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CATALOGUE

Linear Actuators

Electro-mechanical Actuators

Hydro-mechanical Actuators

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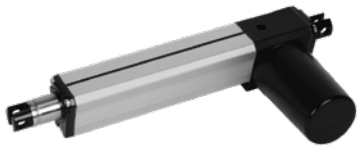
LINEAR ACTUATORS

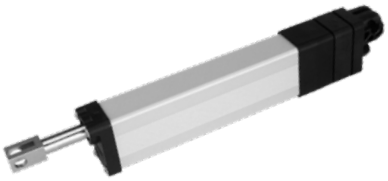
Electrically and manually operated linear actuators for adjusting procedures under demanding conditions in industry, automotive engineering and medicine technology

Electro-mechanical Actuators



L 1.101

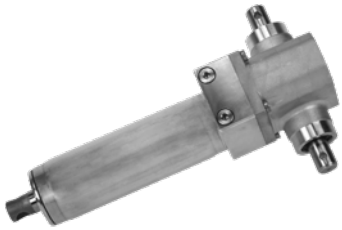
Linear Actuators RA 600
Version with limit switch or stroke measuring system
max. lifting force 1,000 up to 6,000 N
strokes from 100 to 600 mm



L 4.202

Linear Actuators RA 60 K
Version with limit switch or stroke measuring system
max. lifting force 300 up to 600 N
strokes from 100 to 150 mm

Hydro-mechanical Actuators



L 7.101

Linear Actuators RH 1250
manual-hydraulic version
max. lifting force 4.5 up to 12.5 kN
strokes from 80 to 250 mm

Linear Actuators RA 600

Max. lifting force 1,000 to 6,000 N, stroke from 100 to 600 mm
Version with limit switches or stroke measuring system

Application

Linear actuators RA 600 are used for electrically-operated adjustments and as actuating elements in applications with control-oriented demands in short-time service.
The actuators are suited for manifold industrial applications, indoors and outdoors.

Principal use

- Machine tool building
- Food machines
- Building services engineering
- Conveyor and dosing technology
- Chemical industry
- Solar technology
- Renewable energy generation

Fixing and installation

The linear actuators RA 600 have two fork eyes with Ø 12 mm for the connection of user's constructions.
It has to be considered that the linear actuator has to be mounted protected against torsion. The pushing rod must be installed without any side loads.
The connecting construction has to be designed so that no forced conditions act on the pushing rod.
The electrical connection is made by coded plug-type connectors.

Advantages

- High operating safety by self-locking spindle drive
- High static retention force
- Sturdy design by high-quality drive components
- Resistant against corrosion and disinfectants
- Press and splash water protection as per code class IP69K (optional)
- Reliable even with rough environmental conditions
- Compact design
- Mounting position: any
- Maintenance free
- Industrial design

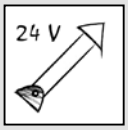
Description

Linear actuators RA 600 consist of a 24 V DC direct current drive, whose drive energy is transferred over a worm gear and a spindle lifting gear to the pushing rod.
The self-locking spindle lifting gear stops the actuator in case of power failure and maintains it safely in the reached position.
Features of the sturdy design are the generous dimensioning of the actuator and the solid design of the housing.
Alternative to code class IP66 also a press and splash water protection as per code class IP69K is available as an option.
Linear actuators RA 600 are protected against corrosion and function without any troubles also in rough operating and environmental conditions. Since they are maintenance-free, this is guaranteed permanently.
The version with limit switches is equipped with 2 sensors, that prevent an unintentional movement to the mechanical stroke ends and thus the overload of the mechanics.
The version with stroke measuring system allows the realisation of control-oriented applications and the operation of several linear actuators in synchronism.
The stroke ends are freely definable by means of the digital signal.

Operation

Linear actuators RA 600 can optionally be operated by hand panel or foot switch and supply units of the accessory programme as per data sheet M 8.200 with touch control or by an external control with 24 V output.
The version with stroke measuring system delivers the user incremental signals of the stroke measuring system.

Linear actuators RA 600 - 24 V DC



Part-no. I6XX XX2XXS1A

Technical data

Max. push force:	1.000 - 6.000 N
Max. pull force	80% of the push force
Stroke:	100 up to 600 mm
Max. duty cycle:	15%
Code class:	IP66 or IP69K

Operational modes

- Touch control with supply unit and hand panel or foot switch (as per data sheet M 8.200)
- Control by external 24 V DC control

Electrical interface

Plug-type connector 24 V DC

Mechanical interface

2 fork eyes Ø 12 mm
(Ø 10 mm with accessory bearing sleeve)

Accessories

- Bearing sleeve Ø 12 / Ø 10 mm
- Foot switch and hand panel as per data sheet M 8.200
- electrical supply units for 1, 2, 3 or 4 linear actuators as per data sheet M 8.200
- Plug

Material

Cylinder body:	polyamide, black, glass fibre reinforced
Guiding tube:	aluminium, naturally anodised
Pushing rod:	stainless steel

Important notes!

The linear actuators RA 600 are resistant against corrosion, detergents and disinfectants. The admissible environmental temperature is –20° up to +70 °C

Available variants

Linear actuators RA 600 are optionally available in the variants:

- **12 V supply voltage**
- **Absolute stroke measuring system (up to 200 mm stroke)**
- **Reinforced for high vibration load**
- **Especially protected against corrosion**
- **LIN-BUS control**

Version with limit switches

Description

The version with limit switches has 2 integrated Hall-effect sensors, which automatically switch off the motor brake as soon as the upper or lower stroke end position is obtained.
This guarantees that the linear actuator does not mechanically push against the stop. At the plug-type connector of this version the pins 3 and 4 have to be connected to 24 VDC. By changing the polarity, switching over from retracting to extending is effected.

Current consumption

As a function of the load the current consumption amounts linearly up to 6 A at nominal load. For a safe power supply, a supply current of at least 8 A is required.

Static retention force

The static retention force can exceed the maximum lifting force by up to 25%.

Technical data

Force [N]	Velocity Idle running [mm/s]	loaded [mm/s]	Current consumpt. [Ampere]	Duty cycle [max 1.5 min.]
1000	37	29	6	max. 15 %
2000	21	18	5	max. 15 %
4000	11	7	5.5	max. 15 %
6000	8.5	5	7	max. 15 %

Stroke [mm]	L [mm]	L + stroke [mm]	Weight [kg]
100	310	410	3.2
150	360	510	3.6
200	410	610	4.0
300	510	810	4.5
400	650	1050	5.0
500	750	1250	5.7
600	850	1450	6.4

Note: Linear actuators RA 600 with a stroke of 400 mm or more are equipped with an enlarged guiding length.

Code for part numbers

Bestell-Nr. **I6XX XX2XES1A**

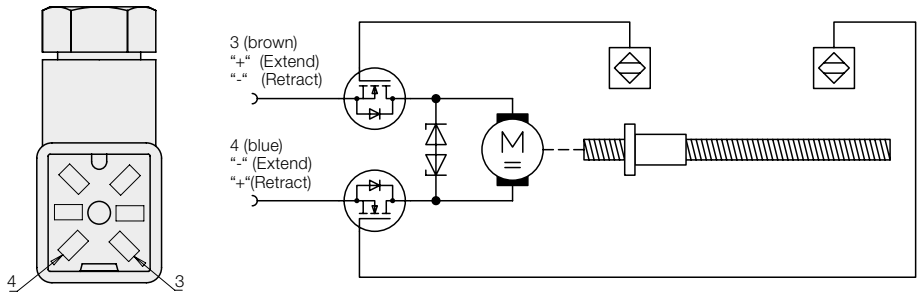
Maximum lifting force
(Push force)
01 = 1,000 N
02 = 2,000 N
04 = 4,000 N
06 = 6,000 N

Stroke
10 = 100 mm
15 = 150 mm
20 = 200 mm
30 = 300 mm
40 = 400 mm
50 = 500 mm
60 = 600 mm

Code class
B = IP66
C = IP69K

Variant 12 V available on request.

Circuit diagram and connection of plug-type connector for RA 600 with stroke end disconnection



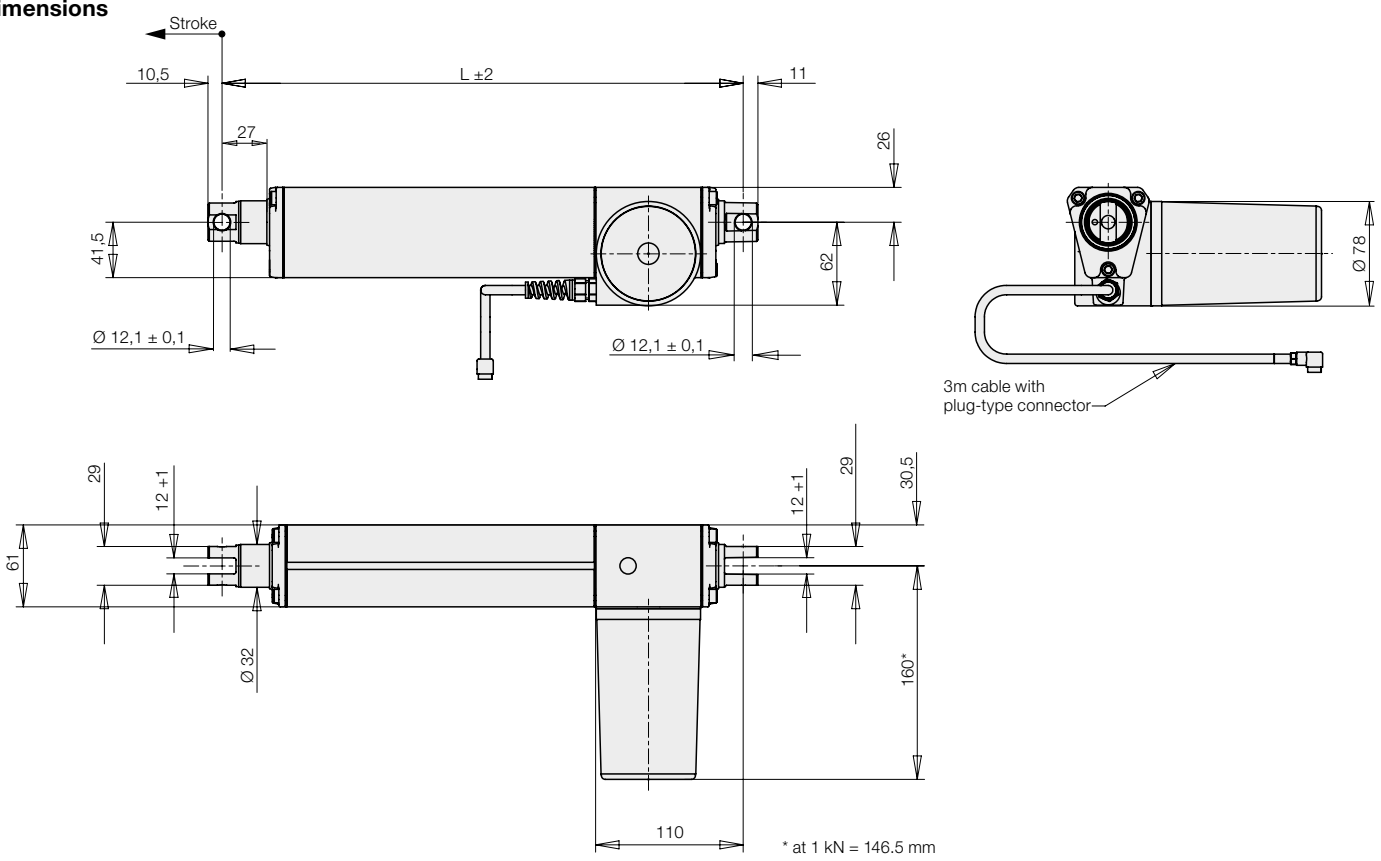
Important notes!

Only RA 600 with incremental stroke measuring system can be operated in synchronism!
If the supply unit (see page 3) is not used, the user has to provide a current limitation of 10 A.

Accessories

See page 3.

Dimensions



Version with stroke measuring system

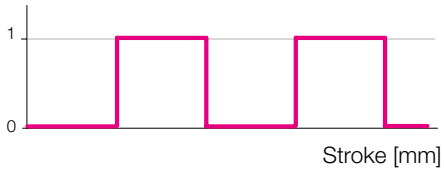
Description

The stroke of linear actuators is transmitted by potential-free square wave signals, which are generated by the rotating spindle, to an external control.
An additional reference point, that initialises the stroke measuring system, is in the retracted stroke end position. This reference point can also be used to switch off the retracted stroke end position.
With the incremental stroke measuring system control-oriented applications and the compound of several linear actuators in synchronism can be realised.
Due to the incremental acquisition of the position, faults of linearity are excluded.
Supply units as per page M 8.200 treat the actuators and the user's connecting construction with care due to a special control and thus contribute to the increase of the service life.

Technical data

See page 2.

Resolution of the stroke measuring system



1 kN: 0.75 mm stroke = 1 edge to edge distance
2 kN: 0.75 mm stroke = 1 edge to edge distance
4 kN: 0.5 mm stroke = 1 edge to edge distance
6 kN: 0.375 mm stroke = 1 edge to edge distance

Code for part numbers

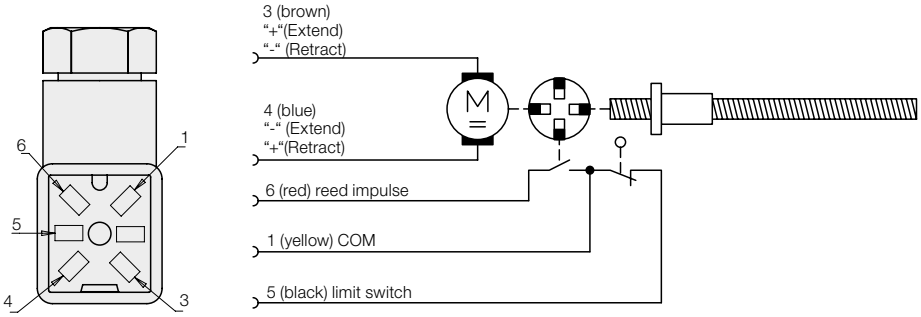
Part no. **I6XX XX2X IS1A**

Maximum lifting force
(Push force)
01 = 1,000 N
02 = 2,000 N
04 = 4,000 N
06 = 6,000 N

Stroke
10 = 100 mm
15 = 150 mm
20 = 200 mm
30 = 300 mm
40 = 400 mm
50 = 500 mm
60 = 600 mm

Code class
B = IP66
C = IP69K

Circuit diagram and connection of plug-type connector for RA 600 with stroke measuring system



Dimensions

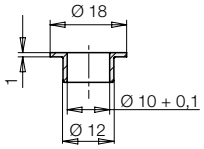
See page 2.

Important notes!

The stroke end positions must not be loaded mechanically. An approach in creep speed or switching off 3 mm before reaching the stroke end positions is required. For supply units with synchronization control this is met by the programmed soft stop function.
The positioning accuracy with touch control amounts to ± 2 mm, depending on the operator and the load.
Place task with higher demands on the positioning accuracy can be realised with special controls.
Therewith place accuracies can be realised within the size range of the resolution of the stroke measuring system.
In addition, there is the possibility to store temporarily up to 3 positions for reproducible approach.

Accessories

• Bearing sleeve for fork eye
DU bushing Ø12 / Ø10
Part no. 3301-936



Electrical accessories

See data sheet M 8.200

• Foot switch
for touch control up–down
with connecting cable 3.0 m
Part no. 3823038

• Hand panel
for touch control up–down
with connecting cable 1.6 m
Part no. 3823025

• Supply unit
with control
for one linear actuator
Part no. 3821246

• Mains cable 230 VAC
with earthing type plug for supply units
Mains cable smooth, 3.0 m
Part no. 3823040

• Plug
for user's control
with 5 solded strands and blade receptacles
Part no. 3823048

Linear Actuators RA 60 K

Max. lifting force 300 to 600 N, stroke from 100 to 150 mm version with limit switches or stroke measuring system

Advantages
- Compact design
- Outstanding durability
- Variable mounting position
- Maintenance free
- Code class IP69K (Cleaning with high-pressure cleaner possible)
- Solid pushing rod guide
- High positioning accuracy by directly coupled stroke measuring system

Linear actuators RA 60 K – 12 V DC

Part no.: F2-XX-XX-1-C-XS3A

Technical data

Max. push force:	300 to 600 N
Max. pull force:	100% of the push force
Stroke:	100 to 150 mm
Max. duty cycle:	15 %
Code class:	IP69K

Operations
- Control by external 12 V DC control
- Optional control by BUS interface

Electrical interface
Cable wires 0.34 mm² 12 VDC

Mechanical interface
2 fork eyes Ø 10 mm

Accessories
- Kit of plug-type connector
- Bus control

Application
Linear actuators RA 60 K are used for electrically-operated proportioning tasks or as actuating element in applications with control-oriented demands in short-time service.
The range of application is versatile.
The version for mobile applications was developed especially for the rough outdoor use and under corrosive environment influences.

Principal use
- Agricultural and forest technology
- Mobile automotive engineering
- Conveyor and dosing technology
- Municipal technology

Fixing and installation
The linear actuators RA 60 K have two fork eyes with Ø 10 mm for the connection of user's constructions.
It has to be considered that the linear actuator has to be mounted protected against torsion.
The pushing rod must be installed without any side loads. The connecting construction has to be designed so that no forced conditions act on the pushing rod.
The electric connection is made alternatively by the plug-type connector available as accessory or directly to a terminal strip in the control box by means of the cable wires.

Description
Linear actuators RA 60 K consist of a 12 VDC direct current drive, whose drive energy is transferred over a planetary gear and a spindle stroke actuator to the pushing rod.
The generated lifting force is available as push and pull force. The sturdy design with code class IP 69 k guarantees a trouble-free function also in rough operating conditions.
Linear actuators RA 60 K are maintenance free and can be operated with a duty cycle of up to 15 %.
The version with limit switches is equipped with 2 sensors, that prevent an unintentional movement to the mechanical stroke ends and thus the overload of the mechanics.
The end positions of the RA 60 K with stroke measuring system are definable by the signal of the stroke measuring system.

Operation
Linear actuators RA 60 K are supplied and operated with 12 V board supply of the vehicle electronics.
The version with stroke measuring system provides the absolute position values of the actuator to the control. Referencing is not required.
RA 60 K can be integrated on request into existing bus systems and controlled by LIN or CAN bus.
Please contact us.

Materials

Body:	polyamide, black, glass fibre reinforced
Guiding tube:	aluminium, anodized and powder coated
Pushing rod:	stainless steel

Important notes
The linear actuators RA 60 K are resistant against corrosion, diesel, oil, detergents, fertilizers and salts.
The admissible environmental temperature is –20° up to +70 °C.
Cleaning with high-pressure cleaner is admissible.
We recommend to install the cable ends or plug-type connectors protected against the environmental conditions to avoid penetration of humidity and premature corrosion.

Description

The version with limit switches has 2 integrated sensors, which automatically switch off the motor as soon as the upper or lower stroke end position is obtained.
This guarantees that the linear actuator does not mechanically push against the stop.
The wires brown and white of this version are to be connected to 12 V DC. By changing the polarity, switching over from retracting to extending is effected.

Technical data

Force	Speed		Current consumption	Duty cycle
	Idle running	loaded		
[N]	[mm/s]	[mm/s]	[A]	[max. 1.5 min.]
300	30	20	3.0	max. 15%
600	16	9	3.5	max. 15%

Stroke	L	L + stroke	Weight
[mm]	[mm]	[mm]	[kg]
100	267	367	1.0
150	317	467	1.1

Code for part numbers

Part no. **F2-XX-XX-1-C-ES3A**

Maximum lifting force
(push force)
03 = 300 N
06 = 600 N

Stroke
10 = 100 mm
15 = 150 mm

Variant 24 V available on request

Current consumption

Depending on the load, the current consumption is linear up to the current value at nominal load specified in the technical data.
For a safe power supply, a supply current of at least 6 A is required.

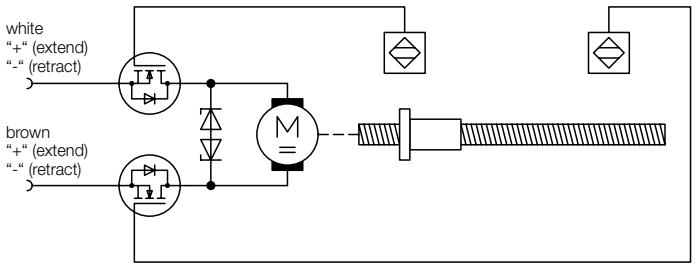
Code class

IP69K (exception: cable end)

Static retention force

200 N at lifting force 300 N
600 N at lifting force 600 N
Since the actuators are designed without holding brake, the piston rod can be displaced in case of higher loads or vibrations and the actuator has to be readjusted, if necessary.

Circuit diagram and configuration of cables for RA 60 K with stroke end disconnection



Important notes

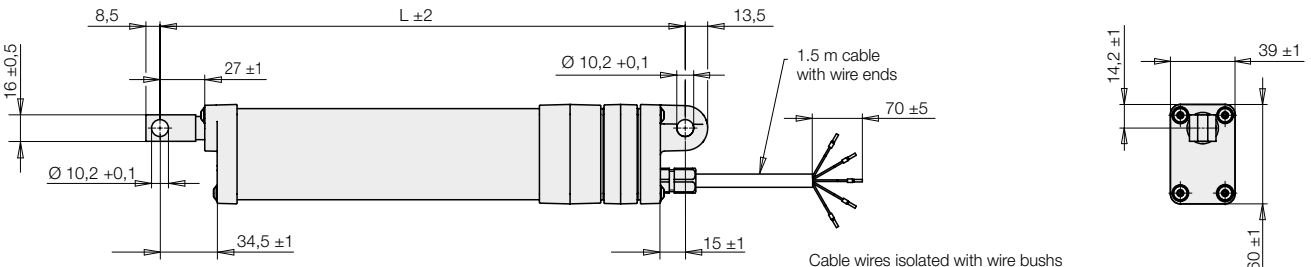
The user has to provide a current limitation of 4.5 A.
In the case of a blockade, the control has to provide for a switching off of the power supply at the latest after 10 seconds to prevent an overload of the actuator.

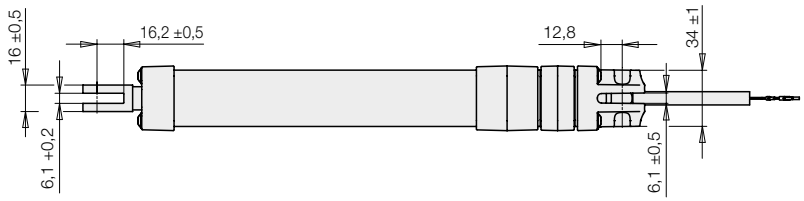
For more information on technical data and tolerances, see operating manual or installation drawing.

Accessories

See page 3

Dimensions





Description
The version with absolute stroke measuring system is equipped with a linear potentiometer. A slider at the pushing rod produces a signal at the potentiometer, that is proportional to the position of the pushing rod. This signal can easily be evaluated by a priority control and is permanently available. Referencing is not required. Due to the direct connection of the absolute stroke measuring system to the pushing rod, one gets a precise stroke information with slight backlash.
With the stroke measuring system, control-oriented applications and the compound of several linear actuators in synchronism can be realised.

Technical data
See page 2

Data stroke measuring system

Connecting resistance	5 k Ω
Linearity	± 1 %

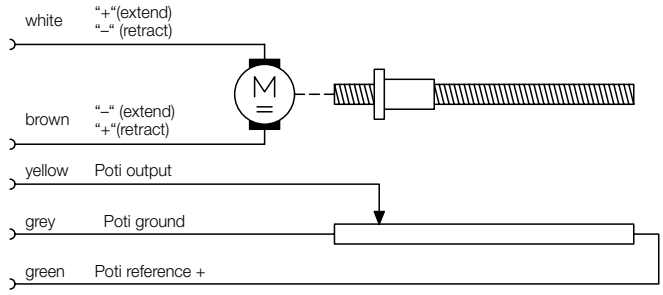
Connection according to the principle of a voltage divider to a stable reference supply point with max. 50 V.

Code for part numbers
Part no. F2-XX-XX-1-C-AS3A

Maximum lifting force
(push force)
03 = 300 N
06 = 600 N

Stroke
10 = 100 mm
15 = 150 mm

Circuit diagram and configuration of cables for RA 60 K with stroke measuring system



Dimensions
See page 2

Important notes
The stroke end positions must not be loaded mechanically. An approach in creep speed or switching off 2 mm before reaching the end positions is required.

Accessories

• Kit of plug-type connector Superseal 5 Pol

Complete kit consisting of plugs and bushing with seals.
For crimping of the plug contacts, the user has to remove the wire bushs of the cable.
The bushing is suited for wire diameters of 0.75 mm^2 to 1.5 mm^2.

Part no. 3823088

• Bus control

The optionally available bus board especially adapted to the customer's requirements offer beside the bus control further advantages such as
– Motor brake function
– Soft start
– Current limitation
– Excess-current release
– Limitation of duty cycle
– Function release blockade
– Error message

Linear Actuators RH 1250

Max. lifting force 4.5 to 12.5 kN, stroke from 80 to 250 mm manual-hydraulic version

Advantages

- High operating safety by speed limiting valve and pressure relief valve
- Optional descent actuation by pushing or turning
- Optional fork or flange mounting
- Precise plunger guide
- Independent of external power supply
- No obligatory tests as per electrical safety regulations
- Compact design
- Single-lever operation
- Maintenance free
- Resistant against disinfectants
- Different lacquerings as an option

Linear actuators RH 1250 manually operated

Part no.: M8-XX-XX-X-A-X-L-X-X

Technical data

Max. push force:	4,500 – 12,500 N
Stroke:	80 – 250 mm

Operations

- Foot pedal or hand lever

Mechanical interface

Plunger eye Ø 12 mm
Centring pivot Ø 38 mm
Optional extra: Fork or flange mounting

Accessories

- Foot pedal
- Hand lever
- Bearing blocks

Application

Linear actuators RH 1250 are universally used as manually-operated actuators for linear movements.

Principal use

- Height adjustment of hospital and nursing beds as well as mobile nursing chairs
- Height adjustment of patient transporters and therapy couches
- Adjustment of examination and care chairs as well as childbirth beds
- Height adjustment of instrument tables
- Actuator for lifting modules and lifting tables

Description

Linear actuators RH 1250 are manually operated, hermetically sealed, hydro-mechanical actuators for linear adjusting procedures.
The compact design contains the pump piston and the valve technology. Also the oil reservoir and the plunger cylinder are integrated.
The hydraulic transmission in connection with the manual operation allows a good dosage of very high forces.
Important for that are also the mechanics with minimum clearance as well as the sensitive responding valves with exactly defined switching points.
In principle only push forces can be generated.

Material

Body:	Aluminium
Operating shaft:	Steel, corrosion resistant
Plunger:	Steel, corrosion resistant

Fixing and installation

The linear actuators RH 1250 have 1 location hole Ø 12.1 mm in the plunger and 2 centring pivots Ø 38 mm for the connection of user's constructions.
The user's construction must exclude side loads and forced conditions.
The centring pivots Ø 38 mm are unlacquered.

There are two different operating directions of the pump lever: clockwise and counterclockwise operation of the pump lever, depending on the user's construction.

Operation

The plunger rod is extended by reversible rotation of approx. 40° by an operating lever at the operating shaft.
The recommended lever length is approx. 300 mm.
To retract the plunger cylinder, the operating shaft has to be turned to the opposite direction by approx. 10°. The operating shaft returns automatically.

Important notes

The linear actuators RH 1250 are resistant against corrosion, detergents and disinfectants up to +70 °C.
The admissible operating temperature is 10° up to 40 °C.
To retract the plunger of the linear actuator a push load of at least 100 N is required.

Functioning

All versions of the RH 1250 are operated with an operating lever, that is pinned at the operating shaft.
The integrated flow control valve provides for an uniform descent speed in all load conditions.
Due to the possibility to get a drilled operating shaft, the actuator can quickly be installed and put into operation.

It has to be considered that the user's construction always acts with push force onto the actuator.
The actuator has a high safety against overload. In the case of overload it is not possible to continue pumping the actuator, but descent is possible. The operator has to make sure that the actuator is not overloaded.

Technical data

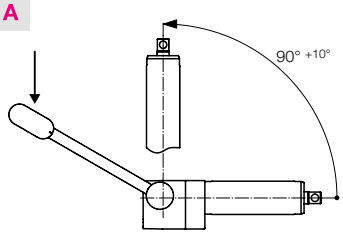
Lifting force	Pump strokes	Required pump torque	v Descent	Release torque Descent	Release angle Descent
[N]	[per 100 mm]	[Nm/full load]	[s/100 mm]	[Nm/full load]	[°]
4500	7 ±1	160	4.5 ±1	10	2 – 10
6500	9 ±1	160	4.5 ±1	11	2 – 10
9500	13 ±1	160	4.5 ±1	15	2 – 10
12500	22 ±1	120	5.5 ±1.2	17	2 – 10

Important notes

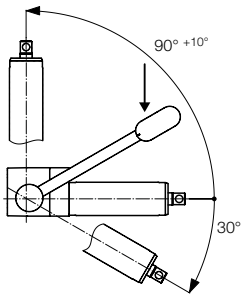
The indicated torques are the maximum torques required for operation.
The return torque of the operating shaft for the pump stroke is max. 6 Nm. The return torque of the operating shaft for the descent is max. 2 Nm. The indicated return torques mus not be exceeded by the user's constructions of the operating lever. Otherwise, it could be possible that the operating lever will not be moved back to the off-position or an unintentional descent of the actuator could occur.

Admissible mounting positions for operating direction

A



D



Code for part numbers

Part no. M8-XX-XX-X-A-X-L-X-X

Maximum lifting force (push force)
04 = 4,500 N
06 = 6,500 N
09 = 9,500 N
12 = 12,500 N

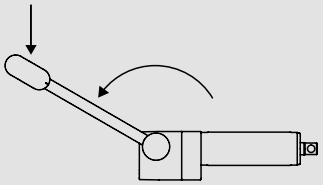
Stroke
08 = 80 mm
14 = 140 mm
20 = 200 mm
25 = 250 mm

Bore hole operating shaft
1 = perpendicular to the plunger Ø 6 mm (see drawing page 3)
2 = parallel to the plunger Ø 6 mm
3 = without bore hole

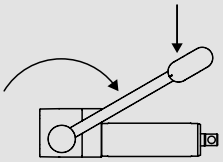
Fixation (page 3)
S = Standard
G = Fork (up to 6,500 N lifting force)
F = Flange (up to 6,500 N lifting force)

Colour
1 = unlacquered
2 = RAL 9016 traffic white
3 = RAL 9006 white aluminium
4 = RAL 9005 black
5 = RAL 7035 light grey
6 = RAL 7038 agate grey

Operating direction
A = pump lever counterclockwise



D = pump lever clockwise



Available on request:

- Stroke lengths up to 600 mm in gradations of 50 mm (up to lifting force 6,500 N)
- Descent actuation by pushing
  Variant for emergency adjustment in hospital beds. By pushing the descent bolt, additionally mounted at the actuator, the plunger can be safely pushed in. The descent bolt returns automatically.
- Descent actuation by turning
  Variant for emergency adjustment in hospital beds. By rotating a descent shaft, additionally mounted at the actuator, the plunger can be safely retracted.
  The descent actuation by turning does not return automatically.
- Front-side thread M8 in the plunger
- Versions with low residual magnetism for MRT applications
- Other descent speeds
- Other colours
- Customised special actuators

The RH 1250 is available in different mounting variants.
Besides the standard mounting with centring pivot Ø 38 mm mounted at the housing, the RH 1250 can be deliverd with fork mounting or flange mounting.

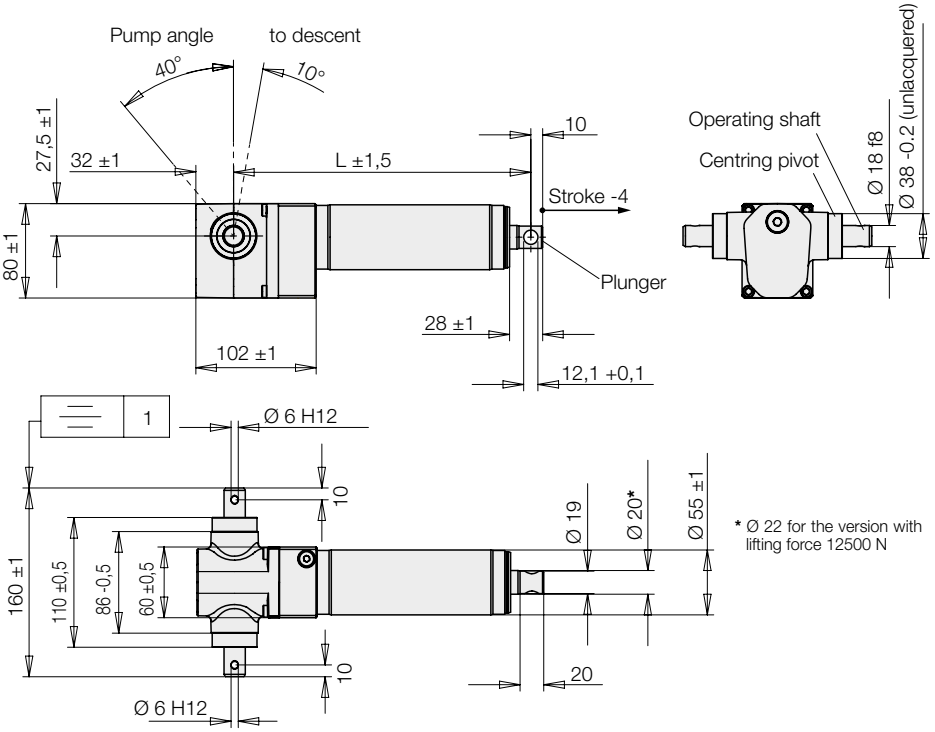
Part no. **M8-XX-XX-X-A-X-L-X-X**

Mounting
S = Standard
G = Fork
F = Flange

Standard

The standard version of the actuator is located by forks or eyes in the user's construction at the centring pivots Ø 38 mm and is secured with a bolt Ø 12 mm. It has to be considered that the user's construction always acts with push force onto the actuator.

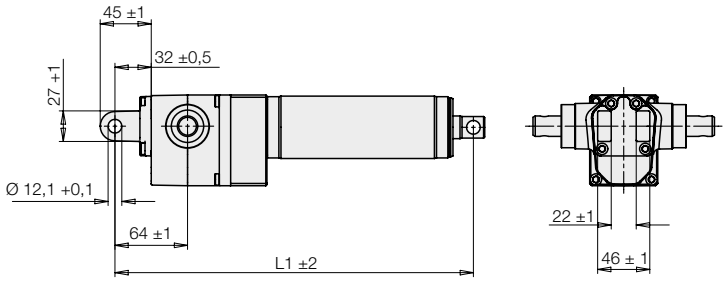
Stroke [mm]	L [mm]	L + stroke [mm]	Weight [kg]
80	192	272	2.2
140	252	392	3
200	312	512	3.5
250	362	612	4



Fork **

For easy mounting by means of flange and bolt.

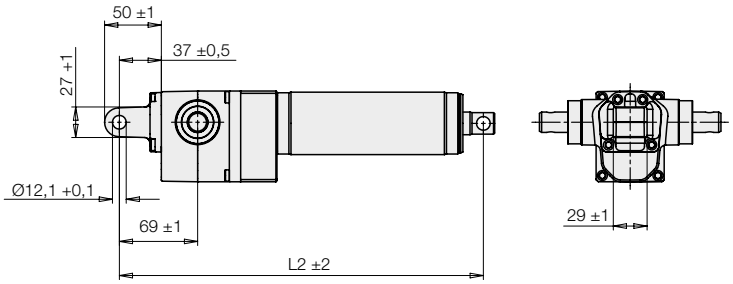
Stroke [mm]	L1 [mm]	L1 + stroke [mm]	Weight [kg]
80	256	336	2.2
140	316	456	3
200	376	576	3.5
250	426	676	4



Flange **

Often selected variant for example in therapy couches. Integration of the actuator in a steel structure by means of fork and bolt.

Stroke [mm]	L2 [mm]	L2 + stroke [mm]	Weight [kg]
80	261	341	2.2
140	321	461	3
200	381	581	3.5
250	431	681	4



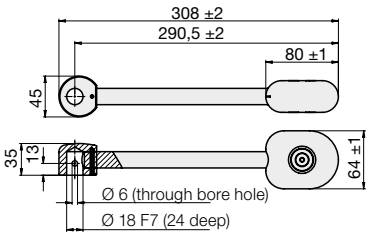
** Fork and flange mounting up to a lifting force of 6.500 N available.
Forks and flanges have drafts.

Important note

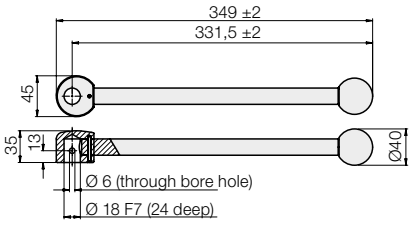
To avoid an overload of the actuator, external stops are to be provided for the operating elements in order to limit the pump angle to 40°. Also for extensions with far-off levers supports for torque compensation have to be provided.

Accessories

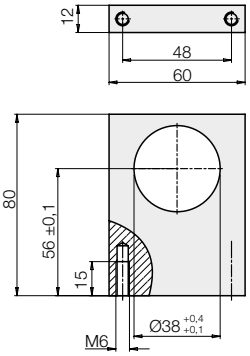
• Foot pedal
Pre-drilled for the arrangement of 90° to the shaft bore hole
Part no. 0990180



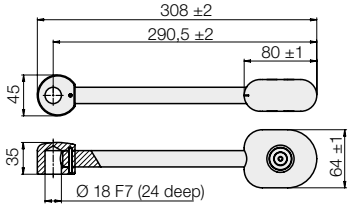
• Hand lever
Pre-drilled for the arrangement of 90° to the shaft bore hole
Part no. 0990182



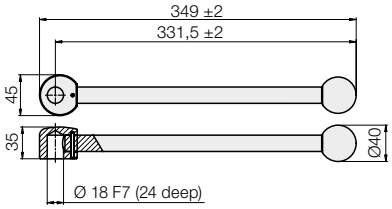
• Bearing block
For location of the RH 1250 at the bearing eyes Ø 38
2 off are required
Part-no. 3537289



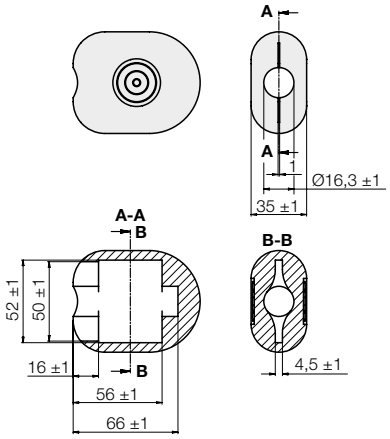
• Foot pedal
Without bore hole for application-specific arrangement.
Part no. 0990181



• Hand lever
Without bore hole for application-specific arrangement.
Part no. 0990183



• Pedal cover, black
For application-specific lever or as spare part
Part-no. 3549002



Important notes
The RH 1250 is not suitable for pull load. If the plunger will be loaded by pulling, air can be pulled into the hydraulic system and this can lead to malfunctions. This can be eliminated by repeated extension and retraction of the actuator.

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