JENNY SCIENCE moving precisely, within tight space

Data Sheet LINAX®

Edition 20 February 2024

LINAX® Linear Motor Axes
4 Types

Lxc Lxc Lxu Lxs Lxe

Lxc, c = compact
Lxu, u = universal
Lxs, s = shuttle
Lxe, e = exclusive

Highlights

Compact dimensions, high precision

Positioning accuracy optical +/- 2 µm, resolution 1 µm or +/-500nm, resolution 100nm

Positioning accuracy magnetic +/- 5µm, resolution 1µm (for Lxu and Lxs only)

Modular system with strokes from 44-1600mm

Peak forces from 24N – 300N

High cycle rates with velocities up to 4m/s due to the linear motor

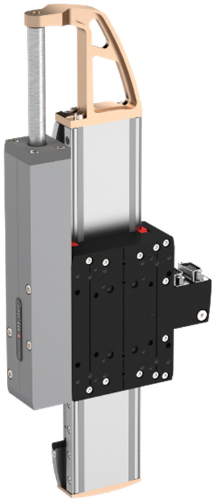
FORCETEQ® basic/pro force control, force limitation, force monitoring with XENAX® Xvi servo controller

Overview

The construction of the very compact LINAX® Lxc (compact) types is based on the patented mono-bloc design. The linear motor coils are located in the mono-bloc and the magnets and the glass scale are on the slider. The magnets are moving while the coils remain stationary. No moving cables and cable chains result which translates into longer life span.

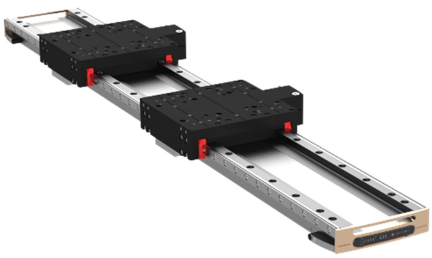
LINAX® Lxc 44F08 with Weight compensation

The Lxu (universal) types are real „all-rounders“. There are three mounting possibilities: mounting to the slider, to the ground plate or to the front face. Also interesting are the four long holes through the carriage slider. This allows for the direct back to back mounting of two Lxu sliders.



LINAX® Lxu xxF60 with Weight compensation

The two Lxs (shuttle) F60 and F120 models are designed for long travel distances up to 1600mm as the main axis. The low-profile design with an "embedded" linear motor is advantageous. As a result, the height is reduced to only 38mm for the Lxs F60 and only 45mm for the Lxs F120. The robust, widely spaced guides can accommodate high torque from cantilever axes.



LINAX® Lxs 800F60, with multiple carriage slider for highly integrated machine concepts

The LINAX® Lxe (exclusive) models have a protective cover that is passed through the carriage slider of the linear motor. The result is a flat and elegant geometry for easy cleaning. This Lxe series is predestined for medical and clean room applications.

LINAX® Lxe 550F40, with protective cover

By using Jenny Science drive components, you can build your machines and devices more compactly and efficiently, while the FORCETEQ® force measurement technology ensures integrated quality control.

The result shows: Reduced space requirements, increased productivity, controlled quality, and decreased energy costs.

Alois Jenny
Jenny Science AG

Content

1 Code for LINAX® Types

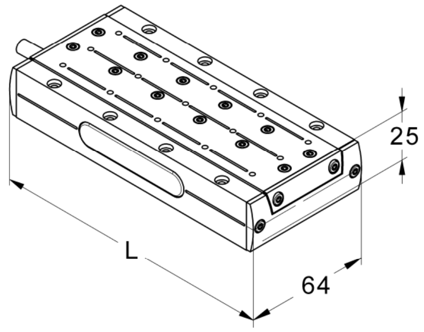
Lxc 85F10

Lx	c	85	10
Lx = LINAX®	c = compact u = universal s = shuttle e = exclusive	85 = 85mm max. net stroke	10 = 10N Nominal force 100% duty cycle

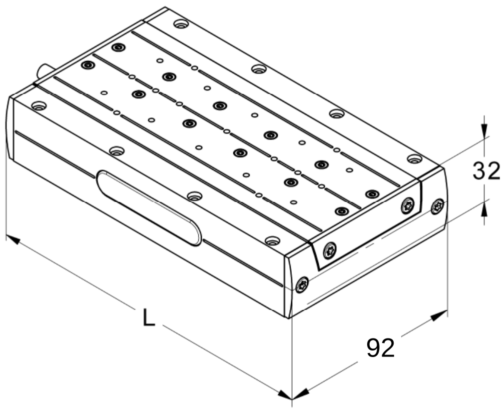
2 LINAX® Lxc F08/F10/F40

2.1 External Dimensions LINAX® Lxc

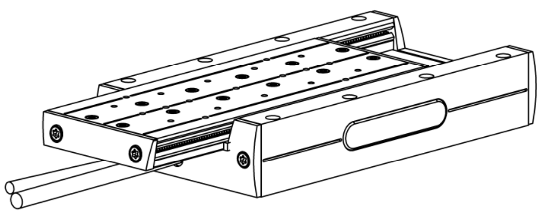
LINAX®	Lxc 44F08	Lxc 85F10	Lxc 135F10	Lxc 230F10
L [mm]	78	144	194	290



LINAX®	Lxc 80F40	Lxc 176F40	Lxc 272F40
L [mm]	169	265	361



Lxc absolute zero point according to REFERENCE:
Slider extended towards the connection cable

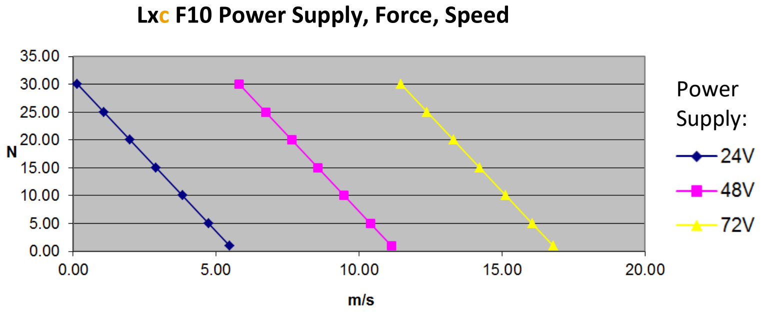


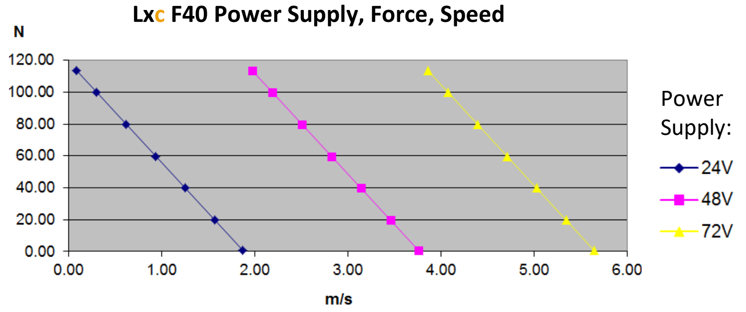
2.2 Dynamics LINAX® Lxc

LINAX®	Stroke [mm]	Force [N] nom./peak	Speed v-max [m/s]	Acceleration a-max [m/s²]	Min. travel Time/stroke [ms]	Weight Slider [g]	Weight Geko [g]	Weight Total [g]
Lxc 44F08	44	8/24	2.0	120	40	130	90	350
Lxc 85F10	85	10/30	2.5	85	70	230	180	650
Lxc 135F10	135	10/30	2.8	60	95	320	-	880
Lxc 230F10	230	10/30	3.2	45	145	450	-	1200
Lxc 80F40	80	40/114	2.0	100	60	520	335	1470
Lxc 176F40	176	40/114	2.5	90	100	750	530	2150
Lxc 272F40	272	40/114	2.8	75	140	1050	-	2800

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

2.2.1 Power Supply, Speed Lxc



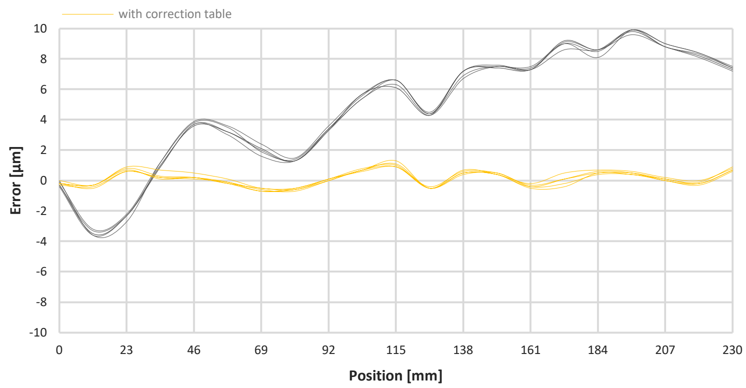


2.3 Precision LINAX® Lxc

2.3.1 Positioning Lxc

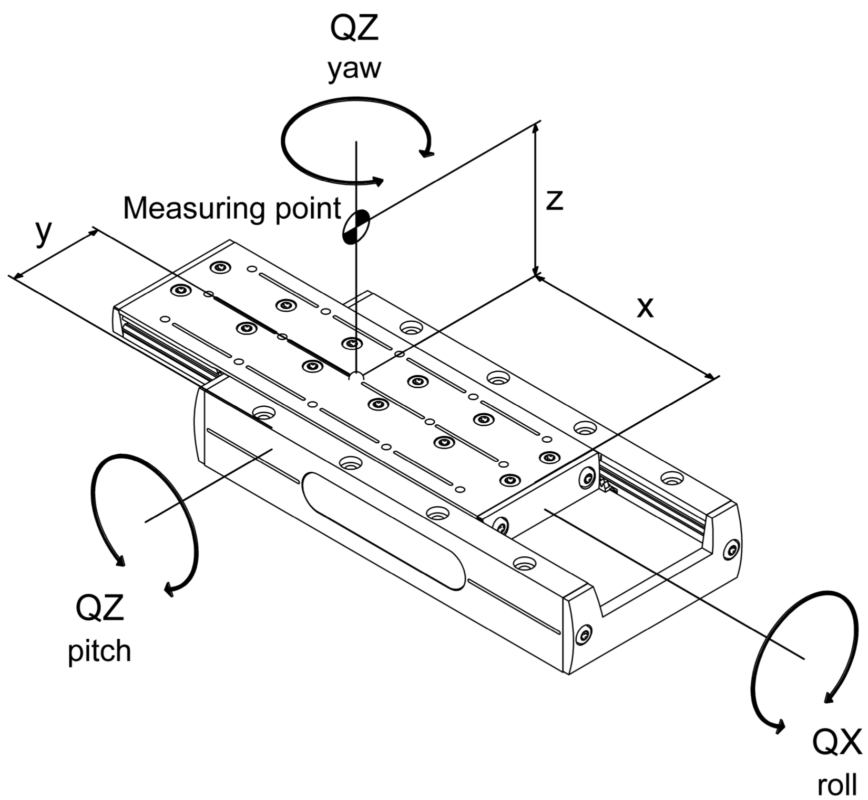
Standard resolution of optical measuring scale	1µm / counter increment
Repeatability	< +/-1.5µm
Optional optical measuring scale with high resolution	100nm / counter increment
Repeatability	< +/-400nm
Linear expansion optical measuring scale	8.5µm/m/°C
Reference	Automatic calculation of the absolute position through the distance coded reference marks, max 10mm, direction of reference can be selected. The reference has to be completed only once after powering on the logic power (24V). The absolute position will be stored until the logic power is turned off (XENAX® Servo controller).
Mechanical zero point absolute	It is located 1.5mm before the mechanical limit. This is where the slider is positioned on the right end while the cable case is in the front of the user.
Correction table for positionerrors with Servo controller Xvi 48V8/75V8/75V8S	The XENAX® Servo controller offers the possibility to correlate the encoder position with the actual position.

Position accuracy optical 1µm
150mm over measuring system



2.3.2 Guidings of Slider Lxc

Cross roller bearings with are used for the LINAX® Lxc linear motor axes. The cross roller bearings are installed in cages and are equipped with forced centering. This construction is very robust and reliable (>350Mio cycles with F08/F10). The LINAX® Lxc linear motor axes have the following tolerances. These data is based on measures with linear motors free of load.



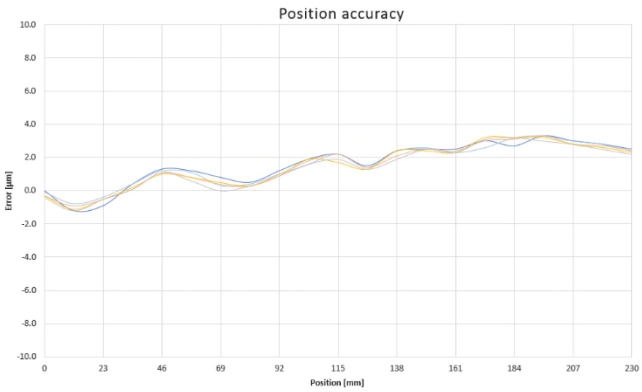
LINAX®	Running Accuracy horizontal EYX [µm]	Running Accuracy vertical EZX [µm]	Tilt Error QX (roll) [arcsec]	Tilt Error QY (pitch) [arcsec]	Tilt Error QZ (yaw) [arcsec]	Tolerance Constr. height [mm]
Lxc 44F08	±5	±5	±15	±30	±20	±0,1
Lxc 85F10	±7	±7	±20	±35	±25	±0,1
Lxc 135F10	±10	±10	±20	±40	±30	±0,1
Lxc 230F10	±12	±12	±20	±50	±35	±0,1
Lxc 80F40	±8	±8	±20	±30	±30	±0,1
Lxc 176F40	±10	±10	±20	±35	±35	±0,1
Lxc 272F40	±12	±12	±20	±40	±40	±0,1

2.3.3 Typical measurement results LINAX ® Lxc 230F10 of series production

Position accuracy

Resolution optical:	1 µm
Absolute accuracy:	±2.5 µm
Repeatability forward:	0.8 µm
Repeatability backward:	1.0 µm
Repeatability bi-directional:	1.3 µm

Position accuracy 25mm over measuring system

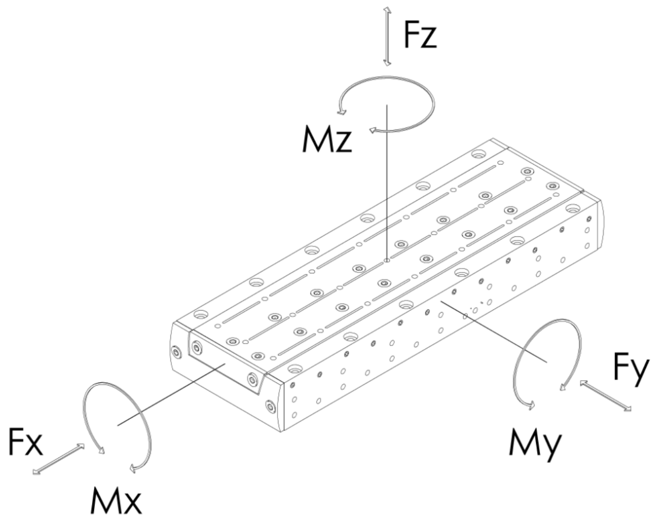


Tilt error

QX roll:	±9.5	asec
QY pitch:	±10.3	asec
QZ yaw:	±9	asec

2.4 Load parameters of Guides Lxc

LINAX®	Mx max [Nm]	Fy max [N] Fz max [N]	My max [Nm] Mz max [Nm]
Lxc 44F08	17	787	11
Lxc 85F10	37	1722	43
Lxc 135F10	47	2181	66
Lxc 230F10	49	2296	95
Lxc 80F40	129	4080	133
Lxc 176F40	165	5236	230
Lxc 272F40	186	5916	328

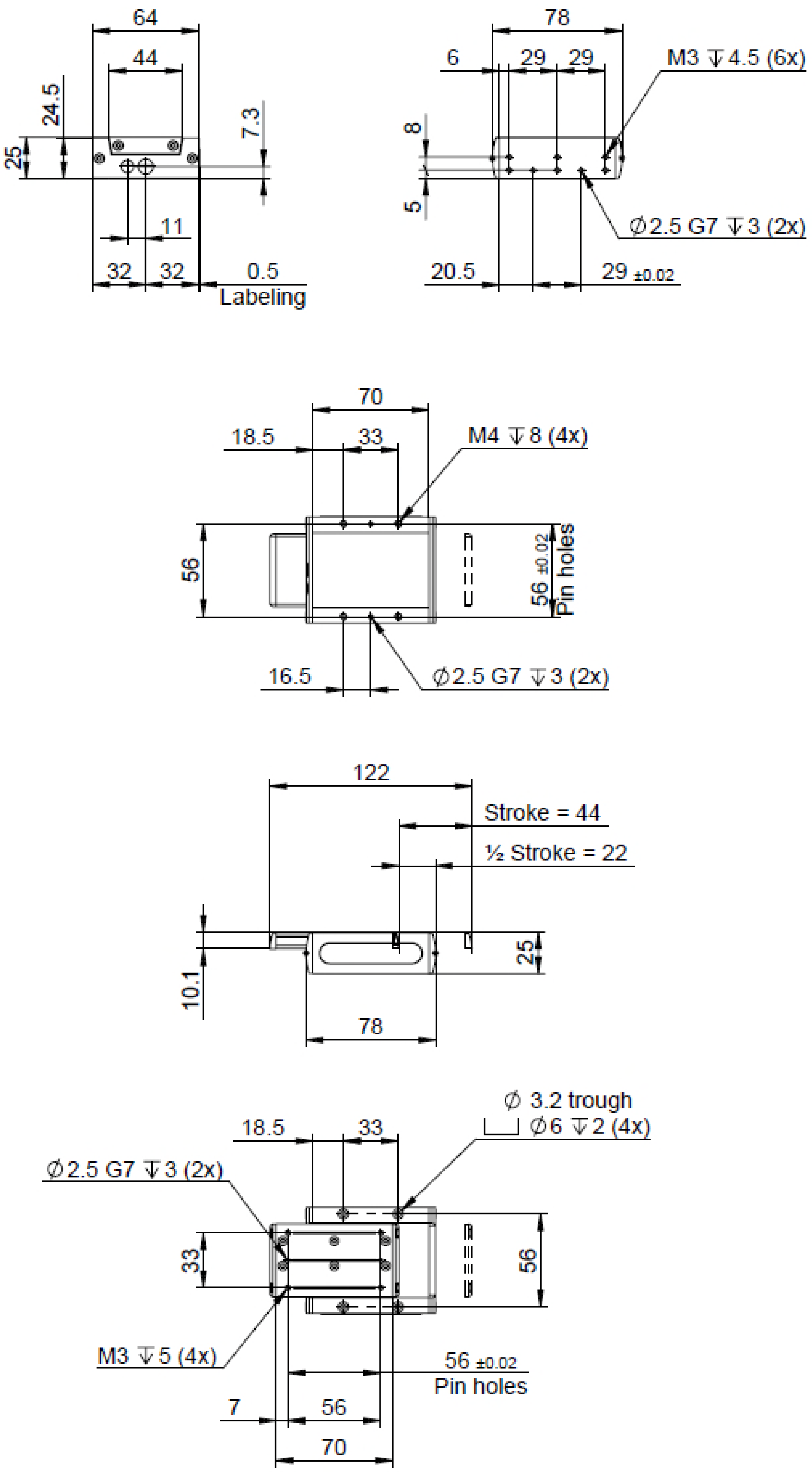


Besides adhering to the individual maximal loads, the following equation must comply if there are multiple forces and moments acting simultaneously on the linear motor:

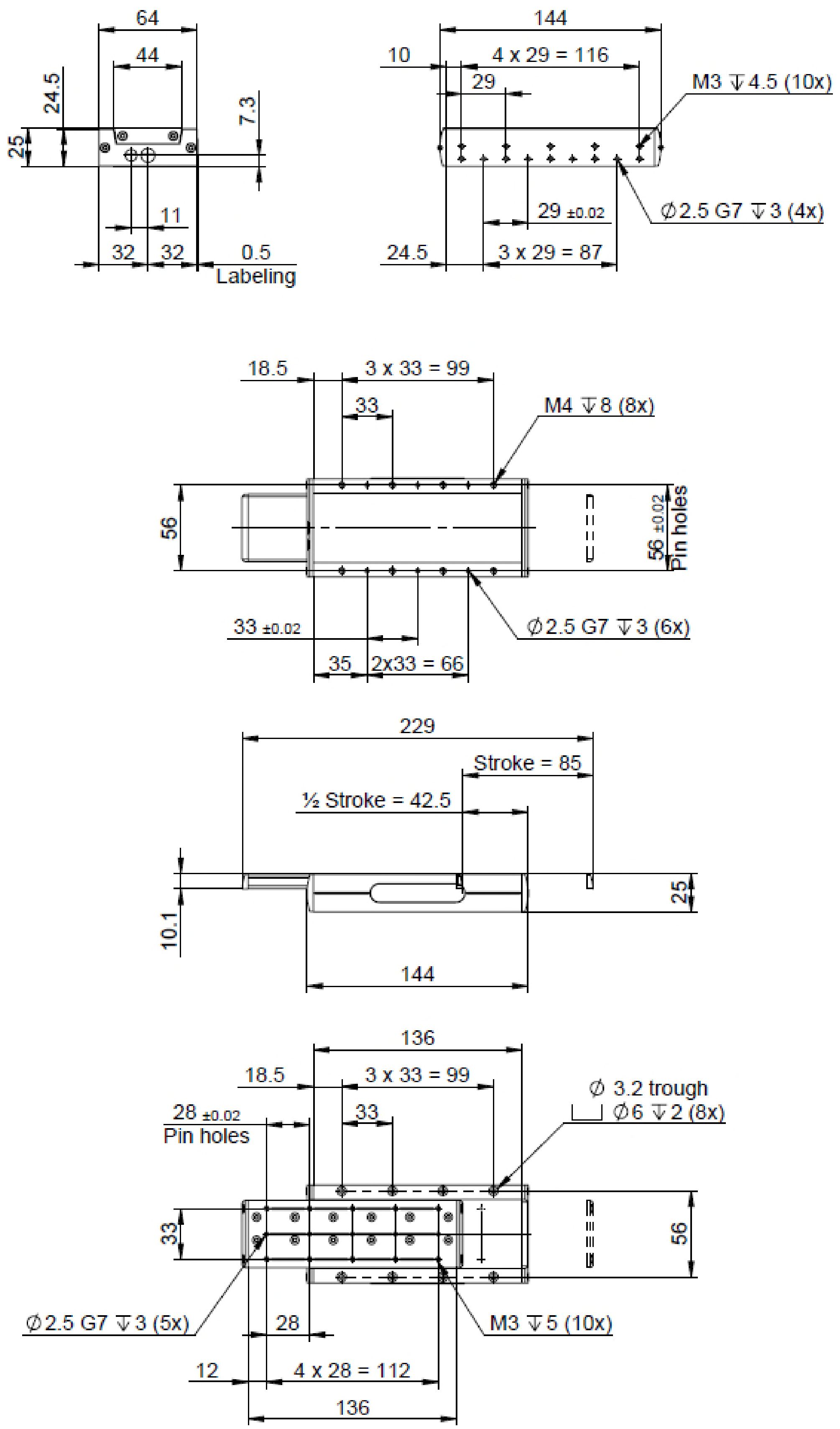
$$\frac{|\mathrm{Fy}|}{\mathrm{Fy}\ max}+\frac{|\mathrm{Fz}|}{\mathrm{Fz\ max}}+\frac{|\mathrm{Mx}|}{\mathrm{Mx\ max}}+\frac{|\mathrm{My}|}{\mathrm{My\ max}}+\frac{|\mathrm{Mz}|}{\mathrm{Mz\ max}}\leq 1$$

2.5 Dimensions Lxc F08/10

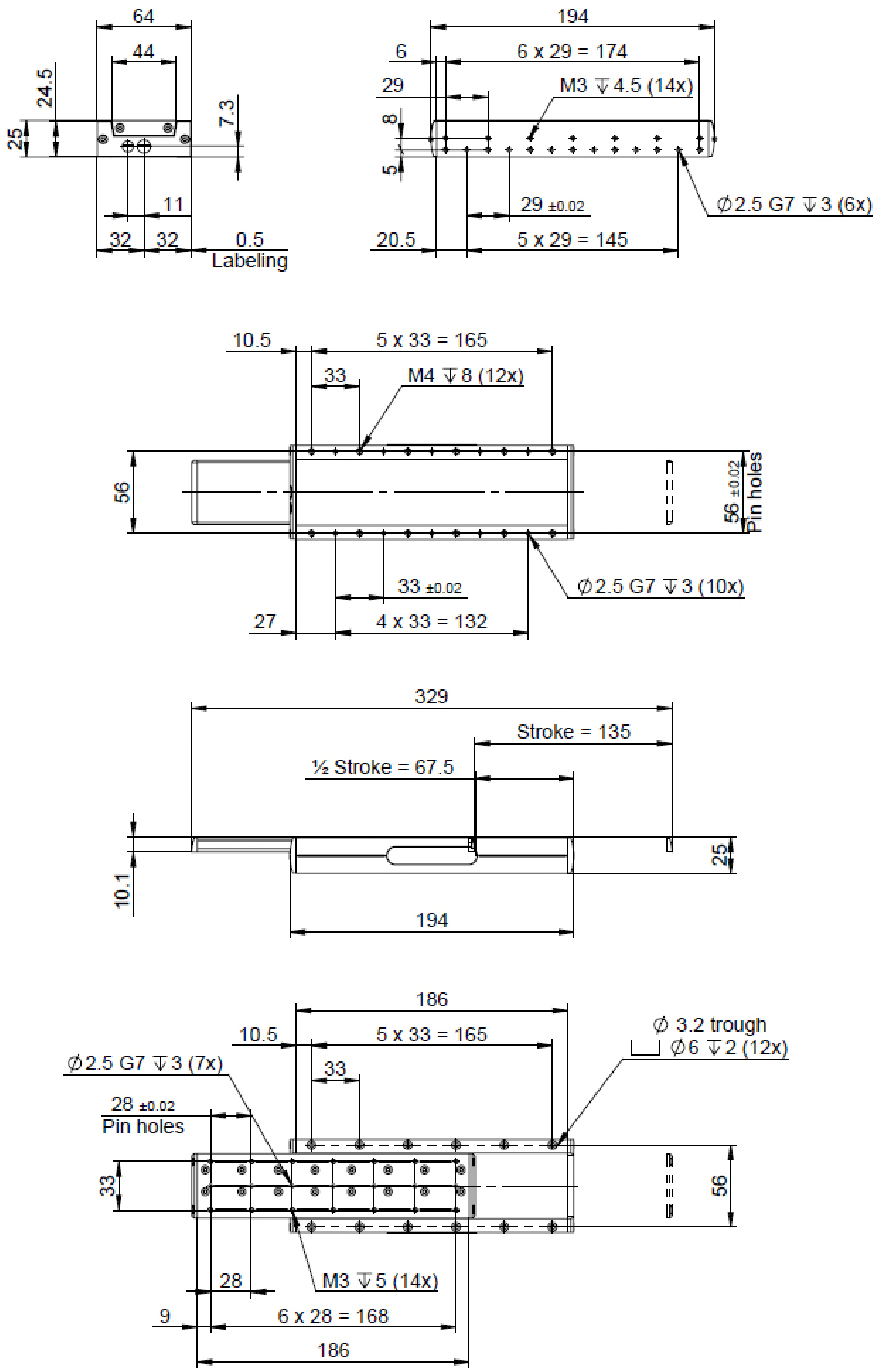
2.5.4 Installation Dimensions LINAX® Lxc 44F08



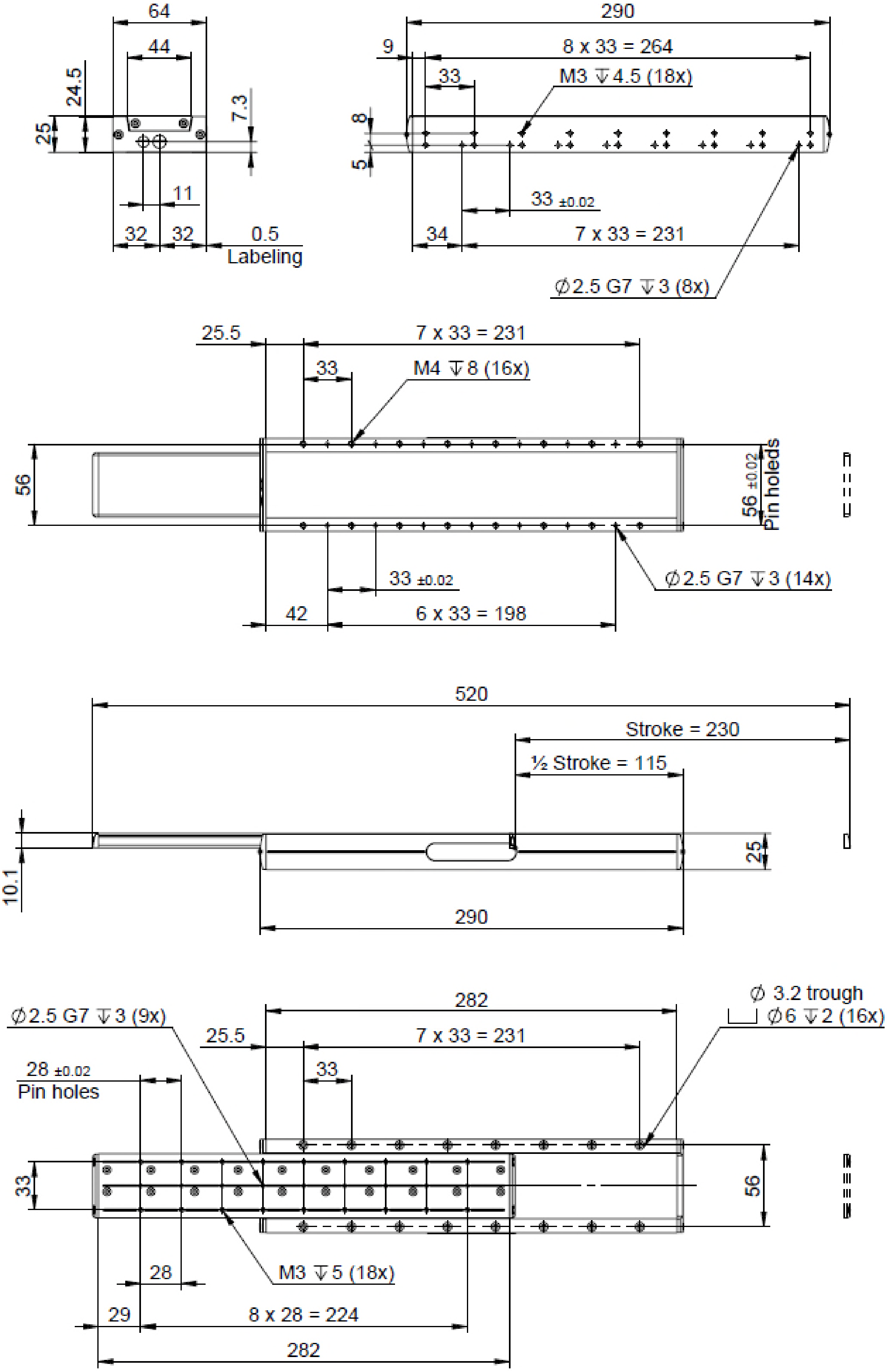
2.5.5 Installation Dimensions LINAX® Lxc 85F10



2.5.6 Installation Dimensions LINAX® Lxc 135F10

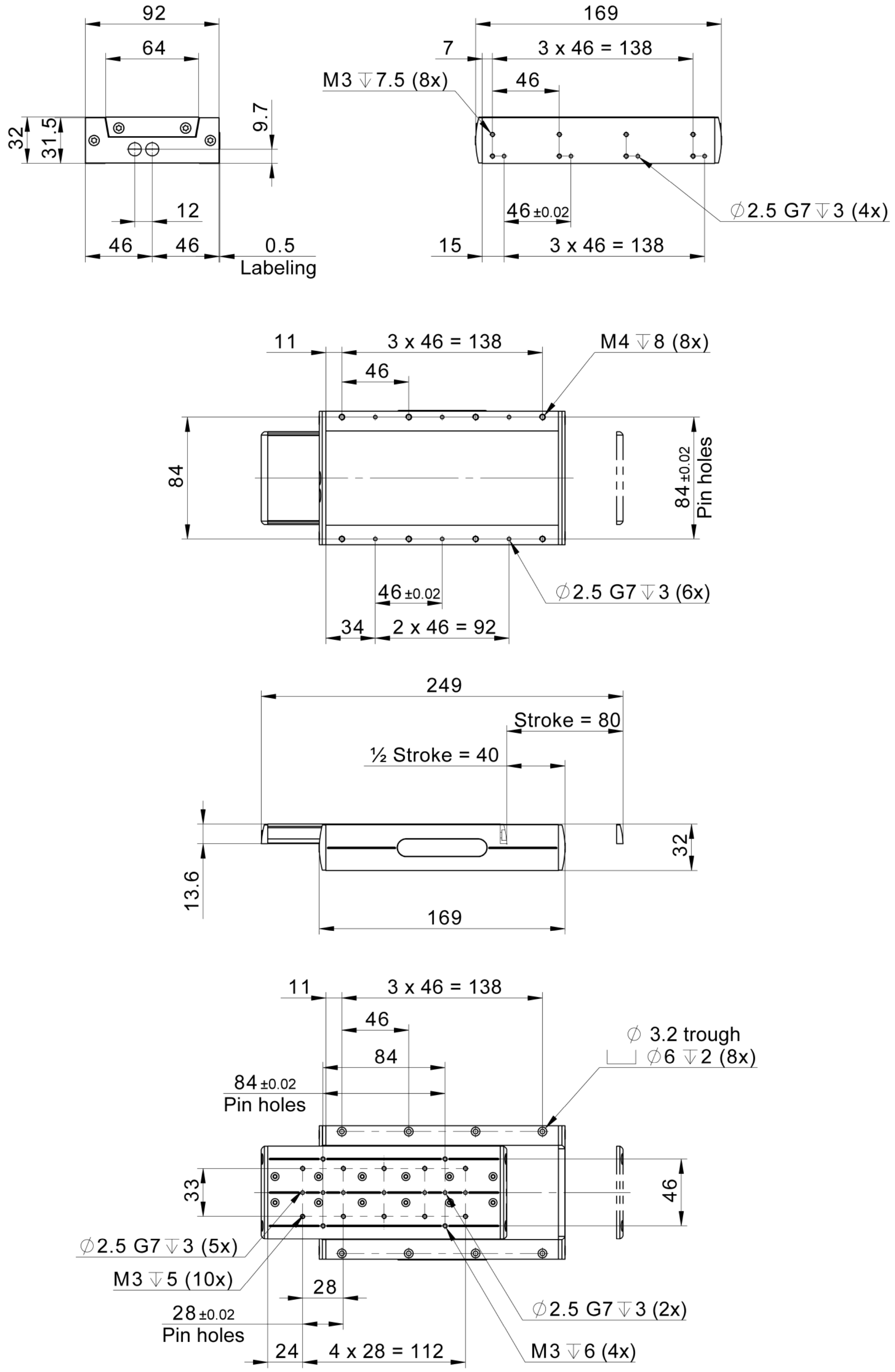


2.5.7 Installation Dimensions LINAX® Lxc 230F10

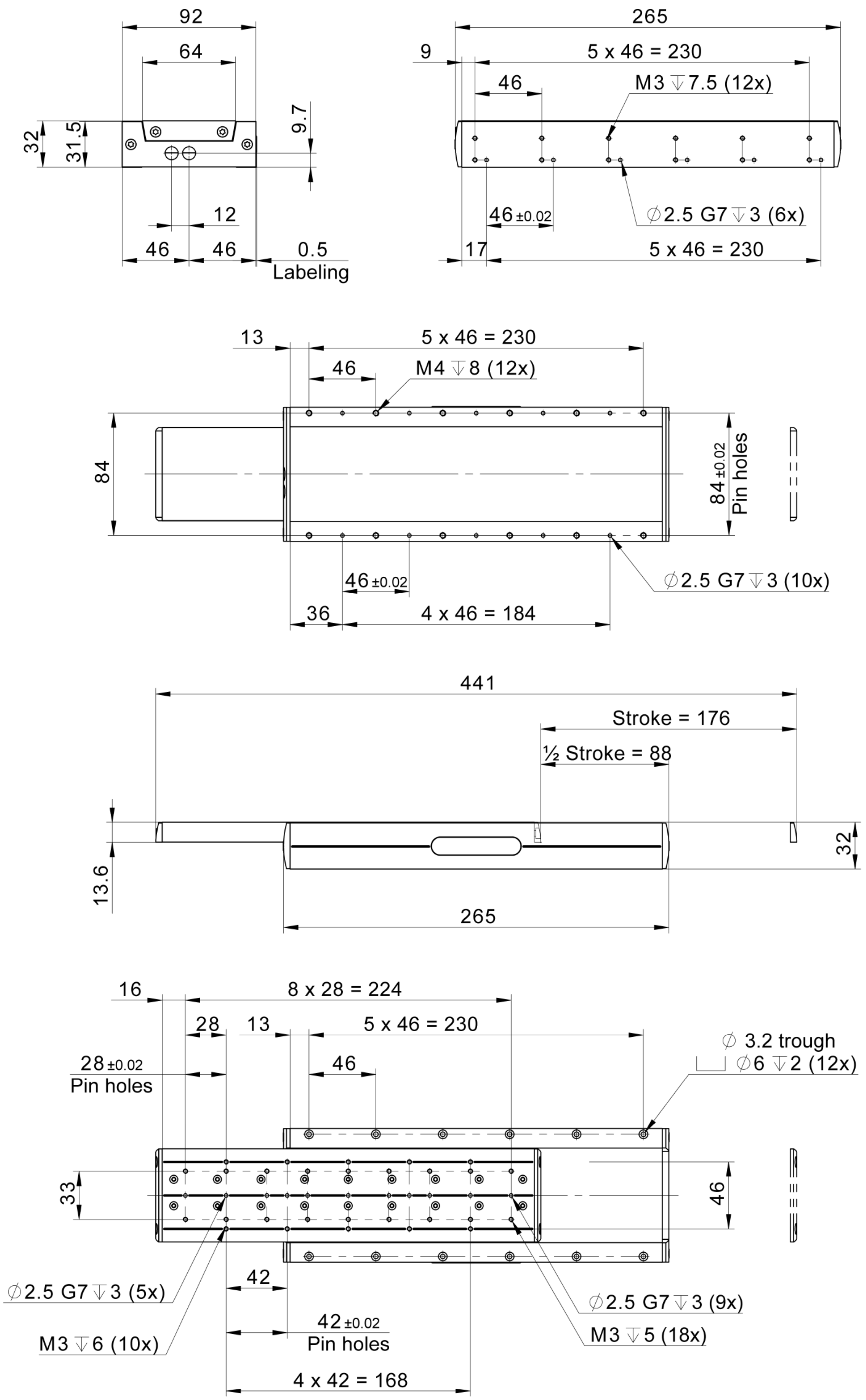


2.6 Dimensions Lxc F40

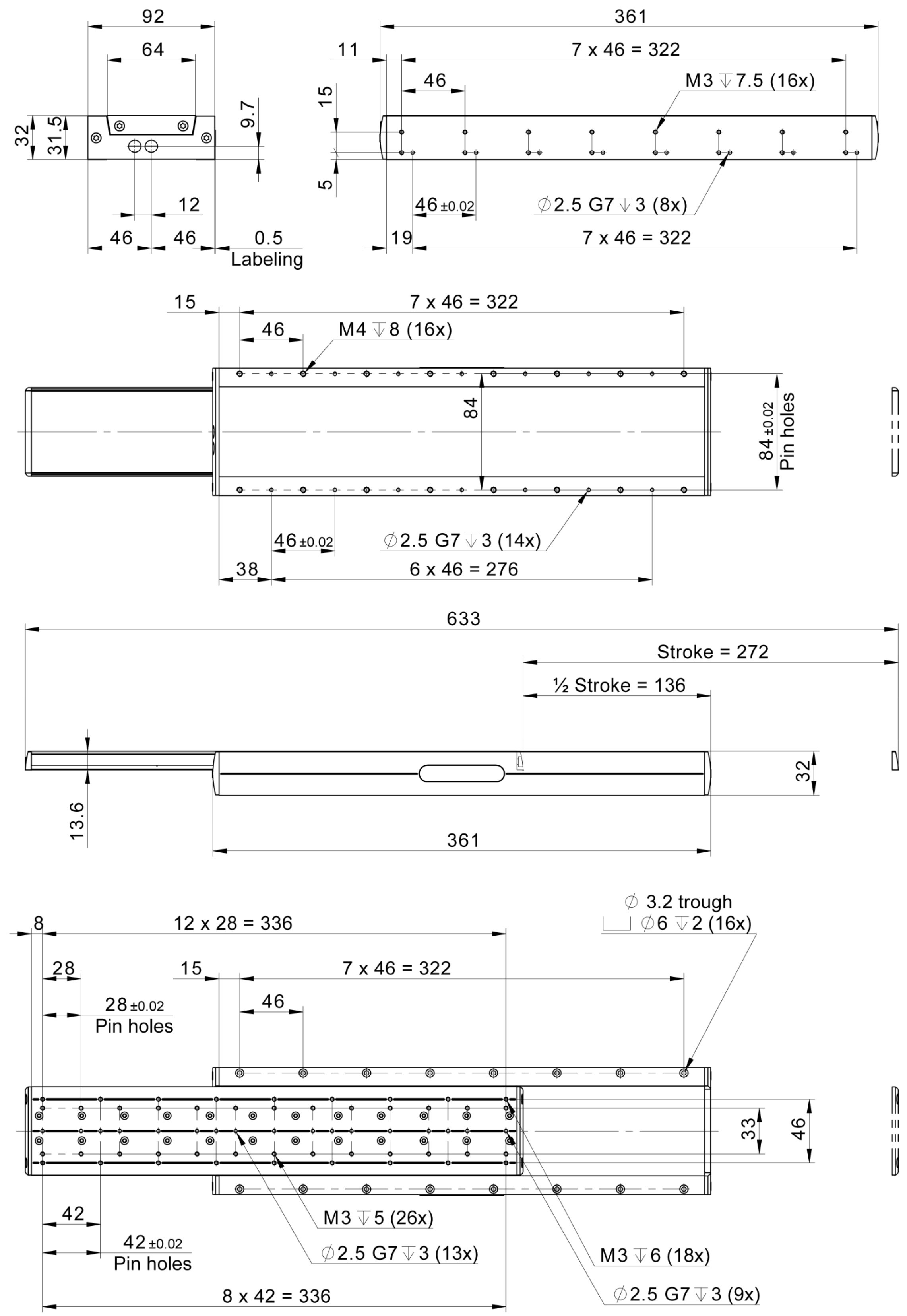
2.6.1 Installation Dimensions LINAX® Lxc 80F40



2.6.2 Installation Dimensions LINAX® Lxc 176F40



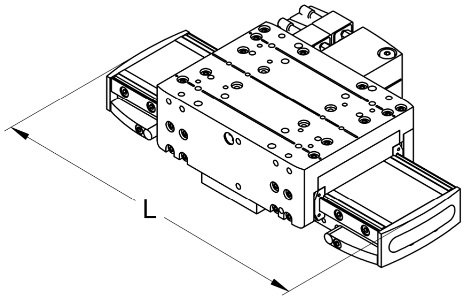
2.6.3 Installation Dimensions LINAX® Lxc 272F40

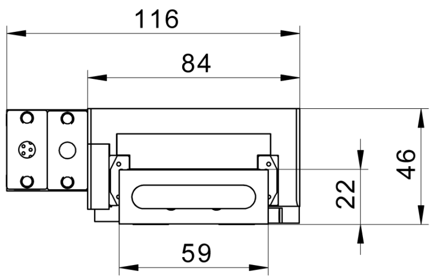


3 LINAX® Lxu F60

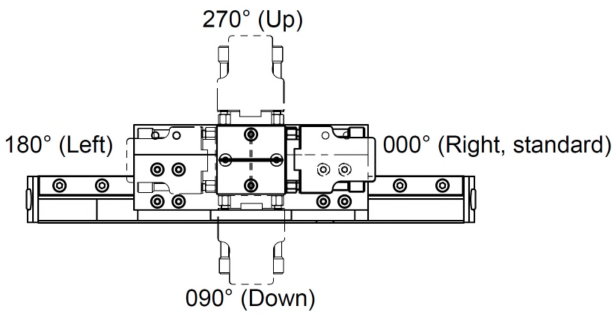
3.1 External Dimensions LINAX® Lxu F60

LINAX® Lxu	**L [mm]**
Lxu 40F60	170
Lxu 80F60	210
Lxu 160F60	290
Lxu 240F60	370
Lxu 320F60	450

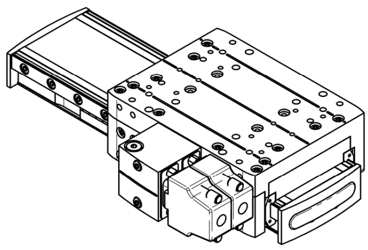




Lxs and Lxu
Rotary connector case in 90° pattern
Default cable connector directed to the right



Lxu absolute zero point according to REFERENCE:
Slider extended towards the connection cable



3.2 Dynamics LINAX® Lxu

3.2.1 Slider in Motion

LINAX®	Stroke [mm]	Force [N] nom./peak	Speed v-max [m/s]	Acceleration a-max [m/s²]	Min. travel time/stroke [ms]	Weight Slider [g]	Weight comp.	Weight Total [g]
Lxu 40F60	40	60/180	2.0	120	40	950	360	1700
Lxu 80F60	80	60/180	2.5	120	55	950	360	1900
Lxu 160F60	160	60/180	3.0	120	80	950	590	2200
Lxu 240F60	240	60/180	3.5	120	100	950	820	2500
Lxu 320F60	320	60/180	3.8	120	115	950	-	2900

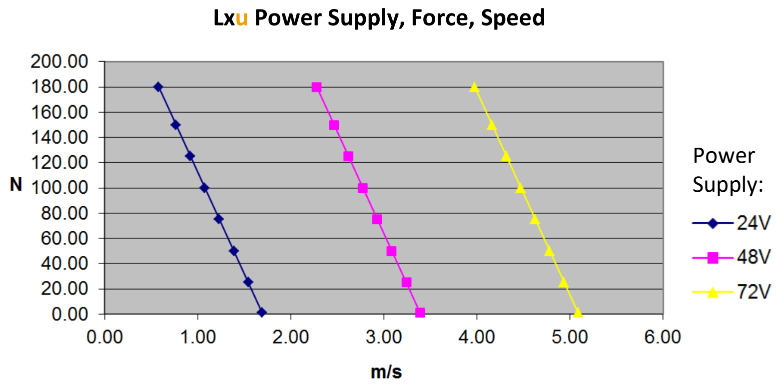
All values only valid with XENAX® Xvi and 20% S-Curve

3.2.2 Ground Plate in Motion

LINAX®	Stroke [mm]	Force [N] nom./peak	Speed v-max [m/s]	Acceleration a-max [m/s²]	Min. travel time/stroke [ms]	Weight Ground Plate [g]	Weight comp.	Weight Total [g]
Lxu 40F60	40	60/180	2.0	160	35	750	350	1700
Lxu 80F60	80	60/180	2.5	120	55	950	350	1900
Lxu 160F60	160	60/180	3.0	100	85	1250	590	2200
Lxu 240F60	240	60/180	3.5	70	120	1550	820	2500
Lxu 320F60	320	60/180	3.8	65	145	1950	-	2900

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

3.2.3 Power Supply, Speed Lxu

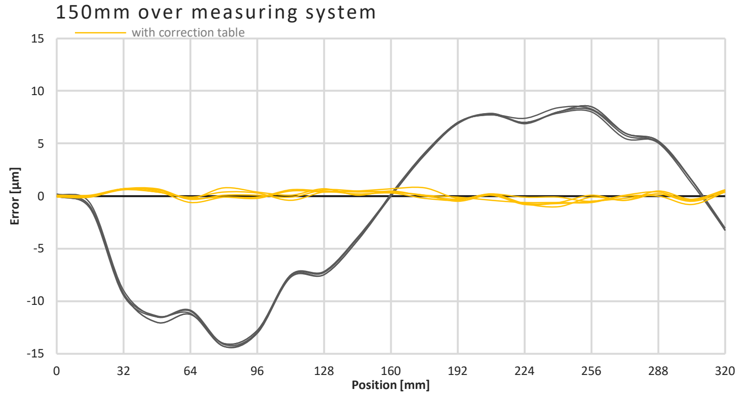


3.3 Precision LINAX® Lxu

3.3.1 Positioning Lxu

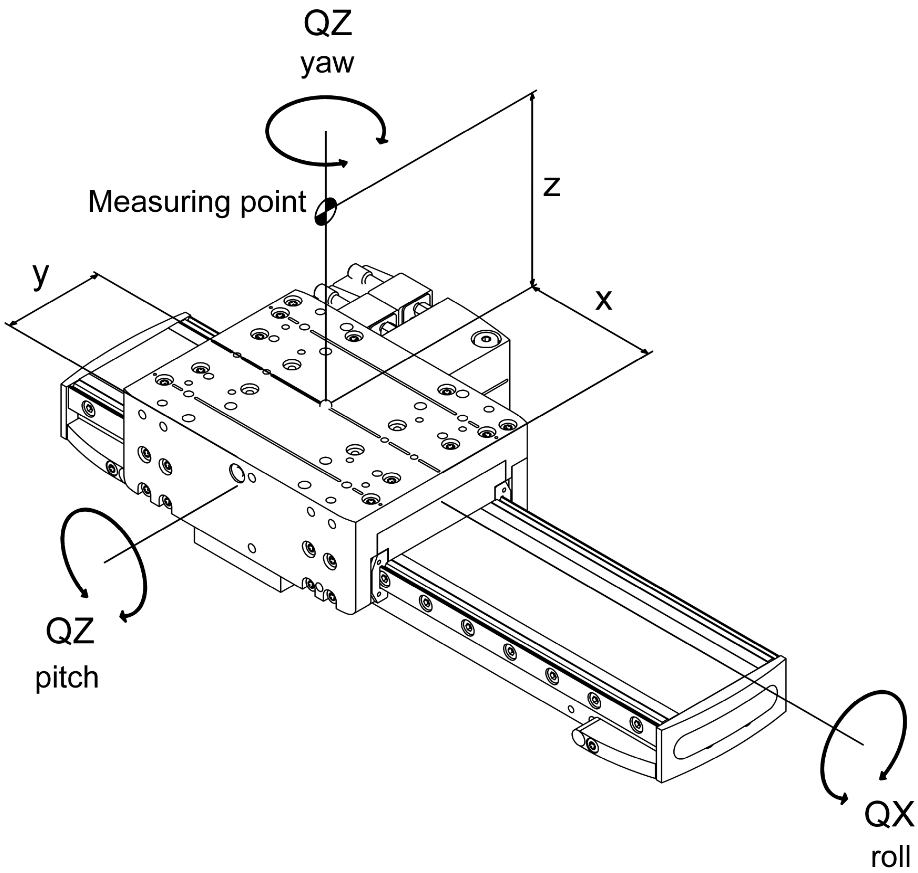
Standard magnetic measuring scale	1µm / counter increment
Repeatability	< +/-5µm
Optional optical measuring scale	1µm / counter increment
Repeatability	< +/-2µm
Optional optical measuring scale with high resolution	100nm / counter increment
Repeatability	< +/-500nm
Linear expansion magnetic measuring scale	11µm/m/°C
Linear expansion optical measuring scale	8.5µm/m/°C
Reference	Automatic calculation of the absolute position through the distance coded reference marks, max 10mm with optical and max 40mm with magnetic measuring scale, direction of reference can be selected. The reference has to be completed only once after powering on the logic power (24V). The absolute position will be stored until the logic power is turned off (XENAX® Servo controller).
Mechanical zero point	It is located 1.5mm before the mechanical limit. This is where the slider is positioned on the right end while the cable case is in the front of the user.
Correction table for positionerrors with servo controller Xvi 48V8/75V8/75V8S	The XENAX® servo controller offers the possibility to correlate the encoder position with the actual position.

Position accuracy optical 1µm
150mm over measuring system



3.3.2 Guidings of Slider Lxu

Ball bearing guides are used for the LINAX® Lxu linear motors. This guiding system is maintenance free for 20‘000km or five years as stated by the supplier.



The LINAX® Lxu linear motor axes have following tolerances as a standard. These data is based on measures with linear motors free of load.

LINAX®	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]
Lxu 40F60	±5	±4	±8	±10	±15	±0,1
Lxu 80F60	±5	±4	±8	±10	±20	±0,1
Lxu 160F60	±8	±5	±10	±20	±25	±0,1
Lxu 240F60	±10	±5	±10	±20	±30	±0,1
Lxu 320F60	±12	±6	±10	±20	±35	±0,1

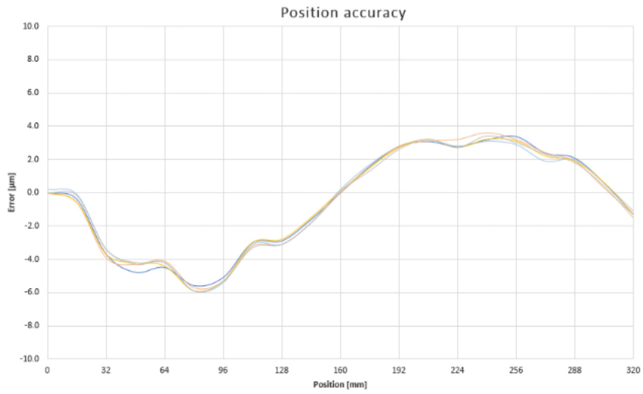
3.3.3 Typical measurement results LINAX ® Lxu 320F60 of series production

Position accuracy

Resolution optical: 1 µm
Absolute accuracy: ±5 µm

Repeatability forward: 0.6 µm
Repeatability backward: 0.7 µm
Repeatability bi-directional: 1.2 µm

Position accuracy 55mm over (Z) measuring system

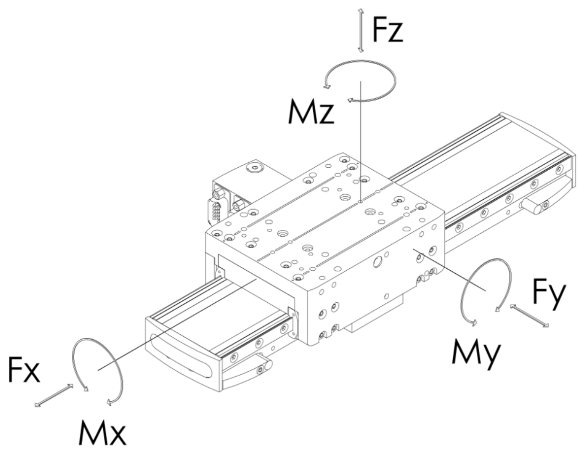


Tilt error

QX roll: ±6.8 asec
QY pitch: ±7.6 asec
QZ yaw: ±15.2 asec

3.4 Stress Values of Guides Lxu

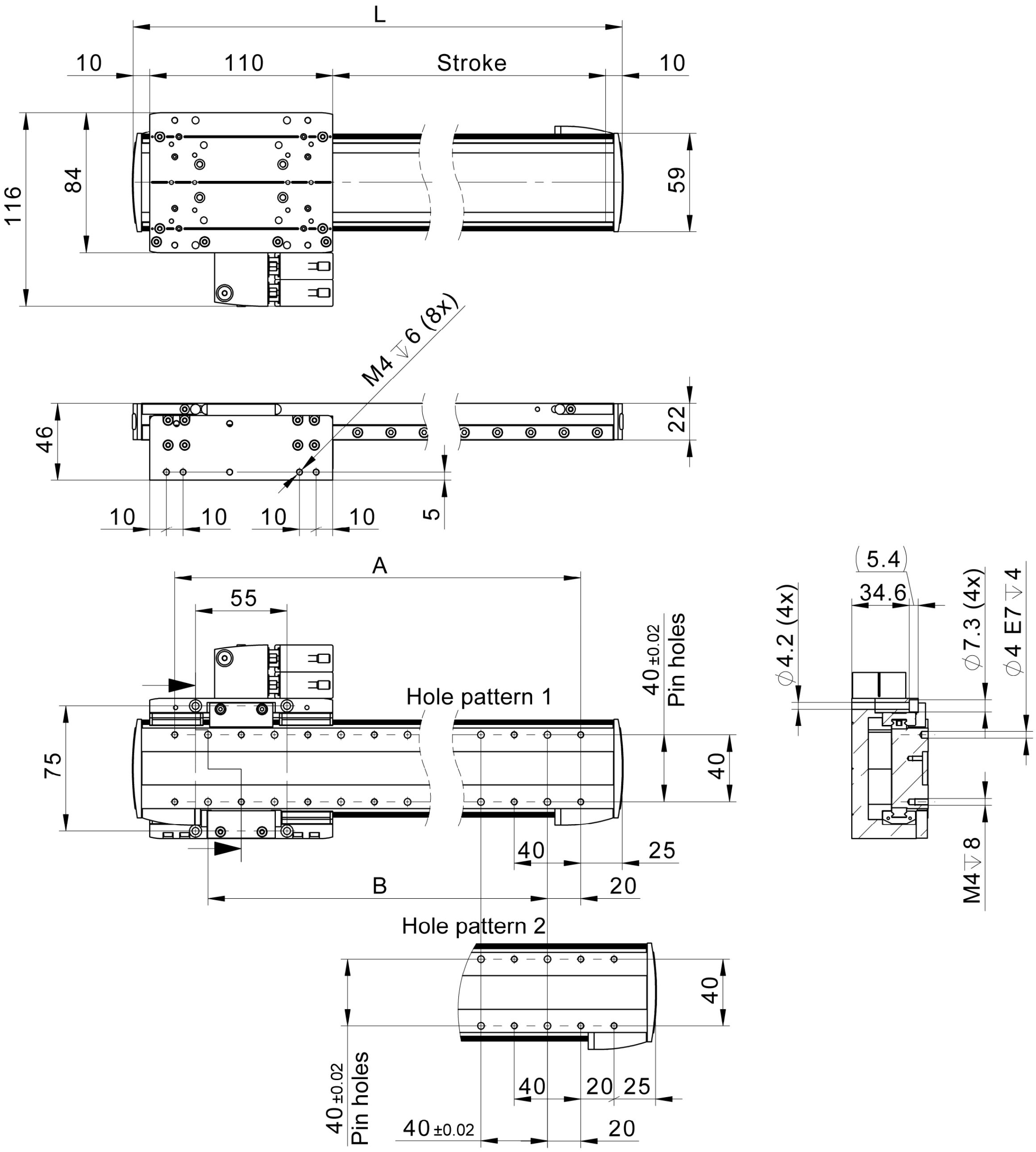
LINAX® Lxu	Mx max [Nm]	Fy max [N] Fz max [N]	My max [Nm] Mz max [Nm]
Lxu xxF60	149	5400	211



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:

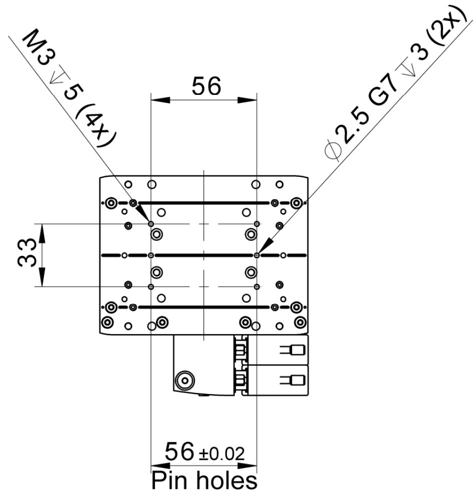
$$\frac{|Fy|}{Fy\ max} + \frac{|Fz|}{Fz\ \mathrm{max}} + \frac{|Mx|}{Mx\ \mathrm{max}} + \frac{|My|}{My\ \mathrm{max}} + \frac{|Mz|}{Mz\ \mathrm{max}} \leq 1$$

3.5 Installation Dimensions LINAX® Lxu 40 – Lxu 320

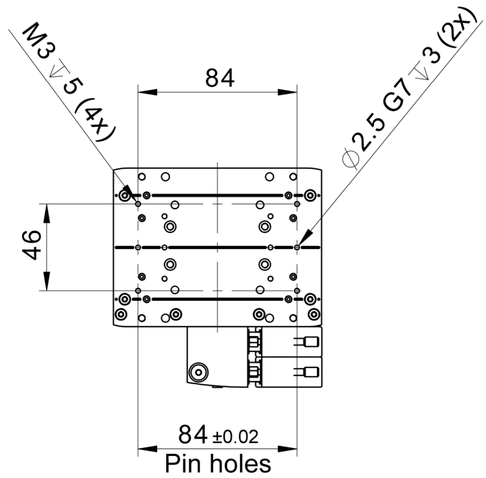


Type	Stroke[mm]	L[mm]	A[mm]	B[mm]	Hole pattern
Lxu 40F60	40	170	80	40	2
Lxu 80F60	80	210	160	120	1
Lxu 160F60	160	290	240	200	1
Lxu 240F60	240	370	320	280	1
Lxu 320F60	320	450	400	360	1

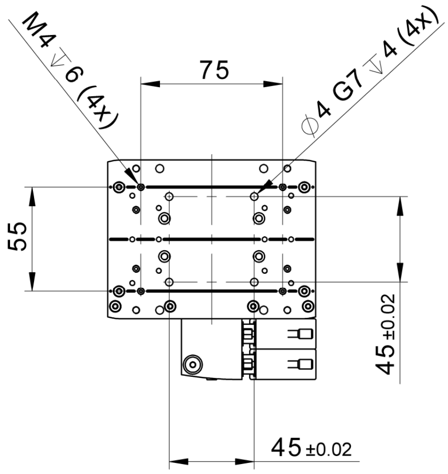
Cross table with **Lxc F08 / F10** Monoblock



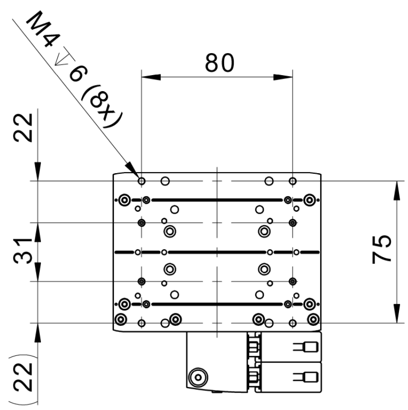
Cross table width **Lxc F40** Monoblock



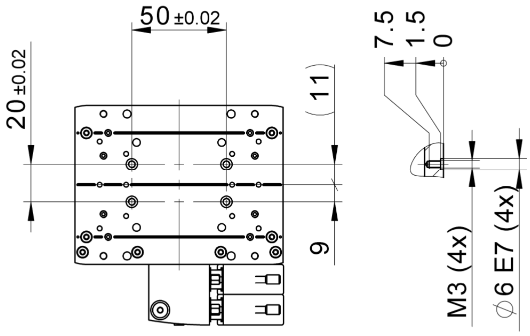
Cantilever with **Lxu F60** slider (back to back)



Application with **Lxu** front flange



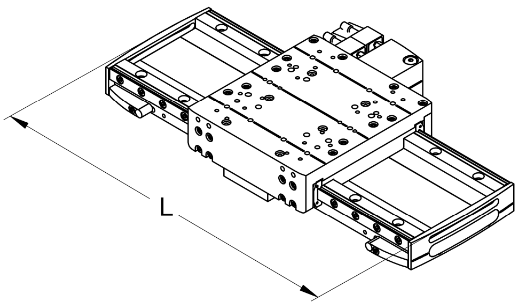
Cantilever with **Ex F20**



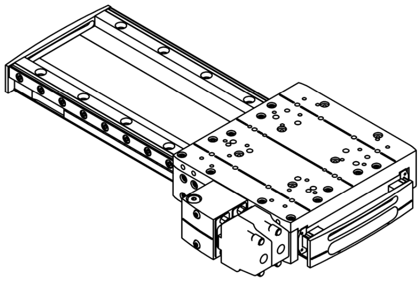
4 LINAX® Lxs F60

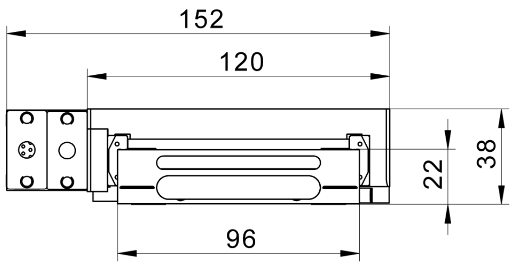
4.1 External Dimensions Lxs F60

LINAX® Lxs	L [mm]
Lxs 160F60	290
Lxs 200F60	330
Lxs 320F60	450
Lxs 400F60	530
Lxs 520F60	650
Lxs 600F60	730
Lxs 800F60	930
Lxs 1000F60	1130
Lxs 1200F60	1330
Lxs 1600F60	1730

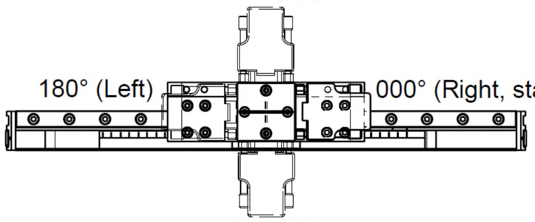


Lxs mechanical zero point according to REFERENCE:
Carriage positioned 1.5mm from the stop on the right,
when viewed from the connector housing.





Lxs and Lxu
Rotatable connector housing in 90° increments
Standard cable outlet to the right
when viewed from the connector housing.

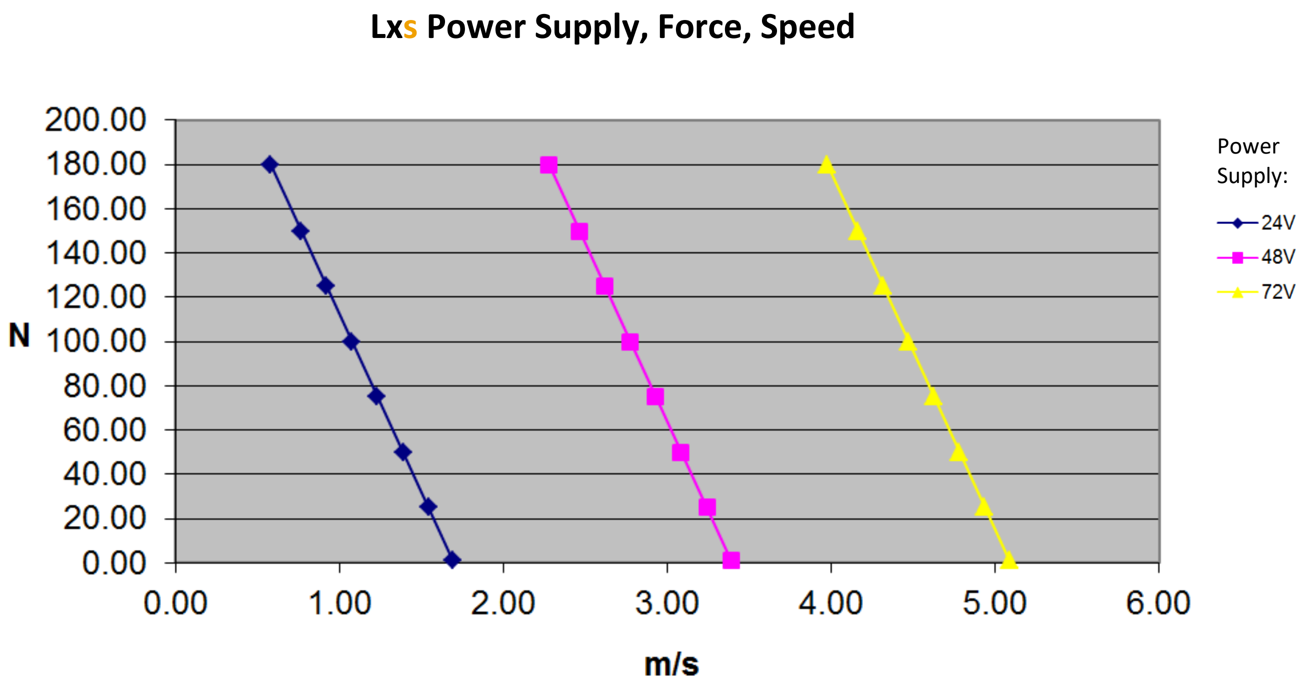


4.2 Dynamics LINAX® Lxs F60

LINAX®	Stroke [mm]	Force [N] nom./peak	Speed v-max [m/s]	Acceleration a-max [m/s²]	Min. travel Time/stroke [ms]	Weight Slider [g]	Weight Total [g]
Lxs 160F60	160	60/180	3.0	120	80	1000	2600
Lxs 200F60	200	60/180	3.5	120	90	1000	2800
Lxs 320F60	320	60/180	3.8	120	120	1000	3450
Lxs 400F60	400	60/180	4.0	120	135	1000	3900
Lxs 520F60	520	60/180	4.0	120	165	1000	4500
Lxs 600F60	600	60/180	4.0	120	185	1000	5000
Lxs 800F60	800	60/180	4.0	120	235	1000	6100
Lxs 1000F60	1000	60/180	4.0	120	285	1000	7200
Lxs 1200F60	1200	60/180	4.0	120	335	1000	8400
Lxs 1600F60	1600	60/180	4.0	120	435	1000	10600

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

4.2.1 Power Supply, Speed Lxs F60

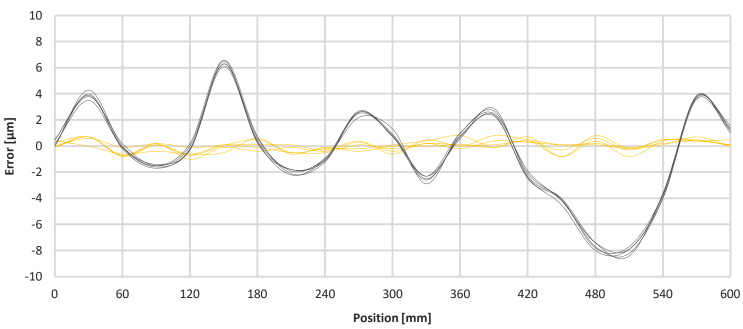


4.3 Precision LINAX® Lxs

4.3.1 Positioning Lxs

Standard magnetic, resolution	1µm / increment
Repeatability	< +/-5µm
Optional optical, resolution	1µm / increment, available up to 1200mm stroke
Repeatability	< +/-2m
Optional optical high resolution	100nm / increment, available up to 1200mm stroke
Repeatability	< +/-500nm
Length expansion magnetic measuring scale	11µm/m/°C
Length expansion optical measuring scale	8.5µm/m/°C
Reference: Automatic calculation of the absolute position by crossing two distance-coded reference marks.	Required maximum travel distance for reference: max 10mm for the optical system max 40mm for the magnetic Lxs 160-600 max 60mm for the magnetic Lxs 800-1600 The travel direction is selectable. The reference procedure only needs to be initiated once after turning on the logic power supply (24V). The absolute position is maintained as long as the logic power supply remains connected (XENAX® Servocontroller).
Position of mechanical zero point	1.5mm away from the mechanical limit stop, with the carriage positioned at the right end when viewed from the connector housing side.
Software-based correction of position errors. Mechanical pitch and roll errors result in additional position errors: The farther away from the scale, the greater the error.	With an interferometer at the relevant measuring point, these position errors are captured in a tabular form. This correction table is then stored in the XENAX® Xvi Servocontroller. The positions are corrected according to this table, with linear interpolation of the intermediate positions.

Measurement system 1µm optical, relevant measurement point 150mm above the scale

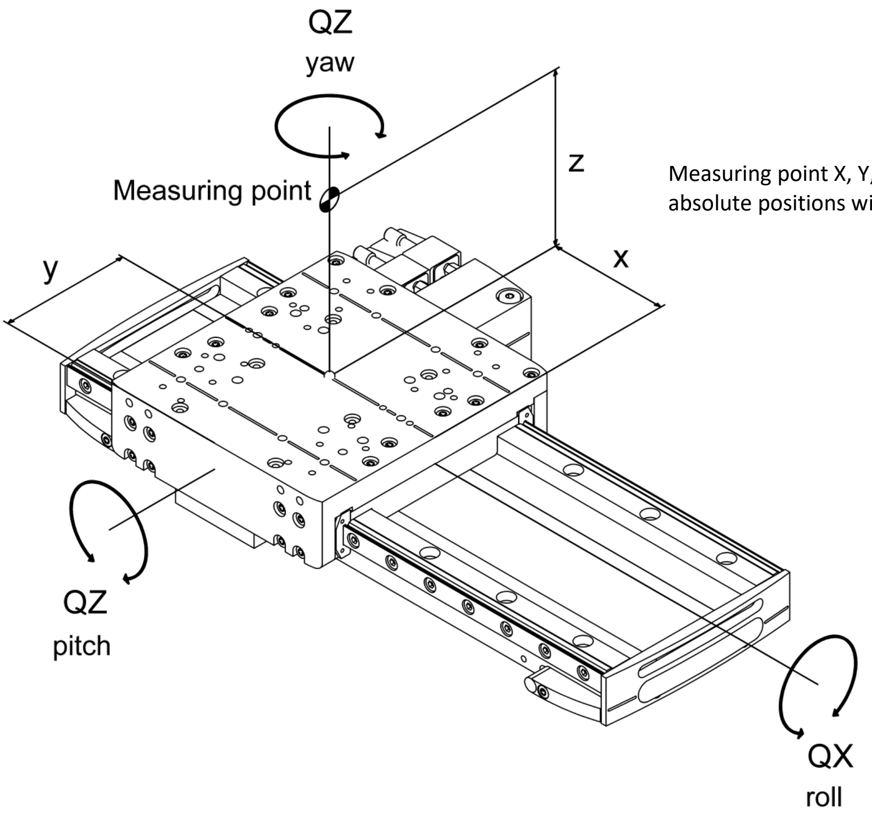


- **Gray,** position errors measured at the relevant point of the setup, measurement system 1µm resolution optical

- **Yellow,** position errors measured at the same point with correction using the correction table

4.3.2 Guidings of Slider Lxs F60

In the LINAX® Lxs linear motor axes, ball recirculating guides are used. These guides are maintenance-free for up to 20,000km or 3 years. After that, they should be re-lubricated.



Measuring point X, Y, Z relevant for capturing absolute positions with the interferometer.

The LINAX® Lxs linear motor axes are delivered with the following tolerances as standard. The specifications are based on an unloaded condition.

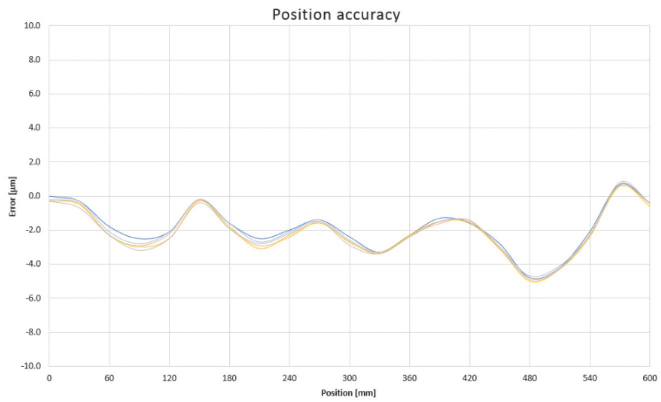
LINAX®	Running Accuracy horizontal EYX [µm]	Running Accuracy vertical EZX [µm]	Tilt Error QX (roll) [arcsec]	Tilt Error QY (pitch) [arcsec]	Tilt Error QZ (yaw) [arcsec]	Tolerance Constr. height [mm]
Lxs 160F60	±5	±3	±5	±10	±10	±0,1
Lxs 200F60	±5	±3	±5	±10	±10	±0,1
Lxs 320F60	±8	±4	±15	±20	±15	±0,1
Lxs 400F60	±10	±4	±15	±20	±15	±0,1
Lxs 520F60	±10	±4	±20	±20	±20	±0,1
Lxs 600F60	±10	±5	±20	±20	±20	±0,1
Lxs 800F60	±10	±7	±25	±25	±25	±0,1
Lxs 1000F60	±12	±8	±30	±25	±25	±0,1
Lxs 1200F60	±13	±9	±30	±25	±25	±0,1
Lxs 1600F60	±16	±12	±35	±30	±30	±0,1

4.3.3 Typical measurement results LINAX ® Lxs 600F60 of series production

Position accuracy

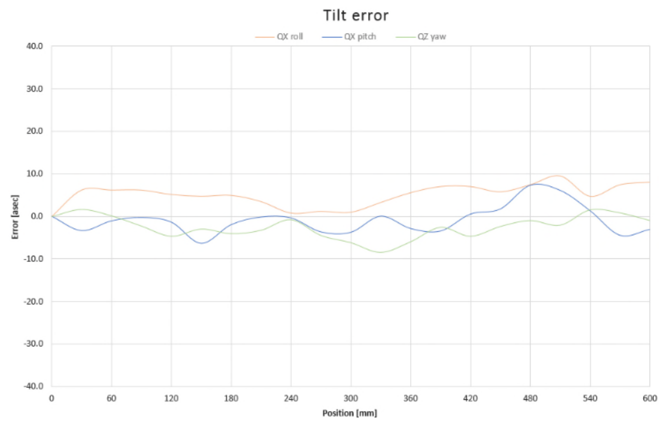
Resolution optical:	1 µm
Absolute accuracy:	±2.9 µm
Repeatability forward:	0.7 µm
Repeatability backward:	0.7 µm
Repeatability bi-directional:	1.3 µm

Position accuracy 50mm over (Z) measuring system



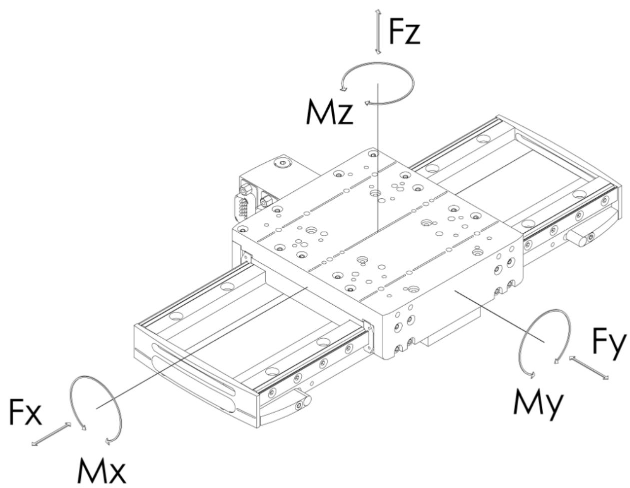
Tilt error

QX roll:	±4.7	asec
QY pitch:	±6.9	asec
QZ yaw:	±5.1	asec



4.4 Load parameters of Guides Lxs

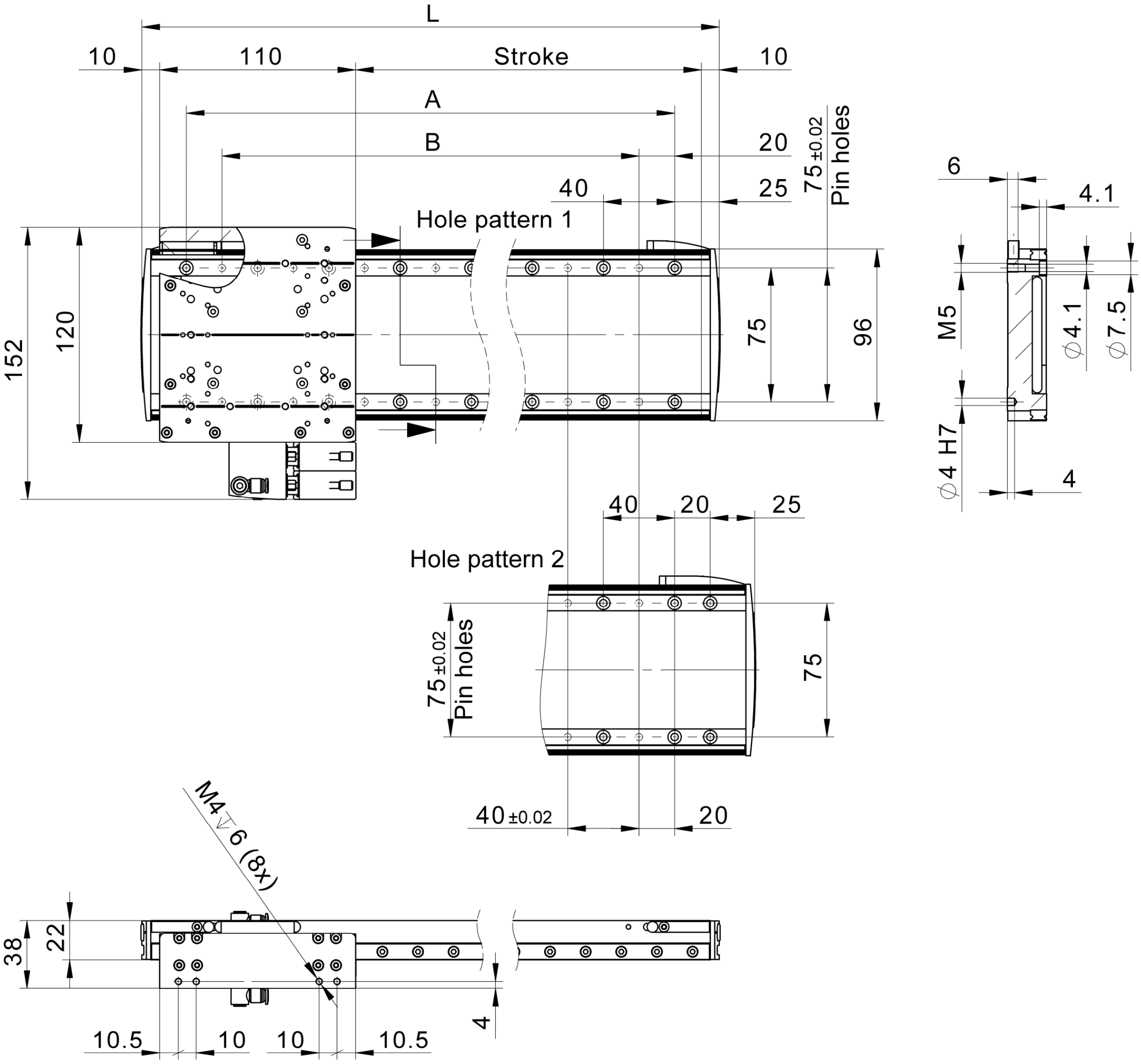
LINAX® Lxs	Mx max [Nm]	Fy max [N] Fz max [N]	My max [Nm] Mz max [Nm]
Lxs xxF60	243	5400	211



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:

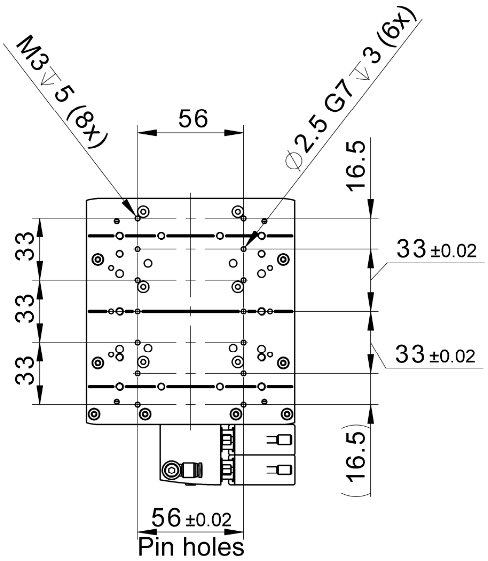
$$\frac{|Fy|}{Fy\ max}+\frac{|Fz|}{\mathrm{Fz\ max}}+\frac{|Mx|}{\mathrm{Mx\ max}}+\frac{|My|}{\mathrm{My\ max}}+\frac{|Mz|}{\mathrm{Mz\ max}}\leq 1$$

4.5 Installation Dimensions LINAX® Lxs 160 – Lxs 1600

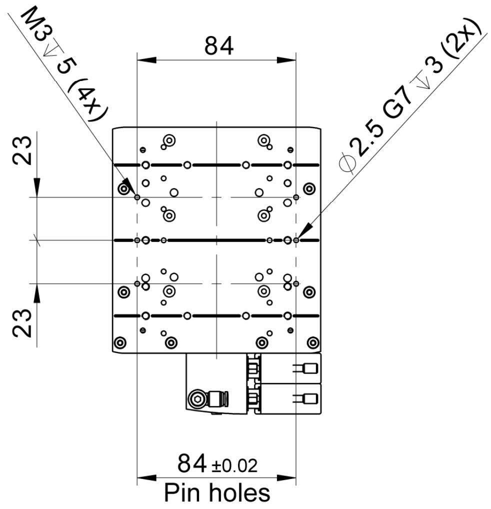


Type	Stroke[mm]	L[mm]	A[mm]	B[mm]	Hole pattern
Lxs 160F60	160	290	240	200	1
Lxs 200F60	200	330	240	200	2
Lxs 320F60	320	450	400	360	1
Lxs 400F60	400	530	480	440	1
Lxs 520F60	520	650	560	520	2
Lxs 600F60	600	730	640	600	2
Lxs 800F60	800	930	880	840	1
Lxs 1000F60	1000	1130	1040	1000	2
Lxs 1200F60	1200	1330	1280	1240	1
Lxs 1600F60	1600	1730	1680	1640	1

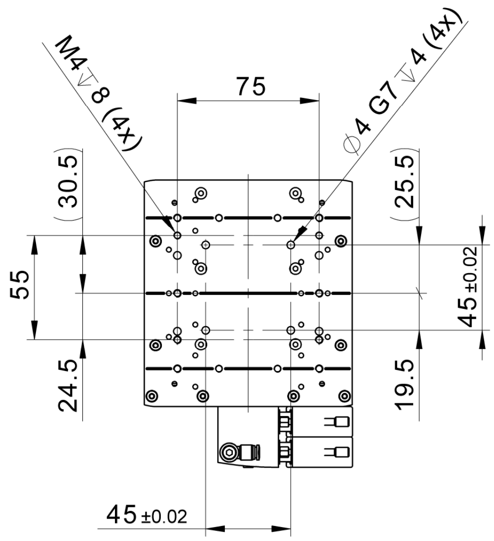
Cross table with **Lxc F08 / F10** Monoblock



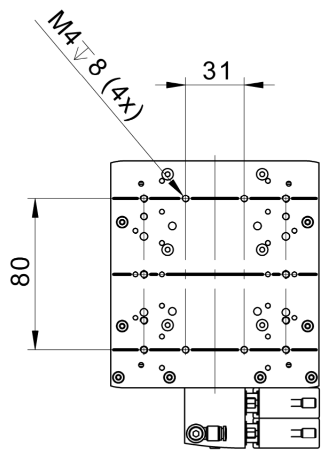
Cross table width **Lxc F40** Monoblock



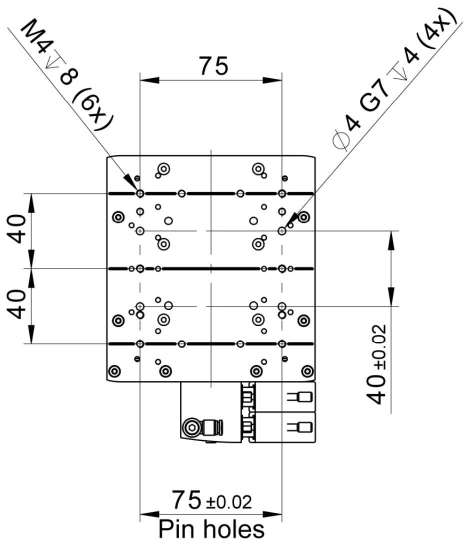
Cantilever with **Lxu F60** slider (back to back)



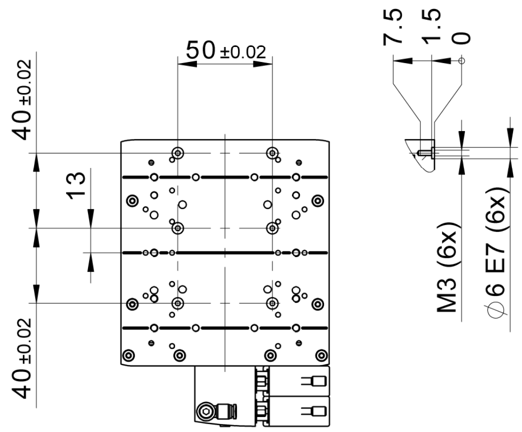
Application with **Lxu** front flange



Cross table with **Lxs F60** Base plate



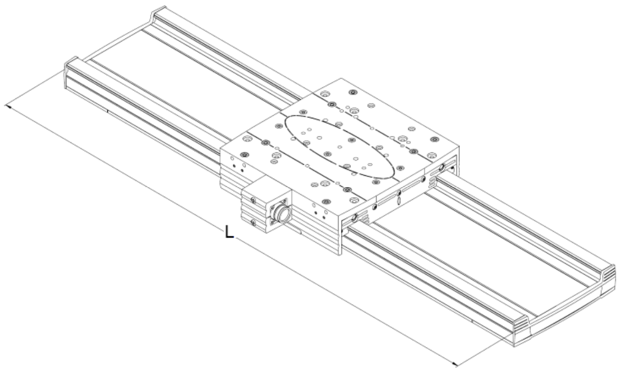
Cantilever with **Ex F20**

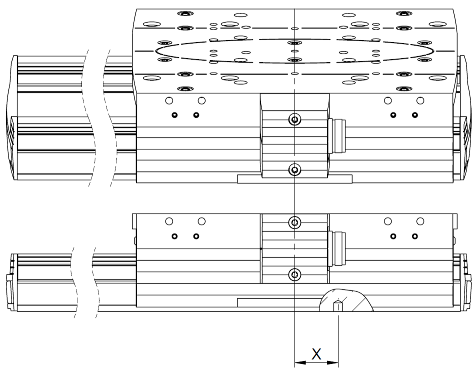


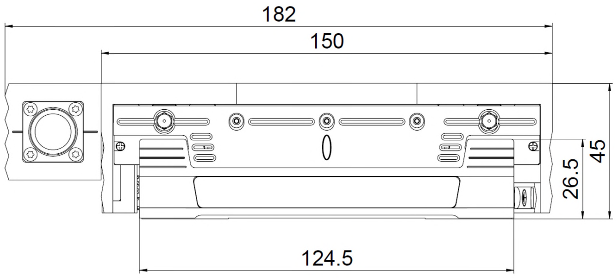
5 LINAX® Lxs F120

5.1 External Dimensions Lxs F120

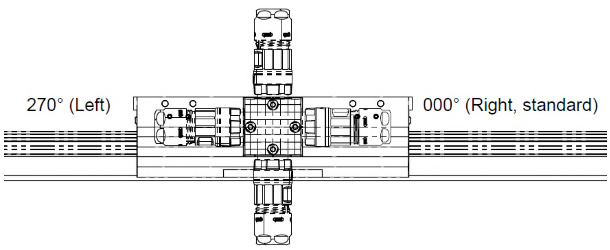
LINAX® Lxs	L [mm]	Zero point [mm]
Lxs 080F120	243	20
Lxs 200F120	363	40
Lxs 400F120	563	20
Lxs 520F120	683	40
Lxs 600F120	763	40
Lxs 800F120	963	40
Lxs 1000F120	1163	40
Lxs 1200F120	1363	40
Lxs 1600F120	1763	40







Lxs and Lxu
Rotatable connector housing in 90° increments
Standard cable outlet to the right
when viewed from the connector housing.

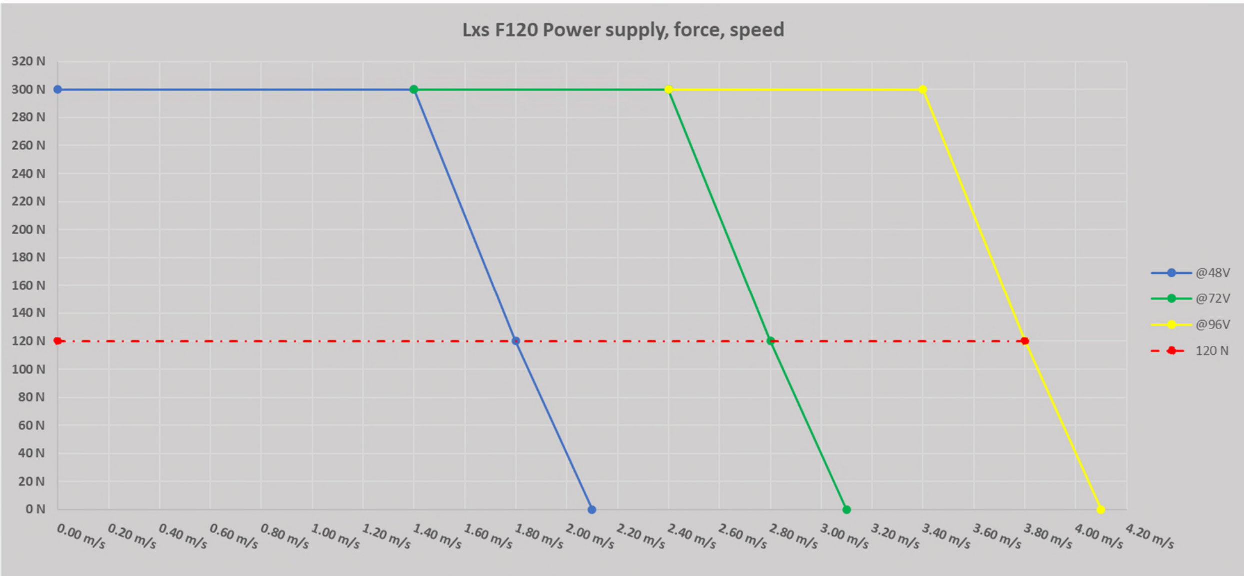


5.2 Dynamics LINAX® Lxs F120

LINAX®	Stroke [mm]	Force [N] nom./peak	Speed v-max [m/s]	Acceleration a-max [m/s²]	Min. travel Time/stroke [ms]	Weight Slider [kg]	Weight Total [kg]
Lxs 080F120	080	120/300	1.8 /2.8/*3.8	100	58	2.30	4.70
Lxs 200F120	200	120/300	1.8 /2.8/*3.8	100	108	2.30	5.90
Lxs 400F120	400	120/300	1.8 /2.8/*3.8	100	179	2.30	7.80
Lxs 520F120	520	120/300	1.8/2.8/*3.8	100	222	2.30	9.00
Lxs 600F120	600	120/300	1.8/2.8/*3.8	100	250	2.30	9.80
Lxs 800F120	800	120/300	1.8/2.8/*3.8	100	322	2.30	11.80
Lxs 1000F120	1000	120/300	1.8/2.8/*3.8	100	393	2.30	13.70
Lxs 1200F120	1200	120/300	1.8/2.8/*3.8	100	464	2.30	15.70
Lxs 1600F120	1600	120/300	1.8/2.8/*3.8	100	607	2.30	19.60

All values are only valid with XENAX® Xvi and a 20% S-Curve.

5.2.1 Power supply voltage versus speed Lxs F120

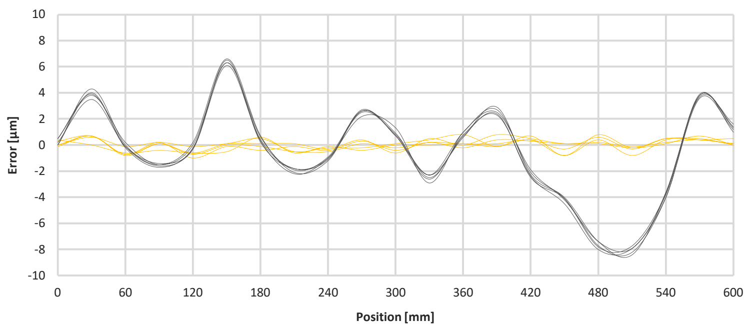


5.3 Precision LINAX® Lxs F120

5.3.2 Absolute positioning Lxs F120

Standard magnetic, resolution Repeatability	1µm / absolute < +/-4µm
Optional optical, resolution Repeatability	1µm / absolute < +/-2m
Optional optical high resolution Repeatability	100nm / absolute < +/-500nm
Length expansion magnetic measuring scale	11µm/m/°C
Length expansion of optical stainless steel tape	10.6µm/m/°C
Reference run:	Not required, as the position is available immediately after turning on with the absolute measurement system.
Position of mechanical zero point	Positioned 1.5mm away from the mechanical end limit, the carriage is at the right end when viewed from the connector housing. The center of the carriage is aligned with a pinhole.
Software-based correction of position errors. Mechanical pitch and roll errors result in additional position errors: The farther away from the scale, the greater the error.	With an interferometer at the relevant measuring point, these position errors are captured in a tabular form. This correction table is then stored in the XENAX® Xvi Servocontroller. The positions are corrected according to this table, with linear interpolation of the intermediate positions.

Measurement system 1µm optical, relevant measurement point 150mm above the scale

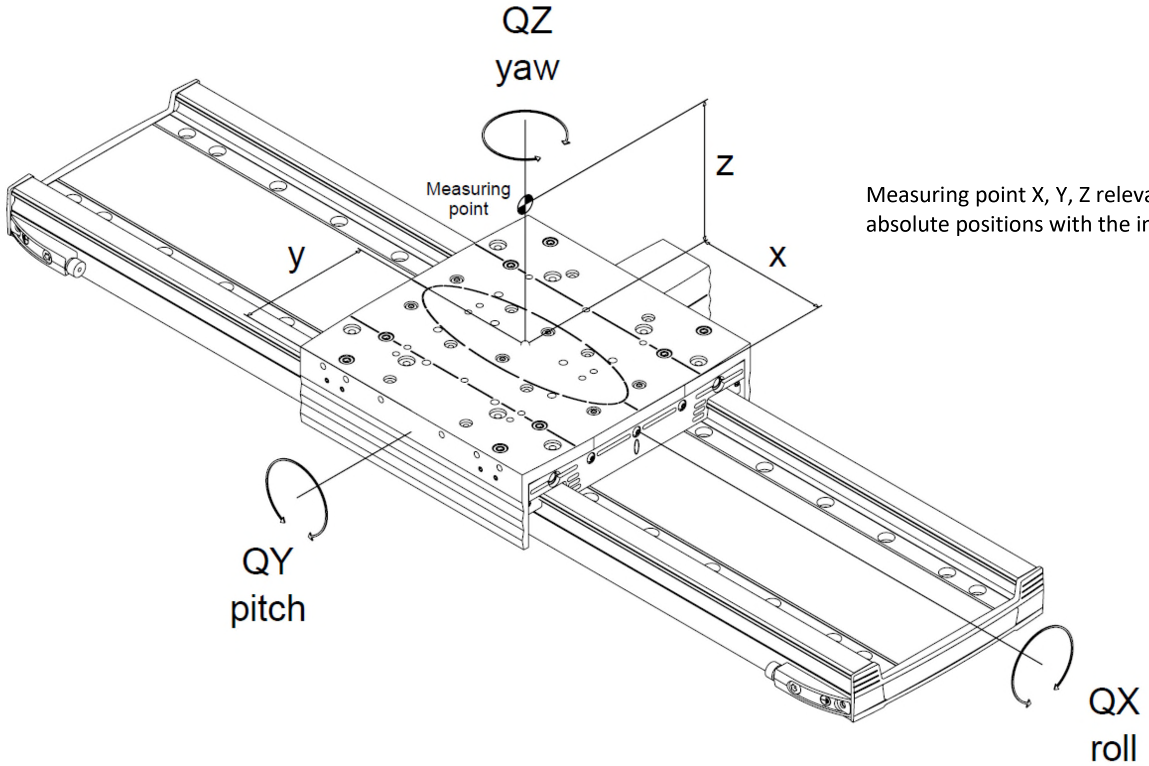


- Gray, position errors measured at the relevant point of the setup, measurement system 1µm resolution optical

- Yellow, position errors measured at the same point with correction using the correction table

5.3.3 Carriage guide Lxs F120

The LINAX® Lxs linear motor axes utilize robust 4-row ball recirculating guides. These guides are maintenance-free for up to 20,000km or 5 years. After that, they should be re-lubricated.



Measuring point X, Y, Z relevant for capturing absolute positions with the interferometer.

The LINAX® Lxs linear motor axes are delivered with the following tolerances as standard. The specifications are based on an unloaded condition.

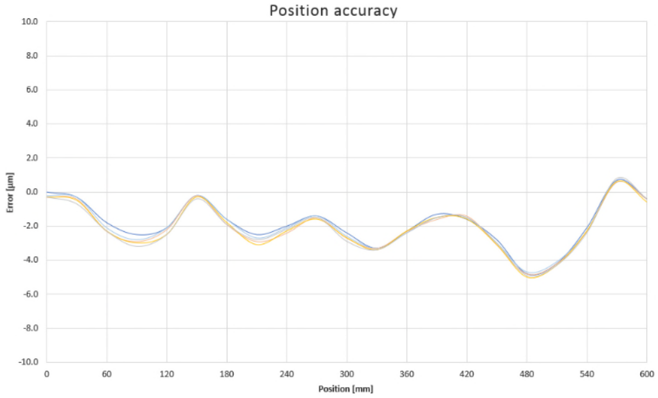
LINAX®	Running Accuracy horizontal EYX [µm]	Running Accuracy vertical EZX [µm]	Tilt Error QX (roll) [arcsec]	Tilt Error QY (pitch) [arcsec]	Tilt Error QZ (yaw) [arcsec]	Tolerance Constr. height [mm]
Lxs 080F120	±4	±2	±4	±10	±5	±0,1
Lxs 200F120	±5	±3	±5	±15	±10	±0,1
Lxs 400F120	±10	±4	±15	±30	±15	±0,1
Lxs 520F120	±10	±4	±20	±30	±20	±0,1
Lxs 600F120	±10	±5	±20	±30	±20	±0,1
Lxs 800F120	±10	±7	±25	±35	±25	±0,1
Lxs 1000F120	±12	±8	±30	±35	±25	±0,1
Lxs 1200F120	±13	±9	±30	±35	±25	±0,1
Lxs 1600F120	±16	±12	±35	±40	±30	±0,1

5.3.4 Typical measurement results LINAX ® Lxs 600F120 of series production

Position accuracy absolute at relevant measuring point

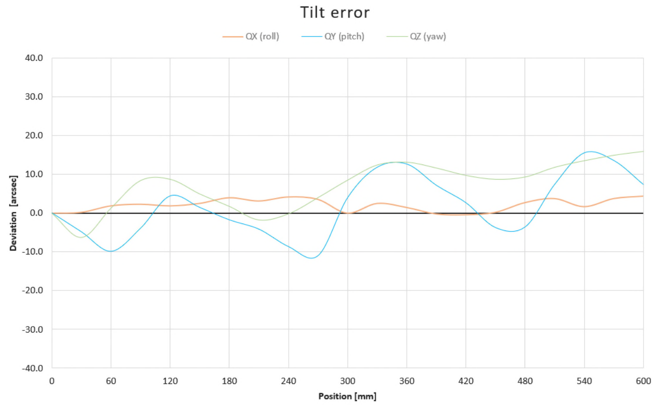
Resolution optical:	1 µm
Absolute accuracy:	±2.9 µm
Repeatability forward:	0.6 µm
Repeatability backward:	0.7 µm
Repeatability bi-directional:	1.2 µm

Position accuracy 50mm over (Z) measuring system



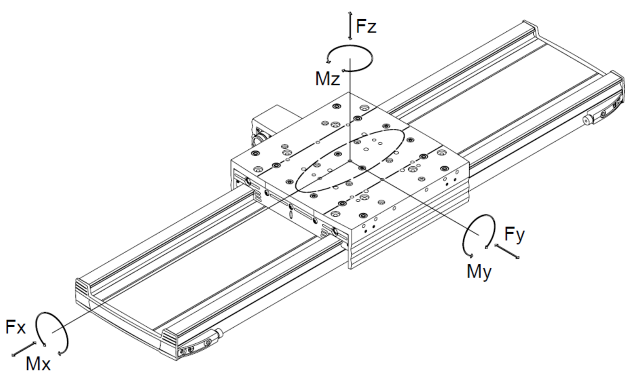
Tilt error

QX roll:	±2.4	asec
QY pitch:	±13.3	asec
QZ yaw:	±11.1	asec



5.4 Load parameters of Guides Lxs F120

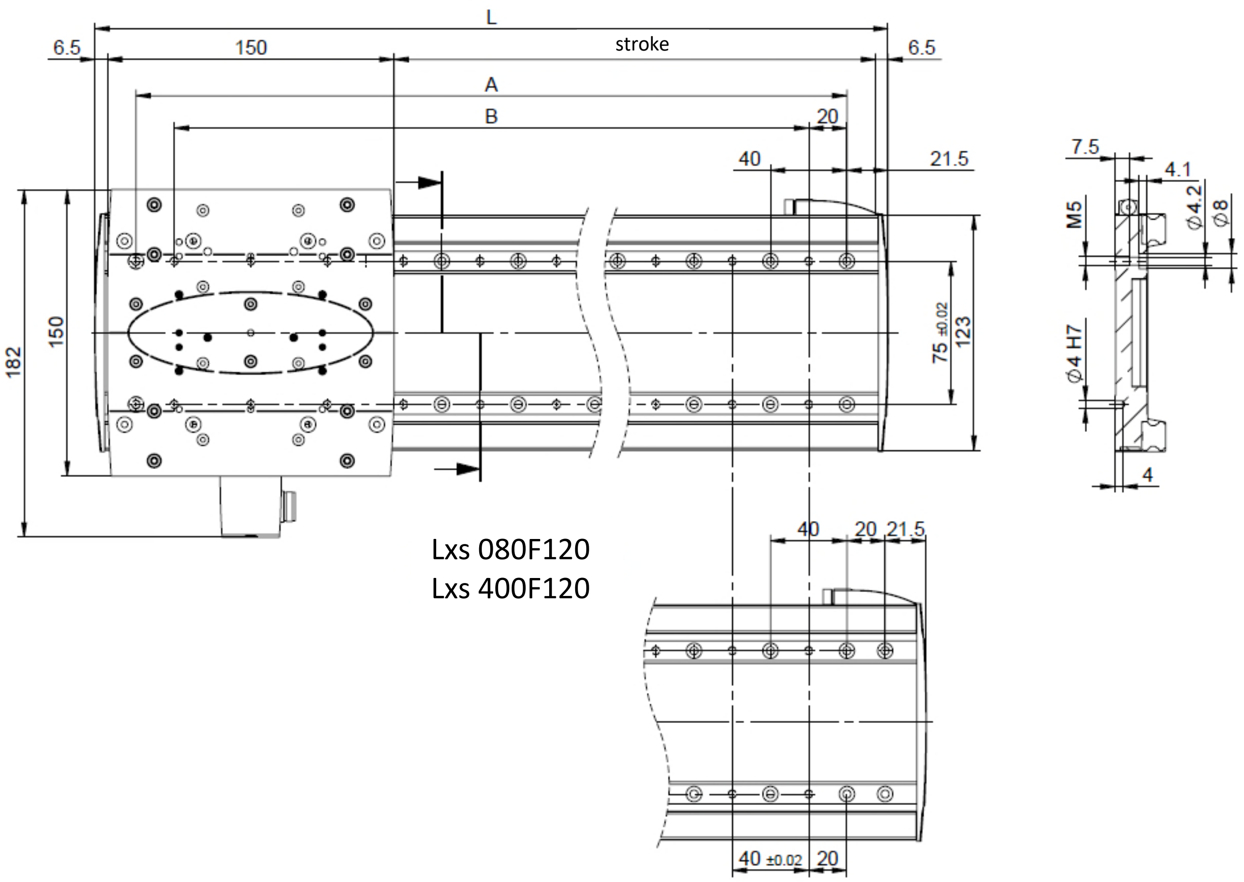
LINAX® Lxs	Mx max [Nm]	Fy max [N] Fz max [N]	My max [Nm] Mz max [Nm]
Lxs xxF120	444	8220	411

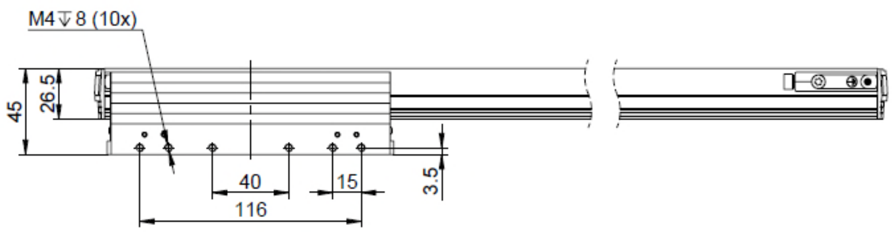


Besides adhering to the individual maximal loads, the following equation must comply if there are multiple forces and moments acting simultaneously on the linear motor:

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

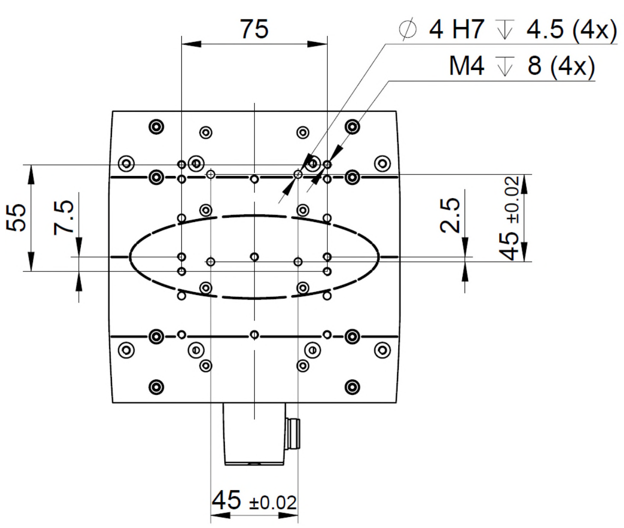
5.5 Installation dimensions LINAX®Lxs 080F120 –Lxs 1600F120



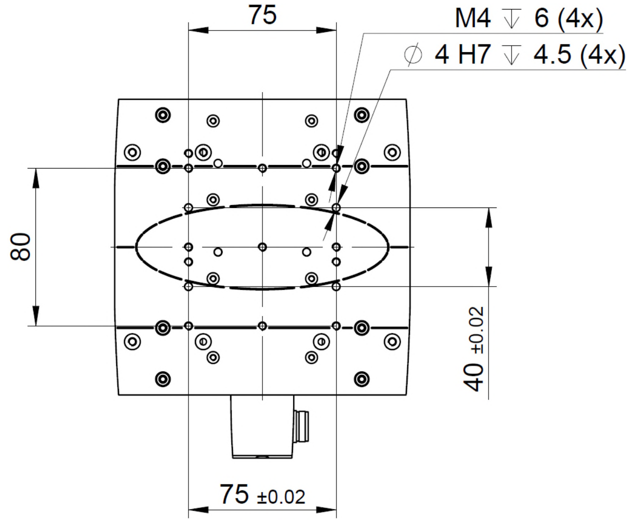


Typ	Stroke [mm]	L[mm]	A[mm]	B[mm]
Lxs 080F120	080	243	200	120
Lxs 200F120	200	363	320	280
Lxs 400F120	400	563	520	440
Lxs 520F120	520	683	640	600
Lxs 600F120	600	763	720	680
Lxs 800F120	800	963	920	880
Lxs 1000F120	1000	1163	1120	1080
Lxs 1200F120	1200	1363	1320	1280
Lxs 1600F120	1600	1763	1720	1680

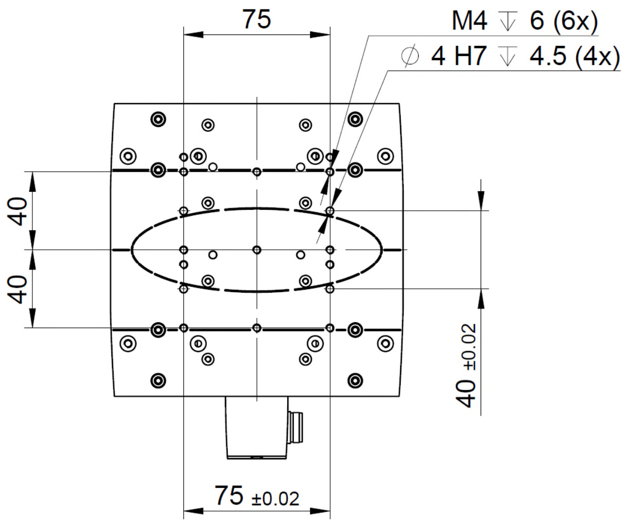
Cantilever with **Lxu F60** carriage (back to back)



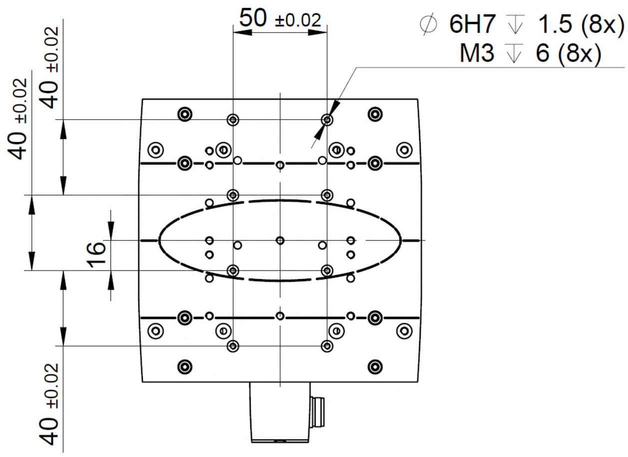
Portal with **Lxu** face flange



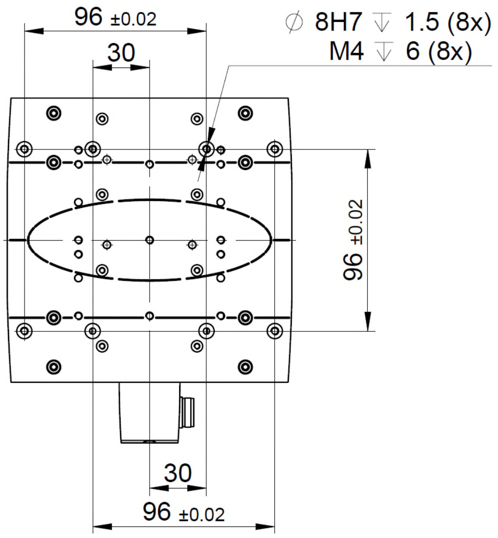
Cross table with **Lxs F60/120** base plate



Cantilever with **Ex F20**



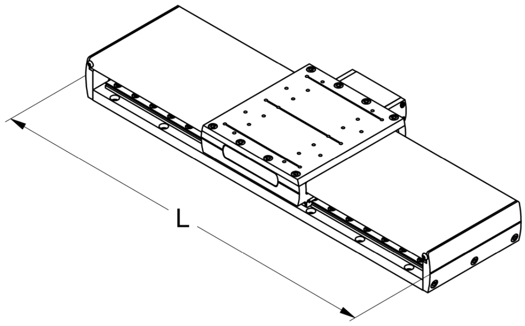
Mounting **Rxhq 110**

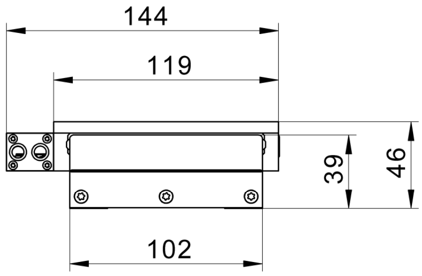


6 LINAX® Lxe F40

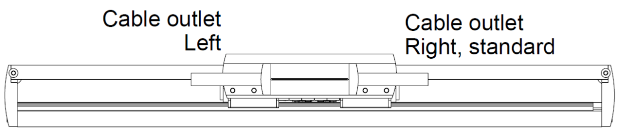
6.1 External Dimensions LINAX® Lxe F40

LINAX® Lxe	L [mm]
Lxe 250F60	386
Lxe 400F60	536
Lxe 550F60	686
Lxe 800F60	936
Lxe 1000F60	1136

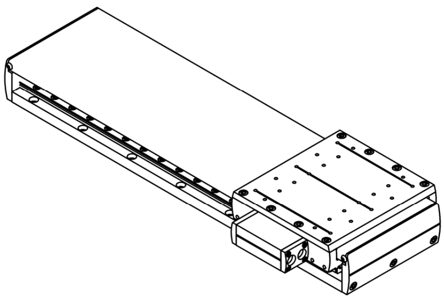




Lxe
Cable outlet to the left or right
Default cable outlet to the right



Lxe absolute zero point according to REFERENCE:
Slider extended towards the connection cable

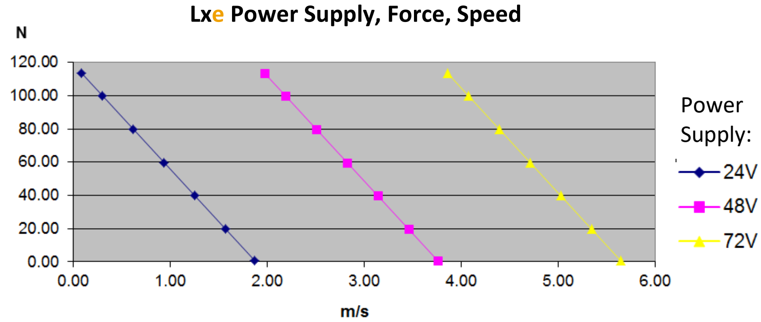


6.2 Dynamics LINAX® Lxe

LINAX®	Stroke [mm]	Force [N] nom./peak	Speed v-max [m/s]	Acceleration a-max [m/s²]	Min. travel Time/stroke [ms]	Weight Slider [g]	Weight Total [g]
Lxe 250F40	250	40/114	3.5	75	120	980	3080
Lxe 400F40	400	40/114	4.0	75	155	980	3850
Lxe 550F40	550	40/114	4.0	75	190	980	4620
Lxe 800F40	800	40/114	4.0	75	255	980	5900
Lxe 1000F40	1000	40/114	4.0	75	305	980	6930

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

6.2.1 Power Supply, Speed Lxe



6.3 Precision LINAX® Lxe

6.3.1 Positioning Lxe

Standard resolution of optical measuring scale	1µm / counter increment
Repeatability	< +/-2µm
Optional optical measuring scale with high resolut	100nm / counter increment
Repeatability	< +/-500nm
Linear expansion optical measuring scale	8.5µm/m/°C
Reference	Automatic calculation of the absolute position through the distance coded reference marks, max 10mm, direction of reference can be selected. The reference has to be completed only once after powering on the logic power (24V). The absolute position will be stored until the logic power is turned off (XENAX® Servo controller).
Mechanical zero point absolute	1.5mm before the mechanical limit. This is where the slider is positioned on the right end while the cable case is in the front of the user.
Correction table for positionerrors with servo controller Xvi 48V8/75V8/75V8S	The XENAX® servo controller offers the possibility to correlate the encoder position with the actual position.

6.3.2 Guidings of Slider Lxe

For the LINAX® Lxe linear motor axis, ball bearing guides are used. This guiding system is maintenance free for 20'000km or five years as stated by the supplier. The LINAX® Lxe linear motor axes have following tolerances as a standard. These data is based on measures with linear motors free of load.

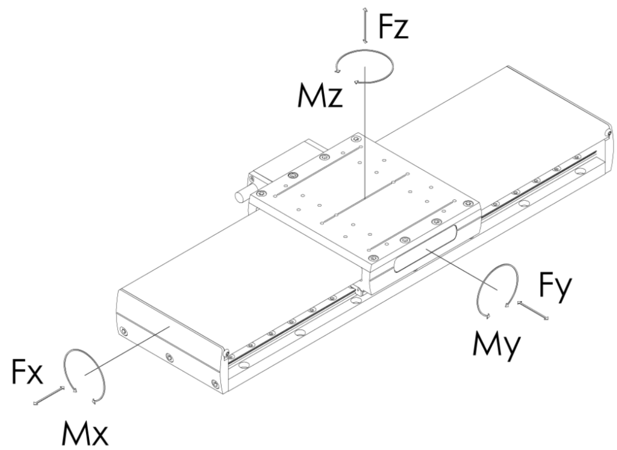
LINAX®	Running Accuracy horizontal EYX [µm]	Running Accuracy vertical EZX [µm]	Tilt Error QX (roll) [arcsec]	Tilt Error QY (pitch) [arcsec]	Tilt Error QZ (yaw) [arcsec]	Tolerance Constr. height [mm]
Lxe 250F40	±8	±5	±10	±10	±15	±0,1
Lxe 400F40	±10	±8	±10	±10	±20	±0,1
Lxe 550F40	±12	±8	±20	±20	±25	±0,1
Lxe 800F40	±14	±10	±25	±25	±25	±0,1
Lxe 1000F40	±16	±10	±25	±25	±30	±0,1

6.4 Stress Values of Guides Lxe

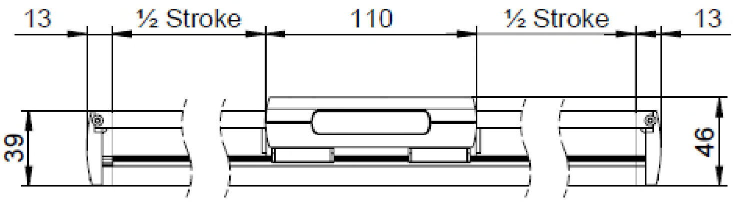
LINAX® Lxe	Mx max [Nm]	Fy max [N] Fz max [N]	My max [Nm] Mz max [Nm]
Lxe xxF40	205	5400	194

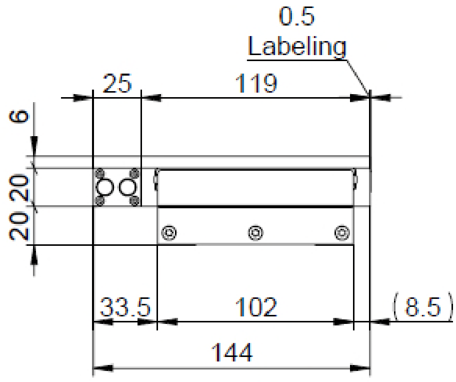
Besides adhering to the individual maximal loads, the following equation must comply if there are multiple forces and moments acting simultaneously on the linear motor:

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

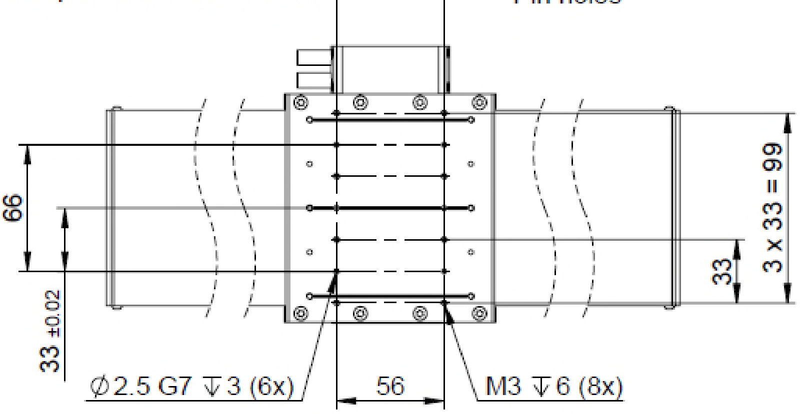


6.5 Dimensions LINAX® Lxe

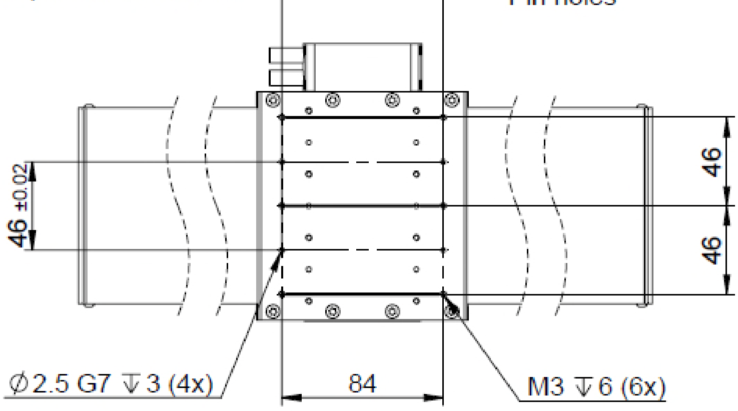


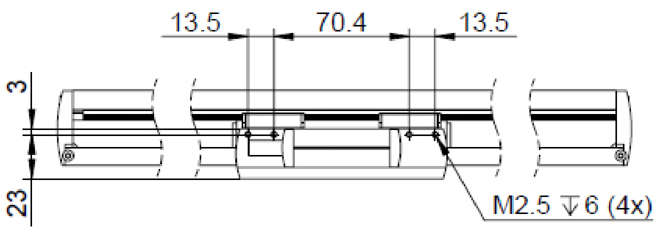


Hole pattern for Lx F04/F10

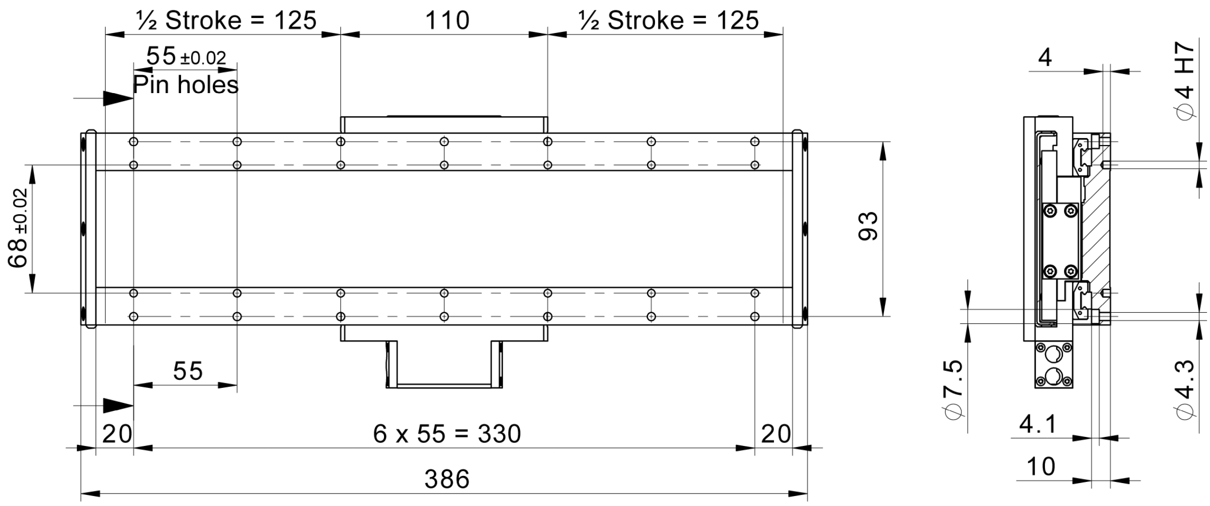


Hole pattern for Lx F40

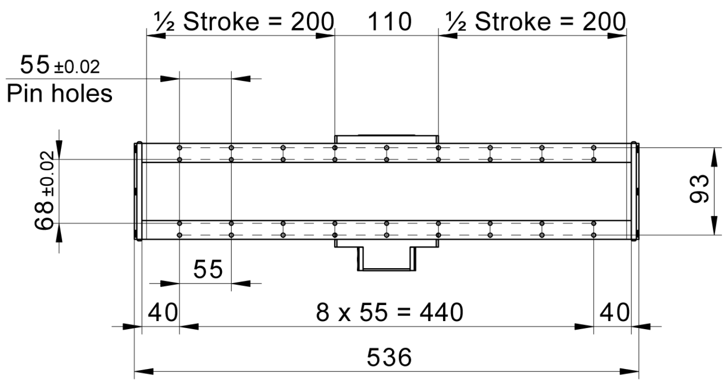




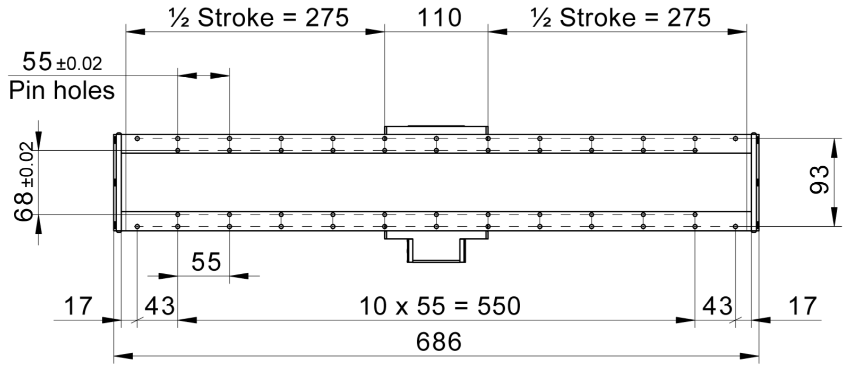
6.5.1 Installation Dimensions LINAX® Lxe 250F40



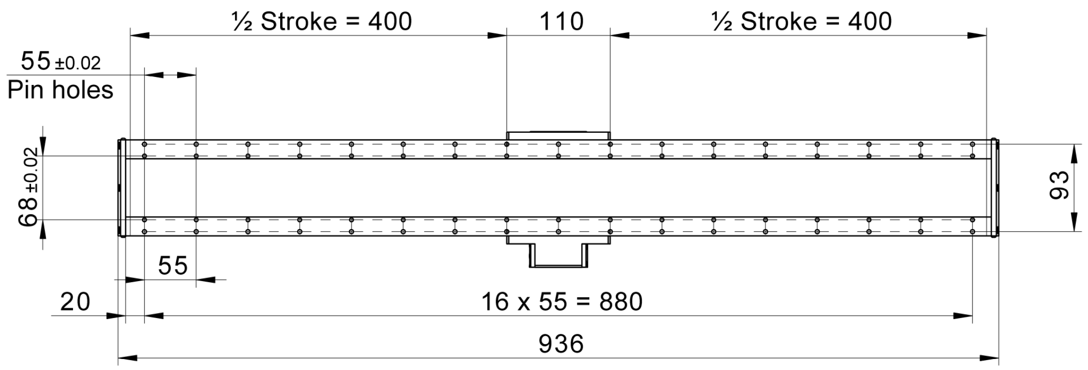
6.5.2 Installation Dimensions LINAX® Lxe 400F40



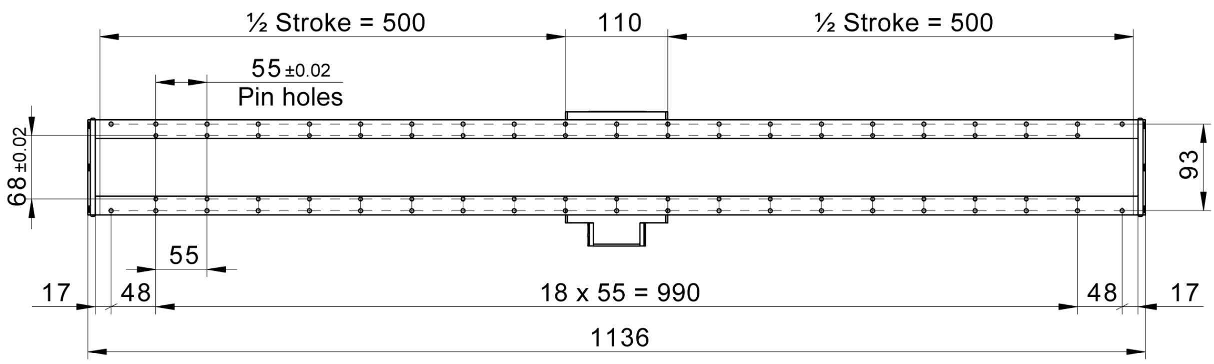
6.5.3 Installation Dimensions LINAX® Lxe 550F40



6.5.4 Installation Dimensions LINAX® Lxe 800F40



6.5.5 Installation Dimensions LINAX® Lxe 1000F40



7 Weight Compensation

In case of power interruption the motor of the LINAX® linear motors becomes powerless. If the axis is mounted vertically, the slider falls downwards. The optional available weight compensation can prevent this. If the XENAX® Xvi Servo Controller is connected and the logic power remains under power (e.g. emergency stop) the coils are shorted. The linear motor which acts as generator brakes the drive. The weight compensation will avoid that the slider is moving constantly downwards.

When compared to a simple brake, a further great advantage of the weight compensation is the relief of the vertical linear motor. With the weight compensation the motor operates weightlessly and heats much less. This savings in energy can be re-used for higher dynamics.

7.1 Weight Compensation STEP CAD Data

CAD drawings can be downloaded as .STEP files from http://www.jennyscience.ch.

7.2 Weight Compensation Lxc 44F08

The weight compensation for the compact Lxc 44F08 linear motor axis is available in the version with spring force and with compressed air.

The weight compensation with spring force can be equipped with 4 different springs for external payloads of **0-200g, 200-400g, 400-600g and 600-900g.**

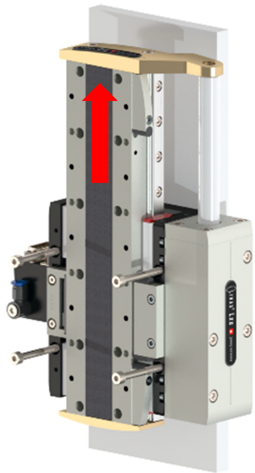
7.3 Weight Compensation Lxc 85F10, Lxc 80F40, Lxc 176F40

The weight compensation is mounted on the right side and is based on air pressure while there is no air consumption. With a customary air pressure regulator e.g. Festo “VRPA” the compensation force can be adjusted until the weight of the slider and the payload are fully compensated. If there is power interruption the slider remains in position or moves slowly upward depending on the adjustment of the air pressure regulator. The weight compensation for the Lxc 85F10 can also be mounted on the right side.

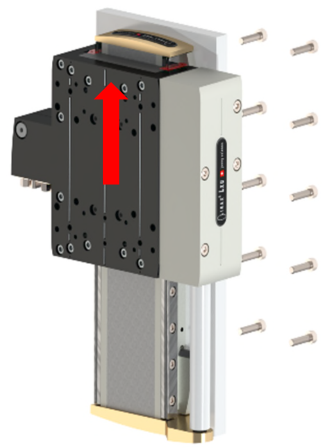
7.4 Weight Compensation Lxu 40F60, Lxu 80F60, Lxu 160F60

This weight compensation for the Lxu axis is also based on air pressure, while there is no air consumption. The air connection of weight compensation is located on the connector case to save room and to keep cables one-sided. With a customary air pressure regulator e.g. Festo "VRPA" the compensation force can be adjusted until the slider holds position or moves upwards in case of power interruption.

Effective direction of weight compensation with moving ground plate.

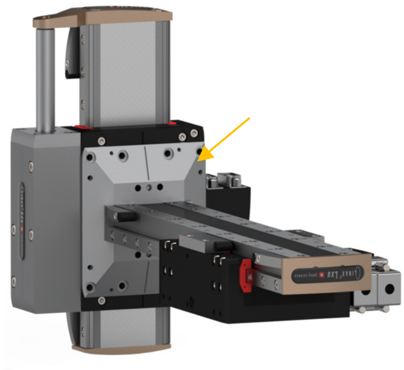


Effective direction of the weight compensation with moving the slide.

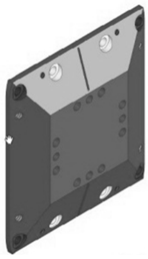


8 Front Flange Connections LINAX® Lxu

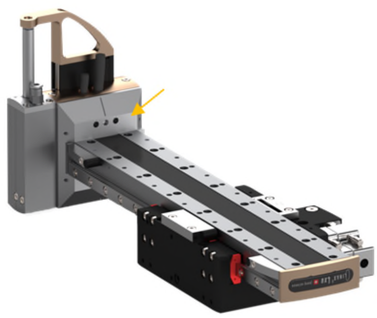
There can be mounted a further Lxu or a Lxc linear motor axis on the front of the LINAX® Lxu. If the front plate is removed, the front flange Lxu can be mounted with 4 screws and 2 centering pins. These front flanges can be rotated, mounted and centred in a 90 pattern (except from ELAX®).

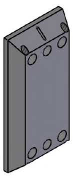


Lxu-Lxc F08/F10

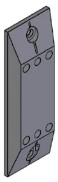


Lxu-Lxu
Lxu-Lxc F40

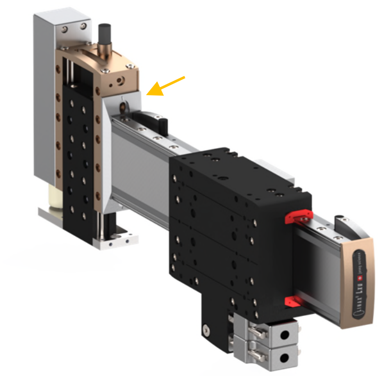


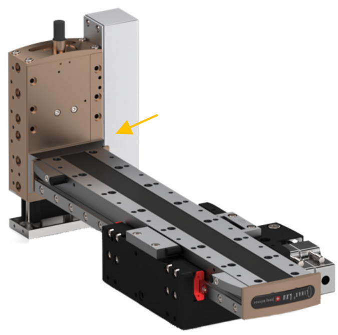


Lxu-Elax flat



Lxu-Elax upright

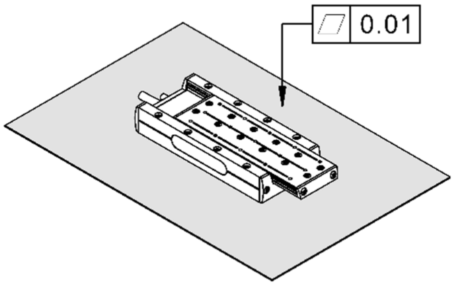




9 Installation, Important Instructions

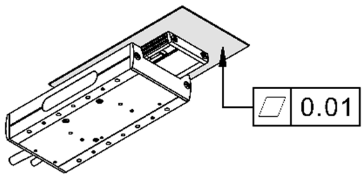
9.1 Flatness for Mounting on Ground Plate

If the LINAX® linear motor axes are mounted on a ground plate, it has to have a flatness of 0.01mm over a length of 200mm. If the flatness is out of this tolerance, the LINAX® linear motor axis 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



9.2 Flatness for Mounting on Slider

These same conditions hold true for components that are mounted on the slider of the LINAX® linear motor axis. The contact surface has to have a flatness of 0.01mm over a length of 200mm.



9.3 Flatness 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.

9.4 Power Supply

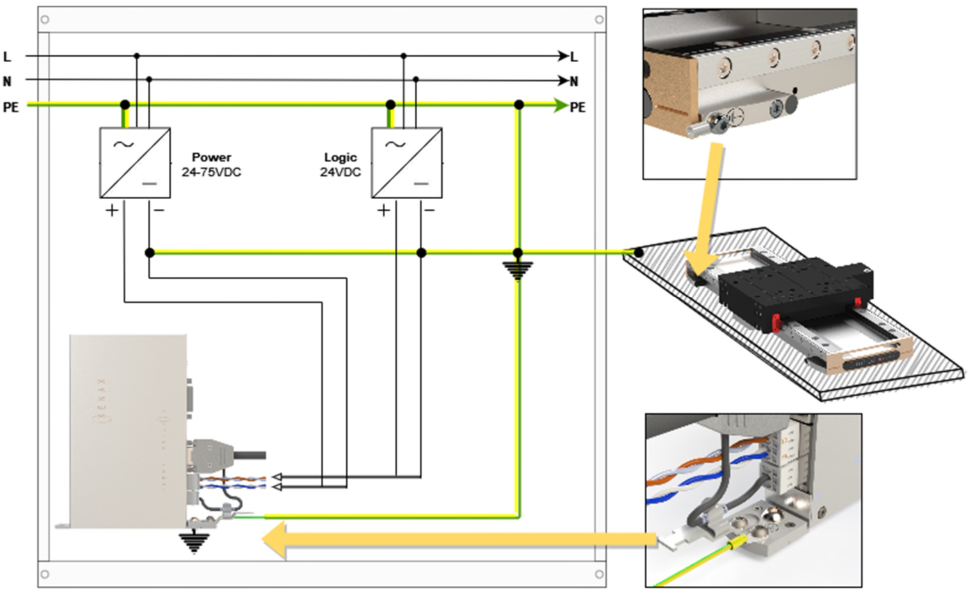
The typical POWER supply is 24V DC. For the stronger LINAX® F40 / F60 axes with high masses (>2kg) or high dynamics (>1.5m/s) a POWER supply of 48V or 72V DC is applicable. The current consumption per axis can be up to 8A and 18A peak per axis. Depending on mass in motion, profile and power supply voltage.

For a fuse protection of the power supply it must be considered that a short peak current of 8A can be reached for the rotating field adjustment.

For a detailed calculation of the required power supply in your application, please contact our support https://www.jennyscience.ch/en/contact.

LINAX® TYP	I COMMUTATION [A]	IMAX [A]
LINAX® Lxc F08	6.1	7.0
LINAX® Lxc F10	5.5	9.2
LINAX® Lxc/e F40	6.0	10.9
LINAX® Lxs/u F60	8.0	15.7
LINAX® Lxs F120	8.0	18.0

9.5 Earthing concept



Important

- 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 **base plate** of the Lxs/Lxu motors must be connected to the GND/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.

Note

If the Lxs/Lxu is mounted on a non-conductive base plate (e.g. granite), the protective earth must be connected directly to the motor.

10 Maintenance, Lifespan

10.1 Lubrication of LINAX® Lxc Types

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 LINAX® Lxc series with 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 Dosage pistole for lubrication
155.00.11 Cartridge with standard lubricant

10.2 Lifespan Expectations LINAX® Lxc Types

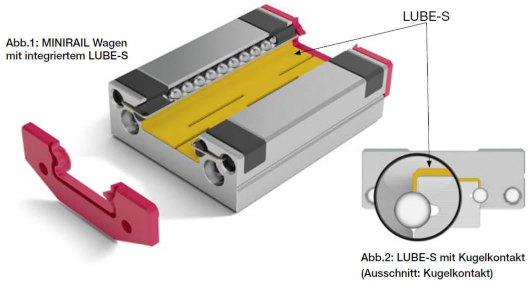
The LINAX® linear motor axes operate without wear and tear and without loss in accuracy over time. Generally speaking the mechanical guiding system is the determining factor for life span. The LINAX® Lxc linear motor axes have cross roll guides with the favourable linear support. These types of guides are precise, robust and low-maintenance. The LINAX® Lxc cross roll guiding cages are centered with racks and pinions. According to our experiences a lifespan of over 350Mio cylces can be achieved at medium strain, good maintenance and without external dirt particles.

10.3 Lubrication of LINAX® Lxu, Lxs, Lxe Types

For the Lxu, Lxs and Lxe types we use ball bearing guides with integrated permanent lubrication. For the older LINAX® models re-lubrication was completed with a lubricant filled syringe in order to refill the internal lubrication reservoir. Depending on dynamics the re-lubrication was suggested every 12 months.

The most recent used guiding carriages are maintenance free and no re-lubrication is necessary. The reservoir at the inside of the carriages lubricates all the balls automatically. Even for short-stroke applications lubrication is ensured.

Long term lubrication system integrated!



10.4 Lifespan Expectations Lxu, Lxs, Lxe Types

The guiding carriages have an integrated lubrication reservoir as a standard.
We recommend to re-lubricate the guiding system every 5'000km.
Important: If the guiding rails are cleaned, it has to be re-lubricated afterwards otherwise the lubricant in the reservoir might be used up and the guiding rails might run dry.

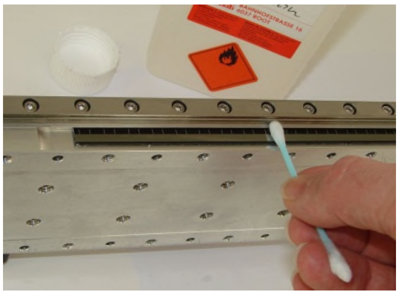
10.5 Lifespan Extending Measures

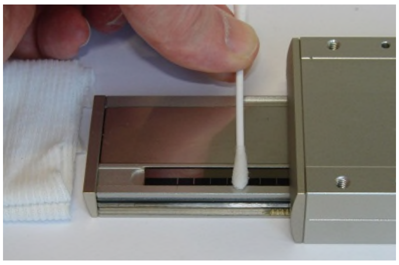
- Program trajectories with curve profile instead of trapezoidal profiles (XENAX® servo controller, default S-curve profile = 20%).
- Dynamics should only be as high as necessary.
- Movements which are not cycle time relevant can be executed slower.
- Prevent that dirt particles get into guiding rails and guiding carriages.
- Clean and lubricate guiding beams every 12 months.

10.6 Cleaning Glass Scale

After mechanical mounting or if there is visible dirt, the class scale should be cleaned thoroughly. Please do not touch glass scale afterwards.

If there is error „54, LINAX® measuring head signal too weak" the glass scale is contaminated and signal errors might occur. Use cotton swab or lint-free cloth with thin fluid and de-greasing detergent.
E.g. cleaning alcohol from drugstore or pharmacy.





11 Safety, Environment

11.1 Safety 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 IFA:2012 EN 61326-1, EN 61800-3, EN 50370-1	Immunity for Functional Safety Functional safety of power drive systems 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 IFA:2012	Radiated EM Field, Interference voltage Functional safety of power drive systems

11.2 Environment 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, after 40°C performance reduction
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

MRL 2006/42/EC notes

- Danger for persons with medical Implants due to magnetic fields

- Surfaces may become hot, up to 85°C

- Lubrication only with non-toxic lubricants, verify safety data sheet

- Noise level up to 70 dB(A)

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Jenny Science AG can neither guarantee nor be made responsible for any consequences resulting from incorrect information.

These manual is subject to change without notice.

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