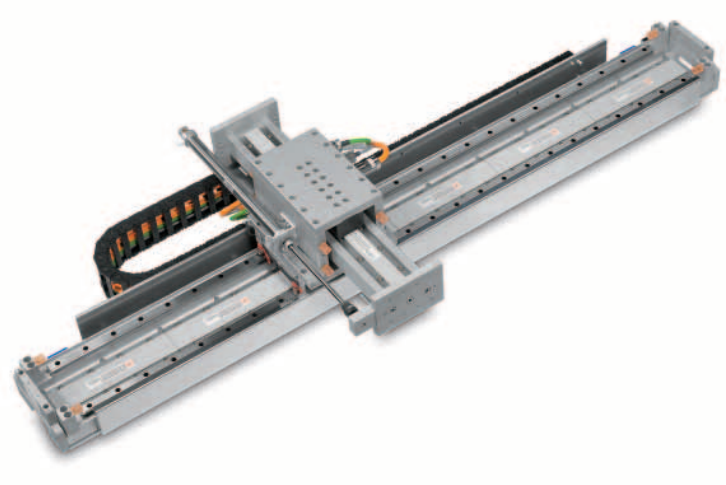
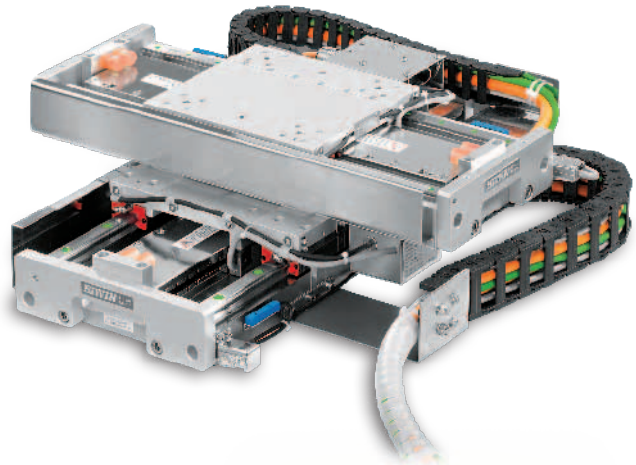
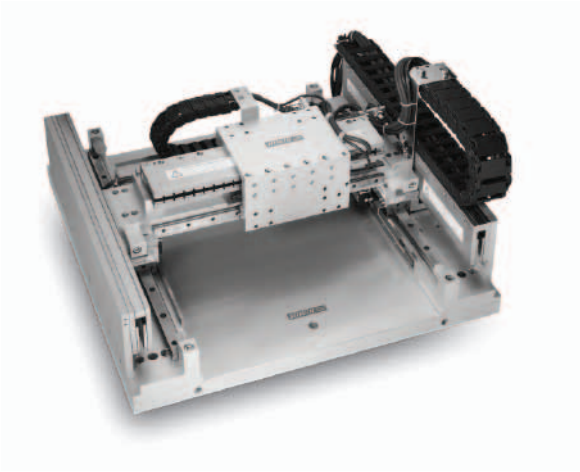
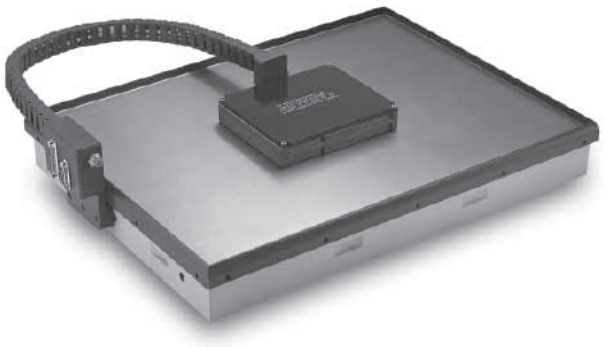
HIWIN®

Motion Control & Systems









Positioning Systems

Linear Motor Systems

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Note:
The technical data in this catalog may
be changed without prior notice.

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Welcome to HIWIN

HIWIN positioning systems facilitate positioning that is accurate in terms of time and location. These positioning systems are designed as direct drives and are suitable for installation in a horizontal or vertical position. Due to the direct drive, they are free of backlash, very dynamic and are low maintenance. They can be supplied as a complete solution including a drive amplifier on request.

Positioning Systems

HIWIN®
Motion Control & Systems

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Positioning Systems
Customized Positioning Systems

1.1 Glossary

Resolution
This is the smallest stroke that can be detected by the distance measuring system in use. The achievable > increment is usually higher than the resolution due to additional factors.

Acceleration
This is the speed change per time unit, i.e. acceleration = speed / time or a = v / t.

Acceleration time
This is defined as the time that a drive requires to reach maximum speed from standstill.

Continuous torque, continuous force
(also see Section 1.3, F_c)
A motor can produce continuous torque or nominal torque (with rotational movements) and continuous force or nominal force (with linear movements) in continuous operation (duty cycle = 100 %).

Continuous current I_c
(also see Section 1.3, I_c)
This is the current supplied over a longer period; the maximum permitted continuous current per winding is referred to as the nominal current. The continuous current is characterized by the fact that the dissipation power only results in motor warming of approximately 90 °C above ambient temperature.

Torque
This is the dimension which causes a rotation movement in a body and consequently a vectorial dimension, which can be expressed in the following cross product:

$$\vec{M} = \vec{r} \times \vec{F}_1$$

The torque is expressed physically in the unit Nm = kgm^2/s^2.

Flatness
This is a measure for the vertical straightness of a movement on the X axis. A deviation from the absolute levelness is a shift on the Z axis when moving on the X axis.

Eccentricity
This is the deviation of the center point of rotation of rotary tables from its position during rotation. It is created by centering and bearing tolerances.

Guide deviation
This is the linear deviation from the stroke axis. It is dependent on straightness (thus the accuracy at the level of the table) and levelness (the accuracy external to the level of the table).

Back EMF constant
(also see Chapter 1.3, K_u)
This is the relation between the back EMF voltage (rms) and the motor rotational speed or speed (rpm or m/s). Back EMF is the electromagnetic force that is created during the movement of windings in the magnetic field of permanent magnets, e.g. in a servo motor.

Accuracy (Absolute accuracy)
This, or the actual inaccuracy, corresponds to the deviation between a targeted position and the actual position. The accuracy along an axis is defined as the difference between the actual and target positions after all other linear deviations that can be eliminated have been excluded. Such systematic and linear deviations are the result, for example, of cosine errors, angle deviations, shaft pitch errors, thermal expansion etc. Accuracy is calculated for all relevant target positions of an application using to the following formula:
Maximum of all sums of systematic target-actual deviations + 2 sigma (standard deviation). Accuracy must not be confused with > repeatability.

Straightness
This is a measure for the horizontal straightness of a movement on the X axis. A deviation from the absolute straightness is a shift on the Y axis when moving on the X axis.

Force, torque
Force (in linear movements) or torque (in rotational movements) is given for defined conditions, e.g. as continuous force or torque at:

- 25 °C ambient temperature
- 110 °C winding temperature
- 100 % operating time for linear motors and torque motors
- 50 % operating time for rotary tables

or as peak force or peak torque.

Force constant K_f
(also see Chapter 1.3, K_f)
This is the winding-specific parameter used to calculate the resultant force as $F = I \times K_f$ by multiplication with the input current.

Attraction force F_a
This force is created between the primary and secondary parts of iron-core linear motors, by biasing voltage of the drive system, which must then be taken up by the guide.

Motor constant K_m
(also see Chapter 1.3, K_m)
This designates the ratio of generated power and dissipation power and consequently is a measure for efficiency of a motor.

Increment
This, or the smallest increment, is the minimum stroke that a linear drive can travel repeatedly. It is determined by the >resolution of the linear drive plus the increment of the motor and all errors in the drive line (reverse play, winding etc.)

Peak torque, peak force F_p
The peak torque (for rotational movements) or the peak force (for linear movements) is the maximum force that a motor can generate for approximately one second. With HIWIN, it is at the end of the linear modulation range at peak current I_p and is significant especially during acceleration and braking.

Peak current I_p
(also see Chapter 1.3, I_p)
It is used for short-term generation of peak power. HIWIN defines peak current as follows: Iron-core motors and coreless motors have three times the permitted continuous current as Ip. The maximum permitted length of peak current is one second. Thereafter, the motor must cool down to the nominal temperature before peak current can be supplied again.

Multi-Index
One incremental track is arranged on the scale. The sensor in the encoder head reads out 3 signals: incremental tracks A and B and Z-track for the internal reference signal. Each reference mark on the scale creates a reference signal (multi-index). An external reference switch is essential to trigger the reference signal. After operating the external reference switch the next reference mark on the magnetic scale defines the reference signal.

Single-Index
The magnetic scale is split in two tracks, incremental track and reference-track. Depending on the specification one or several reference marks are on the index rack are arranged on scale.
In the sensor are two sensor heads integrated. One for the tracks A and B and one for the reference track. Single-index-scales are always custom-made.

Stiffness
This corresponds to the mechanical deformation resistance that a component or assembly has against a static external load in a steady-state, static state (static stiffness) or the elastic deformation resistance that a component or assembly has against a dynamic force working from the outside (dynamic stiffness).

Wobbling
This is the angle deviation in the rotation axis from rotary tables during rotational movements, i.e. tipping of the surface of a rotary table. The causes are mainly tolerances in the bearing.

Winding resistance R_{25}
This is the winding-specific dimension that is produced by the winding resistance at 25 °C winding temperature . At 80 °C winding temperature, the winding resistance increases to approximately $1.2 \times R_{25.}$

Winding temperature T_{max}
(also see Chapter 1.3, T)
This is the permitted winding temperature. The actual motor temperature is dependent on the installation, cooling and operating conditions and consequently can only be determined in an actual case and cannot be calculated.

Repeatability
This may not be confused with absolute preciseness. A linear axis can have slight preciseness, but high repeatability. The uni-directional repeatability is measured when there is movement to a target position from an appropriately large stroke in the same direction several times; doing this the other way around does not work. In the measurement of bi-direction repeatability, there is movement to a target position is driven from different movement directions; doing this the other way around does not work.

1.2 Typical Dimensions

1.2.1 Winding-independent dimensions

F_a Relative constant force between primary and secondary part (magnetic basis) that must be handled by a mechanical guide.

F_c Motor power, which is available in nominal operation as continuous force and which results in warming to 90 °C above ambient temperature.

F_p Motor power that can be generated for a short time, which is reached at I_p at the end of the linear modulation range and results in substantial heating up when there is no cooling.

K_m Motor constant, which expresses the ratio of generated power and dissipation power and consequently the degree of effectiveness.

P_v The heat output created in the motor winding, which results in a time-dependent temperature rise dependent on the operating mode (current) and the ambient conditions (cooling) In the upper control P_v is especially high in the upper modulation range (at I_p) due to the quadratic dependency of current, while only relatively slight warming occurs in the range of the nominal current. P_v is calculated using the motor constant K_m for a movement section with the required force F: $P_v = F / K_m^2$

P_{vp} Peak dissipation power at I_p

P_c Dissipation power at I_c

T Permissible winding temperature, which is recorded by sensors or thermal circuit breakers; the created motor surface temperature is dependent on

- the actual installation conditions (table size)
- the heat dissipation conditions (cooling)
- the operating mode and consequently the mean performance entry

can only be determined if these variables are known.

1.2.2 Winding-dependent dimensions

I_c For generating the current connected for continuous force.

I_p For short-term generation of the peak force of connected peak current.

K_f Winding dimension, which produces the created force with the current: $F = I \times K_f$

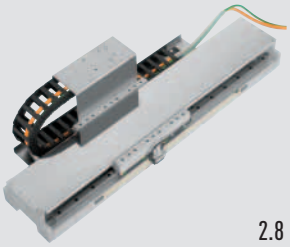
K_u Winding dimension, which results dependent on the speed created in the motor terminals- in generator operation: $U_g = K_u \times v$

R_{25} Winding resistance at 25 °C; this increases to approx. 1.2 times the value at 80 °C.

HIWIN®
Motion Control & Systems

2. Linear Motors


2.7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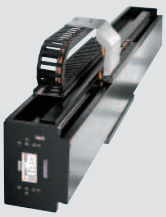
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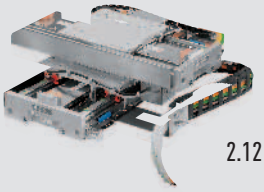
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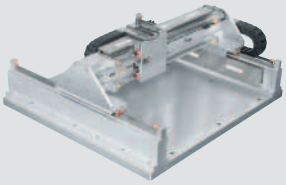
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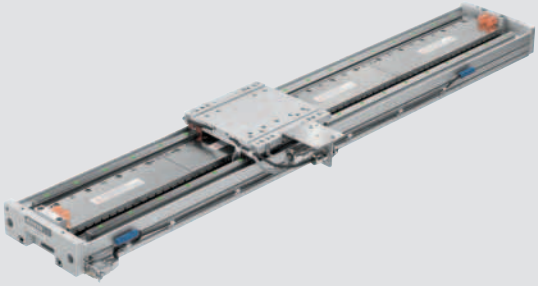
Positioning Systems
Linear motor axis

2. Linear Motor Axe

2.1 Product Overview



LMX1E Page 15

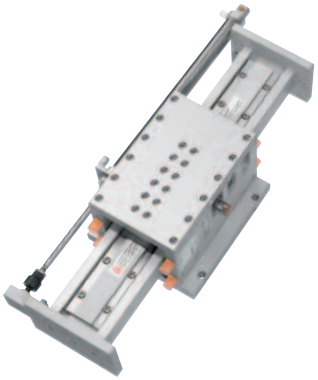
- Complete axis with coreless motor, type LMC
- Ideal for applications with a high degree of synchronization requirements
- Optional enclosure by metal cover or bellow cover
- Also for use as a cross table
- Stroke is measured via optical distance measuring system incrementally or absolutely
- Total length up to 4000 mm

LMX1L-S Page 22

- Complete axis with iron-core motor, type LMS
- Ideal for applications with high continuous power requirements
- Optional enclosure by metal cover or bellow cover
- Also for use as a cross table
- Stroke is measured via optical or magnetic distance measuring system incrementally or absolutely depending on requirements
- Total length up to 4000 mm

LMX1L-SC7 Page 36

- Complete axis with iron-core motor, type LMS C7
- Sandwich design makes high power density possible without static load of the guides by attraction forces
- Optional enclosure by metal cover or bellow cover
- Stroke is measured via optical or magnetic distance measuring system incremental or absolutely depending on requirements
- Total length up to 4000 mm



LMV1L Page 38

- Complete axis with iron-core motor, type LMS
- Use as a vertical axis
- For applications with gripper connection
- Stroke is measured via optical or magnetic distance measuring system incrementally or absolutely depending on requirements

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Motion Control & Systems

LMH1L

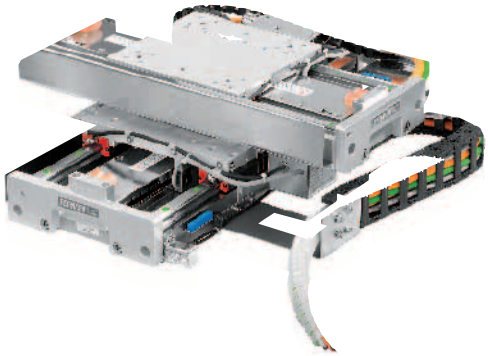
Page 40

- Complete axis with iron-core motor, type LMS
- Stroke is measured incrementally via magnetic encoders
- Ideal for applications with long stroke (up to 30 m)
- Enclosure possible

Cross tables

Page 43

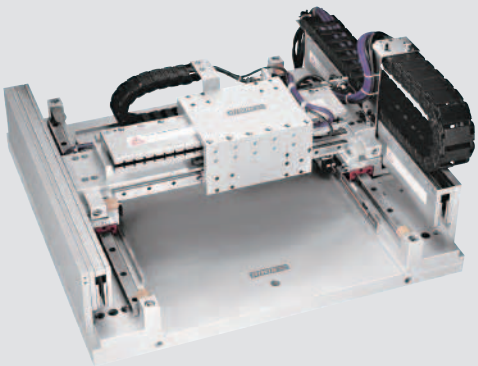
- Combination of axis from the LMX series
- With coreless or iron-core motors



Gantry systems

Page 47

- Standardized gantry systems with coreless motors or iron-core motors



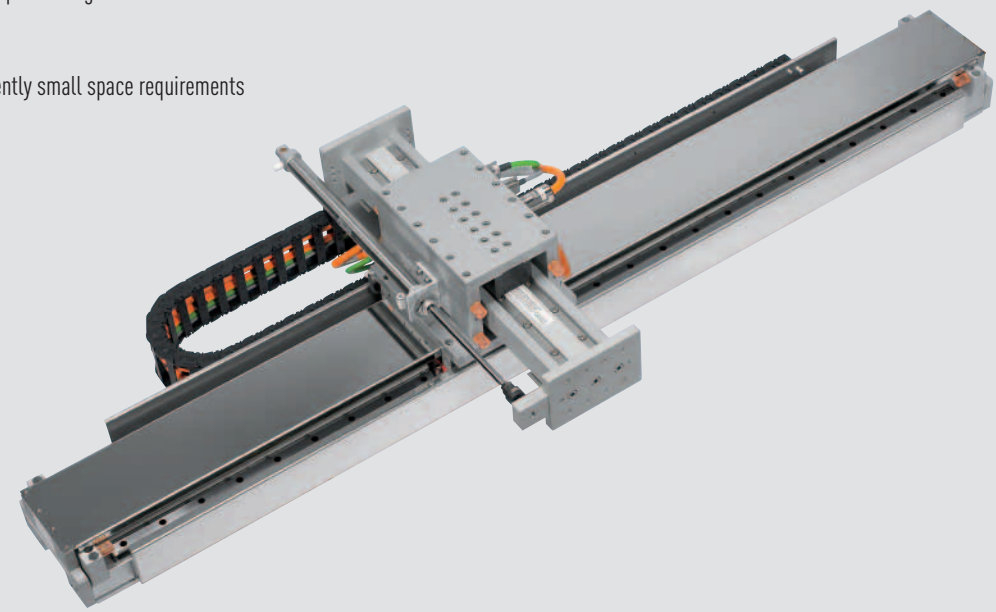
Positioning Systems
Linear motor axis

2.2 Typical Properties of Linear Motor Axis

HIWIN linear motor axis are directly driven axis with linear motors, which are designed as a plug and play solution. Standardized energy chains and customized cable guides are available as an option. These are suspended complete axis with distance measuring system, guides, limit switches and optionally with covers as protection against environmental influences. An arresting brake can be built in optionally.

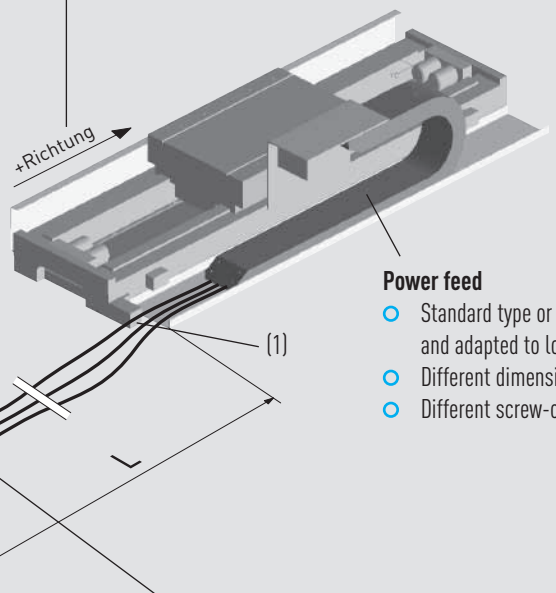
Due to the direct drive, the linear axis are free from backlash, very dynamic, low maintenance and can also be equipped with several forcers. The linear axis are supplied as a complete solution including drive amplifier on request. Customers can select the drive manufacturer of their wish. We supply the required electronic parameters for adaptation of the linear motors.

- Several forcers per axis
- Can be combined with other axis
- No realignment
- Low maintenance
- Long operating life and high reliability
- Extremely precise and fast positioning
- Smooth running
- High stroke speed
- Compact design, consequently small space requirements
- Optimum accuracy



2.3 Scope of delivery

Positive (+) movement direction
The movement direction is defined via the position of the reference switch. As a standard, it is on the same side as the limit switch plug (1).



Drive amplifier:
(see page 10)
The suitable drive amplifier is selected according to the customer's applications and parameterized in line with the linear motor axis to be supplied. This ensures the dynamic running properties of the respective linear motor axis.

Power feed
- Standard type or designed customer-specific and adapted to local conditions
- Different dimensions for additional cables possible
- Different screw-on positions possible

Possible Interfaces:
- Profibus
- CANopen
- Sercos
- Serial via RS232
- 10 V analog
- Pulse/direction

Ohters on request

Three cables:
- Output cable
- Encoder cable
- Limit switch cable

Standard lengths each L = 2 m, optional to L_{max} = 10 m from the end of the cable chain possible; the cables are certified according to CE and UL regulations.

Standard linear motor axis
Different types: see pages 15 – 48

Positioning Systems
Linear motor axis

2.4 Drive Amplifier for Linear Motor Axis

HIWIN selects the drive amplifier suitable for the respective application or according to customer request.

Our system partners for drive amplifiers include:

LTi LUST

Perfection in Automation www.br-automation.com

BECKHOFF New Automation Technology

manz automation

ACS Tech80 Redefining Motion Control

Parker

Schneider Electric

DANAHER MOTION

CONTROL TECHNIQUES www.controltechniques.de

Jetter Automation. Made easy.

SIEB & MEYER

Rexroth Bosch Group

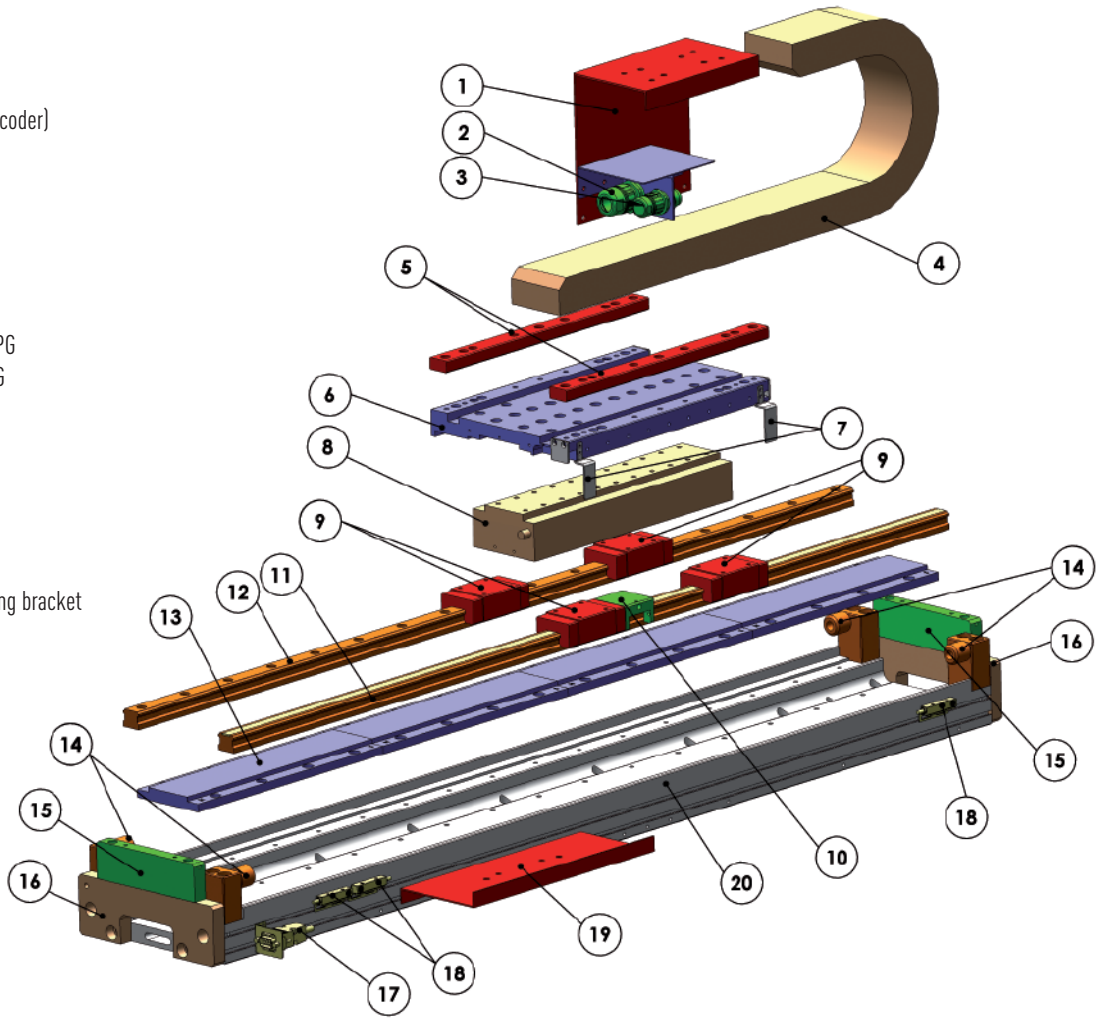
Copley Controls Corp.

metronix servo drives

ESR ESR Pollmeier GmbH www.esr-pollmeier.de

2.5 System Configuration

1 Fixing of the power feed
2 Motor plug
3 Distance measuring system plug (encoder)
4 Power feed
5 optional: Distance plate for cover
6 Forcer plate
7 Cam switch
8 Forcer
9 Linear guideway block
10 Distance measuring system MAGIC-PG
11 Rail with magnet scale for MAGIC-PG
12 Rail
13 Stator
14 Stopping buffer
15 optional: Distance plate for cover
16 End cap
17 Plug for limit- and reference switch
18 Limit- and reference switch incl. fixing bracket
19 Fixing of the power feed
20 Basic profile



General Specifications for Linear Motor Axis

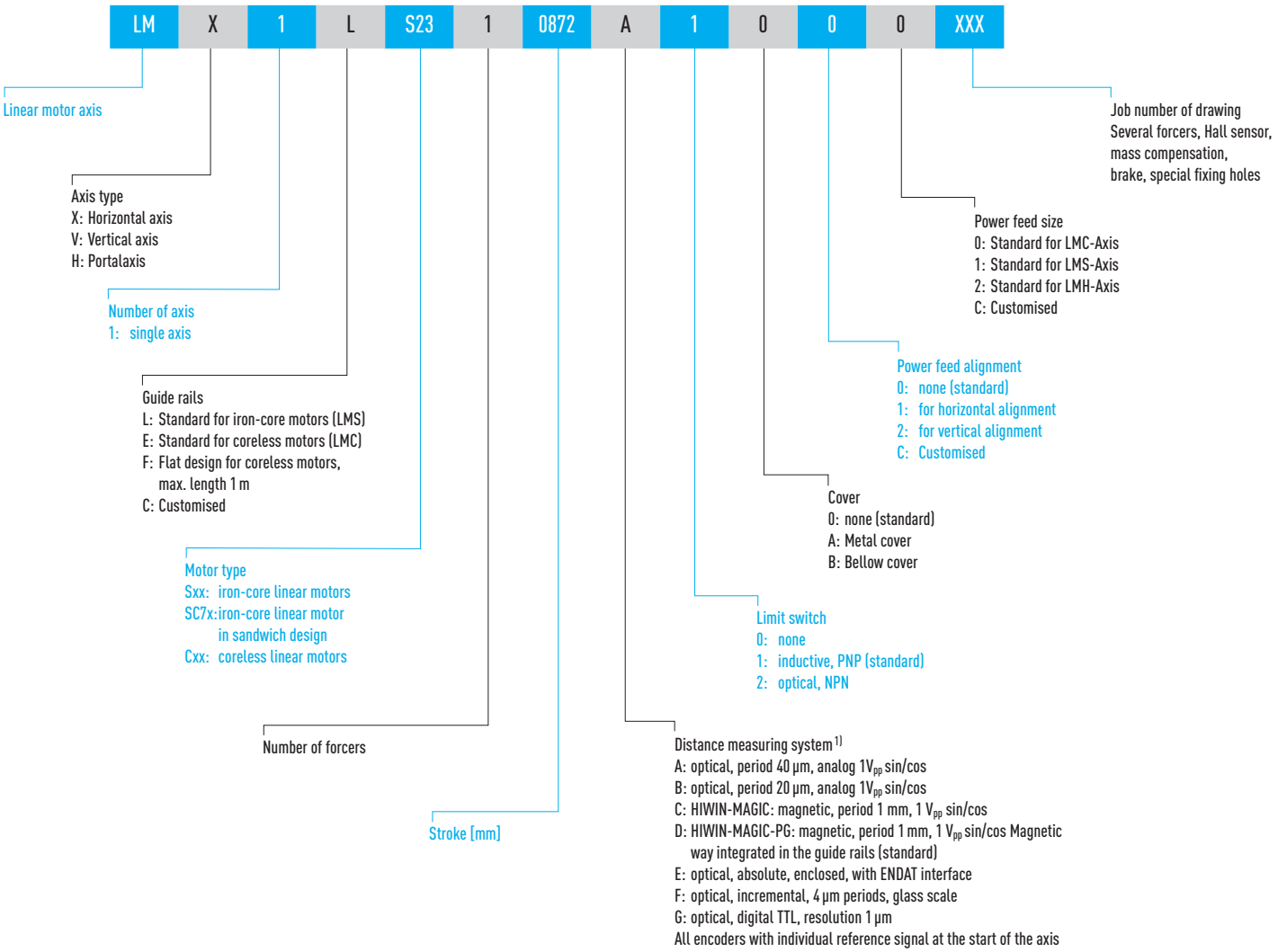
Name	Motor type	v_{max} [m/s]	a_{max} [m/s²]	Total length L_{max} [mm]	Repeatability [mm]	Accuracy [1)] [mm/300 mm]	Straightness [1)] [mm/300 mm]	Flatness [mm/300 mm]	Page
LMX1E- ...	LMC	5	100 [4)]	4000	± 0.001 [2)]	± 0.005 [2)]	± 0.01	± 0.01	15
LMX1L-S ...	LMS	4	50 [4)]	4000	± 0.001 [2)]	± 0.005 [2)]	± 0.01	± 0.01	22/36
LMV1L- ...	LMS	1.8	30	600	± 0.001 [2)]	± 0.005 [2)]	± 0.01	± 0.01	38
LMH1L- ...	LMS	4	50	30000	± 0.02 [3)]	± 0.05 [3)]	± 0.03	± 0.03	40

[1)] Values apply only with an appropriate specified base frame.
[2)] Values apply to the optical incremental distance measuring system with 40 µm periods of the sin/cos signal.
[3)] Values apply to the HIWIN-MAGIC optical incremental distance measuring system with a sinus/cosinus signal (see catalogue Direct Components).
[4)] If bellow covers are used, the maximum acceleration could be restricted.

The distance measuring system is optical or magnetic, depending on the linear axis type or the customer's requirement. As standard, sin/cos 1 V_{pp} is processed as an output signal; a TTL signal is also possible.
The maximum operating voltage depends on the linear motor type in use. For motor types LMS and LMT (iron-core motors), the maximum permissible operating voltage is 400 Vac. For the LMC motor series (coreless motors), the maximum operating voltage is 230 Vac.

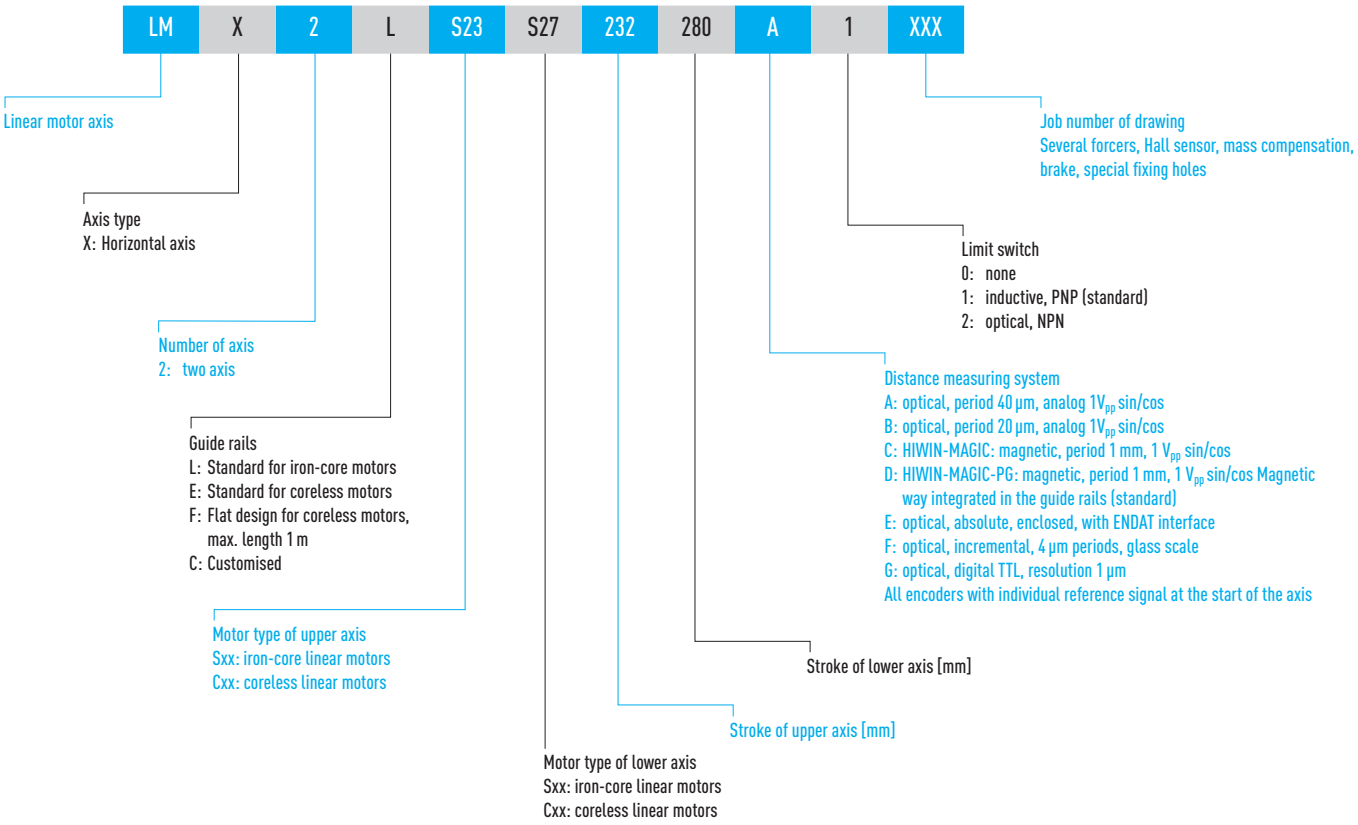
2.6 Model Numbers for Linear Motor Axis

2.6.1 Model Numbers for Single Linear Motor Axis



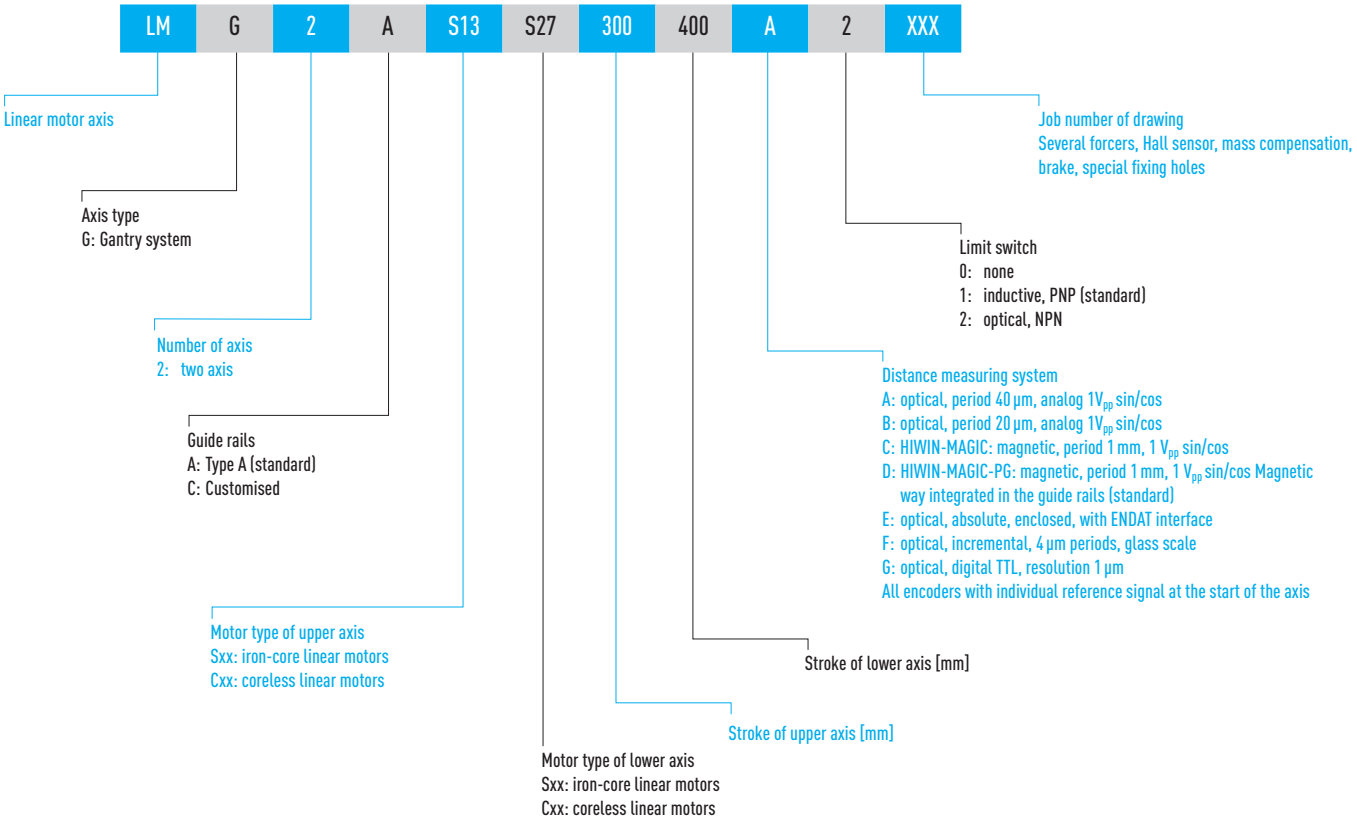
1) For LMH-axis distance measuring system "D" is obligatory

2.6.2 Model numbers forr Cross Tables



Positioning Systems
Linear motor axis

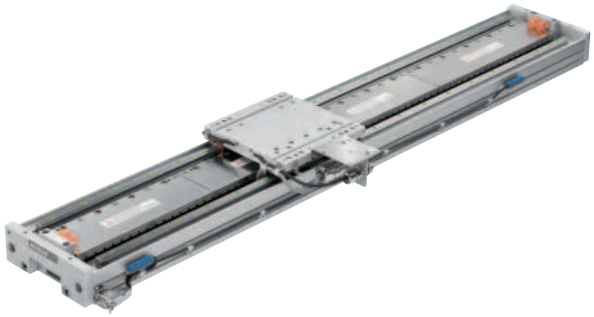
2.6.3 Model Numbers for Gantry Systems

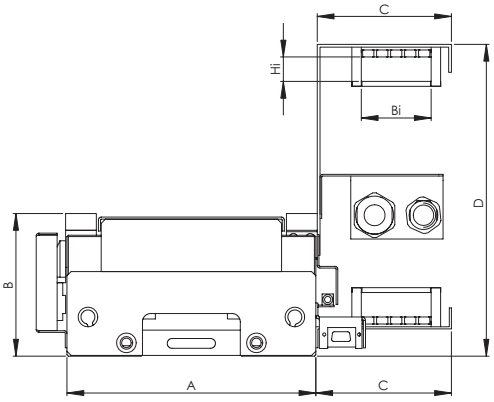


2.7 LMX1E Linear Motor Axis

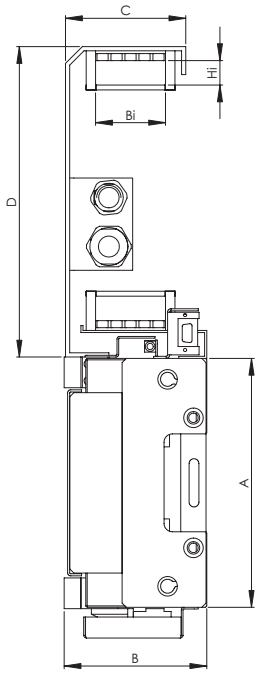
LMX1E linear motor axis are equipped with a coreless motor and are well suited for applications with a high degree of synchronous operational requirements. They can also be used in cross tables. They are distinguished by their very flat design. The stroke is measured incrementally or absolutely via optical encoders. The LMX1E linear motor axis have very high dynamics and are available in overall lengths up to 4,000 mm.

- Max. acceleration 100 m/s^2
- Max. speed 5 m/s
- Up to 4,000 mm long





Power feed horizontal



Power feed vertical

Dimension of power feed

Power feed alignment	C [mm]	D [mm]	Internal dimension $B_i \times H_i$ [mm]
Horizontal	97	170	50 × 21
Vertical	79	170	50 × 21

Specifications for LMX1E Linear Motor Axis

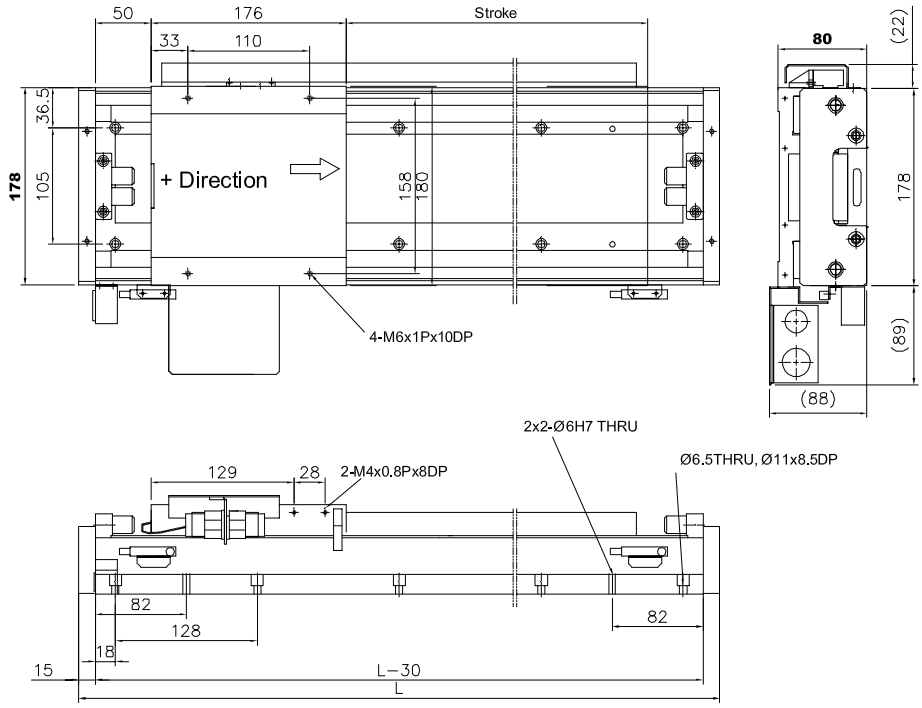
Name (Model number) xxxx = Stroke [mm]	Motor type	F_c [N]	F_p [N]	Mass of glider [kg]	Length of glider [mm]	v_{max} [m/s]	a_{max} [m/s^2]	Dimension A [mm]	Dimension B [mm]
LMX1E-CB5-1-xxxx-C100	LMC B5	91	364	2	178	5	100	178	80
LMX1E-CB6-1-xxxx-C100	LMC B6	109	436	3	208	5	100	178	80
LMX1E-CB8-1-xxxx-C100	LMC B8	145	580	4.2	272	5	100	178	80
LMX1E-CB5-1-xxxx-C1A0	LMC B5	91	364	2.3	178	5	100	178	92/101*
LMX1E-CB6-1-xxxx-C1A0	LMC B6	109	436	3.3	208	5	100	178	92/101*
LMX1E-CB8-1-xxxx-C1A0	LMC B8	145	580	4.5	272	5	100	178	92/101*

Notes: F_c = Continuous power, 100 % operating time (ED) at 100 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors:
* See Dimensional Tables on pages 16 – 21

2.7.1 LMX1E without Cover

Dimensions and mass of the LMX1E-CB5 axis without cover

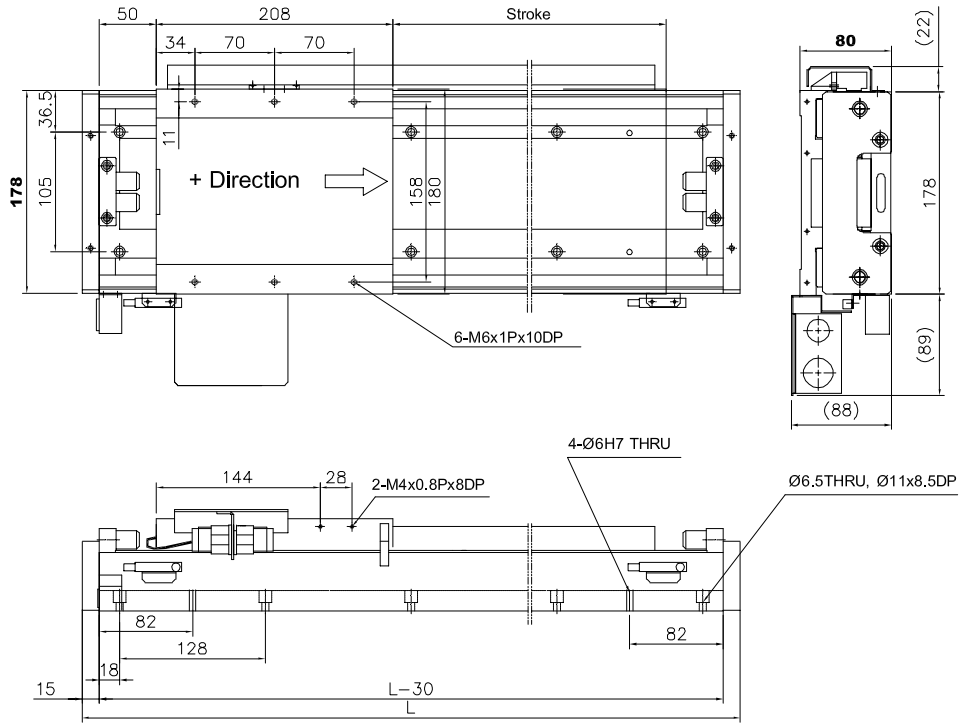
All values in mm



Stroke [mm]	144	272	400	528	656	784	912	1040	1296	1552	1808
Total length L [mm]	450	578	706	834	962	1090	1218	1346	1602	1858	2114
Mass [kg]	19	22.5	26	30	33	36.5	40.5	44	51	58.5	66

Dimensions and Mass of the LMX1E-CB6 Axis without Cover

All values in mm

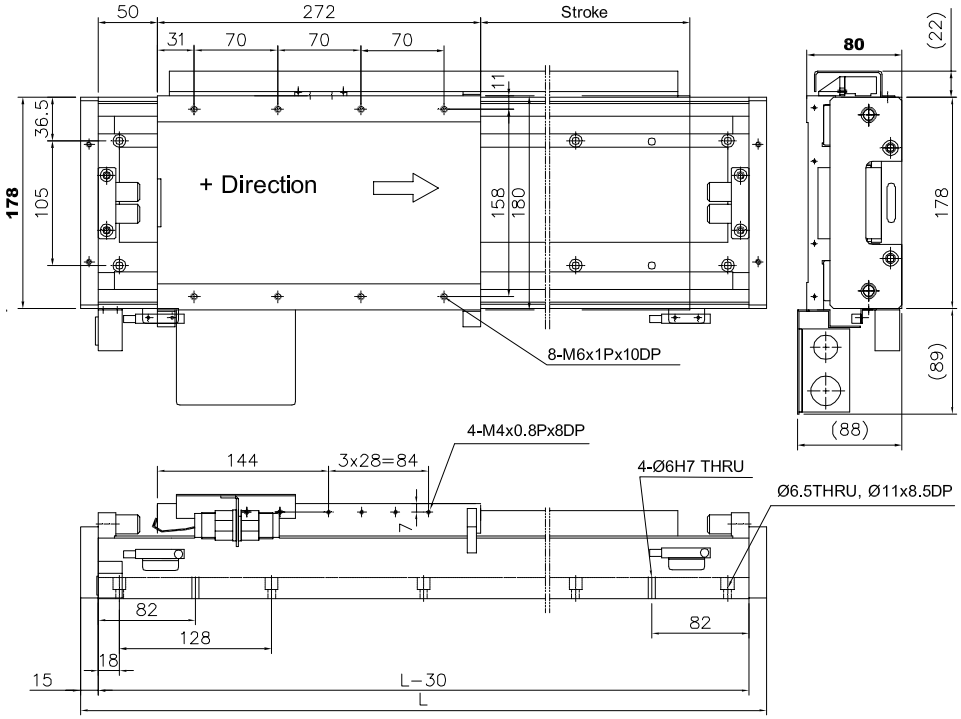


Stroke [mm]	112	240	368	496	624	752	880	1008	1264	1520	1776
Total length L [mm]	450	578	706	834	962	1090	1218	1346	1602	1858	2114
Mass [kg]	19.3	23	26.6	30.2	33.9	37.5	41.2	44.8	52.1	59.4	66.6

Positioning Systems
Linear motor axis

Dimensions and Mass of the LMX1E-CB8 Axis without Cover

All values in mm
h = H – 80

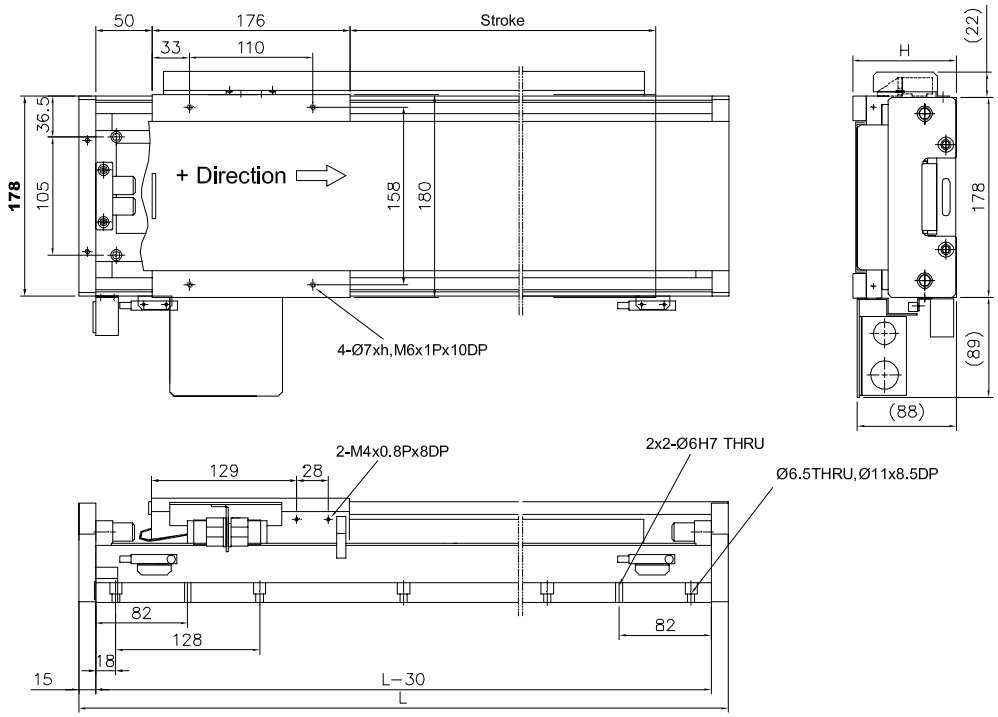


Stroke [mm]	176	304	432	560	688	816	944	1200	1456	1712
Total length L [mm]	578	706	834	962	1090	1218	1346	1602	1858	2114
Mass [kg]	24.5	28.1	31.7	35.4	39	42.7	46.3	53.6	60.8	68.1

2.7.2 LMX1E with cover

Dimensions and Mass of the LMX1E-CB5 Axis with Cover

All values in mm
h = H – 80



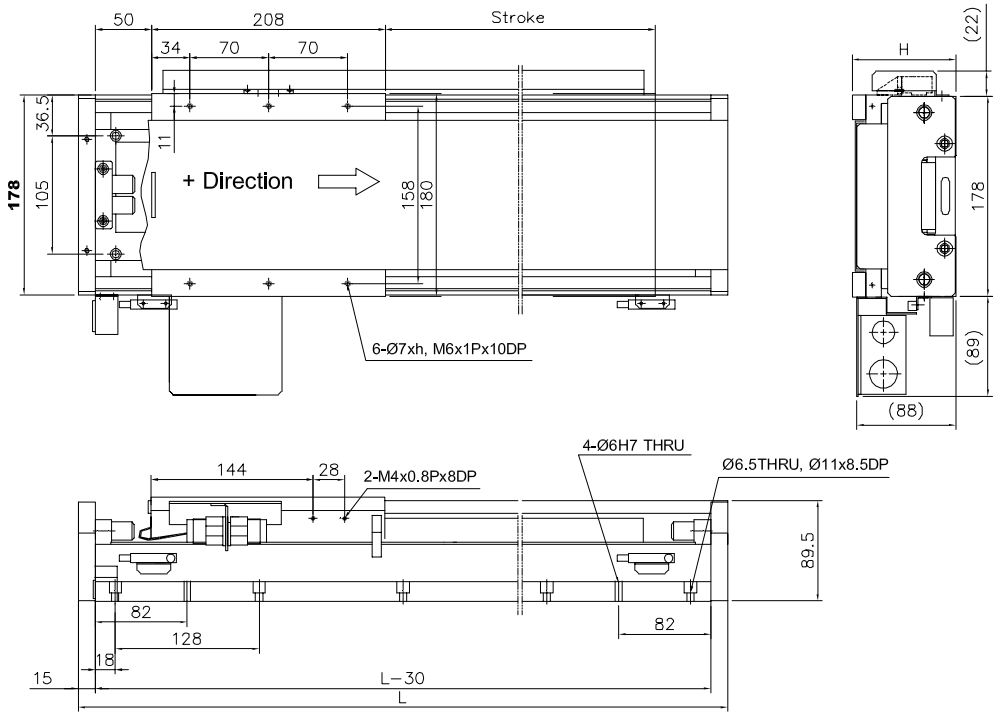
L_1 = Total length with metal cover [mm]
L_2 = Total length with bellow cover [mm]

Stroke [mm]	144	272	400	528	656	784	912	1040	1296	1552	1808
Total length L_1 [mm]	450	578	706	834	962	1090	1218	1346	1602	1858	2114
Total length L_2 [mm]	458	660	860	1060	1259	1460	1660	1859	2260	2659	3060
H [mm]	95	95	95	95	95	95	95	95	105	105	105
Mass [kg]	20.3	24.3	28	32	36	40	44	48	56	64	71.7

Positioning Systems
Linear motor axis

Dimensions and Mass of the LMX1E-CB6 Axis with Cover

All values in mm
h = H – 80

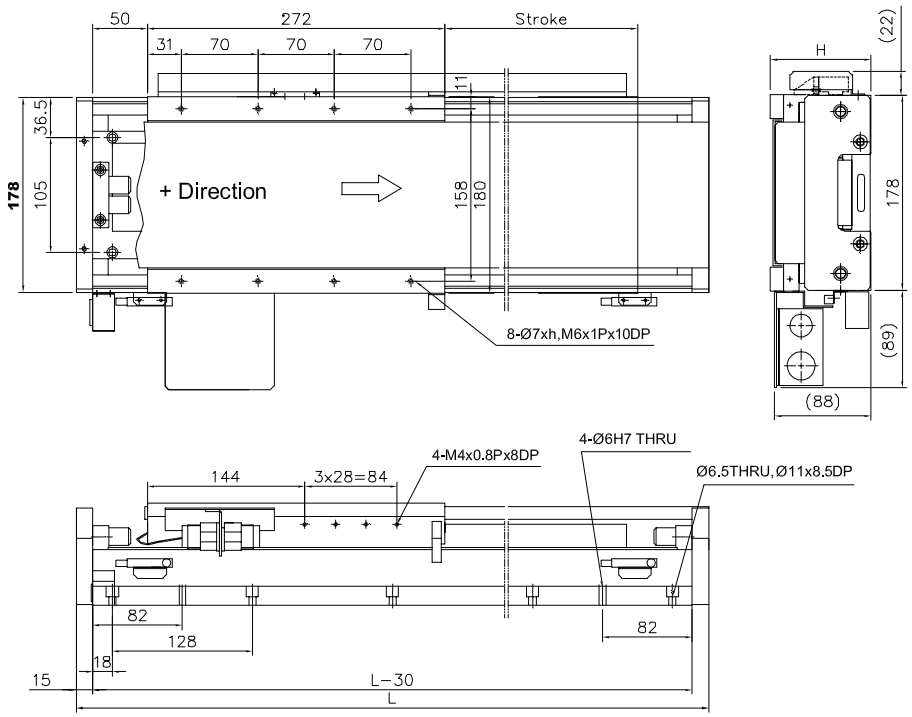


L_1 = Total length with metal cover [mm]
L_2 = Total length with bellow cover [mm]

Stroke [mm]	112	240	368	496	624	752	880	1008	1264	1520	1776
Total length L_1 [mm]	450	578	706	834	962	1090	1218	1346	1602	1858	2114
Total length L_2 [mm]	442	642	841	1041	1242	1442	1641	1842	2241	2642	3041
H [mm]	95	95	95	95	95	95	95	95	105	105	105
Mass [kg]	21	25	28.9	32.8	36.8	40.7	44.7	48.7	56.6	64.5	72.4

Dimensions and Mass of the LMX1E-CB8 Axis with Cover

All values in mm
h = H – 80



L_1 = Total length with metal cover [mm]
L_2 = Total length with bellow cover [mm]

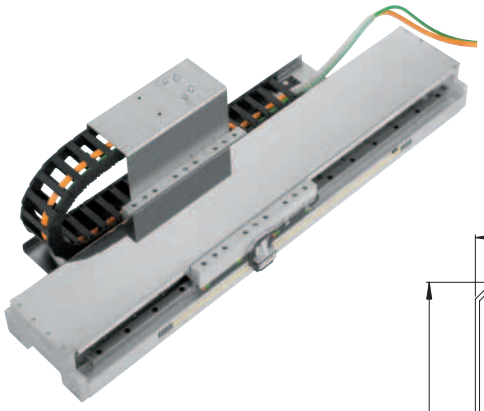
Verfahrweg [mm]	176	304	432	560	688	816	944	1200	1456	1712
Gesamtlänge L_1 [mm]	578	706	834	962	1090	1218	1346	1602	1858	2114
Gesamtlänge L_2 [mm]	606	806	1005	1205	1406	1605	1805	2206	2606	3005
H [mm]	95	95	95	95	95	95	95	105	105	105
Gewicht [kg]	26.4	30.4	34.3	38.3	42.2	46.2	50.2	58	66	74

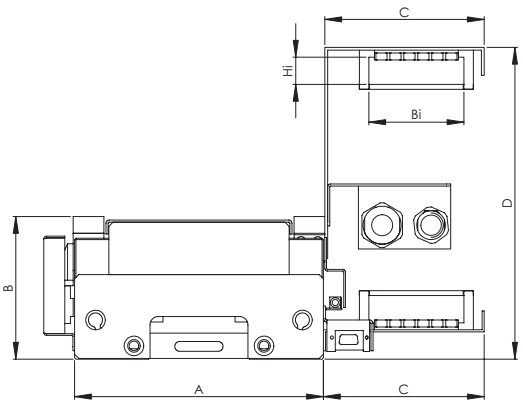
Positioning Systems
Linear motor axis

2.8 LMX1L-S Linear Motor Axis

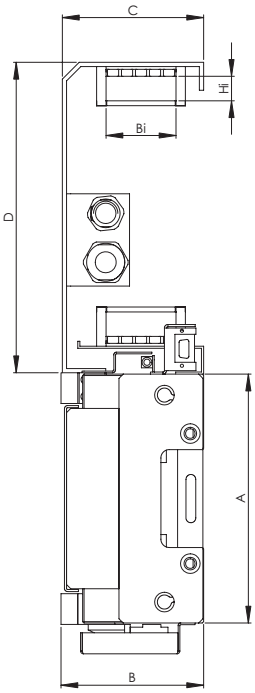
LMX1L linear motor axis are equipped with an iron-core motor, which provides substantial continuous force. They can also be used in cross tables. The stroke is measured via the optical or magnetic distance measuring systems incrementally or absolutely. The LMX1L-S linear motor axis have a very compact design and are available in overall lengths up to 4,000 mm.

- Max. acceleration 50 m/s²
- Max. speed 4 m/s
- Up to 4,000 mm long





Power feed horizontal



Power feed vertical

Dimension of power feed

Power feed alignment	C [mm]	D [mm]	Internal dimension $B_i \times H_i$ [mm]
Horizontal	115	223	68 × 21
Vertical	89	222	68 × 21

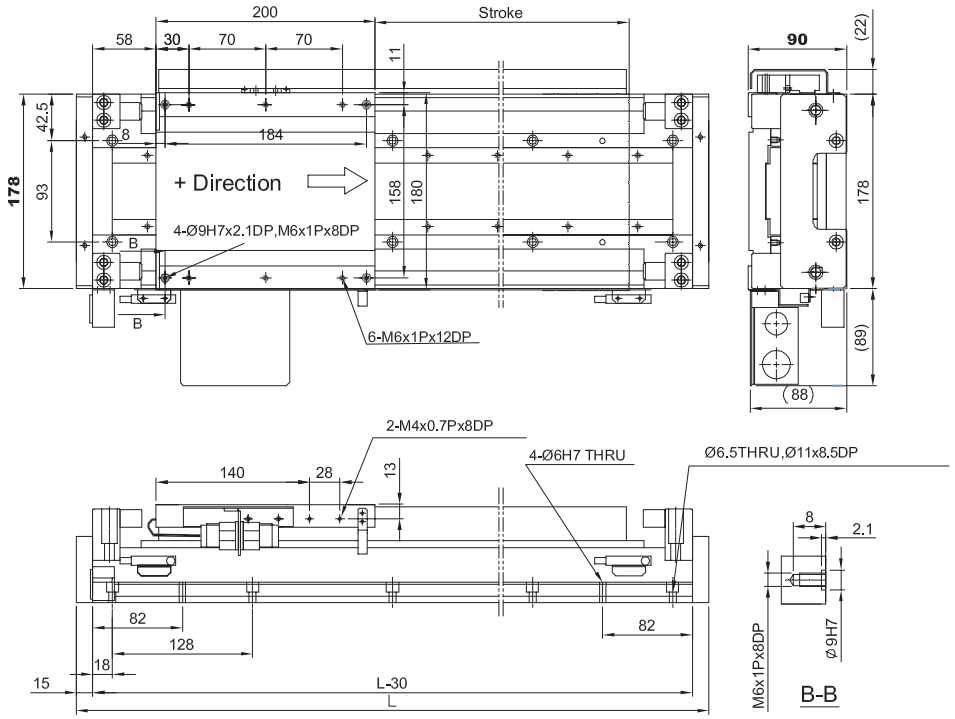
Name (Model number) xxxx = stroke [mm]	Motor type	F_c [N]	F_p [N]	Mass of Glider [kg]	Length of glider [mm]	v_{max} [m/s]	a_{max} [m/s²]	Dimension A [mm]	Dimension B [mm]
LMX1L-S23-1-xxxx-D100	LMS 23	270	720	7.5	200	4	50	178	90
LMX1L-S27-1-xxxx-D100	LMS 27	415	1080	9.5	280	4	50	178	90
LMX1L-S37-1-xxxx-D100	LMS 37	580	1500	12	280	3.5*	50	202	95
LMX1L-S37L-1-xxxx-D100	LMS 37L	580	1500	12	280	4	50	202	95
LMX1L-S47-1-xxxx-D100	LMS 47	790	2040	18	280	2.5*	50	232	95
LMX1L-S47L-1-xxxx-D100	LMS 47L	790	2040	18	280	4	50	232	95
LMX1L-S57-1-xxxx-D100	LMS 57	950	2400	22	280	2*	50	252	100
LMX1L-S57L-1-xxxx-D100	LMS 57L	950	2400	22	280	4	50	252	100
LMX1L-S67-1-xxxx-D100	LMS 67	1160	3000	26	280	2*	50	272	100
LMX1L-S67L-1-xxxx-D100	LMS 67L	1160	3000	26	280	4	50	272	100
LMX1L-S23-1-xxxx-D1A0	LMS 23	270	720	7.8	200	4	50	178	102/111
LMX1L-S27-1-xxxx-D1A0	LMS 27	415	1080	9.9	280	4	50	178	102/111
LMX1L-S37-1-xxxx-D1A0	LMS 37	580	1500	12.5	280	3.5*	50	202	107/116
LMX1L-S37L-1-xxxx-D1A0	LMS 37L	580	1500	12.5	280	4	50	202	107/116
LMX1L-S47-1-xxxx-D1A0	LMS 47	790	2040	18.8	280	2.5*	50	232	107/116
LMX1L-S47L-1-xxxx-D1A0	LMS 47L	790	2040	18.8	280	4	50	232	107/116
LMX1L-S57-1-xxxx-D1A0	LMS 57	950	2400	23	280	2*	50	252	112/121
LMX1L-S57L-1-xxxx-D1A0	LMS 57L	950	2400	23	280	4	50	252	112/121
LMX1L-S67-1-xxxx-D1A0	LMS 67	1160	3000	27	280	2*	50	272	112/121
LMX1L-S67L-1-xxxx-D1A0	LMS 67L	1160	3000	27	280	4	50	272	112/121

Notes: F_c = Continuous power, 100 % operating time (ED), at 120 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters of LMS linear motors: see catalogue Direct Components
* Limited by back-EMF of the motor winding

2.8.1 LMX1L-S linear motor axis without cover

Dimensions and Mass of the LMX1L-S23 Linear Axis without Cover

All values in mm

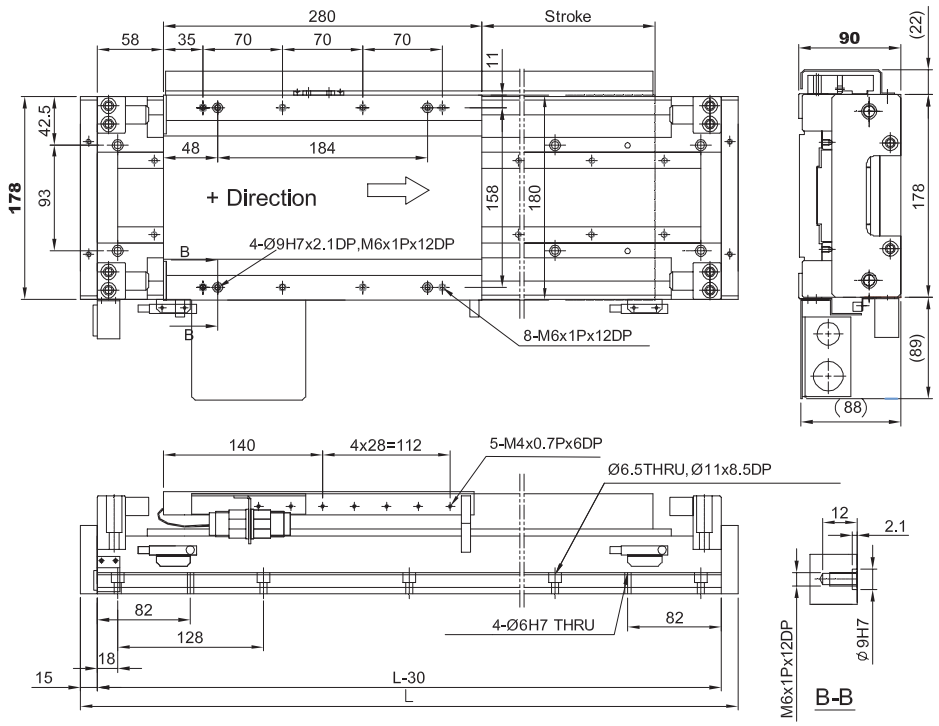


Stroke [mm]	104	232	360	488	616	744	872	1000	1256	1512	1768	2024
Total length L [mm]	450	578	706	834	962	1090	1218	1346	1602	1858	2114	2370
Mass [kg]	21.0	23.5	27.0	31.0	34.0	37.0	40.0	43.0	50.0	56.0	62.0	68.0

Positioning Systems
Linear motor axis

Dimensions and Mass of the LMX1L-S27 Linear Axis without Cover

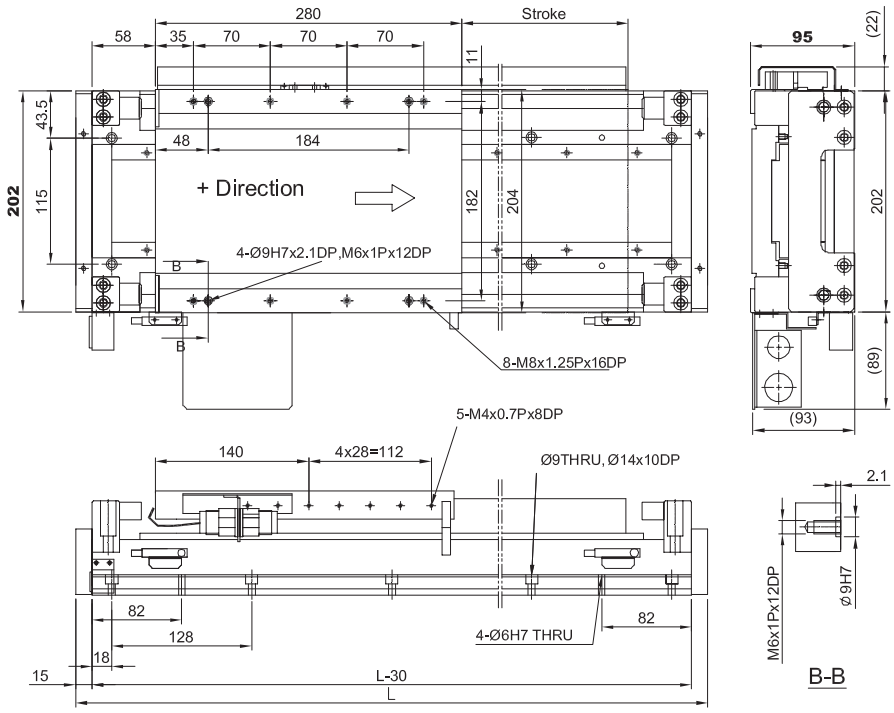
All values in mm



Stroke [mm]	152	280	408	536	664	792	920	1176	1432	1688	1944	2200
Total length L [mm]	578	706	834	962	1090	1218	1346	1602	1858	2114	2370	2626
Mass [kg]	27.0	30.0	33.5	37.0	40.0	43.5	46.5	52.0	58.0	64.0	70.0	76.0

Dimensions and Mass of the LMX1L-S37 und LMX1L-S37L Linear Axis without Cover

All values in mm

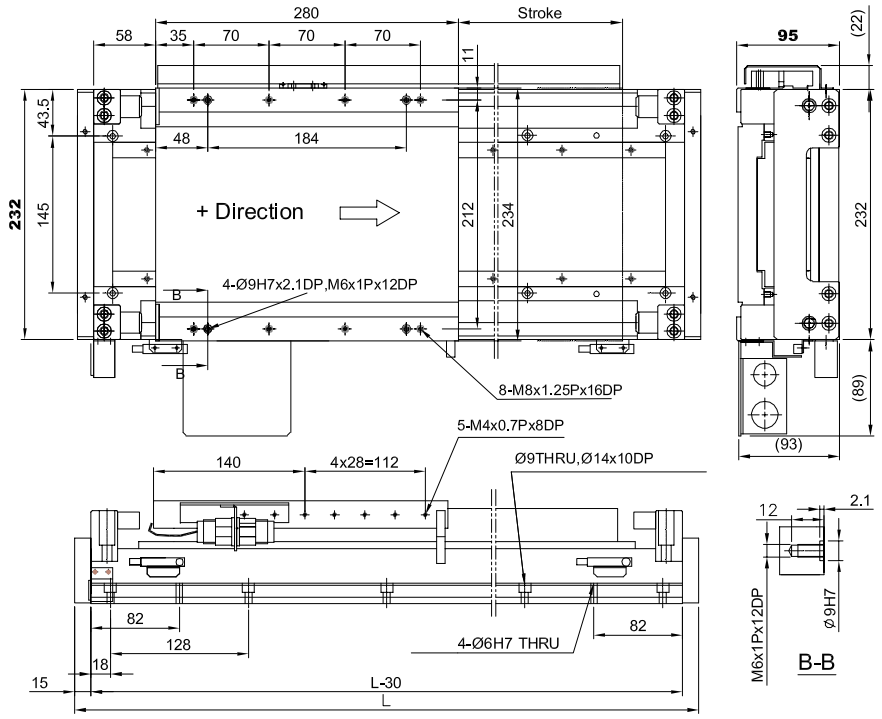


Stroke [mm]	152	280	408	536	664	792	920	1176	1432	1688	1944	2200
Total length L [mm]	578	706	834	962	1090	1218	1346	1602	1858	2114	2370	2626
Mass [kg]	33	36	40	43	47	50	54	62	70	78	86	94

Positioning Systems
Linear motor axis

Dimensions and Mass of the LMX1L-S47 und LMX1L-S47L Linear Axis without Cover

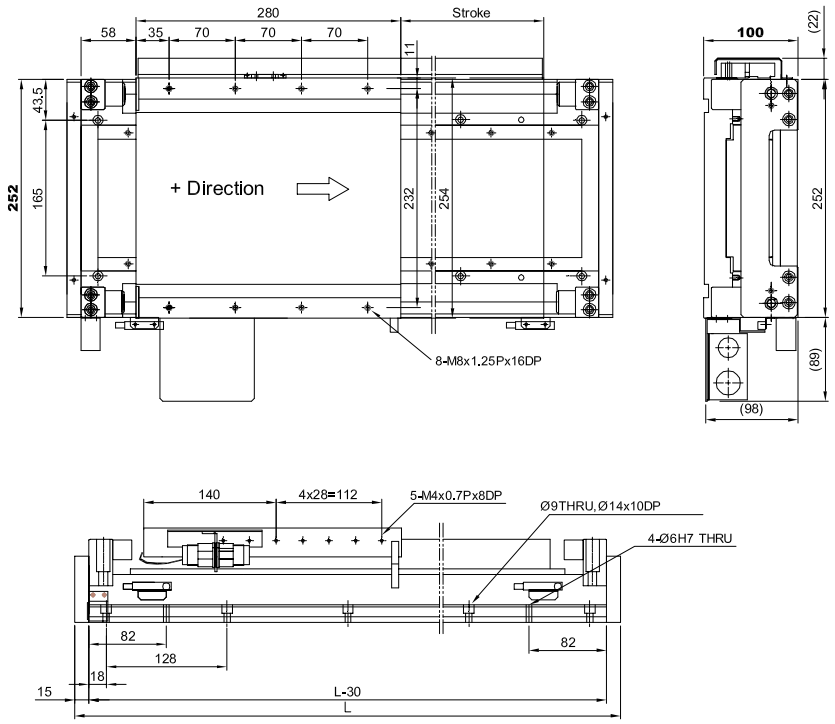
All values in mm



Stroke [mm]	152	280	408	536	664	792	920	1176	1432	1688	1944	2200
Total length L [mm]	578	706	834	962	1090	1218	1346	1602	1858	2114	2370	2626
Mass [kg]	38	41	46	50	55	58	63	71	80	88	96	105

Dimensions and Mass of the LMX1L-S57 und LMX1L-S57L Linear Axis without Cover

All values in mm

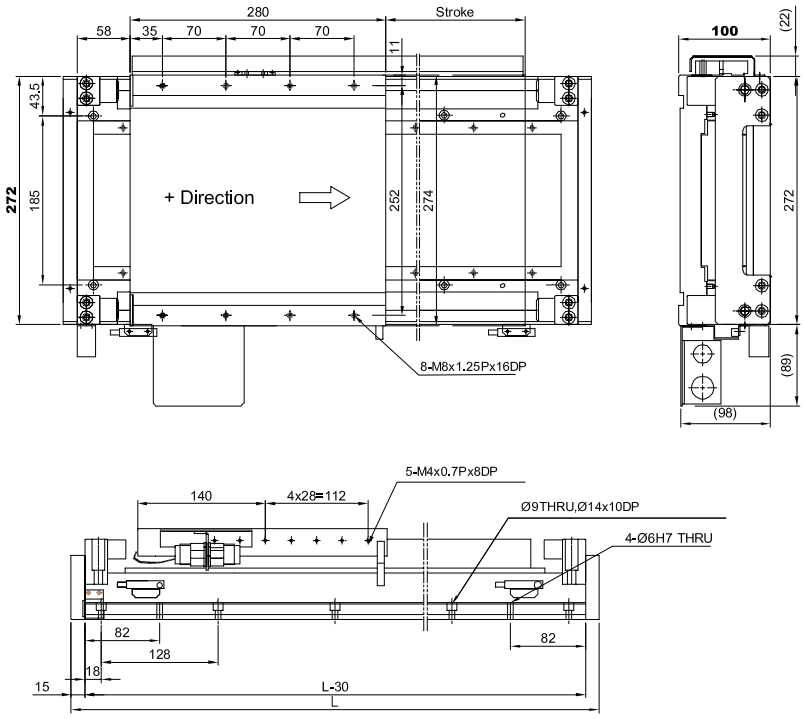


Stroke [mm]	152	280	408	536	664	792	920	1176	1432	1688	1944	2200
Total length L [mm]	578	706	834	962	1090	1218	1346	1602	1858	2114	2370	2626
Mass [kg]	47	51	57	63	69	73	80	90	100	110	120	130

Positioning Systems
Linear motor axis

Dimensions and Mass of the LMX1L-S67 und LMX1L-S67L Linear Axis without Cover

All values in mm

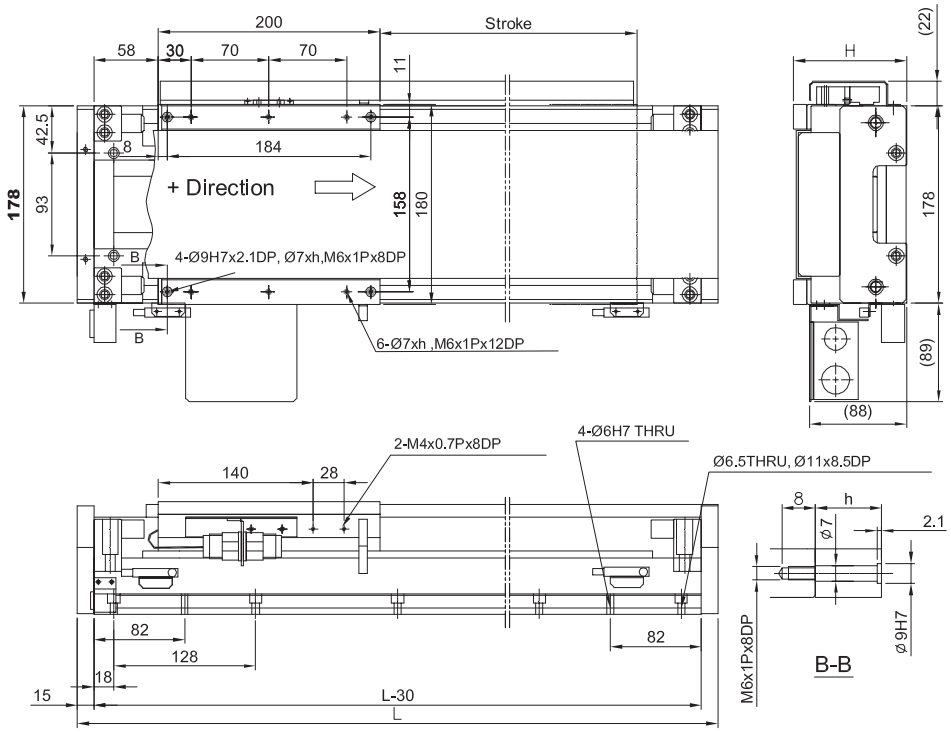


Stroke [mm]	152	280	408	536	664	792	920	1176	1432	1688	1944	2200
Total length L [mm]	578	706	834	962	1090	1218	1346	1602	1858	2114	2370	2626
Mass [kg]	50	55	61	68	74	78	86	97	107	118	129	140

2.8.2 LMX1L-S linear motor axis with cover

Dimensions and Mass of the LMX1L-S23 Linear Motor Axis with Cover

All values in mm
h = H – 90



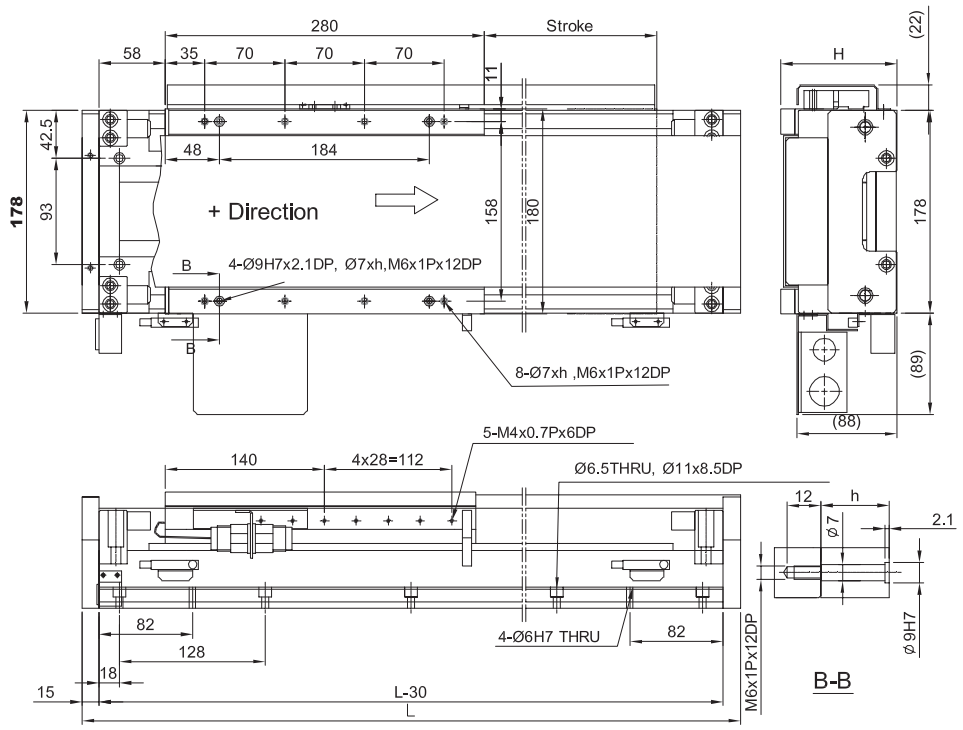
L_1 = Total length with metal cover [mm]
L_2 = Total length with bellow cover [mm]

Stroke [mm]	104	232	360	488	616	744	872	1000	1256	1512	1768	2024
Total length L_1 [mm]	450	578	706	834	962	1090	1218	1346	1602	1858	2114	2370
Total length L_2 [mm]	421	621	821	1021	1222	1421	1621	1821	2221	2622	3021	3421
H [mm]	102	102	102	102	102	102	102	102	111	111	111	111
Mass [kg]	23.0	26.0	29.5	34.0	37.0	40.0	43.5	46.5	54.0	60.5	67.0	74.0

Positioning Systems
Linear motor axis

Dimensions and Mass of the LMX1L-S27 Linear Motor Axis with Cover

All values in mm
h = H – 90

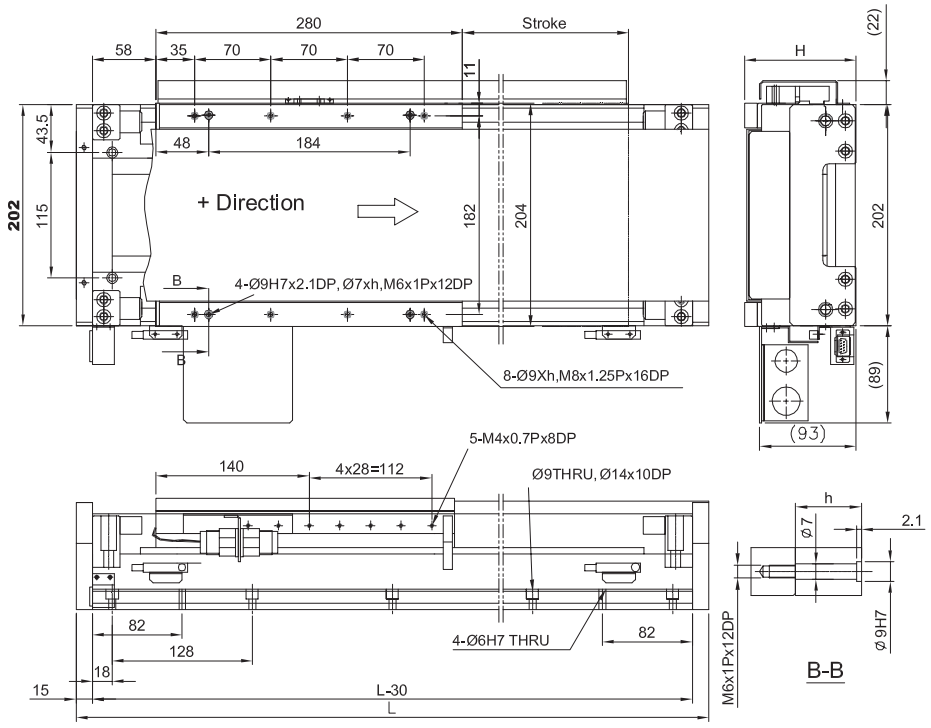


L_1 = Total length with metal cover [mm]
L_2 = Total length with bellow cover [mm]

Stroke [mm]	152	280	408	536	664	792	920	1176	1432	1688	1944	2200
Total length L_1 [mm]	578	706	834	962	1090	1218	1346	1602	1858	2114	2370	2626
Total length L_2 [mm]	576	775	976	1176	1376	1576	1776	2177	2576	2976	3376	3776
H [mm]	102	102	102	102	102	102	102	111	111	111	111	111
Mass [kg]	29.5	32.5	36.0	40.0	43.0	47.0	50.0	56.0	62.5	69.0	75.5	82.0

Dimensions and Mass of the LMX1L-S37 and LMX1L-S37L Linear Motor Axis with Cover

All values in mm
h = H – 95



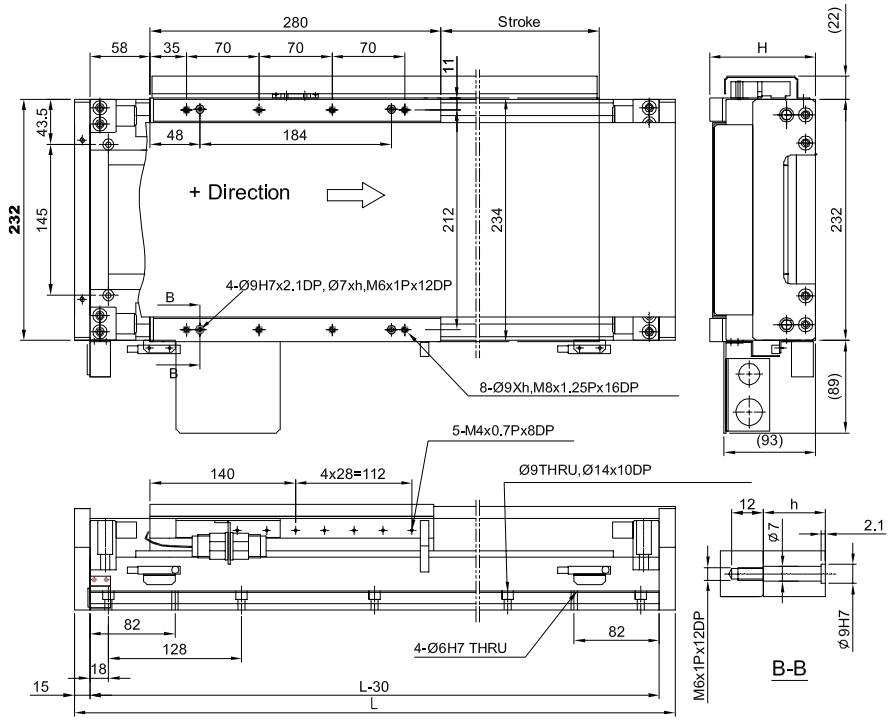
L_1 = Total length with metal cover [mm]
L_2 = Total length with bellow cover [mm]

Stroke [mm]	152	280	408	536	664	792	920	1176	1432	1688	1944	2200
Total length L_1 [mm]	578	706	834	962	1090	1218	1346	1602	1858	2114	2370	2626
Total length L_2 [mm]	576	775	976	1176	1376	1576	1776	2177	2576	2976	3376	3776
H [mm]	107	107	107	107	107	107	107	116	116	116	116	116
Mass [kg]	36	40	44	47	51	55	59	68	76	85	94	103

Positioning Systems
Linear motor axis

Dimensions and Mass of the LMX1L-S47 und LMX1L-S47L Linear Motor Axis with Cover

All values in mm
h = H – 95

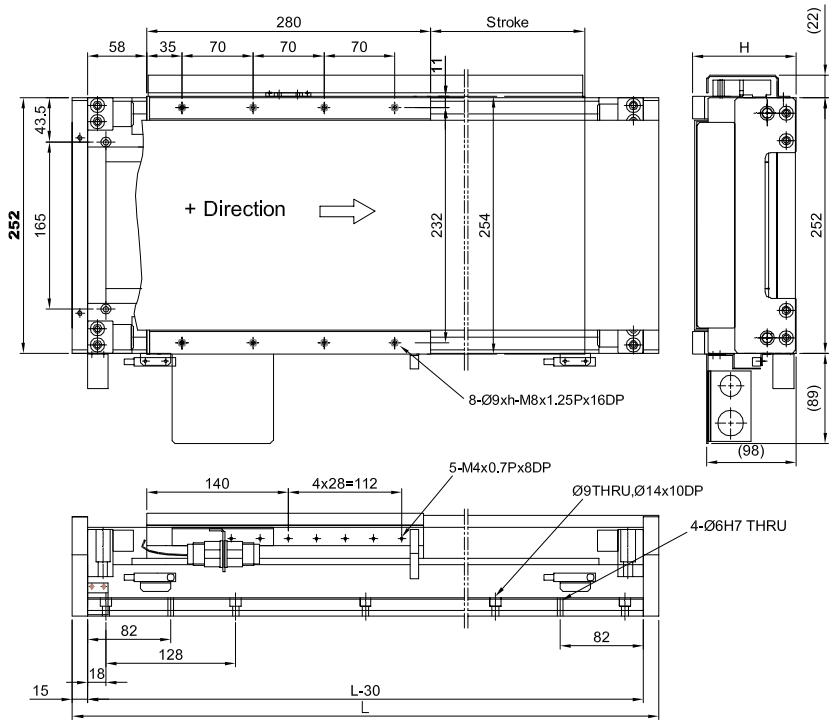


L_1 = Total length with metal cover [mm]
L_2 = Total length with bellow cover [mm]

Stroke [mm]	152	280	408	536	664	792	920	1176	1432	1688	1944	2200
Total length L_1 [mm]	578	706	834	962	1090	1218	1346	1602	1858	2114	2370	2626
Total length L_2 [mm]	576	775	976	1176	1376	1576	1776	2177	2576	2976	3376	3776
H [mm]	107	107	107	107	107	107	107	116	116	116	116	116
Mass [kg]	42	45	50	55	60	63	69	78	87	96	105	114

Dimensions and Mass of the LMX1L-S57 und LMX1L-S57L Linear Motor Axis with Cover

All values in mm
h = H – 100

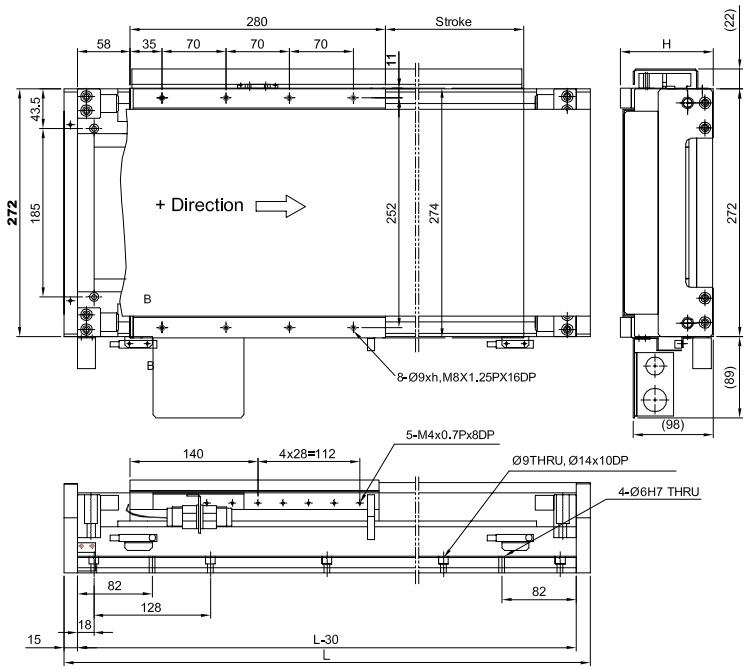


L_1 = Total length with metal cover [mm]
L_2 = Total length with bellow cover [mm]

Stroke [mm]	152	280	408	536	664	792	920	1176	1432	1688	1944	2200
Total length L_1 [mm]	578	706	834	962	1090	1218	1346	1602	1858	2114	2370	2626
Total length L_2 [mm]	576	775	976	1176	1376	1576	1776	2177	2576	2976	3376	3776
H [mm]	112	112	112	112	112	112	112	121	121	121	121	121
Mass [kg]	48.5	53.0	59.0	65.5	72.0	76.0	73.5	94.0	104.0	114.5	125.0	135.5

Positioning Systems
Linear motor axis

Dimensions and Mass of the LMX1L-S67 und LMX1L-S67L Linear Motor Axis with Cover



All values in mm
h = H – 100

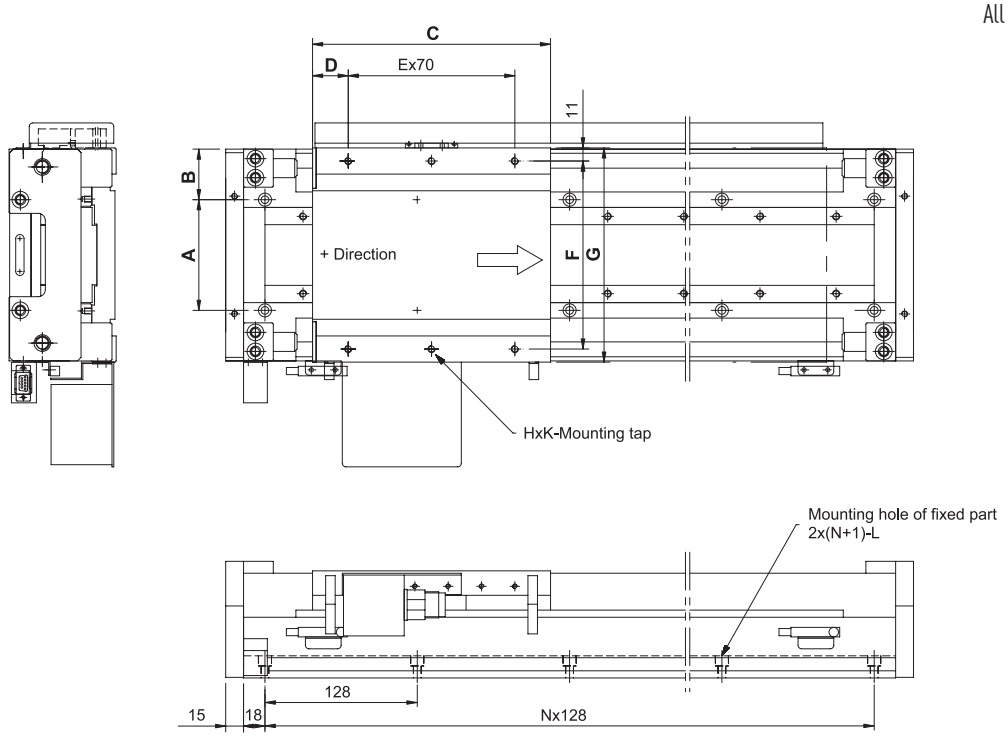
L_1 = Total length with metal cover [mm]
L_2 = Total length with bellow cover [mm]

Stroke [mm]	152	280	408	536	664	792	920	1176	1432	1688	1944	2200
Total length L_1 [mm]	578	706	834	962	1090	1218	1346	1602	1858	2114	2370	2626
Total length L_2 [mm]	576	775	976	1176	1376	1576	1776	2177	2576	2976	3376	3776
H [mm]	112	112	112	112	112	112	112	121	121	121	121	121
Mass [kg]	50	55	62	67	73	79	85	96	108	119	130	141

2.8.3 Installation Dimensions for LMX1L-S Linear Motor Axis

Connection dimensions for LMX1L-S linear motor axis

All values in mm



Connection dimensions for LMX1L-S linear motor axis, values A-L

	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	K [mm]	L [mm]
LMX1L-S23	93	42.5	200	30	2	158	180	6	M6 × 1P/12 deep	Dia. 6.5/dg*, dia. 11/8.5 deep
LMX1L-S27	93	42.5	280	35	3	158	180	8	M6 × 1P/12 deep	Dia. 6.5/dg*, dia. 11/8.5 deep
LMX1L-S37	115	43.5	280	35	3	182	204	8	M8 × 1.25P/15 deep	Dia. 9/dg*, dia. 14/10 deep
LMX1L-S37L	115	43.5	280	35	3	182	204	8	M8 × 1.25P/15 deep	Dia. 9/dg*, dia. 14/10 deep
LMX1L-S47	145	43.5	280	35	3	212	234	8	M8 × 1.25P/15 deep	Dia. 9/dg*, dia. 14/10 deep
LMX1L-S47L	145	43.5	280	35	3	212	234	8	M8 × 1.25P/15 deep	Dia. 9/dg*, dia. 14/10 deep
LMX1L-S57	165	43.5	280	35	3	232	254	8	M8 × 1.25P/15 deep	Dia. 9/dg*, dia. 14/10 deep
LMX1L-S57L	165	43.5	280	35	3	232	254	8	M8 × 1.25P/15 deep	Dia. 9/dg*, dia. 14/10 deep
LMX1L-S67	185	43.5	280	35	3	252	274	8	M8 × 1.25P/15 deep	Dia. 9/dg*, dia. 14/10 deep
LMX1L-S67L	185	43.5	280	35	3	252	274	8	M8 × 1.25P/15 deep	Dia. 9/dg*, dia. 14/10 deep

* dg = continuous

Connection dimensions for LMX1L-S linear motor axis, value N and stroke

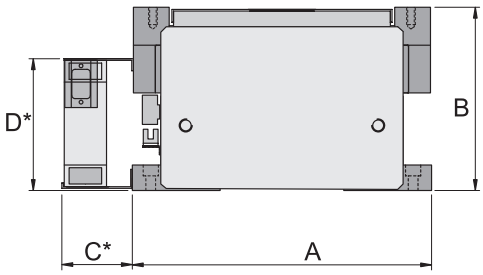
LMX1L-S23												
Stroke [mm]	104	232	360	488	616	744	872	1000	1256	1512	1768	2024
N	3	4	5	6	7	8	9	10	12	14	16	18
LMX1L-S27 (L) to -S67(L)												
Stroke [mm]	152	280	408	536	664	792	920	1176	1432	1688	1944	2200
N	4	5	6	7	8	9	10	12	14	16	18	20

Positioning Systems
Linear motor axis

2.9 LMX1L-SC7 Linear Motor Axis

LMX1L-SC7 linear motor axis are complete axis with iron-core motors. The attraction forces are cancelled thanks to the special design of the motor with arrangement of the forcer between two stators (sandwich construction). This relieves the load, especially on the guide rails.

- Very high power density
- No attraction forces are created thanks to the sandwich construction of the motor, so that the guides are not subject to static loads
- An optical or magnetic encoder measures the stroke incrementally or absolutely
- Total length up to 4000 mm
- Max. acceleration 50 m/s²
- Max. speed 4 m/s



*Dimensions C and D are customer-specific

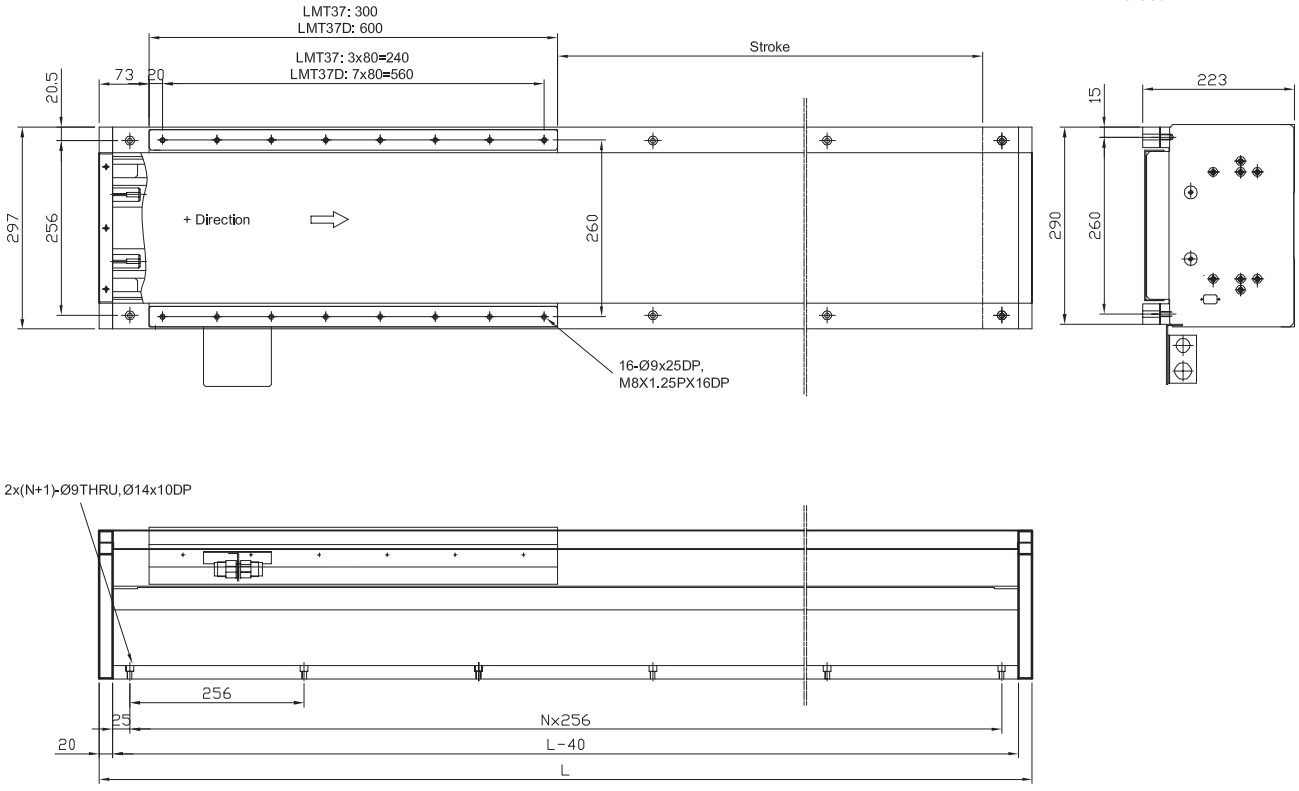
Specifications for LMX1L-T Linear Motor Axis

Name (Model number) xxxx = Stroke	Motor type	F_c [N]	F_p [N]	Mass of glider [kg]	Length of glider [mm]	v_{max} [m/s]	a_{max} [m/s²]	Dimension A [mm]	Dimension B [mm]
LMX1L-SC7-1-xxxx-A1A0	LMS C7	1070	3000	25	300	2*	50	297	223
LMX1L-SC7L-1-xxxx-A1A0	LMS C7L	1070	3000	25	300	4	50	297	223
LMX1L-SC7-2-xxxx-A1A0	LMS C7-2	2140	6000	50	600	2*	50	297	223
LMX1L-SC7L-2-xxxx-A1A0	LMS C7L-2	2140	6000	50	600	4	50	297	223

Notes: F_c = Continous power, 100 % operating time (ED), at 120 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors: see catalogue Direct Components
* Limited by back-EMF of the motor winding

Dimensions of LMX1L-T Linear Motor Axis

All values in mm



Dimensions and Mass of the LMX1L-SC7 and LMX1L-SC7L Linear Motor Axis with Cover

Stroke [mm]	388	644	900	1156	1412	1668	1924	2180	3160
Total length L [mm]	858	1124	1370	1626	1882	2138	2394	2650	3674
N	3	4	5	6	7	8	9	10	14
Mass [kg]	120	150	179	208	237	267	297	327	565

Dimensions and Mass of the LMX1L-SC7-2 und LMX1L-SC7L-2 Linear Motor Axis with Cover

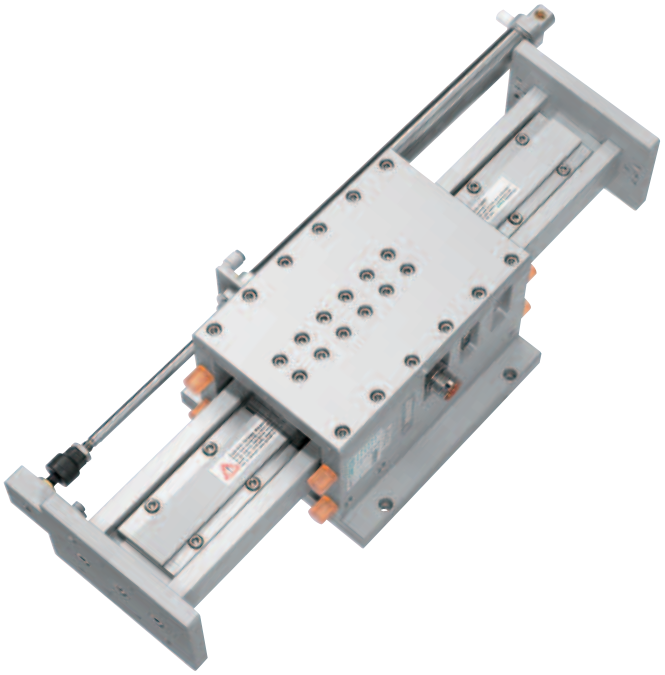
Stroke [mm]	388	644	900	1156	1412	1668	1924	2180	3160
Total length L [mm]	1114	1370	1626	1882	2138	2394	2650	2906	3930
N	4	5	6	7	8	9	10	11	15
Mass [kg]	175	205	234	263	292	322	352	382	620

Positioning Systems
Linear motor axis

2.10 LMV1L Linear Motor Axis

LMV1L linear motor axis are equipped with an iron-core motor, which provides substantial continuous force. These axis are equipped with pneumatic weight compensation as a standard to ensure high dynamics in a vertical direction. The moving distance is measured incrementally or absolutely via optical or magnetic encoders depending on requirements.
LMV1L linear motor axis are ideal for applications with a gripper connection, in which the gripper extends completely out of the transfer area. The moved working load is approx. 20 kg.

- Max. acceleration 30 m/s^2
- Max. speed 1.8 m/s



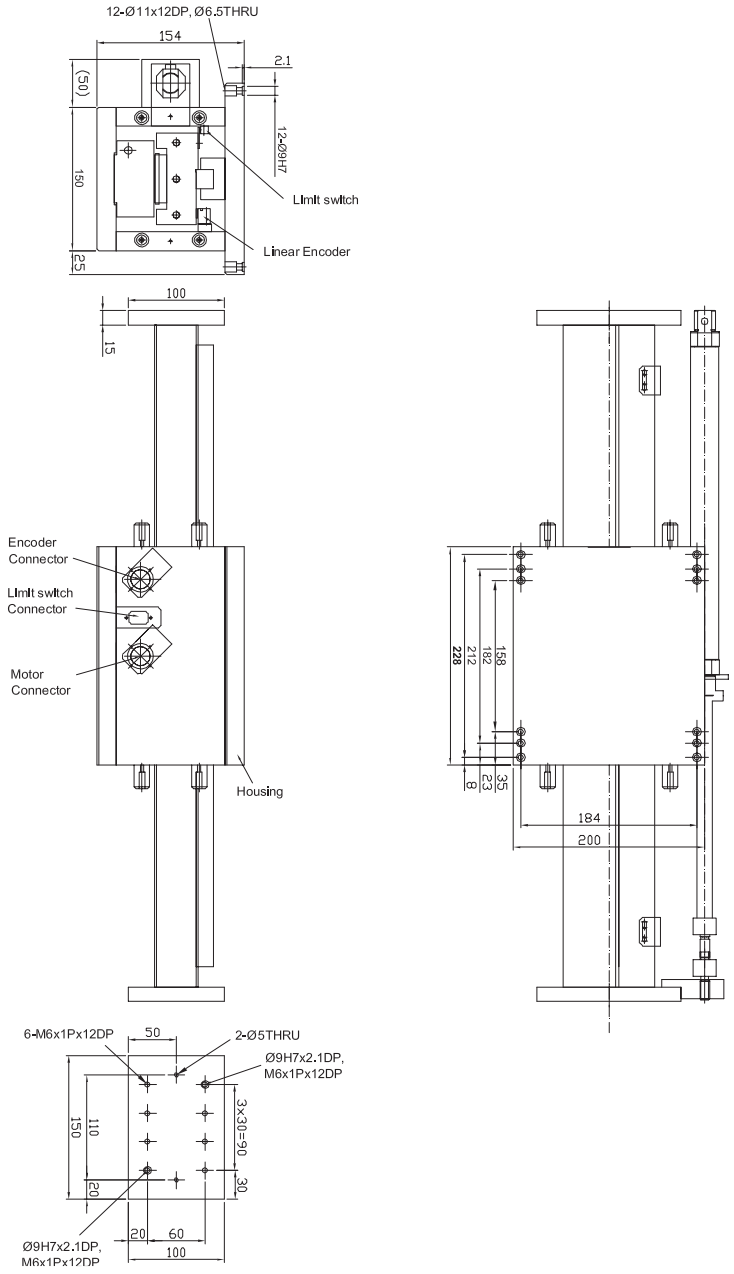
Specifications for LMV1L linear motor axis

Name (Model number)	Motor type	F_c [N]	F_p [N]	Mass of glider [kg]	v_{max} [m/s]	a_{max} [m/s^2]	Stroke [mm] [mm]
LMV1L-S13-1-120-A100	LMS 13	180	470	6	1.8	30	120
LMV1L-S13-1-250-A100	LMS 13	180	470	8	1.8	30	250
LMV1L-S23-1-250-A100	LMS 23	220	600	10	1.8	30	250
LMV1L-S23-1-400-A100	LMS 23	220	600	12	1.8	30	400

Notes: F_c = Continuous power, 100 % operating time (ED), at 120 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors: see catalogue Direct Components

Dimensions of LMV1L linear motor axis

All values in mm



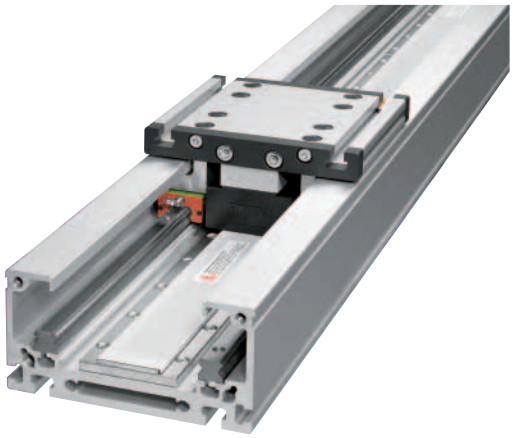
Total length and mass of the LMV1L linear motor axis

Model number	Stroke [mm]	Total length L [mm]	Mass [kg]
LMV1L-S13-1-120-A100	120	444	15
LMV1L-S13-1-250-A100	250	572	19
LMV1L-S23-1-250-A100	250	572	26
LMV1L-S23-1-400-A100	400	722	29

Positioning Systems
Linear motor axis

2.11 LMH1L Linear Motor Axis

Linear guideways and linear motor rare integrated in the Al-profile of the LMH-axis. This enables a very compact construction. The linear motor axes LMH1L are available in three profile sizes of 160, 200 and 240 mm width.



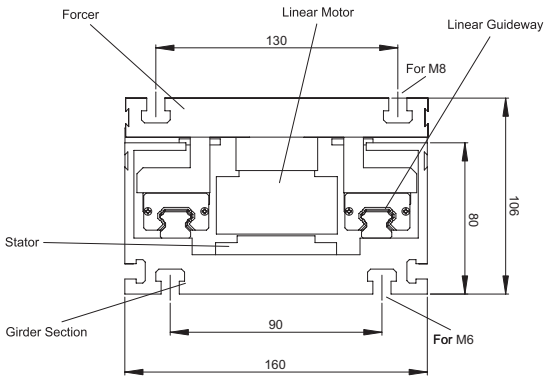
2.11.1 LMH1L-S1

The LMH1L-S1 portal axis equipped with linear motors are designed as a complete axis with strokes up to 30 m. Several gliders can be positioned independently of each other using the linear motor technology. The distance is measured incrementally and enables positioning accuracy up to 0.05 mm. An absolute measuring system can be built in as an option.

- Max. acceleration 50 m/s²
- Max. speed 4 m/s
- Up to 30 m stroke

Connection Dimensions for LMH1L-S1 Linear Motor Axis

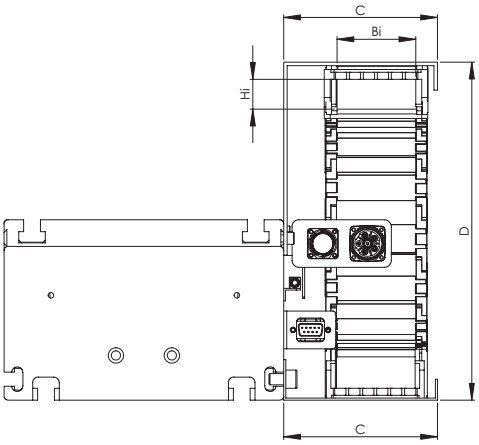
Installation notes: The axis are attached to the machine bed using T-slots. The customer mechanism is also attached using T-slots on the glider.



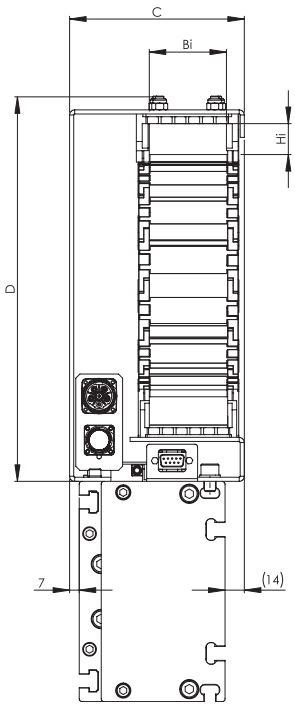
All values in mm

Dimension of power feed

Power feed alignment	C [mm]	D [mm]	Internal dimension $B_i \times H_i$ [mm]
Horizontal	110	245	57 × 25
Vertical	127	260	57 × 25



Power feed horizontal



Power feed vertical

Specifications for LMH1L-S1 Linear Motor Axis

Name (Model number) xxxx = stroke [mm]	Motor type	F_c [N]	F_p [N]	Mass of glider [kg]	Length of glider [mm]	v_{max} [m/s]	a_{max} [m/s²]	Mass of the girder [kg/m]
LMH1L-S13-1-xxxx-C000	LMS 13	220	560	7	251	4	50	20
LMH1L-S17-1-xxxx-C000	LMS 17	260	650	10	360	4	50	20
LMH1L-S17D-1-xxxx-C000	LMS 17D	520	1300	20	601	4	50	20

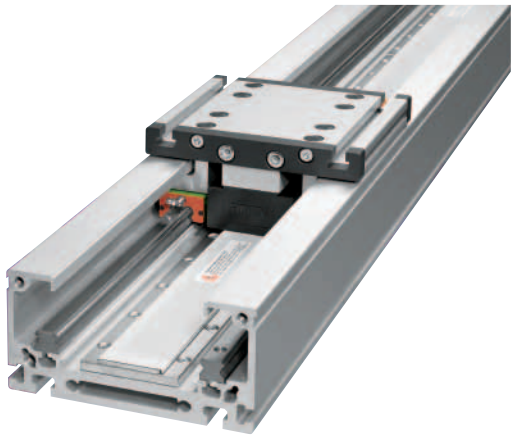
Notes: F_c = Continuous power, 100 % operating time (ED), at 120 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors: see catalogue Direct Components

2.11.2 LMH1L-S2

The LMH1L-S2 portal axis equipped with linear motors are designed as a complete axis with strokes up to 30 m. Several gliders can be positioned independently of each other using the linear motor technology. The distance is measured incrementally

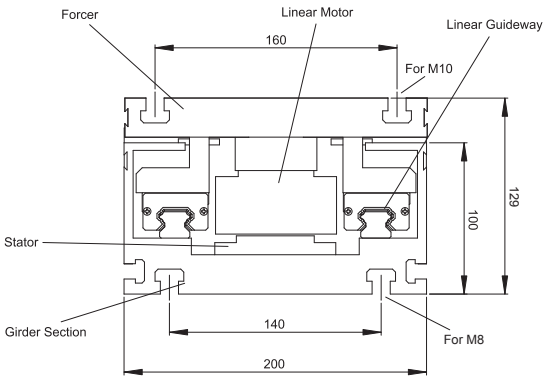
and enables positioning accuracy up to 0.05 mm. An absolute measuring system can be built in as an option.

- Max. acceleration 50 m/s²
- Max. speed 4 m/s
- Up to 30 m stroke



Connection Dimensions for LMH1L-S2 Linear Motor Axis

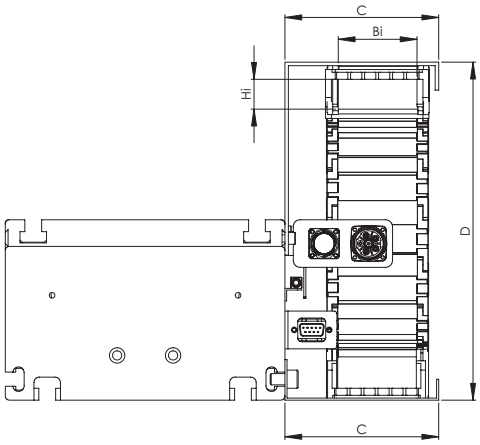
Installation notes: The axis are attached to the machine bed using T-slots. The customer mechanism is also attached using T-slots on the glider.



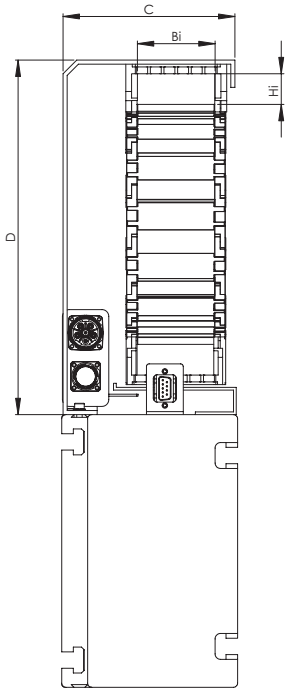
All values in mm

Dimension of power feed

Power feed alignment	C [mm]	D [mm]	Internal dimension $B_i \times H_i$ [mm]
Horizontal	110	245	57 × 25
Vertical	128	260	57 × 25



Power feed horizontal



Power feed vertical

Specifications for LMH1L-S2 Linear Motor Axis

Name (Model number) xxxx = stroke [mm]	Motor type	F_c [N]	F_p [N]	Mass of glider [kg]	Length of glider [mm]	v_{max} [m/s]	a_{max} [m/s²]	Mass of the girder [kg/m]
LMH1L-S23-1-xxxx-D000	LMS 23	270	720	8	250	4	50	28
LMH1L-S27-1-xxxx-D000	LMS 27	415	1080	11	343	4	50	28
LMH1L-S27D-1-xxxx-D000	LMS 27D	830	2160	22	600	4	50	28

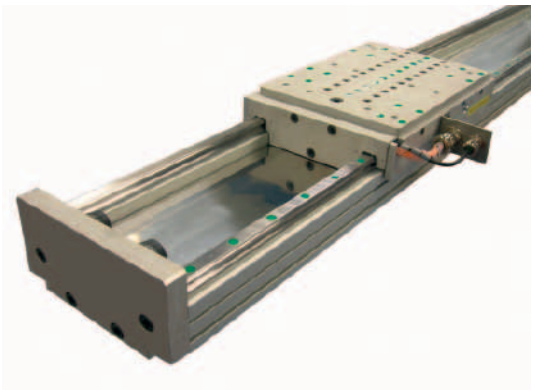
Notes: F_c = Continuous power, 100 % operating time (ED), at 120 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors: see catalogue Direct Components

Positioning Systems
Linear motor axis

2.11.3 LMH1L-S4 Linear Motor Axis

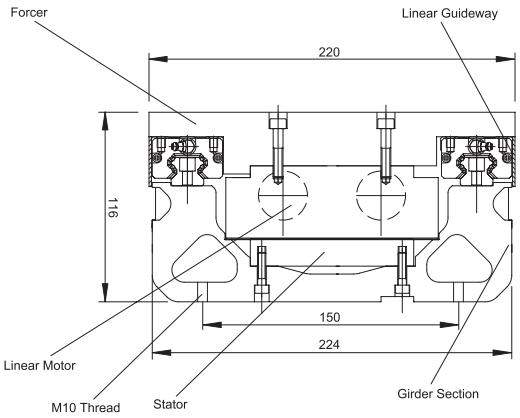
The portal axis LMH1L-S4 equipped with linear motors is designed as a complete axis with strokes up to 30 m for very high continuous forces. Several gliders can be positioned independently of each other using the linear motor technology. The stroke is measured incrementally and enables positioning accuracy up to 0.05 mm. An absolute measuring system can be built in as an option.

- Max. acceleration 50 m/s²
- Max. speed 4 m/s
- Up to 30 m stroke



Connection Dimensions for LMH1L-S4 Linear Motor Axis

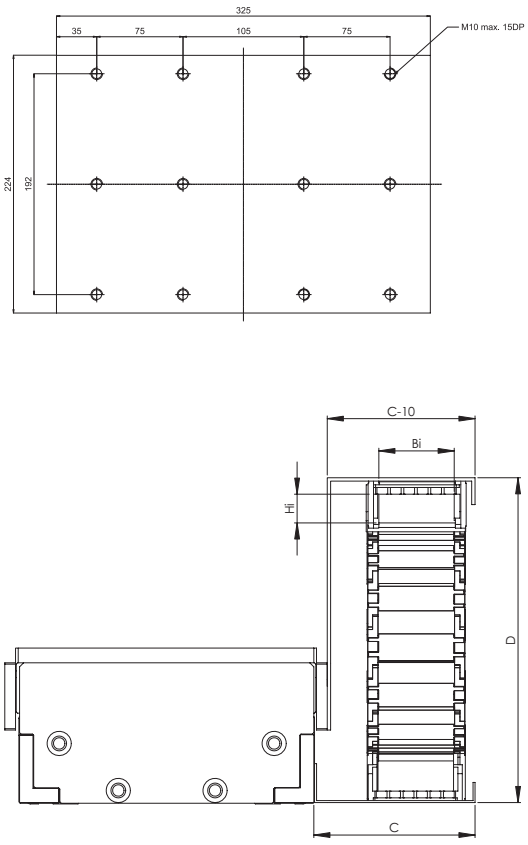
Installation note: Mounting of the connection mechanism via M10 threads at distances of 120 mm.



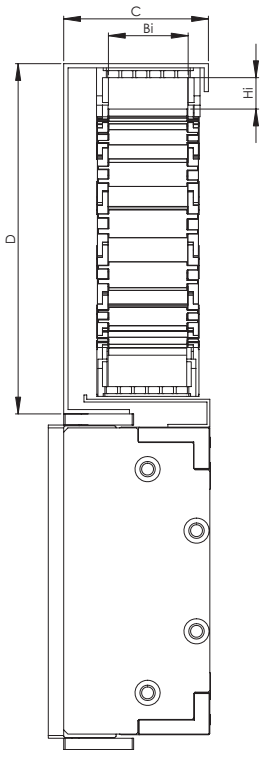
Dimension of power feed

Power feed alignment	C [mm]	D [mm]	Internal dimension $B_i \times H_i$ [mm]
Horizontal	110	245	57 × 25
Vertical	105	260	57 × 25

Dimensions of mounting area



Power feed horizontal



Power feed vertical

Specifications for LMH1L-S4 Linear Motor Axis

Name (Model number) xxxx = stroke [mm]	Motor type	F_c [N]	F_p [N]	Mass of glider [kg]	Length of glider [mm]	v_{max} [m/s]	a_{max} [m/s²]	Mass of the girder [kg/m]
LMH1L-S47L-1-xxxx-D000	LMS 47L	790	2040	19	325	4	50	37
LMH1L-S47LD-1-xxxx-D000	LMS 47LD	1580	4080	36	600	4	50	37

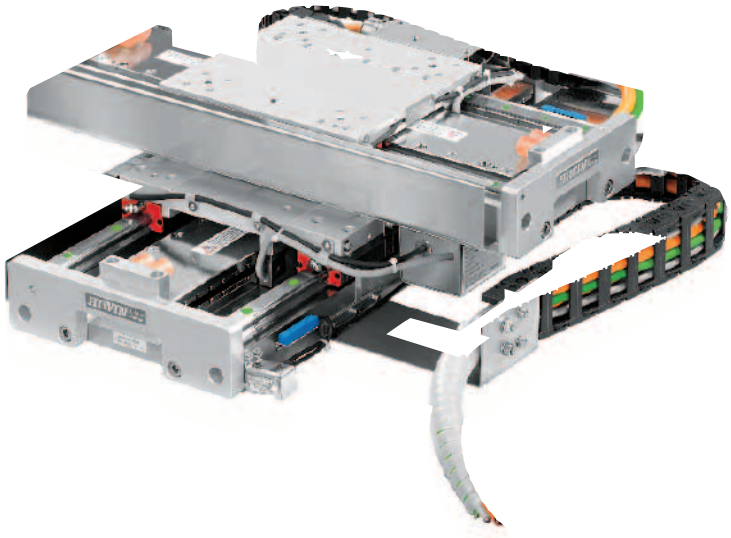
Notes: F_c = Continuous power, 100 % operating time (ED), at 120 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors: see catalogue Direct Components

2.12 Cross Tables

The linear motor axis of the LMX series can be combined to form cross tables. The structure of the model number shows that almost any combination of LMX axis is possible. A cross table with LMX2E axis is shown in Chapter 2.12.1. Chapter 2.12.2 shows a cross table with LMX2L axis.

2.12.1 LMX2E-CB5-CB8 Cross Table

- Equipped with coreless linear motors
- Slight inertia and fast acceleration
- No cogging
- Extremely stiff aluminum frame with low profile
- Simple assembly



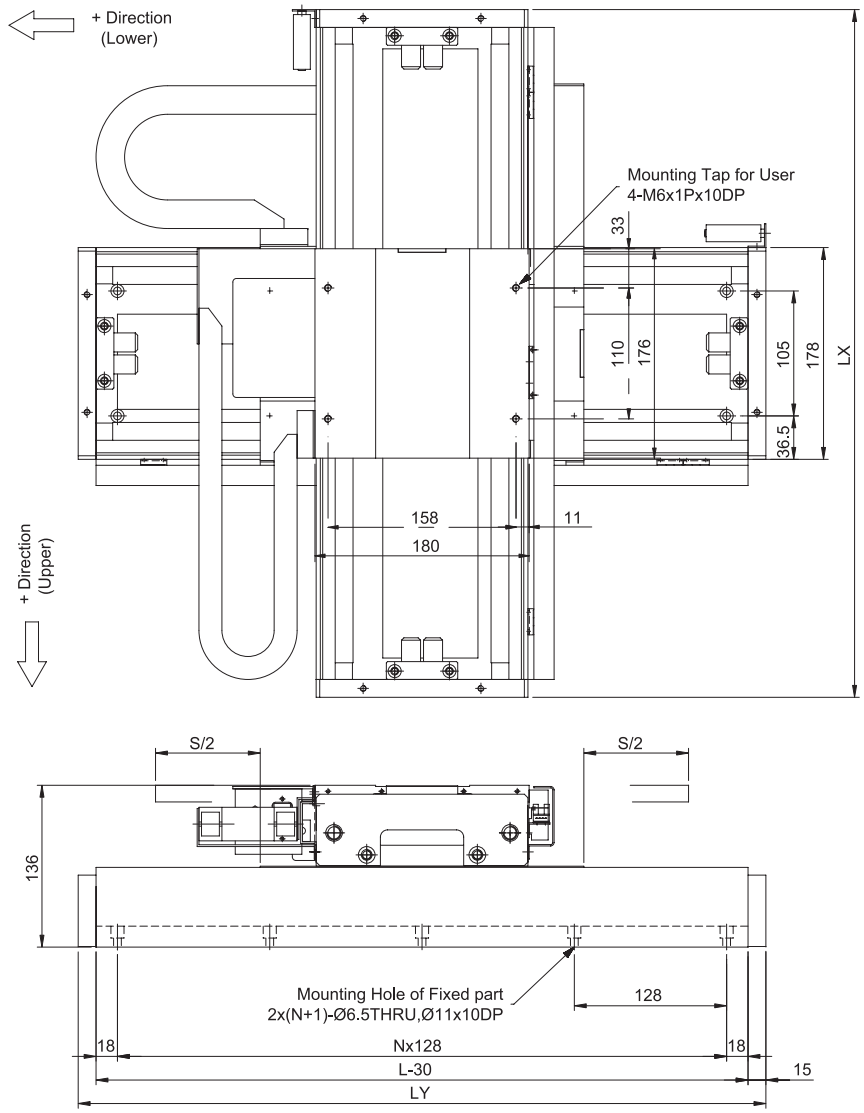
Specifications for LMX2E-CB5-CB8 cross table

Name (Model number) xxxx = stroke [mm]	Orthogonality [arc-sec]	Repeatability [mm]	v_{max} [m/s]	a_{max} [m/s²]	Motor type	Fc [N]	Fp [N]	Mass of glider [kg]
LMX2E-CB5 CB8-xxxx-xxxx-A1	± 10	± 0.002	5	100	Upper axis: LMC B5	91	364	2.5
					Lower axis: LMC B8	145	580	Mass lower axis + 4.0

Notes: F_c = Continuous power, 100 % operating time (ED), at 100 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors: see catalogue Direct Components

Dimensions of LMX2E-CB5-CB8 cross table

All values in mm

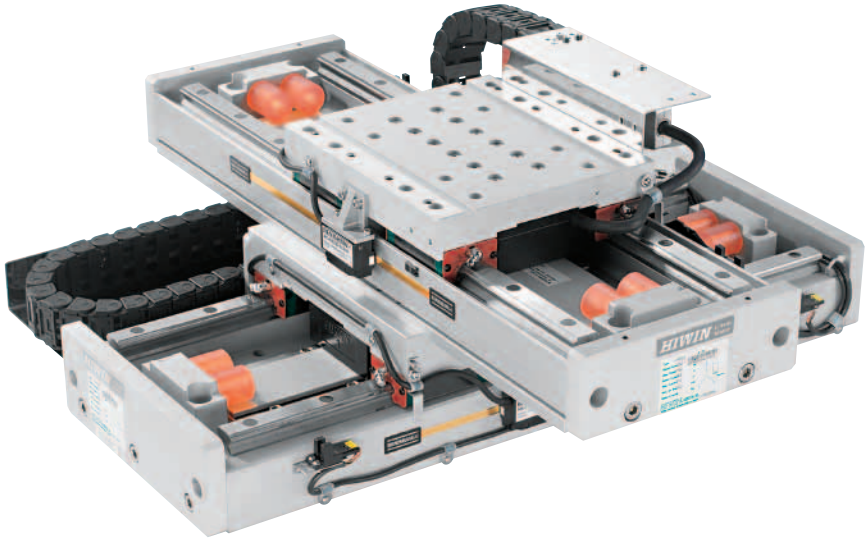


Connection dimensions and mass of the LMX2E-CB5-CB8 cross table with three stroke examples

Name (Model number)	Stroke (upper/lower) [mm]	Total length (LX × LY) [mm]	N [mm]	Mass (upper axis) [kg]	Mass (XY axis) [kg]
LMX2E-CB5-CB8-144-176-A1	144 × 179	450 × 578	4	19	42
LMX2E-CB5-CB8-272-304-A1	272 × 304	578 × 706	5	22.5	49.5
LMX2E-CB5-CB8-432-400-A1	400 × 432	706 × 834	6	26	57

2.12.2 LMX2L-S23-S27 Cross Table

- Equipped with iron-core linear motors
- Higher force and fast acceleration
- Extremely stiff aluminum frame with low profile
- Simple assembly



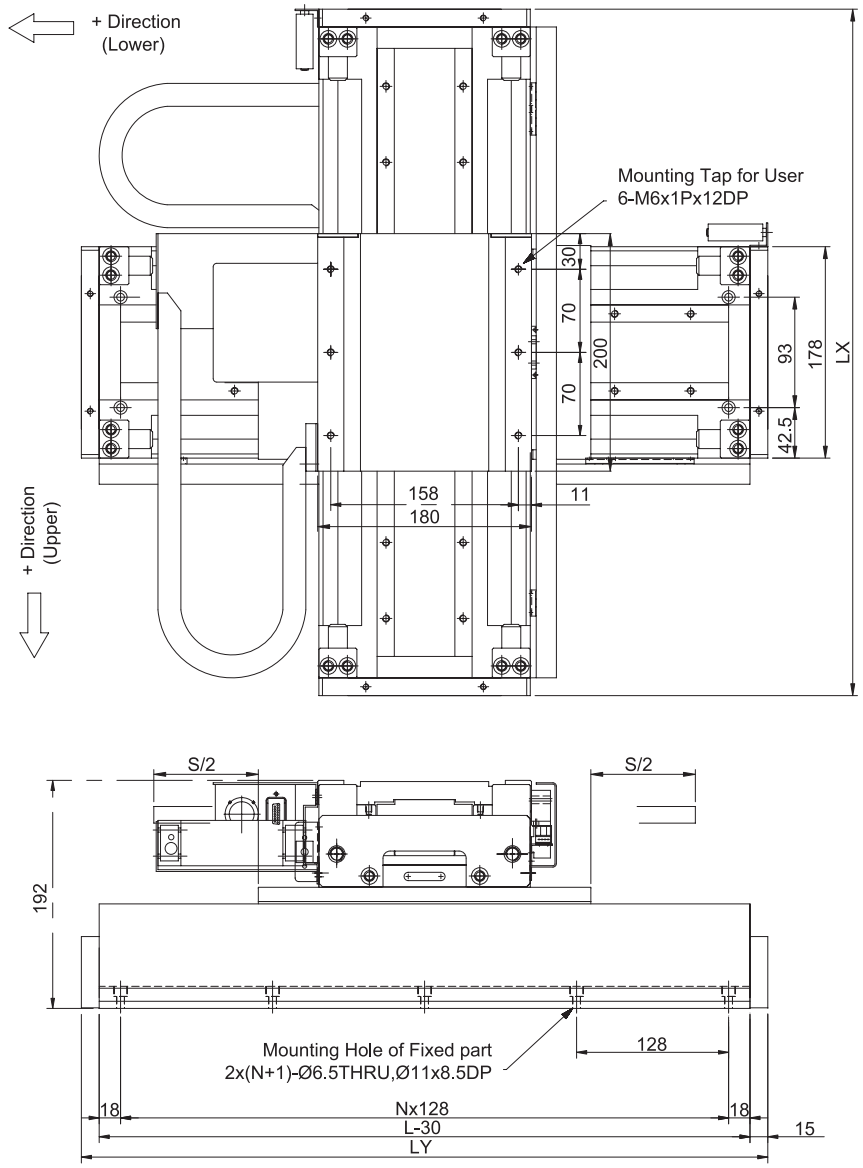
Specifications for LMX2L-S23-S27 cross table

Name (Model number) xxxx = stroke [mm]	Orthogonality [arc-sec]	Repeatability [mm]	v_{max} [m/s]	a_{max} [m/s²]	Motor type	Fc [N]	Fp [N]	Mass of glider [kg]
LMX2L-S23 S27-xxxx-xxxx-A1	± 10	± 0.002	4	50	Upper axis: LMS 23	270	720	7.5
					Lower axis: LMS 27	415	1080	Mass upper axis + 9.5

Notes: F_c = Continuous power, 100 % operating time (ED), at 120 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors: see catalogue Direct Components

Dimensions of LMX2L-S23-S27 cross table

All values in mm

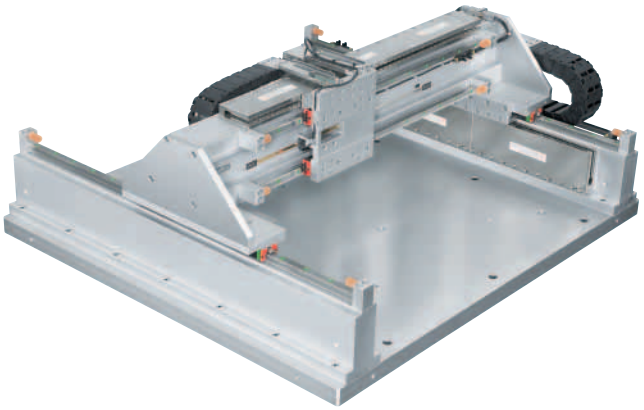


Connection dimensions and mass of the LMX2L-S23-S27 cross table with three stroke examples

Name (Model number)	Stroke (upper/lower) [mm]	Total length (LX × LY) [mm]	N [mm]	Mass (upper axis) [kg]	Mass (XY axis) [kg]
LMX2L-S23-S27-232-280-A1	232 × 280	578 × 706	5	26	58.5
LMX2L-S23-S27-360-408-A1	360 × 408	706 × 834	6	29.5	65.5
LMX2L-S23-S27-706-536-A1	706 × 536	706 × 962	7	29.5	70

2.13 Gantry Systems

The standardized gantry systems of the LMG2A series are systems with one-sided step bearings. The LMG2A-C type has coreless linear motors. The LMG1A-S type is driven by iron-core linear motors.



2.13.1 LMG2A-CB6 CC8 Gantry System

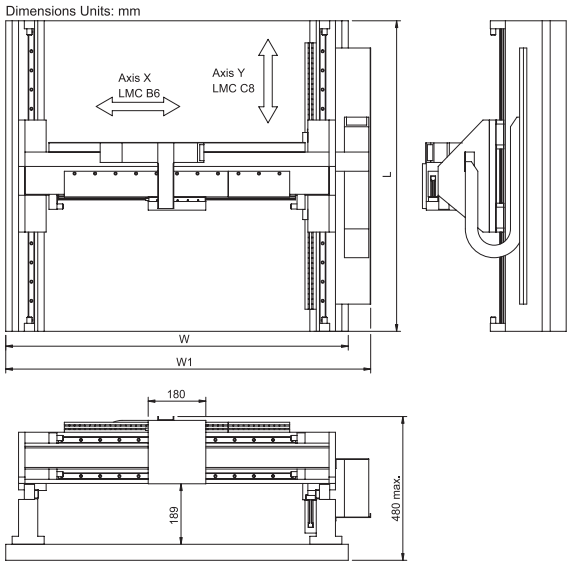
- Equipped with coreless linear motors
- Slight inertia and fast acceleration
- No cogging
- Stiff aluminum bridge
- Simple assembly

Specifications for LMG2A-CB6 CC8 gantry system

Name (Model number) xxxx = Stroke [mm]	Orthogonality [arc-sec]	Repeatability [mm]	v_{max} [m/s]	a_{max} [m/s²]	Motor type	F_c [N]	F_p [N]	Mass of the glider [kg]
LMG2A-CB6 CC8-xxxx-xxxx-A1	± 10	± 0.002 / 0.004	5	100	Upper axis: LMC B6	109	436	3.0
					Lower axis: LMC C8	195	780	Mass upper axis + 3.5

Notes: F_c = Continuous power, 100 % operating time (ED), at 100 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors: see catalogue Direct Components

Dimensions of the LMG2A-CB6 CC8 gantry system



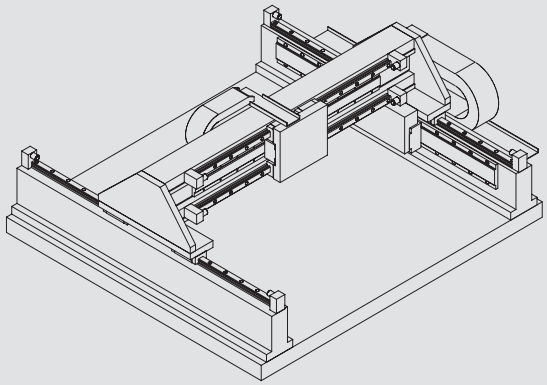
Dimensions of the LMG2A-CB6 CC8 gantry system with four stroke examples

Type (Model number)	Stroke X axis [mm]	Stroke Y axis [mm]	Dimensions W [mm]	W1 [mm]	L [mm]
LMG2A-CB6 CC8-0300-0400-A1	300	400	870	940	870
LMG2A-CB6 CC8-0500-0500-A1	500	500	1070	1140	970
LMG2A-CB6 CC8-0750-0750-A1	750	750	1390	1390	1220
LMG2A-CB6 CC8-0750-1000-A1	750	1000	1390	1390	1470

Positioning Systems
Linear motor axis

2.13.2 LMG2A-S13 S27 Gantry System

- Equipped with iron-core linear motors
- Higher force and fast acceleration
- Less cogging and constant speed
- Stiff aluminum bridge
- Simple assembly



Specifications for LMG2A-S13 S27 gantry system

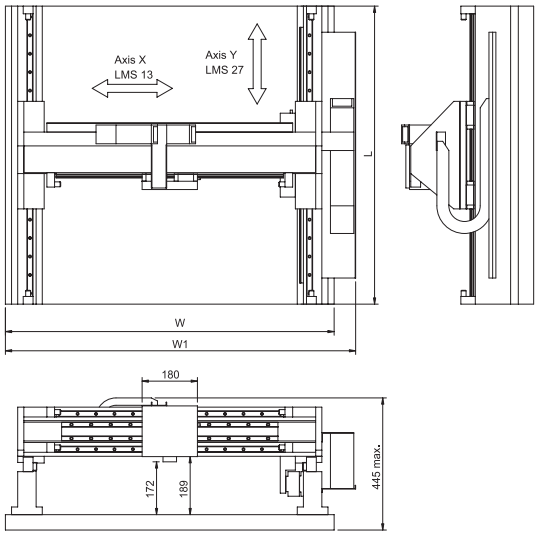
Name (Model number) xxxx = Stroke [mm]	Orthogonality [arc-sec]	Repeatability [mm]	v_{max} [m/s]	a_{max} [m/s²]	Motor type	Fc [N]	Fp [N]	Mass of Glider [kg]
LMG2A-S13 S27-xxxx-xxxx-A1	± 10	± 0.002 / 0.004	4	50	Upper axis: LMS 13	220	560	5.0
					Lower axis: LMS 27	415	1080	Mass upper axis + 7.0

Notes: F_c = Continuous power, 100 % operating time (ED), at 120 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors: see catalogue Direct Components

Dimensions of LMG2A-S13 S27 gantry system with four stroke examples

Type (Model number)	Stroke X axis [mm]	Stroke Y axis [mm]	Dimensions W [mm]	W1 [mm]	L [mm]
LMG2A-S13 S27-0300-0400-A1	300	400	870	940	870
LMG2A-S13 S27-0500-0500-A1	500	500	1070	1140	970
LMG2A-S13 S27-0750-0750-A1	750	750	1320	1390	1220
LMG2A-S13 S27-0750-1000-A1	750	1000	1320	1390	1470

Dimensions of LMG2A-S13 S27 gantry system



Dimensions Units: mm

3. Customized Positioning Systems

The standardized positioning stages shown in this catalog are designed to handle many different kinds of positioning tasks. For positioning tasks that cannot be solved using standard stages, application engineers are available to work out an optimized solution.

A few customized solutions are shown on the next four pages. Sometimes only the mechanics are customized. In the planar motor example, the customized solution used special software for optimum integration of the positioning system in the production process.

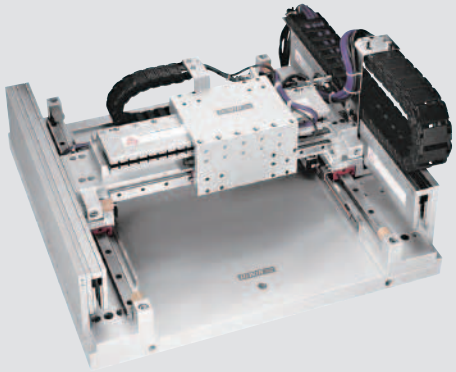
3.1 Examples

Economic Installation and Inspection
XY gantry systems make many applications extremely economical. Setup of the gantry from standard components.

- Standard axis of the LMX1L series
- Repeatability ± 2 µm
- Supplied with machine bed

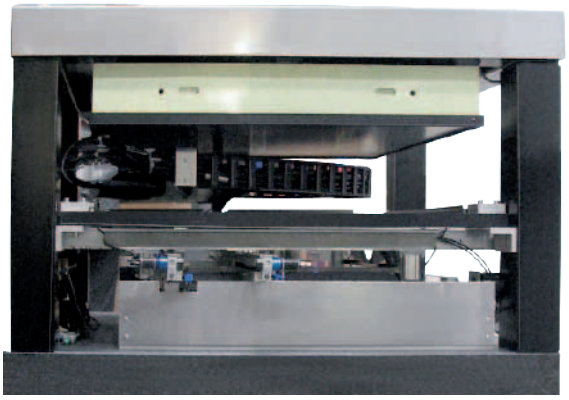
Micro shapes and Macroshapes
Milling and microstructures with cutting tools and lasers are application areas in which gantry systems can deliver a number of benefits. They are also an excellent buy for your money.

- Coreless LMC motors
- Repeatability ± 2 µm
- Tried and tested technology with high output



Planar motors
Servo-planar motors offer an excellent technological platform for inspection tasks. In inspection of printed circuit boards, they have an optical sensor for complete monitoring of printed conductive tracks and SMD components.

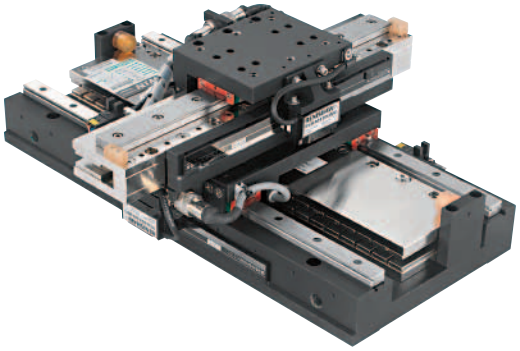
- Air-cushion bearing ensures minimum wear
- Guaranteed levelness for the complete stroke (up to 1000 mm × 1000 mm)
- Repeatability ± 3 µm



Positioning Systems
Linear motor axis

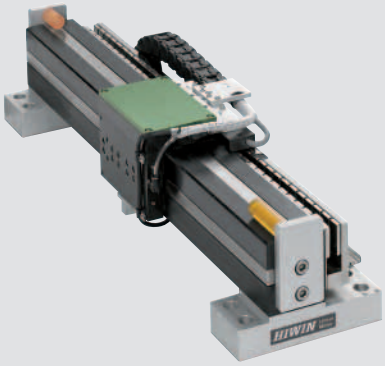
Wafer quality control at the highest level
High precision X-Y Stages with air-cushions are the prerequisites for surface monitoring, which even find the smallest errors, for example, in wafer production for the electronics and chip industries.

- Flatness ± 2 µm
- Repeatability ± 2 µm
- Accuracy ± 5 µm
- Resolution 5 nm



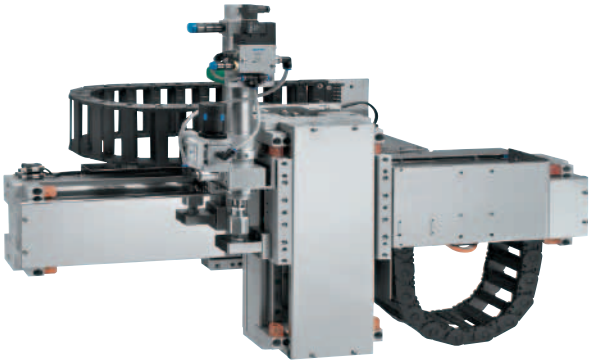
Micro-system Technology and Wafer Processing
Absolute precision and suitability for clean room conditions are the prerequisites for every drive in microsystem technology and wafer processing.
Linear motor X-Y Stages are ideal for these tasks.

- Stroke 200 mm × 200 mm, optional 300 mm × 300 mm
- Flatness ± 4 µm across the complete stroke
- Repeatability ± 1 µm across both axes
- Accuracy ± 4 µm across both axes
- Clean room suitability class 100, optional class 10
- Optionally suitable for vacuums up to 10^{-3} mbar



Overview for Laser Scanners
High degree of synchronization and extended operating lives are a must for optical inspection systems such as laser scanners.
Linear Motors with air bearings fulfill these requirements.

- No friction thanks to air bearings
- No cogging thanks to coreless linear motors
- Stroke up to 1,500 mm

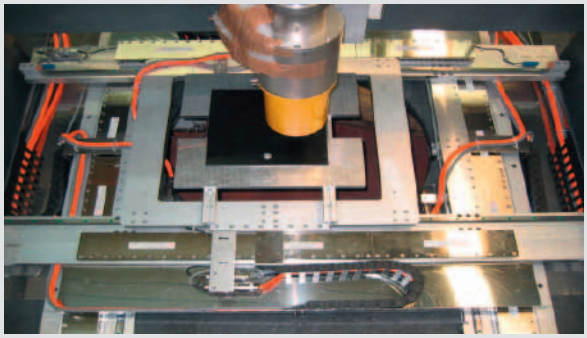


Photovoltaic-panel assembly
High dynamic positioning of Silicium-cells for 24 hours each day.

- Linear motors also in vertical axes enable a long durability
- Vertical axes with adjustable mass compensation and clamping element for emergeny-stop.

X-ray-inspection of printed circuit boards
Delivery of the whole linear-motor-system consisting of Linear motor axis, drives, cables for an inline-inspection-machine.

- System with Coreless LMC-components
- High dynamic in spite of 100 kg mass to move
- Stroke: 550 × 550 mm
- Repeatability: ± 1µm

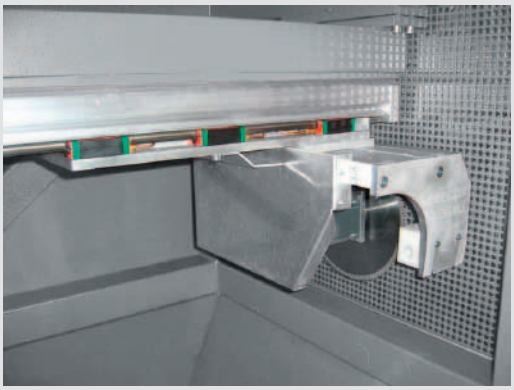


Automatic assembly
Dynamic Assembly of circuit boards in fully automated assembly lines.

- Gantry system with LMS-components and KK-stage (Z-axis)
- Stroke: 650 × 660 × 135 mm
- Acceleration: 20 m/s²
- Flatness: ± 20 µm
- Rectangularity: 0.01°
- Interferometrical survey of the axis
- Delivery ready assembled in the base frame

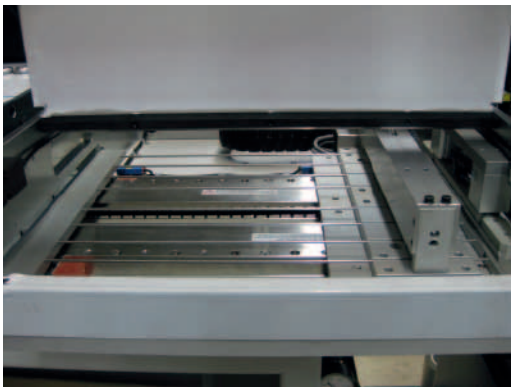
Moveable Saw
Linear Motor Axis enables the cutting during the transport of bars.

- Customised LM-system with LMS47D
- Cycle time approx. 1.3 s (mass: 55 kg, Stroke: 1.5 m)
- Speed: 3 m/s
- Acceleration: 22 m/s²

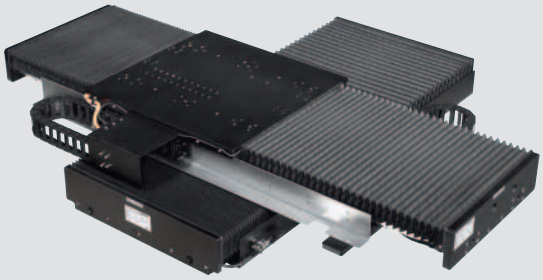


Film transport
Compact and flat linear motor axis with high power density integrated in the production line.

- Two parallel LMC-axis
- Stroke: 300 mm
- All components assembled on a customised base frame 600 × 500 mm

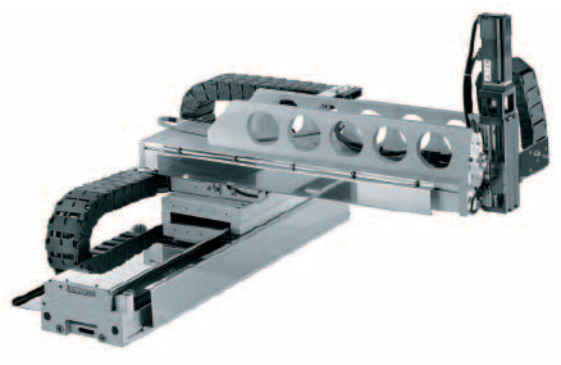


Positioning Systems
Linear motor axis



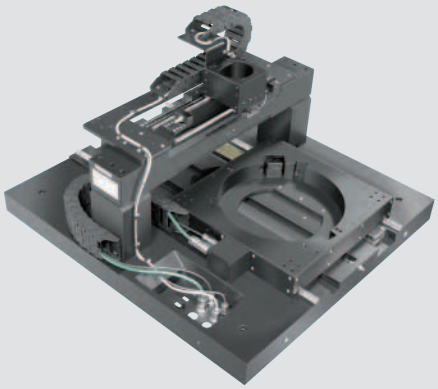
Laser trimming
Optimal results make a high demand on evenness and rectangularity on a large stroke. Themetal particles of the laser machining necessitate the bellow cover.

- Cross table with bellow cover
- Stroke: 700 × 750 mm
- Repeatability: ± 2 µm
- Flatness: ± 0.01 / 300 mm
- Rectangularity: ± 5 arcsec



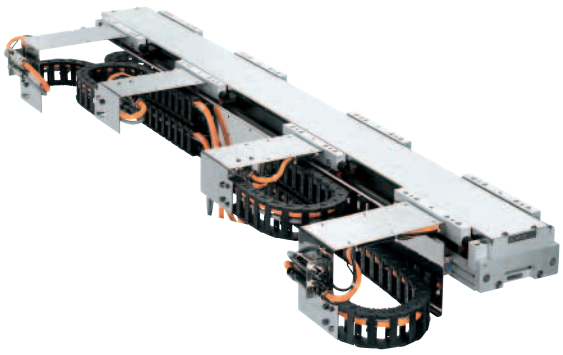
Dispenser
Highest requirements on the flatness.

- Stroke of cross table: 150 × 250 × 60 mm
- High Stiffness of the lower axes due the steel frame
- Upper axes stiffened by aluminium profile
- Creation of a Calibration chart to compensate the deviation of the flatness



Laser scriping
High Accuracy due the use of glass scales.

- Customised LMC-linear motor system
- Lower axis is positions the part. Upper axis operates the Laser
- Stroke: 400 × 110 mm
- Repeatability: ± 1µm
- Rectangularity: 8 µm
- Flatness: ± 5 µm



Laser Exposure
Excelent results enabled due the very smooth motion of the coreless linear motor axes.

- 4 forcers on each axes
- Optimised adaptation of the profile of the existing frame

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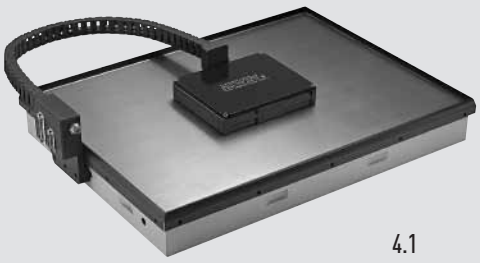
Motion Control & Systems



4.1

4. Planar Servo Motors and Planar Motors

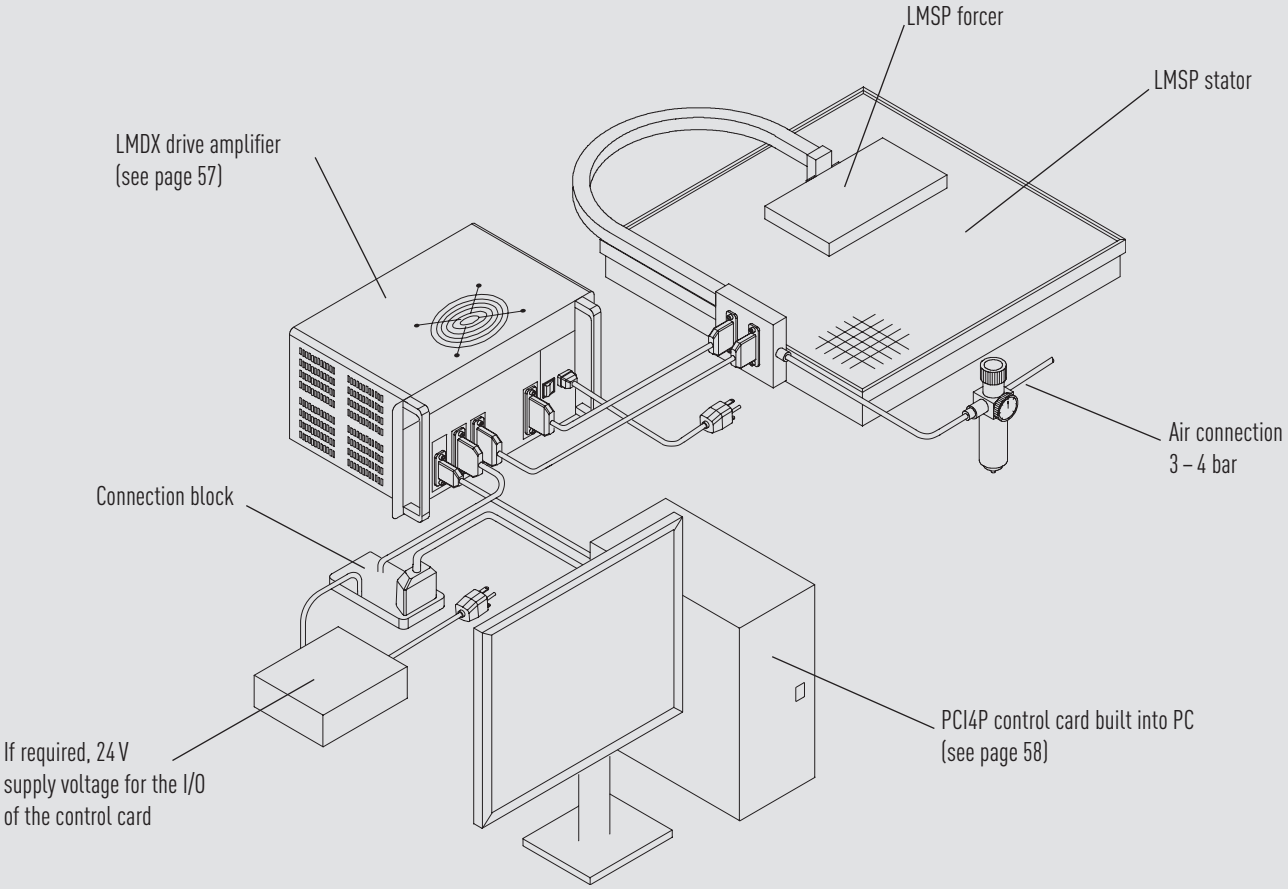
XY movements with air suspension through A planar servo stepping motor with integrated stroke measurement. Can be operated above head and even in a vacuum.

4.1 LMSP Planar Servo Motor

LMSP planar servo motors are equipped with integrated stroke measurement sensors and work with position control (closed loop).

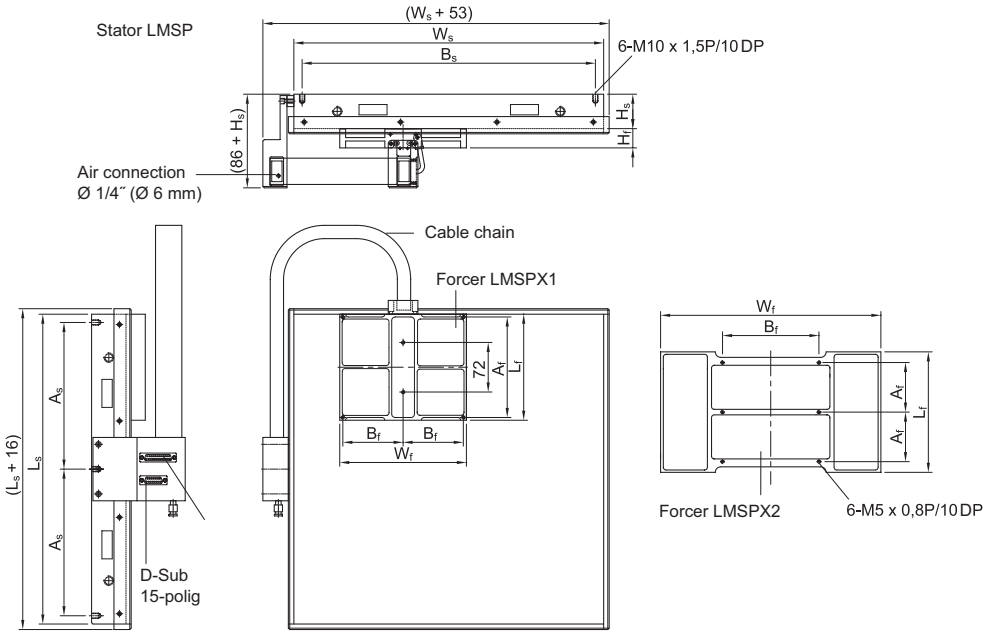
- XY table
- Closed loop thanks to integrated distance measurement
- Stepping motor facilitates the use of simple drive electronics
- Air suspension free of wear
- No externally measurable magnetic fields
- Practically no heating up
- Can be built in above head
- Stator area up to 1000 × 1000 mm
- Can be used in vacuums

4.1.1 Configuration of LMSP with LMDX Servo Driver



4.1.2 Specifications for the LMSP Planar Servo Motor

Connection dimensions for the LMSP Planar Servo Motor
(For W_f values see Table 4.1, for W_s values see Table 4.2)



All values in mm

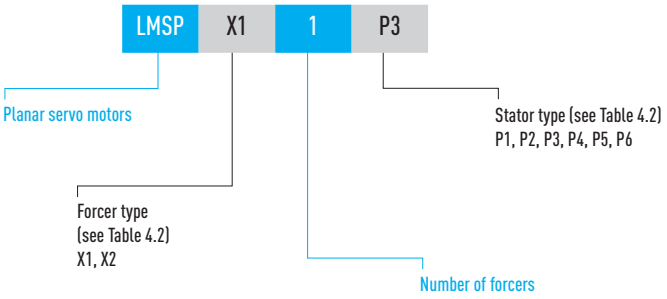
Table 4.1 **Specifications for the LMSP Planar Servo Motor**

		Symbol	Unit	LMSPX1	LMSPX2
Performance	Max. force	T_m	N	75	140
	Resolution	R_s	mm	0.001	0.001
	Repeatability	R_p	mm	0.002	0.002
	Accuracy	A_c	mm	± 0.015	± 0.015
	Max. speed	V	m/s	0.9	0.8
	Max. load	—	kg	12.2	24.3
Forcer	Length	L_f	mm	154	175
	Width	W_f	mm	184	320
	Height	H_f	mm	28	30
	Air pressure	P_a	kg/cm^2	3 – 4	3 – 4
	Air flow rate	F_a	l/min	6.4	11
	Mass	M_f	kg	1.8	3.7
	Distance between fixing holes	$A_f \times B_f$	mm × mm	146 × 87.5	72 × 140

Table 4.2 **Dimensions and mass of stators LMSP-P1 to LMSP-P6**

		Unit	P1	P2	P3	P4	P5	P6
Dimensions of stator $L_S \times W_S$		mm	350 × 330	450 × 450	600 × 450	600 × 600	1000 × 600	850 × 850
Max. stroke	**LMSPX1**	mm	190 × 140	290 × 260	440 × 260	440 × 410	840 × 410	690 × 660
(one forcer)	**LMSPX2**	mm	–	270 × 125	420 × 125	420 × 275	820 × 275	670 × 525
Height of stator		mm	50	50	70	70	100	120
Mass of stator		kg	27	36	52	66	120	250
Distance A between fixing holes $_S \times B_S$		mm	165 × 310	213 × 426	288 × 426	288 × 576	(318-324-318) × 280	400 × 400
n = (number of fixing holes)			6	6	6	6	10	9

4.1.3 Model Numbers for LMSP Planar Servo Motors



4.1.4 LMDX servo driver

The servo driver for the LMSP planar servo motor is available in two different voltage versions and with a digital I/O interface card.

Dimensions of the LMDX Servo Driver

All values in mm

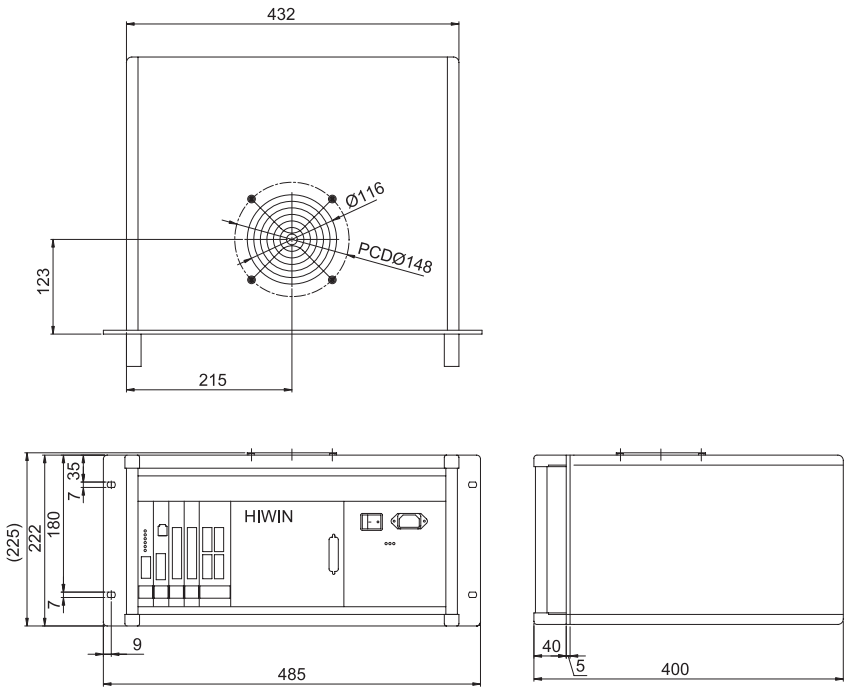


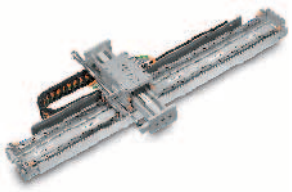
Table 4.3 **Specifications for the LMDX Servo Driver**

		Unit	Value
Power supply	Voltage	V_{AC}	95 – 125 (Model number LMDX1) 200 – 240 (Model number LMDX2)
	Frequency	H_z	50 / 60
	Power	V_A	500 (max.)
Output current		A	3 (max.)
Interface	Parameterization: RS-232		9600 baud, 8 data bits, 2 stop bits, unequal parity
	Digital I/O signal		DXIO modular card: 8 inputs: including HOME and RESET 6 outputs: including IN POSITION, ALARM, SVON DXIO16 modularCard (optional): 16 inputs, 16 outputs
	Pulse	Pulse	STEP/DIRECTION
Resolution		µm/Pulse	up to min. 1 (configurable)
Mass		kg	13.3
Max. operating temperature		°C	50

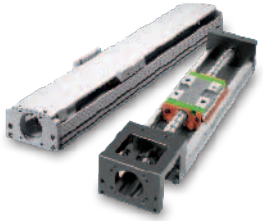
Notes

Linear Guideways

Ballscrews



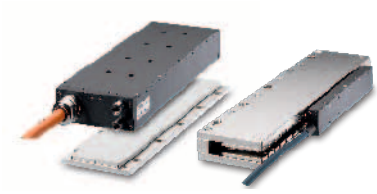
Linear Motor Systems



Linear Axes with Ballscrews

Linear Actuators

Ball Bearings



Linear Motor Components

Rotary Tables

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