JENNY SCIENCE

moving precisely, within tight space

Version from
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Creator
Marcel Mehr, Development

Datasheet ELAX® Ex F20



ELAX® Ex F20, Linear Motor Slide

Highlights

Flexible positioning with a repeat accuracy of ± 5µm, resolution 1µm

Single cable solution
Reduces wiring effort

Peak forces from 60N
High cycle rates with velocities up to 3m/s due to the linear motor

Distinct less energy consumption in comparison to pneumatic slides

Forceteq® basic/pro force control
Force limitation, force monitoring with XENAX® Xvi servo controller

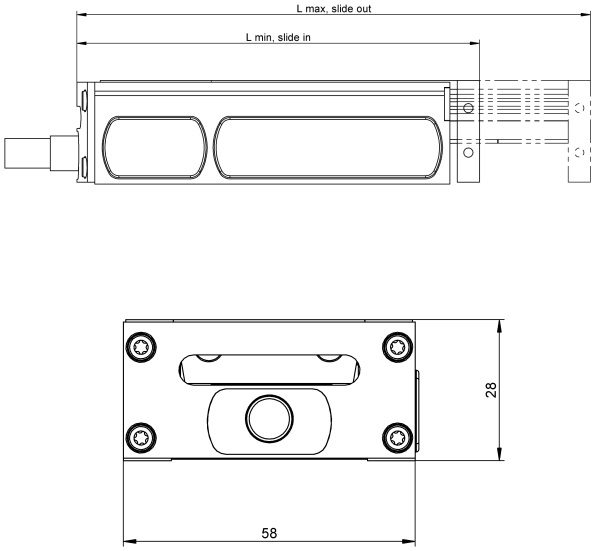
Functional Safety, TÜV certified
SIL 2, PL d, CAT 3 with XENAX® Xvi servo controller

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1 Specification data & installation dimensions

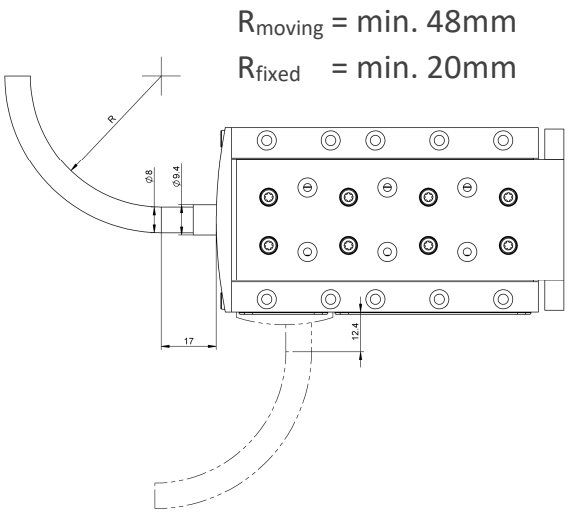
1.1 Dimensions



ELAX® Ex F20	L min [mm] *(in)*	L max [mm] *(in)*
Ex 30F20	109 *(4.29)*	139 *(5.47)*
Ex 50F20	129 *(5.08)*	179 *(7.05)*
Ex 80F20	177 *(6.96)*	257 *(10.12)*
Ex 110F20	207 *(8.15)*	317 *(12.48)*
Ex 150F20	267 *(10.51)*	417 *(16.42)*

1.2 Mass of the axes

ELAX® Ex F20	Mass slider [g] *(lbs)*	Mass weight comp. spring [g] *(lbs)*	Mass weight comp. magnetic [g] *(lbs)*	Mass total including spring / magn. [g] *(lbs)*	Masse total without weight comp. [g] *(lbs)*
Ex 30F20	195 *(0.43)*	165 *(0.36)*	300 *(0.66)*	725 / 860 *(1.60 / 1.90)*	560 *(1.23)*
Ex 50F20	265 *(0.58)*	200 *(0.44)*	300 *(0.66)*	830 / 930 *(1.83 / 2.05)*	630 *(1.39)*
Ex 80F20	340 *(0.75*	270 *(0.60)*	500 *(1.10)*	1050 / 1280 *(2.32 / 2.82)*	780 *(1.72)*
Ex 110F20	415 *(0.91)*	440 *(0.97)*	500 *(1.10)*	1385 / 1885 *(3.85 / 4.16)*	945 *(2.08)*
Ex 150F20	490 *(1.08)*	N/A	N/A	N/A	1110 *(2.45)*



1.3 Cable outlet & bending radius

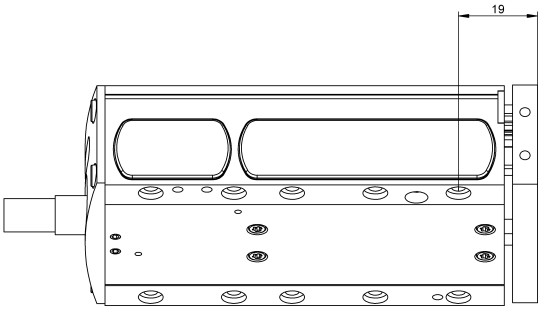
The cable outlet is located at the back as standard but can be ordered on the side as an option.
For permanently moving cables, a minimum bending radius of 48mm (R_{moving}) must be observed. The cable must be fixed before and after the moving section on the outer jacket. For fixed installations, a one-time bending radius of 20mm (R_{fixed}) must be respected. The cable is not designed for torsional stress, but achieves more than 1million cycles at a torsion of ±90° over a length of 1 m.

If the bend begins directly at the cable outlet, the cable must be routed straight over a defined length before any bending or movement is allowed.

1.4 Absolute position & zero-point

1.4.1 Reference drive

The reference drive is used to determine the position of the slide in the magnetic measuring system. This is done internally to the mechanical stop - either in the retracted or extended position. If an internal stop cannot be reached for mechanical reasons, an external mechanical stop can be teached in initially as an alternative.

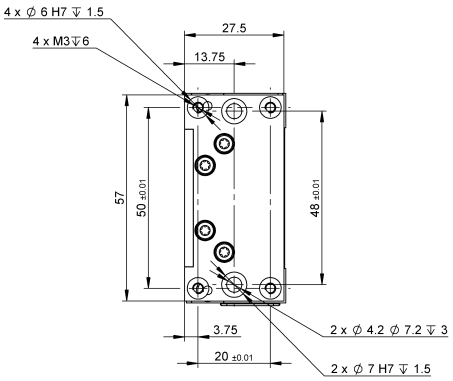


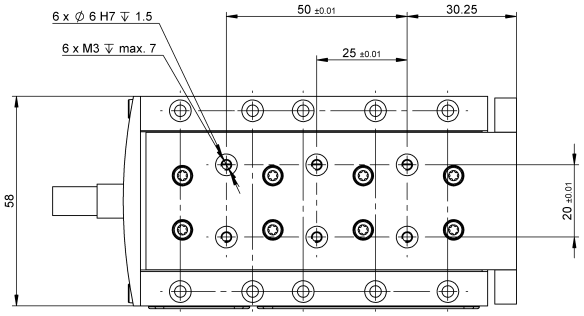
1.4.2 Zero-point & mechanical stop

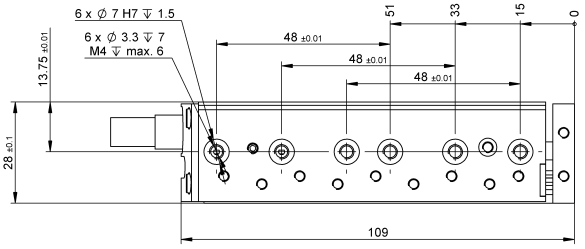
The zero-point position is 1 mm distanced from the mechanical stop in the retracted position and is calculated and approached fully automatically after the reference run. In the zero-point position, the front flange is 19 mm ± 0.3 mm away from the first fitting hole.

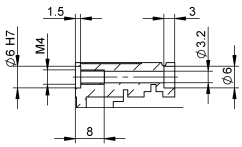
1.5 Installation dimensions Ex 30F20

front flange

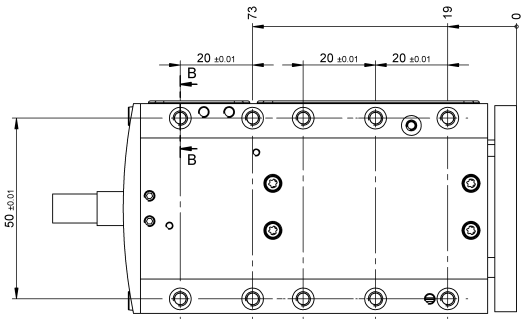






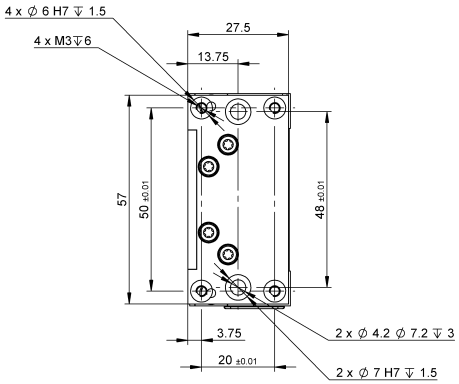


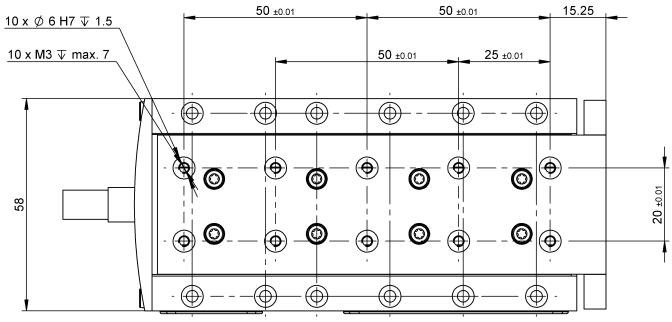
B-B

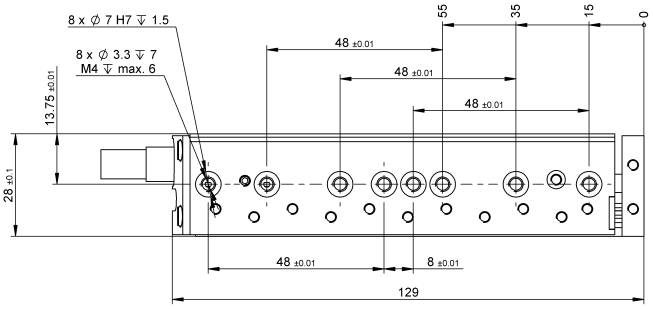


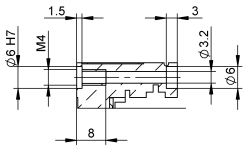
1.6 Installation dimensions Ex 50F20

front flange

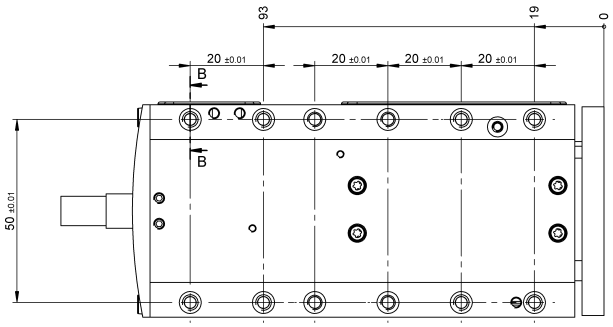




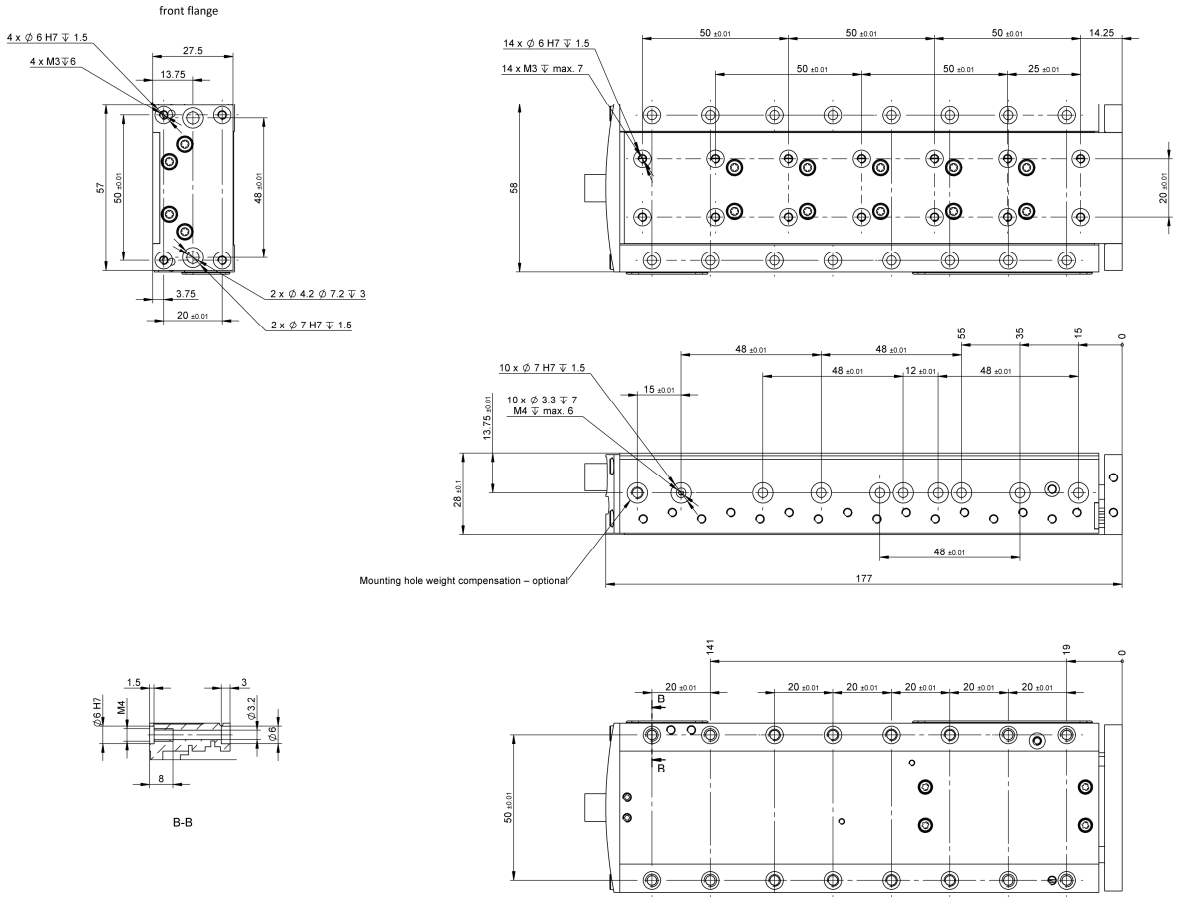




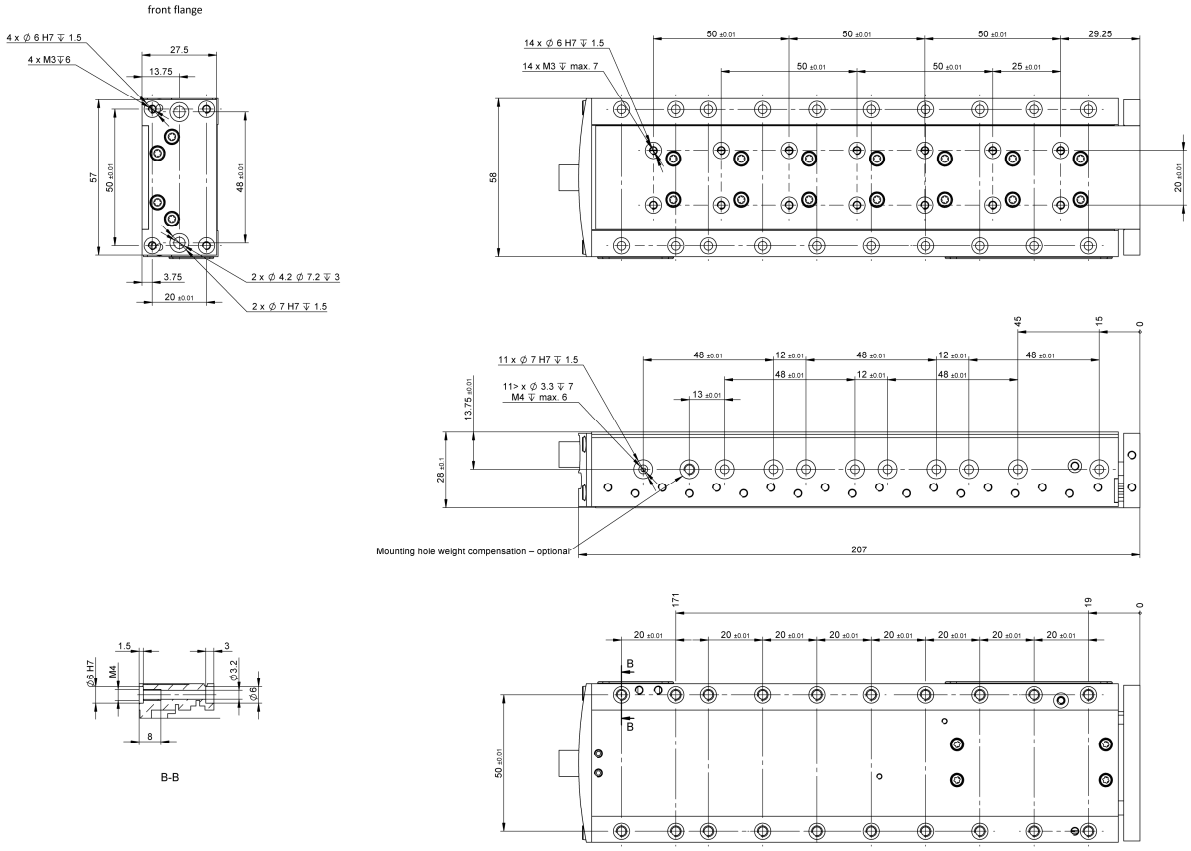
B-B



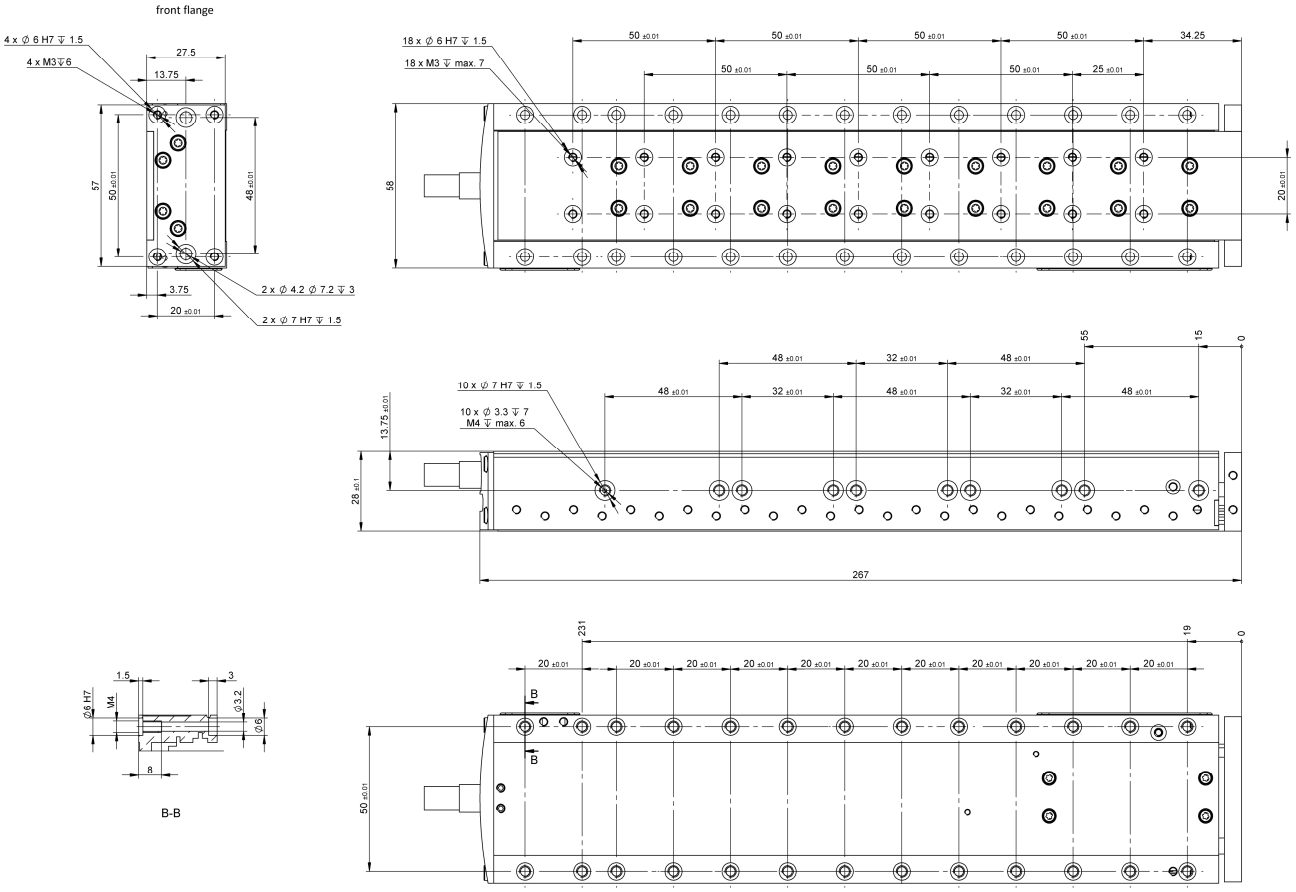
1.7 Installation dimensions Ex 80F20



1.8 Installation dimensions Ex 110F20

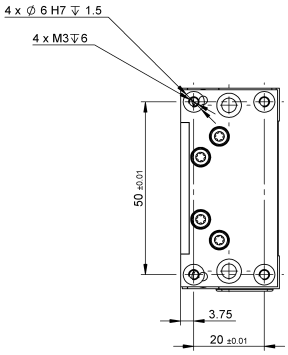


1.9 Installation dimensions Ex 150F20



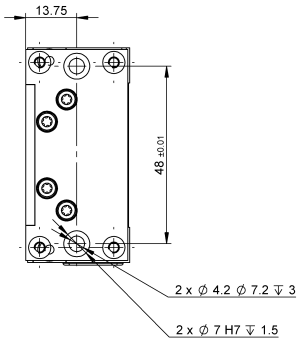
1.10 Hole pattern in use

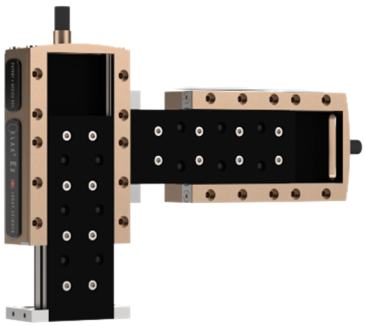
Y-Z Pick & Place flat **Ex**

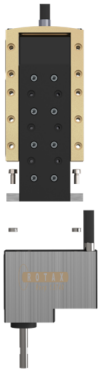




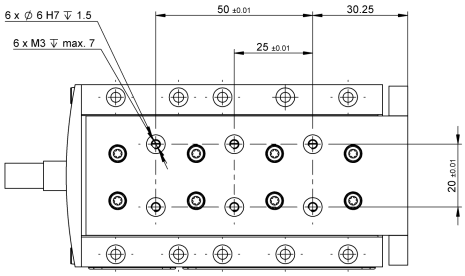
Y-Z Pick & Place upright **Ex** or **Rxvp**

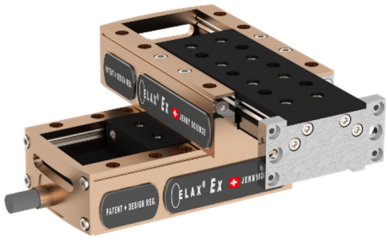




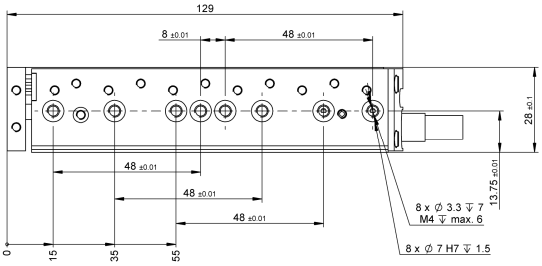


X-Y crosstable **Ex**





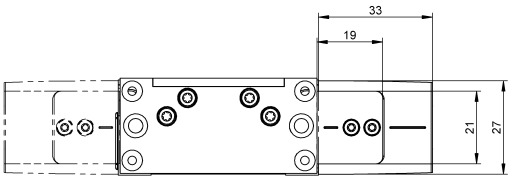
Forceteq® pro **Signateq® Sq**

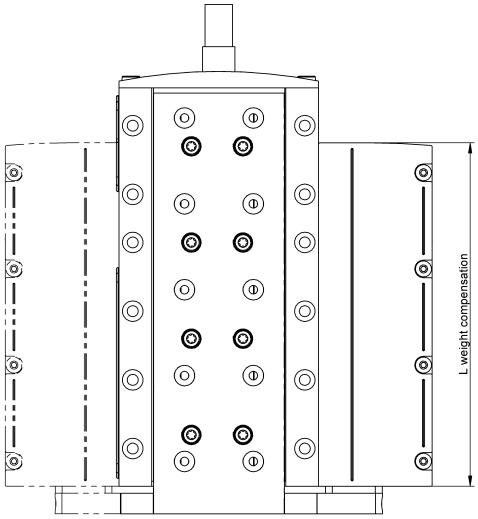




2 Weight compensation

2.1 Magnetic weight compensation

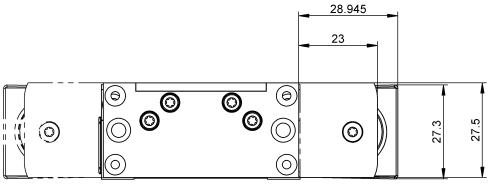


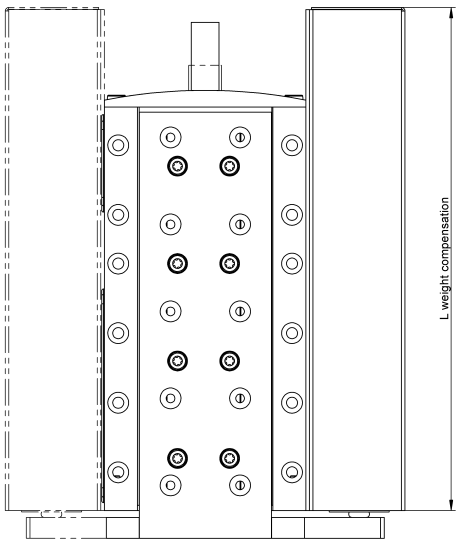


The magnetic weight compensation for the retracted state is pre-mounted either on the right or left side. It can be selected in the following steps to match the additional mass attached to the carriage: 600 g, 1200 g, 1800 g or 2500 g. The mass of the carriage is already taken into account - only the additional weight attached needs to be considered.

ELAX® Ex F20	L weight compensation [mm]
Ex 30F20	100.0
Ex 50F20	100.0
Ex 80F20	163.5
Ex 110F20	163.5
Ex 150F20	-

2.2 Spring weight compensation





The weight compensation with spring force can be ordered either for the retracted or extended state and thus for your installation situation. It can be selected in the following steps to match the additional mass attached to the slide: 500 g, 1000 g, 1500 g or 2000 g. The mass of the carriage itself is already taken into account - only the mounted additional weight needs to be taken into account.

ELAX® Ex F20	L weight compensation [mm]
Ex 30F20	114.6
Ex 50F20	144.6
Ex 80F20	199.6
Ex 110F20	244.6
Ex 150F20	-

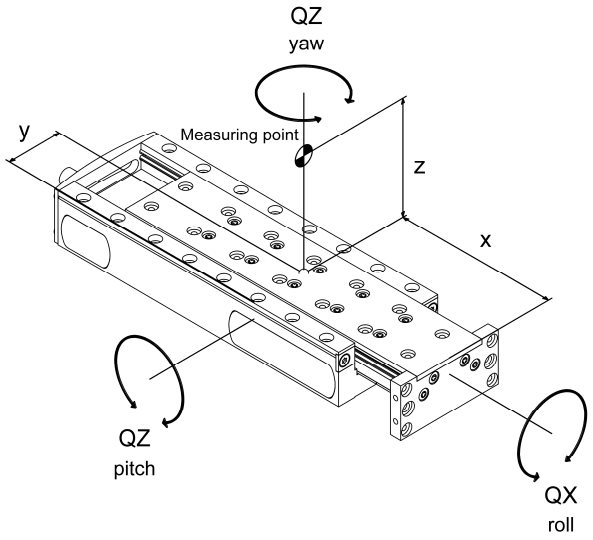
3 Precision and performance data

3.1 Absolute positioning

Measuring system	Bidirectional repeatability
1µm magnetic	< ± 5.0µm

Measuring system	Length expansion measuring scale
1µm magnetic	11.0µm/m/°C

3.2 Slide guide

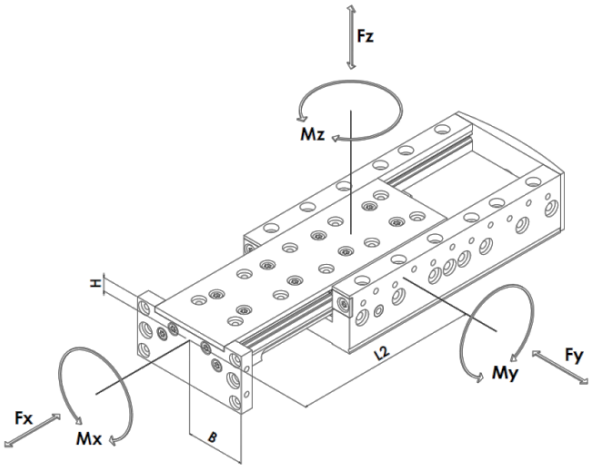


The ELAX® Ex models use crossed roller guides with hardened rollers.

The ELAX® Ex linear motor slides are supplied with the following tolerances as standard.

Ex F20	Running Accuracy horizontal EYX [µm]	Running Accuracy vertical EZX [µm]	Tilt Error QX (roll) [arcsec]	Tilt Error QY (pitch) [arcsec]	Tilt Error QZ (yaw) [arcsec]	Tolerance Constr. Height [mm]
Ex 30F20	± 5	± 5	± 50	± 150	± 120	± 0.1
Ex 50F20	± 8	± 8	± 50	± 150	± 130	± 0.1
Ex 80F20	± 10	± 10	± 60	± 170	± 150	± 0.1
Ex 110F20	± 12	± 12	± 60	± 170	± 150	± 0.1
Ex 150F20	± 15	± 15	± 70	± 200	± 170	± 0.1

Values for unloaded single axis, measured on a flat granite surface.



3.3 Stress values of guides

ELAX®	L2 [mm]	Mx max [Nm]	Fy max Fz max [N]	My max Mz max [Nm]
Ex 30F20	68	20	1050	17
Ex 50F20	88	20	1050	17
Ex 80F20	128	30	1575	33
Ex 110F20	158	30	1575	33
Ex 150F20	208	40	2100	56

Besides adhering to the individual maximal loads, the following equation must comply if there are multiple forces and moments acting simultaneously on the linear motor:

$$\frac{|\mathrm{Fy}|}{\mathrm{Fy}\,max} + \frac{|\mathrm{Fz}|}{\mathrm{Fz\ max}} + \frac{|\mathrm{Mx}|}{\mathrm{Mx\ max}} + \frac{|\mathrm{My}|}{\mathrm{My\ max}} + \frac{|\mathrm{Mz}|}{\mathrm{Mz\ max}} \leq 1$$

3.4 Dynamics

ELAX®	Stroke [mm]	Force nom./peak [N]	Speed v.max [m/s] 24V/48V	Acceleration a-max [m/s²]	Min. time/stroke @48V [ms]	Mass slider [g]
Ex 30F20	30	20 / 60	1.2/1.5	80	45	195
Ex 50F20	50	20 / 60	1.2/1.9	75	60	265
Ex 80F20	80	20 / 60	1.2/2.4	70	75	340
Ex 110F20	110	20 / 60	1.2/2.6	65	90	415
Ex 150F20	150	20 / 60	1.8/3.0	60	110	490

Values only valid with XENAX® Xvi and 20% S-Curve

3.5 Life time

Endurance test in the "torture chamber"

ELAX® Ex 50F20

Durability test in "torture chamber" >700 Mio cycles

ELAX® Ex 50F20 vertical, load weight 460g, stroke 30mm, speed 8.5Hz, no weight compensation, motor temp. 65° initial lubrication and relubrication every 100 million cycles. This durability test was carried out in the period from 10.04.2014 to 23.03.2017, thereby a distance of 47'000 km was driven.

Cycles achievable in practice with 50% reduction for reserve **>350 Mio cycles**

ELAX® direct drive with linear motor – precision without wear
The contactless ELAX® direct drive with linear motor operates completely wear-free, thereby guaranteeing consistent accuracy throughout its entire service life.
The mechanical guide is the element that determines the service life. Our ELAX® Ex guides with cross roller guidance offer decisive advantages over conventional recirculating ball bearing systems: Thanks to the advantageous line contact (instead of point contact with ball bearings), the load is distributed more evenly. The material alloy of the cross rollers and guide rods, which is specially designed for durability, ensures high robustness and precision.
The cross roller guides are characterised by the following properties:

- High precision and stability
- Low maintenance
- Less sensitive to dirt than closed ball circulation systems

Our experience over many years shows that with moderate loads, regular maintenance and a clean environment, service lives of over 350 million cycles can be achieved.

Actions with which life time can be extended:

- Trajectories with curve profiles instead of trapezoidal profiles (XENAX® Servo controller, default value S-curve profile = 20%).
- Dynamics not higher than needed.
- Completing non cycle time critical motions slower.
- Avoid pollution in the guides.
- Cleaning and lubrication of the guiding beams every 12 months.

4 Installation and maintenance

4.1 Handling and installation

Electrostatic sensitive devices (ESD)



The built-in components may contain electrostatic sensitive components. Please be sure to observe the applicable ESD protection regulations.
Do not touch any ESD-sensitive components or connection points!

Specialised staff



All activities in connection with transport, connection, commissioning and maintenance may only be carried out by qualified and authorised specialist personnel.

Transport

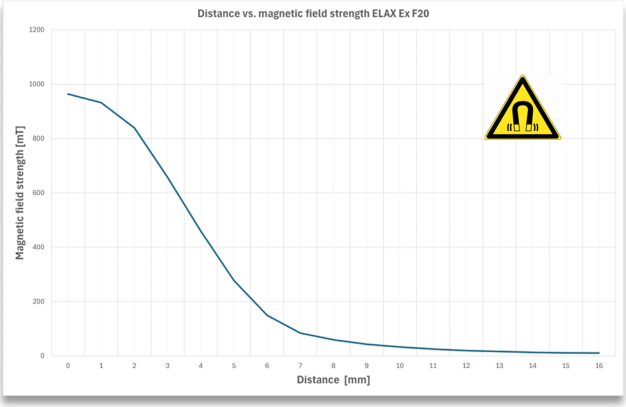
Check the system immediately upon receipt for possible transport damage. When unpacking, take particular care with sensitive components such as cables, plugs, encoders and motors. It is not permitted to commission damaged products.

Handling



Linear motor axes must always be transported in a horizontal position, as the carriage can fall uncontrollably into the mechanical stop in a vertical position.
There is a risk of hands and fingers being squeezed!

Magnetic fields



Linear motor slides generate magnetic fields below the slide due to their permanent magnets. However, there are no magnetic fields on the top of the slide or below the base plate.



Measuring system



The magnetic measuring system is sensitive to external magnetic influences and can be damaged if handled incorrectly. Avoid contact between magnetic fields - for example from other motors or magnetic torches - and the magnetic scale tape on the axis.

Mechanical assembly



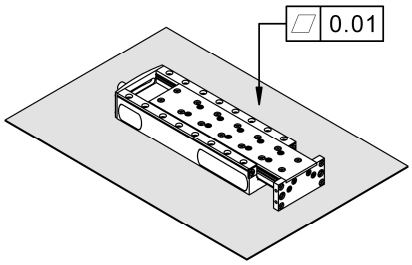
Protective gloves and suitable tools must be used for mechanical assembly.
The carriage of the linear motor axes must never be pulled off the rail. This will cause irreparable damage.
Additional applications are mounted using the threaded holes and locating holes provided for this purpose.

Tightening torques

Coefficient of static friction μT = steel
Aluminium alloy dry
Strength class (screw) = 8.8

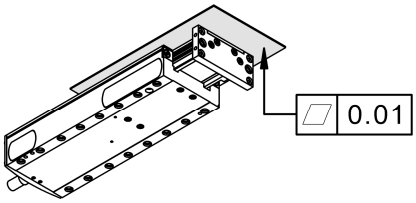
Thread	Tightening torque [Nm]	Min. screw-in depth [mm]
M2.5	0.72	3.5
M3	1.28	3.3
M4	2.97	4.4
M5	6.03	5.5

Flatness base plate



If the linear motor axes are mounted on a base plate, this must have a flatness of 0.01mm over a legth of 200mm. Otherwise, the linear motor axis can be distorted when screwed tight and the guides can jam. This increases wear, reduces lifetime and can damage the guides.

Flatness component assembly



The same requirements apply to the contact surface of components that are screwed onto the slide of a linear motor axis. This contact surface must have a flatness of 0.01mm over a legth of 200mm.

Flatness - practical test

Before assembly, check how smoothly the carriage can be moved by hand. Then tighten the screws and check the run again. There should be no noticeable difference. Otherwise, the contact surface must be reworked.

4.2 Electrical connections

Safety instructions for the power supply

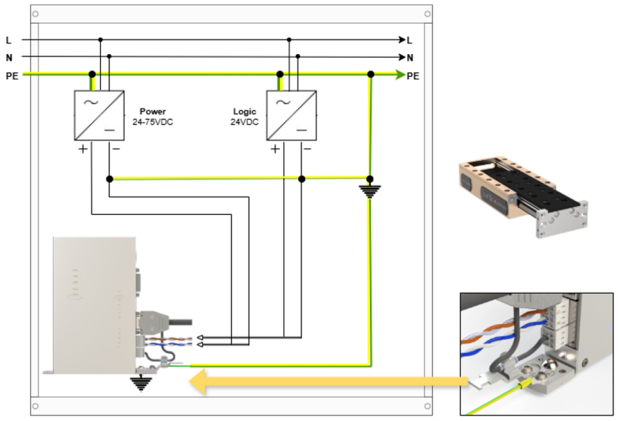


A defective or incorrect power supply can cause irreparable damage to the machine.
The earthing cable must be always connected to the system.



Never pull out the plug during operation! There is a danger to life and a risk of serious injury and damage to property.
Electrical connections must never be disconnected when energised. Switch off the power supply and wait at least 10 seconds before disconnecting.
The drives may only be connected to the specified power supply.
Plugs with a screw lock must be screwed on properly.
Only use original Jenny Science AG cables and do not make any modifications to them.

Earthing concept



- The **0 volt** connection of the logic supply (pin 1) and the 0 volt connection of the power supply (pin 3) have to be connected to the ground/chassis star point of the switch cabinet.
- The **XENAX® servo controller** must be screwed onto a conductive background, which is connected to the GND/chassis star point of the switch cabinet. The motor cable must be connected to the shield clamp.

4.3 Maintenance and servicing



Maintenance work must only be carried out when the axles are at a complete standstill. The axis must not be in control mode and must be disconnected from the power supply first.



The linear motor system must not be immersed in liquids or sprayed for cleaning.

Cleaning

Coarse contamination must always be removed with a soft brush or oil-free compressed air. Depending on the environmental conditions, regular cleaning is necessary to prevent foreign particles from entering the guide system or electronics or settling on the magnetic plate.

Lubrication of roller guides

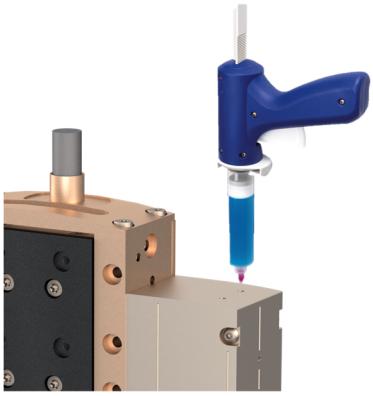
The initial lubrication by Jenny Science on delivery is sufficient for several years, depending on the load.

The ELAX® cross roll cages are force centered through gear pinions and gear rods. The lubrication intervals depend on multiple parameters, such as operational demands, dynamics, operational temperature, pollution etc. Preventively we suggest lubricating the guides every 12 months or every 100 million cycles.



Clean the guides before lubricating. Relubrication is carried out using a dispensing gun and a suitable grease cartridge. Position the carriage so that you can access the guide rails on the carriage and those on the monoblock, on the left and right. Now apply some grease to the flat running surface of the guide rails by pressing the dispensing gun. Then move the carriage back and forth and remove the excess grease with a cotton swab.

Lubrication of magnetic weight compensation



The initial lubrication by Jenny Science on delivery is sufficient for several years, depending on the load.
Two needle holes are provided for lubricating the recirculating ball bearing guide installed in the weight compensation. To do this, fully retract the carriage, place the dispensing gun on the respective needle hole and apply the lubricant by actuating the dispensing gun.

4.4 Notes according to Machinery Directive 2006/42/EC

Shield	Location	Meaning
	Safety door in the area of the axis	Respect of minimum distance with pacemakers or implanted defibrillators

The linear motor axis from Jenny Science AG contains permanent magnets.
People with implants that can be magnetically influenced or with prostheses that contain ferromagnetic components are at risk due to the magnetic fields that occur (>0.5mT) and must ensure a safety distance of at least 50mm.

Shield	Location	Meaning
	Safety door in the area of the axis	Warning of megnetic field

Due to the high magnetic field strengths, large attractive forces occur particularly in the immediate vicinity (distance approx. 50 mm) of the magnetic tracks. It must therefore be strictly ensured that objects made of steel or iron (e.g. watches, rings, etc.) as well as technical devices (e.g. computers, credit cards, hard discs, etc.), which could be attracted, influenced or destroyed by the magnetic field, are not brought into this area with the free hand. An appropriate safety distance must be maintained.

Shield	Location	Meaning
	Safety door in the area of the axis	Warning of surface temperature up to 80°C

The surfaces of the motors can become hot during operation of the axis. The surface temperature of the motor can reach up to 80°C.
Monitoring devices and the error messages of the control units must be checked continuously. Switch off the motor if there are any changes compared to normal operation.

Noise level up to 70 dB(A)

5 Safety und enviroment

5.1 Safety together with XENAX® Servocontroller

EN 61000-6-2:2005 Electromagnetic compatibility (EMC), Immunity for industrial environments	EMC Immunity Testing, Industrial Class A
EN 61326-3-1	Immunity for Functional Safety
IFA:2012	Functional safety of power drive systems
EN 61326-1, EN 61800-3, EN 50370-1	Electrostatic discharges ESD, Electromagnetic Fields, Fast electric transients Bursts, radio frequency common mode
EN 61000-6-3:2001 Electromagnetic compatibility (EMC), Emission standard for residential, commercial and light-industrial environments	EMC Emissions Testing, Residential Class B
EN 61326-1, EN61800-3, EN50370-1	Radiated EM Field, Interference voltage
IFA:2012	Functional safety of power drive systems

5.2 Enviroment conditions

Storage and transport	No storage outside. Storage rooms have to be well-ventilated and dry. Storage temperature from -25°C bis +55°C
Operating temperature	5°C -50°C environment
Operating humidity	10-90% non-condensing
Cooling	No external cooling needed. Dynamics can possibly be increased by mounting the slider case on a thermoconductive ground plate.
Protection	IP 40

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