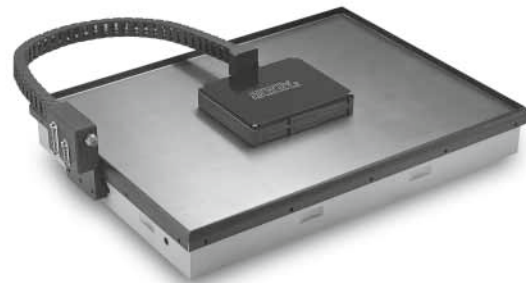
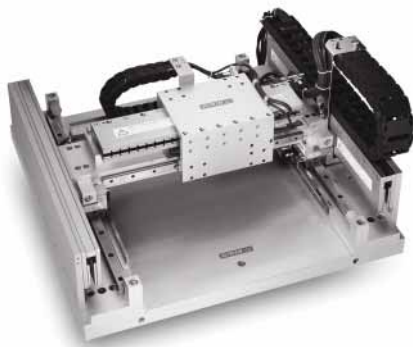


**HIWIN®**

Linear Technology



# Positioning Systems

Linear Motor Systems



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Linear Technology

## 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.



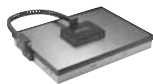
# Positioning Systems

Making linear progress affordable



## Table of Contents

### Introduction



|                                                 |    |
|-------------------------------------------------|----|
| <b>1. General Information</b>                   |    |
| 1.1 Glossary                                    | 2  |
| 1.2 Typical Parameters                          | 4  |
| <b>2. Linear Motors</b>                         |    |
| 2.1 Product overview                            | 6  |
| 2.2 Typical characteristics of Linear Motors    | 8  |
| 2.3 Scope of delivery                           | 9  |
| 2.4 Drive Amplifier for Linear Motors           | 10 |
| 2.5 System Configuration                        | 11 |
| 2.6 Model Numbers                               | 12 |
| 2.7 LMX1E Linear Motors                         | 15 |
| 2.8 LMX1L-S Linear Motors                       | 22 |
| 2.9 LMX1L-T Linear Motors                       | 36 |
| 2.10 LMV1L Linear Motors                        | 38 |
| 2.11 LMH1L Linear Motors                        | 40 |
| 2.12 X-Y Stages                                 | 43 |
| 2.13 Gantry systems                             | 47 |
| <b>3. Customized Positioning Systems</b>        |    |
| 3.1 Examples                                    | 48 |
| <b>4. Planar servo motors and planar motors</b> |    |
| 4.1 LMSP Planar Servo Motors                    | 54 |
| 4.2 Control Card PC14P                          | 58 |
| 4.3 Terminal block PC14B-TB                     | 58 |

# 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 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  $I_p$ . 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.

# Positioning Systems

## Customized Positioning Systems

### 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

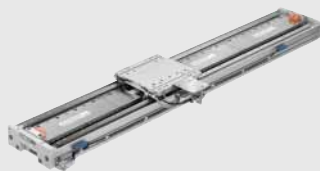
can only be determined if these variables are known.

#### 1.2.2 Winding-dependent dimensions

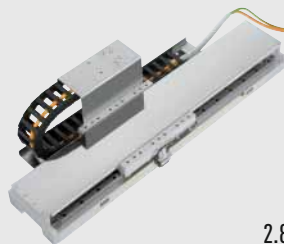
- $I_c$  For generating the current connected for continuous force.
- $I_p$  For short-term generation of the peak force of connected peak current.
- $K_f$  Winding dimension, which produces the created force with the current:  
 $F = I \times K_f$
- $K_u$  Winding dimension, which results dependent 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.

### 2. Linear Motors

|      |                                          |    |
|------|------------------------------------------|----|
| 2.1  | Product overview                         | 6  |
| 2.2  | Typical characteristics of Linear Motors | 8  |
| 2.3  | Scope of delivery                        | 9  |
| 2.4  | Drive Amplifier for Linear Motors        | 10 |
| 2.5  | System Configuration                     | 11 |
| 2.6  | Model Numbers                            | 12 |
| 2.7  | LMX1E Linear Motors                      | 15 |
| 2.8  | LMX1L-S Linear Motors                    | 22 |
| 2.9  | LMX1L-T Linear Motors                    | 36 |
| 2.10 | LMV1L Linear Motors                      | 38 |
| 2.11 | LMH1L Linear Motors                      | 40 |
| 2.12 | X-Y Stages                               | 43 |
| 2.13 | Gantry systems                           | 47 |



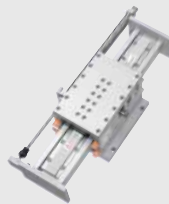
2.7



2.8



2.9



2.10



2.11



2.12



2.13

# 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 bellows 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

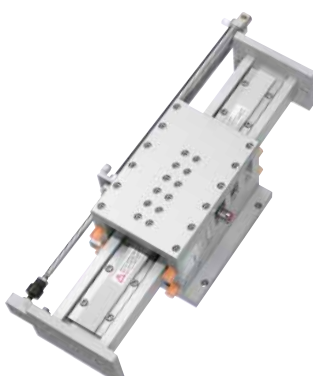
- Complete axis with iron-core motor, type LMS
- Ideal for applications with high continuous power requirements
- Optional enclosure by metal cover or bellows cover
- Also for use as a cross table
- Stroke is measured via optical or magnetic distance measuring system incrementally or absolutely depending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



##### LMX1L-T

Page 36

- Complete axis with iron-core motor, type LMT
- Sandwich design makes high power density possible without static load of the guides by attraction forces
- Optional enclosure by metal cover or bellows 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

## 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

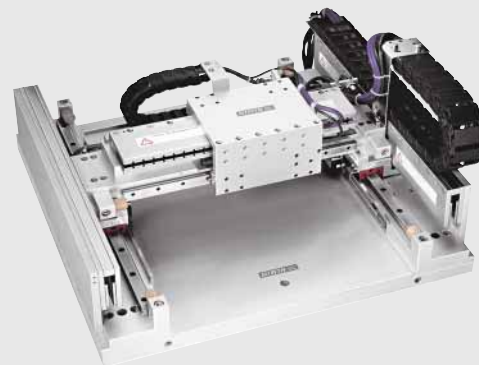
- Combination of axis from the LMX series
- With coreless or iron-core motors



## 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

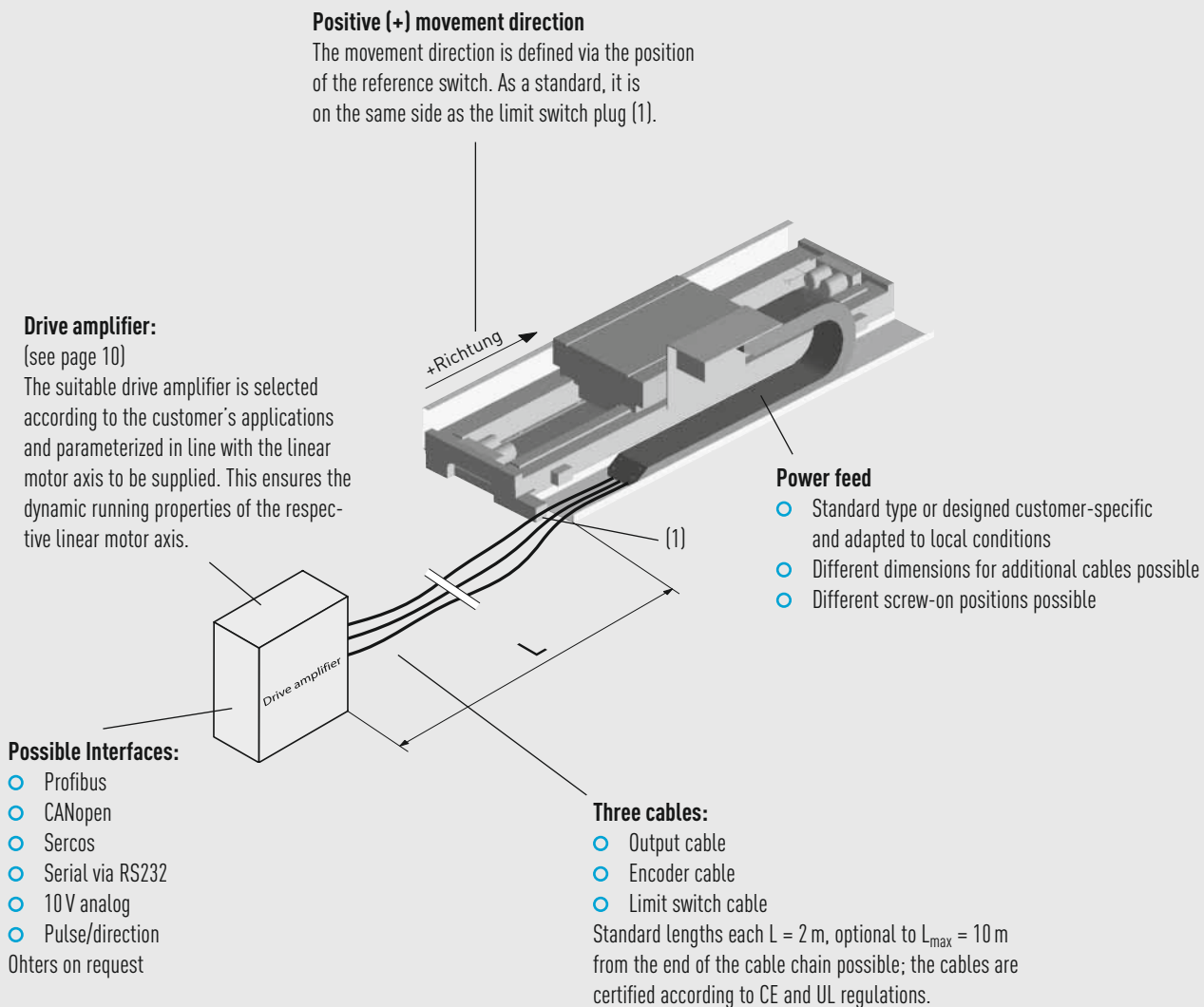
HIWIN linear motor axis are directly driven axis with linear motors, which are designed as a plug and play solution. Standardized energy chains and customized cable guides are available as an option. These are suspended complete axis with distance measuring system, guides, limit switches and optionally 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



## 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:

# LUST



Perfection in Automation  
[www.br-automation.com](http://www.br-automation.com)



# BECKHOFF

New Automation Technology



# manz automation



# ACS Tech80

REDEFINING MOTION CONTROL



# Parker



# DANAHER MOTION



# CONTROL TECHNIQUES

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# Rexroth Bosch Group



# Copley Controls Corp.



# metronix servo drives

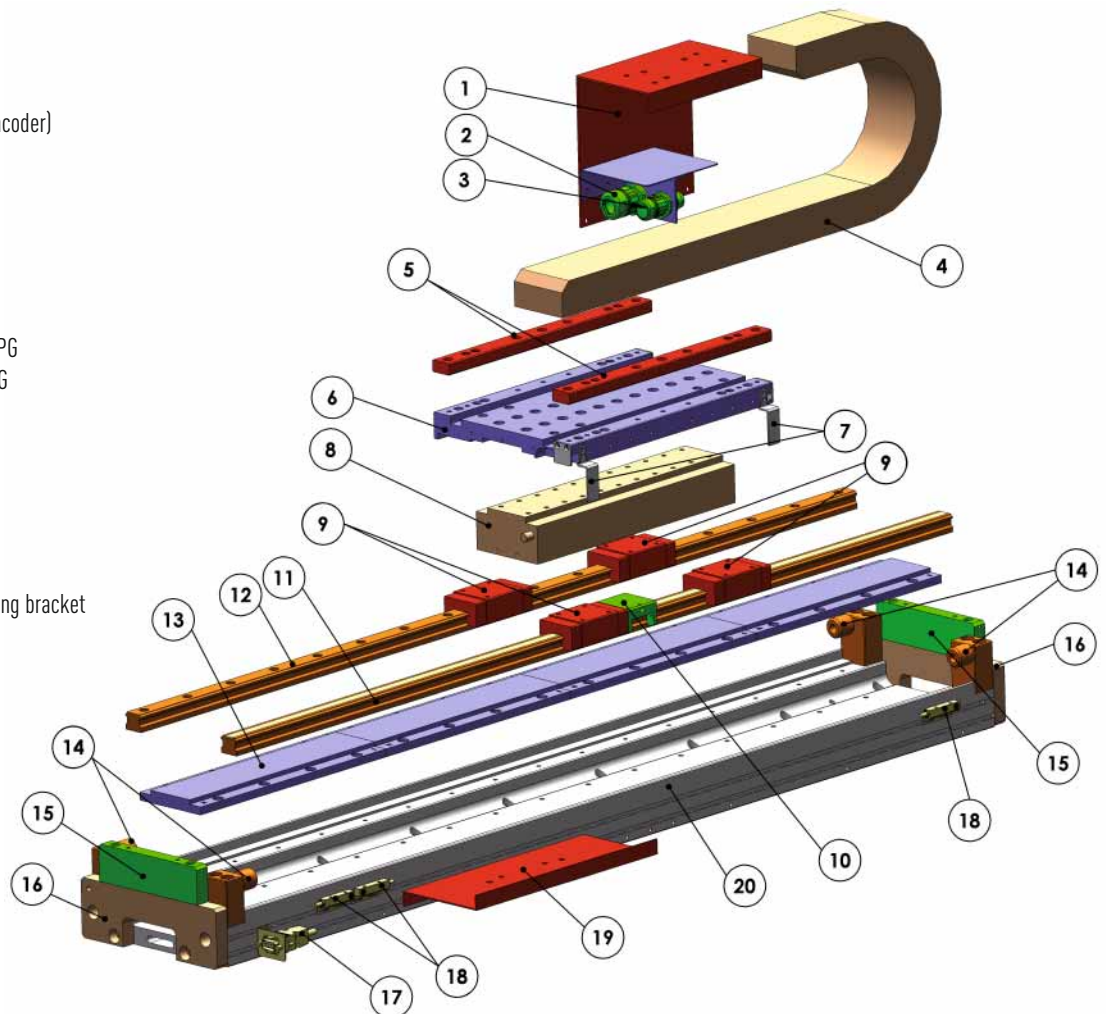


# ESR

ESR Pollmeier GmbH  
[www.esr-pollmeier.de](http://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 | $v_{max}$<br>[m/s] | $a_{max}$<br>[m/s <sup>2</sup> ] | Total length<br>$L_{max}$<br>[mm] | Repeatability<br>[mm] | Accuracy <sup>1)</sup><br>[mm/300 mm] | Straightness <sup>1)</sup><br>[mm/300 mm] | Flatness<br>[mm/300 mm] | Page |
|-------------|------------|--------------------|----------------------------------|-----------------------------------|-----------------------|---------------------------------------|-------------------------------------------|-------------------------|------|
| LMX1E- ...  | LMC        | 5                  | 100 <sup>4)</sup>                | 4000                              | ± 0.001 <sup>2)</sup> | ± 0.005 <sup>2)</sup>                 | ± 0.01                                    | ± 0.01                  | 15   |
| LMX1L-S ... | LMS        | 4                  | 50 <sup>4)</sup>                 | 4000                              | ± 0.001 <sup>2)</sup> | ± 0.005 <sup>2)</sup>                 | ± 0.01                                    | ± 0.01                  | 22   |
| LMX1L-T ... | LMT        | 4                  | 50                               | 4000                              | ± 0.001 <sup>2)</sup> | ± 0.005 <sup>2)</sup>                 | ± 0.01                                    | ± 0.01                  | 36   |
| LMV1L- ...  | LMS        | 1.8                | 30                               | 600                               | ± 0.001 <sup>2)</sup> | ± 0.005 <sup>2)</sup>                 | ± 0.01                                    | ± 0.01                  | 38   |
| LMH1L- ...  | LMS        | 4                  | 50                               | 30000                             | ± 0.02 <sup>3)</sup>  | ± 0.05 <sup>3)</sup>                  | ± 0.03                                    | ± 0.03                  | 40   |

<sup>1)</sup> Values apply only with an appropriate specified base frame.

<sup>2)</sup> Values apply to the optical incremental distance measuring system with 40 µm periods of the sin/cos signal.

<sup>3)</sup> Values apply to the HIWIN-MAGIC optical incremental distance measuring system with a sinus/cosinus signal (see catalogue Direct Components).

<sup>4)</sup> 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<sub>pp</sub> is processed as an output signal; a TTL signal is also possible.

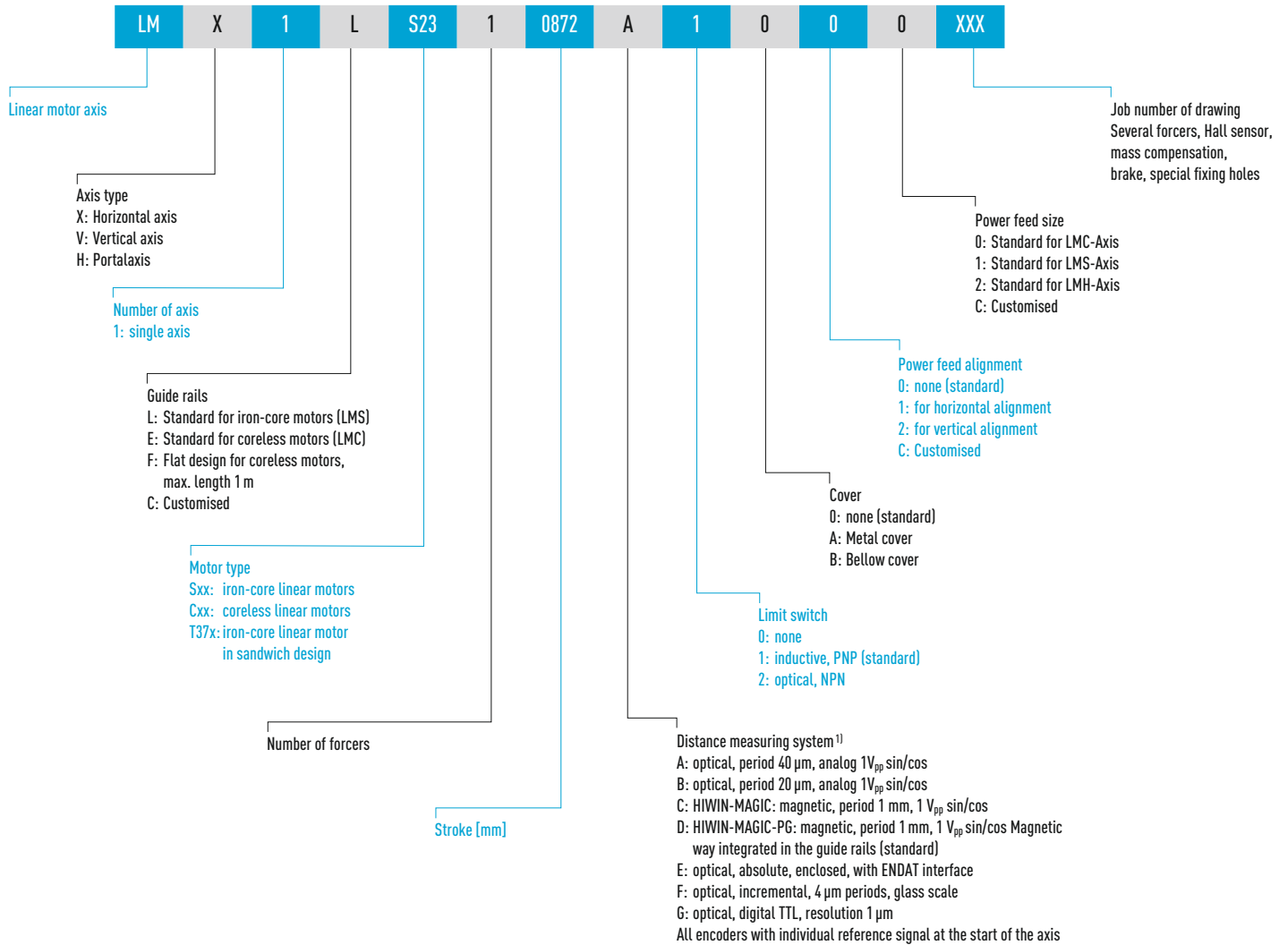
The maximum operating voltage depends on the linear motor type in use. For motor types LMS and LMT (iron-core motors), the maximum permissible operating voltage is AC 530 V. For the LMC motor series (coreless motors), the maximum operating voltage is AC 240 V.

# Positioning Systems

## Linear motor axis

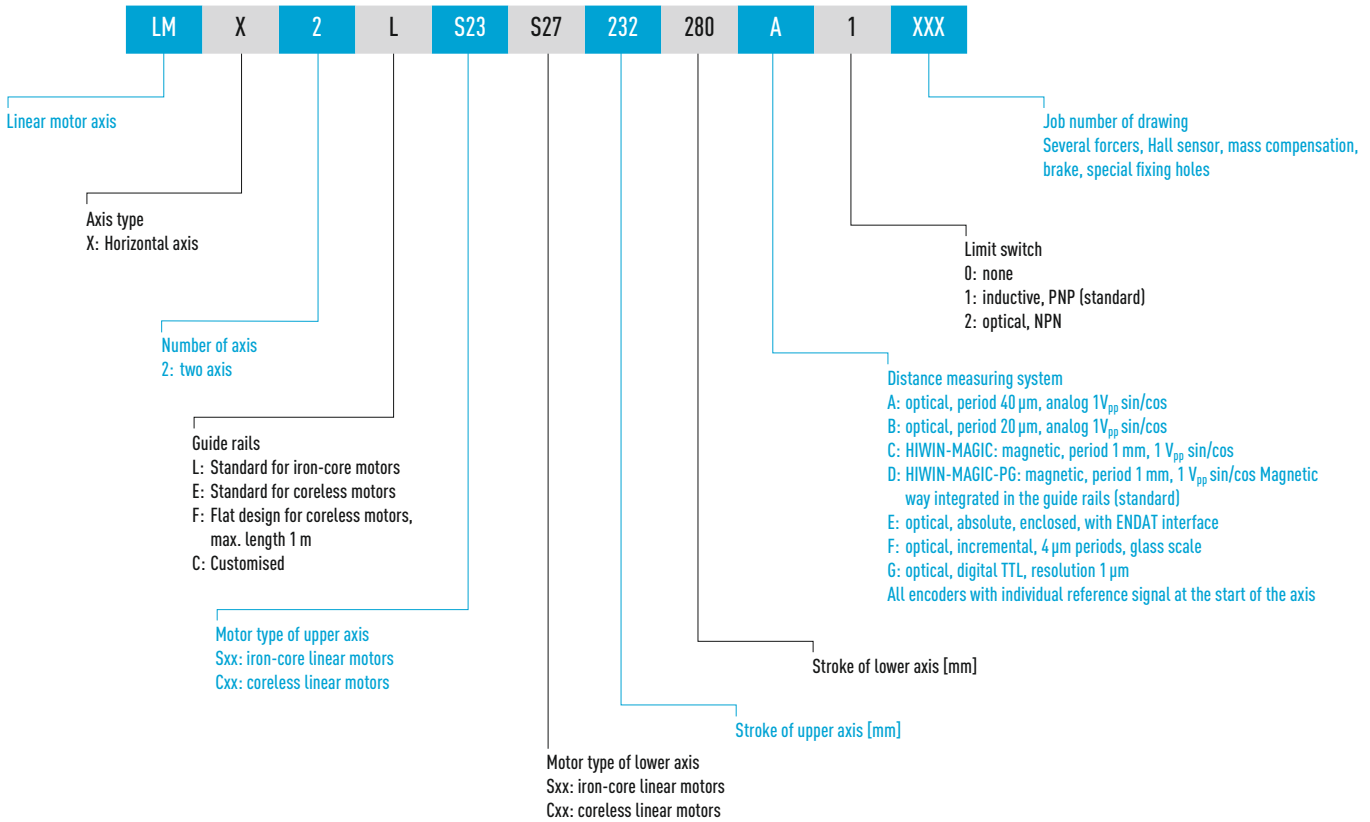
### 2.6 Model Numbers for Linear Motor Axis

#### 2.6.1 Model Numbers for Single Linear Motor Axis



<sup>1)</sup> For LMH-axis distance measuring system “D” is obligatory

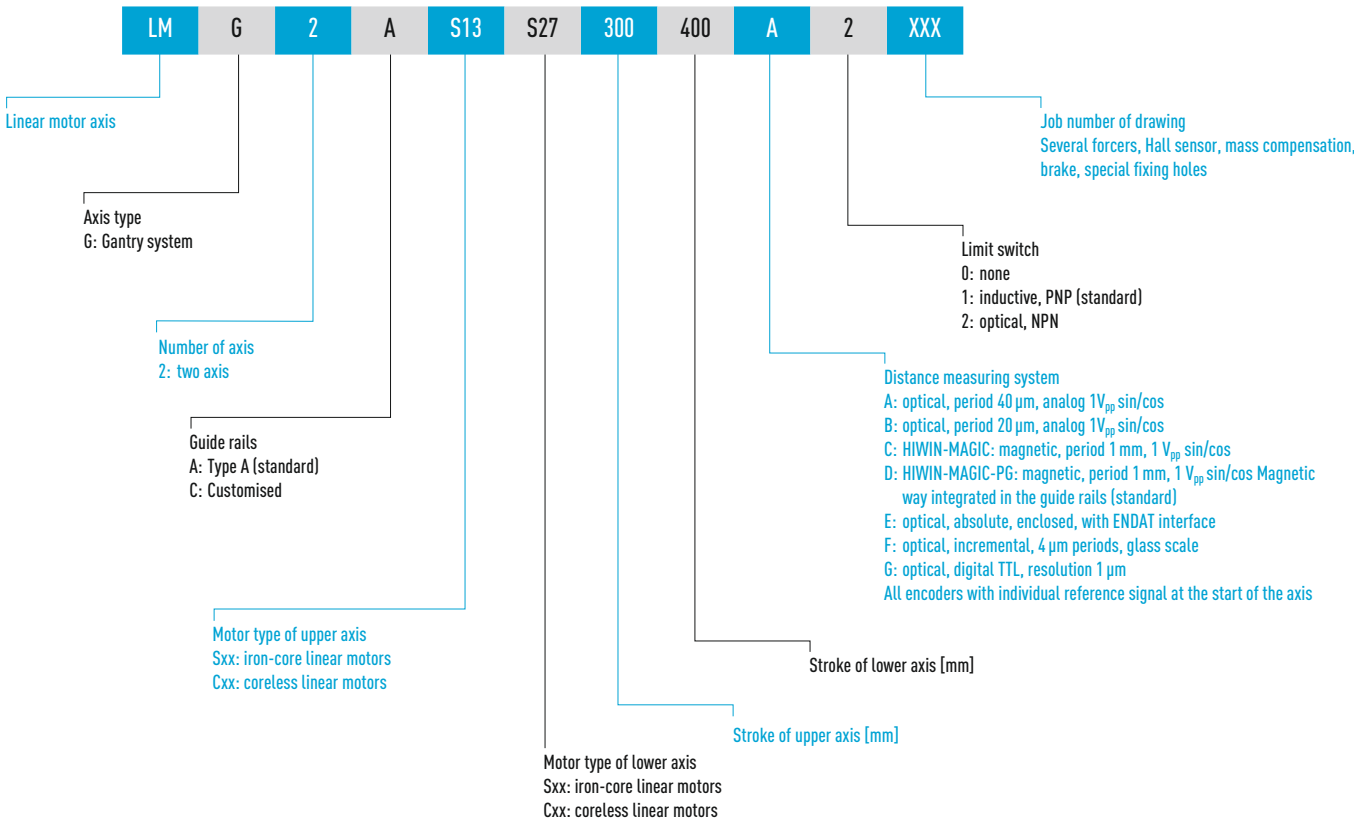
## 2.6.2 Model numbers for Cross Tables



# Positioning Systems

## Linear motor axis

### 2.6.3 Model Numbers for Gantry Systems



## 2.7 LMX1E Linear Motor Axis

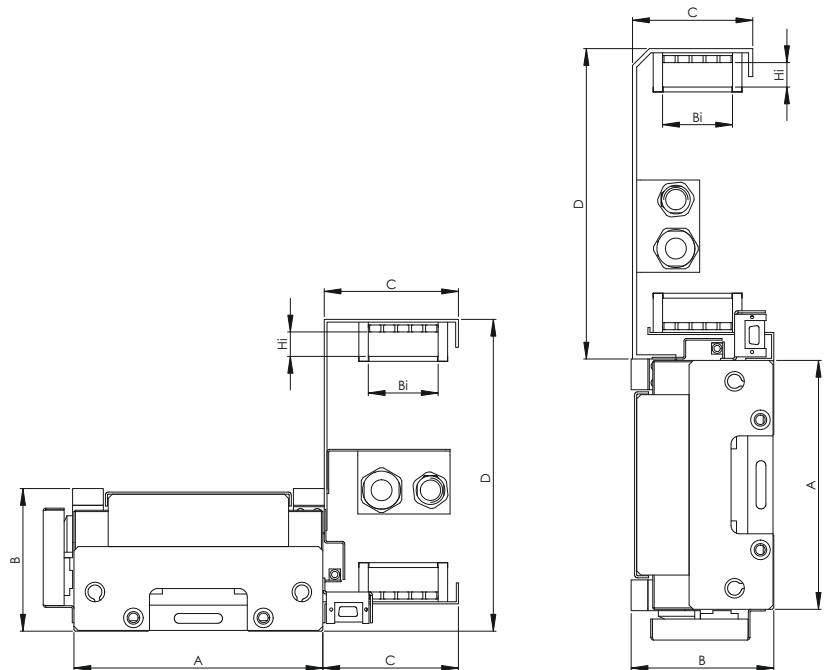
LMX1E linear motor axis are equipped with a coreless motor and are well suited for applications with a high degree of synchronous operational requirements. They can also be used in cross tables. They are distinguished by their very flat design. The stroke is measured incrementally or absolutely via optical 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<sup>2</sup>
- Max. speed 5 m/s
- Up to 4,000 mm long



### Dimension of power feed

| Power feed alignment | C [mm] | D [mm] | Internal dimension B <sub>i</sub> × H <sub>i</sub> [mm] |
|----------------------|--------|--------|---------------------------------------------------------|
| Horizontal           | 97     | 170    | 50 × 21                                                 |
| Vertical             | 79     | 170    | 50 × 21                                                 |



Power feed horizontal

Power feed vertical

### Specifications for LMX1E Linear Motor Axis

| Name<br>(Model number)<br>xxxx = Stroke [mm] | Motor type | F <sub>c</sub><br>[N] | F <sub>p</sub><br>[N] | Mass of glider<br>[kg] | Length of glider<br>[mm] | v <sub>max</sub><br>[m/s] | a <sub>max</sub><br>[m/s <sup>2</sup> ] | Dimension A<br>[mm] | Dimension B<br>[mm] |
|----------------------------------------------|------------|-----------------------|-----------------------|------------------------|--------------------------|---------------------------|-----------------------------------------|---------------------|---------------------|
| LMX1E-CB5-1-xxxx-A100                        | LMC B5     | 90                    | 270                   | 2                      | 178                      | 5                         | 100                                     | 178                 | 80                  |
| LMX1E-CB6-1-xxxx-A100                        | LMC B6     | 110                   | 330                   | 3                      | 208                      | 5                         | 100                                     | 178                 | 80                  |
| LMX1E-CB8-1-xxxx-A100                        | LMC B8     | 145                   | 435                   | 4.2                    | 272                      | 5                         | 100                                     | 178                 | 80                  |
| LMX1E-CB5-1-xxxx-A1A0                        | LMC B5     | 90                    | 270                   | 2.3                    | 178                      | 5                         | 100                                     | 178                 | 92/101*             |
| LMX1E-CB6-1-xxxx-A1A0                        | LMC B6     | 110                   | 330                   | 3.3                    | 208                      | 5                         | 100                                     | 178                 | 92/101*             |
| LMX1E-CB8-1-xxxx-A1A0                        | LMC B8     | 145                   | 435                   | 4.5                    | 272                      | 5                         | 100                                     | 178                 | 92/101*             |

Notes: F<sub>c</sub> = Continuous power, 100 % operating time (ED) at 80 °C winding temperature

F<sub>p</sub> = Peak force (1 s)

Electrical parameters for linear motors:

\* See Dimensional Tables on pages 16 – 21

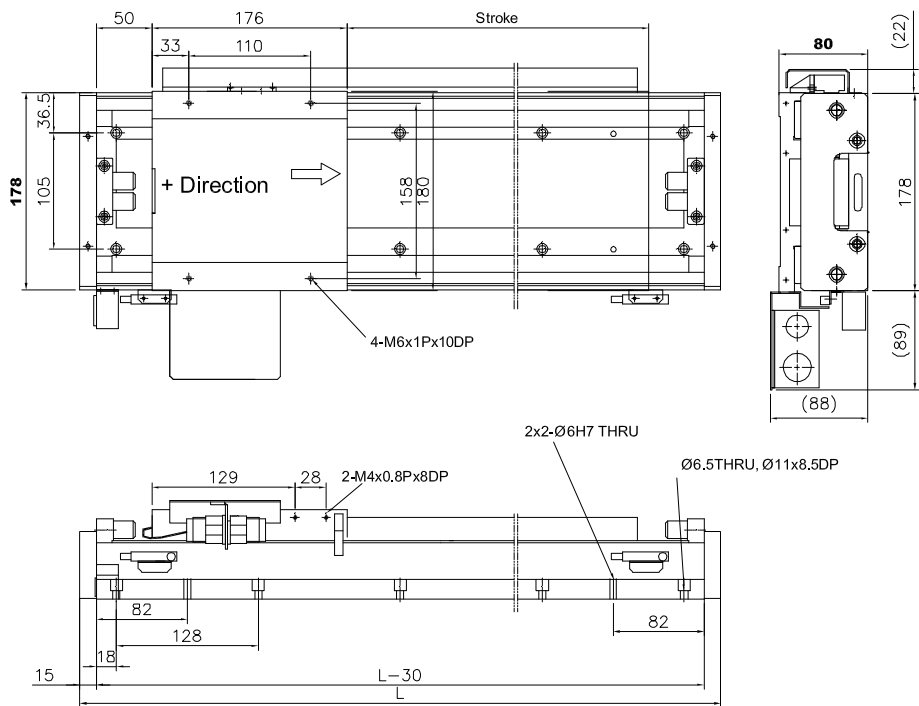
# Positioning Systems

## Linear motor axis

### 2.7.1 LMX1E without Cover

Dimensions and mass of the LMX1E-CB5 axis without cover

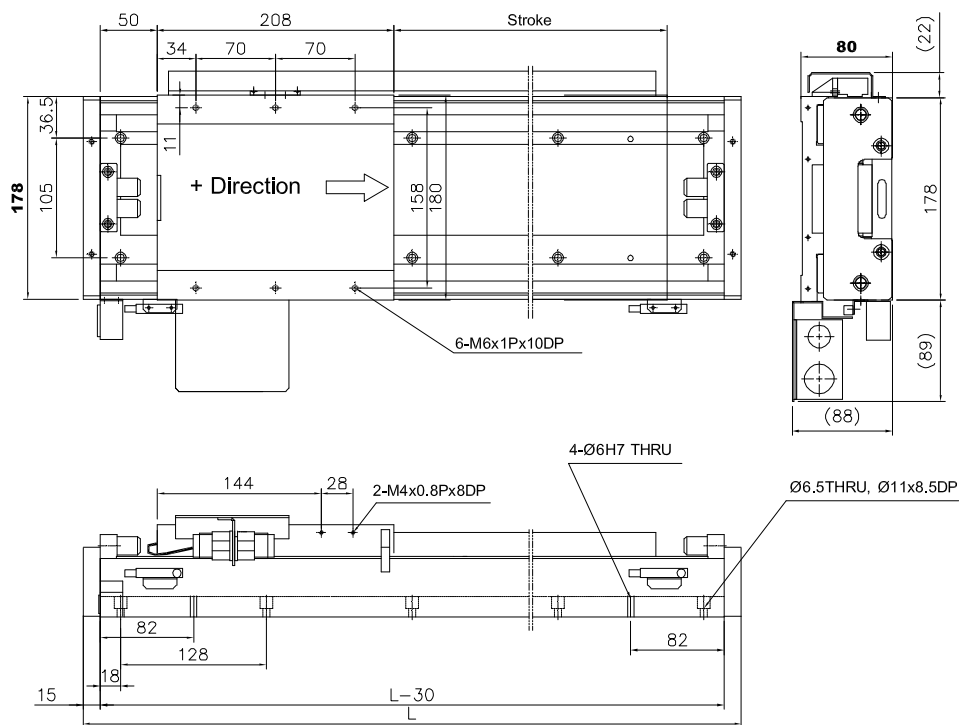
All values in mm



|                     |     |      |     |     |     |      |      |      |      |      |      |
|---------------------|-----|------|-----|-----|-----|------|------|------|------|------|------|
| 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



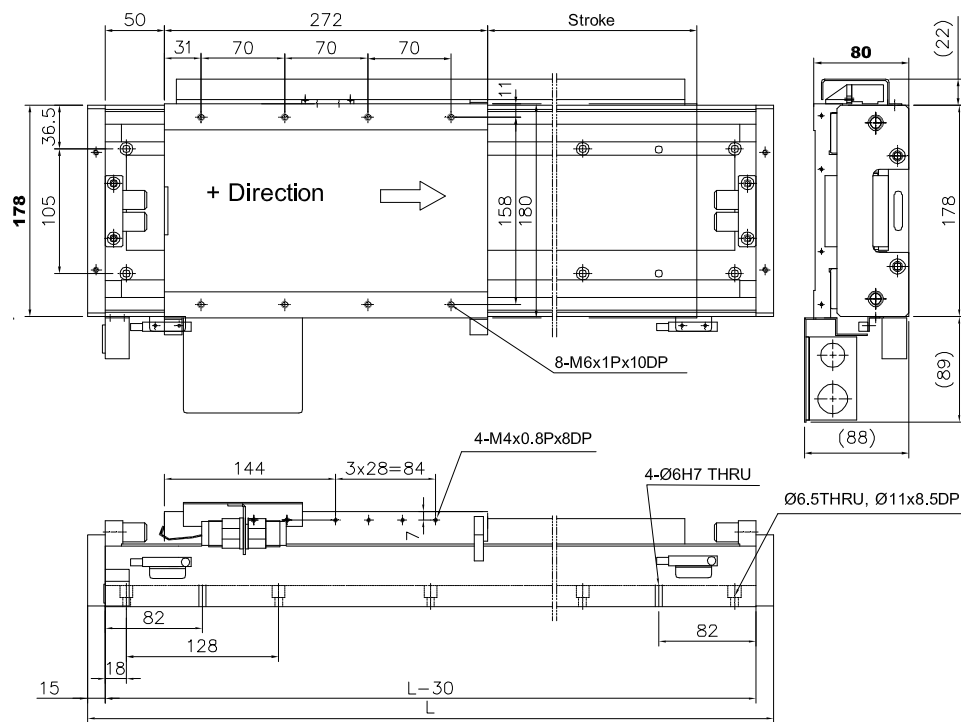
|                     |      |     |      |      |      |      |      |      |      |      |      |
|---------------------|------|-----|------|------|------|------|------|------|------|------|------|
| Stroke [mm]         | 112  | 240 | 368  | 496  | 624  | 752  | 880  | 1008 | 1264 | 1520 | 1776 |
| 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

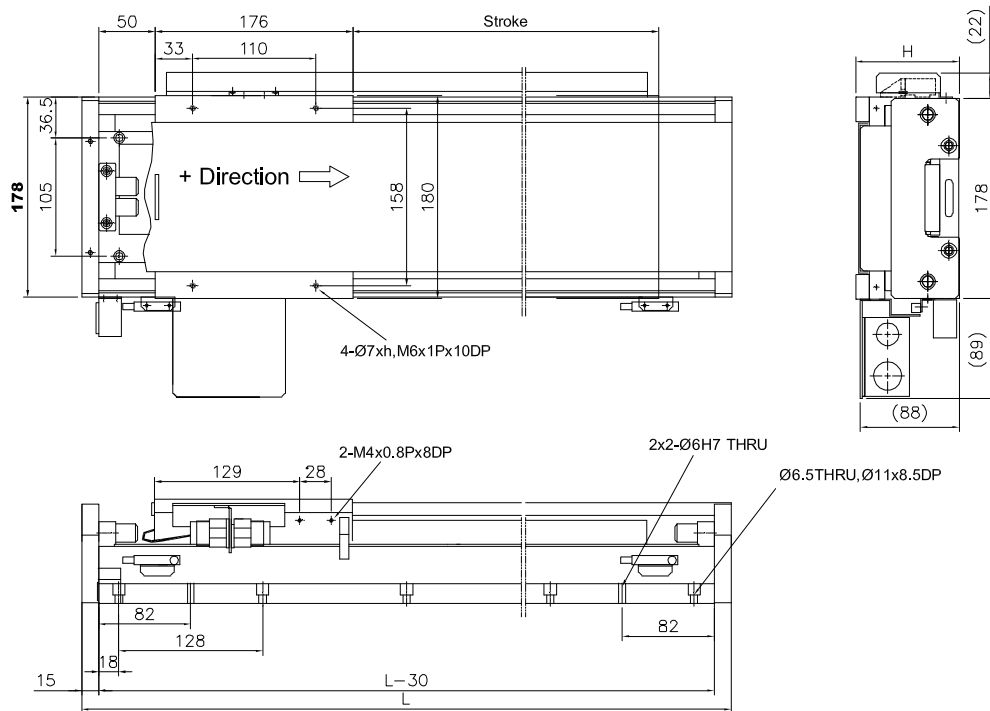


|                     |      |      |      |      |      |      |      |      |      |      |
|---------------------|------|------|------|------|------|------|------|------|------|------|
| Stroke [mm]         | 176  | 304  | 432  | 560  | 688  | 816  | 944  | 1200 | 1456 | 1712 |
| Total length L [mm] | 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 bellows cover [mm]

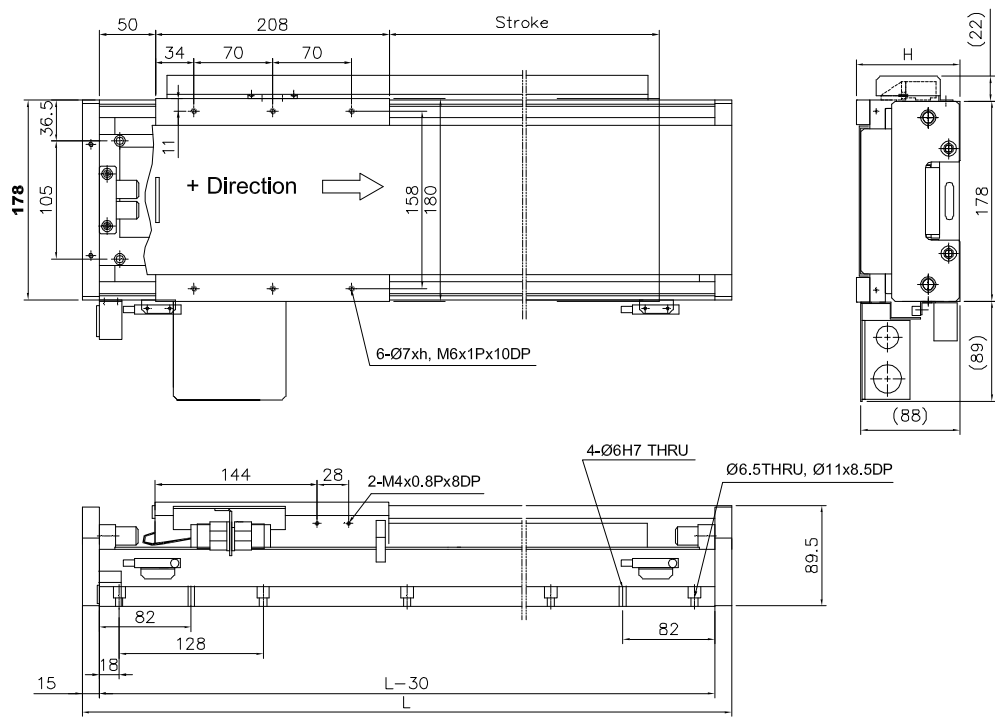
| Stroke [mm]             | 144  | 272  | 400 | 528  | 656  | 784  | 912  | 1040 | 1296 | 1552 | 1808 |
|-------------------------|------|------|-----|------|------|------|------|------|------|------|------|
| Total length $L_1$ [mm] | 450  | 578  | 706 | 834  | 962  | 1090 | 1218 | 1346 | 1602 | 1858 | 2114 |
| Total length $L_2$ [mm] | 458  | 660  | 860 | 1060 | 1259 | 1460 | 1660 | 1859 | 2260 | 2659 | 3060 |
| H [mm]                  | 92   | 92   | 92  | 92   | 92   | 92   | 92   | 92   | 101  | 101  | 101  |
| 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

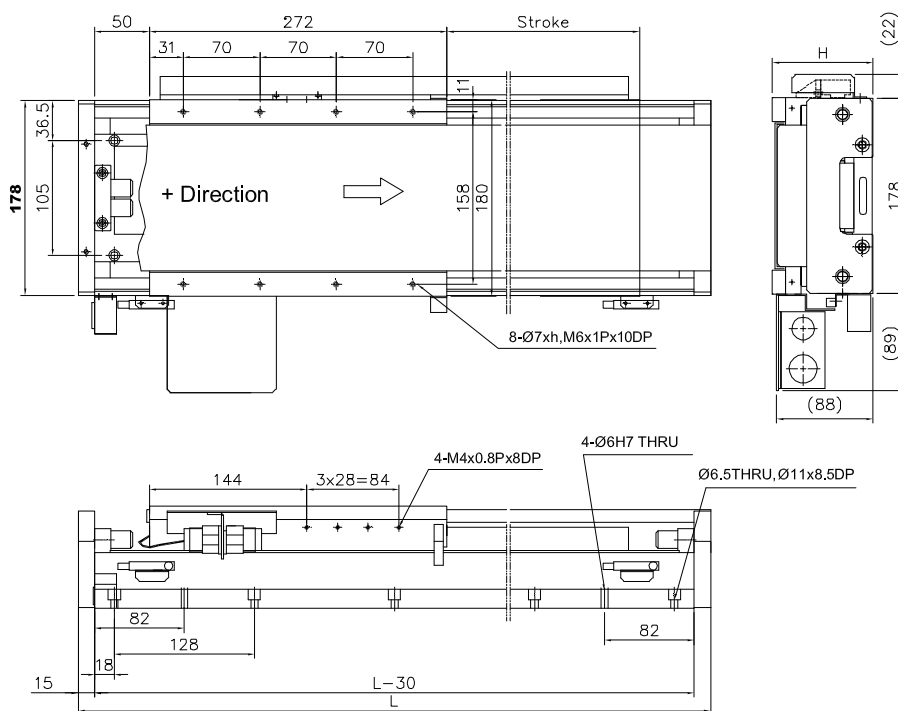


L<sub>1</sub> = Total length with metal cover [mm]  
L<sub>2</sub> = Total length with bellow cover [mm]

|                                  |     |     |      |      |      |      |      |      |      |      |      |
|----------------------------------|-----|-----|------|------|------|------|------|------|------|------|------|
| Stroke [mm]                      | 112 | 240 | 368  | 496  | 624  | 752  | 880  | 1008 | 1264 | 1520 | 1776 |
| Total length L <sub>1</sub> [mm] | 450 | 578 | 706  | 834  | 962  | 1090 | 1218 | 1346 | 1602 | 1858 | 2114 |
| Total length L <sub>2</sub> [mm] | 442 | 642 | 841  | 1041 | 1242 | 1442 | 1641 | 1842 | 2241 | 2642 | 3041 |
| H [mm]                           | 92  | 92  | 92   | 92   | 92   | 92   | 92   | 92   | 101  | 101  | 101  |
| 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 bellows 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]                 | 92   | 92   | 92   | 92   | 92   | 92   | 92   | 101  | 101  | 101  |
| Gewicht [kg]           | 26.4 | 30.4 | 34.3 | 38.3 | 42.2 | 46.2 | 50.2 | 58   | 66   | 74   |

# Positioning Systems

## Linear motor axis

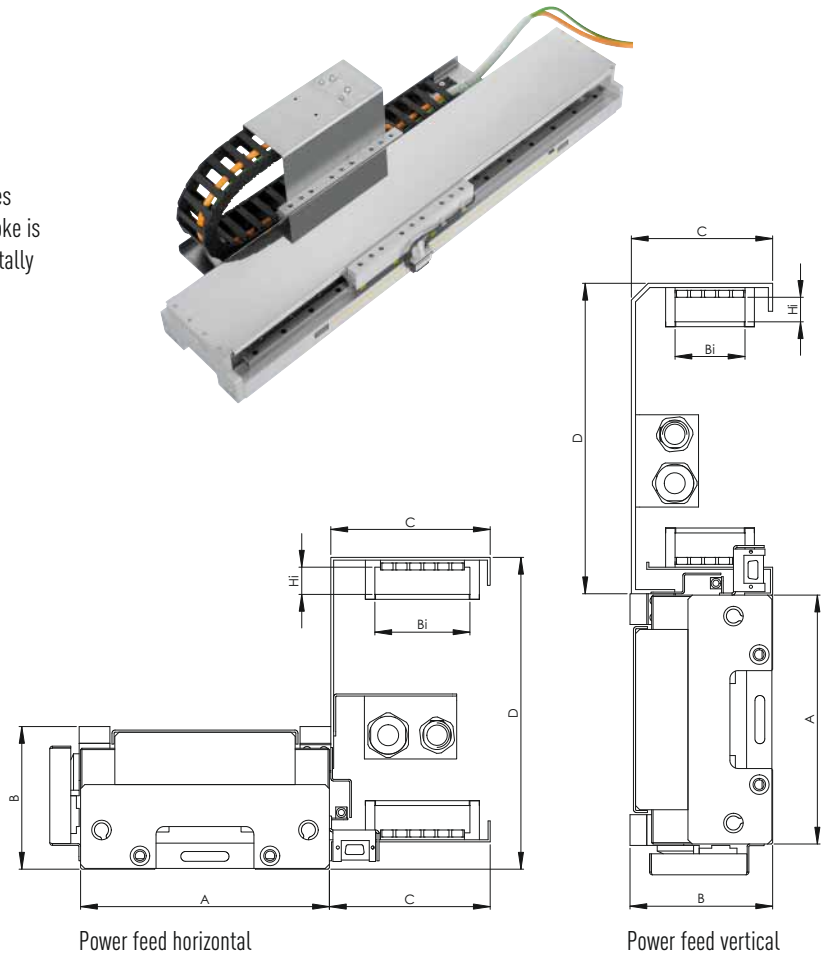
### 2.8 LMX1L-S Linear Motor Axis

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/s<sup>2</sup>
- Max. speed 4 m/s
- Up to 4,000 mm long

#### Dimension of power feed

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



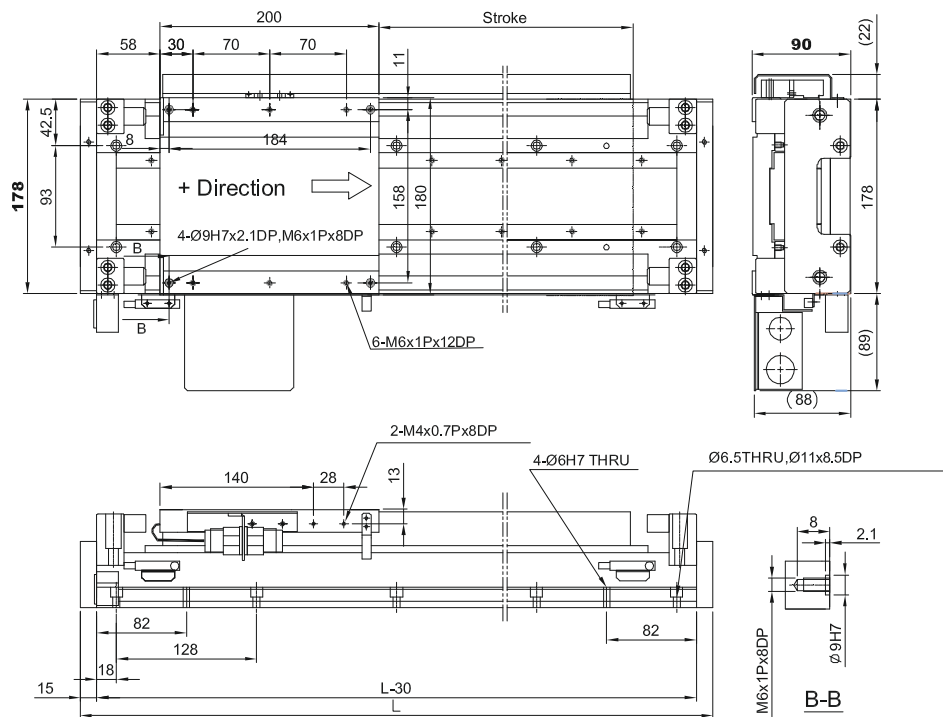
| Name<br>(Model number)<br>xxxx = stroke [mm] | Motor type | $F_c$<br>[N] | $F_p$<br>[N] | Mass of<br>Glider<br>[kg] | Length of<br>glider<br>[mm] | $v_{max}$<br>[m/s] | $a_{max}$<br>[m/s <sup>2</sup> ] | Dimension A<br>[mm] | Dimension B<br>[mm] |
|----------------------------------------------|------------|--------------|--------------|---------------------------|-----------------------------|--------------------|----------------------------------|---------------------|---------------------|
| LMX1L-S23-1-xxxx-D100                        | LMS 23     | 220          | 600          | 7.5                       | 200                         | 4                  | 50                               | 178                 | 90                  |
| LMX1L-S27-1-xxxx-D100                        | LMS 27     | 340          | 900          | 9.5                       | 280                         | 4                  | 50                               | 178                 | 90                  |
| LMX1L-S37-1-xxxx-D100                        | LMS 37     | 475          | 1250         | 12                        | 280                         | 3.5*               | 50                               | 202                 | 95                  |
| LMX1L-S37L-1-xxxx-D100                       | LMS 37L    | 475          | 1250         | 12                        | 280                         | 4                  | 50                               | 202                 | 95                  |
| LMX1L-S47-1-xxxx-D100                        | LMS 47     | 650          | 1700         | 18                        | 280                         | 2.5*               | 50                               | 232                 | 95                  |
| LMX1L-S47L-1-xxxx-D100                       | LMS 47L    | 650          | 1700         | 18                        | 280                         | 4                  | 50                               | 232                 | 95                  |
| LMX1L-S57-1-xxxx-D100                        | LMS 57     | 780          | 2000         | 22                        | 280                         | 2*                 | 50                               | 252                 | 100                 |
| LMX1L-S57L-1-xxxx-D100                       | LMS 57L    | 780          | 2000         | 22                        | 280                         | 4                  | 50                               | 252                 | 100                 |
| LMX1L-S67-1-xxxx-D100                        | LMS 67     | 950          | 2500         | 26                        | 280                         | 2*                 | 50                               | 272                 | 100                 |
| LMX1L-S67L-1-xxxx-D100                       | LMS 67L    | 950          | 2500         | 26                        | 280                         | 4                  | 50                               | 272                 | 100                 |
| LMX1L-S23-1-xxxx-D1A0                        | LMS 23     | 220          | 600          | 7.8                       | 200                         | 4                  | 50                               | 178                 | 102/111             |
| LMX1L-S27-1-xxxx-D1A0                        | LMS 27     | 340          | 900          | 9.9                       | 280                         | 4                  | 50                               | 178                 | 102/111             |
| LMX1L-S37-1-xxxx-D1A0                        | LMS 37     | 475          | 1250         | 12.5                      | 280                         | 3.5*               | 50                               | 202                 | 107/116             |
| LMX1L-S37L-1-xxxx-D1A0                       | LMS 37L    | 475          | 1250         | 12.5                      | 280                         | 4                  | 50                               | 202                 | 107/116             |
| LMX1L-S47-1-xxxx-D1A0                        | LMS 47     | 650          | 1700         | 18.8                      | 280                         | 2.5*               | 50                               | 232                 | 107/116             |
| LMX1L-S47L-1-xxxx-D1A0                       | LMS 47L    | 650          | 1700         | 18.8                      | 280                         | 4                  | 50                               | 232                 | 107/116             |
| LMX1L-S57-1-xxxx-D1A0                        | LMS 57     | 780          | 2000         | 23                        | 280                         | 2*                 | 50                               | 252                 | 112/121             |
| LMX1L-S57L-1-xxxx-D1A0                       | LMS 57L    | 780          | 2000         | 23                        | 280                         | 4                  | 50                               | 252                 | 112/121             |
| LMX1L-S67-1-xxxx-D1A0                        | LMS 67     | 950          | 2500         | 27                        | 280                         | 2*                 | 50                               | 272                 | 112/121             |
| LMX1L-S67L-1-xxxx-D1A0                       | LMS 67L    | 950          | 2500         | 27                        | 280                         | 4                  | 50                               | 272                 | 112/121             |

Notes:  $F_c$  = Continuous power, 100 % operating time (ED), at 80 °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

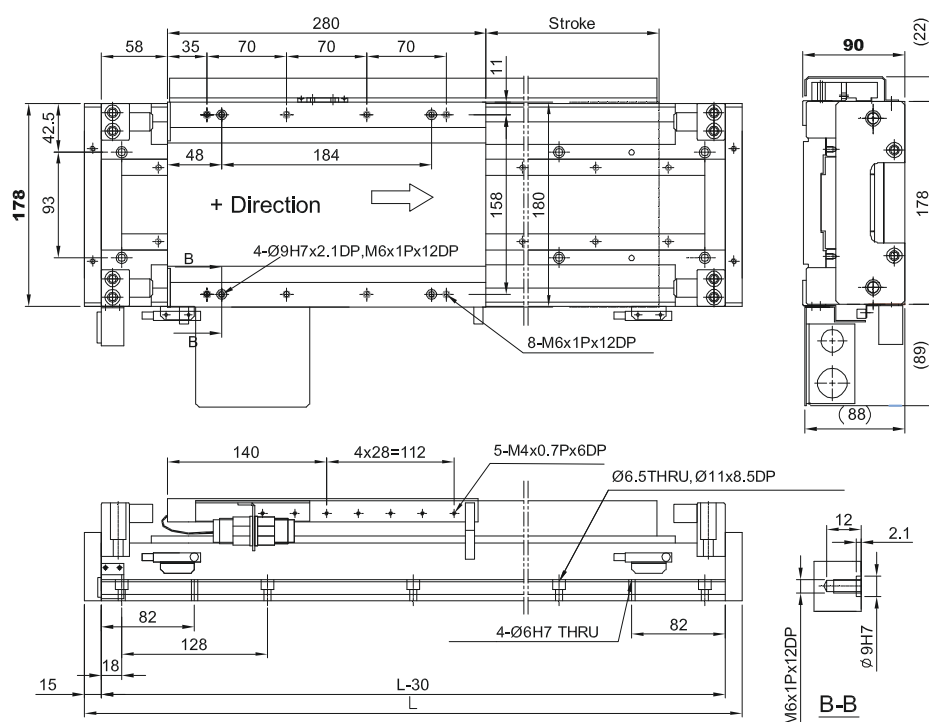


|                     |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Stroke [mm]         | 104  | 232  | 360  | 488  | 616  | 744  | 872  | 1000 | 1256 | 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 |

## Linear motor axis

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

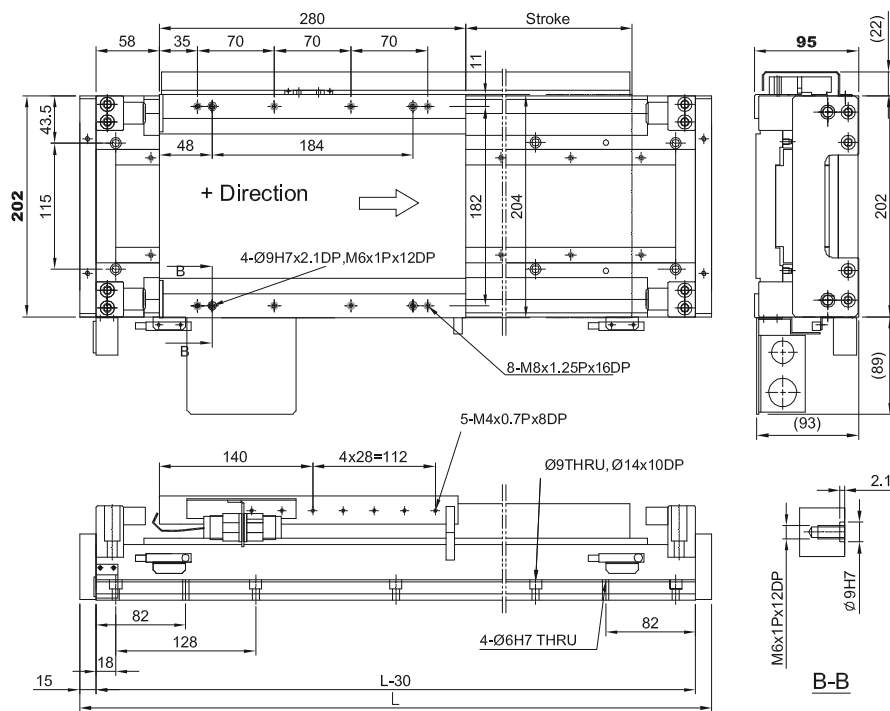
All values in mm



|                     |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 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



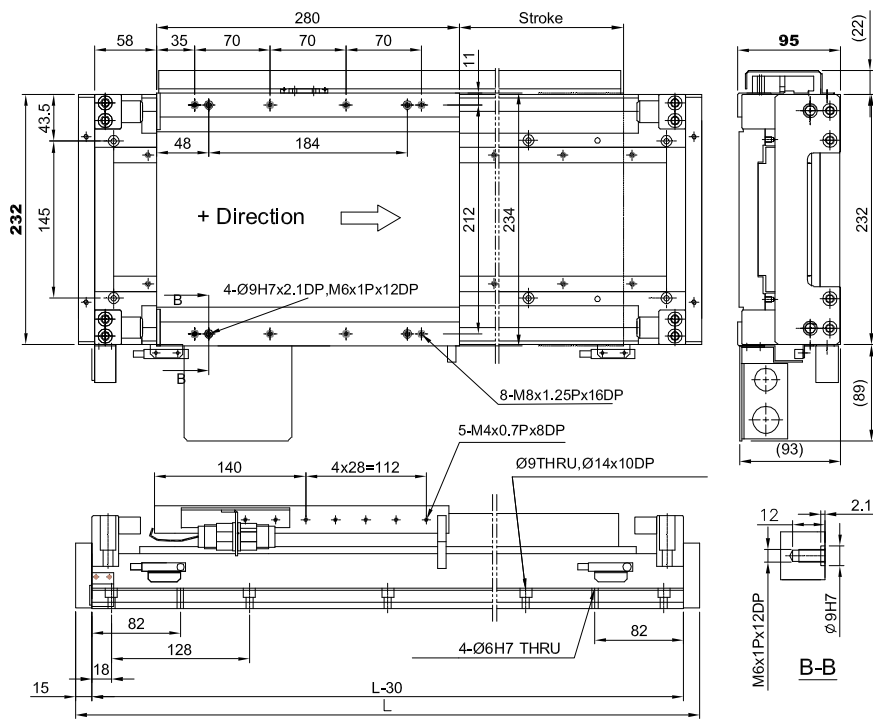
|                     |     |     |     |     |      |      |      |      |      |      |      |      |
|---------------------|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| Stroke [mm]         | 152 | 280 | 408 | 536 | 664  | 792  | 920  | 1176 | 1432 | 1688 | 1944 | 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

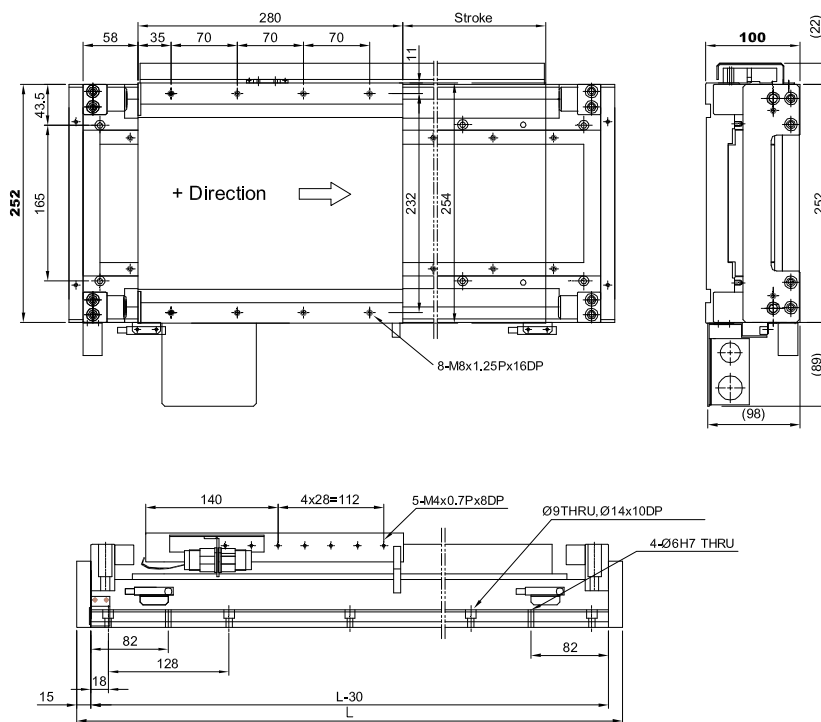
All values in mm



|                     |     |     |     |     |      |      |      |      |      |      |      |      |
|---------------------|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| 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



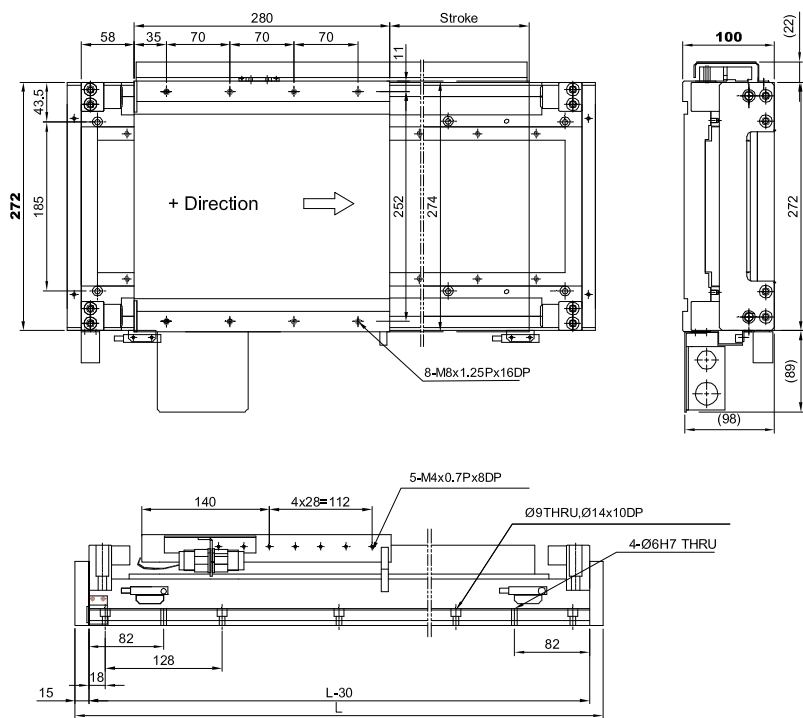
|                     |     |     |     |     |      |      |      |      |      |      |      |      |
|---------------------|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| Stroke [mm]         | 152 | 280 | 408 | 536 | 664  | 792  | 920  | 1176 | 1432 | 1688 | 1944 | 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

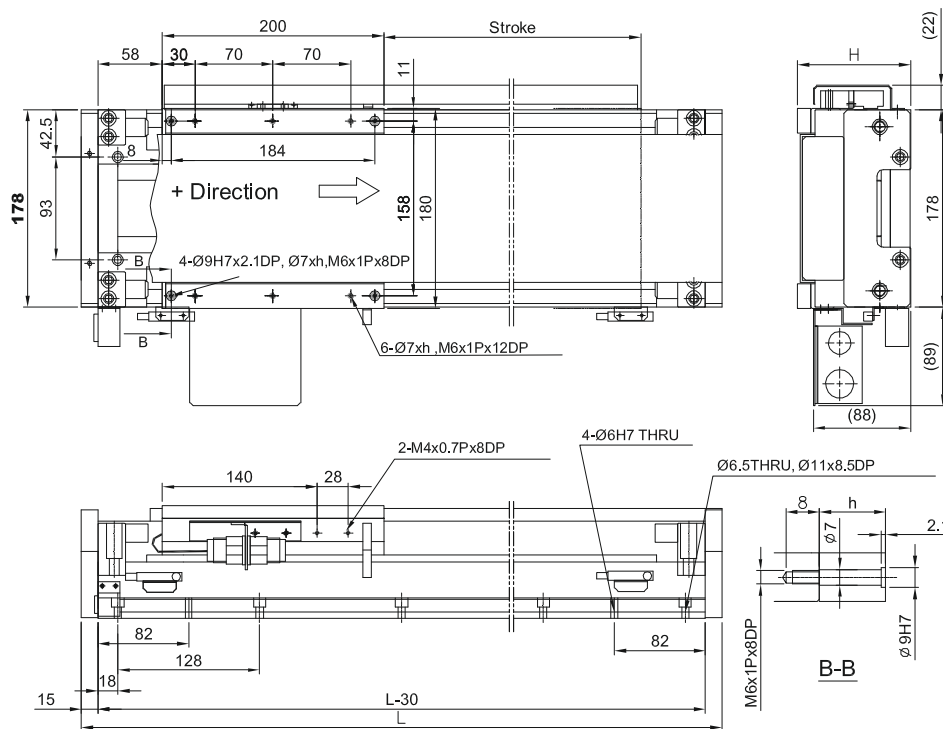


|                     |     |     |     |     |      |      |      |      |      |      |      |      |
|---------------------|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| Stroke [mm]         | 152 | 280 | 408 | 536 | 664  | 792  | 920  | 1176 | 1432 | 1688 | 1944 | 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]

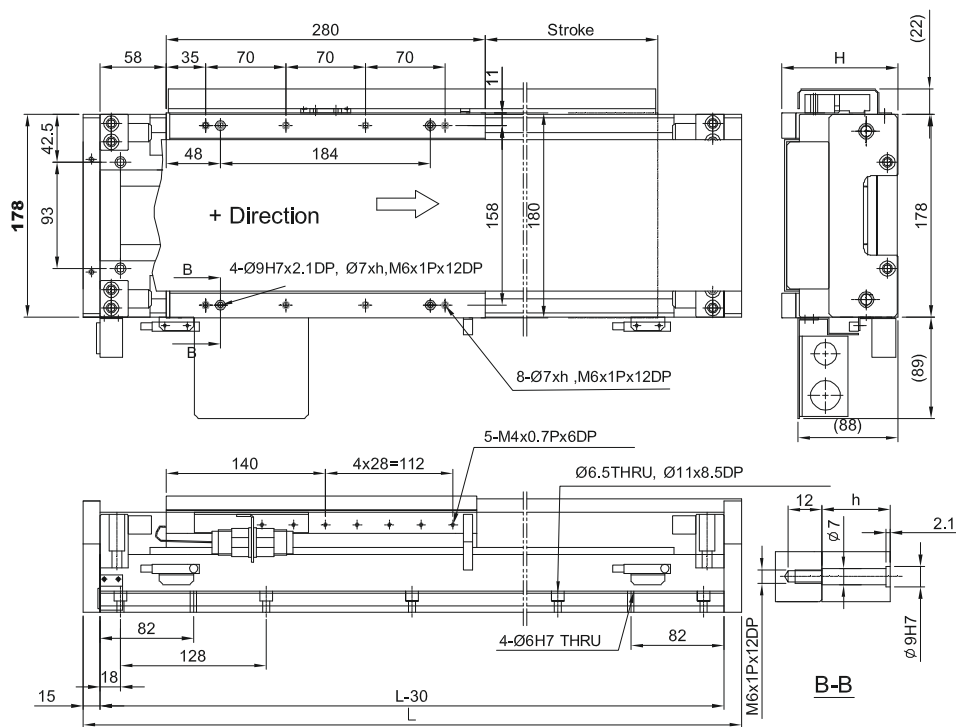
| Stroke [mm]             | 104  | 232  | 360  | 488  | 616  | 744  | 872  | 1000 | 1256 | 1512 | 1768 | 2024 |
|-------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Total length $L_1$ [mm] | 450  | 578  | 706  | 834  | 962  | 1090 | 1218 | 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  
 $h = H - 90$

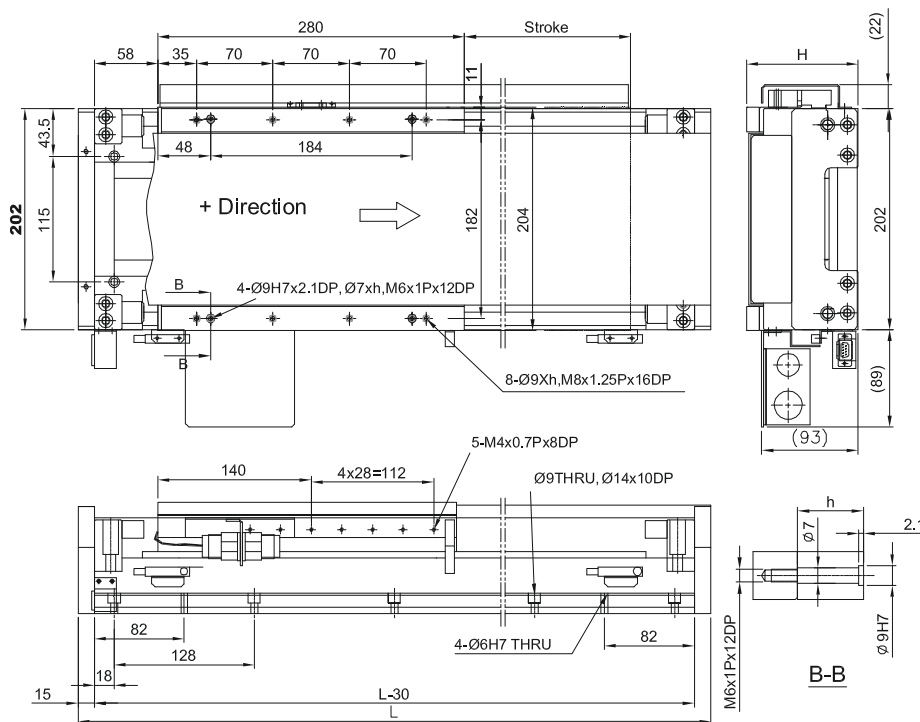


$L_1$  = Total length with metal cover [mm]  
 $L_2$  = Total length with bellows cover [mm]

|                         |      |      |      |      |      |      |      |      |      |      |      |      |
|-------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 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]

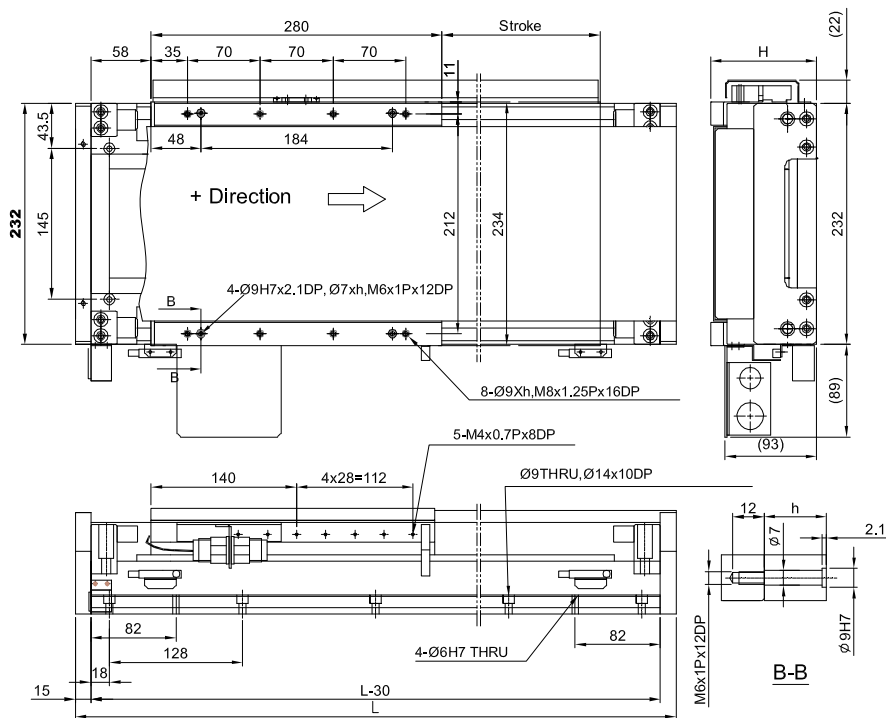
| Stroke [mm]             | 152 | 280 | 408 | 536  | 664  | 792  | 920  | 1176 | 1432 | 1688 | 1944 | 2200 |
|-------------------------|-----|-----|-----|------|------|------|------|------|------|------|------|------|
| Total length $L_1$ [mm] | 578 | 706 | 834 | 962  | 1090 | 1218 | 1346 | 1602 | 1858 | 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

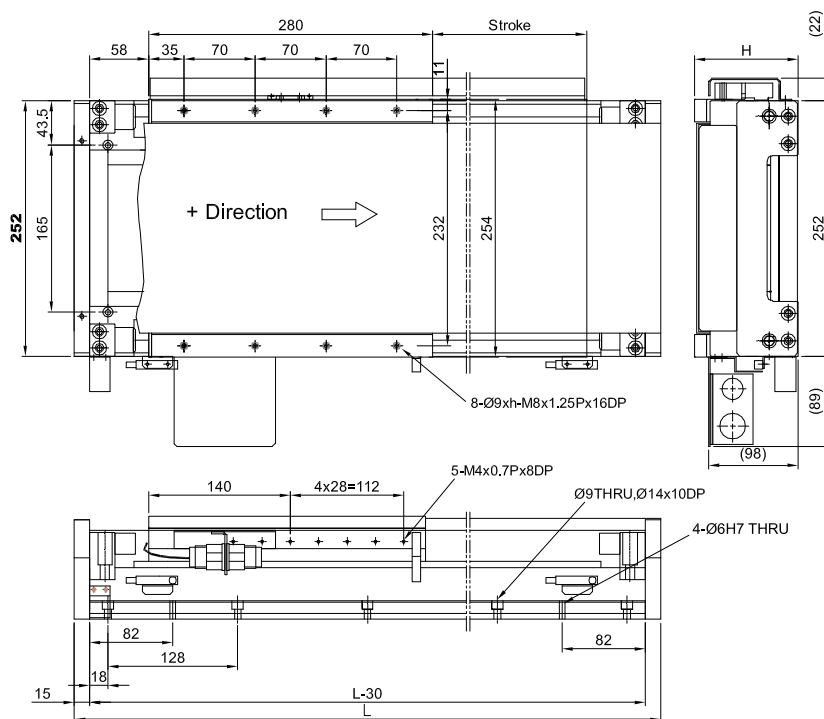


$L_1$  = Total length with metal cover [mm]  
 $L_2$  = Total length with bellows cover [mm]

| 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



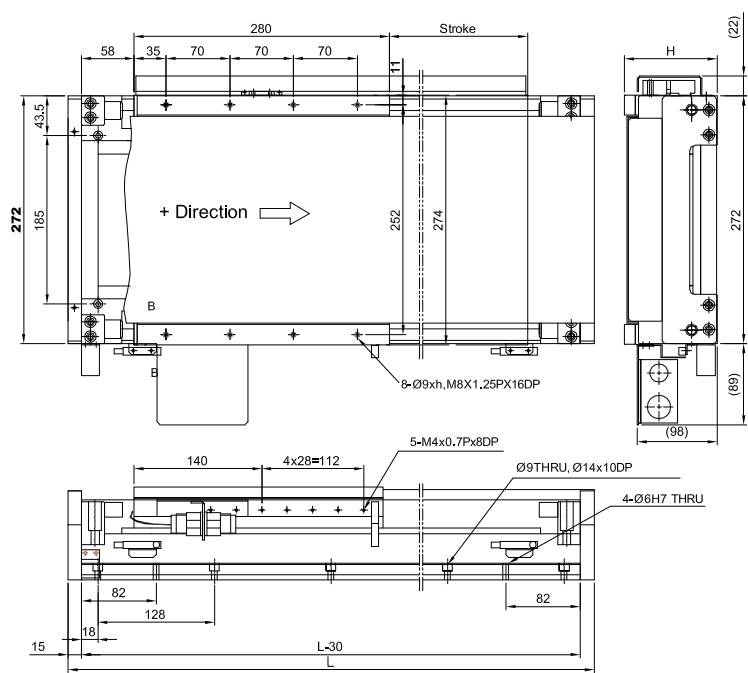
$L_1$  = Total length with metal cover [mm]  
 $L_2$  = Total length with bellows cover [mm]

| 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

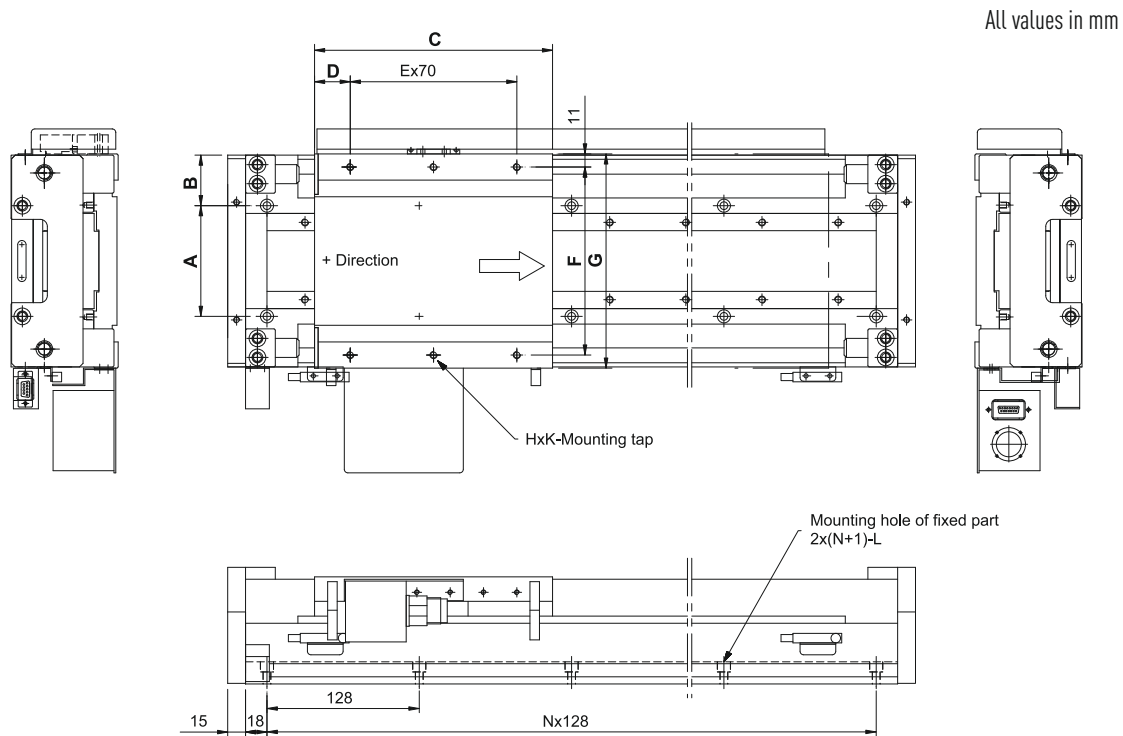
L<sub>1</sub> = Total length with metal cover [mm]

L<sub>2</sub> = Total length with bellow cover [mm]

|                                  |     |     |     |      |      |      |      |      |      |      |      |      |
|----------------------------------|-----|-----|-----|------|------|------|------|------|------|------|------|------|
| Stroke [mm]                      | 152 | 280 | 408 | 536  | 664  | 792  | 920  | 1176 | 1432 | 1688 | 1944 | 2200 |
| Total length L <sub>1</sub> [mm] | 578 | 706 | 834 | 962  | 1090 | 1218 | 1346 | 1602 | 1858 | 2114 | 2370 | 2626 |
| Total length L <sub>2</sub> [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



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

|            | A<br>[mm] | B<br>[mm] | C<br>[mm] | D<br>[mm] | E<br>[mm] | F<br>[mm] | G<br>[mm] | H<br>[mm] | K<br>[mm]          | L<br>[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   |  |

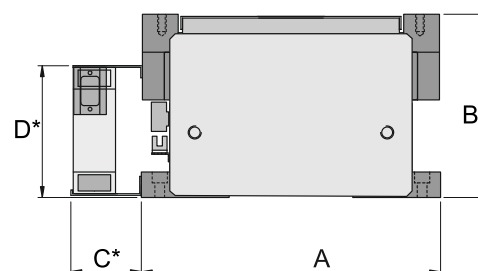
# Positioning Systems

## Linear motor axis

### 2.9 LMX1L-T Linear Motor Axis

LMX1L-T 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/s<sup>2</sup>
- Max. speed 4 m/s



\*Dimensions C and D are customer-specific

### Specifications for LMX1L-T Linear Motor Axis

| Name<br>(Model number)<br>xxxx = Stroke | Motor type | F <sub>c</sub><br>[N] | F <sub>p</sub><br>[N] | Mass of<br>glider<br>[kg] | Length of<br>glider<br>[mm] | v <sub>max</sub><br>[m/s] | a <sub>max</sub><br>[m/s <sup>2</sup> ] | Dimension A<br>[mm] | Dimension B<br>[mm] |
|-----------------------------------------|------------|-----------------------|-----------------------|---------------------------|-----------------------------|---------------------------|-----------------------------------------|---------------------|---------------------|
| LMX1L-T37-1-xxxx-A1A0                   | LMT 37     | 950                   | 2500                  | 25                        | 300                         | 2*                        | 50                                      | 297                 | 223                 |
| LMX1L-T37L-1-xxxx-A1A0                  | LMT 37L    | 950                   | 2500                  | 25                        | 300                         | 4                         | 50                                      | 297                 | 223                 |
| LMX1L-T37D-1-xxxx-A1A0                  | LMT 37D    | 1900                  | 5000                  | 50                        | 600                         | 2*                        | 50                                      | 297                 | 223                 |
| LMX1L-T37LD-1-xxxx-A1A0                 | LMT 37LD   | 1900                  | 5000                  | 50                        | 600                         | 4                         | 50                                      | 297                 | 223                 |

Notes: F<sub>c</sub> = Continuous power, 100 % operating time (ED), at 80 °C winding temperature

F<sub>p</sub> = Peak force (1 s)

Electrical parameters for linear motors: see catalogue Direct Components

\* Limited by back-EMF of the motor winding



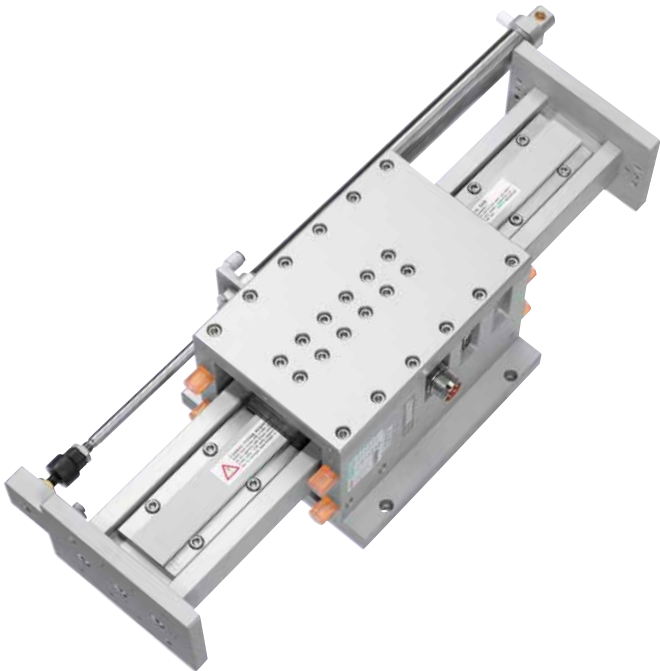
# Positioning Systems

## 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<sup>2</sup>
- Max. speed 1.8 m/s



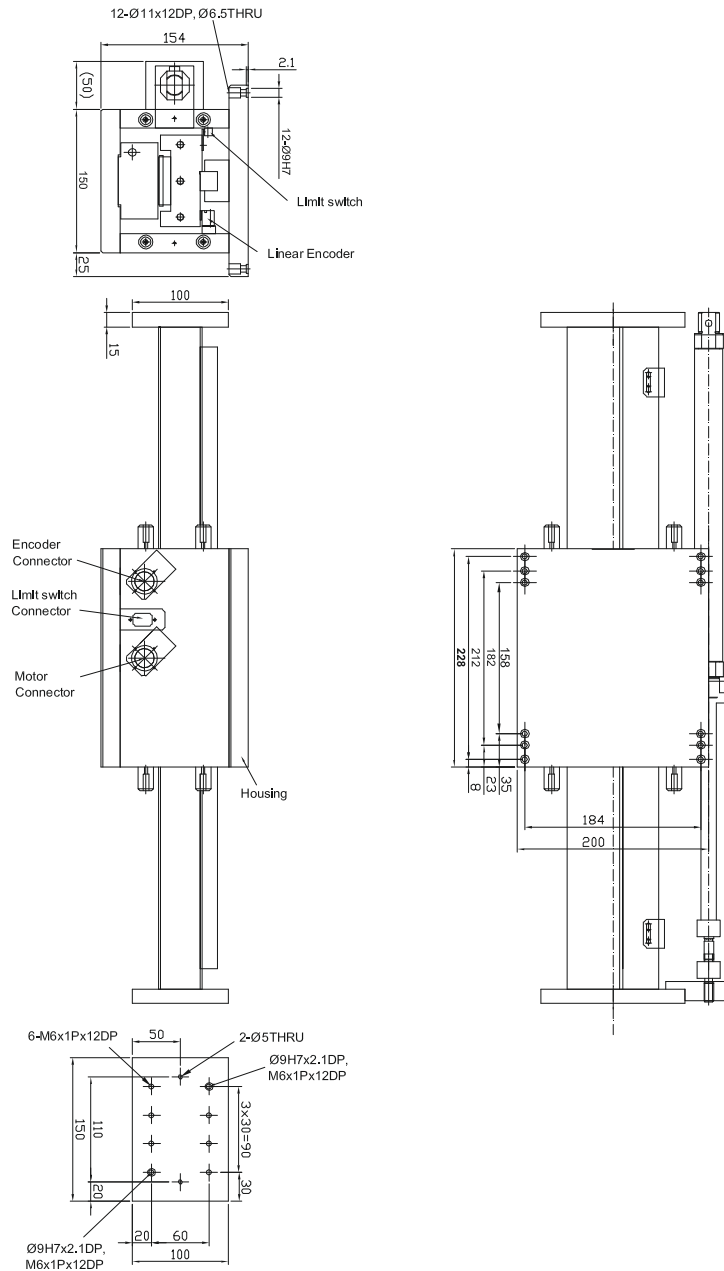
#### Specifications for LMV1L linear motor axis

| Name<br>(Model number) | Motor type | F <sub>c</sub><br>[N] | F <sub>p</sub><br>[N] | Mass of<br>glider<br>[kg] | v <sub>max</sub><br>[m/s] | a <sub>max</sub><br>[m/s <sup>2</sup> ] | Stroke [mm]<br>[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<sub>c</sub> = Continuous power, 100 % operating time (ED), at 80 °C winding temperature  
F<sub>p</sub> = 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

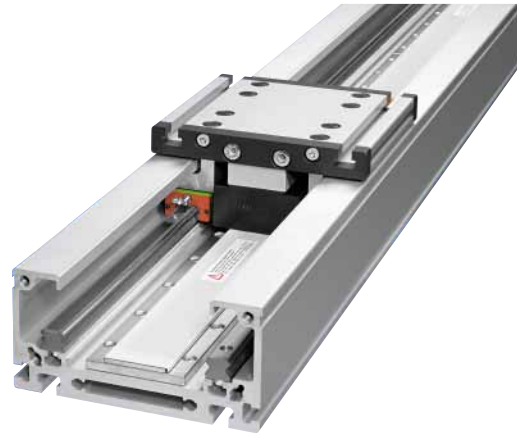
### 2.11 LMH1L Linear Motor Axis

Linear guideways and linear motor are 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/s<sup>2</sup>
- Max. speed 4 m/s
- Up to 30 m stroke

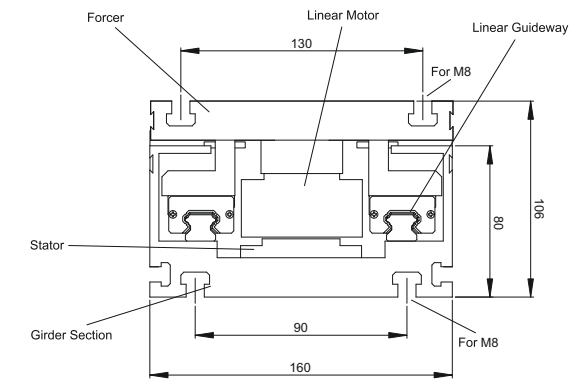


#### Connection Dimensions for LMH1L-S1 Linear Motor Axis

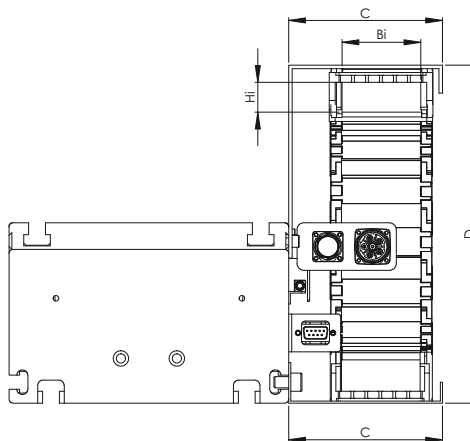
Installation notes: The axis are attached to the machine bed using T-slots. The customer mechanism is also attached using T-slots on the glider.

#### Dimension of power feed

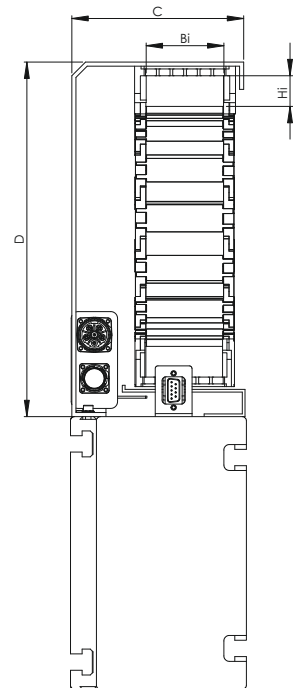
| Power feed alignment | C [mm] | D [mm] | Internal dimension $B_i \times H_i$ [mm] |
|----------------------|--------|--------|------------------------------------------|
| Horizontal           | 110    | 245    | 57 × 25                                  |
| Vertical             | 105    | 260    |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



All values in mm



Power feed horizontal



Power feed vertical

#### Specifications for LMH1L-S1 Linear Motor Axis

| Name<br>(Model number)<br>xxxx = stroke [mm] | Motor type | $F_c$<br>[N] | $F_p$<br>[N] | Mass of glider<br>[kg] | Length of glider<br>[mm] | $v_{max}$<br>[m/s] | $a_{max}$<br>[m/s <sup>2</sup> ] | Mass of the girder<br>[kg/m] |
|----------------------------------------------|------------|--------------|--------------|------------------------|--------------------------|--------------------|----------------------------------|------------------------------|
| LMH1L-S13-1-xxxx-D000                        | LMS 13     | 180          | 540          | 7                      | 260                      | 4                  | 50                               | 20                           |
| LMH1L-S17-1-xxxx-D000                        | LMS 17     | 210          | 630          | 10                     | 355                      | 4                  | 50                               | 20                           |
| LMH1L-S17D-1-xxxx-D000                       | LMS 17D    | 420          | 1260         | 20                     | 620                      | 4                  | 50                               | 20                           |

Notes:  $F_c$  = Continuous power, 100 % operating time (ED), at 80 °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/s<sup>2</sup>
- Max. speed 4 m/s
- Up to 30 m stroke

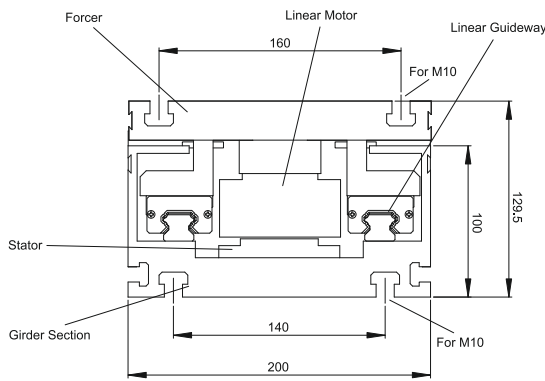


### Connection Dimensions for LMH1L-S2 Linear Motor Axis

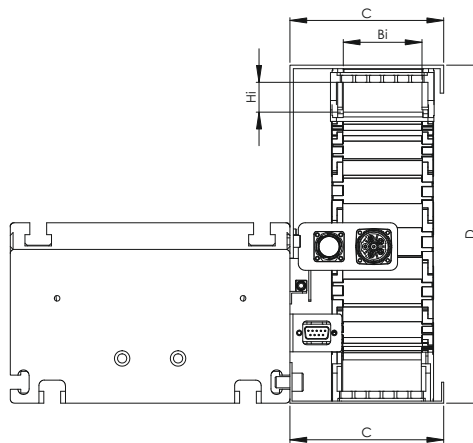
Installation notes: The axis are attached to the machine bed using T-slots. The customer mechanism is also attached using T-slots on the glider.

### Dimension of power feed

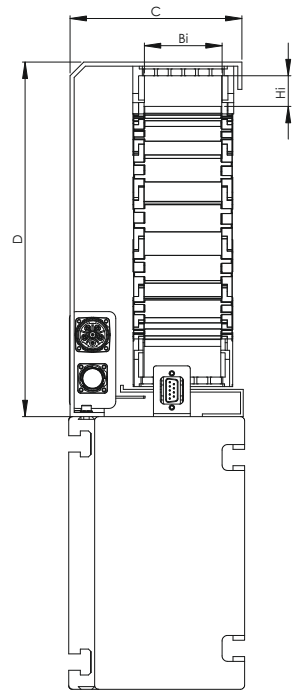
| Power feed alignment | C [mm] | D [mm] | Internal dimension<br>$B_i \times H_i$ [mm] |
|----------------------|--------|--------|---------------------------------------------|
| Horizontal           | 110    | 245    | 57 × 25                                     |
| Vertical             | 128    |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



All values in mm



Power feed horizontal



Power feed vertical

### Specifications for LMH1L-S2 Linear Motor Axis

| Name<br>(Model number)<br>xxxx = stroke [mm] | Motor type | $F_c$<br>[N] | $F_p$<br>[N] | Mass of glider<br>[kg] | Length of glider<br>[mm] | $v_{max}$<br>[m/s] | $a_{max}$<br>[m/s <sup>2</sup> ] | Mass of the girder<br>[kg/m] |
|----------------------------------------------|------------|--------------|--------------|------------------------|--------------------------|--------------------|----------------------------------|------------------------------|
| LMH1L-S23-1-xxxx-D000                        | LMS 23     | 220          | 600          | 8                      | 250                      | 4                  | 50                               | 28                           |
| LMH1L-S27-1-xxxx-D000                        | LMS 27     | 340          | 900          | 11                     | 343                      | 4                  | 50                               | 28                           |
| LMH1L-S27D-1-xxxx-D000                       | LMS 27D    | 680          | 1800         | 22                     | 600                      | 4                  | 50                               | 28                           |

Notes:  $F_c$  = Continuous power, 100 % operating time (ED), at 80 °C winding temperature  
 $F_p$  = Peak force (1 s)  
 Electrical parameters for linear motors: see catalogue Direct Components

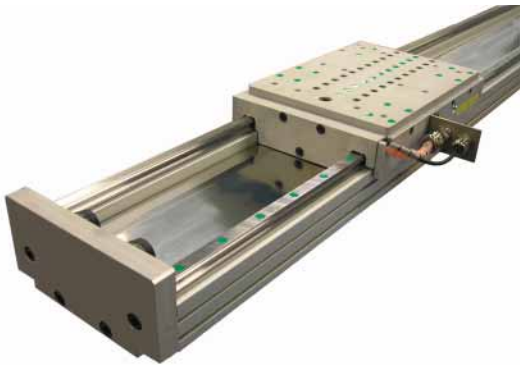
# Positioning Systems

## Linear motor axis

### 2.11.3 LMH1L-S4 Linear Motor Axis

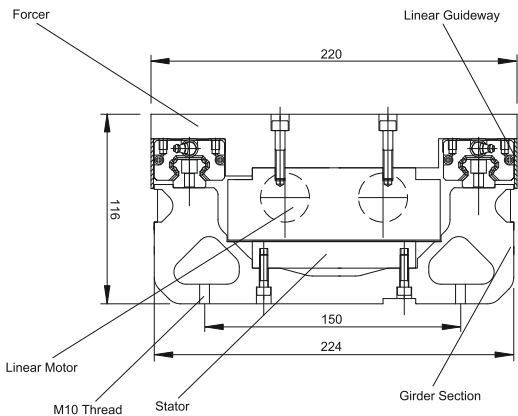
The portal axis LMH1L-S4 equipped with linear motors is designed as a complete axis with strokes up to 30 m for very high continuous forces. Several gliders can be positioned independently of each other using the linear motor technology. The stroke is measured incrementally and enables positioning accuracy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

- Max. acceleration 50 m/s<sup>2</sup>
- Max. speed 4 m/s
- Up to 30 m stroke

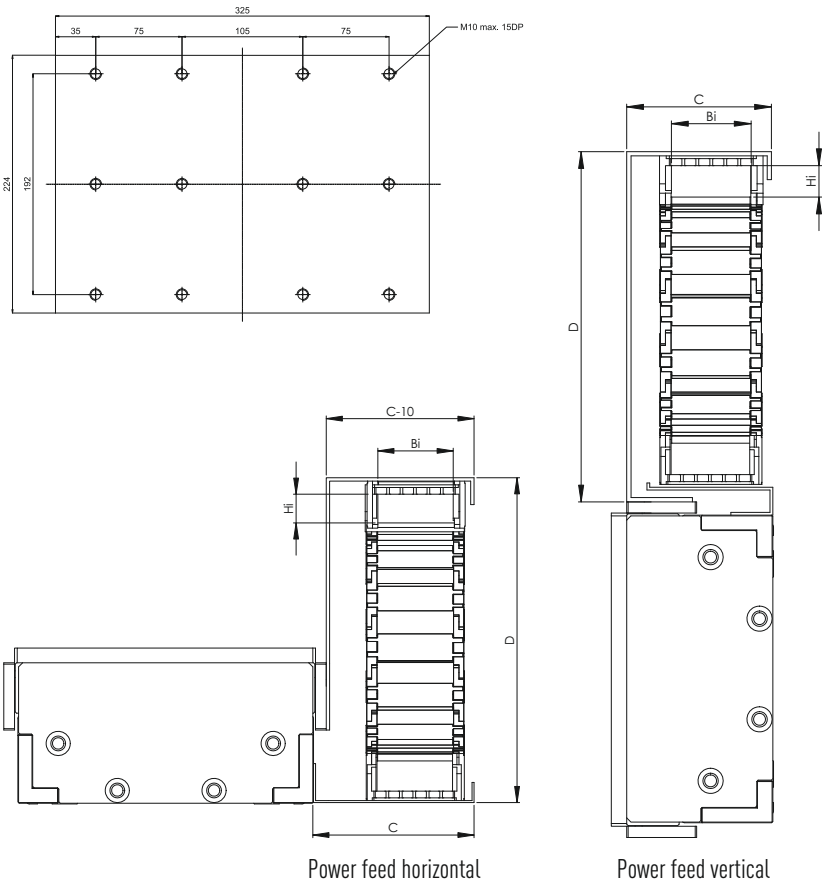


#### Connection Dimensions for LMH1L-S4 Linear Motor Axis

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



#### Dimensions of mounting area



#### Dimension of power feed

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

#### Specifications for LMH1L-S4 Linear Motor Axis

| Name<br>(Model number)<br>xxxx = stroke [mm] | Motor type | $F_c$<br>[N] | $F_p$<br>[N] | Mass of glider<br>[kg] | Length of glider<br>[mm] | $v_{max}$<br>[m/s] | $a_{max}$<br>[m/s <sup>2</sup> ] | Mass of the girder<br>[kg/m] |
|----------------------------------------------|------------|--------------|--------------|------------------------|--------------------------|--------------------|----------------------------------|------------------------------|
| LMH1L-S47L-1-xxxx-D000                       | LMS 47L    | 650          | 1700         | 19                     | 325                      | 4                  | 50                               | 37                           |
| LMH1L-S47LD-1-xxxx-D000                      | LMS 47LD   | 1300         | 3400         | 36                     | 600                      | 4                  | 50                               | 37                           |

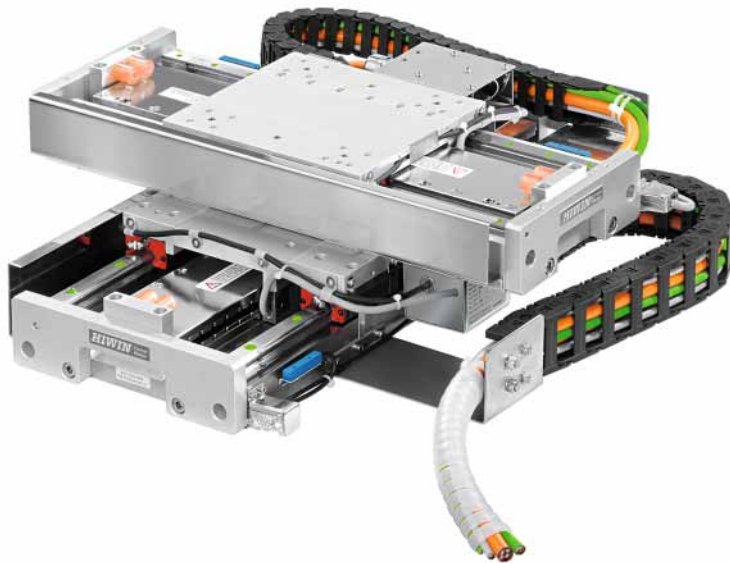
Notes:  $F_c$  = Continuous power, 100 % operating time (ED), at 80 °C winding temperature  
 $F_p$  = Peak force (1 s)  
 Electrical parameters for linear motors: see catalogue Direct Components

## 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

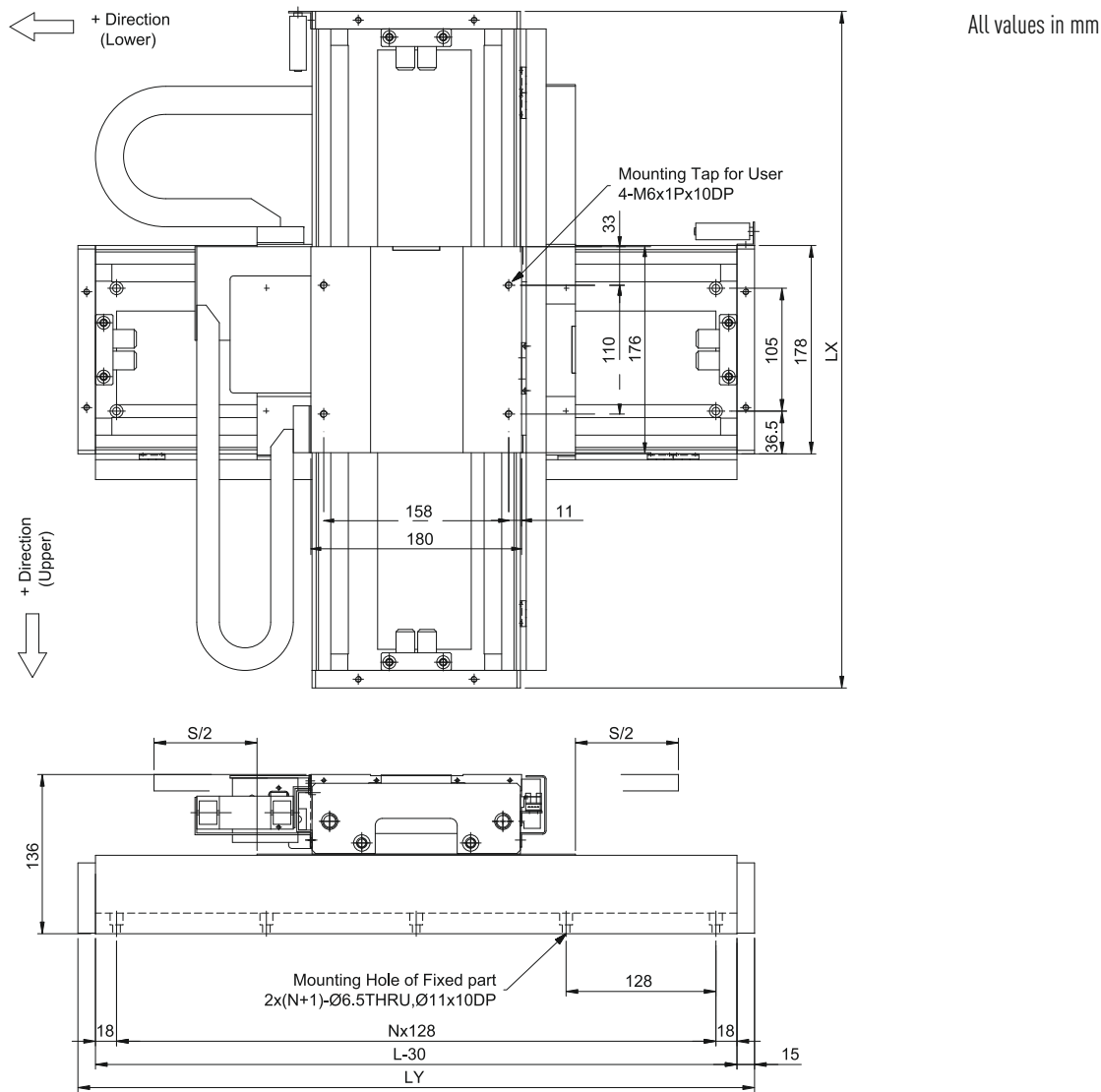
| Name<br>(Model number)<br>xxxx = stroke [mm] | Orthogonality<br>[arc-sec] | Repeatability<br>[mm] | $v_{max}$<br>[m/s] | $a_{max}$<br>[m/s <sup>2</sup> ] | Motor type         | $F_c$<br>[N] | $F_p$<br>[N] | Mass of<br>glider<br>[kg] |
|----------------------------------------------|----------------------------|-----------------------|--------------------|----------------------------------|--------------------|--------------|--------------|---------------------------|
| LMX2E-CB5 CB8-xxxx-xxxx-A1                   | ± 10                       | ± 0.002               | 5                  | 100                              | Upper axis: LMC B5 | 90           | 270          | 2.5                       |
|                                              |                            |                       |                    |                                  | Lower axis: LMC B8 | 145          | 435          | Mass lower axis + 4.0     |

Notes:  $F_c$  = Continuous power, 100 % operating time (ED), at 80 °C winding temperature  
 $F_p$  = Peak force (1 s)  
 Electrical parameters for linear motors: see catalogue Direct Components

# Positioning Systems

## Linear motor axis

Dimensions of LMX2E-CB5-CB8 cross table



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

| Name<br>(Model number)   | Stroke<br>(upper/lower)<br>[mm] | Total length<br>(LX × LY)<br>[mm] | N<br>[mm] | Mass<br>(upper axis)<br>[kg] | Mass<br>(XY axis)<br>[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

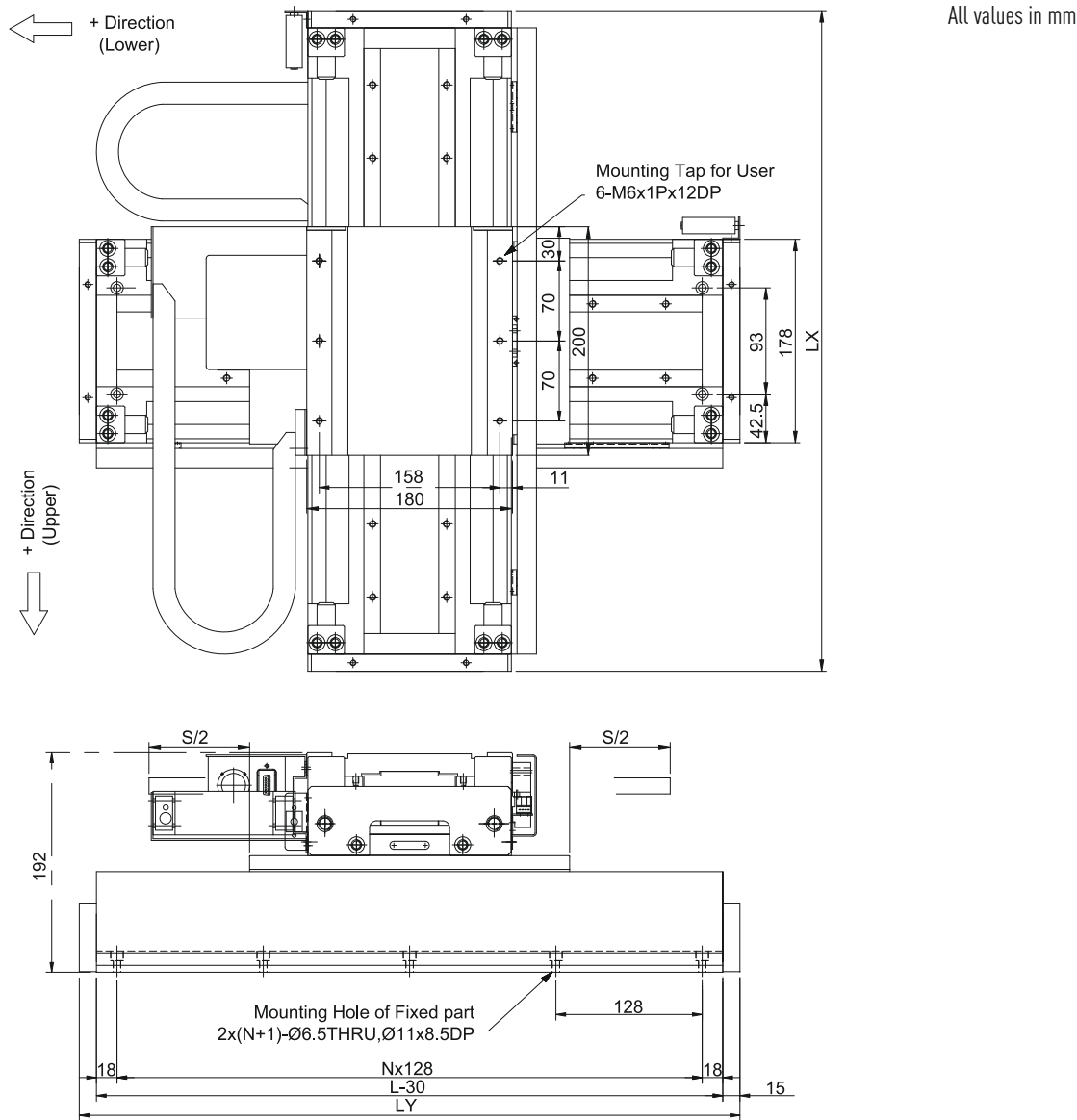
| Name<br>(Model number)<br>xxxx = stroke [mm] | Orthogonality<br>[arc-sec] | Repeatability<br>[mm] | $v_{max}$<br>[m/s] | $a_{max}$<br>[m/s <sup>2</sup> ] | Motor type         | $F_c$<br>[N] | $F_p$<br>[N] | Mass of<br>glider<br>[kg] |
|----------------------------------------------|----------------------------|-----------------------|--------------------|----------------------------------|--------------------|--------------|--------------|---------------------------|
| LMX2L-S23 S27-xxxx-xxxx-A1                   | ± 10                       | ± 0.002               | 4                  | 50                               | Upper axis: LMS 23 | 220          | 600          | 7.5                       |
|                                              |                            |                       |                    |                                  | Lower axis: LMS 27 | 340          | 900          | Mass upper axis + 9.5     |

Notes:  $F_c$  = Continuous power, 100 % operating time (ED), at 80 °C winding temperature  
 $F_p$  = Peak force (1 s)  
 Electrical parameters for linear motors: see catalogue Direct Components

# Positioning Systems

## Linear motor axis

Dimensions of LMX2L-S23-S27 cross table



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

| Name<br>(Model number)   | Stroke<br>(upper/lower)<br>[mm] | Total length<br>(LX × LY)<br>[mm] | N<br>[mm] | Mass<br>(upper axis)<br>[kg] | Mass<br>(XY axis)<br>[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

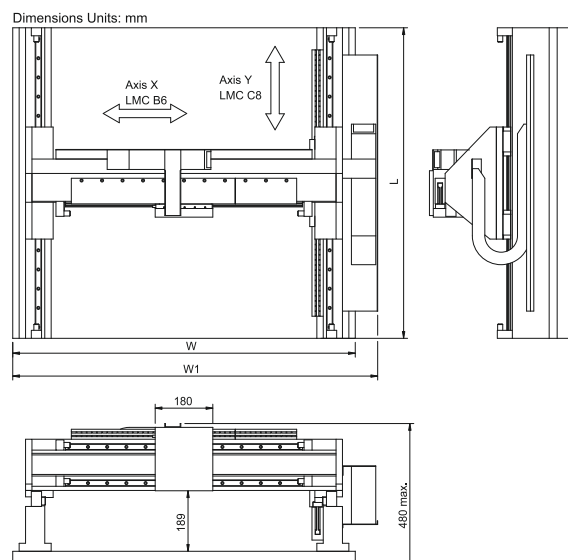


### Specifications for LMG2A-CB6 CC8 gantry system

| Name<br>(Model number)            | Orthogonality | Repeatability       | $v_{\max}$ | $a_{\max}$          | Motor type         | $F_c$ | $F_p$ | Mass<br>of the glider |
|-----------------------------------|---------------|---------------------|------------|---------------------|--------------------|-------|-------|-----------------------|
| xxxx = Stroke [mm]                | [arc-sec]     | [mm]                | [m/s]      | [m/s <sup>2</sup> ] |                    | [N]   | [N]   | [kg]                  |
| <b>LMG2A-CB6 CC8-xxxx-xxxx-A1</b> | $\pm 10$      | $\pm 0.002 / 0.004$ | 5          | 100                 | Upper axis: LMC B6 | 110   | 330   | 3.0                   |
|                                   |               |                     |            |                     | Lower axis: LMC C8 | 195   | 585   | Mass upper axis + 3.5 |

Notes:  $F_c$  = Continuous power, 100 % operating time (ED), at 80 °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

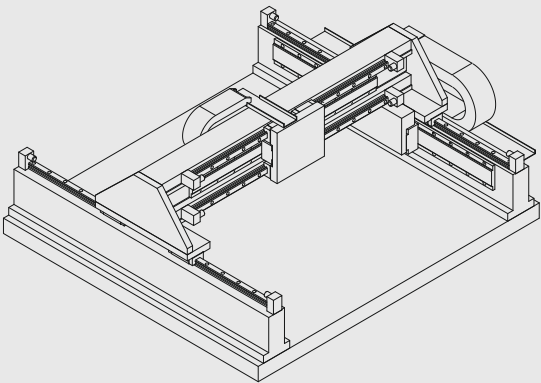
| Type<br>(Model number)            | Stroke<br>X axis<br>[mm] | Stroke<br>Y axis<br>[mm] | Dimensions |            |           |
|-----------------------------------|--------------------------|--------------------------|------------|------------|-----------|
|                                   |   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

# Positioning Systems

## Linear motor axis

### 2.13.2 LM62A-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 LM62A-S13 S27 gantry system

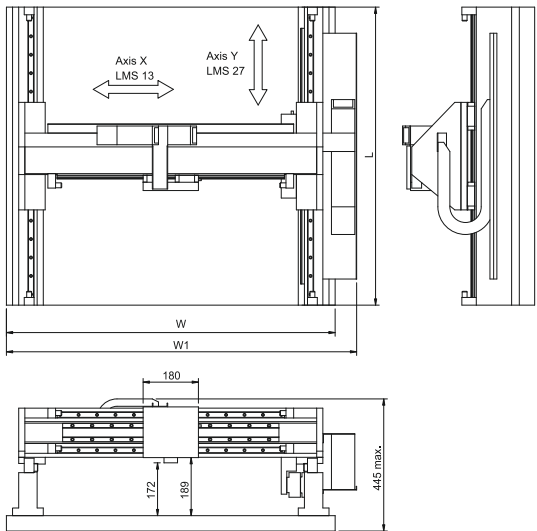
| Name<br>(Model number)     | Orthogonality | Repeatability   | $v_{max}$ | $a_{max}$           | Motor type         | $F_c$ | $F_p$ | Mass of<br>Glider     |
|----------------------------|---------------|-----------------|-----------|---------------------|--------------------|-------|-------|-----------------------|
| xxxx = Stroke [mm]         | [arc-sec]     | [mm]            | [m/s]     | [m/s <sup>2</sup> ] |                    | [N]   | [N]   | [kg]                  |
| LM62A-S13 S27-xxxx-xxxx-A1 | ± 10          | ± 0.002 / 0.004 | 4         | 50                  | Upper axis: LMS 13 | 180   | 360   | 5.0                   |
|                            |               |                 |           |                     | Lower axis: LMS 27 | 340   | 680   | Mass upper axis + 7.0 |

Notes:  $F_c$  = Continuous power, 100 % operating time (ED), at 80 °C winding temperature  
 $F_p$  = Peak force (1 s)  
Electrical parameters for linear motors: see catalogue Direct Components

#### Dimensions of LM62A-S13 S27 gantry system with four stroke examples

| Type<br>(Model number)     | Stroke<br>X axis<br>[mm] | Stroke<br>Y axis<br>[mm] | Dimensions |            |           |
|----------------------------|--------------------------|--------------------------|------------|------------|-----------|
|                            |                          |                          | W<br>[mm]  | W1<br>[mm] | L<br>[mm] |
| LM62A-S13 S27-0300-0400-A1 | 300                      | 400                      | 870        | 940        | 870       |
| LM62A-S13 S27-0500-0500-A1 | 500                      | 500                      | 1070       | 1140       | 970       |
| LM62A-S13 S27-0750-0750-A1 | 750                      | 750                      | 1320       | 1390       | 1220      |
| LM62A-S13 S27-0750-1000-A1 | 750                      | 1000                     | 1320       | 1390       | 1470      |

#### Dimensions of LM62A-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.

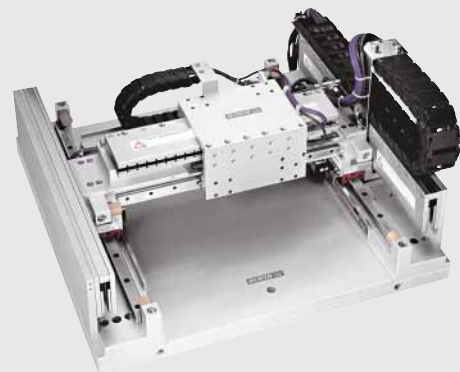
- Standard axis of the LMX1L series
- Repeatability  $\pm 2 \mu\text{m}$
- Supplied with machine bed



#### 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  $\pm 2 \mu\text{m}$
- Tried and tested technology with high output



#### Planar motors

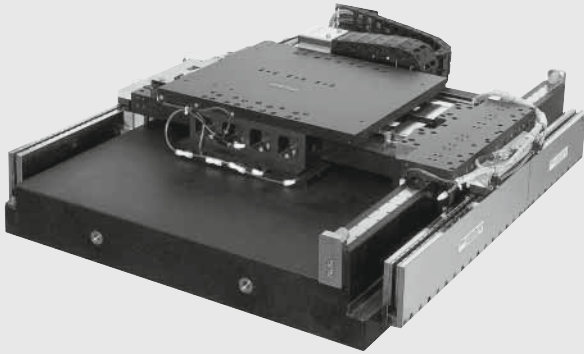
Servo-planar motors offer an excellent technological platform for inspection tasks. In inspection of printed circuit boards, they have an optical sensor for complete monitoring of printed conductive tracks and SMD components.

- Air-cushion bearing ensures minimum wear
- Guaranteed levelness for the complete stroke (up to 1000 mm  $\times$  1000 mm)
- Repeatability  $\pm 3 \mu\text{m}$



# Positioning Systems

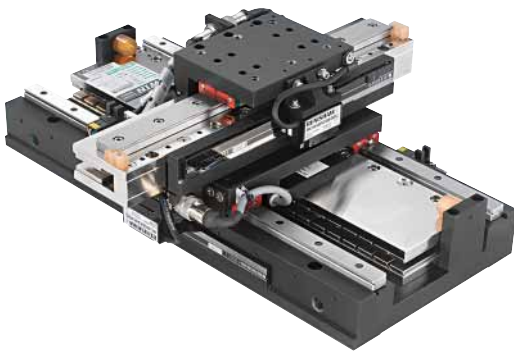
## Linear motor axis



### 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  $\pm 2 \mu\text{m}$
- Repeatability  $\pm 2 \mu\text{m}$
- Accuracy  $\pm 5 \mu\text{m}$



### 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.

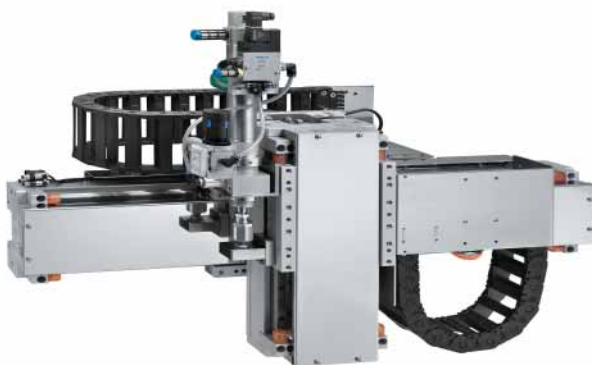
- Stroke  $200 \text{ mm} \times 200 \text{ mm}$ , optional  $300 \text{ mm} \times 300 \text{ mm}$
- Flatness  $\pm 4 \mu\text{m}$  across the complete stroke
- Repeatability  $\pm 1 \mu\text{m}$  across both axes
- Accuracy  $\pm 4 \mu\text{m}$  across both axes
- Clean room suitability class 100, optional class 10
- Optionally suitable for vacuums up to  $10^{-3} \text{ mbar}$



### 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  $1,500 \text{ mm}$



### Photovoltaic-panel assembly

High dynamic positioning of Siliconium-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 emergency-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: ± 1 µm



### 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/s<sup>2</sup>
- 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/s<sup>2</sup>



### 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. The metal particles of the laser machining necessitate the bellow cover.

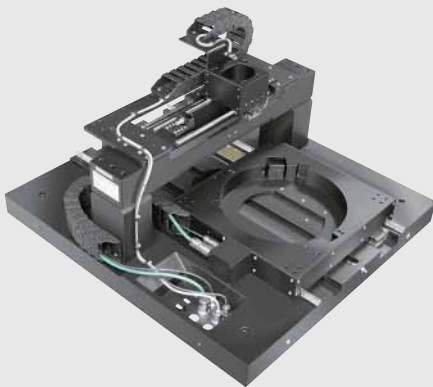
- Cross table with bellow cover
- Stroke: 700 × 750 mm
- Repeatability: ± 2 µm
- Flatness: ± 0.01 / 300 mm
- Rectangularity: ± 5 arcsec



### 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: ± 1 µm
- Rectangularity: 8 µm
- Flatness: ± 5 µm



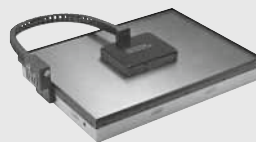
### Laser Exposure

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

**4. Planar servo motors and planar motors**

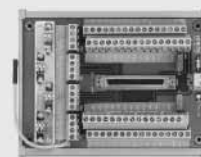
|     |                         |    |
|-----|-------------------------|----|
| 4.1 | LMSP Planar Servo Motor | 54 |
| 4.2 | LMPP Planar Motor       | 58 |
| 4.3 | Control Card PC14P      | 58 |



4.1



4.2



4.3

# Positioning Systems

## Planar Servo Motors and Planar Motors

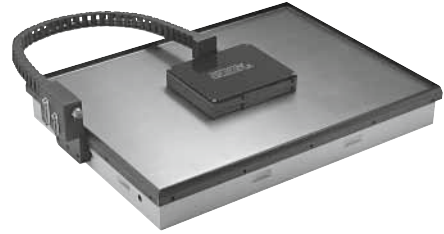
### 4. Planar Servo Motors and Planar Motors

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.

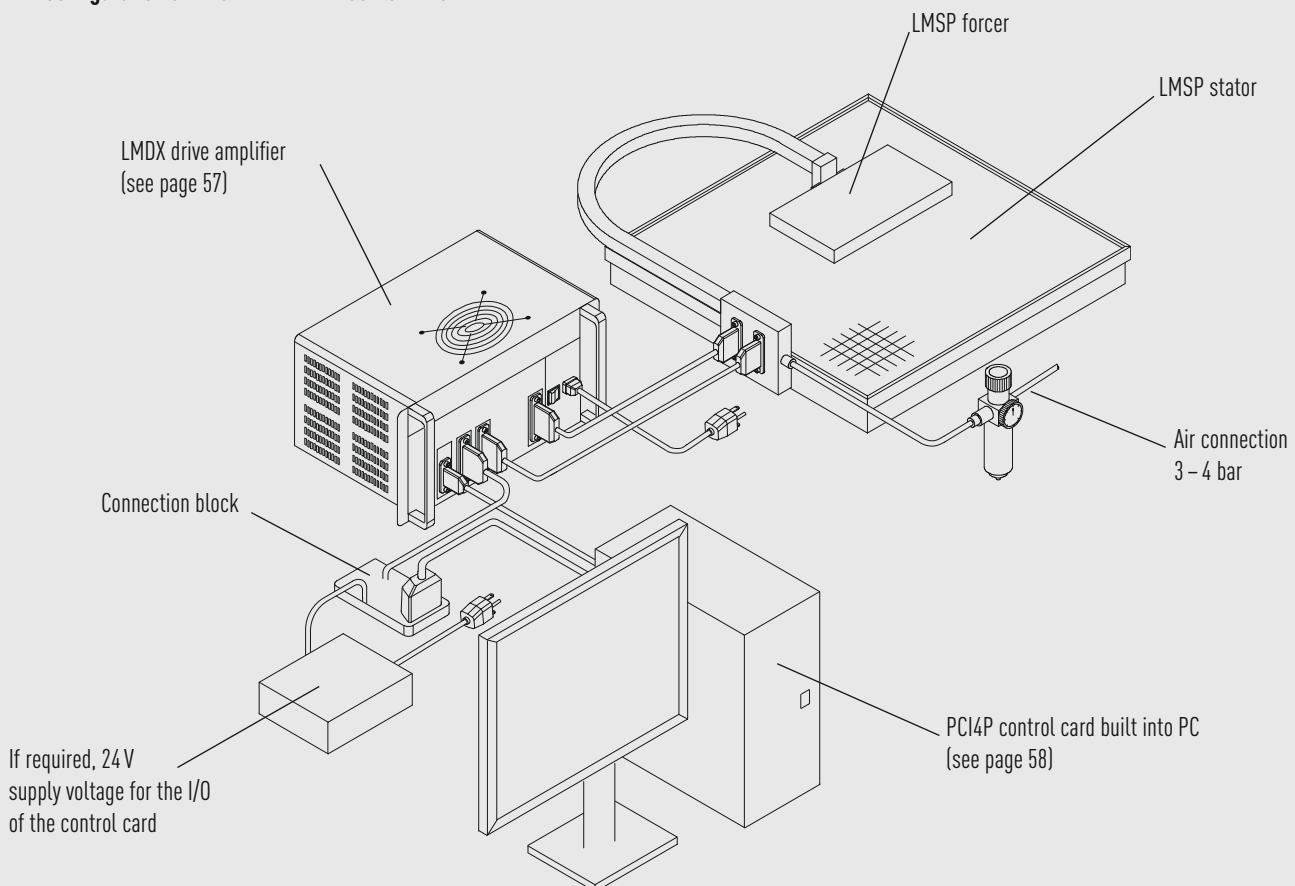
#### 4.1 LMSP Planar Servo Motor

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  $1000 \times 1000$  mm
- Can be used in vacuums



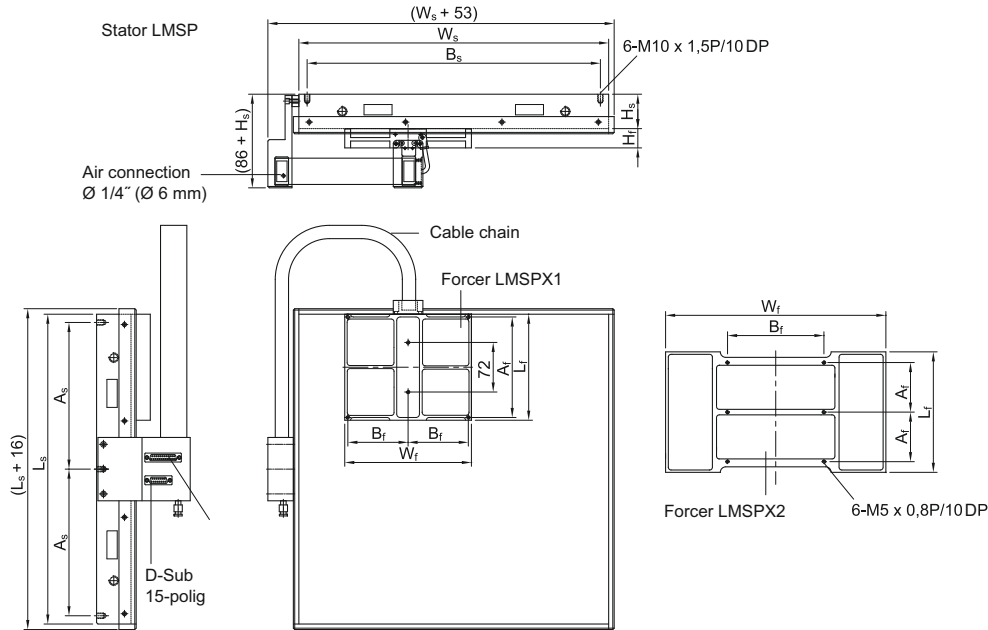
#### 4.1.1 Configuration of LMSP with LMDX Servo Driver



#### 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                |
|             | Resolution                    | $R_s$            | mm                 | 0.001             |
|             | Repeatability                 | $R_p$            | mm                 | 0.002             |
|             | Accuracy                      | $A_c$            | mm                 | $\pm 0.015$       |
|             | Max. speed                    | $V$              | m/s                | 0.9               |
|             | Max. load                     | —                | kg                 | 12.2              |
| Forcer      | Length                        | $L_f$            | mm                 | 154               |
|             | Width                         | $W_f$            | mm                 | 184               |
|             | Height                        | $H_f$            | mm                 | 28                |
|             | Air pressure                  | $P_a$            | kg/cm <sup>2</sup> | 3 – 4             |
|             | Air flow rate                 | $F_a$            | l/min              | 6.4               |
|             | Mass                          | $M_f$            | kg                 | 1.8               |
|             | Distance between fixing holes | $A_f \times B_f$ | mm × mm            | $146 \times 87.5$ |
|             |                               |                  |                    | $72 \times 140$   |

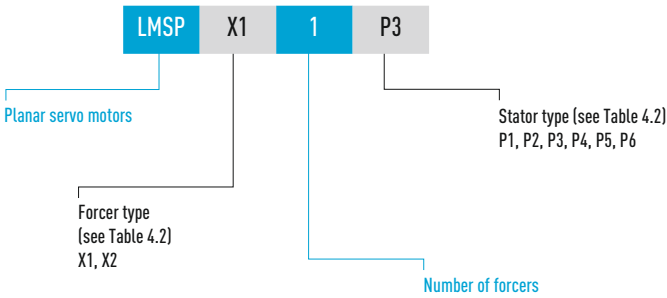
# Positioning Systems

## Planar Servo Motors and Planar Motors

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                                    | mm   | 190 × 140 | 290 × 260 | 440 × 260 | 440 × 410 | 840 × 410           | 690 × 660 |
| (one forcer)                                   | 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

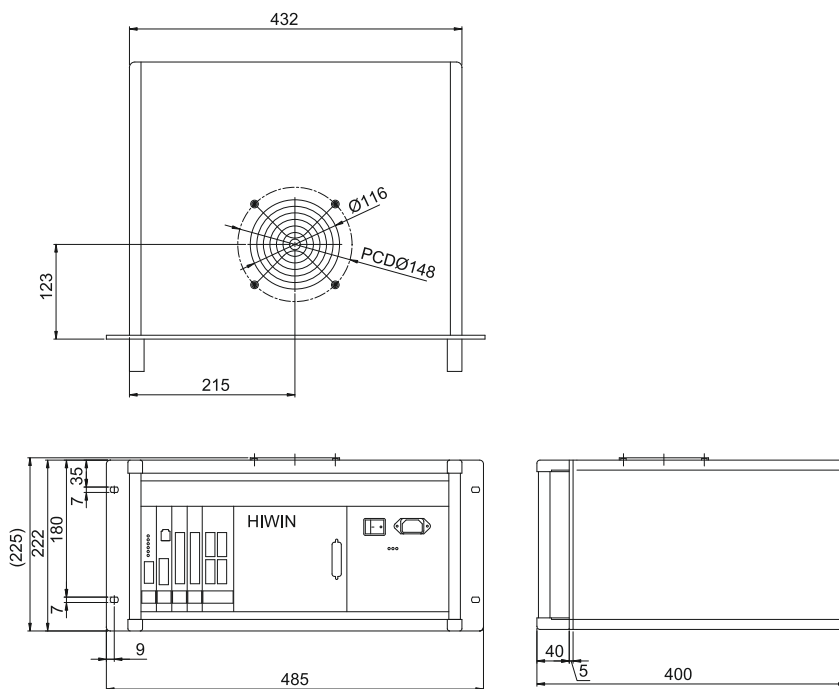


#### 4.1.4 LMDX servo driver

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                                                                                                  |
|-----------------------------------|--------------------------|---------------|--------------------------------------------------------------------------------------------------------|
| <b>Power supply</b>               | Voltage                  | $V_{AC}$      | 95 – 125 (Model number LMDX1)<br>200 – 240 (Model number LMDX2)                                        |
|                                   | Frequency                | $H_z$         | 50 / 60                                                                                                |
|                                   | Power                    | $V_A$         | 500 (max.)                                                                                             |
| <b>Output current</b>             |                          | A             | 3 (max.)                                                                                               |
| <b>Interface</b>                  | 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<br>6 outputs: including IN POSITION, ALARM, SVON |
|                                   |                          |               | DXIO16 modularCard (optional): 16 inputs, 16 outputs                                                   |
|                                   | Pulse                    | Pulse         | STEP/DIRECTION                                                                                         |
| <b>Resolution</b>                 |                          | $\mu m/Pulse$ | up to min. 1 (configurable)                                                                            |
| <b>Mass</b>                       |                          | kg            | 13.3                                                                                                   |
| <b>Max. operating temperature</b> |                          | $^{\circ}C$   | 50                                                                                                     |

# Positioning Systems

## Planar Servo Motors and Planar Motors

### 4.2 PCI4P Control Card

The HIWIN control card PCI4P controls the drive amplifier for up to four axes. It can be used for stepping motors and for pulse-controlled servo motors.

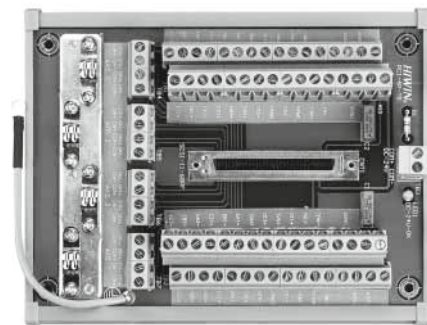
- 32 bit PCI card, Plug and Play
- 4-output pulse sequence generator
- 13 digital inputs, 5 digital outputs
- Supports the STEP/DIR and (CW/CCW) pulse formats
- Linear interpolation for three axes
- Circular interpolation for two axes
- Supports T and S speed profiles
- 4 × 32-bit counter for digital incremental encoders
- DLL driver libraries for Windows, MCCL Motion Library for VC++/ VBprogramming under Windows 98/2000/XP with 98 functions
- Referencing, limit switch, jog function
- For operation of stepping motors, AC servo motors and linear motors
- MotionMaker™ user interface for convenient operation
- Differential pulse output reduces noise



### 4.3 PCI4B-TB Terminal Block

The PCI4B-TB terminal block provides clear connection options for pulse generators and all control card inputs and outputs.

- Power supply slot  
+ 5 V DC  $\pm 5\%$ , max. 900 mA via PCI bus in PC
- External supply voltage  
+24 V DC  $\pm 5\%$ , max. 500 mA, user-configured







Linear Guideways



Ball Screws



Linear Axes with ballscrew



Linear Motor Systems



Rotary Tables



Linear Actuators



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