback systems or motor short-circuit to achieve magnetic braking effect (for DC motors without brake only).

ACTUATOR AND GEAR BOX INSTALLATION

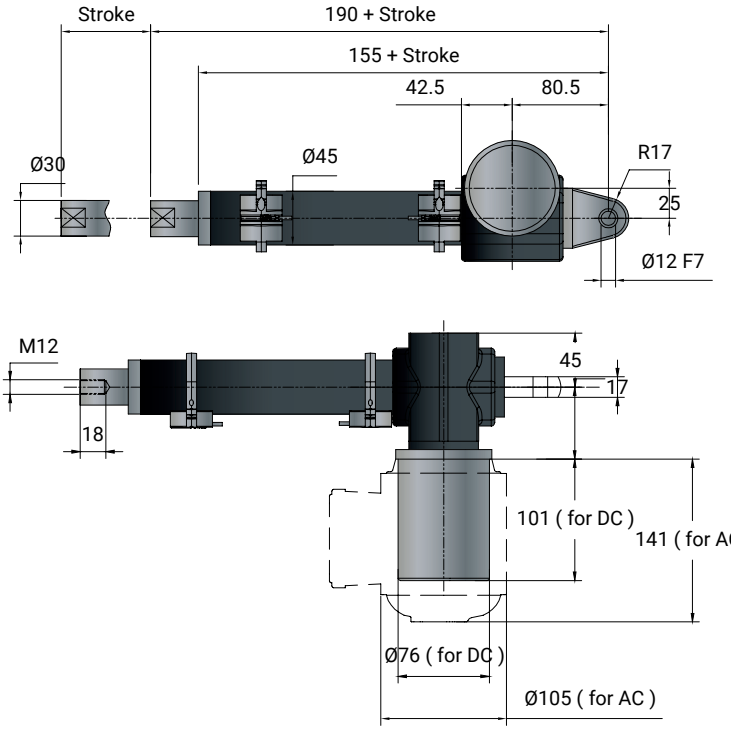
During machine designing it is extremely important to forsee proper mounting points so that actuator won't have to stand radial forces but axial ones only.
Than, when physically installing actuator into machinery, an accurate aligment of the connecting points is very important to avoid grease losses and nut wear due to radial forces.
Axis of front and back connecting points must always be parallel.
Actuators shall work within their nominal stroke.
When framework is being designed, 10mm extra stroke (in both directions) must be considered to have less possibilities of mechanical end-stops.
Also when stroke is 20 times longer than lead screw diameter, at least 150mm extra stroke (in extracted position) shall be included in order to prevent the actuator from having radial forces when push rod is completely out.

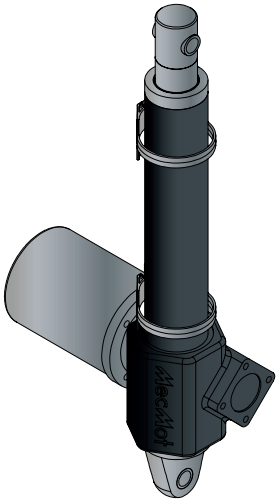
Running against mechanical stop causes serious damages to actuator components!

Off-set load lead to side-forces on actuator axis causing unexpected wear, lubricant loss and non-regular operation.
Before starting the actuators or gear box up, following checkings shall be performed:
If actuator is equipped with limit switches devices, before starting the motor, ensure they are connected and working, in order to avoid any mechanical end-stops.
Make sure push rod will start travelling in the correct direction and limit swiches are correctly adjusted. Start motor "step-by-step" to check all this.
All wirings of actuator (motor and stroke control devices) must be done with power switched off. If not, both operator and actuator are at risk.
When actuators are equipped with single-phase motors, capaciotors must be discharged before ant operation.
In case limit switches are already adjusted, be careful because manual rotation of push-rod will cause adjusment loss!

For a correct selection of actuators it is absolutely necessary to refer to above reported instructions and technical advises. Mecmot declines any responsibility releted to demanges caused to things and persons due to not proper use of the technical information given on this catalouge or incorrect use of actuators and gear boxes.
More information about installation of the actuators are reported in the use and maintenance manual.

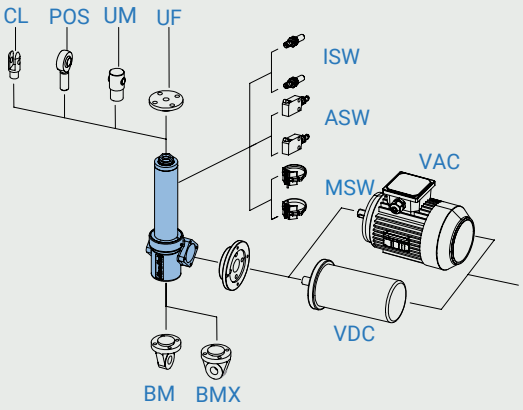
EP6-AC/DC Max 8 kN

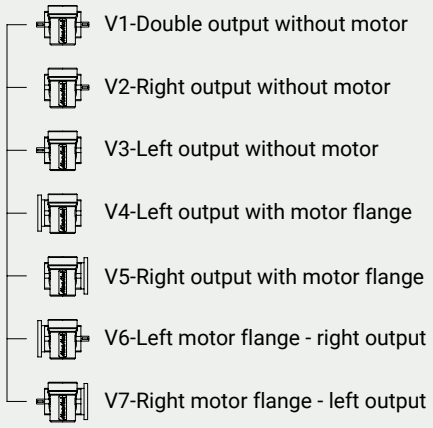


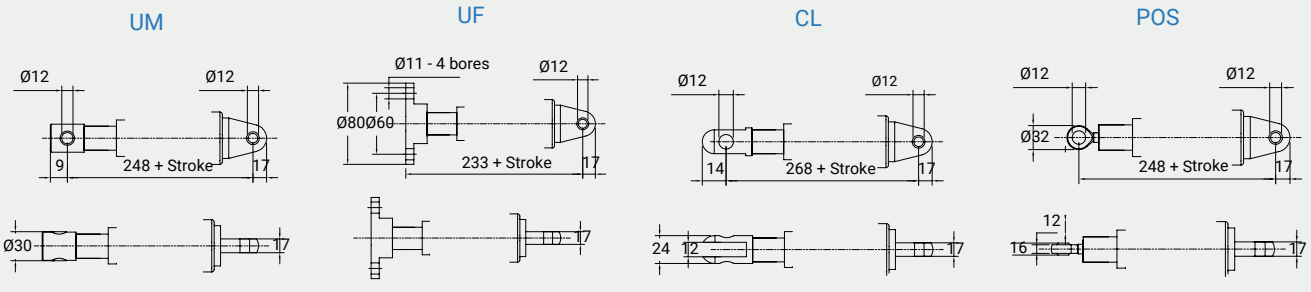


GENERAL FEATURES

Permanent magnet DC motor
Three phase or single phase motor
Worm gearbox
Acme Lead Screw
Crome plated push rod
Working temperature range -10 C - +60 C
Potentiometer and encoder on request
Duty %30 (5 min) a +30 C



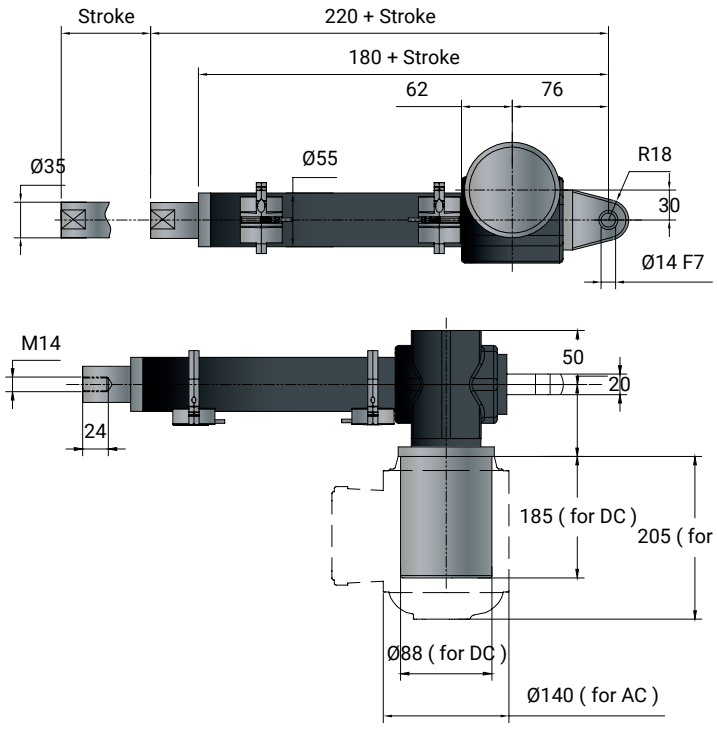


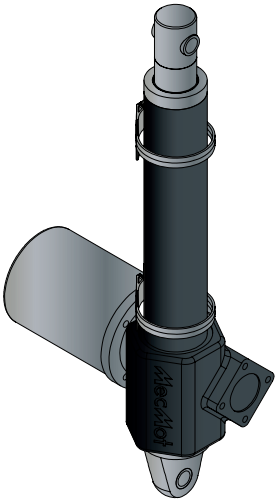


EP6 (Vac 3-phase)					
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power (KW)	Motor Speed (KW)
500	46	A01	IEC56	0,09	2800
900	30	A02	IEC56	0,09	2800
1800	15	A03	IEC56	0,09	2800
3850	7,5	A04	IEC56	0,09	2800
8000	3,7	A05	IEC56	0,09	2800

EP6 (Vdc)						
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power	Motor Speed (rpm)	Max Current for F max (A) 24 Vdc
500	46	A11	IEC56	0,09	2800	12
900	30	A21	IEC56	0,09	2800	12
1800	15	A31	IEC56	0,09	2800	12
3850	7,5	A41	IEC56	0,09	2800	12
8000	3,7	A51	IEC56	0,09	2800	12

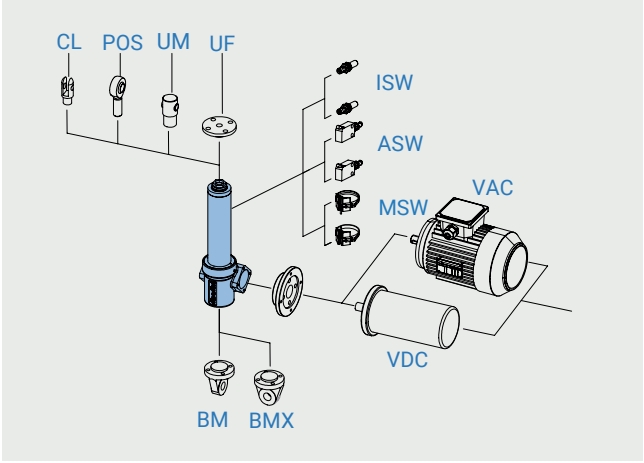
EP10-AC/DC Max 12 kN

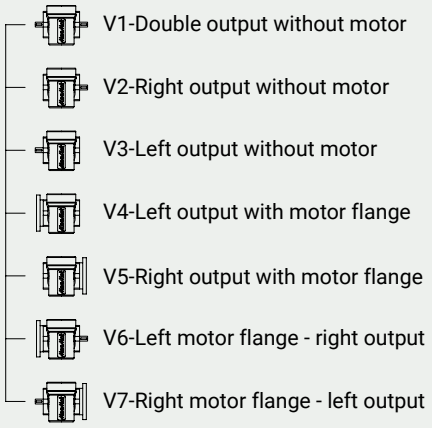


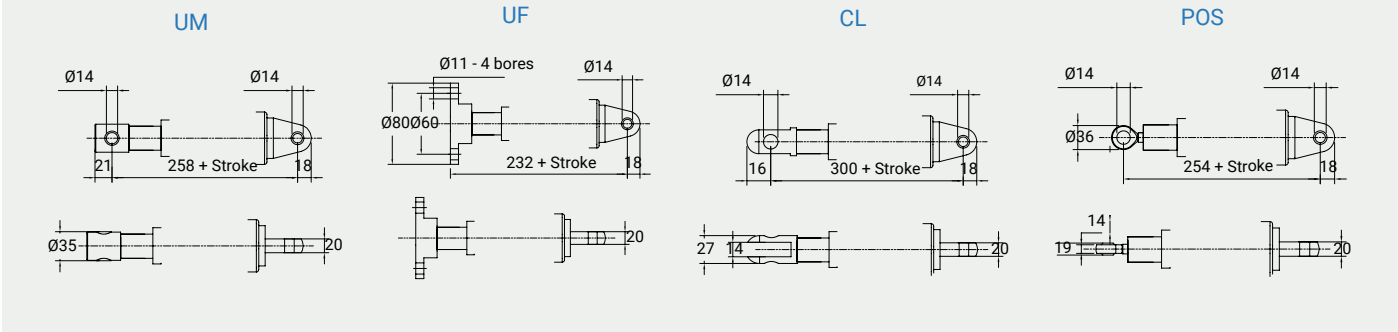


GENERAL FEATURES

Permanent magnet DC motor
Three phase or single phase motor
Worm gearbox
Acme Lead Screw
Crome plated push rod
Working temperature range -10 C - +60 C
Potentiometer and encoder on request
Duty %30 (5 min) a +30 C



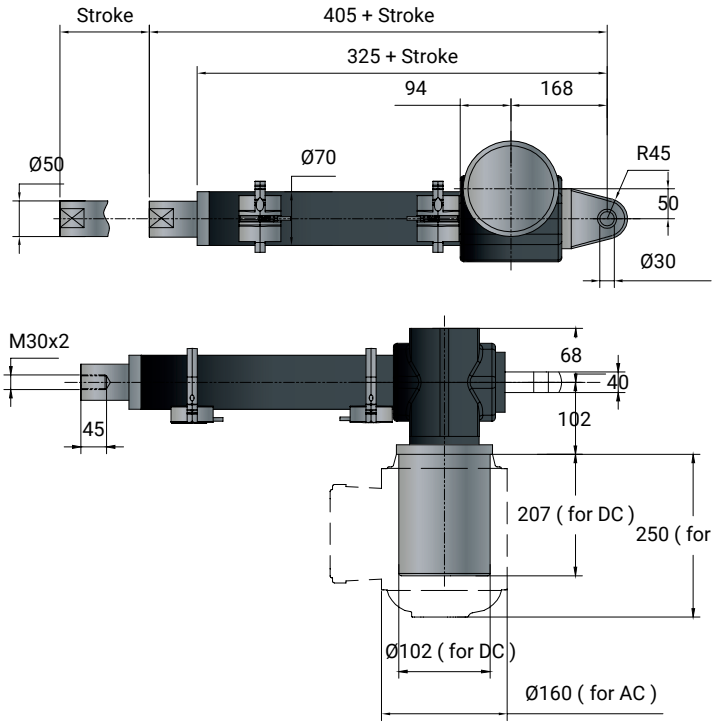


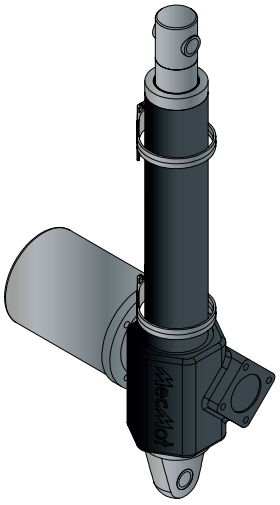


EP10 (Vac 3-phase)					
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power (KW)	Motor Speed (KW)
1200	46	A01	IEC63	0,37	2800
5000	11	A02	IEC63	0,37	2800
8000	7,5	A03	IEC63	0,37	2800
12000	5,5	A04	IEC63	0,37	2800

EP10 (Vdc)						
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power	Motor Speed (rpm)	Max Current for F max (A) 24 Vdc
1200	46	A11	IEC63	0,25	2800	12
5000	11	A21	IEC63	0,25	2800	12
8000	7,5	A31	IEC63	0,25	2800	12
12000	5,5	A41	IEC63	0,25	2800	12

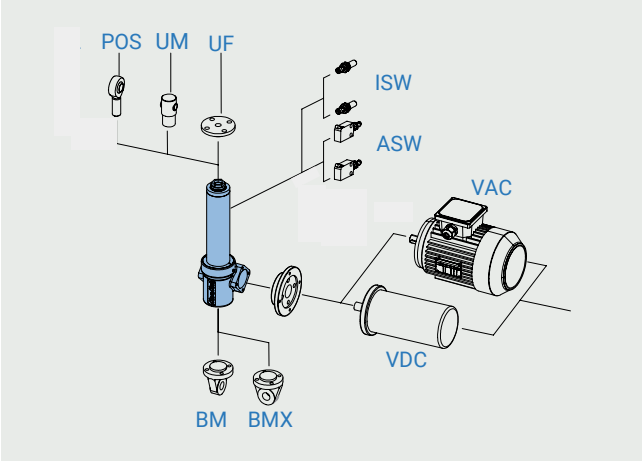
EP25-AC/DC Max 35 kN

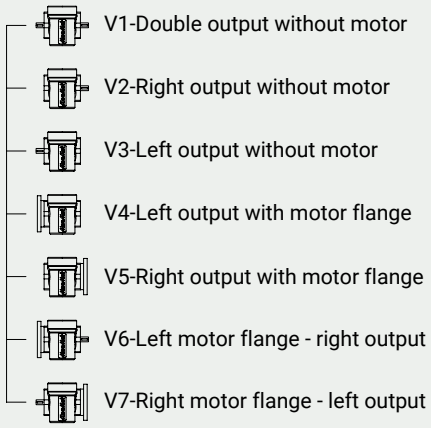




GENERAL FEATURES

Permanent magnet DC motor
Three phase or single phase motor
Worm gearbox
Acme Lead Screw
Crome plated push rod
Working temperature range -10 C - +60 C
Potentiometer and encoder on request
Duty %30 (5 min) a +30 C





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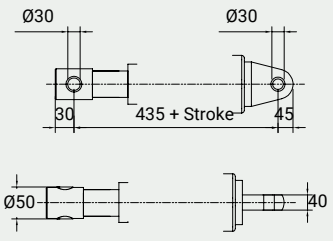

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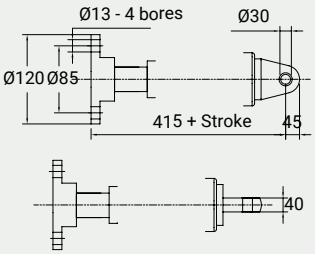

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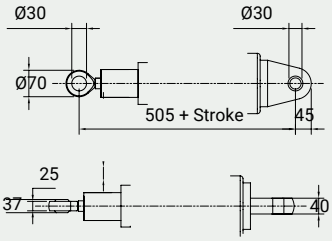
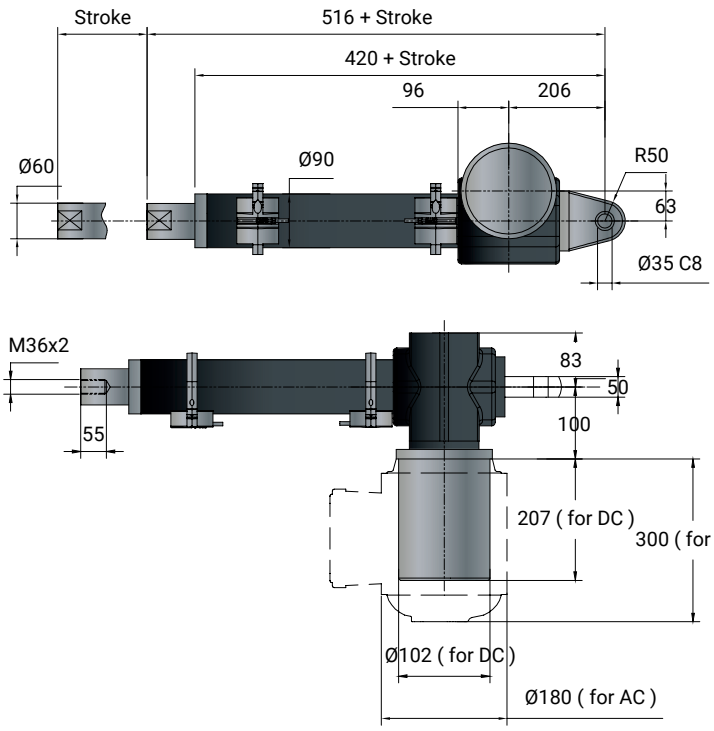
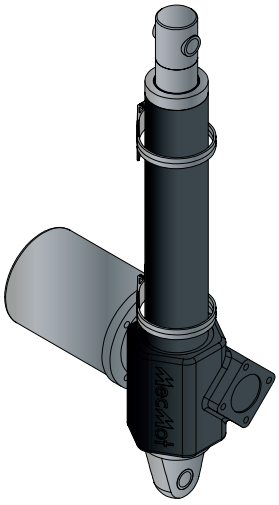


EP25 (Vac 3-phase)					
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power (KW)	Motor Speed (KW)
5000	46	A01	IEC80	1,1	2800
15000	15	A02	IEC80	1,1	2800
25000	11,5	A03	IEC80	1,1	2800
35000	6	A04	IEC80	1,1	2800

EP25 (Vdc)						
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power	Motor Speed (rpm)	Max Current for F max (A) 24 Vdc
2800	46	A11	IEC80	0,5	2800	12
8500	15	A21	IEC80	0,5	2800	12
1200	11,5	A31	IEC80	0,5	2800	12
20000	6	A41	IEC80	0,5	2800	12

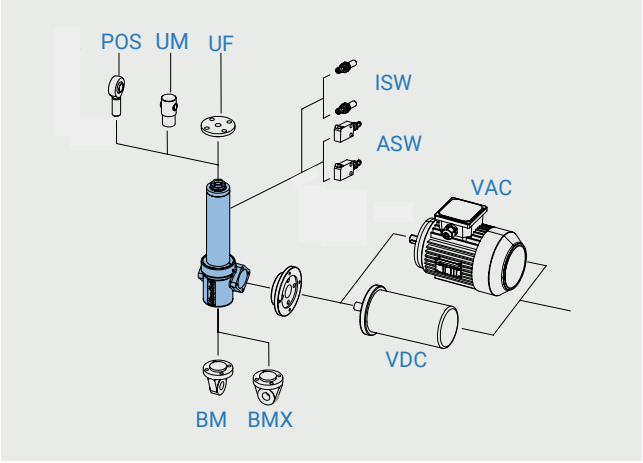
EP50-AC/DC Max 60 kN

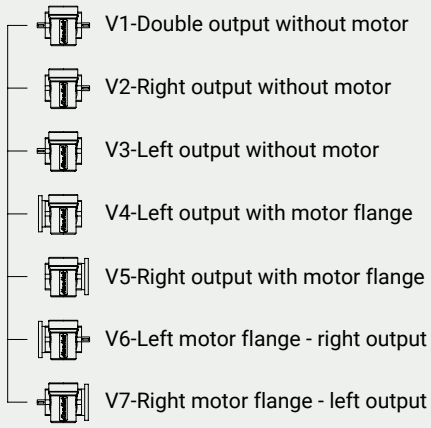




GENERAL FEATURES

Permanent magnet DC motor
Three phase or single phase motor
Worm gearbox
Acme Lead Screw
Crome plated push rod
Working temperature range -10 C - +60 C
Potentiometer and encoder on request
Duty %30 (5 min) a +30 C





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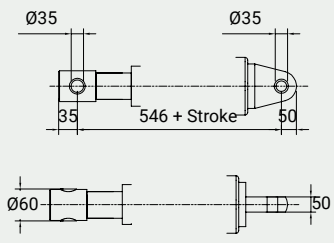

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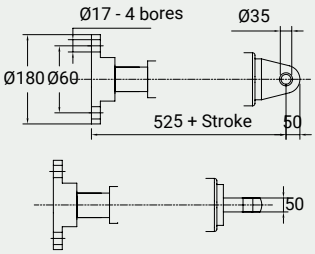

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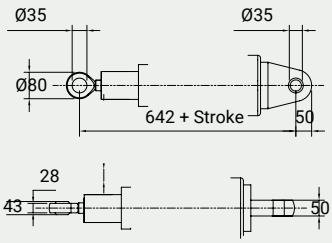
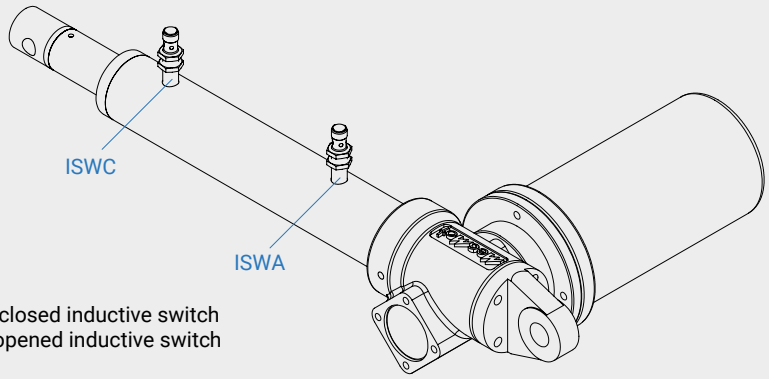


EP10 (Vac 3-phase)					
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power (KW)	Motor Speed (KW)
10000	46	A01	IEC90	2,2	2800
20000	23	A02	IEC11	2,2	2800
40000	11,5	A03	IEC11	2,2	2800
60000	8	A04	IEC11	2,2	2800

EP10 (Vdc)						
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power	Motor Speed (rpm)	Max Current for F max (A) 24 Vdc
4000	46	A11	IEC80	0,5	2800	12
8000	23	A21	IEC80	0,5	2800	12
17000	11,5	A31	IEC80	0,5	2800	12
24000	8	A41	IEC80	0,5	2800	12

INDUCTIVE SENSORS ISW

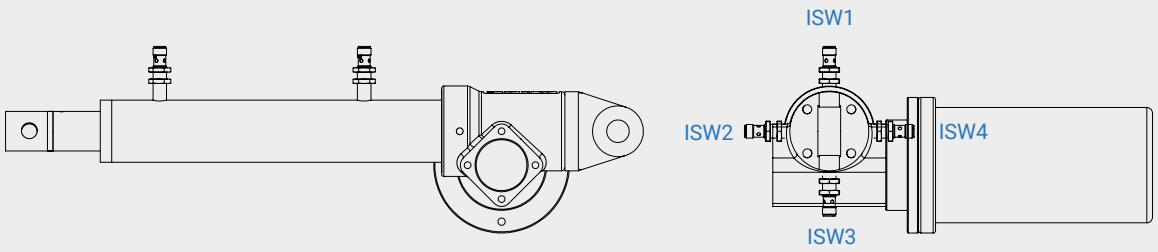


ISWC: All -closed inductive switch
ISWA: All-opened inductive switch

ISW INDUCTIVE LIMIT SWITCHES	
DC Voltage	5 ÷ 40 Vdc
Temperature Range	25° ÷ 75°
Proction Level	IP67
Switch Status Indicator	YELLOW LED

ORDERING KEY REFERENCES
Inductive sensors: 2ISW = 2 Sensors NO+NC

ISW POSITION

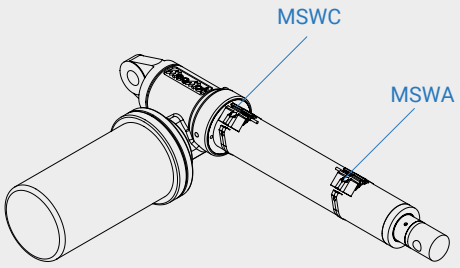


Magnetic limit switches MSW

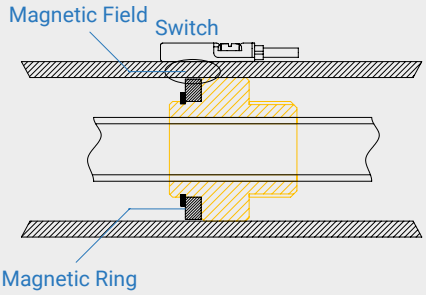
Magnetic sensors are activated by a magnetic field generated by a magnetic ring fixed to the nut.
These reads are mounted on outer tube with brackets; outer tube shall therefore be built with non-magnetic materials.

The magnetic switches are fixed as shown in the figure, the customer can rotate at will by adjusting the bracket.

Due to the size of the magnetic switches and to the so called switching band generated by the internal magnet the maximum working stroke is reduced by a few milimetres. This switching band width differs according to actuators size.



MSWC: All -closed magnetic switch
MSWA: All-opened magnetic switch
Supplied on EP6 - EP10



MSW MAGNETIC LIMIT SWITCHES			
Performance	Type Reed NC	Type Reed NO	PNP
DC voltage	3/110 V	3/30 V	6/30 V
AC voltage	3/110 V	3/30 V	/
25°C Current	0,5 A	0,1 A	0,20 A
Power	20 VA	6 VA	4 W
Supply Cable	PVC 2 x 0,14 mm	PVC 2 x 0,14 mm	PVC 3 x 0,14 mm
Cablenght		2500 mm	
Protection		IP67	

Circuit Reed NC

Circuit with normally closed Reed switch protected by a varistor against overvoltages caused when switching off, with LED indicator.

Circuit PNP

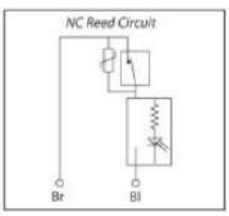
Circuit with Hall-effect switch and PNP outlet.
Protected against overvoltage spikes and reverse of polarity.
With LED indicator.

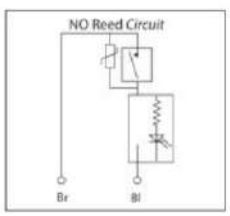
Circuit Reed NO

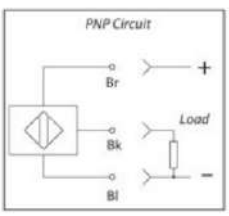
Circuit with normally open Reed switch protected by a varistor against overvoltages caused when swiching off, with LED indicator.

Ordering Key References

Magnetic limit switches:
2MSW0=2 Sensors circuit Reed NC
(standart version without prior information)
2MSW1=2 Sensors circuit Reed NO
2MSW2=2 Sensors PNP

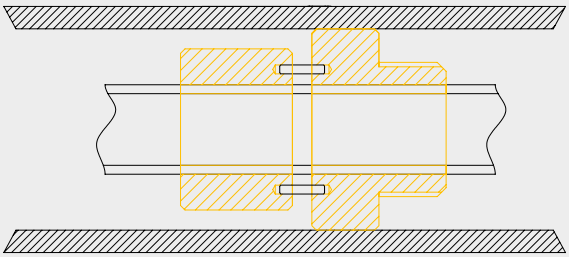






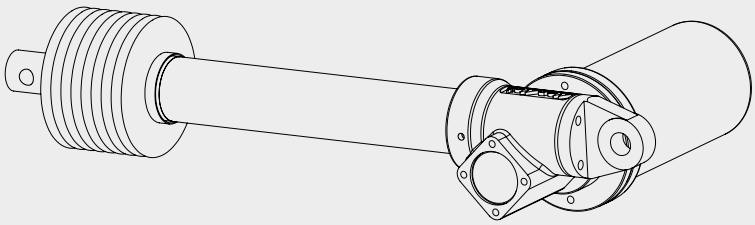
SAFETY NUT

The safety nut has been designed to start working only in case of main nut maximum wear. This safety nut is connected to the main bronze nut and travels with it along the stroke.
When the bronze nut is completely worn out, the steel nut starts working on acme screw until it comes to a complete grip to acme screw.
This kind of nut can work in both directionsand that is integral with the load in both compression or traction (pushing / pulling).



Bellows Boot

Option "KK"
Bellows boot protectspush rods: pharmaceuntical and food industries or aggressive environments are typical examples of applications where this option can be required.



Linear actuator

Ordering Code

	10	A01	200	UM	BM	MSW	V6	KK	...
EP	1	2	3	4	5	6	7	8	9

1 - Linear actuator size
6 - 10 - 25 - 50

2 - Version
A01 - A02 - A03 - A04 - A05 - A11 - A21 - A31 - A41 - A51

3 - Stroke
100 - 200 - 300 -400 - 500 - 600 - 700 - 800

4 - Front attachment
UM - UF - CR - POS

5 - Rear attachment position
BM - Standart
BMX - 90°

6 - Stroke end switches
ISW - Inductive proximity switches
MSW - Magnetic switches
ASW - Electric switches

7 - Actuator input
V1-Double output without motor
V2-Right output without motor
V3-Left output without motor
V4-Left output with motor flange
V5-Right output with motor flange
V6-Left motor flange - right output
V7-Right motor flange - left output

8- Accessories
SN - Safety nut
KK - Bellow

9- Other specifications
Example: Low noise
Push rod stainless steel