Data Sheet ELAX® Ex F20

Edition March 2019

Linear Motor Slide ELAX®

Highlights

Flexible positioning with an accuracy of +/- 10µm, resolution 1µm

Modular system with strokes of 30-150mm (1.18" – 5.90")

High cycle rates with velocity up to 3m/s thanks to linear motor

Force control, force limitation and force recording with XENAX® servo controller

Distinct less energy consumption in comparison to pneumatic slides

No need to exchange dampers, no broken sensor cables

Variable one-cable connection on the back or sidewise

General

ELAX® is the evolutionary step of the widespread pneumatic slides. The great accomplishment is the patented compact integration of the linear motor in the slider case, resulting in a force/volume ratio which has hitherto never been achieved.

A further essential key factor for future oriented automation solutions with ELAX® are the components with direct screw connections. Be inspired!

Alois Jenny
Jenny Science AG

Content

1 Type Overview ELAX® Ex F20

Type	Stroke [mm]	Weight Slider [g]	Weight Total [g]	Total with weight comp. [g]
Ex 30F20	30 (1.18")	195 (0.43 lbs)	560 (1.23 lbs)	710 (1.57 lbs)
Ex 50F20	50 (1.97")	265 (0.58 lbs)	630 (1.39 lbs)	820 (1.81 lbs)
Ex 80F20	80 (3.15")	340 (0.75 lbs)	780 (1.72 lbs)	1040 (2.29 lbs)
Ex 110F20	110 (4.33")	415 (0.91 lbs)	945 (2.08 lbs)	1255 (2.77 lbs)
Ex 150F20	150 (5.90")	490 (1.08 lbs)	1110 (2.45 lbs)	

2 Modular System

2.1 Arrangements

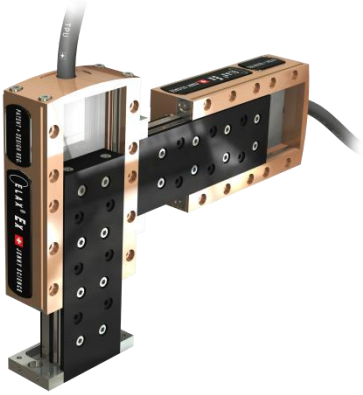
2.1.1 Y-Z Pick and Place flat

Multiple square grids 20 x 50mm
4 x dowel pins Ø6mm
4 x hexagon socket screws M3x30mm

2.1.2 Y-Z Pick and Place upright

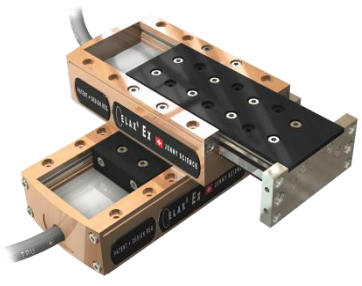
Multiple linear grids 48mm
2 x dowel pins Ø7mm
2 x low head trox screws M4x8mm

For thin Pick and Place with distance of < 30mm

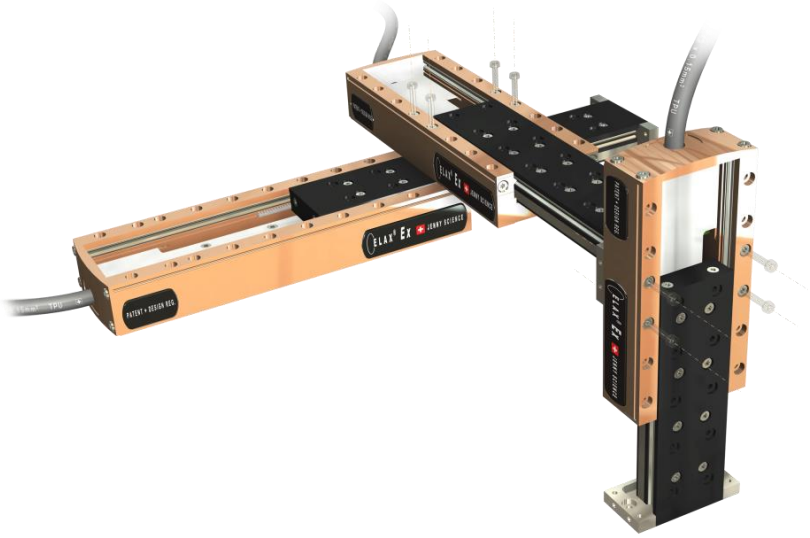


2.1.3 X-Y Cross Table

Multiple square grids 20 x 50mm
4 x dowel pins Ø6mm
4 x hexagon socket screws M3x30mm



2.1.4 X-Y-Z Cantilever

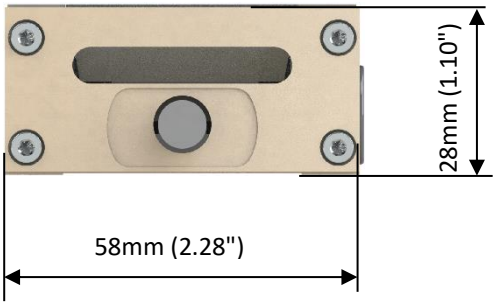


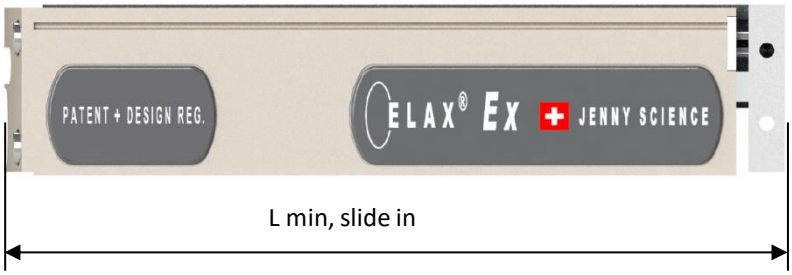
Multiple square grids 20 x 50mm
8 x dowel pins Ø6mm
8 x hexagon socket screws M3x30mm

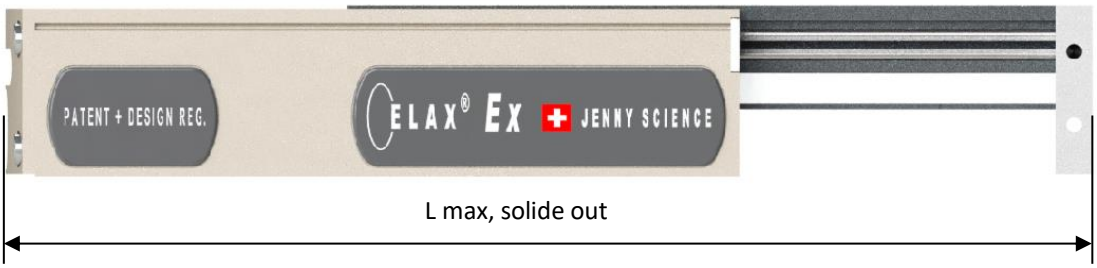
3 Dimension

3.1 Installation

Cross Section ELAX®

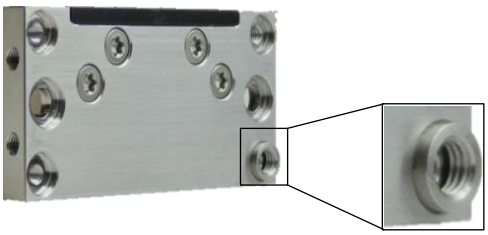






Type	L min [mm]	L max [mm]
Ex 30 F20	110 (4.33")	140 (5.51")
Ex 50 F20	130 (5.12")	180 (7.09")
Ex 80 F20	178 (7.01")	258 (10.16")
Ex 110 F20	208 (8.19")	318 (12.52")
Ex 150 F20	268 (10.55")	418 (16.46")

3.2 Front Flange, Universal Mounting Plate

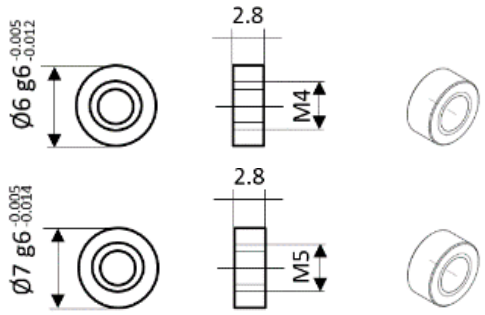


Dowel pin with internal threads to remove it

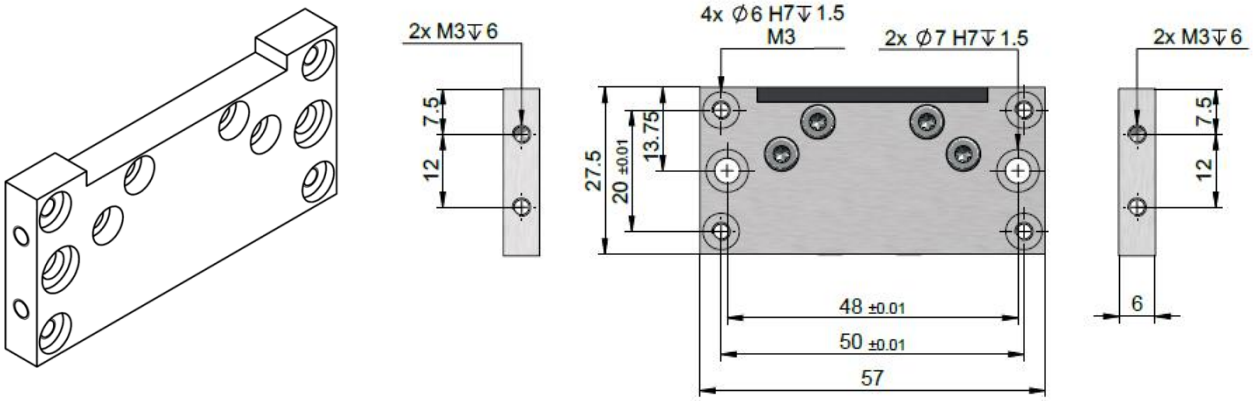
3.2.1 Dowel Pin Ø6mm and Ø7mm

Without adapter plate, direct with dowel pins and screws. There are dowel pins with an outside of Ø6mm for flat installation with 4 x hexagon socket screws M3x30mm.

The dowel pins with an outside of Ø7mm are used for installations where slide and front flange are connected uprightly with 2 x low head torx screws M4x8mm.



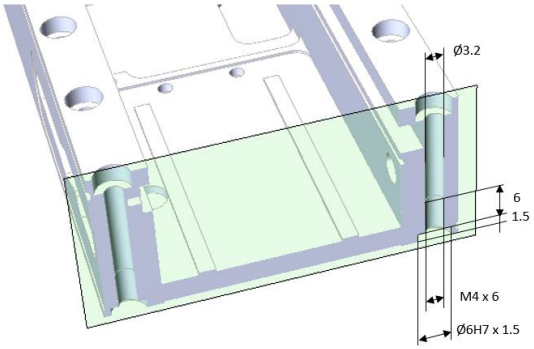
3.2.2 Dimensions Front Flange



3.3 Universal Drilling Holes in Motor Case

X-Y cross table or Y-Z Pick and Place flat
4 x hexagon socket screws M3x30mm and 4 x dowel pins Ø6mm.

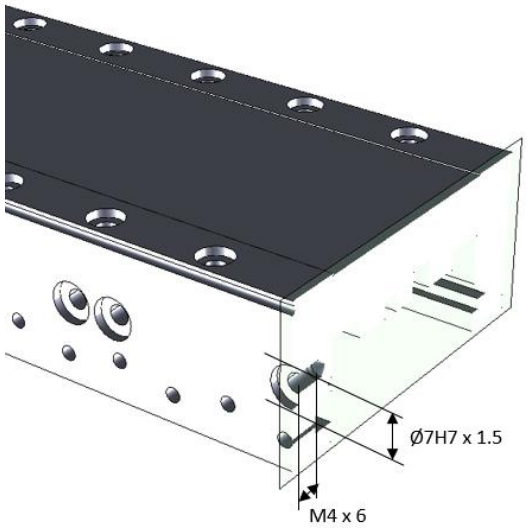
These matrix threads 20 x 50mm in the motor case allow a connection to another ELAX slide for a **X-Y cross table**. Or a connection to a front flange for a **flat Y-Z Pick and Place**. The M4 threads bellow further allow for mounting to a ground plate.



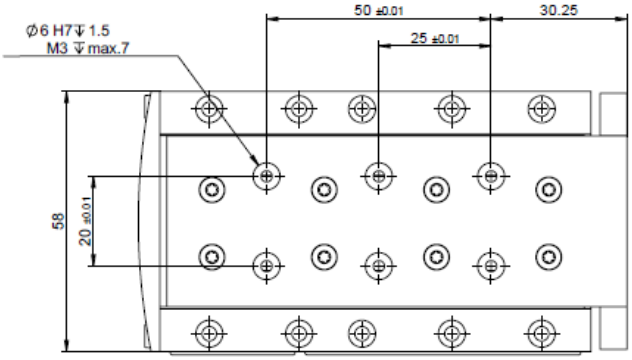
Y-Z Pick and Place upright
2 x torx screws with low head M4x8mm and 2 x dowel pins Ø7mm.

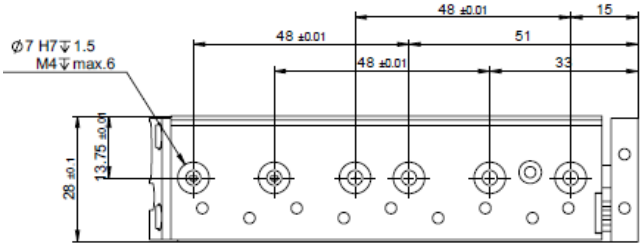
These matrix threads with a distance of 48mm allow a connection to a front flange for a **Y-Z Pick and Place upright**.

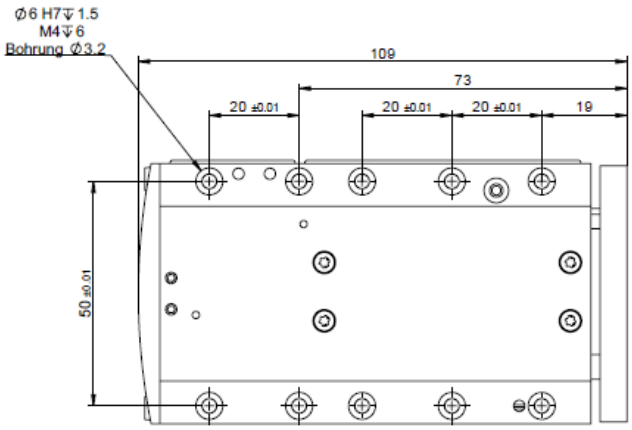
This is how multiple Y-Z Pick and Place units can be placed next to each other very closely (<30mm distance).



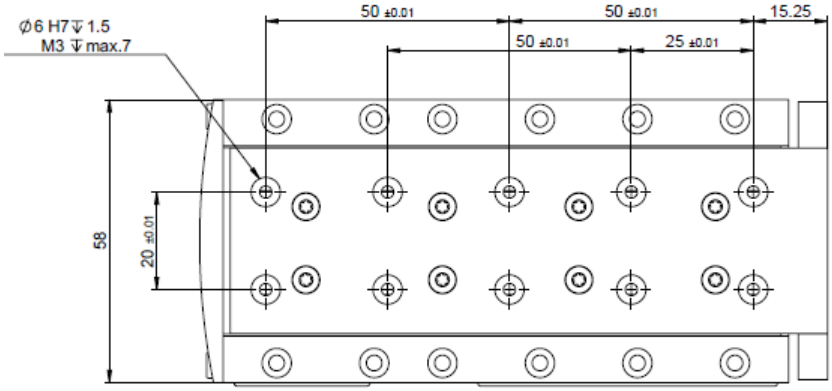
3.4 Hole Matrix Ex 30F20

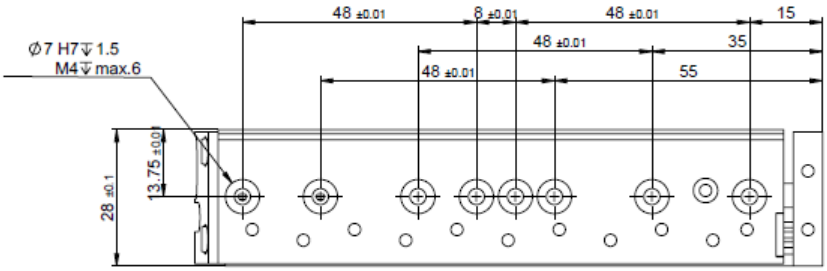


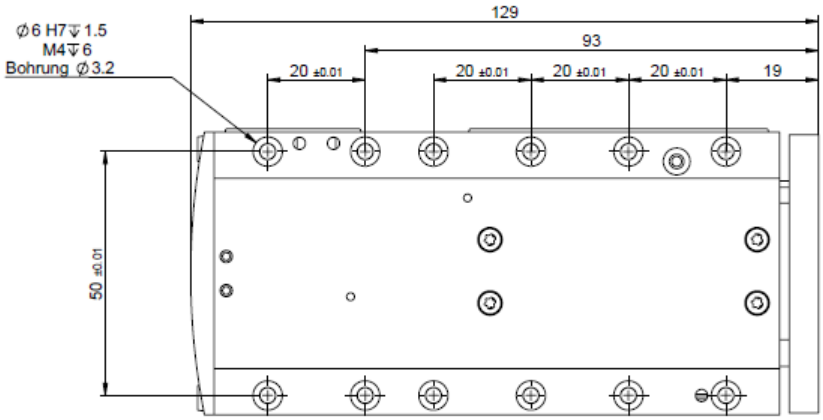




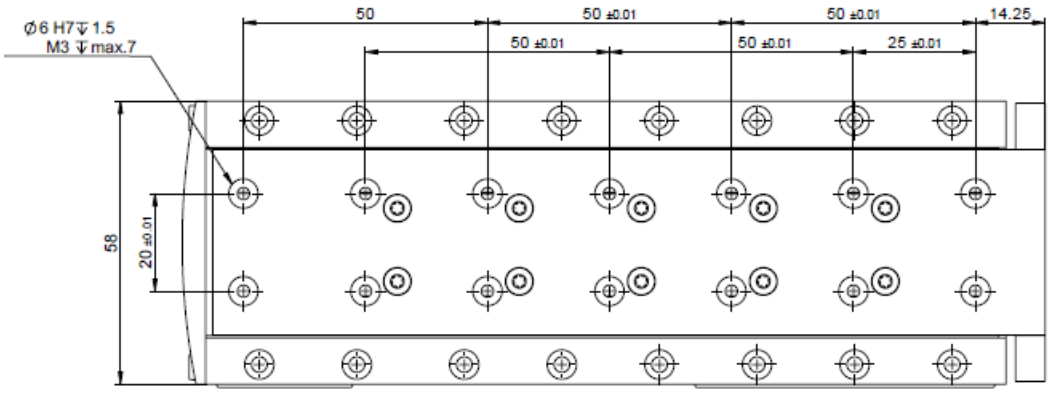
3.5 Hole Matrix Ex 50F20

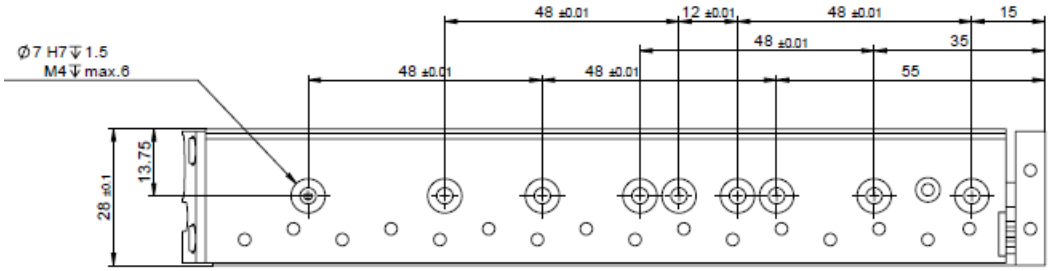


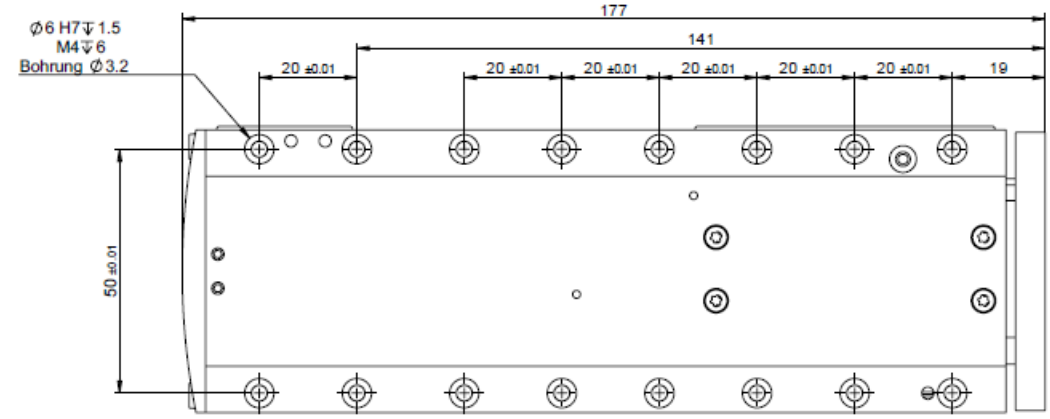




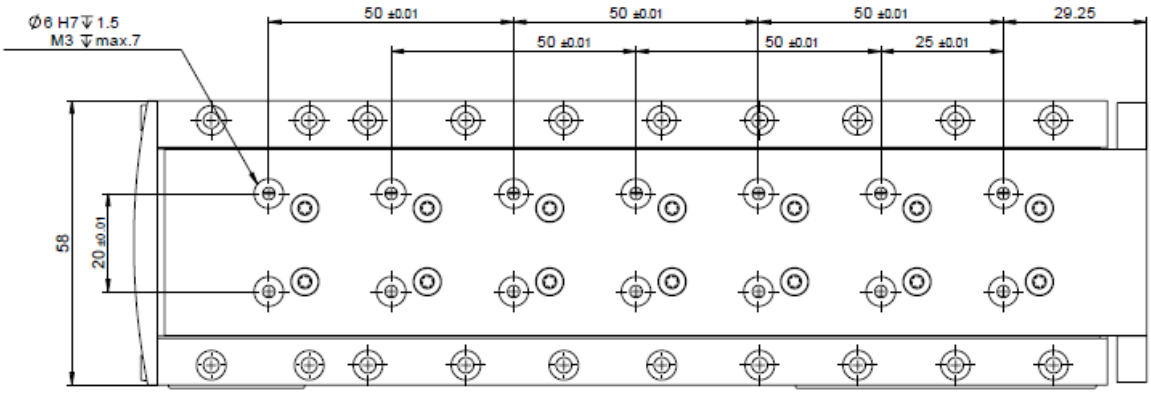
3.6 Hole Matrix Ex 80F20

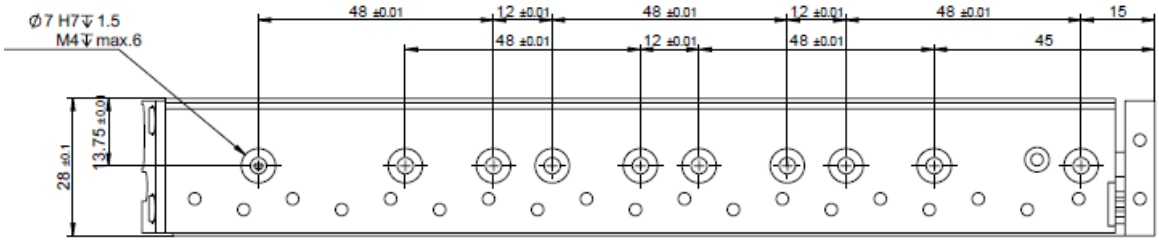


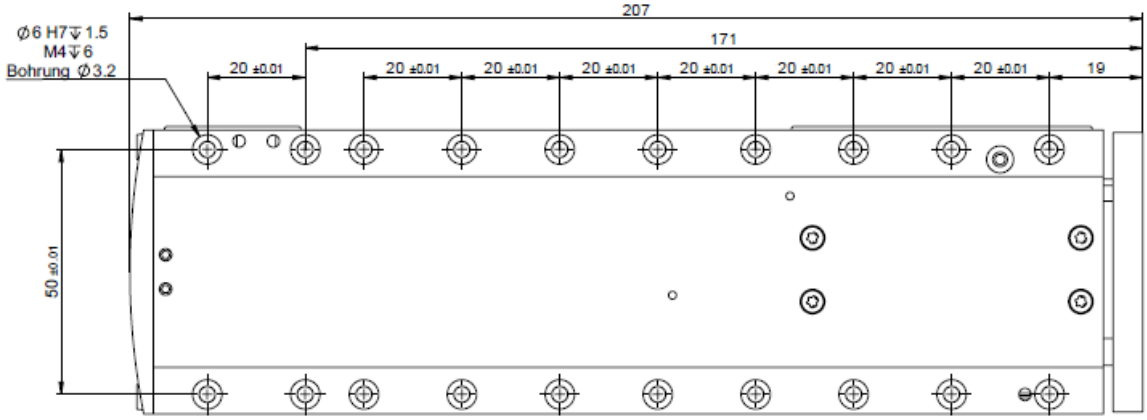




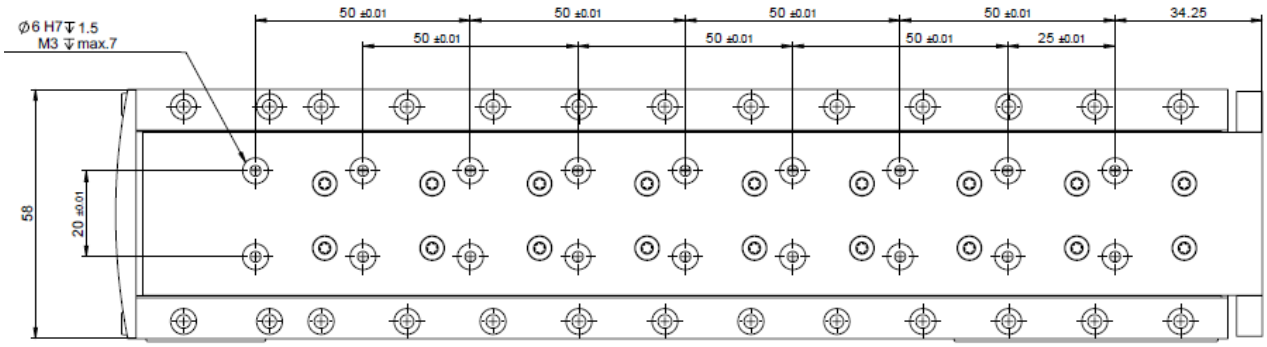
3.7 Hole Matrix Ex 110F20

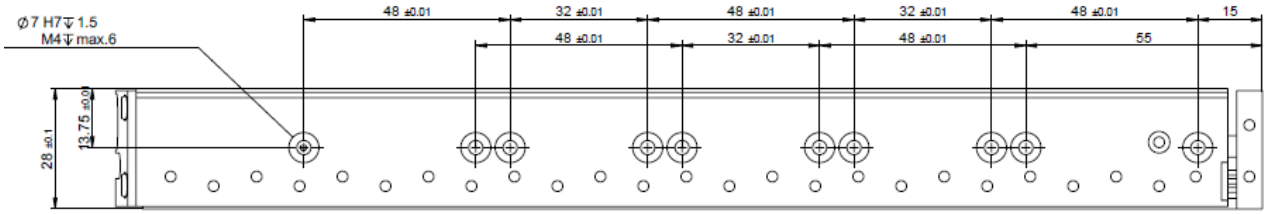


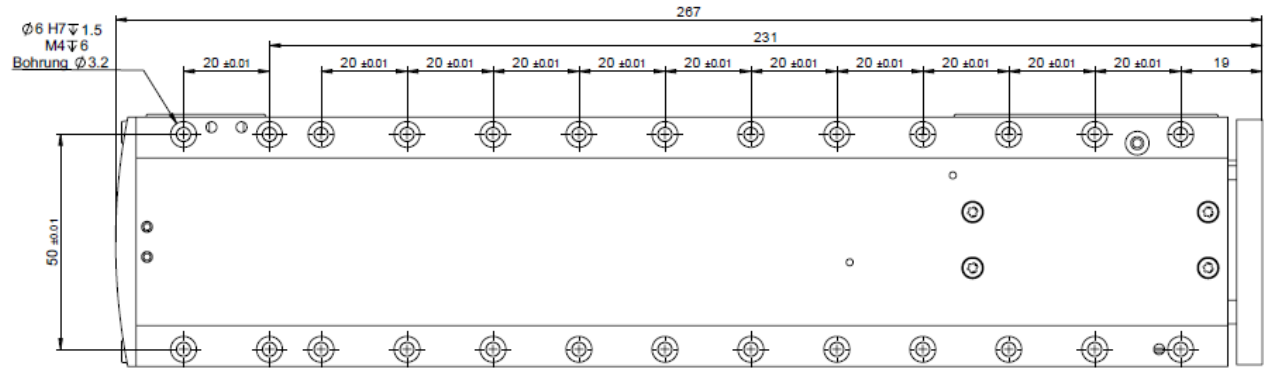




3.8 Hole Matrix Ex 150F20







4 Smart Praxis Oriented Details

4.1 One-Cable Connection Reduces Cabling Requirements

The one-cable connection from Jenny Science simplifies the whole machine cabling complexity. In addition, the cable chains are more compact and lighter, need less room and achieve higher dynamics.

4.2 Variable Cable Connection Offers More Flexibility

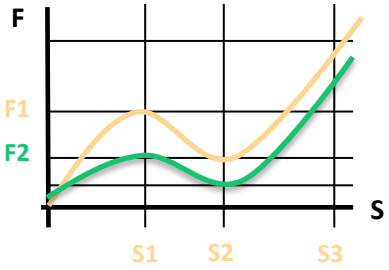
The cable connection can be oriented sidewise in order to keep the space behind the ELAX free for more compact machine installations.

4.3 Weight Compensation in Vertical Oriented Applications

This new constructed weight compensation unloads the linear motor in the ELAX slide. The linear motor has far less and this saving of energy can be used for high dynamics. In case of power interruption, the slide remains in position or drives upwards depending on the settings – without air pressure or electricity.

4.4 Record and Limit Forces

The patented function „Force Calibration“ is able to compensate the magnetic cogging forces, the payload and the friction forces of the ELAX® direct drives in a very simple way. This is how it becomes possible to control, to limit and to monitor forces in process. Together with the XENAX® servo controller it is also possible to record complete force/way diagrams. No need for an additional force sensor.



4.5 Chrome Steel Cover

For food- and pharm industry or for clean room of laboratory automation or medical technique.

With this chrome steel cover the modular matrix holes and threads are covered and the surface is smooth and easy to clean.

5 Performance Data

5.1 Motor forces, dynamics

Metric System:

ELAX®	Ex 30F20	Ex 50F20	Ex 80F20	Ex 110F20	Ex 150F20
Fn	20N	20N	20N	20N	20N
Fpeak	60N	60N	60N	60N	60N
Acceleration a-max.	80m/s²	75m/s²	70m/s²	65m/s²	60m/s²
Velocity v-max.	1.5m/s	1.9m/s	2.3m/s	2.6m/s	2.9m/s
Stroke	30mm	50mm	80mm	110mm	150mm
Min. time for max. stroke with 500g payload	40ms	55ms	70ms	85ms	100ms
Forced centering cross roll cage for highest dynamic	standard	standard	standard	standard	standard

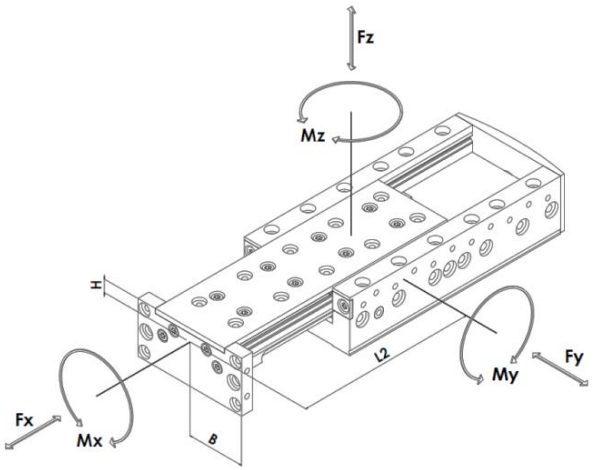
British System:

Fn	*4.5lbf*	*4.5lbf*	*4.5lbf*	*4.5lbf*	*4.5lbf*
Fpeak	*13.5lbf*	*13.5lbf*	*13.5lbf*	*13.5lbf*	*13.5lbf*
Acceleration a-max.	*262ft/s²*	*246ft/s²*	*230ft/s²*	*213ft/s²*	*197ft/s²*
Velocity v-max.	*4.9ft/s*	*6.2ft/s*	*7.5ft/s*	*8.5ft/s*	*9.5ft/s*
Stroke	*1.18in*	*1.97in*	*3.15in*	*4.33in*	*5.9in*
Min. cycle time for max. stroke with payload of 1.1 lbs	*40ms*	*55ms*	*70ms*	*85ms*	*100ms*
Forced centering cross roll cage for highest dynamic	*standard*	*standard*	*standard*	*standard*	*standard*

Fn = Nominal force 100% Duty cycle
Fp = Peak force 10% Duty cycle,
Performance limitation through temperature observation

5.2 Mechanical Payload Values

Type	Mx max [Nm]	Fy max [N] Fz max [N]	My max [Nm] Mz max [Nm]
Ex 30	20/14.8lbf ft	1050/236lbf	17/12.5lbf ft
Ex 50	20/14.8lbf ft	1050/236lbf	17/12.5lbf ft
Ex 80	30/22.1lbf ft	1575/354lbf	33/24.3lbf ft
Ex 110	30/22.1lbf ft	1575/354lbf	33/24.3lbf ft
Ex 150	40/29.5lbf ft	2100/472lbf	56/41.3lbf ft



If there are multiple forces and moments on the linear motor, besides considering the maximum loads the following equation must comply:

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

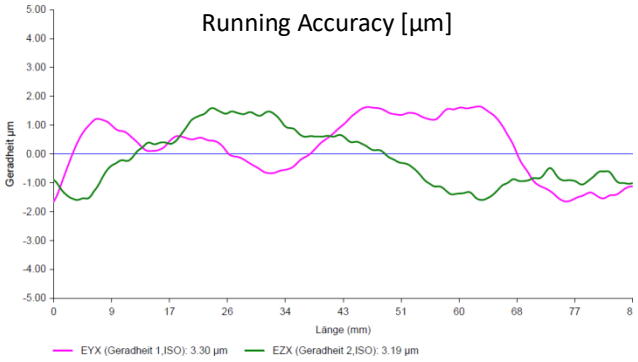
6 Accuracy

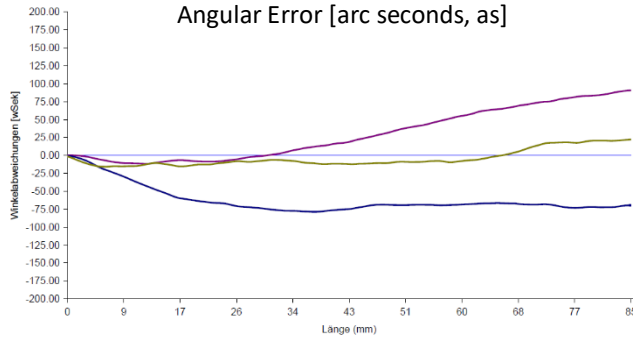
6.1 Positioning

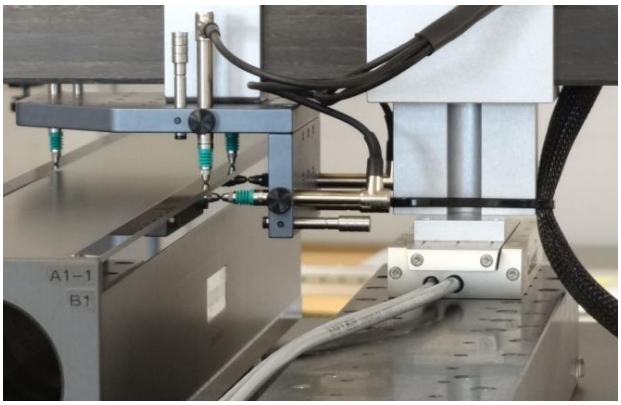
Standard resolution magnetic measuring scale	1µm / Increments *(0.03937µin / increments)*
Accuracy	< +/-10µm (< +/- 0.3937 *µin)*
Linear expansion magnetic measuring scale	11µm/m/°C
Reference	To mechanical limitation internal, selectable either driving in or out
Zero Point absolute	1mm *(0.03937in)* distance of mechanical limitation when slide is in the case. Fully automatic calculation of absolute positioning after reference drive.

6.2 Slide Guiding

ELAX® electrical slides with linear motor are delivered with the following tolerances as a standard. This data is based on unstressed condition.





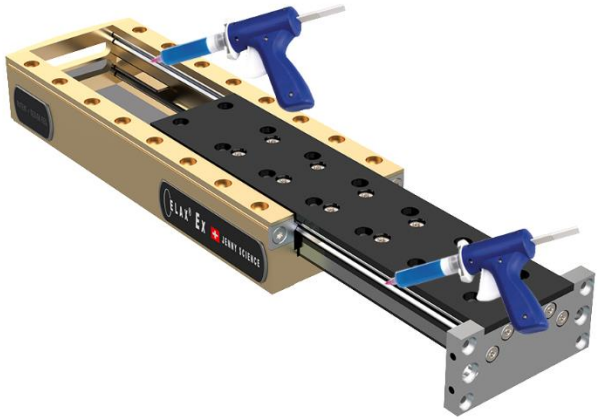


ELAX®	Ex 30F20	Ex 50F20	Ex 80F20	Ex 110F20	Ex 150F20
Metric System:					
Running accuracy horizontal EYX / vertical EZX	±5µm	±8µm	±10µm	±12µm	±15µm
Tolerance construction height	±0,1mm	±0,1mm	±0,1mm	±0,1mm	±0,1mm
British/Engl. System:					
Running accuracy horizontal EYX / vertical EZX	*±0.20µin*	*±0.31µin*	*±0.39µin*	*±0.47µin*	*±0.59µin*
Tolerance construction height	*±0.04in*	*±0.04in*	*±0.04in*	*±0.04in*	*±0.04in*
Angular error QX (roll)	±50as	±50as	±60as	±60as	±70as
Angular error QY (pitch)	±150as	±150as	±170as	±170as	±200as
Angular error QZ (yaw)	±120as	±130as	±150as	±150as	±170as

7 Maintenance, Life Time

7.1 Lubrication

The initial lubrication through Jenny Science prior to delivery should be sufficient for multiple years, depending on the operational demands of the linear motor.
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 to lubricate the bearing rails every 12 months.
For this we recommend the dosage pistol incl. Lubricating cartridge.



155.00.10 VA Dosage pistole for lubrication
155.00.15 VA Cartridge with spez. lubricant

7.2 Life Time

The ELAX® direct drive with linear motor operates without contact, without wear and tear and without loss in accuracy. In principle the mechanical guides are the determining elements. The ELAX® cross roll guides have a beneficial "**linear** force support", in contrast to the "**point** force support" in ball bearing guides.
The cross roll guides are precise, robust and low on maintenance. They are also less pollution sensitive than closed circulating ball bearing systems. With medium operational stress, good maintenance and no external pollution our experience shows that a life time of 20 000km (12 400 miles) can be achieved.

Example Calculation, middle Payload (1.5kg)

SWISS MADE

ELAX® Ex 80F20

Actual load capacity in the middle Fz C_{eff}	1575N (12x164Nx80%)
Magnet Power	180N
Initial tension	80N
Mid load capacity	15N
Equivalent load P	275N
Experience probability factor a	0.62 (95%)
$L = a * (C_{eff}/P)^{33} * 10^5$ m = 19'662'00 m →	20'000 running-km

Endurance test in torture centre **>50 Mio Cycles**
No maintenance, just initial lubrication, ELAX® Ex 30F20 vertical, payload 460g, stroke 30mm, speed 17Hz, no weight compensation, motor temp. 65°

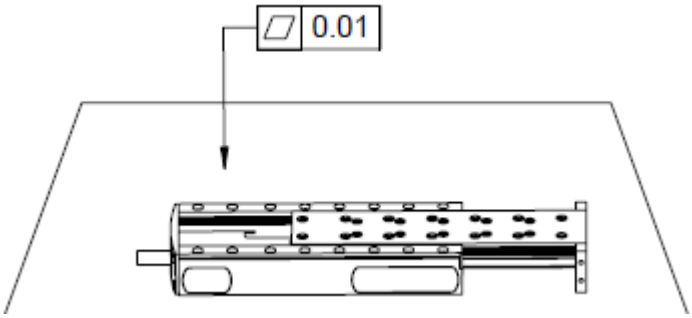
Actions with which life time can be extended:

- 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.

8 Installation, Important Instructions

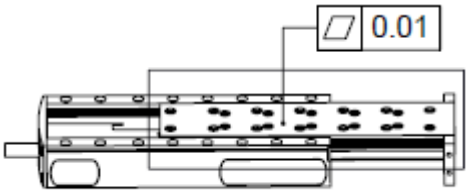
8.1 Straightness for Mounting on Ground Plate

If the ELAX® electric slides are mounted on a ground plate, it has to have a straightness of 0.01mm. If the straightness is out of this tolerance, the ELAX® can be distorted when screwed to the ground plate which might cause the guidings to seize. This increases the wear and tear, reduces the lifespan and might even destroy the guiding system.



8.2 Straightness for Mounting on Slider

These same conditions hold true for components that are mounted on the slider of the ELAX®. The contact surface has to have a straightness of 0.01mm.



8.3 Straightness Practical Test

Before mounting the ground plate or the slider, please test how smooth the slider can be moved by hand.
After tightening the screws, move the slider again by hand. There should not be any noticeable changes in smoothness, otherwise the contact surfaces have to be revised.

9 Safety, Environment

9.1 Safety with XENAX® Servo Controller

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

9.2 Environmental Conditions

Storage and transport	No outdoor storage. Storage rooms have to be well vented and dry. Storage temperature -25°C up to +55°C (-13°F up to 131°F).
Operational temperature	5°C - 50°C (41°F - 122°F) Environment, reduction in performance at 40°C (104°F).
Operational humidity	10-90% non-condensing.
Cooling	No need of external cooling. If linear motor case is mounted on a heat conductive base, higher performance can be achieved.
Protection category	IP 40

Note

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