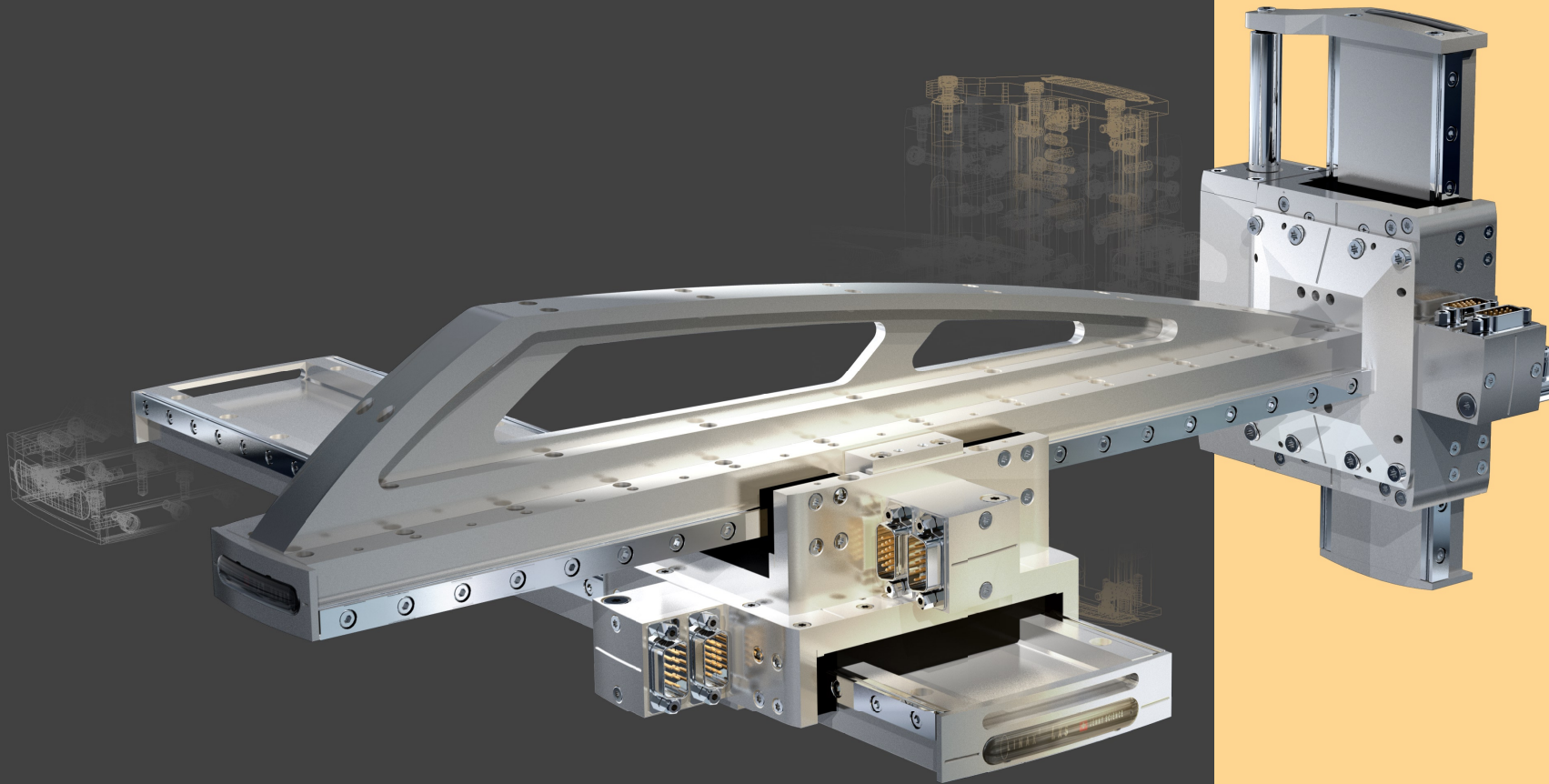


J E N N Y S C I E N C E

www.jennyscience.ch



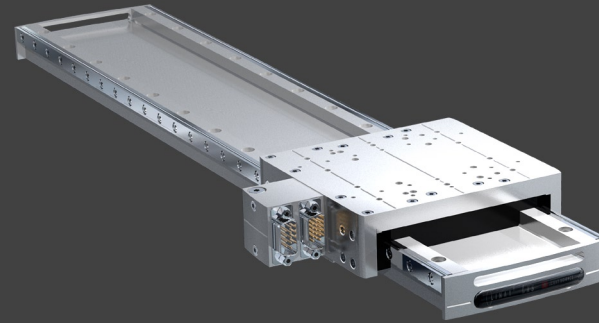
moving precisely, within tight space



Perfect modular systems



LINAX® Linear motor axes



XENAX® Ethernet servo controller



EtherCAT

ETHERNET
POWERLINK

PROFI
NET

CANopen

Reduce your development cycle

Profit from the modular system of Jenny Science linear motor axes and reduce your development cycle. The LINAX® series are optimally tuned to one another with strokes of 1µm-1200mm and travel forces of 4-180N. From a single axis through fast pick & place handling up to portal gantry systems, the components are directly screw-in via centering pins. These flexible and sophisticated construction possibilities are absolutely unique on the market. On our website, www.jennyscience.ch you will find the corresponding 3D CAD STEP files. Additionally we offer you the suitable XENAX® servo controller with Ethernet link to the established real-time Ethernet protocols. **Thereby the time for both construction as well as for software development is reduced.**

Minimize the risk

In practice, engineers are often searching for spindles, guiding systems, measurement systems and controllers, followed by a lot of effort in construction, installation and setup. The result is often unsatisfactory causing delays, inexplicit responsibility, and in the worst case leading to subsequent improvements at the customer's plant. **Minimize your risk by using proven, standardized drive components from Jenny Science, delivered from one single source.**

Reduce your costs and the costs of your customers

One of the primary targets for the development of LINAX® linear motor axes is the minimum space requirements and less weight. In this way you can build your machines lighter, more compact and with higher efficiency.

Manufacturing companies often have large, heavy assembly machines and automatic units, which move and process small parts of only a few grammes. Part size and machine size are out of proportion. This is inefficient and expensive, too much unnecessary weight is moved and the machines require too much space. As a result of this, large facilities are required which need to be heated and air conditioned. Here unnecessary resources are consumed. This is directly reflected in the production and investment costs. This points to building machines and automatic units lighter and more compactly.

With the standard drive components of Jenny Science you build lighter and more compact machines in less time. This reduces costs in the development, manufacturing and, not least in installation and set-up.

For your customers this means: more compact machines, less space requirement and lower energy costs.



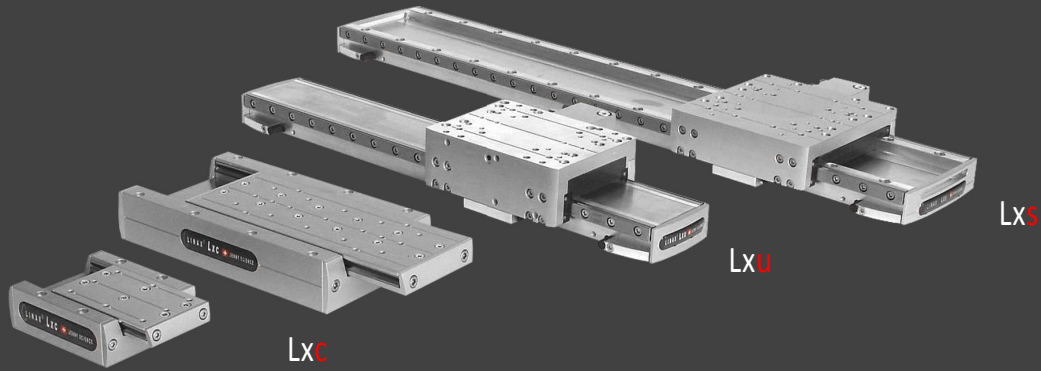
Fraunhofer

TESTED®
DEVICE

Jenny Science AG
Linax-Lite-400F40R
Report No. JE 0910-497

Qualifizierungsurkunde
Hersteller: Jenny Science AG
Hersteller: Jenny Science AG

LINAX® all series clean room approved
ISO classes 3-5



All series available in clean room standard ISO classes 3-5

Precision:
optical scale with 1µm resolution as standard, accuracy absolute +/- 2 µm, optional 100nm resolution

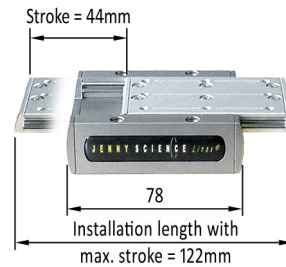
LINAX® Series
Lxc, Lxu, Lxs, Lxe

- 4 practice orientated series
- Series key Lxc 135F10 (c = Type, 135 = Stroke, 10 = Force)
- Series (compact, universal, shuttle, exclusive)
- Stroke [mm] (44 - 1200)
- Travel force [N] nominal 100% on-time (4 - 60)

LINAX® Lxc
c = compact: The very compact Lxc series are based on the patented mono-bloc design. The coils are located in the mono-bloc and the magnets with the optical scale are on the carriage slider. The magnets are able to move but the coils remain stationary. This means that the cables are stationary and there are no movable cable chains necessary in single axis applications.

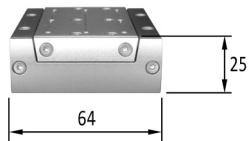
Lxc Model	Hub [mm]	L Mono. [mm]	Force Fn/ Fp [N]	Weight Slider/Tot [g]
Lxc 44F04	44	78	04/12	130/350
Lxc 85F10 ¹⁾	85	144	10/30	230/650
Lxc 135F10	135	194	10/30	320/880
Lxc 230F10	230	290	10/30	450/1200
Lxc 80F40 ¹⁾	80	169	40/114	520/1470
Lxc 176F40 ¹⁾	176	265	40/114	750/2150
Lxc 272F40	272	361	40/114	1050/2800

¹⁾ Weight compensation available up to 3kg/6kg

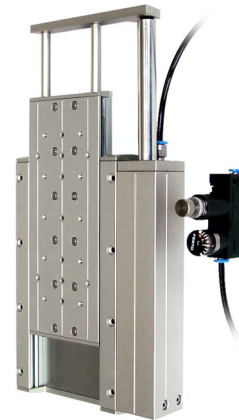
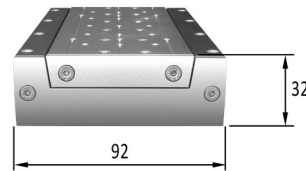


Installation length = L Mono. + used stroke
e.g. Lxc 135F10, used stroke = 105mm
Installation length = 194mm + 105mm = 299mm

Lxc F04 F10

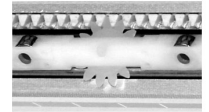


Lxc F40



Weight compensation Lxc/Lxu

The weight compensation works with compressed air but has no air consumption. With a commercial air pressure regulator the compensation force is adjusted such that the weight of the slider and weight of the payload are compensated. In case of a power interruption the slider carriage remains in position or moves slowly upwards, depending on the compensation force that has been set.

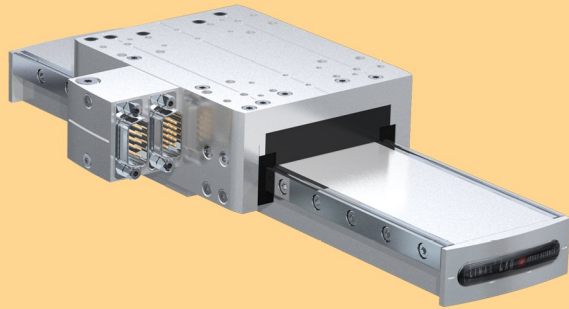


Lxc: cross-roll cage with forced centring as standard (Schneeberger). This prevents „cage-creep“ and increases reliability and lifespan.

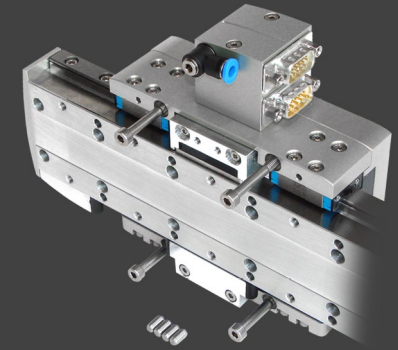
A great advantage of the weight compensation compared to a brake is the support of the vertical linear motor. The motor runs weightlessly and heats up much less. This results in higher dynamics, at the same time saving energy.



Dirt wipers optional for Linax Lxc F40 available, not necessary for other models.



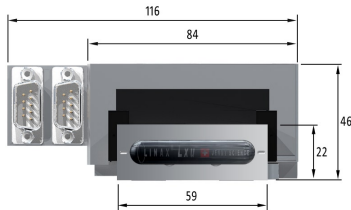
LINAX® Lxu with weight compensation



LINAX® Lxu 4 screws through the sliding carriage

LINAX® Lxu

u = universal: These axes are real “all-rounders”. There are three mounting possibilities: mounting to slide, to the ground plate or on the front face. Also interesting are the four long holes through the sliding carriage. For example, this allows the direct back to back mounting of two Lxu slides, which is ideal for X-Z handling.



Lxu Model	Stroke [mm]	L Instal [mm]	Force Fn/ Fp [N]	Weight Slider/Tot [g]
Lxu 40F60 ¹⁾	40	170	60/180	950/1700
Lxu 80F60 ¹⁾	80	210	60/180	950/1900
Lxu 160F60 ¹⁾	160	290	60/180	950/2200
Lxu 240F60	240	370	60/180	950/2600
Lxu 320F60	320	450	60/180	950/2900

Connector case
Lxs und Lxu
mountable in 90°
pattern

¹⁾ with weight compensation available up to 6kg

Weight compensation Lxu

For vertical applications an integrated weight compensation unit is available. The air pressure coupling is inside the 90° “rotatable” connector case. The functionality is identical to the weight compensation of LINAX® Lxc. See previous page.



Spring-applied brake Lxu

With long strokes (>160mm) the weight compensation needs too much space. In this case a spring-applied brake can be used. The spring-applied brake interacts with the bearing rail. In the “off” status the brake is clamped (non air-pressure). By activating a 3/2 way pneumatic valve, the brake is released with compressed air. With the XENAX® Xvi 75V8® servo controller, an OUTPUT FUNCTION can be set to control the brake valve automatically. The stroke of the linear motor axis is reduced by 35mm after installing the spring-applied brake. For example, the LINAX® Lxu 320F60 with a spring applied brake still has a stroke of 285mm.

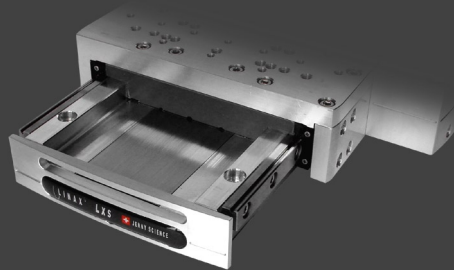
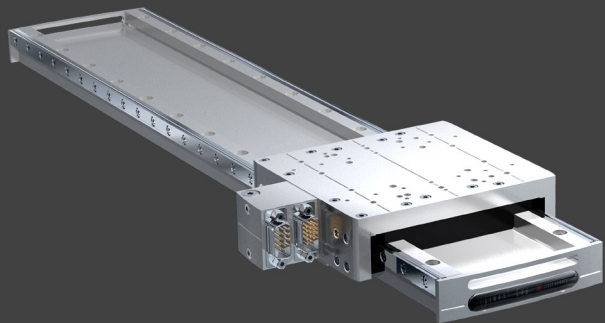
Measurement system in three classes of accuracy, Lxu and Lxs

With the LINAX® linear motor axes you can set-up high-precision positioning systems. There is no backlash and almost no wear. The accuracy remains constant over the whole lifetime. With the new Linax® Lxs and Lxu linear motor axes you can choose between three classes of accuracy of +/- 8µm magnetic, +/- 2µm optical and +/- 0.5µm, likewise optical.

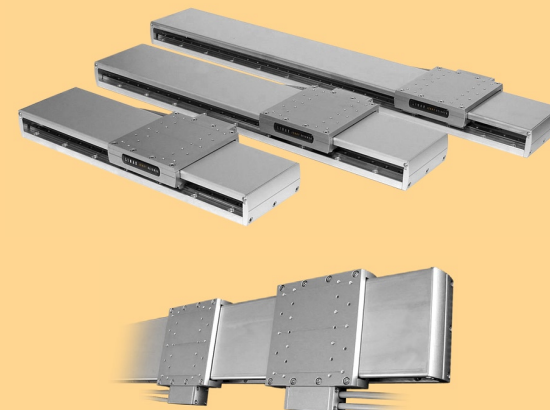
Guides with integrated self-lubrication

Reliable, long-life guides are the basis for high-quality linear motor axes. During their free return travel the balls bearings are fed through a porous, oil-impregnated synthetic resin sleeve. Capillary action ensures that oil flows continually to the inner surface of the sleeve. Thus freedom from maintenance for 20,000 km or five years is guaranteed. In addition to the long maintenance-free periods, there are two further advantages: quiet running and minimal friction.





LINAX® Lxs und Lxu dirt wipers as standard

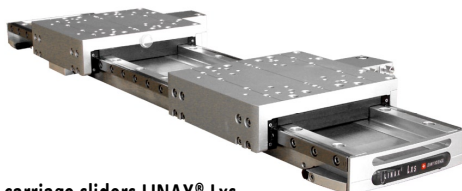


LINAX® Lxs

s = shuttle: As the name implies, the Lxs shuttle series are basis axes for long strokes up to 1200mm. Of particular importance is the wide body construction with recessed linear motor, by which the height is reduced to just 38mm. The widely spaced guiding rails are able to withstand high moments of force.

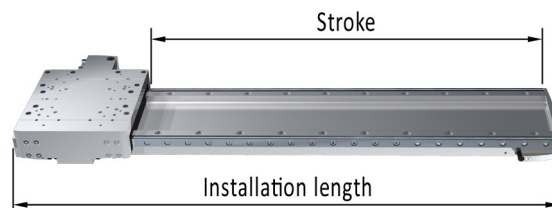
Wear-resistant dirt wipers as standard

With the new LINAX® Lxs and Lxu linear motor axes the internal space of the motor is protected against pollution and small parts by dirt wipers. These are flush-mounted to both ends of the slide and run directly over the flat stainless-steel magnet cover. Together with the magnetic measurement system, a high dirt resistance of IP 50 is achieved.



Multiple carriage sliders LINAX® Lxs

With the LINAX® Lxs linear motor axes it is possible to assemble two or more carriage sliders on the same ground plate. The cable outlet can be orientated on the left or right side of the connector housing. For each carriage slider a XENAX® servo controller is required.



Short installation length LINAX® Lxs and Lxu: Installation length = stroke + 130mm

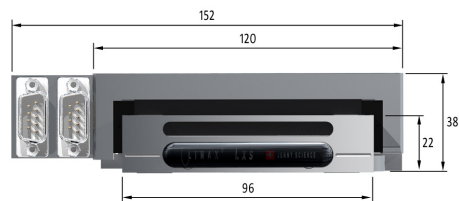
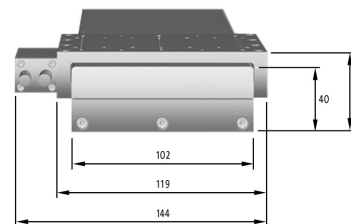
LINAX® Lxe

e = exclusive: The Lxe models have a special cover that is passed through the carriage slider of the linear motor. The outcome of this is a flat and elegant exterior geometry for easy cleaning. This Lxe series is predestined for medical and clean room applications. Additional carriage sliders on the same ground plate allow highly integrated machine concepts.



Lxe cross table fitting

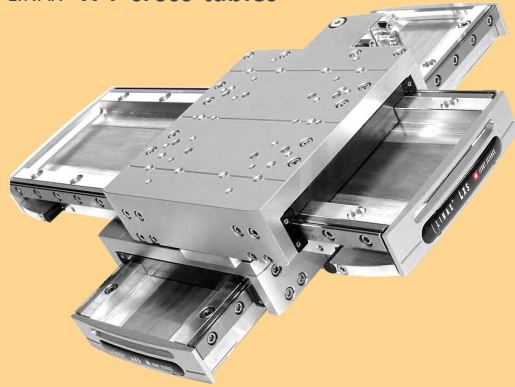
Prior to fitting a 2 x Lxe F40 cross table the 6mm slider plate of the lower LINAX® axis is removed. This reduces the total installation height by 6mm to 86mm.



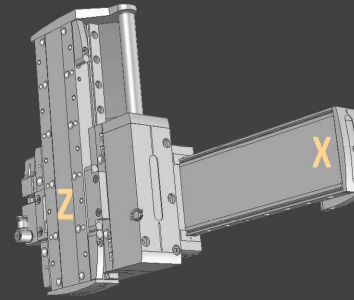
Lxs Model	Stroke [mm]	L Install [mm]	Force Fn/ Fp [N]	Weight Slider/Tot [g]
Lxs 160F60	160	290	60/180	1000/2600
Lxs 200F60	200	330	60/180	1000/2800
Lxs 320F60	320	450	60/180	1000/3400
Lxs 400F60	400	530	60/180	1000/3900
Lxs 520F60	520	650	60/180	1000/4500
Lxs 600F60	600	730	60/180	1000/5000
Lxs 800F60	800	930	60/180	1000/6100
Lxs 1000F60	1000	1130	60/180	1000/7200
Lxs 1200F60	1200	1330	60/180	1000/8400

Lxe Model	Stroke [mm]	L Install [mm]	Force Fn/ Fp [N]	Weight Slider/Tot [g]
Lxe 250F40	250	386	40/120	980/3080
Lxe 400F40	400	536	40/120	980/3850
Lxe 550F40	550	686	40/120	980/4620
Lxe 800F40	800	936	40/120	980/5900
Lxs 1000F40	1000	1136	40/120	980/6930

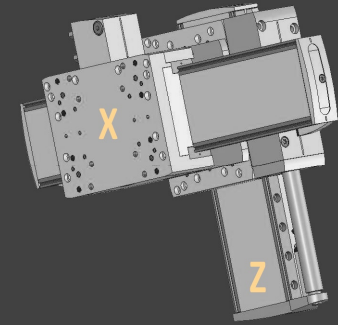
LINAX® X-Y cross tables



LINAX® Pick & Place



X-Axis fixed, is not moved up and down



X-Axis moving, minimal installation space

X-Y cross tables

The series Lxc and Lxs are predestined for cross table configurations. The flat design of the linear motor and the direct screwing without intermediate plates minimize the total height of the cross table. The minimal height with the small Lxc linear motor axes is only 50mm. Thanks to the modular system, it is possible to create combinations of axes with various strokes and even various LINAX® series.

Highest precision in a compact size with LINAX® Lxs cross tables

This illustrates another advantage of the widely spaced guiding design. The wider the guiding rails' distance the more stable and precise the construction. Therefore, the linear motor is recessed between the guiding rails. This results in low height. Also the Lxs models are directly screwed with centring pins for a low overall height of only 76mm. The working area likewise has minimal space requirements. An X-Y cross table with a stroke of e.g. 400 x 400mm has a mounting area of only 530mm x 560mm (incl. connector case on the side).



Flexible grid distances possible

X-Z LINE PORTAL

(designed for highest dynamics)

The ground plate of the X-axis is fixed in an upright orientation. The carriage slider of this X-axis is directly fixed to the carriage slider of the Z-axis. Contrary to the pick and place handling from competitors in this configuration the X-axis is not moved up and down. The Z-Axis, with 4 movements per cycle, has less mass to accelerate and hold. This increases the dynamics and reduces the mechanical vibration. The Z-axis has the optional weight compensation installed.

Your optimally designed Pick & Place

The modular system makes it possible!

This demonstrates once again the enormous possibilities of the practice orientated modular system.

Forces: 4 - 180N

Strokes: 44 - 320mm

Configuration variable: Line portal with fixed or moving X-axis or line cantilever.

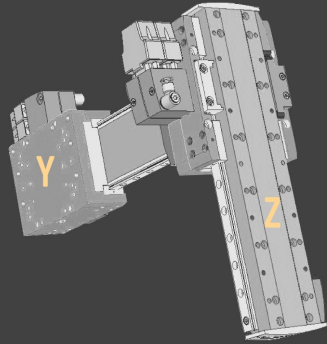
X-Z LINE PORTAL

(designed for minimal installation space)

In this configuration the ground plate of the Z-axis is fixed in a vertical orientation. The ground plate of the X-axis is connected via an intermediate plate fixed to the carriage slider of the Z-axis. Thus, the X-axis and the Z-axis need minimal installation space. The Z-axis runs with the optional weight compensation. This weight compensation is turned upside down in order to compensate the weight of the X-axis and the weight of payload.

You have the choice and don't have to accept any compromises. And you remain ready for future requirements.

Control drive Pick & Place

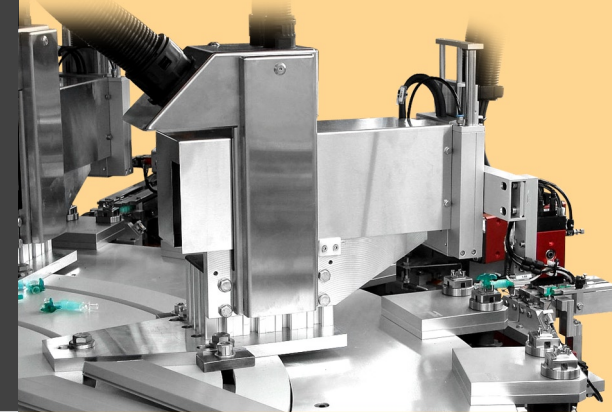


Y-axis rotatable in 90° pattern



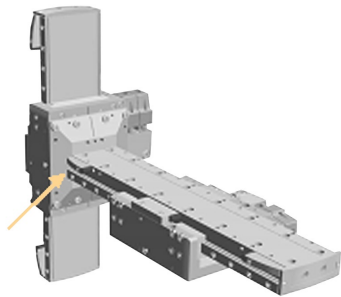
XENAX® Xvi 75V8 servo controller with Master-Slave operation, predestined for Pick & Place

Pick & Place encapsulated for medical application



Y-Z LINE CANTILEVER

The carriage slider of the Y-axis is stationary mounted. The front flange is fixed at the end of the Y magnet track. The Z-axis is vertical with the carriage slider screwed to the other side of the Lxu front flange.



Lxu with front flange, rotatable in 90° pattern

Easy, direct control with master slave

This master slave operation of the new XENAX® Xvi 75V8 servo controller runs without a superior position controller. With one master axis and up to 3 slave axes this operation mode is ideal for fast, repetitive handling cycles. Every axis gets a node address from 0-3. The XENAX® servo controller with address 0 is the master. All positioning profiles are entered into the master and then these are automatically distributed to all slave axes. Refer to the heading XENAX®, Master-Slave.

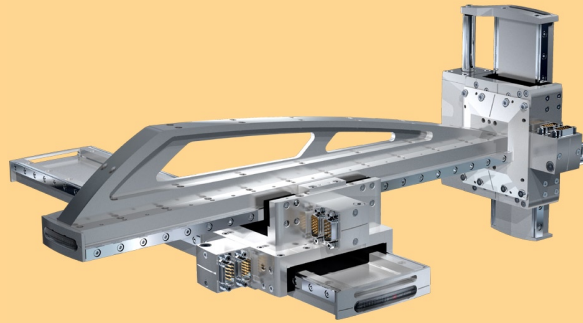
Pick & Place handling encapsulated for medical application

In this example, the stainless steel cover plate was designed by the client for easier cleaning in his medical application. The slider carriage of the X-axis (Lxu 240F60) is fix mounted to a vertical support. The Z-axis (Lxc 80F40) is screwed to the front side of the Lxu magnet track via the Lxu front. The advantage of this configuration is the horizontal X-axis is not moved up and down during the cycle. Thanks to this, the Pick & Place runs smoothly and quietly using less energy and results in more free space under the X-axis. The modular system makes this possible.

FRONT FLANGE rotatable in a 90° pattern

A further Lxu or Lxc linear motor axis can be mounted to the front face of each LINAX®. To do this, the front plate has to be removed and the Lxu front flange is then mounted with 4 screws and 2 centring pins. The front flange can be screwed and centred in a 90° rotatable pattern.

Area cantilever



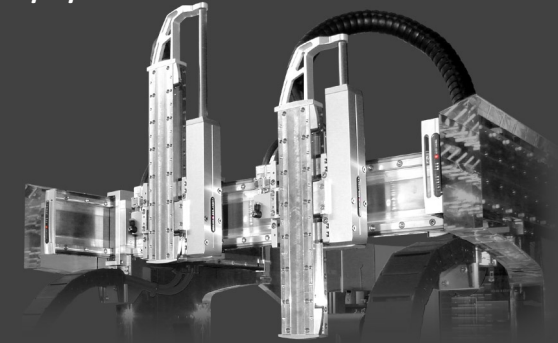
Area cantilever with reinforcement for high stiffness

Overhead Configuration



LINAX® Lxs X-Y over head cross table with Z-axis Lxc for maximum free space in working area

Gantry System



Gantry: LINAX® Lxs axes installed upright for minimal deflection and minimal installation space

3 Dimensional Systems

The supreme discipline of the LINAX® linear motor axes

Compact design with coupling components from the modular system

A typical design for 3D movement consists of a LINAX® Lxs (Shuttle) basis axis for the long stroke and supporting the force moments from the cantilever. On the top of this the Lxu (Universal) Y-Axis is mounted as a cantilever directly to the slide, screwed back to back. At the end of the cantilever axis is the "Lxu front flange", mounted to the front face. Mounted to this is the slider carriage of the vertical Lxu (Universal) Z-Axis including the weight compensation.

Overhead 3D system for more free space

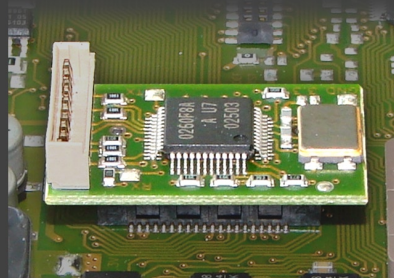
LINAX® Lxs/Lxu/Lxe

This configuration consists of two Lxs axes as an X-Y cross table above, in an upside down configuration. On the lower slider carriage, a fixing angle is mounted for coupling the Z-axis. In the illustration, this is an Lxc 80F40 including a weight compensation unit. This design results in a maximum of free space on the process-/handling level.

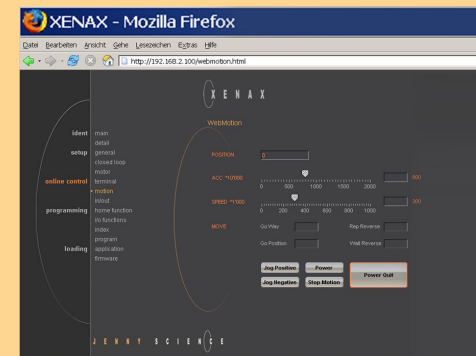
Gantry Installation

LINAX Lxs/Lxu

In the "gantry" configuration all Lxs axes are arranged upright. This saves space and increases the stability in the vertical direction. There is no bending of the axes. The basic frame design is less complex. The parallelism of the two synchronous Y-axes should be very precise. A tolerance of (+/- 5µm) over the length of the ground plate fixture is necessary. If this accuracy is not possible, a flexible angle bracket can be used. This allows a tolerance of (+/-50 µm) to be accommodated.



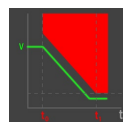
Safety Motion Unit (SMU)



Technical data XENAX® Xvi 75V8

Features	Xvi 75V8
For linear motor axes LINAX® Lxc / Lxe LINAX® Lxs / Lxu	X X X
For AC, EC, DC motors	X
Webbrowser set-up	X
Ethernet TCP / IP RS232 Pulse / Direction	X X X
Input Output / Voltage*	12V 8 / 24V active
Start-up Key	optional
Voltage Current	15-75V 8 / 18A
Binary coded inputs for pre-selection program numbers	15 programs
Busmodule EtherCAT® Powerlink® Profinet® CANopen®	optional
Master-Slave operation	X
Profile generator S-curve	X
Safety Motion STO, SS1	X
Safety Motion SS2, SLS	optional
Float sensing**	X
Dimensions [mm] Weight [g]	182x110x30 515

Safety scalable



Stop Functions

- Safe Torque Off (STO)**
Stop-Category 0, XENAX® function, switch off power stage, standard
- Safe Stop (SS1)**
Stop-Category 1, XENAX® function, hardware interruption of power stage via Input 9 (SS1), standard
- Safe Stop (SS2)**
Stop-Category 2, XENAX® function SMU module (optional) via 2 inputs (two channels)

Safety moving functions

- Safety-Limited Speed (SLS)**
SLS, XENAX® SMU module (optional) via 2 inputs (two channel)

* The Outputs of the XENAX® Xvi 75V8 servo controller are flexibly configurable as sink driver (0V) or source driver (24V).

** With activation of the "Float sensing" function the cogging forces of magnets, the payload and friction forces of the LINAX® linear motor axis are compensated. Refer to the heading XENAX® Float sensing.

Web Browser Setup, Ethernet TCP/IP and Web server as standard
With the Web browser (such as Firefox® or Internet Explorer®), the user navigates through the parameterization menu. The integrated Web server in the XENAX® Ethernet servo controller contains the Java user interface WebMotion®. Never before has the set-up of a servo controller been easier.

Never before has the set-up of a servo controller been so easy. All you need to do is enter the weight of the load.

With an Ethernet switch you can easily combine several axes for multi-axis operation.

Smart phone controls LINAX®

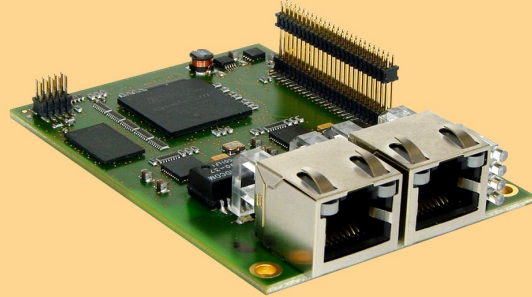


iPhone App



For set-up, test or maintenance, you can control a single axis at any time with your smart phone. All you need is a wireless connection and the IP address of the corresponding XENAX® servo controller.

XENAX® Bus Module



In-house development:
FPGA bus module
plug-on (optional)

EtherCAT®

ETHERNET
POWERLINK

PROFI
NET

CANopen



Beckhoff (EtherCAT)



TRIO (EtherCAT)



B & R (Powerlink)



Siemens (Profinet) ab 2012



Bus module for real-time Ethernet and field bus

The bus module is directly connected via a fast parallel data and address bus with the controller of XENAX® Xvi.

Point to point movement with multiple axes (Profile positioning mode)

In this mode, the XENAX® servo controller receives the parameters of acceleration, velocity and position via bus system in advance. The profile trajectory is calculated in the XENAX® servo controller. Thus, the requirements for the master control system are lower, making it possible to control and monitor the linear motor axes with low performance PLC controls. In the simplest case, the parameters can be programmed and saved on the XENAX® servo controller, after which the axes can be controlled with a simple I/O interface without a bus system.

Compact all-in-one:
Safety, Webserver, Ethernet
TCP/IP, real-time bus module
and Master-Slave

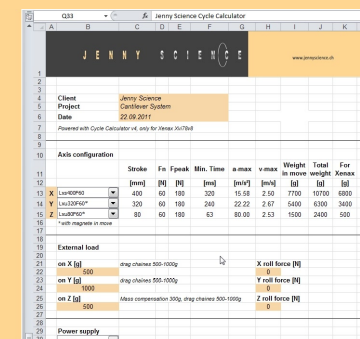
Axis interpolation made easy:

You remain in your familiar programming environment (Cyclic synchronized positioning mode)

With modern, high-performance industrial PLC control systems, the real-time communication via Ethernet has become possible. The trajectories can be calculated and transmitted as cyclic position values within a time cycle of a few 100µs. The comfortable NC tools for interpolated movements are instantly usable. For example the G commands corresponding to DIN 66025 (Beckhoff, B&R), or the powerful technology objects (Siemens). The application programmers can work in their familiar programming environment and require no special know-how in drive technology.



Master-Slave operation: 3 x XENAX® Xvi 75V8 with area cantilever



Master-Slave operation up to 4 axes

An awesome thing is this software based Master-Slave operation mode via I2C bus. Typical applications are handling modules. With a total of 4 axes, X,Y,Z and a rotative axis can be controlled from one master. The master and his slaves operate autonomously in stand-alone configuration and can be controlled directly with simple I/O signals.

12 Input / 8 Output, an easy interface for decentralized intelligence

In addition to the standard I/O functionality for sensor check or for actuator control, it is possible to assign complex functionalities to this digital I/O interface. If several programs should be selected, there is the possibility to binary code the input numbers 09-11 as a pointer to 15 different programs.

Conditions such as “In Motion”, “End of Program”, “Home”, “Error” etc., can be assigned to a physical output. The outputs of the XENAX® Xvi 75V8 servo controller are flexibly configurable via software as sink driver (0V) or source driver (24V).

Cycle Calculator for cycle time and power calculation

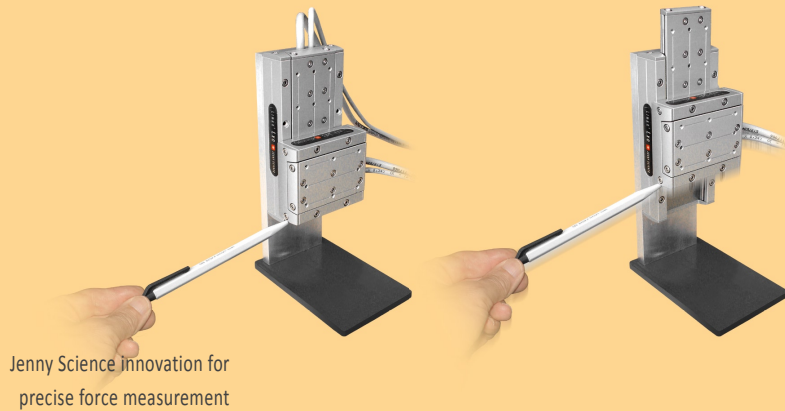
With this Excel-based Cycle Calculator you are able to calculate cycle times and performance limits in advance. The technical data of all LINAX® linear motor axis series are stored in the database. You can select the designated types and enter strokes and payload. The Cycle Calculator calculates the cycle time and the necessary performance accounting for possible waiting time. Also complex sequences of movements can be entered and calculated giving additional assurance of a correct set-up.

I/O Box for easy set-up and test



8 switches are connected to the inputs 1-8. The binary-coded rotary switch is connected to the inputs 9-12. The program numbers 1-15 can be pre-selected. Via trigger-input number 8 the pre-selected program is started.

XENAX® Float sensing



Jenny Science innovation for precise force measurement

Float sensing

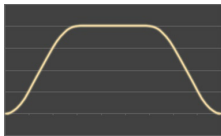
On running the “Float sensing” function the magnetic cogging forces, the load force and the friction forces are compensated.

The LINAX® linear motor axis is then free of all undesirable, parasitical forces. This gives the powerful, iron core LINAX® linear motor axes the same characteristics as an ironless linear motor and in addition the gravitational force and the friction forces are neutralized. The slider carriage floats weightlessly up and down. The float sensing function is the basis for a precise force measurement, joining processes and way-force recording. This float sensing technology, for example with the Lxc 85F10, enables a force assessment range from 0.2N up to 10N with a repeat accuracy of +/- 0.1N.

Smooth motion with S-profile

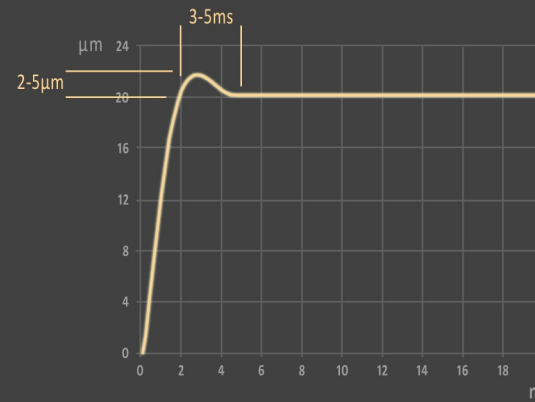
XENAX® Xvi internally calculates the driving profile with linearly increasing acceleration/deceleration. The output is the advantageous S-curve as a speed profile. In comparison to the common trapezoidal profile there are no current peaks. The axes run smoothly over the turning points. The coupled moving parts are relieved of strain, the system runs quieter which also increases the operational life. Thanks to „softened arrival“ at the target position „potential overshoot“ will be prevented.

Result: smooth motion, less wear, higher positional accuracy.

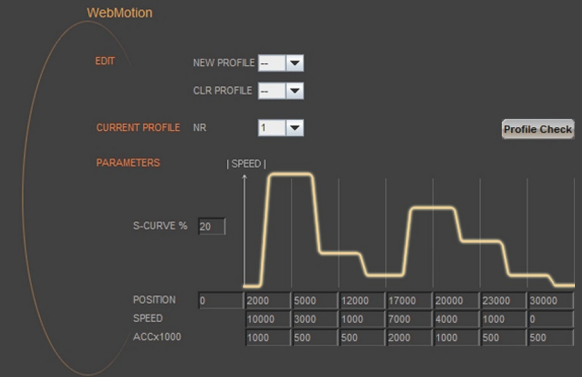


S-curves speed profile

XENAX® Precise, fast positioning



XENAX® Complex motion profiles



Easy closed loop set-up thanks to linear motor communication

The XENAX® Xvi servo controller communicates via I2C-bus with the connected LINAX® linear motor axis. The data are directly read from the memory of the linear motor. Thus the controller knows the motor parameters, like force constant, inductance, number of pole pairs, etc. Within these parameters, an automatic set-up of the state controller is carried out.

Never before has the set-up of a servo controller been easier. All you need to do is enter the weight of the load.

State controller with axis observer

For the desired high quality closed loop the state controller needs exact values of the state variables for the physical system. The axis observer is the mathematical representation of the physical system. In this way the physical system is changeable through external influences, e.g. forces, temperature, friction etc. To permanently adjust for these external influences the axis observer runs adaptively, compensating these using a correction matrix.

Result: highest accuracy with fastest positioning. Furthermore, considerable gains in stability, smoothness and dynamics are achieved compared to a classic PID. This is an enormous advantage for vibration sensitive direct drive linear motors.

Complex motion profiles - easy set-up

A challenge with complex motion profiles is a simple way to enter the desired profile geometry. We have implemented a modular solution by „linking“ a few basic profiles.

Your benefit: easy programming of complex motion profiles.

Jenny Science AG
D4, Platz 4
CH-6039 Root D4

From 01.04.2012
Jenny Science AG
Sandblatte 7a
CH-6026 Rain

Phone 0041 41 455 44 55
Fax 0041 41 455 44 50

alois.jenny@jennyscience.ch
www.jennyscience.ch