



# Linear Motor System

Technical Information



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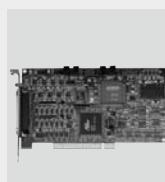
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# Positioning Systems

## Customized Positioning Systems

The standardized positioning axes presented in this catalogue make it possible to handle many kinds of positioning tasks. For positioning tasks, that cannot be solved using standard axes, application engineers are available to work out an optimized solution for customers. The inquiry form at the end of this catalogue serves to help our application engineers make a preliminary design.

A sampling of customized solutions is shown here. In several examples, mechanics are not the only parts customized. For instance, with the planar motors, special software is developed in order to obtain optimal integration of the positioning system to the production process.

### 1.1 Examples

#### Economical Pick & Place and Inspection

XY gantry systems are economical for many applications. Gantry axes are assembled from standard components.

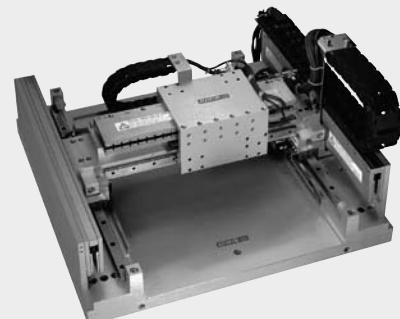
- Standard axes of the LMX1L series
- Repeatability  $\pm 2 \mu\text{m}$
- Delivery with base frame.



#### Microshapes and Macroshapes

Milling of microstructures with cutting tools and lasers are application areas in which gantry systems excel. They are also very economical to implement.

- Coreless motors LMC
- Repeatability  $\pm 2 \mu\text{m}$
- Technology proven through countless worldwide installations



#### Planar Motors

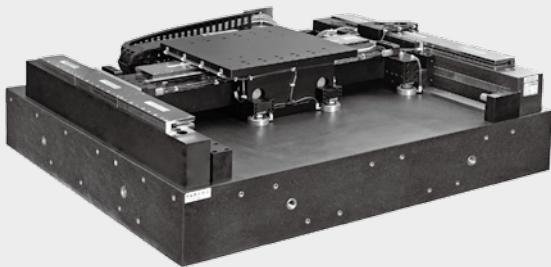
Servo-planar motors provide an excellent technological platform for inspection tasks. During inspection of circuit boards, optical sensors are integrated to completely monitor the printed conductive tracks and SMD components.

- Virtually no wear due to an air-cushion bearing
- Guaranteed levelness for the complete stroke path (up to 1000 mm x 1000 mm)
- Repeatability  $\pm 3 \mu\text{m}$



# Positioning Systems

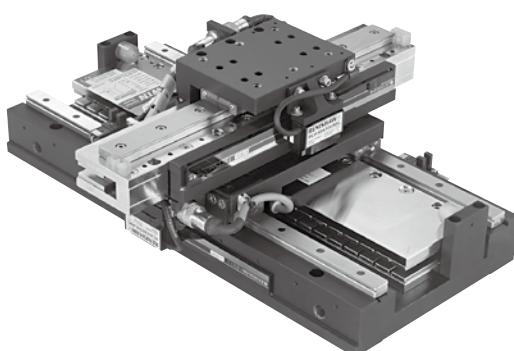
## Customized Positioning Systems



### Wafer Quality Control and Mask Production at the Highest Level

High precision cross stages with air-bearings are the prerequisites for surface monitoring and mask production, to find even the smallest errors, to produce precision masks, in wafer production for the electronics, chip and flat panel industries.

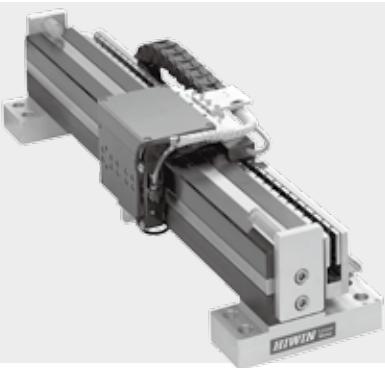
- Flatness  $\pm 2 \mu\text{m}$
- Repeatability  $\pm 0.5 \mu\text{m}$
- Accuracy  $\pm 1.5 \mu\text{m}$



### Microsystem 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 cross stages meet these requirements.

- Stroke 200 mm x 200 mm, optional 300 mm x 300 mm
- Levelness  $\pm 4 \mu\text{m}$  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



### Laser Scanners

Extremely smooth motion and long operating life are a must for optical inspection systems such as laser scanners. Linear motor stages with air bearings fulfill these requirements.

- Frictionless air cushions
- Coreless linear motors are not effected by cogging.
- Stroke up to 1,500 mm



### Horizontal high-speed hot weld machine for welding synthetic materials

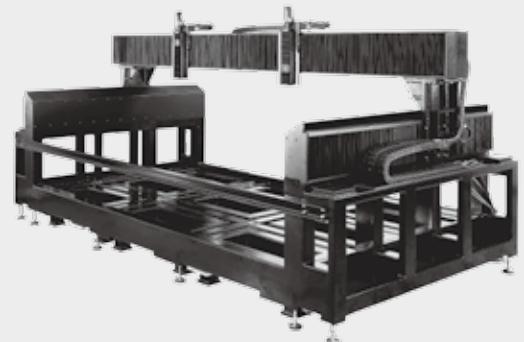
Linear motor stages of the LMX1L series with absolute position measurement offer:

- No commutation required at power up
- No "drawing" of the synthetic material when removed from the heated plate
- Welding is controlled by time, force and path
- Lower changeover times due to higher speeds

### Water jet application

LMS double forcer linear stage provides 2.5m stroke and carries two Hiwin KK stages on the Z-axis. The lower 2 axes are also equipped with LMS high thrust liner motors and run under synchronization.

- No commutation required at power up
- Large stroke
- Delivered with base frame, cover and high end motion controller



### Total solution for AOI industry

LMC linear stage provides smooth motion for the special needs in AOI applications. With the LMS linear stage mounted to the upper axis, the ballscrew driven Z-axis integrated with a CCD camera can attain high speeds.

- Repeatability  $\pm 1 \mu\text{m}$
- Velocity ripple below 1.5 %
- Delivery with base frame and cover



### Custom made stage for glass working

The linear motor stage is designed to carry a working head to move above the flat table. The customer's working head is for cutting double layer glasses.

- Gantry structure linear motor positioning stage for Gen. 5 glass
- 1300 mm x 1450 mm stroke
- Smooth motion
- Sinusoidal commutation and no cogging
- LMC series motors
- Repeatability  $\pm 2 \mu\text{m}$
- Rigid base structure



# Positioning Systems

## Customized Positioning Systems

### 1.2 Glossary

#### 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 a drive requires from start until achieving maximum speed.

#### Accuracy

This, or actually the better terminology, the inaccuracy, corresponds to the deviation between target and actual position. The accuracy along an axis is defined as the remaining difference of target and actual position, after other linear deviations are excluded. Such systematic or linear deviations can be caused by cosine error, angle deviation, ball screw error, thermal expansion, etc. For all target positions of interest in an application, it is calculated with the following formula: Maximum of sum of systematic target-actual-difference + 2 sigma (standard deviation)  
Please do not confuse accuracy with repeatability.

#### Attraction force $F_a$

This is created between the primary and secondary parts of the iron-core linear motors which must be taken up by the guide.

#### Back emf constant

(see also Chapter 1.3,  $K_v$ )

This is the ratio of the back emf voltage (rms) to the motor rotational speed or linear speed (rpm or m/s). The back emf is the electromagnetic force, which is created at the movement of the coil in the magnetic field of permanent magnets, e.g. in a servomotor.

#### Continuous torque, continuous force

(see also Chapter 1.3,  $F_c$ )

Or also nominal torque, nominal force. This is the torque or force, that rotary or linear motors can produce in continuous operation (duty cycle = 100%).

#### Continuous current

(also see Chapter 1.3,  $I_c$ )

It is a current that flows over longer time into motor. The maximum allowed current into each coil is also called nominal current. It is characterized when the generated heat results in motor warming of up to 80 °C.

#### Eccentricity

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

#### Force, torque

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

- 20 °C ambient temperature
- 80 °C winding temperature
- 100% duty cycle

or as peak force or peak torque.

#### Force constant $K_f$

(see also Chapter 1.3,  $K_f$ )

This is a coil specific constant. The motor output force can be calculated by multiplying the force constant of the motor by input current:  $F = I \times K_f$

#### Guide deviation

This is the deviation from the axis of stroke. It depends on horizontal straightness (also straightness) and vertical straightness (also flatness).

#### Horizontal straightness

It is a measure for horizontal straightness when moving in X-axis. If there is deviation in horizontal straightness, there would be positioning error in Y-axis, as the system moves along X-axis.

#### Motor constant $K_m$

(see also Chapter 1.3,  $K_m$ )

This designates the ratio of generated force and dissipation power and consequently is a measure of efficiency for a motor.

#### Peak current $I_p$

(see also Chapter 1.3,  $I_p$ )

This current is applied to coils for a short time to generate peak force. HIWIN defines it to be the following: For iron core type motors,  $I_p$  is 2 times the allowed continuous current. For coreless types, it is 3 times the allowed continuous current. The maximum time for applying peak current is 1 second. After that, motor has to cool down to nominal operating temperature, before further peak current could be applied again.

### Peak torque, peak force $F_p$

The peak torque (for rotary motion) or peak force (for linear motion) is the maximum force that a motor can generate for approximately one second with peak current  $I_p$ . While applying  $I_p$  into motor, it is operating near the non-linear range of motor. This is especially useful for acceleration and braking.

### Repeatability

Repeatability may not be confused with absolute accuracy. A linear axis can have medium accuracy, but have good repeatability. Uni-directional repeatability can be measured in a way, that a target position is approached multiple times from an appropriately large enough enough distance and the same approaching direction. In this way, the backlash will not have any effect. For measurement of bi-directional repeatability, the target position is approached from different directions, in which case the backlash will take effect.

### Resolution

It is the smallest distance, that the position measuring system will detect. The reachable step size is, in principle, larger than resolution due to other additional factors.

### Step size

Also called resolution. It is the smallest possible movement of a system. It depends on encoder, amplifier, mechanical construction, backlash, etc.

### Stiffness

This corresponds to the mechanical resistance to deformation a part or an assembly can provide under external static load. (static stiffness) Or, it is the elastic resistance to deformation a part or an assembly can provide under external dynamic load. (dynamic stiffness)

### Torque

This is a measurement of the rotational movement in a body and consequently a vectorial direction that can be expressed in the following cross product:

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

The torque is expressed in the equation  $Nm = kg \times m^2/s^2$ .

### Vertical straightness

It is a measure for vertical straightness when moving in X-axis. If there is deviation in vertical straightness, there would be positioning error in Z-axis, as the system moves along X-axis.

### Winding resistance $R_{25}$

This is the coil-specific dimension of is the winding resistance at 25 °C. At 80° C, the winding resistance increases to approximately  $1,2 \times R_{25}$ .

### Winding temperature $T_{max}$ (see also 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 a concrete case and cannot be calculated.

### Wobbling

It is a term for rotary motor. Wobble is the angular deviation of rotating axis from theoretical axis of rotation as the motor turns. The reason for it is possibly bearing tolerances.

# Positioning Systems

## Customized Positioning Systems

### 1.3 Typical Dimensions

#### 1.3.1 Coil-Independent Dimensions

- $F_a$  Relatively constant attracting force between motor primary and secondary part. The force is taken by a mechanical guide.
- $F_c$  Motor force available as continuous force in nominal operation and results in warming to 70-80 °C.
- $F_p$  Short term motor force, which is available at applying  $I_p$  to the coils and operate near the non-linear area. Without cooling means, it will cause a very strong temperature rising of coils.
- $K_m$  Motor constant, which is the ratio of generated force to dissipation power and is consequently an index of motor efficiency.
- $P_v$  The generated power in a motor coil, which results in time dependent temperature rise according to supplied current and ambient cooling conditions. In the non-linear operating area of current ( $I_p$ ),  $P_v$  is especially high due to quadratic relation to current, whereas in the linear area of current ( $I_c$ ), it results in relative low warming.  $P_v$  can be calculated with motor constant  $K_m$  and force as below:  $P_v = F/K_m^2$
- $P_{vp}$  Peak power at  $I_p$
- $P_c$  Continuous power at  $I_c$
- $T$  Permissible temperature of motor winding, which is monitored with help of sensor or thermal switch. The motor surface temperature depends on:
  - The actual assembly condition (position stage size)
  - Heat dissipation condition (cooling means)
  - Actual operation
 So the actual temperature can only be determined with the above informations.

#### 1.3.2 Coil-Dependent Dimensions

- $I_c$  The current for generating continuous force
- $I_p$  The peak current for generating short term peak force
- $K_f$  Coil characteristic value for calculation of force with the formula:  $F = I \times K_f$
- $K_v$  Coil characteristic value, which results armature back emf dependent of velocity when motor works as generator. :  $U_g = K_v \times v$
- $R_{25}$  Winding resistance at 25 °C; this increases to approx., 1.2 times the value at 80 °C.

## 2 Linear Motor Stages

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# Positioning Systems

## Linear Motor Stages

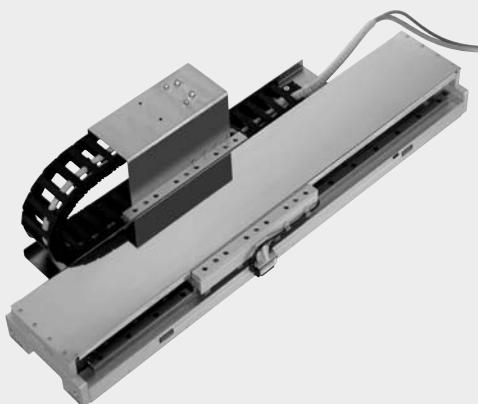
### 2.1 Product Overview



#### LMX1E-C

**Page 14**

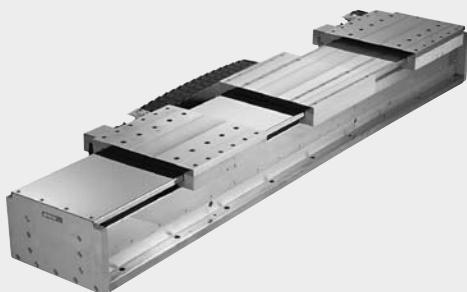
- Complete linear stage with coreless motor, type LMC
- Excellent for applications with a high degree of synchronous operation requirements
- Also for use as cross table
- Stroke is measured via optical encoder incrementally or absolutely
- Total length to 4,000 mm



#### LMX1L-S

**Page 19**

- Complete linear stage with iron-core motor, type LMS
- Specially suited for applications with high demands on continuous power
- Also for use as cross table
- Stroke is measured via optical or magnetic encoder incrementally or absolutely depending on requirements
- Total length to 4,000 mm



#### LMX1L-T

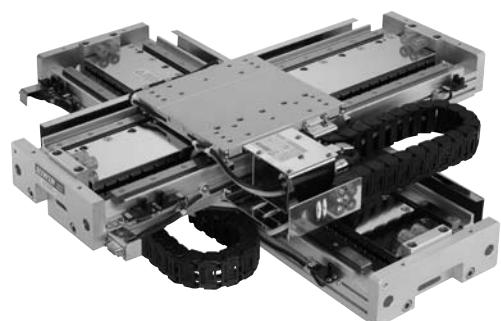
**Page 27**

- Complete linear stage with iron-core motor, type LMT
- Sandwich design makes high power density possible without static load of the guideways by attraction force
- Stroke is measured via optical or magnetic encoder incrementally or absolutely depending on requirements
- Total length to 4,000 mm

### Cross Tables

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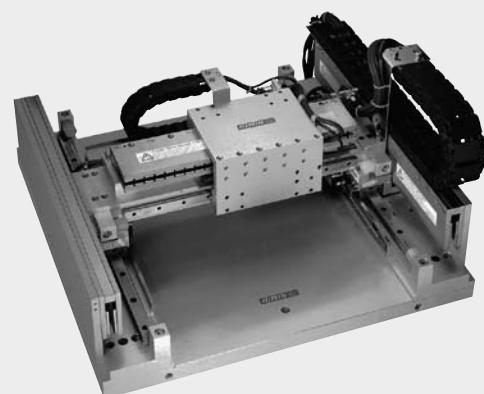
- Combination of linear stages of the LMX series
- With iron-core or coreless motors



### Gantry Systems

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- Standardized gantry systems with iron-core or coreless motors



# Positioning Systems

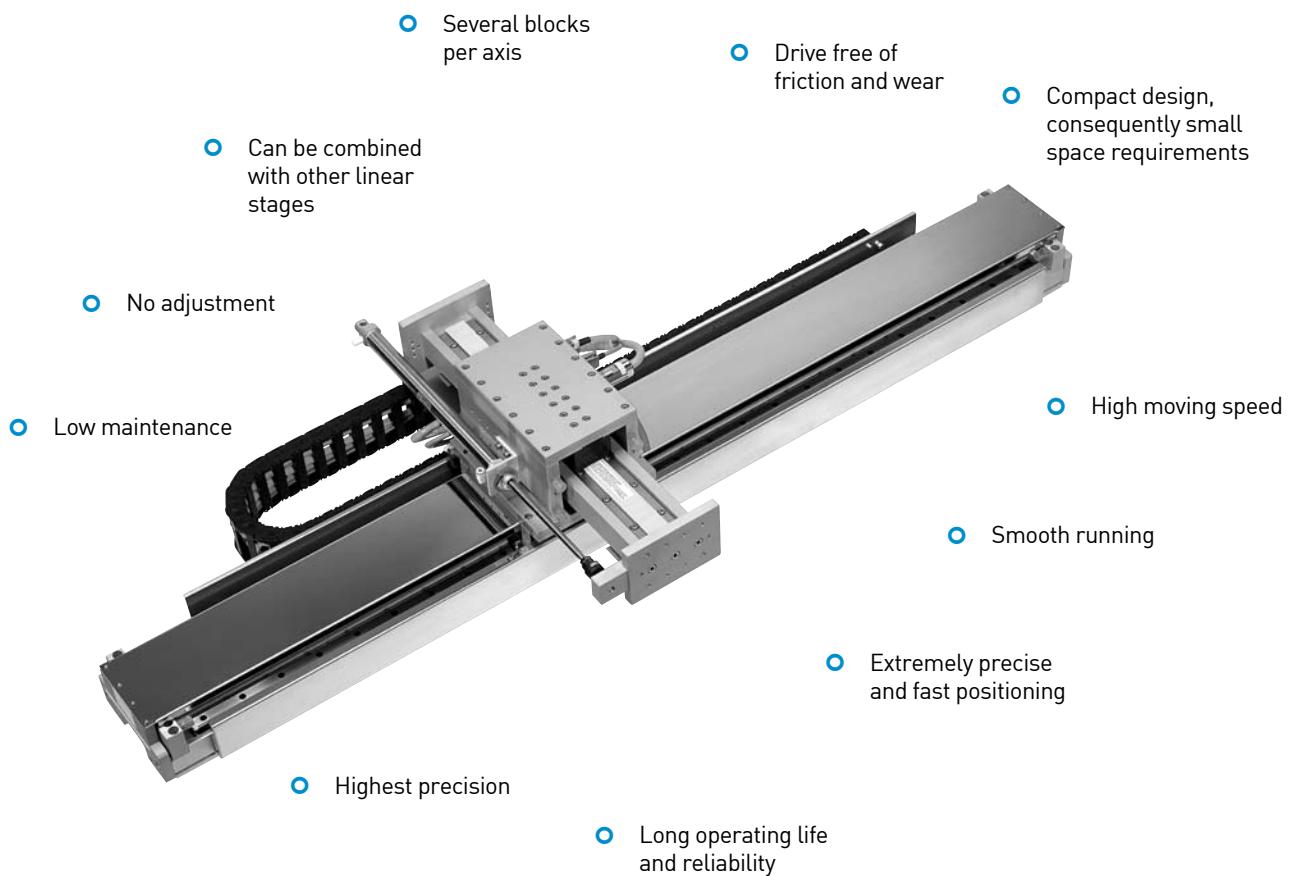
## Linear Motor Stages

### 2.2 Typical Properties of Linear Motor Stages

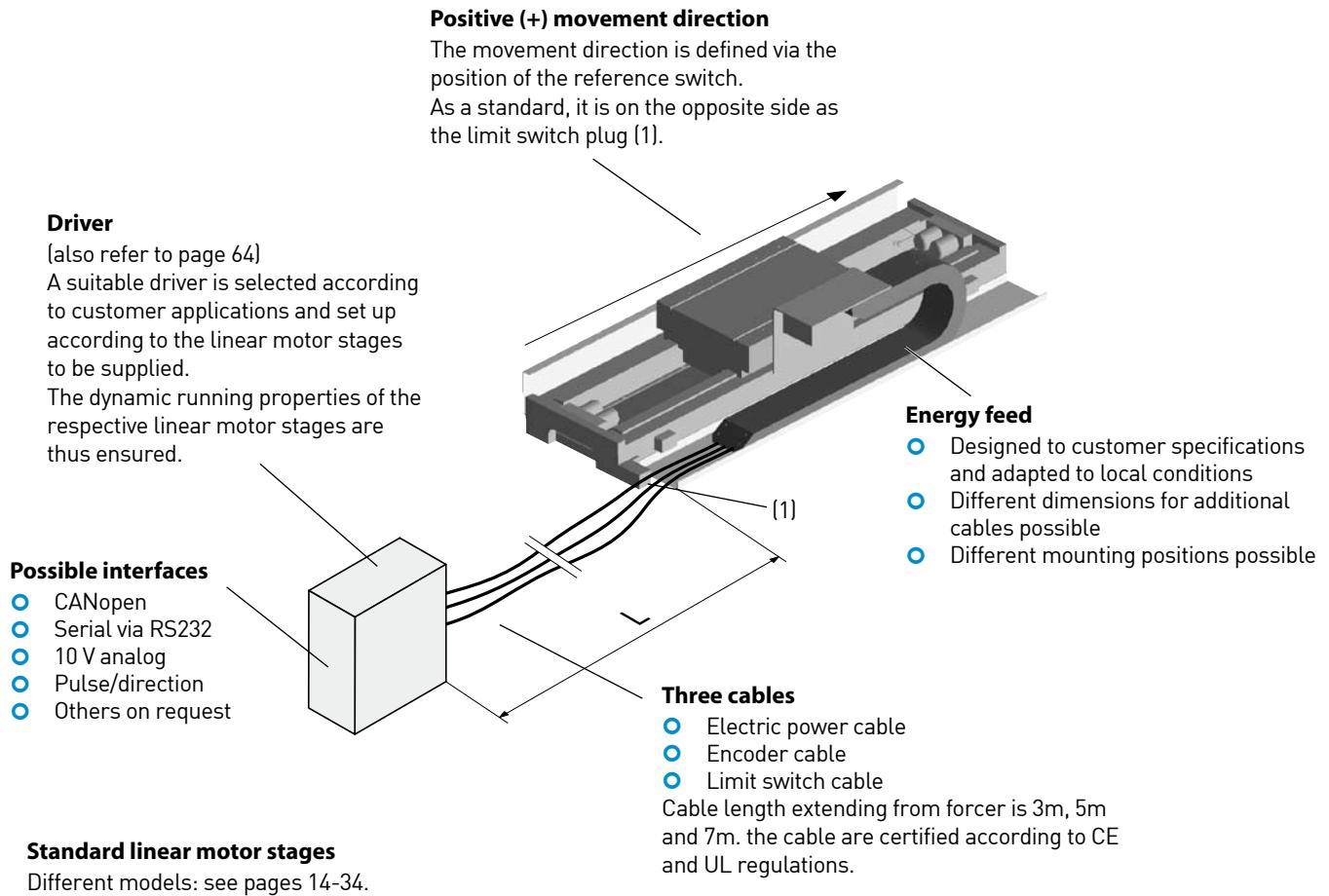
HIWIN linear motor stages are directly driven axes with linear motors, which are designed as a plug and play solution. Standardized cable chains and customized cable guides are possible as an option. They are complete axes with distance measurement system, linear guide way, limit switch and optionally covers as protection against ambient influences. An arresting brake can be added as an option.

Due to the direct drive, the linear stages are backlash-free, very dynamic, low maintenance and can be equipped with several blocks.

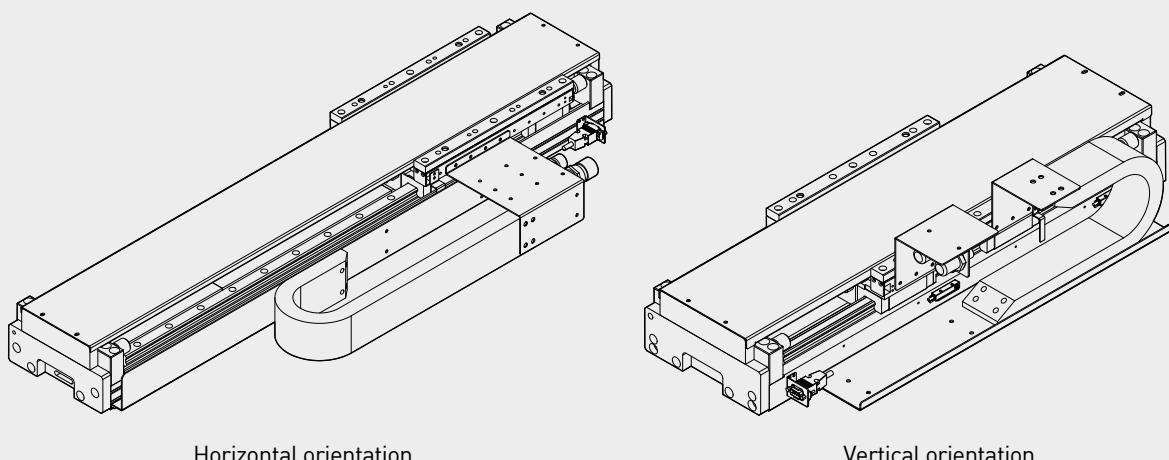
The linear stages are provided as a complete solution including drivers on request. Customers can select the drive manufacturer of their choice. We supply the required electronic parameters for adaptation of the linear motor.



## 2.3 Scope of Delivery



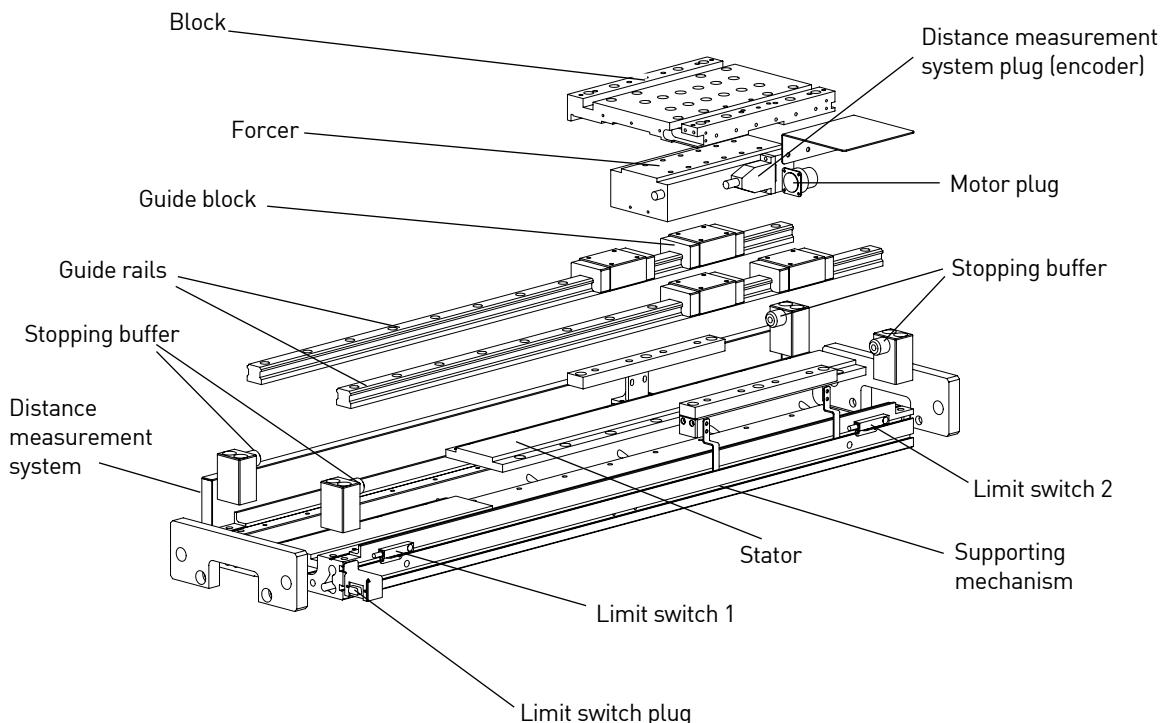
### 2.3.1 Cable Chain Orientation



# Positioning Systems

## Linear Motor Stages

### 2.4 System Configuration



#### General Specifications of Linear Motor Stages

Name	Motor Type	$v_{max}$ [m/s]	$a_{max}$ [m/s <sup>2</sup> ]	Total Length $L_{max}$ [mm]	Repeatability [mm]	Accuracy [mm/300 mm]	Straightness [mm/300 mm]	Flatness [mm/300 mm]	Page
LMX1E-C ...	LMC	3	50	4000	+/- 0.001*	+/- 0.005*	+/- 0.005	+/- 0.005	14
LMX1L-S ...	LMS	3	50	4000	+/- 0.001*	+/- 0.005*	+/- 0.005	+/- 0.005	19
LMX1L-T ...	LMT	2	50	4000	+/- 0.001*	+/- 0.005*	+/- 0.005	+/- 0.005	27

\* Values apply to the optical, incremental distance measurement system with 40µm periods of the sin/cos signal.

The distance measurement system is either digital or analog, depending on the customer's request. As a standard, digital encoder with 1µm resolution is provided.

The permissible operating voltage depends on the used linear motor type. The maximum permitted operating voltage is 480 VAC for the motor types LMS and LMT (iron-core motors). The maximum permitted operating voltage is 280 VAC for the motor type LMC (coreless motors).

## 2.5 Structure of Order Number

### 2.5.1 Structure of Order Number of Single-Axis Type Series

LMX1 L S23 -1 - 0872 - G 2 0 0 - XXXXXXXX								
Stage type	Motor type	Quantity of Forcer	Stroke [mm]	Encoder-Type	Limit switch	Cover	Cable chain	Customized drawing number
L - Iron-core motors	Sxx - Iron-core linear motor			A - Optical, period 40 µm, analog 1Vpp sin/cos	0 - None	0 - None (standard)	0 - None (standard)	Multi-Forcer, hall sensor, mass compensation, special brake, special mounting holes
E - Coreless motors				B - Optical, period 20 µm, analog 1Vpp sin/cos	1 - Inductive, PNP	1 - For horizontal orientation, size 15x30	1 - For horizontal orientation, size 15x30	
C - Customized	Cxx - Coreless linear motor			G - Optical, digital TTL, resolution 1 µm (standard)	2 - Optical, NPN (standard)	A - Metal sheet	2 - For vertical orientation, size 15x30	
	T37x- Iron-core linear Linear motor in sandwich form					B - Below		C - Customized

### 2.5.2 Structure of Order Number of Cross Tables

LMX2 L S23 S27 - 232 - 280 G 2 - XXXXXXXX							
Stage type	Motor type of upper axis	Motor type of lower axis	Stroke of upper axis [mm]	Stroke of lower axis [mm]	Encoder-Type	Limit switch	Customized drawing number
L - Iron-core motors	Sxx - Iron-core linear motor	Sxx - Iron-core linear motor			A - Optical, period 40 µm, analog 1Vpp sin/cos	0 - None	Multi-Forcer, hall sensor, mass compensation, special brake, special mounting holes
E - Coreless motors					B - Optical, period 20 µm, analog 1Vpp sin/cos	1 - Inductive, PNP	
C - Customized	Cxx - Coreless linear motor	Cxx - Coreless linear motor			G - Optical, digital TTL, resolution 1 µm (standard)	2 - Optical, NPN (standard)	
	T37x- Iron-core linear Linear motor in sandwich form						

### 2.5.3 Structure of Order Number of Gantry Type Series

LMG2 A S13 S27 - 300 - 400 G 2 - XXXXXXXX							
Stage type	Motor type of upper axis	Motor type of lower axis	Stroke of upper axis [mm]	Stroke of lower axis [mm]	Encoder-Type	Limit switch	Customized drawing number
A - Standard	Sxx - Iron-core linear motor	Sxx - Iron-core linear motor			A - Optical, period 40 µm, analog 1Vpp sin/cos	0 - None	Multi-Forcer, hall sensor, mass compensation, special brake, special mounting holes
C - Customized	Cxx - Coreless linear motor	Cxx - Coreless linear motor			B - Optical, period 20 µm, analog 1Vpp sin/cos	1 - Inductive, PNP	

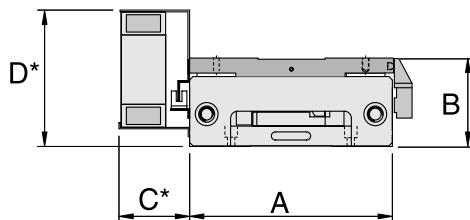
# Positioning Systems

## Linear Motor Stages

### 2.6 Linear Motor Stages LMX1E-C

Linear motor stages LMX1E-C are equipped with a coreless motor and well suited for applications with a high degree of synchronous operation requirements. They can also be used in cross tables. They are distinguished by their low profile design. The travel is measured via optical encoder incrementally. The linear motor stages LMX1E-C 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
- Length up to 4,000 mm



\* Dimensions C and D are customer-specific

#### Specifications for Linear Motor Stages LMX1E-C

Type (Order code) xxxx=Stroke [mm]	Motor Type	F <sub>c</sub> [N]	F <sub>p</sub> [N]	Mass of Slider [kg]	Length of forcer [mm]	v <sub>max</sub> [m/s]	a <sub>max</sub> [m/s <sup>2</sup> ]	Dimension A [mm]	Dimension B [mm]
<b>LMX1E-CB5-1-xxxx-G200</b>	LMC B5	90	270	2	178	3	50	178	80
<b>LMX1E-CB6-1-xxxx-G200</b>	LMC B6	110	330	3	208	3	50	178	80
<b>LMX1E-CB8-1-xxxx-G200</b>	LMC B8	145	435	4.2	272	3	50	178	80
<b>LMX1E-CB5-1-xxxx-G200</b>	LMC B5	90	270	2.3	178	3	50	178	92/101
<b>LMX1E-CB6-1-xxxx-G200</b>	LMC B6	110	330	3.3	208	3	50	178	92/101
<b>LMX1E-CB8-1-xxxx-G200</b>	LMC B8	145	435	4.5	272	3	50	178	92/101

Note: F<sub>c</sub> = continuous force, 100% operating time

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

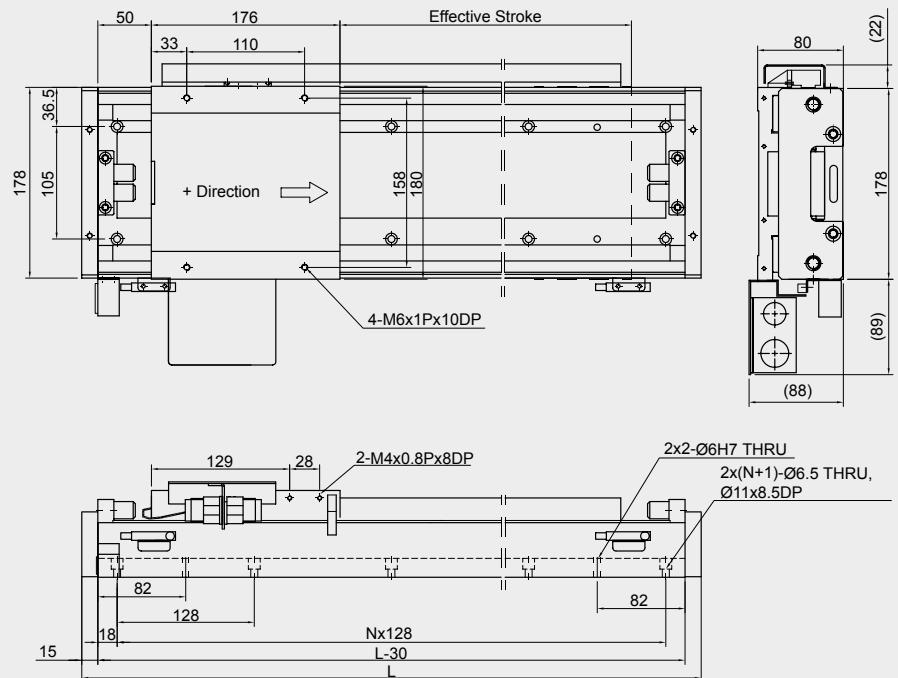
Electric parameters for the linear motors: see page 46.

Mass of slider includes forcer, forcer plate, guide blocks.

## 2.6.1 Linear Motor Stages LMX1E-C without Cover

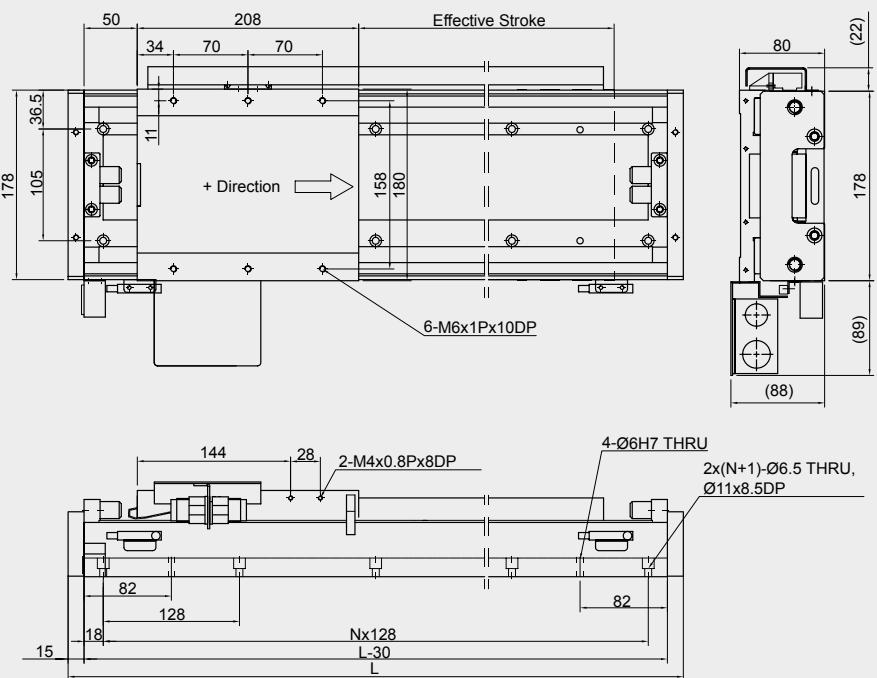
### Dimensions and weight of the linear motor stage LMX1E-CB5 without cover

Stroke [mm]	Total length L [mm]	N	Mass [kg]
<b>144</b>	450	3	19
<b>272</b>	578	4	22.5
<b>400</b>	706	5	26
<b>528</b>	834	6	30
<b>656</b>	962	7	33
<b>784</b>	1090	8	36.5
<b>912</b>	1218	9	40.5
<b>1040</b>	1346	10	44
<b>1296</b>	1602	12	51
<b>1552</b>	1858	14	58.5
<b>1808</b>	2114	16	66



### Dimensions and weight of the linear motor stage LMX1E-CB6 without cover

Stroke [mm]	Total length L [mm]	N	Mass [kg]
<b>112</b>	450	3	19
<b>240</b>	578	4	23
<b>368</b>	706	5	26.5
<b>496</b>	834	6	30
<b>624</b>	962	7	34
<b>752</b>	1090	8	37.5
<b>880</b>	1218	9	41
<b>1008</b>	1346	10	45
<b>1264</b>	1602	12	52
<b>1520</b>	1858	14	59.5
<b>1776</b>	2114	16	66.5

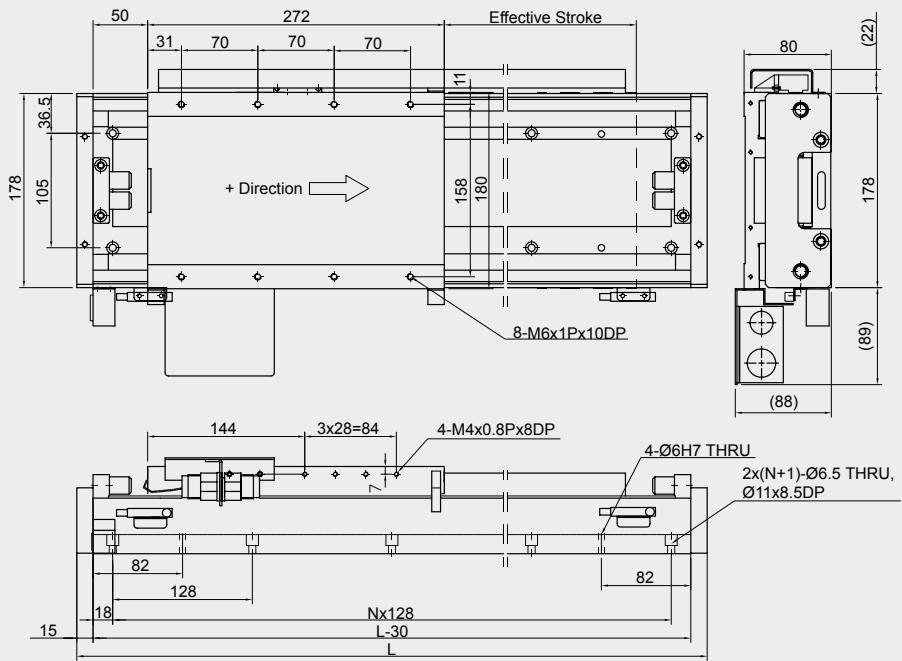


# Positioning Systems

## Linear Motor Stages

**Dimensions and weight of the linear motor stage LMX1E-CB8 without cover**

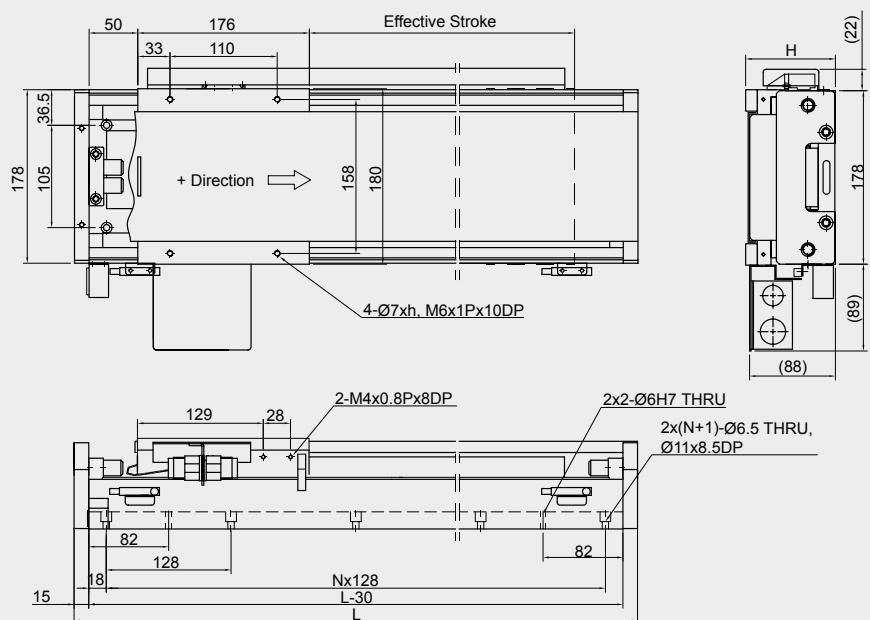
Stroke [mm]	Total length L [mm]	N	Mass [kg]
<b>176</b>	578	4	24.5
<b>304</b>	706	5	28
<b>432</b>	834	6	32
<b>560</b>	962	7	35.5
<b>688</b>	1090	8	39
<b>816</b>	1218	9	43
<b>944</b>	1346	10	46
<b>1200</b>	1602	12	53.5
<b>1456</b>	1858	14	61
<b>1712</b>	2114	16	68



## 2.6.2 Linear Motor Stages LMX1E-C with Cover

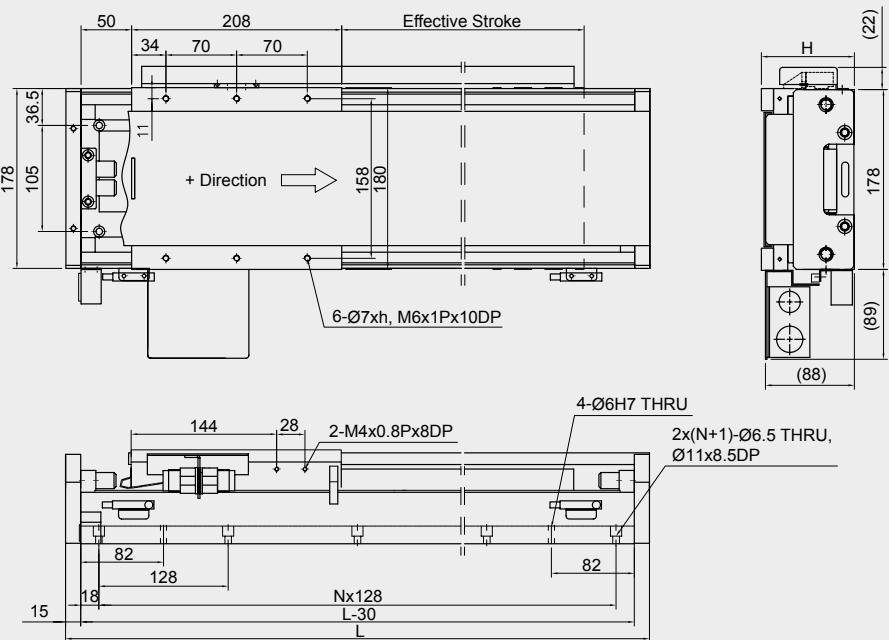
### Dimensions and weight of the linear motor stage LMX1E-CB5 with cover

Stroke [mm]	Total length L [mm]	N	Mass [kg]	H [mm]	h [mm]
<b>144</b>	450	3	20.5	95	15
<b>272</b>	578	4	24.5	95	15
<b>400</b>	706	5	28	95	15
<b>528</b>	834	6	32	95	15
<b>656</b>	962	7	36	95	15
<b>784</b>	1090	8	40	95	15
<b>912</b>	1218	9	44	95	15
<b>1040</b>	1346	10	48	95	15
<b>1296</b>	1602	12	56	105	25
<b>1552</b>	1858	14	64	105	25
<b>1808</b>	2114	16	72	105	25



### Dimensions and weight of the linear motor stage LMX1E-CB6 with cover

Stroke [mm]	Total length L [mm]	N	Mass [kg]	H [mm]	h [mm]
<b>112</b>	450	3	21	95	15
<b>240</b>	578	4	25	95	15
<b>368</b>	706	5	29	95	15
<b>496</b>	834	6	33	95	15
<b>624</b>	962	7	37	95	15
<b>752</b>	1090	8	41	95	15
<b>880</b>	1218	9	45	95	15
<b>1008</b>	1346	10	49	95	15
<b>1264</b>	1602	12	56	105	25
<b>1520</b>	1858	14	64.5	105	25
<b>1776</b>	2114	16	72.5	105	25

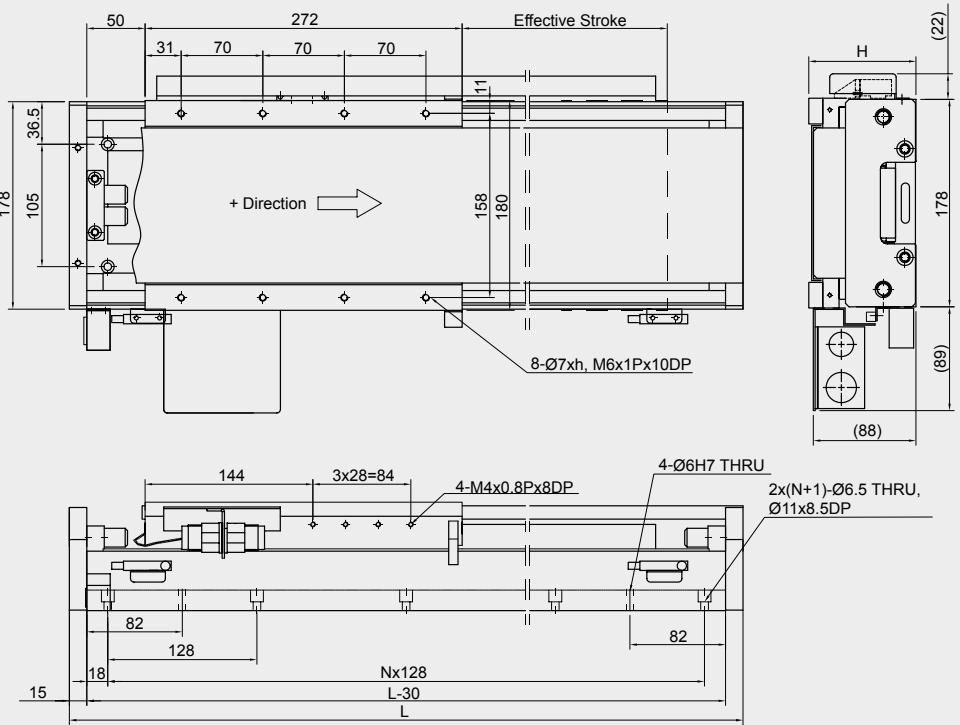


# Positioning Systems

## Linear Motor Stages

### Dimensions and weight of the linear motor stage LMX1E-CB8 with cover

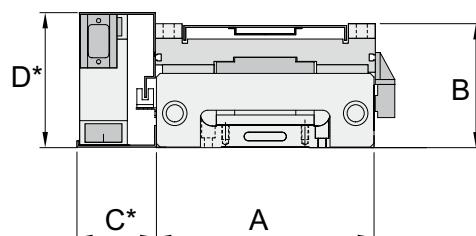
Stroke [mm]	Total length L [mm]	N	Mass [kg]	H [mm]	h [mm]
<b>176</b>	578	4	26.5	95	15
<b>304</b>	706	5	30.5	95	15
<b>432</b>	834	6	34.5	95	15
<b>560</b>	962	7	38.5	95	15
<b>688</b>	1090	8	42	95	15
<b>816</b>	1218	9	46	95	15
<b>944</b>	1346	10	50	95	15
<b>1200</b>	1602	12	58	105	25
<b>1456</b>	1858	14	66	105	25
<b>1712</b>	2114	16	74	105	25



## 2.7 Linear Motor Stages LMX1L-S

Linear motor stages LMX1L-S are equipped with an iron-core motor, which provides substantial continuous power. They can also be used in cross tables. The travel is measured via optical or magnetic encoders incrementally or absolutely. The linear motor stages LMX1L-S 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
- Length up to 4,000 mm



\* Dimensions C and D are customer-specific

### Specifications for Linear Motor Stages LMX1L-S

Type (Order code) xxxx=Stroke [mm]	Motor Type	F <sub>c</sub> [N]	F <sub>p</sub> [N]	Mass of Slider [kg]	Length of forcer [mm]	v <sub>max</sub> [m/s]	a <sub>max</sub> [m/s <sup>2</sup> ]	Dimension A [mm]	Dimension B [mm]
LMX1L- S23 -1-xxxx-G200	LMS 23	220	430	7.5	200	3	50	178	90
LMX1L- S27 -1-xxxx-G200	LMS 27	340	680	9.5	280	3	50	178	90
LMX1L- S37 -1-xxxx-G200	LMS 37	475	950	12	280	3*	50	202	95
LMX1L- S37L-1-xxxx-G200	LMS 37L	475	950	12	280	3	50	202	95
LMX1L- S47 -1-xxxx-G200	LMS 47	650	1300	18	280	2.5*	50	232	95
LMX1L- S47L-1-xxxx-G200	LMS 47L	650	1300	18	280	3	50	232	95
LMX1L- S57 -1-xxxx-G200	LMS 57	780	1560	22	280	2	50	252	100
LMX1L- S57L-1-xxxx-G200	LMS 57L	780	1560	22	280	3	50	252	100
LMX1L- S67 -1-xxxx-G200	LMS 67	950	1900	26	280	2	50	272	100
LMX1L- S67L-1-xxxx-G200	LMS 67L	950	1900	26	280	3	50	272	100
LMX1L- S23 -1-xxxx-G2A0	LMS 23	220	440	7.8	200	3	50	178	102/111
LMX1L- S27 -1-xxxx-G2A0	LMS 27	340	680	9.9	280	3	50	178	102/111
LMX1L- S37 -1-xxxx-G2A0	LMS 37	475	950	12.5	280	3*	50	202	107/116
LMX1L- S37L-1-xxxx-G2A0	LMS 37L	475	950	12.5	280	3	50	202	107/116
LMX1L- S47 -1-xxxx-G2A0	LMS 47	650	1300	18.8	280	2.5*	50	232	107/116
LMX1L- S47L-1-xxxx-G2A0	LMS 47L	650	1300	18.8	280	3	50	232	107/116
LMX1L- S57 -1-xxxx-G2A0	LMS 57	780	1560	23	280	2*	50	252	112/121
LMX1L- S57L-1-xxxx-G2A0	LMS 57L	780	1560	23	280	3	50	252	112/121
LMX1L- S67 -1-xxxx-G2A0	LMS 67	950	1900	27	280	2*	50	272	112/121
LMX1L- S67L-1-xxxx-G2A0	LMS 67L	950	1900	27	280	3	50	272	112/121

Note: F<sub>c</sub> = continuous force, 100% operating time

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

Electric parameters for the linear motors: see page 42

\* Limited by back emf constant of the motor coil

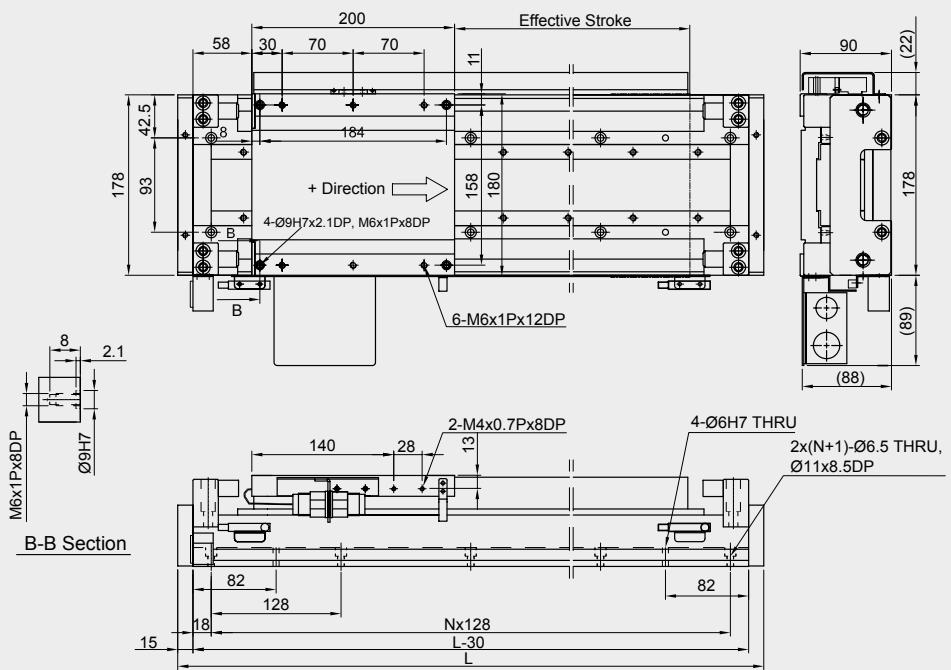
# Positioning Systems

## Linear Motor Stages

### 2.7.1 Linear Motor Stages LMX1L-S without Cover

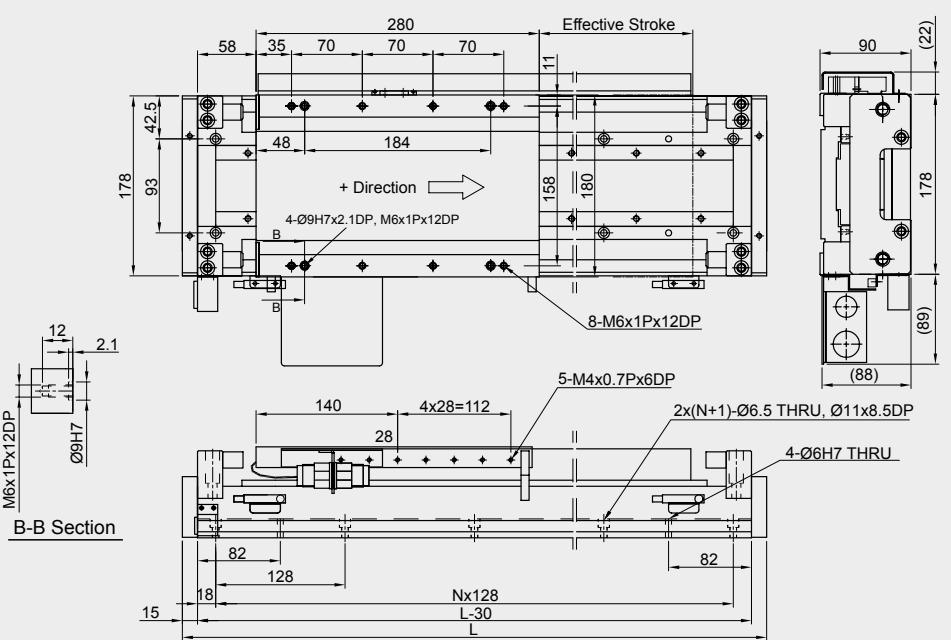
#### Dimensions and weight of the linear motor stage LMX1L-S23 without cover

Stroke [mm]	Total length L [mm]	N	Mass [kg]
104	450	3	21
232	578	4	23.5
360	706	5	27
488	834	6	31
616	962	7	34
744	1090	8	37
872	1218	9	40
1000	1346	10	43
1256	1602	12	50
1512	1858	14	56
1768	2114	16	62



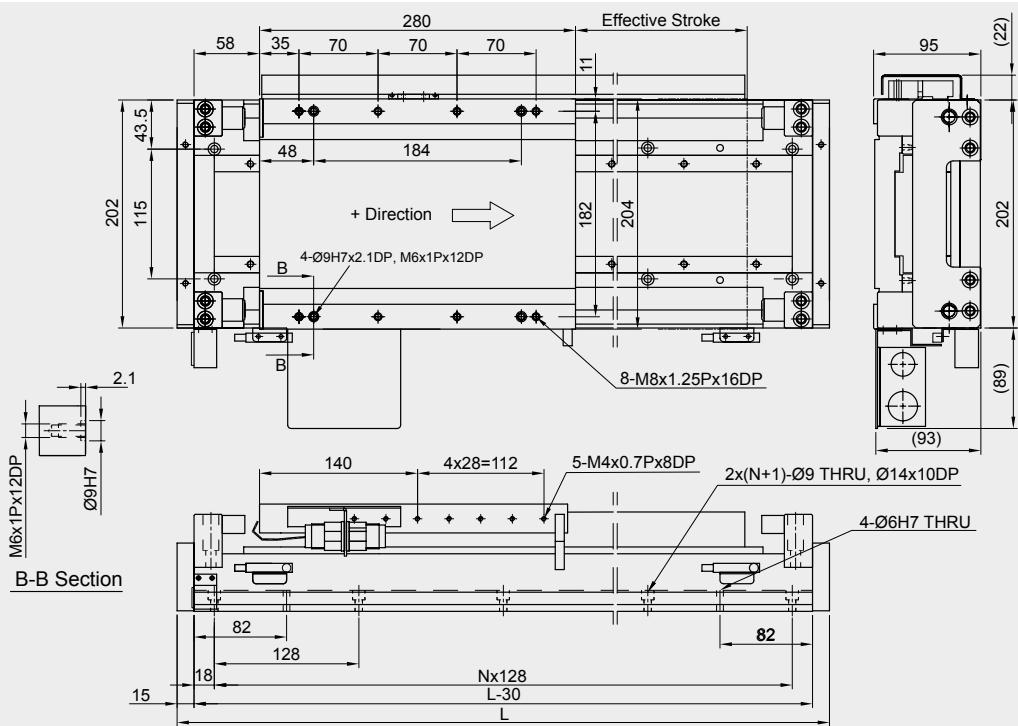
#### Dimensions and weight of the linear motor stage LMX1L-S27 without cover

Stroke [mm]	Total length L [mm]	N	Mass [kg]
152	578	4	27
280	706	5	30
408	834	6	33.5
536	962	7	37
664	1090	8	40
792	1218	9	43
920	1346	10	46
1176	1602	12	52
1432	1858	14	58
1688	2114	16	64



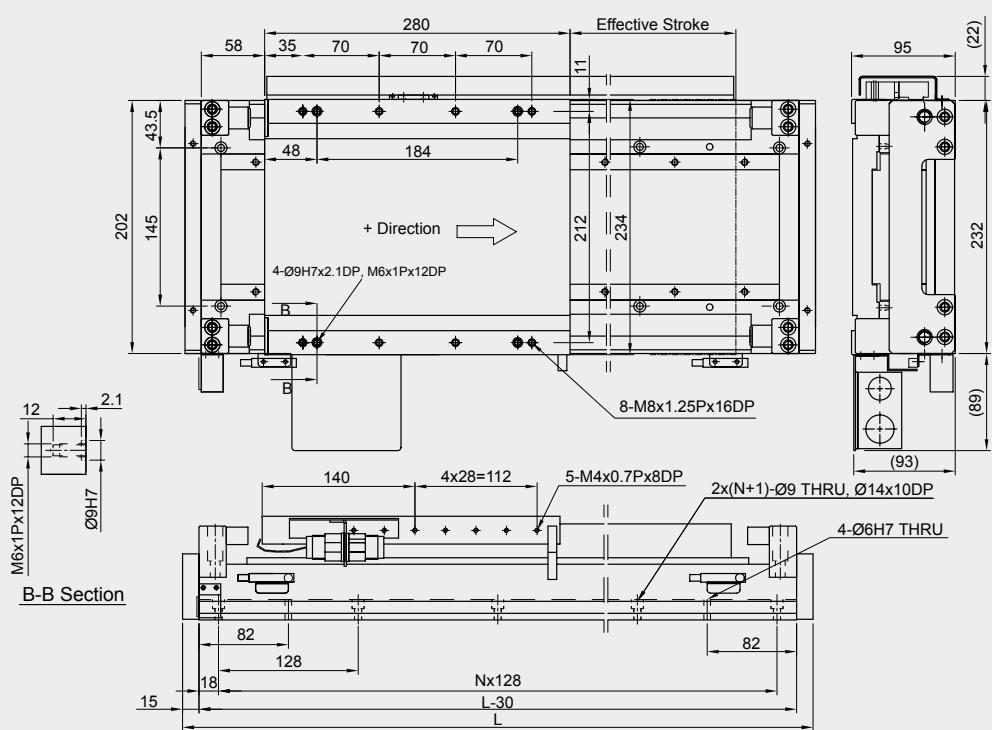
**Dimensions and weight of the linear motor stages LMX1L-S37 and LMX1L-S37L without cover**

Stroke	Total length L [mm]	N	Mass [kg]
152	578	4	33
280	706	5	36
408	834	6	40
536	962	7	43
664	1090	8	47
792	1218	9	50
920	1346	10	54
1176	1602	12	62
1432	1858	14	70
1688	2114	16	78



**Dimensions and weight of the linear motor stages LMX1L-S47 and LMX1L-S47L without cover**

Stroke	Total length L [mm]	N	Mass [kg]
152	578	4	38
280	706	5	41
408	834	6	46
536	962	7	50
664	1090	8	55
792	1218	9	58
920	1346	10	63
1176	1602	12	71
1432	1858	14	80
1688	2114	16	88

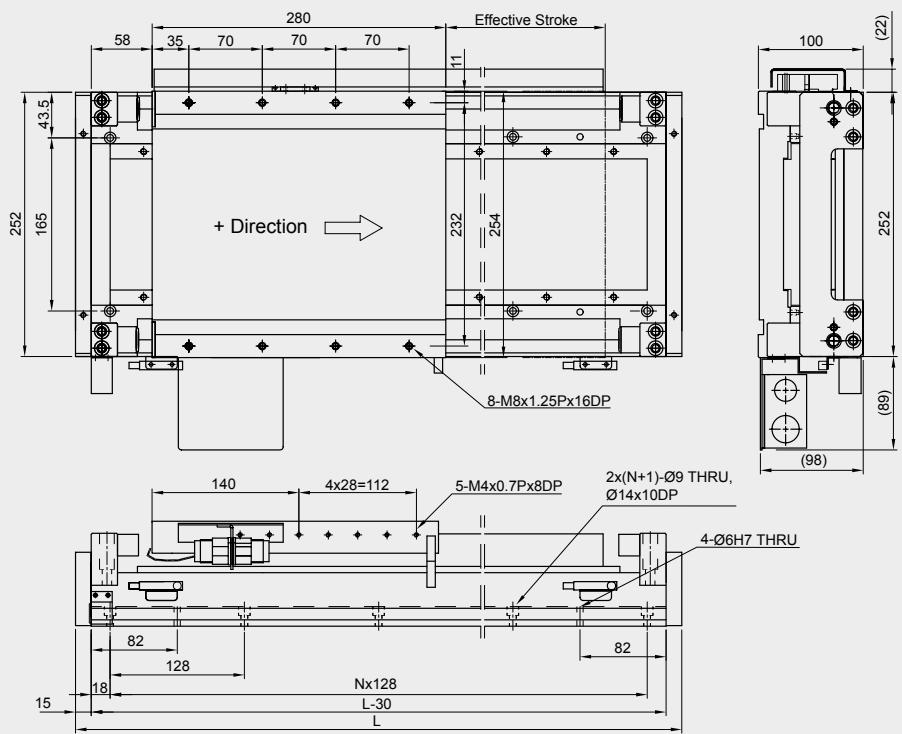


# Positioning Systems

## Linear Motor Stages

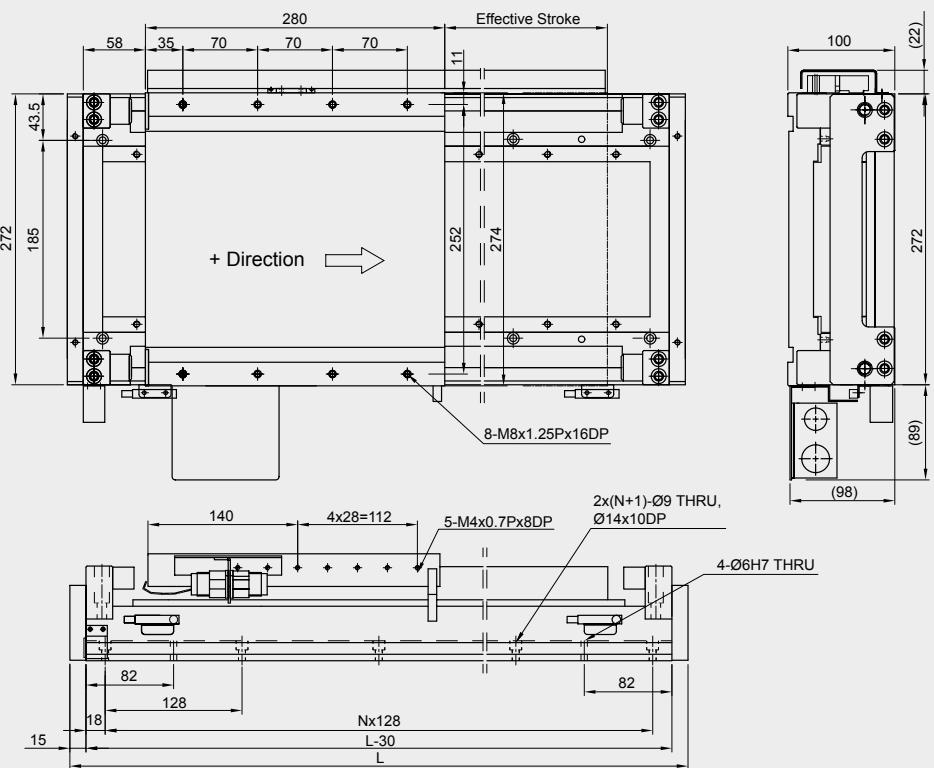
### Dimensions and weight of the linear motor stages LMX1L-S57 and LMX1L-S57L without cover

Stroke	Total length L	N	Mass
[mm]	[mm]		[kg]
<b>152</b>	578	4	47
<b>280</b>	706	5	51
<b>408</b>	834	6	57
<b>536</b>	962	7	63
<b>664</b>	1090	8	69
<b>792</b>	1218	9	73
<b>920</b>	1346	10	80
<b>1176</b>	1602	12	90
<b>1432</b>	1858	14	100
<b>1688</b>	2114	16	110



### Dimensions and weight of the linear motor stages LMX1L-S67 and LMX1L-S67L without cover

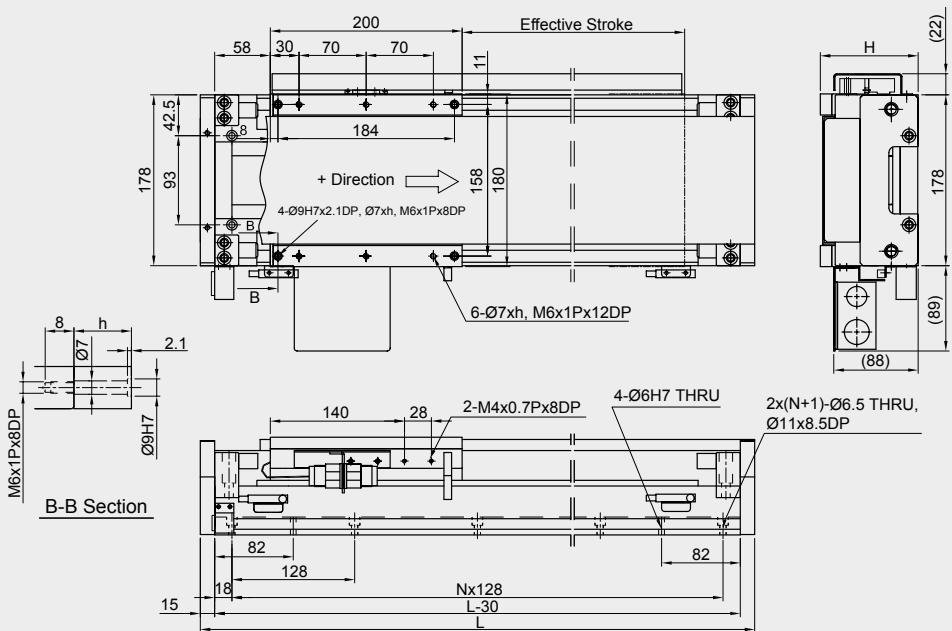
Stroke	Total length L	N	Mass
[mm]	[mm]		[kg]
<b>152</b>	578	4	50
<b>280</b>	706	5	55
<b>408</b>	834	6	61
<b>536</b>	962	7	68
<b>664</b>	1090	8	74
<b>792</b>	1218	9	78
<b>920</b>	1346	10	86
<b>1176</b>	1602	12	97
<b>1432</b>	1858	14	107
<b>1688</b>	2114	16	118



## 2.7.2 Linear Motor Stages LMX1L-S with Cover

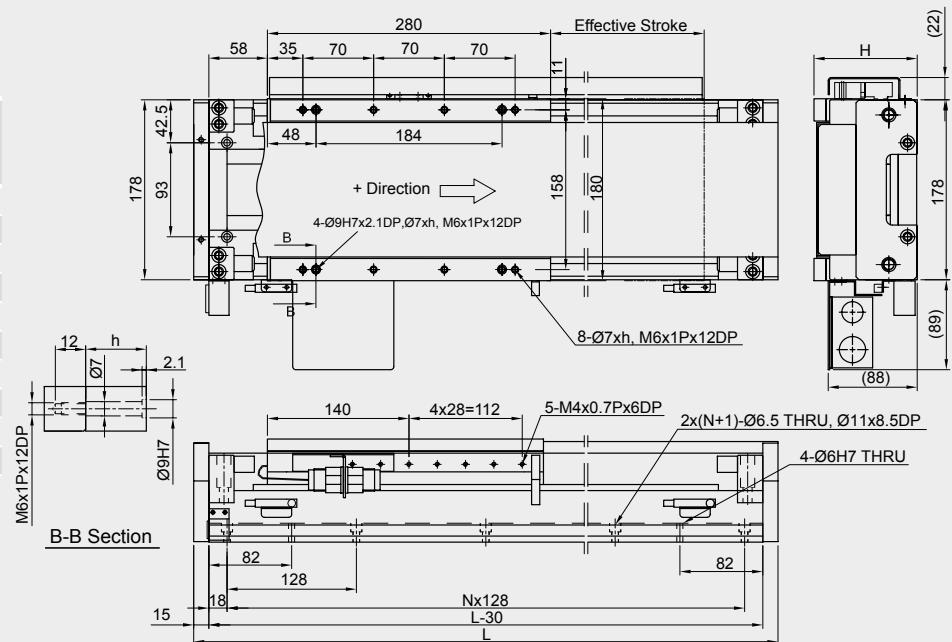
### Dimensions and weight of the linear motor stage LMX1L-S23 with cover

Stroke	Total length L	N	Mass	H	h
[mm]	[mm]		[kg]	[mm]	[mm]
104	450	3	23	102	12
232	578	4	26	102	12
360	706	5	29.5	102	12
488	834	6	34	102	12
616	962	7	37	102	12
744	1090	8	40	102	12
872	1218	9	43.5	102	12
1000	1346	10	46.5	102	12
1256	1602	12	54	111	21
1512	1858	14	60.5	111	21
1768	2114	16	67	111	21



### Dimensions and weight of the linear motor stage LMX1L-S27 with cover

Stroke	Total length L	N	Mass	H	h
[mm]	[mm]		[kg]	[mm]	[mm]
152	578	4	29.5	102	12
280	706	5	32.5	102	12
408	834	6	36	102	12
536	962	7	40	102	12
664	1090	8	43	102	12
792	1218	9	47	102	12
920	1346	10	50	102	12
1176	1602	12	56	111	21
1432	1858	14	62.5	111	21
1688	2114	16	69	111	21

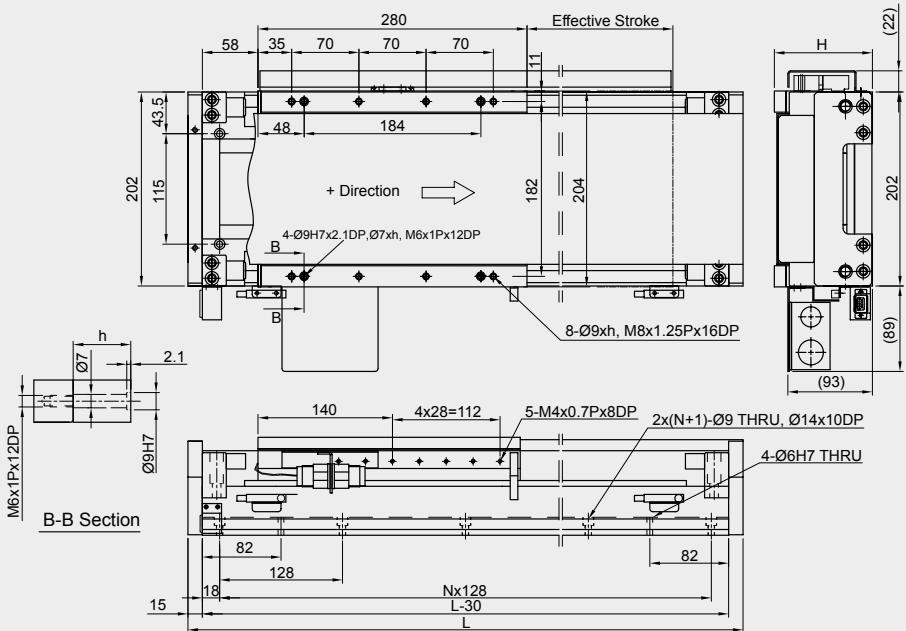


# Positioning Systems

## Linear Motor Stages

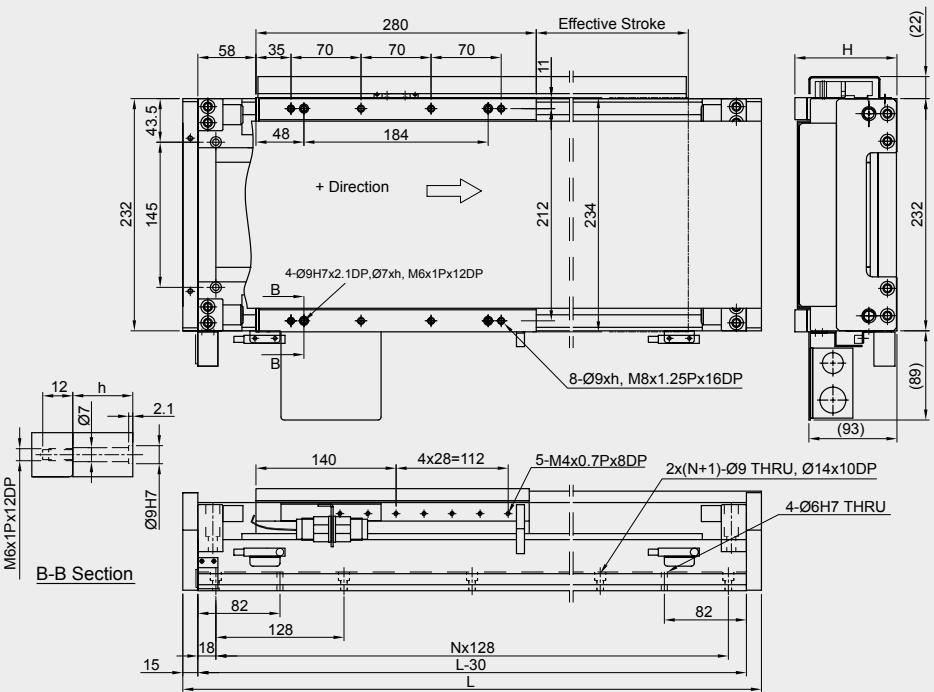
## Dimensions and weight of the linear motor stages LMX1L-S37 and LMX1L-S37L with cover

Stroke	Total length L	N	Mass	H	h
[mm]	[mm]		[kg]	[mm]	[mm]
<b>152</b>	578	4	36	107	12
<b>280</b>	706	5	40	107	12
<b>408</b>	834	6	44	107	12
<b>536</b>	962	7	47	107	12
<b>664</b>	1090	8	51	107	12
<b>792</b>	1218	9	55	107	12
<b>920</b>	1346	10	59	107	12
<b>1176</b>	1602	12	68	116	21
<b>1432</b>	1858	14	76	116	21
<b>1688</b>	2114	16	85	116	21



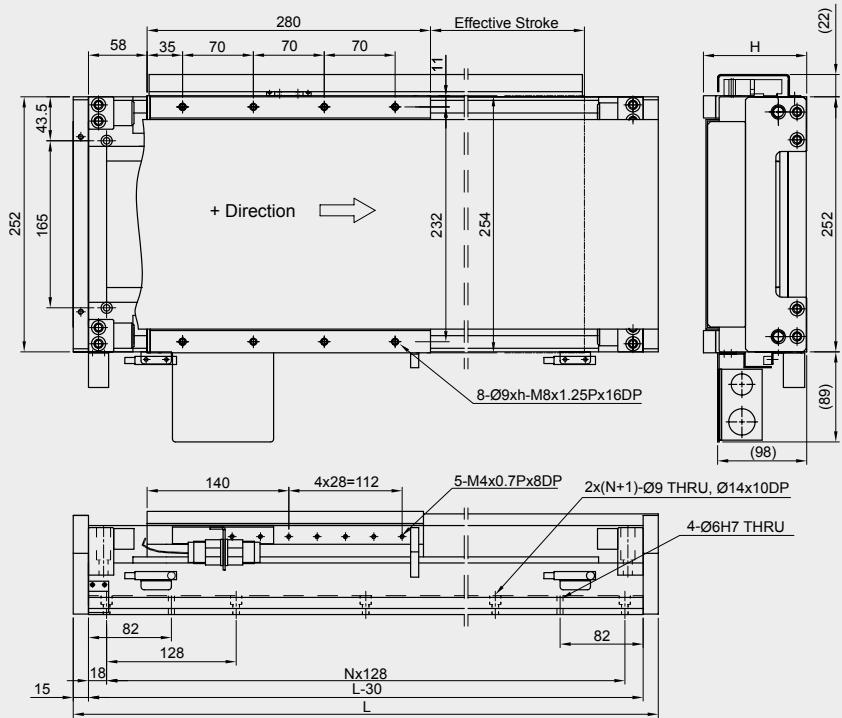
## Dimensions and weight of the linear motor stages LMX1L-S47 and LMX1L-S47L with cover

Stroke	Total length L [mm]	N	Mass [kg]	H [mm]	h [mm]
<b>152</b>	578	4	36	107	12
<b>280</b>	706	5	40	107	12
<b>408</b>	834	6	44	107	12
<b>536</b>	962	7	47	107	12
<b>664</b>	1090	8	51	107	12
<b>792</b>	1218	9	55	107	12
<b>920</b>	1346	10	59	107	12
<b>1178</b>	1602	12	68	116	21
<b>1432</b>	1858	14	76	116	21
<b>1688</b>	2114	16	85	116	21



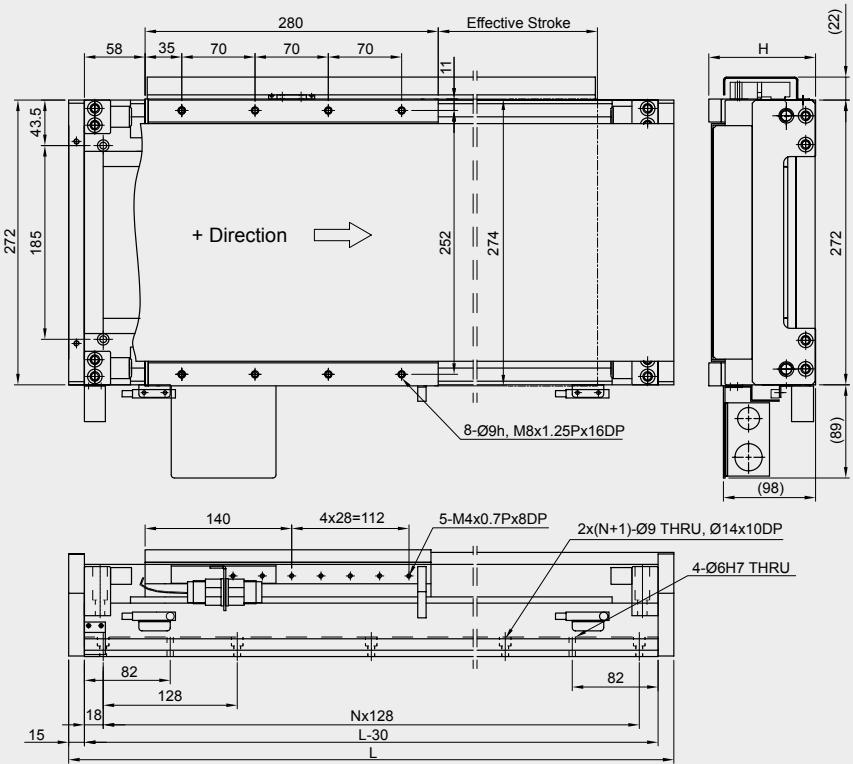
## Dimensions and weight of the linear motor stages LMX1L-S57 and LMX1L-S57L with cover

Stroke	Total length L	N	Mass	H	h
[mm]	[mm]		[kg]	[mm]	[mm]
152	578	4	48.5	112	12
280	706	5	53	112	12
408	834	6	59	112	12
536	962	7	65.5	112	12
664	1090	8	72	112	12
792	1218	9	76	112	12
920	1346	10	83.5	112	12
1176	1602	12	94	121	21
1432	1858	14	104	121	21
1688	2114	16	114.5	121	21



## Dimensions and weight of the linear motor stages LMX1L-S67 and LMX1L-S67L with cover

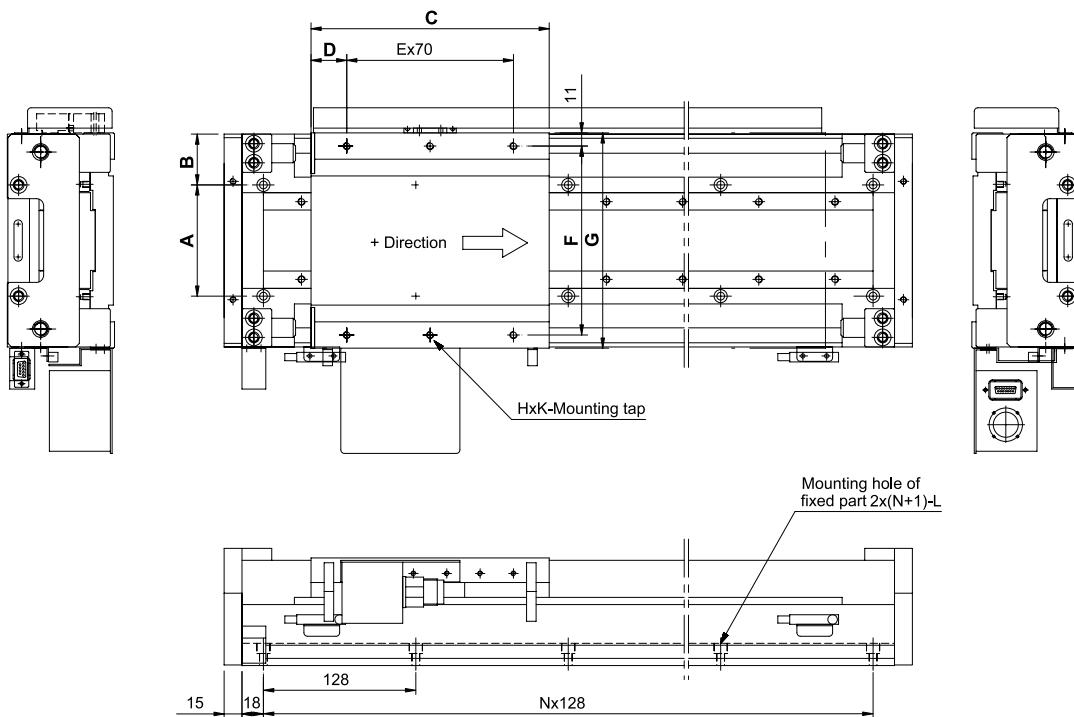
Stroke	Total length L	N	Mass	H	h
[mm]	[mm]		[kg]	[mm]	[mm]
152	578	4	51.5	112	12
280	706	5	57	112	12
408	834	6	63	112	12
536	962	7	71	112	12
664	1090	8	77	112	12
792	1218	9	81.5	112	12
920	1346	10	90	112	12
1176	1602	12	101	121	21
1432	1858	14	111.5	121	21
1688	2114	16	123	121	21



# Positioning Systems

## Linear Motor Stages

### 2.7.3 Installation Dimensions for Linear Motor Stages LMX1L-S



#### Values A-L

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

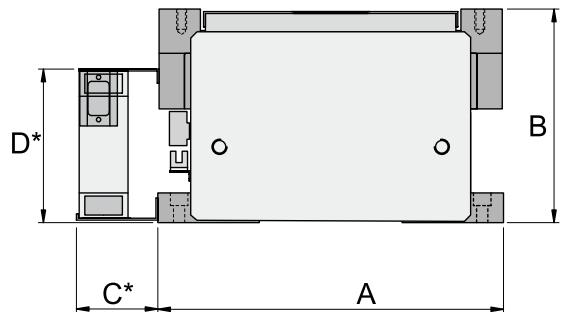
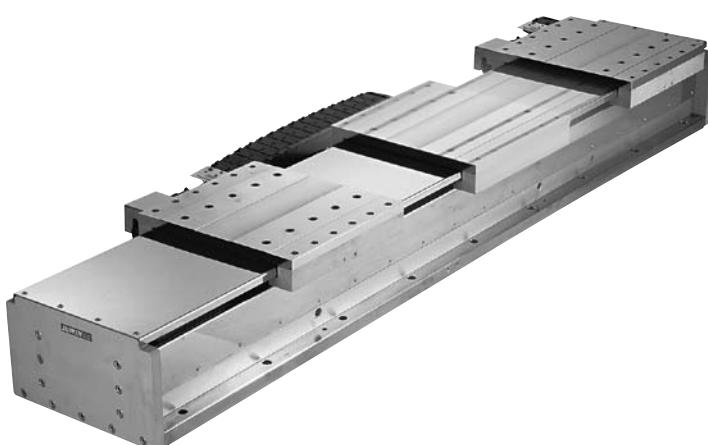
#### Value N and stroke

LMX1L-S23	Stroke [mm]	N	LMX1L-S27(L) to -S67(L)	
			Stroke [mm]	N
104		3	152	4
232		4	280	5
360		5	408	6
488		6	536	7
616		7	664	8
744		8	792	9
872		9	920	10
1000		10	1176	12
1256		12	1432	14
1512		14	1688	16
1768		16	1948	18

## 2.8 Linear Motor Stages LMX1L-T

Linear motor stages LMX1L-T are complete axes with iron-core motors. Due to the special design of the motor with arrangement of the forcer between two stators (sandwich construction), the attraction forces are canceled. This relieves the load especially on the guide rails.

- Very high power density
- Due to the sandwich construction of the motor, no attraction forces are created, so that the guides are not subject to static loads.
- The travel is measured via optical or magnetic encoders incrementally or absolutely.
- Total length to 4,000 mm
- Max. acceleration 50 m/s<sup>2</sup>
- Max. speed 4 m/s



\* Dimensions C and D are customer-specific

### Specifications for Linear Motor Stages LMX1L-T

Type (Order code) xxxx=Stroke [mm]	Motor Type	F <sub>c</sub> [N]	F <sub>p</sub> [N]	Mass of Slider [kg]	Length of forcer [mm]	v <sub>max</sub> [m/s]	a <sub>max</sub> [m/s <sup>2</sup> ]	Dimension A [mm]	Dimension B [mm]
LMX1L-T37 -1-xxxx-G2A0	LMT 37	950	1900	25	300	2*	50	297	223
LMX1L-T37L -1-xxxx-G2A0	LMT 37L	950	1900	25	300	3	50	297	223
LMX1L-T37D -1-xxxx-G2A0	LMT 37D	1900	2710	50	600	2*	50	297	223
LMX1L-T37LD -1-xxxx-G2A0	LMT 37LD	1900	1900	50	600	3	50	297	223

Note: F<sub>c</sub> = continuous force, 100% operating time

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

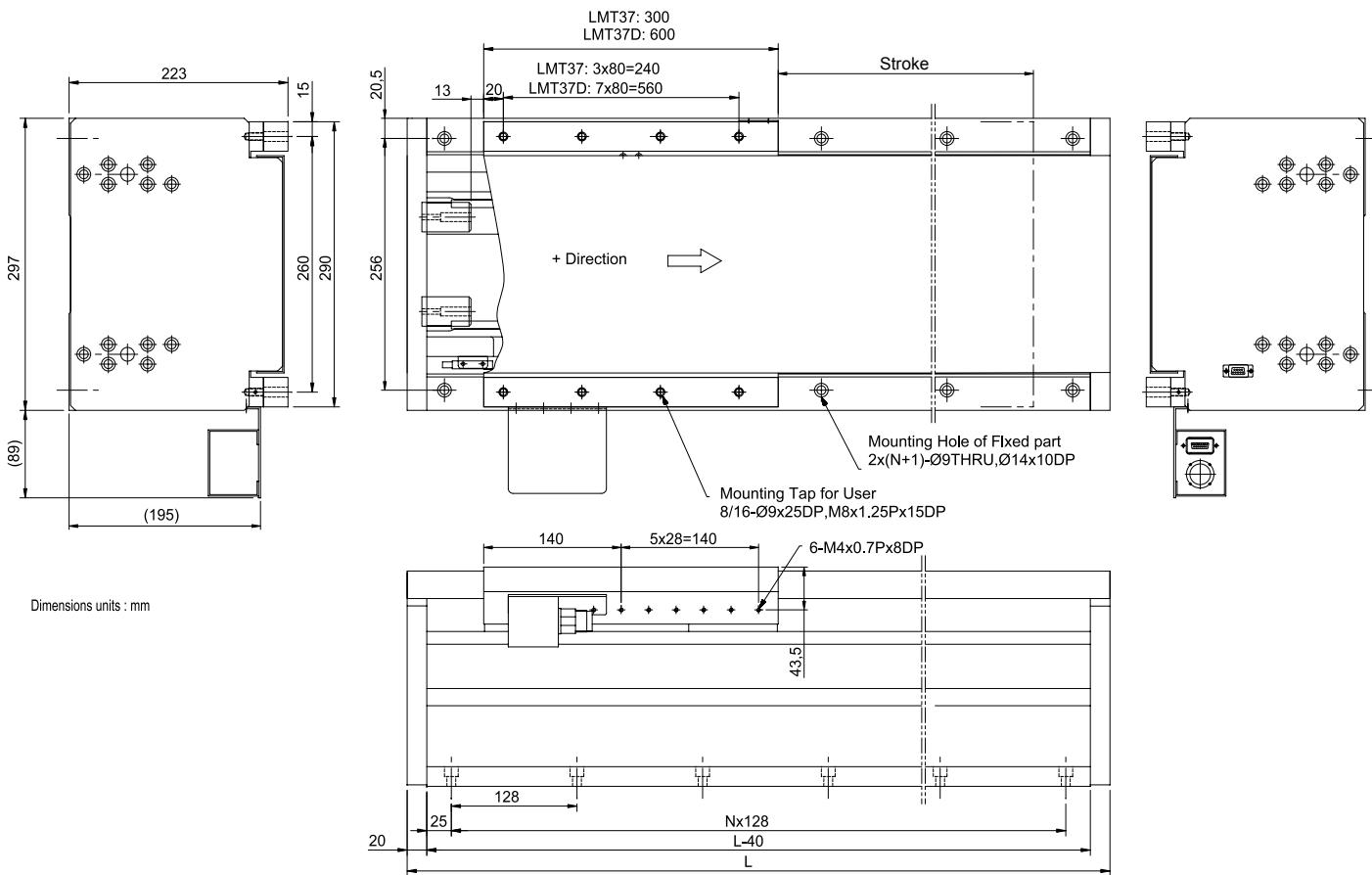
Electric parameters for the linear motors: see page 48

\* Limited by back emf constant of the motor coil

# Positioning Systems

## Linear Motor Stages

### Installation dimensions for linear motor stages LMX1L-T



**Dimensions and weight of the linear motor stages LMX1L-T37 and LMX1L-T37L, both with cover**

Stroke [mm]	Total length L [mm]	N	Mass [kg]
<b>388</b>	858	6	120
<b>516</b>	986	7	135
<b>644</b>	1124	8	150
<b>772</b>	242	9	165
<b>900</b>	1370	10	179
<b>1156</b>	1626	12	208
<b>1412</b>	1882	14	237
<b>1668</b>	2138	16	267
<b>1924</b>	2394	18	297
<b>2180</b>	2650	20	327

**Dimensions and weight of the linear motor stages LMX1L-T37D and LMX1L-T37LD, both with cover**

Stroke [mm]	Total length L [mm]	N	Mass [kg]
<b>388</b>	1114	8	175
<b>516</b>	1242	9	190
<b>644</b>	1370	10	205
<b>772</b>	1498	11	220
<b>900</b>	1626	12	234
<b>1156</b>	1882	14	263
<b>1412</b>	2138	16	292
<b>1668</b>	2394	18	322
<b>1924</b>	2650	20	352
<b>2180</b>	2906	22	382

## 2.9 Cross Tables

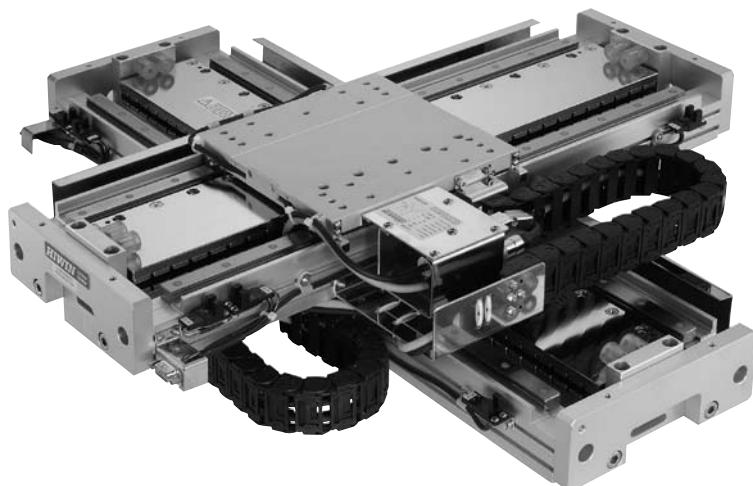
The linear motor stages of the LMX1 series can be combined to form cross tables.

The structure of the order number shows that almost every combination of LMX1 linear motor stages is possible.

A cross table with LMX1E-C linear motor stages is shown in 2.9.1. 2.9.2 shows a cross table with LMX1L-S linear motor stages.

### 2.9.1 Cross Table LMX2E-CB5-CB8

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



#### Specifications for Cross Table LMX2E-CB5-CB8

Type (Order code) xxxx=Stroke [mm]	Orthogo- nality [arc-sec]	Repeat- ability [mm]	$v_{max}$ [m/s]	$a_{max}$ [m/s <sup>2</sup> ]	Motor Type	$F_c$ [N]	$F_p$ [N]	Mass of Slider [kg]
LMX2E-CB5 CB8-xxxx-xxxx-G20	+/- 10	+/- 0.002	3	50	Upper axis: LMC B5 Lower axis: LMC B8	90 145	270 435	2.5 Mass of upper axis + 4

Note:  $F_c$  = continuous force, 100% operating time

$F_p$  = peak force (1 s)

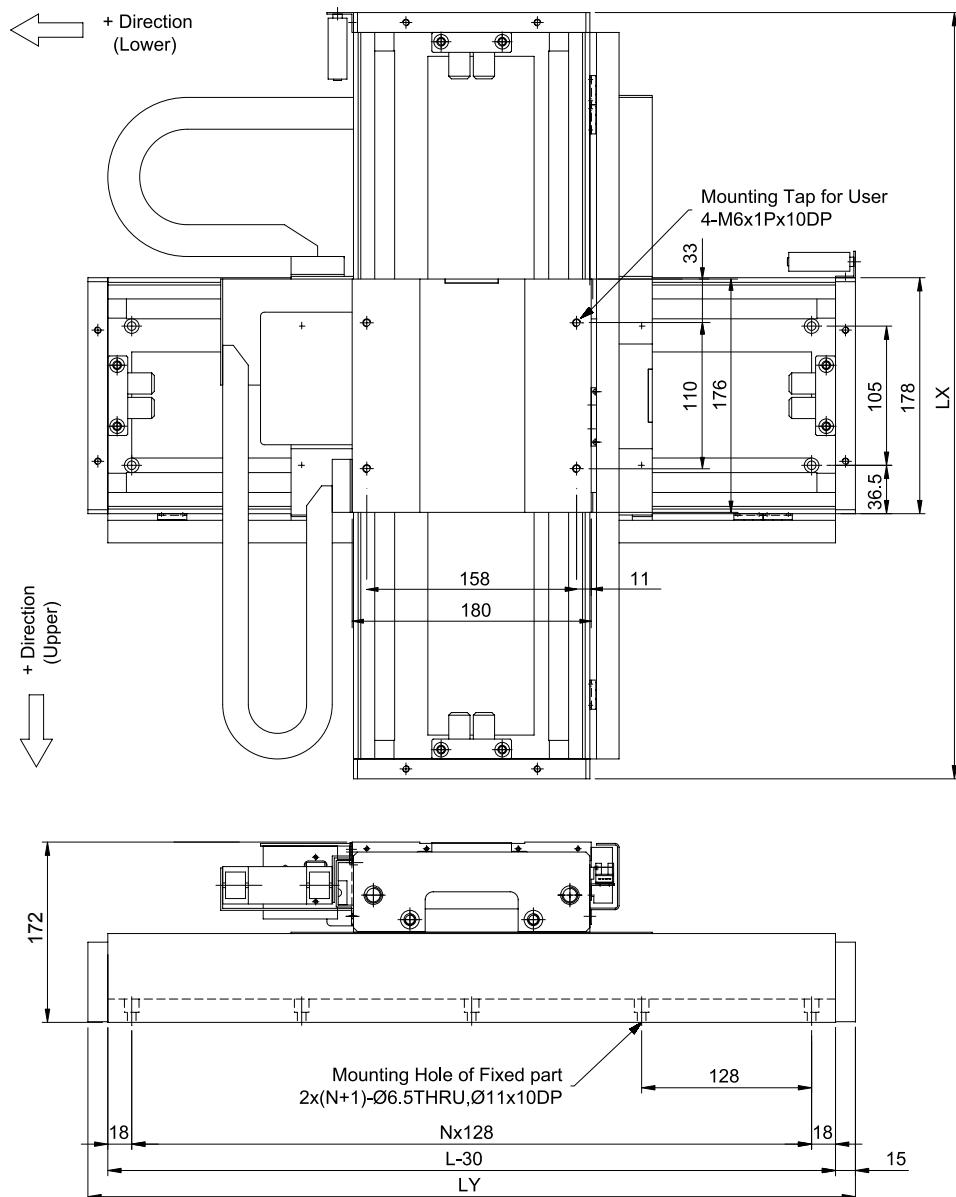
Electric parameters for the linear motors: see page 46

# Positioning Systems

## Linear Motor Stages

### Dimensions of Cross Table LMX2E-CB5-CB8

Dimensions Units: mm

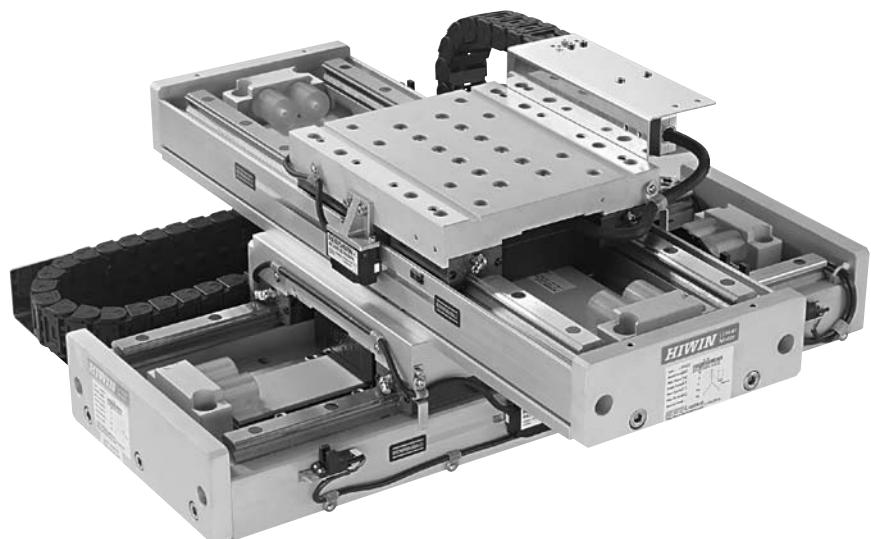


### Dimensions and weight of cross table LMX2E-CB5-CB8 with three examples of strokes

Type (Order code)	Stroke (upper/lower) [mm]	Total length (LX x LY) [mm]	N	Mass (upper axis) [kg]	Mass (XY axis) [kg]
LMX2E-CB5-CB8-144-179-G20	144 x 179	450 x 578	4	19	42
LMX2E-CB5-CB8-272-304-G20	272 x 304	578 x 706	5	22.5	49.5
LMX2E-CB5-CB8-400-432-G20	400 x 432	706 x 834	6	26	57

## 2.9.2 Cross Table LMX2L-S23-S27

- Equipped with iron-core linear motors
- Higher thrust and fast acceleration
- Especially rigid aluminum frame with low profile
- Simple assembly



### Specifications for Cross Table LMX2L-S23-S27

Type (Order code) xxxx=Stroke [mm]	Orthogo- nality [arc-sec]	Repeat- ability [mm]	$v_{max}$ [m/s]	$a_{max}$ [m/s <sup>2</sup> ]	Motor Type	$F_c$ [N]	$F_p$ [N]	Mass of Slider [kg]
LMX2L-S23-S27-xxxx-xxxx-G20	+/- 10	+/- 0.002	3	50	Upper axis: LMS 23	220	440	7.5
					Lower axis: LMS 27	340	680	Mass of upper axis + 9.5

Note:  $F_c$  = continuous force, 100% duty cycle

$F_p$  = peak force (1 s)

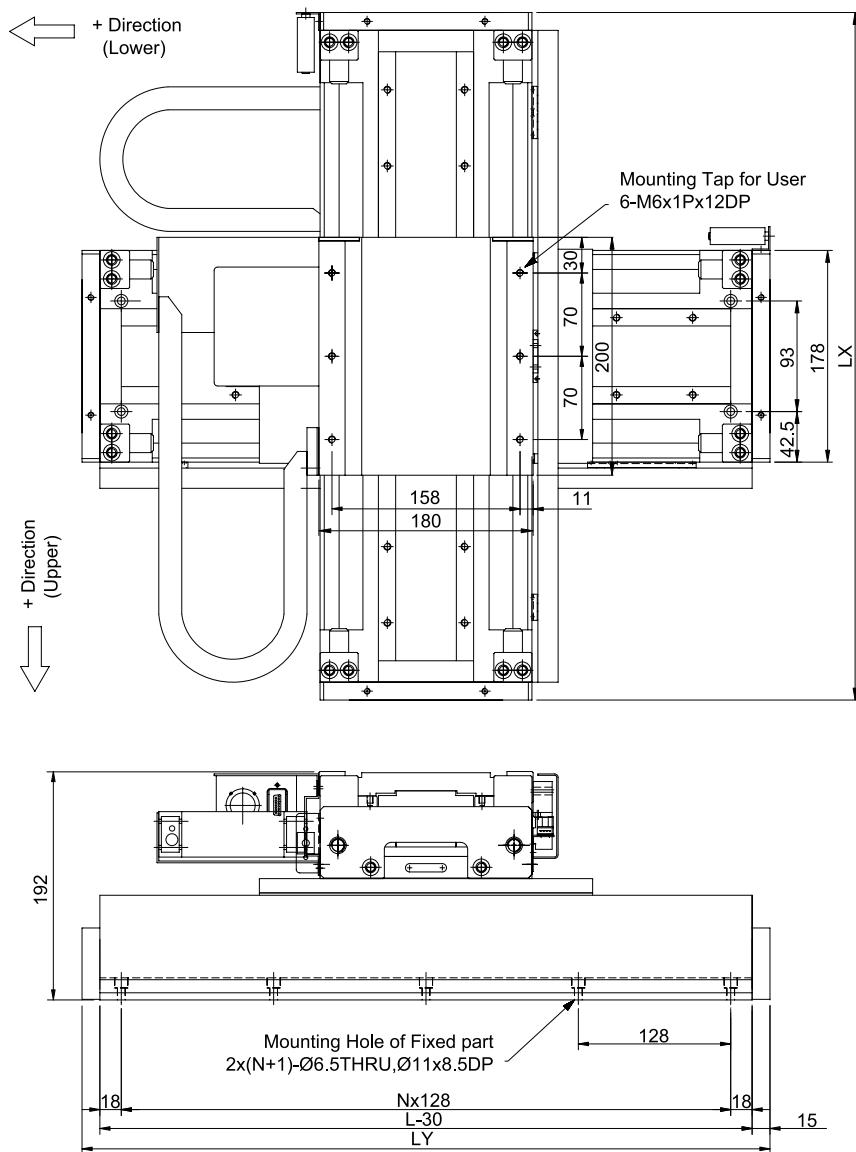
Electric parameters for the linear motors: see page 42

# Positioning Systems

## Linear Motor Stages

### Dimensions of Cross Table LMX2L-S23-S27

Dimensions Units: mm



### Dimensions and mass of cross table LMX2L-S23-S27 with three examples of strokes

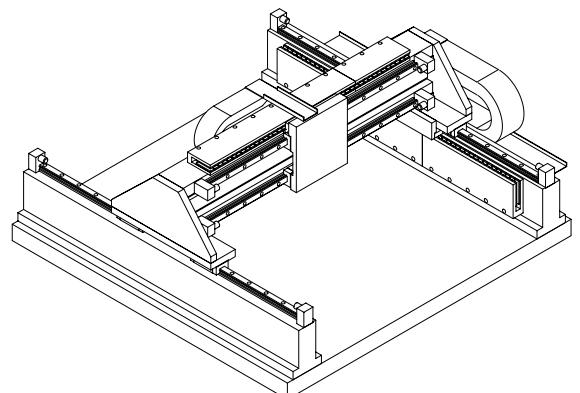
Type (Order code)	Stroke (upper/lower) [mm]	Total length (LX x LY) [mm]	N	Mass (upper axis) [kg]	Mass (XY axis) [kg]
LMX2L-S23-S27-232-280-G20	232 x 280	578 x 706	5	26	58.5
LMX2L-S23-S27-360-408-G20	360 x 408	706 x 834	6	29.5	65.5
LMX2L-S23-S27-488-536-G20	488 x 536	834 x 962	7	29.5	70

## 2.10 Gantry Systems

The standardized gantry system of the LMG2A series are systems with one-sided supporting guide rail. The type LMG2A-C is equipped with coreless linear motors. The type LMG2A-S is driven by iron-core linear motors.

### 2.10.1 Gantry-System LMG2A-CB6 CC8

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



#### Specifications for Gantry System LMG2A-CB6 CC8

Type (Order code) xxxx=Stroke [mm]	Orthogo- nality [arc-sec]	Repeat- ability [mm]	$v_{max}$ [m/s]	$a_{max}$ [m/s <sup>2</sup> ]	Motor Type		$F_c$ [N]	$F_p$ [N]	Mass of Slider [kg]
LMG2A-CB6 CC8-xxxx-xxxx-G2	+/- 10	+/- 0.002/0.004	3	50	Upper axis: LMC B6	110	330	3	

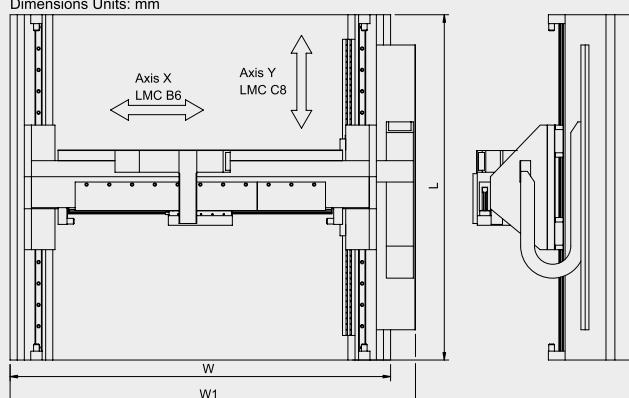
Note:  $F_c$  = continuous force, 100% duty cycle

$F_p$  = peak force (1 s)

Electric parameters for the linear motors: see page 46

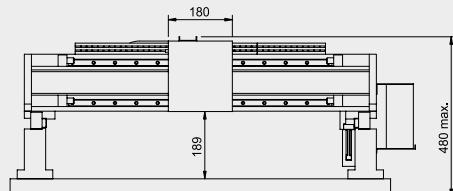
#### Dimensions of Gantry System LMG2A-CB6 CC8

Dimensions Units: mm



#### Dimensions of Gantry System LMG2A-CB6 CC8 with four examples of strokes

Type (Order code)	Stroke X Axis [mm]	Stroke Y Axis [mm]	Dimensions		
			W [mm]	W1 [mm]	L [mm]
LMG2A-CB6 CC8-0300-0400-G2	300	400	870	940	870
LMG2A-CB6 CC8-0500-0500-G2	500	500	1070	1140	970
LMG2A-CB6 CC8-0750-0750-G2	750	750	1390	1390	1220
LMG2A-CB6 CC8-0750-1000-G2	750	1000	1390	1390	1470

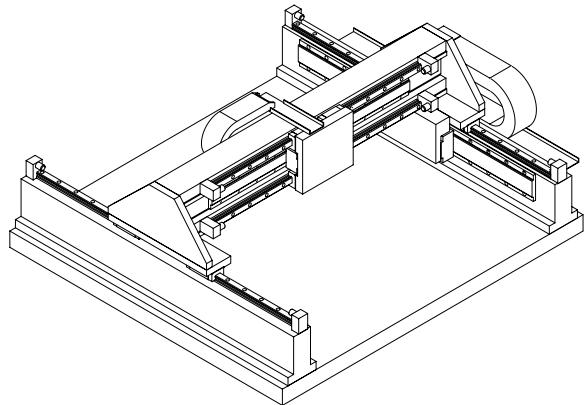


# Positioning Systems

## Linear Motor Stages

### 2.10.2 Gantry System LMG2A-S13 S27

- Equipped with iron-core linear motors
- Higher thrust and fast acceleration
- Less cogging, and constant speed
- Rigid aluminum bridge
- Simple assembly



#### Specifications for Gantry System LMG2A-S13 S27

Type (Order code) xxx = Stroke [mm]	Ortho-gonality [arc-sec]	Repeat-ability [mm]	$v_{max}$ [m/s]	$a_{max}$ [m/s <sup>2</sup> ]	Motor type	$F_c$ [N]	$F_p$ [N]	Mass of Slider [kg]
LMG2A-S13 S27-xxxx-xxxx-G2	+/- 10	+/- 0.002/0.004	3	50	Upper axis: LMS 13	180	360	5
					Lower axis: LMS 27	340	680	Mass of upper axis + 7

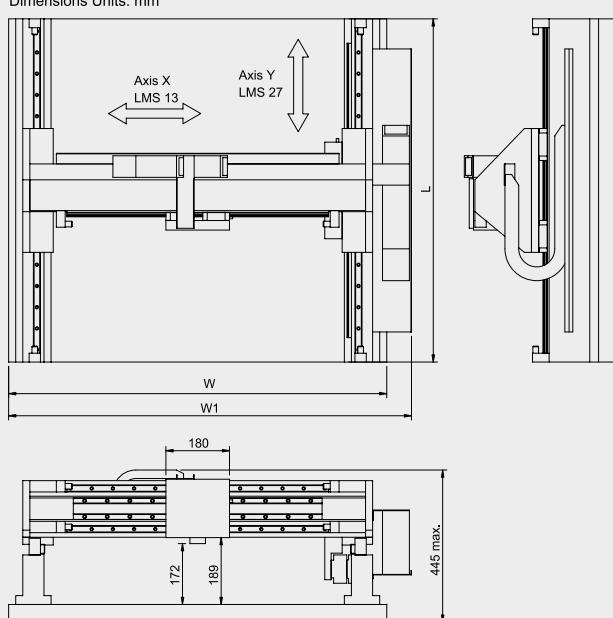
Note:  $F_c$  = continuous force, 100% duty cycle

$F_p$  = peak force (1 s)

Electric parameters for the linear motors: see page 42

#### Dimensions of Gantry System LMG2A-S13 S27

Dimensions Units: mm



#### Dimensions of Gantry System LMG2A-S13 S27 with four examples of strokes

Type (Order code)	Stroke X Axis [mm]	Stroke Y Axis [mm]	Dimensions
	W	W1	L
LMG2A-S13 S27-0300-0400-G2	300	400	870 940 870
LMG2A-S13 S27-0500-0500-G2	500	500	1070 1140 970
LMG2A-S13 S27-0750-0750-G2	750	750	1320 1390 1220
LMG2A-S13 S27-0750-1000-G2	750	1000	1320 1390 1470

### 3 Planar Motor

#### 3.1 Planar Servo Motor L MSP



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#### 3.2 Servo Driver LMDX



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# Positioning Systems

## Planar Motor

### 3 Planar Motor

XY movements on an air bearing through a planar-servo motor with integrated distance measurement. Can be operated upside down.

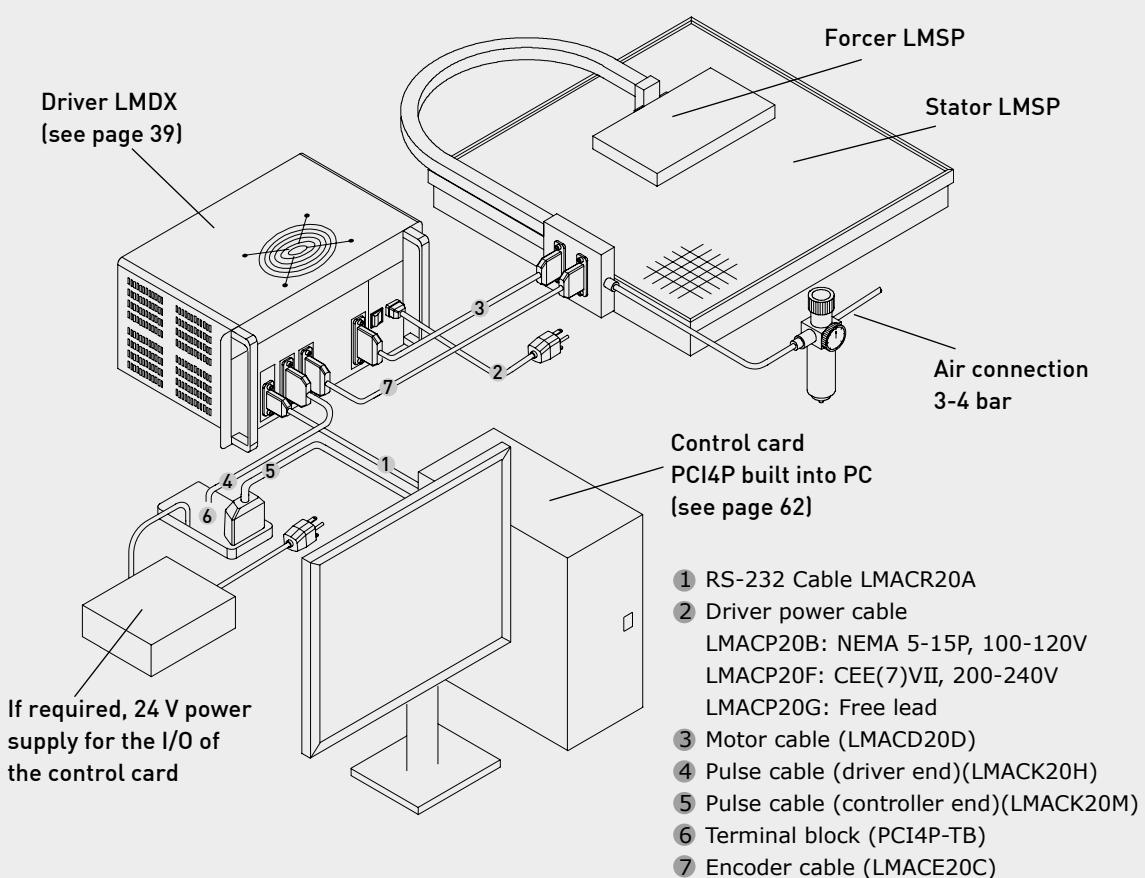


#### 3.1 Planar Servo Motor LMSP

The planar motor LMSP has integrated distance measurement sensors and works with position control (closed loop).

- XY table
- Closed loop thanks to integrated distance measurement
- Air bearing free of wear
- No externally measurable magnetic fields
- Very low heat generation
- Can be mounted upside down
- Stator area up to 1000 x 1000 mm

#### Configuration of LMSP with servo driver LMDX



### Dimensions of the planar servo motor LMSP

(Values  $X_f$  see Table 3.1, values  $X_s$  see Table 3.2)

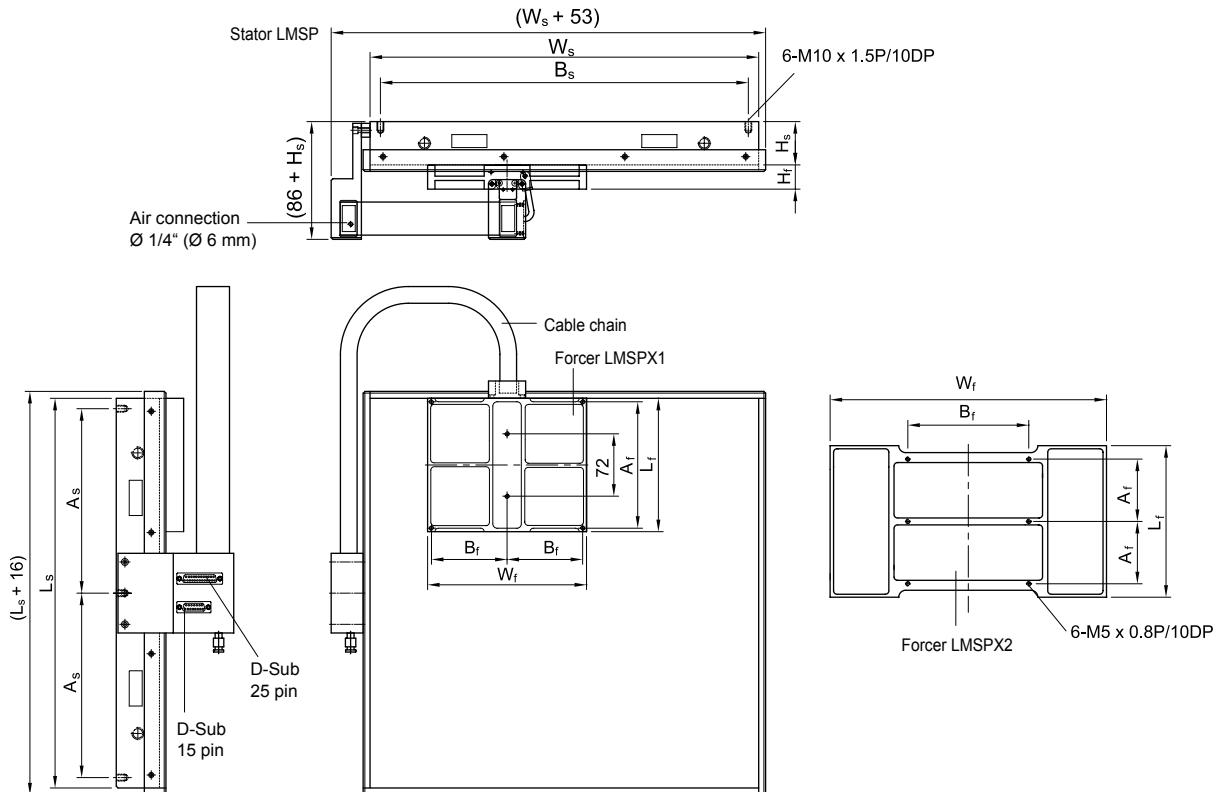


Table 3.1 Specifications for Planar Servo Motor LMSP

	Symbol	Unit	LMSPX1	LMSPX2
Performance	<b>Max. thrust</b>	N	75	140
	<b>Resolution</b>	mm	0.001	0.001
	<b>Repeatability</b> (unidirectional)	mm	0.002	0.002
	<b>Accuracy</b> (every 300mm)	mm	±0.015	±0.015
	<b>Max. speed</b>	m/s	0.9	0.8
	<b>Max. load</b>	kg	12.2	24.3
Forcer	<b>Length</b>	mm	154	175
	<b>Width</b>	mm	184	320
	<b>Height</b>	mm	28	30
	<b>Air pressure</b>	kg/cm <sup>2</sup>	3-4	3-4
	<b>Air flow rate</b>	l/min	6.4	11
	<b>Mass</b>	kg	1.8	3.7
	<b>Fixing distance</b>	mm x mm	146 x 87.5	72 x 140

# Positioning Systems

## Planar Motor

Table 3.2 Dimensions and weight of the stators LMSP-P1 to LMSP-P6

		Unit	P1	P2	P3	P4	P5	P6
<b>Stator dimensions</b>	$L_s \times W_s$	mm	350 x 330	450 x 450	600 x 450	600 x 600	1000 x 600	850 x 850
<b>Max. Stroke</b>	<b>LMSPX1</b>	mm	190 x 140	290 x 260	440 x 260	440 x 410	840 x 410	690 x 660
<b>(one Forcer)</b>	<b>LMSPX2</b>	mm		270 x 125	420 x 125	420 x 275	820 x 275	670 x 525
<b>Stator height</b>	$H_s$	mm	50	50	70	70	100	120
<b>Mass of Stator</b>		kg	27	36	52	66	120	250
<b>Fixing Distance</b>	$A_s \times B_s$	mm	165 x 310	213 x 426	288 x 426	288 x 576	(318-324-318) x 280	400 x 400
<b>No. of mounting holes</b>			6	6	6	6	10	9

### Structure of Order Number

LMSPX 11 P1			
Series	Forcer	Number of forcers	Stator
1			P1
2			P2
			P3
			P4
			P5
			P6

### 3.2 Servo Driver LMDX

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

#### Dimensions of Servo Driver LMDX

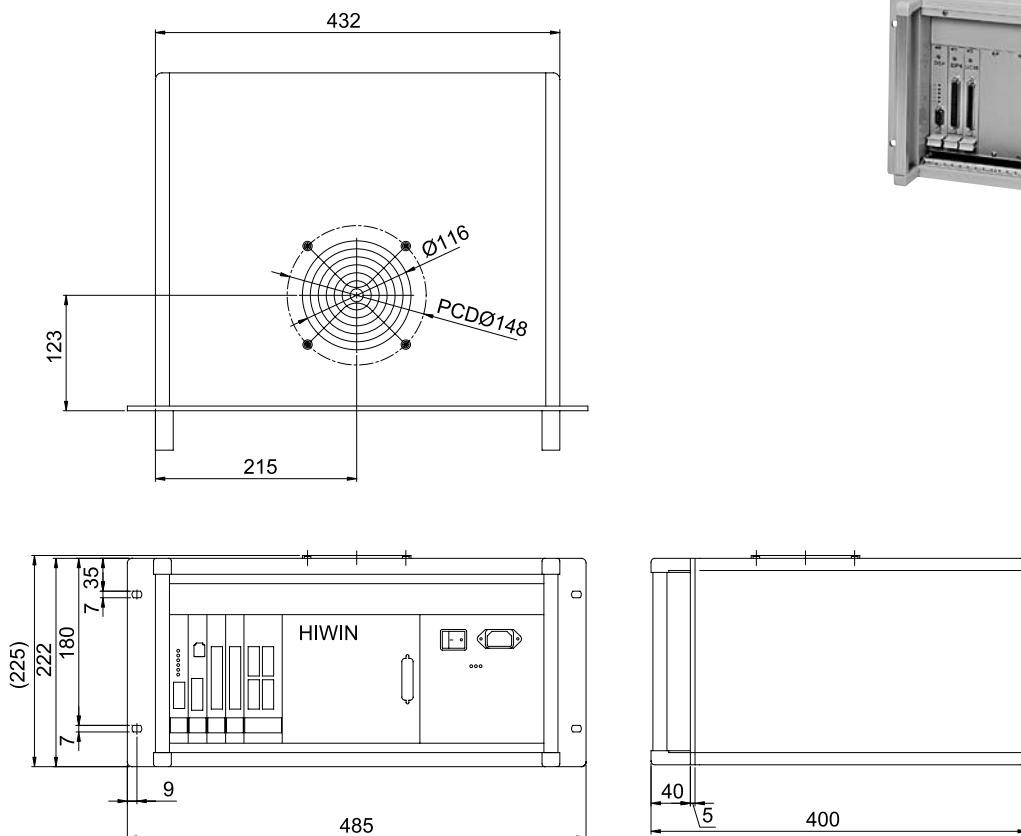


Table 3.3 Specifications for Servo Driver LMDX

		Unit	Value
<b>Power supply</b>	<b>Voltage</b>	V <sub>AC</sub>	95-125 (LMDX1) 200-240 (LMDX2)
	<b>Frequency Output</b>	Hz VA	50/60 500 (max.)
<b>Output current</b>		A	3 (max.)
<b>Interface</b>	<b>Parameter setting: RS-232</b>		9600 Baud, 8 data bits, 2 stop bits, odd parity
	<b>Digital I/O signal</b>		DXIO plug-in card: 8 inputs: including HOME and RESET 6 outputs: including IN-POSITION, ALARM, SVON DXIO16 plug-in card (option): 16 inputs, 16 outputs
	<b>Pulse command</b>	Pulse	STEP/DIR
<b>Resolution</b>		µm/pulse	min. 1 (set by parameter)
<b>Mass</b>		kg	13.3
<b>Max. operation temperature</b>		°C	50



## 4 Linear Motor Components

### 4.1 Linear Motors, LMS Series



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### 4.2 Linear Motors, LMC Series

#### 4.2.1 Linear Motors, LMCA, LMCB, LMCC Series



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#### 4.2.2 Linear Motors, LMCD, LMCE Series

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### 4.3 Linear Motors, LMT Series



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# Positioning Systems

## Linear Motor Components

### 4.1 Linear Motors, LMS Series

HIWIN synchronous linear motors LMS are the power packs of linear drives.

They are especially distinguished by very high power density and minimum cogging torque.

The three-phase motors are composed of a primary part (forcer) with a coiled stack of sheets and a secondary part with permanent magnets (stators). With the combination of several stators, many stroke combinations are possible.

- 3-phase
- High thrust
- Excellent acceleration
- Low cogging
- Many stroke lengths
- Several forcers possible on one stator



#### Force Chart for Linear Motors, LMS Series

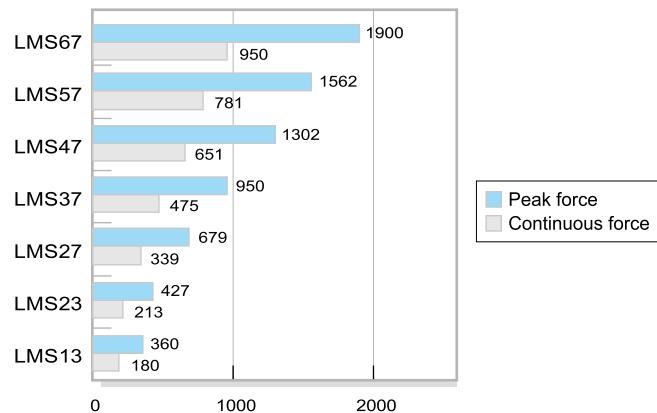


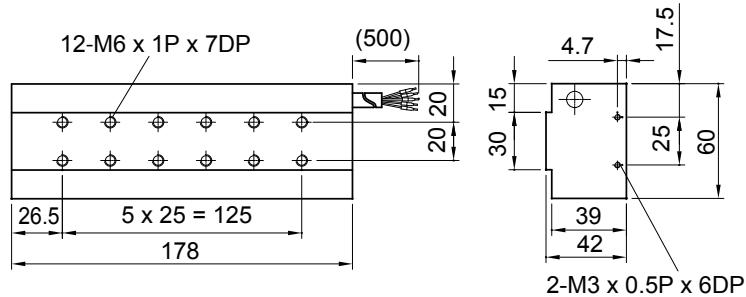
Table 4.1 Specifications for Linear Motors, LMS Series

	Symbol	Unit	LMS13	LMS23	LMS27	LMS37	LMS37L	LMS47	LMS47L	LMS57	LMS57L	LMS67	LMS67L
<b>Continuous force</b>	$F_c$	N	180	213	339	475	475	651	651	781	781	950	950
<b>Continuous current</b>	$I_c$	A (rms)	4.1	3.5	3.5	3.5	7.0	3.5	7.0	3.5	7.0	3.5	7.0
<b>Peak force for 1 sec.</b>	$F_p$	N	360	427	679	950	950	1302	1302	1562	1562	1900	1900
<b>Peak current for 1 sec.</b>	$I_p$	A (rms)	8.2	7.0	7.0	7.0	14.0	7.0	14.0	7.0	14.0	7.0	14.0
<b>Force constant</b>	$K_f$	N/A (rms)	44	61	97	136	68	186	96	223	112	271	136
<b>Attraction force</b>	$F_a$	N	805	1350	2036	2850	2850	4071	4071	4885	4885	5700	5700
<b>Max. winding temp.</b>	$T_{max}$	°C	100	100	100	100	100	100	100	100	100	100	100
<b>Electrical time constant</b>	$K_e$	ms	9.8	11.4	10.8	10.8	10.8	11.1	11.1	11.2	11.2	11.3	11.3
<b>Resistance (line to line at 25 °C)</b>	$R_{25}$	Ω	3.4	4.6	6.2	8.6	2.0	11.2	2.6	13.0	3.2	14.8	3.8
<b>Inductance (line to line)</b>	$L$	mH	34	54	64	90	20	124	30	146	36	168	42
<b>Pole pitch</b>	$2\tau$	mm	32	32	32	32	32	32	32	32	32	32	32
<b>Bend radius of motor cable</b>	$R_{bend}$	mm	37.5	37.5	37.5	37.5	37.5	37.5	37.5	40	40	40	40
<b>Back emf constant (line to line)</b>	$K_v$	Vrms/(m/s)	26	43	51	71	41	101	59	121	61	141	71
<b>Motor constant (at 25 °C)</b>	$K_m$	N/√W	19.4	23.1	31.8	38.0	38.0	45.4	45.4	50.7	50.7	57.6	57.6
<b>Thermal resistance</b>	$R_{th}$	°C/W	0.33	0.33	0.46	0.40	0.40	0.30	0.30	0.26	0.26	0.23	0.23
<b>Thermal switch</b>			100 °C, Bimetal (opener), DC 12 V / 6 A, DC 24 V / 3 A										
<b>Max. DC bus voltage</b>		V	750										
<b>Mass of forcer</b>	$M_f$	kg	1.8	2.7	4.1	5.9	5.9	8.0	8.0	9.4	9.4	10.8	10.8
<b>Unit mass of stator</b>	$M_s$	kg/m	4.2	6.2	6.2	8.2	8.2	11.5	11.5	13.7	13.7	15.9	15.9
<b>Width of stator</b>	$W_s$	mm	60	80	80	100	100	130	130	150	150	170	170
<b>Length of stator / Dimension N</b>	$L_s$	mm	192 mm/N=2, 256 mm/N=3, 320 mm/N=4										
<b>Stator mounting distance</b>	$A_s$	mm	45	65	65	85	85	115	115	135	135	155	155
<b>Total height</b>	$H$	mm	55.2	55.2	57.4	57.4	57.4	57.4	57.4	57.4	57.4	57.4	57.4

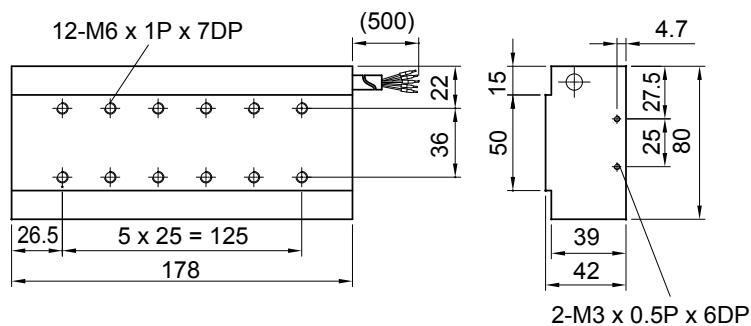
Note: Values in the table refer to operation without forced cooling

All specifications are ± 10 %

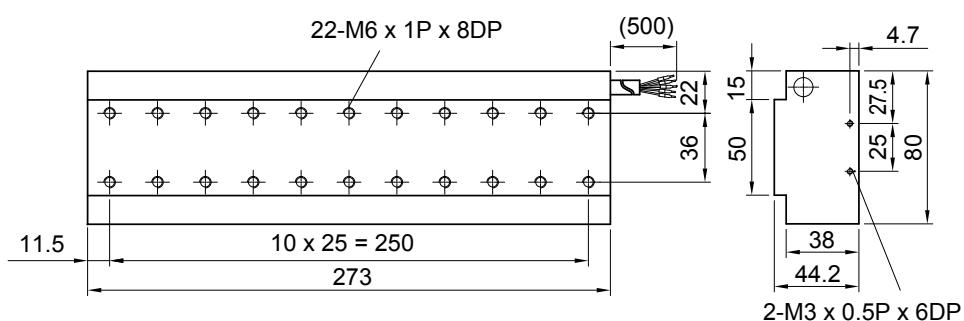
**Dimensions of Linear Motors LMS13**



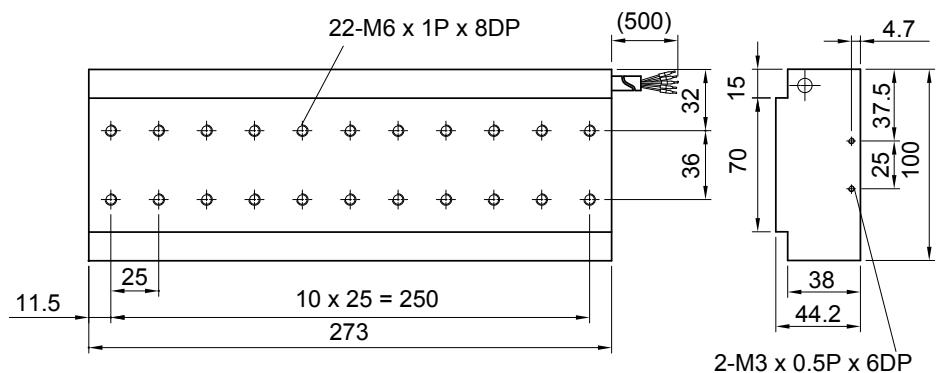
**Dimensions of Linear Motors LMS23**



**Dimensions of Linear Motors LMS27**



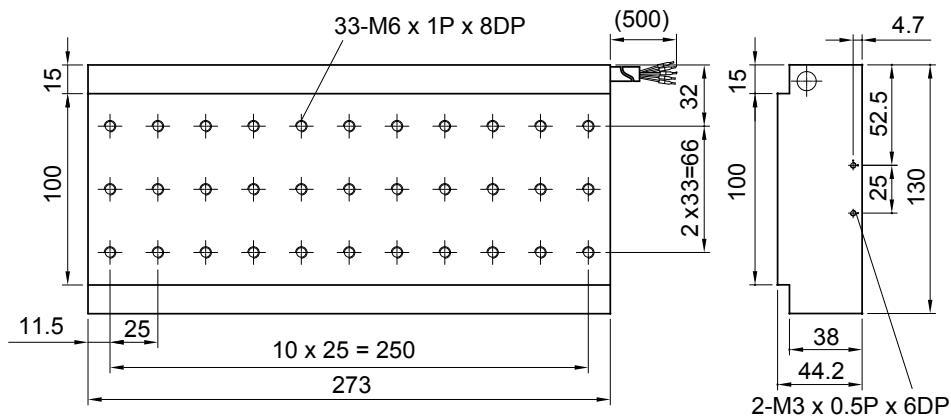
**Dimensions of Linear Motors LMS37 (L)**



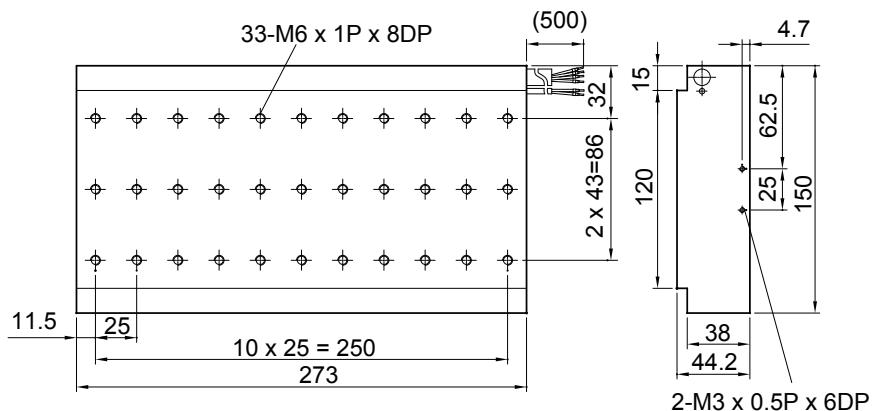
# Positioning Systems

## Linear Motor Components

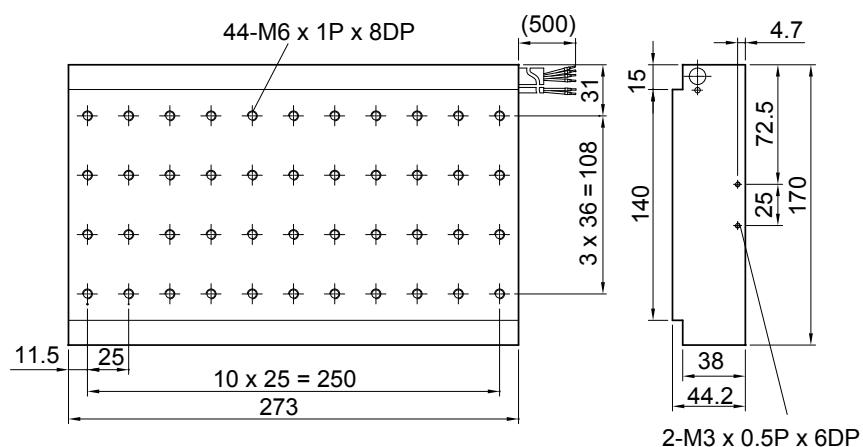
Dimensions of Linear Motors LMS47 (L)



Dimensions of Linear Motors LMS57 (L)



Dimensions of Linear Motors LMS67 (L)

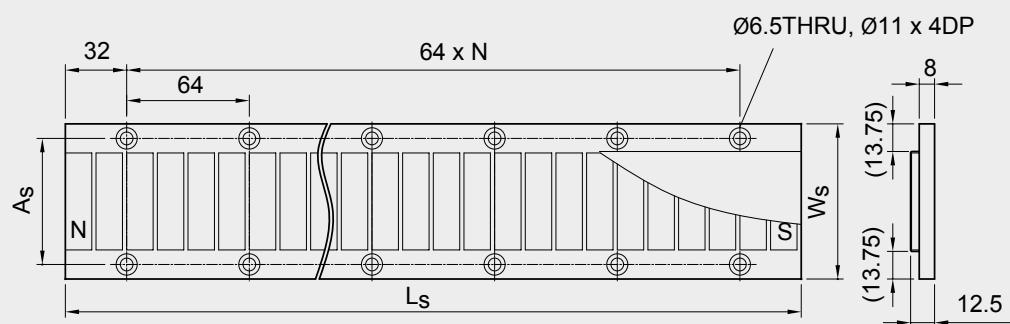


## Structure of the order number of linear motors LMS, stators

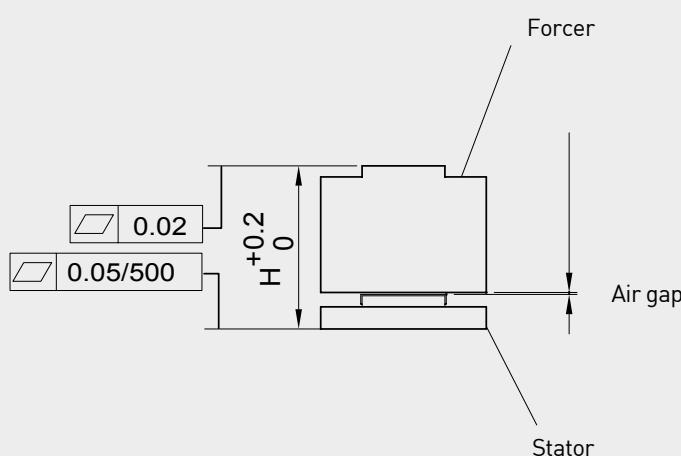
LMS 1 S 2			
Series	Width of stator	Stator model	Length of stator
1: for linear motors, LMS13 series		S: Standard	1: 192 mm (N=2)
2: for linear motors, LMS23 and LMS27 series		C: Customized	2: 256 mm (N=3)
3: for linear motors, LMS37 (L) and LMT37 (L) series			3: 320 mm (N=4)
4: for linear motors, LMS47 (L) series			
5: for linear motors, LMS57 (L) series			
6: for linear motors, LMS67 (L) series			

## Dimensions of stators for linear motors LMS

(Values for  $L_s$ ,  $A_s$ ,  $W_s$  and  $H$  see Table 4.1)



## Installing linear motors LMS



# Positioning Systems

## Linear Motor Components

### 4.2 Linear Motors, LMC Series

#### 4.2.1 Linear Motors, LMCA, LMCB, LMCC Series

HIWIN synchronous linear motors LMC are the born sprinters. They are light, extremely dynamic. This is due to their coreless primary part (forcer) with epoxy cast coils, it needs to move very little of its own weight. The secondary part is composed of an U-shaped stator made of permanent magnets.

- 3-phase
- Extremely dynamic
- Good synchronization and high speed consistency
- Low inertia and high acceleration
- Low profile
- No cogging
- Several forcers possible on one stator



Force Chart for Linear Motors

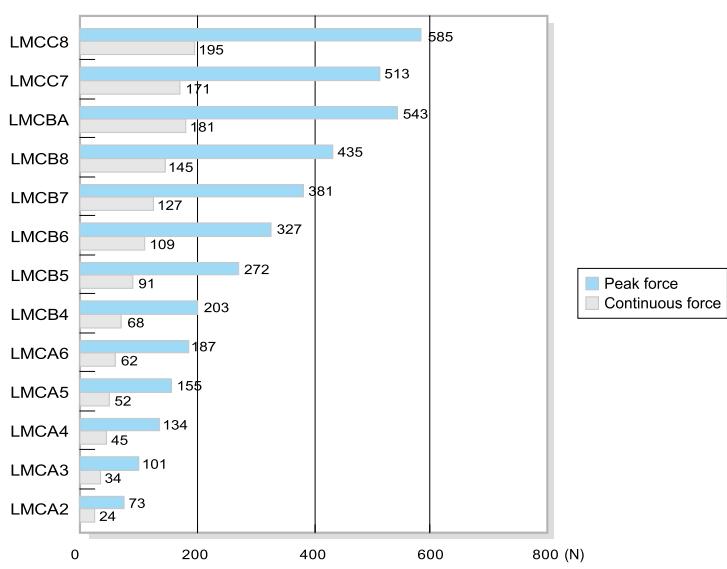


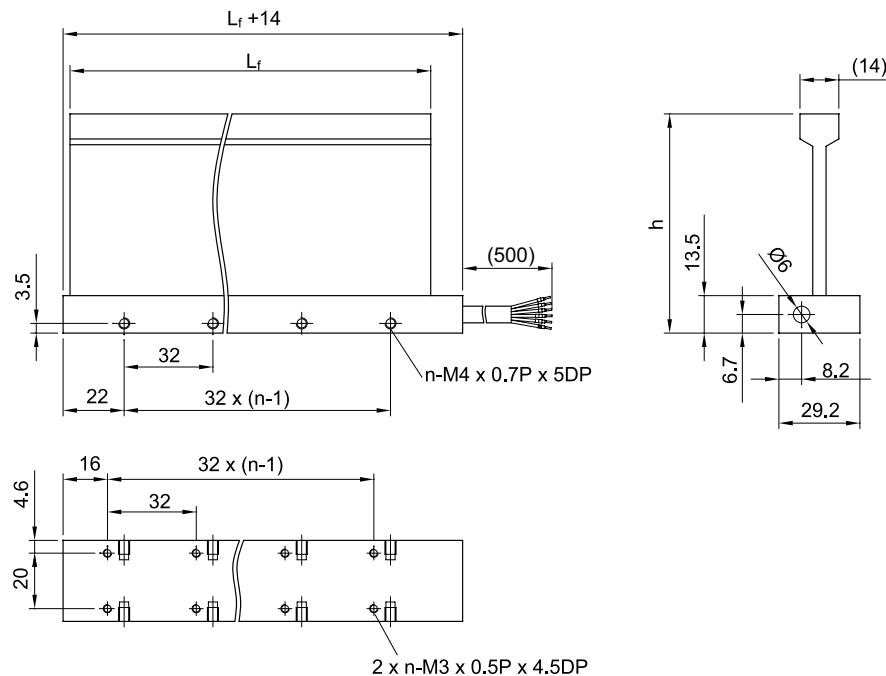
Table 4.2.1 Specifications for Linear Motors, LMCA, LMCB, LMCC Series

	Symbol	Unit	LMCA2	LMCA3	LMCA4	LMCA5	LMCA6	LMCA7	LMCA8	LMCB2	LMCB3	LMCB4	LMCB5	LMCB6	LMCB7	LMCB8	LMCA2	LMCA3	LMCA4	LMCC7	LMCC8
<b>Continuous force</b>	$F_c$	N	24	34	45	52	62	68	91	109	128	145	181	171	195						
<b>Continuous current</b>	$I_c$	A (rms)	2.3	2.1	2.1	1.8	1.8	2	2	2	2	2	2	2	2	2	2	2	2	2	
<b>Peak force (for 1 s)</b>	$F_p$	N	73	101	134	155	187	203	272	327	381	435	543	513	585						
<b>Peak current (for 1 s)</b>	$I_p$	A (rms)	6.9	6.3	6.3	5.4	5.4	6	6	6	6	6	6	6	6	6	6	6	6	6	
<b>Force constant</b>	$K_f$	N/A (rms)	10.6	15.8	21.2	28.2	33.8	32.5	45.4	54.5	63.5	72.5	90.6	85.4	97.5						
<b>Max. winding temp.</b>	$T_{max}$	°C	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
<b>Electrical time constant</b>	$K_e$	ms	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.8	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.0	
<b>Resistance (line to line at 25 °C)</b>	$R_{25}$	Ω	3.4	4.8	6.0	7.0	8.0	8.2	10.4	13.4	14.6	16.6	20.8	16.8	19.2						
<b>Inductance (line to line)</b>	$L$	mH	1.2	1.6	2.2	2.4	2.8	2.6	3.8	4.4	5.4	6.2	7.8	8.4	9.6						
<b>Pole pitch</b>	$2 \tau$	mm	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	
<b>Bend radius of motor cable</b>	$R_{bend}$	mm	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	
<b>Back emf constant (line to line)</b>	$K_v$	Vrms/(m/s)	5.9	8.8	11.9	14.5	17.4	19.0	24.8	29.3	34.7	40.0	50.0	45.4	51.9						
<b>Motor constant (at 25 °C)</b>	$K_m$	N/√W	4.8	6.0	6.9	8.7	9.8	9.3	11.4	12.5	13.7	14.5	16.2	17.0	18.1						
<b>Thermal resistance</b>	$R_{th}$	°C/W	2.25	1.77	1.32	1.48	1.51	1.18	0.92	0.80	0.65	0.57	0.45	0.56	0.49						
<b>Thermal switch</b>			100 °C, Bimetall (opener), DC 12 V / 6 A, DC 24 V / 3 A																		
<b>Max. DC bus voltage</b>		V	325																		
<b>Mass of forcer</b>	$M_f$	kg	0.15	0.23	0.31	0.38	0.45	0.38	0.48	0.58	0.68	0.72	0.88	0.74	0.76						
<b>Unit mass of stator</b>	$M_s$	kg/m	7	7	7	7	7	12	12	12	12	12	21	21	21						
<b>Length of forcer/ Dimension n</b>	$L_f$	mm	66/2	98/3	130/4	162/5	194/6	130/4	162/5	194/6	226/7	258/8	322/10	226/7	258/8						
<b>Height of forcer</b>	$h$	mm	59	59	59	59	59	79	79	79	79	79	99	99	99						
<b>Height of stator</b>	$H_s$	mm	60	60	60	60	60	80	80	80	80	80	80	80	80	103	103				
<b>Width of stator</b>	$W_s$	mm	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	35.2	35.2	35.2			
<b>Length of stator / Dimension N</b>	$L_s$	mm	192 mm/N=2, 256 mm/N=3, 320 mm/N=4																		
<b>Total height</b>	$H$	mm	74.5	74.5	74.5	74.5	74.5	94.5	94.5	94.5	94.5	94.5	117.5	117.5	117.5						

All specifications are ± 10 %

### Dimensions for linear motor LMC forcer

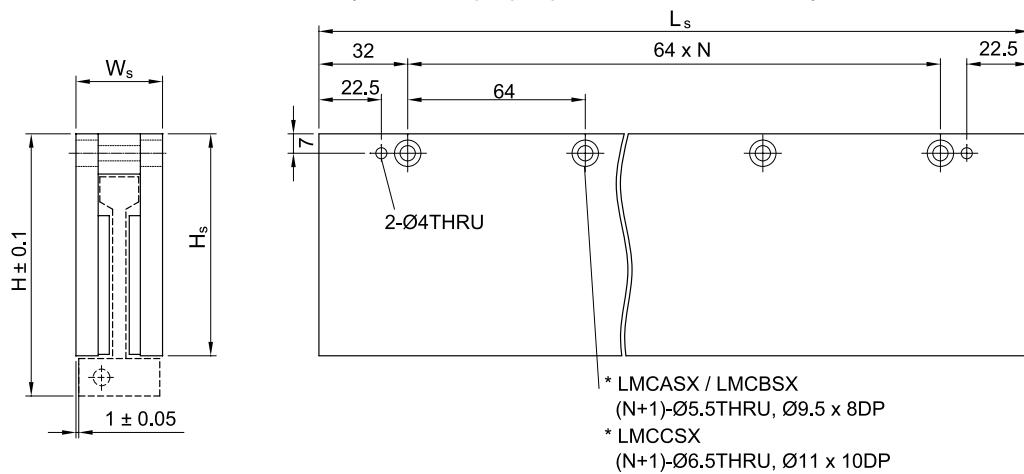
(Values for  $L_f$ ,  $h$  and  $n$ : see Table 4.2.1)



### Installing linear motors LMC

### Dimensions for linear motor LMC stator

(Values for  $L_s$ ,  $H_s$ ,  $W_s$ ,  $N$  and  $H$ : see Table 4.2.1)



\* LMCASX / LMCCSX  
(N+1)-Ø5.5THRU, Ø9.5 x 8DP  
\* LMCCSX  
(N+1)-Ø6.5THRU, Ø11 x 10DP

### Structure of the order number of linear motors LMC stator

LMC A S 2			
Series	Stator height	Stator model	Length of stator
A: 60 mm		S: Standard	1: 192 mm (N=2)
B: 80 mm		C: Customized	2: 256 mm (N=3)
C: 103 mm			3: 320 mm (N=4)

# Positioning Systems

## Linear Motor Components

### 4.2.2 Linear Motors, LMCD, LMCE Series

HIWIN synchronous linear motors LMCD and LMCE are the born sprinters. They are light, extremely dynamic. This is due to their coreless primary part (forcer) with epoxy cast coils, it needs to move very little of its own weight. The secondary part is composed of an U-shaped stator made of permanent magnets.

- 3-phase
- Extremely dynamic
- Good synchronization and high speed consistency
- Low inertia and high acceleration
- Low profile
- No cogging
- Several forcers possible on one stator

#### Force Chart for Linear Motors

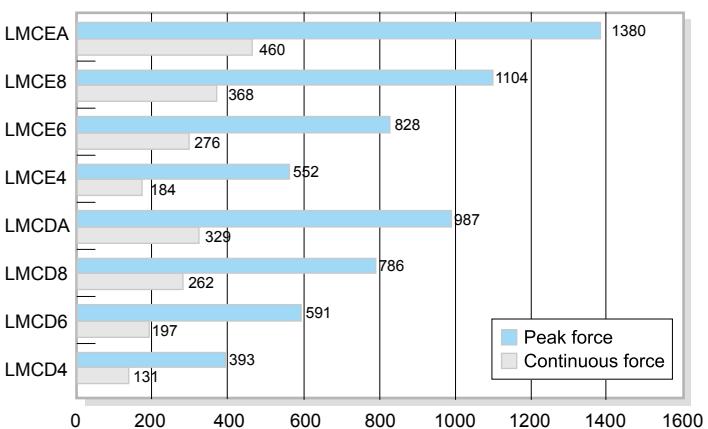


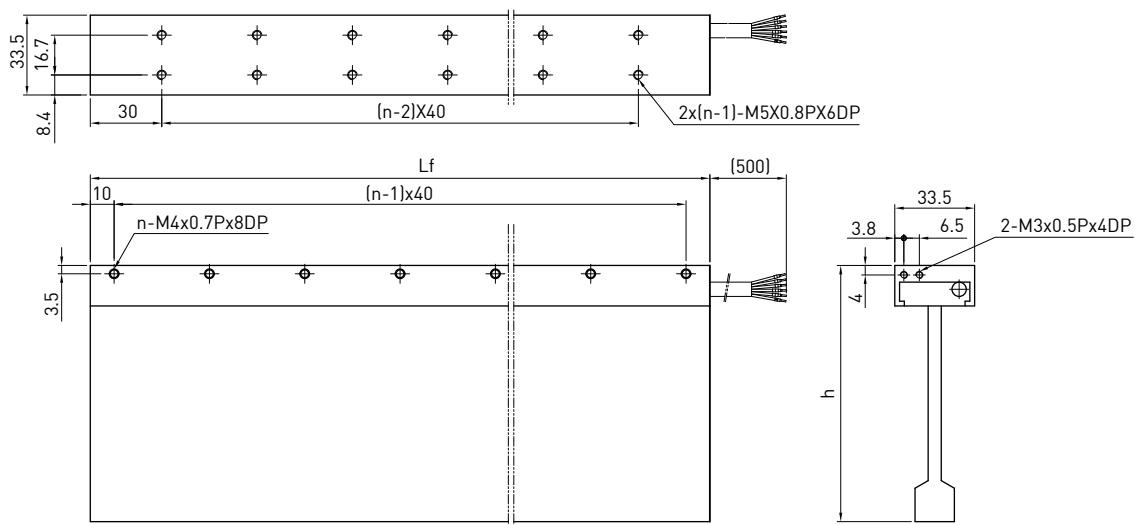
Table 4.2.2 Specifications for Linear Motors, LMCD and LMCE Series

	Symbol	Unit	LMCD4	LMCD6	LMCD8	LMCDA	LMCE4	LMCE6	LMCE8	LMCEA
<b>Continuous force</b>	$F_c$	N	131	197	262	328	184	276	368	460
<b>Continuous current</b>	$I_c$	A (rms)	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25
<b>Peak force (for 1 s)</b>	$F_p$	N	393	591	786	987	552	828	1104	1380
<b>Peak current (for 1 s)</b>	$I_p$	A (rms)	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75
<b>Force constant</b>	$K_f$	N/A (rms)	40.3	60.6	80.6	100.9	56.6	84.9	113.2	141.5
<b>Max. winding temp.</b>	$T_{max}$	°C	100	100	100	100	100	100	100	100
<b>Electrical time constant</b>	$K_e$	ms	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42
<b>Resistance (line to line at 25 °C)</b>	$R_{25}$	Ω	5.1	7.7	10.8	13.8	5.86	8.75	11.7	14.6
<b>Inductance (line to line)</b>	$L$	mH	2.1	3.2	4.5	5.7	2.45	3.65	4.9	6.1
<b>Pole pitch</b>	$2 \tau$	mm	60	60	60	60	60	60	60	60
<b>Bend radius of motor cable</b>	$R_{bend}$	mm	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
<b>Back emf constant (line to line)</b>	$K_v$	Vrms/(m/s)	25	29	33	38	35	40	46	53
<b>Motor constant (at 25 °C)</b>	$K_m$	N/√W	14.6	17.8	20	22.2	19	23.4	27	30.2
<b>Thermal resistance</b>	$R_{th}$	°C/W	0.46	0.30	0.21	0.17	0.41	0.27	0.20	0.16
<b>Thermal switch</b>			100 °C, Bimetall (opener), DC 12 V / 6 A, DC 24 V / 3 A							
<b>Max. DC bus voltage</b>		V					325			
<b>Mass of forcer</b>	$M_f$	kg	0.88	1.32	1.76	2.20	1.23	1.84	2.46	3.08
<b>Unit mass of stator</b>	$M_s$	kg/m	16	16	16	16	20	20	20	20
<b>Length of forcer/ Dimension n</b>	$L_f$	mm	260/7	380/10	500/13	620/16	260/7	380/10	500/13	620/16
<b>Height of forcer</b>	$h$	mm	87.5	87.5	87.5	87.5	107.5	107.5	107.5	107.5
<b>Height of stator</b>	$H_s$	mm	86.8	86.8	86.8	86.8	106.8	106.8	106.8	106.8
<b>Width of stator</b>		mm	35.5	35.5	35.5	35.5	35.5	35.5	35.5	35.5
<b>Length of stator / Dimension N</b>	$L_s$	mm				120 mm/N=2, 300 mm/N=5, 480 mm/N=8				
<b>Total height</b>	$H$	mm	105	105	105	105	125	125	125	125

All specifications are  $\pm 10\%$

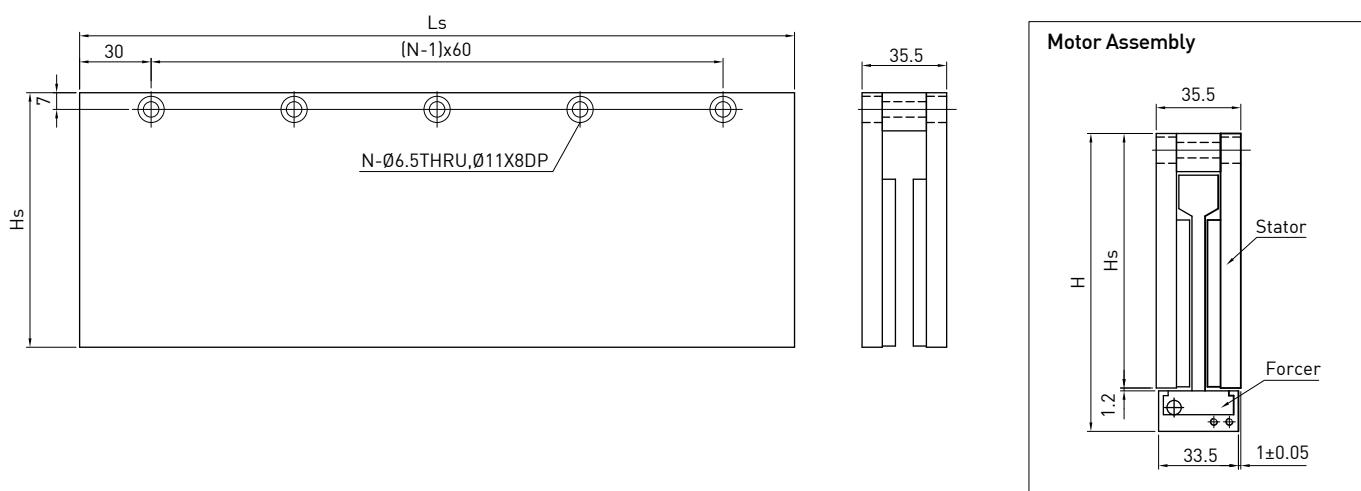
### Dimensions for linear motor LMCD and LMCE forcer

(Values for  $L_f$ ,  $h$  and  $n$ : see Table 4.2.2)



### Dimensions for linear motor LMCD and LMCE stator

(Values for  $L_s$ ,  $H_s$ ,  $N$  and  $H$ : see Table 4.2.2)



# Positioning Systems

## Linear Motor Components

### 4.3 Linear Motors, LMT Series

HIWIN synchronous linear motors LMT are iron-core motors with similar properties to the motors of the LMS series. Due to the special arrangement of the forcer between two stators, the attraction force in the LMT motors is canceled. As a result, the guide rails are relieved of loads and a high power density is achieved with relatively short sliders.

- Large force constant
- Water cooling possible
- Attraction force compensation
- No attraction force introduction into the guide elements
- Several forcers possible on one stator
- Any stroke length

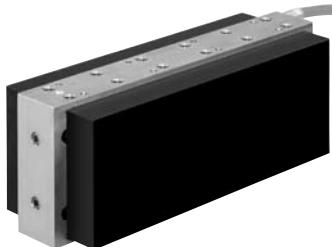


Table 4.3 Specifications for Linear Motors, LMT Series

	Symbol	Unit	LMT37	LMT37(WC) <sup>2)</sup>	LMT37L	LMT37L (WC) <sup>2)</sup>
<b>Continuous force</b>	$F_c$	N	950	1900	950	1400
<b>Continuous current</b>	$I_c$	A(rms)	3.5	7	7.0	10.4
<b>Peak force (for 1 s)</b>	$F_p$	N	1900	2710	1900	1900
<b>Peak current (for 1 s)</b>	$I_p$	A(rms)	7.0	10	14.0	14
<b>Force constant</b>	$K_f$	N/A (rms)	271	271	136	136
<b>Attraction force</b>	$F_a$	N	0 <sup>1)</sup>	0 <sup>1)</sup>	0 <sup>1)</sup>	0 <sup>1)</sup>
<b>Max. winding temp.</b>	$T_{max}$	°C	100	100	100	100
<b>Electrical time constant</b>	$K_e$	ms	9.6	9.6	9.6	9.6
<b>Resistance (line to line at 25 °C)</b>	$R_{25}$	Ω	18.0	18.0	4.6	4.6
<b>Inductance (line to line)</b>	$L$	mH	172	172	44	44
<b>Pole pitch</b>	$2\tau$	mm	32	32	32	32
<b>Bend radius of motor cable</b>	$R_{bend}$	mm	37.5	37.5	37.5	37.5
<b>Back emf constant (line to line)</b>	$K_v$	Vrms/(m/s)	141	141	71	71
<b>Motor constant (at 25 °C)</b>	$K_m$	N/√W	54.1	54.1	54.1	54.1
<b>Thermal resistance</b>	$R_{th}$	°C/W	0.23	0.23	0.23	0.23
<b>Thermal switch</b>			100 °C, Bimetal (opener), DC 12 V/6 A, DC 24 V/3 A			
<b>Max. DC bus voltage</b>		V		750		
<b>Mass of forcer</b>	$M_f$	kg	14.0	14.0	14.0	14.0
<b>Unit mass of stator</b>	$M_s$	kg/m	16.4	16.4	16.4	16.4
<b>Width of stator</b>	$W_s$	mm	100	100	100	100
<b>Length of stator/Dimension N</b>	$L_s$	mm		192 mm/N=2, 256 mm/N=3, 320 mm/N=4		
<b>Stator mounting distance</b>	$A_s$	mm	85	85	85	85
<b>Total height</b>	$H$	mm	131.5	131.5	131.5	131.5

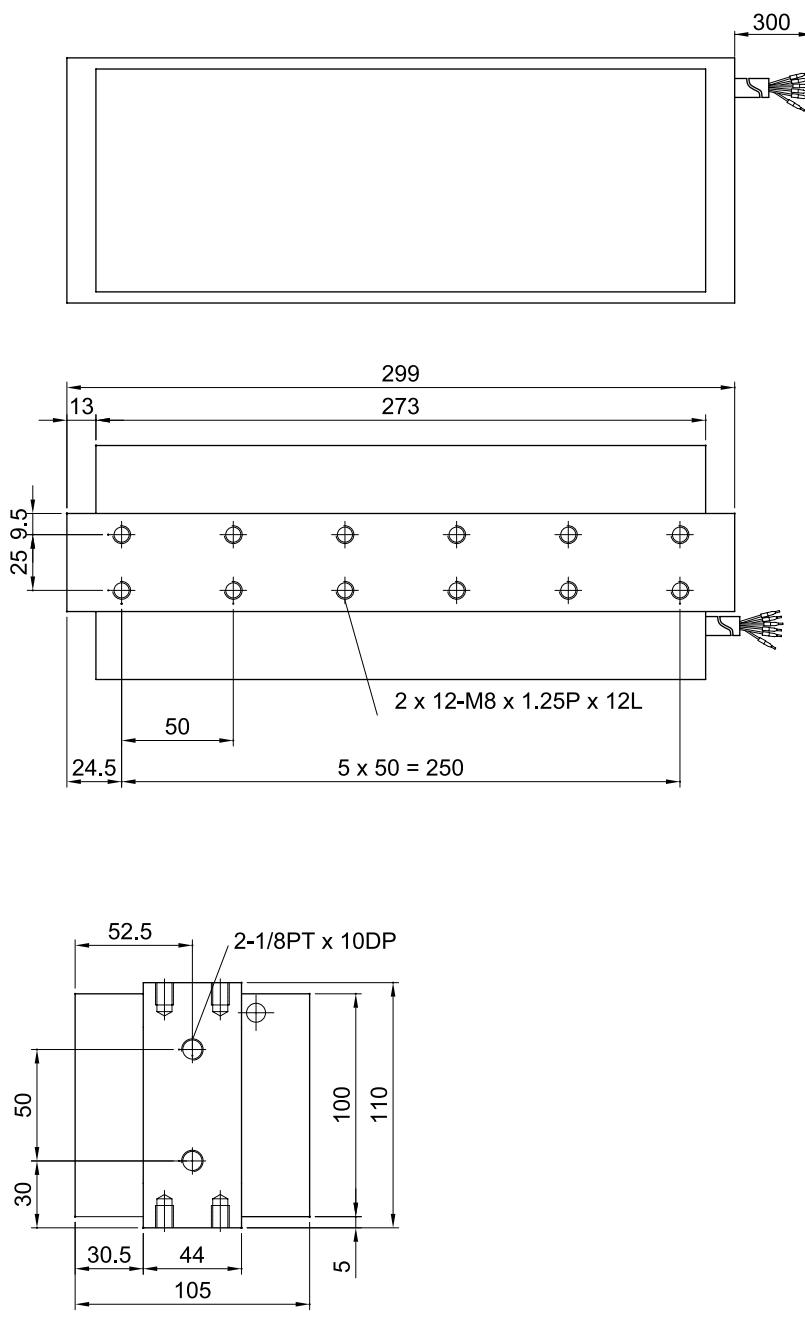
Note: 1) 0: Counter balanced by equal attraction force

2) WC = with water cooling

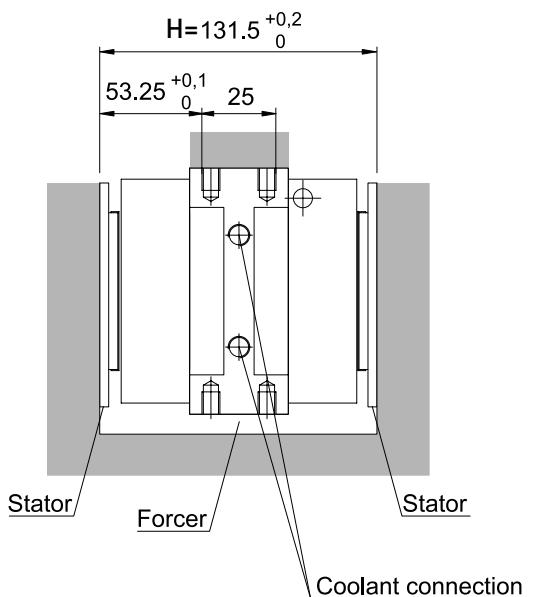
Values in the table are according to no forced cooling except labelled with WC (Water Cooling).

All specifications are ± 10 %

**Dimensions for linear motor LMT forcer**



**Installing linear motors LMT**





## 5 Torque Motor Rotary Tables

5.1 Product Overview and Application Areas	Page 54
5.2 TMS Rotary Tables	Page 55
5.2.1 TMS3 Rotary Tables	Page 56
5.2.2 TMS7 Rotary Tables	Page 57



# Positioning Systems

## Torque Motor Rotary Tables

### 5.1 Product Overview and Application Areas

The extremely rigid connection between motor and load, and a servo-drive regulation ensures excellent acceleration capabilities and good uniformity of movement. HIWIN rotary tables and torque motors are especially well suited for tasks in automation due to the hollow shaft design. Media, cable systems or mechanical parts can be fed through without problems.

HIWIN Rotary Tables:  
TMS series utilize cross roller bearing.

- Drive free of clearance
- Hollow shaft
- No gear transmission losses
- Maintenance free and compact
- Strong torque
- Extremely dynamic
- Driver can be selected freely
- Brush-free drive
- Incremental shaft encoder



Short and compact:  
HIWIN rotary tables are  
optimized for high torques and  
robust dynamics.

**Table 5.1 Application Areas of Rotary Tables**

Classification	Application	Features and main reasons for use					
		Accuracy	Speed	Rigidity	Compactness	Clearliness	Freedom from maintenance
<b>Production equipment</b>	CVD, wafer cleaning, ion implantation	○			○	○	○
	Semi-conductor transport, inspection/processing	○			○	○	○
<b>Assembly machines</b>	Assembly machines for electric components	○	○		○	○	○
	High-speed assembly machines for electronic components	○	○		○	○	○
<b>Machine tools</b>	Various assembly machines	○	○		○		○
	Tool changers		○		○		○
<b>Inspection / testing equipment</b>	C axes	○		○	○		○
	Machine part inspection	○			○		○
	Inspection of electric components	○			○		○
	Inspection of optical components	○			○		○
	Chemical analysis of liquids		○			○	○
	Various Inspection/testing equipment	○			○		○
<b>Robots</b>	Various assembly robots	○	○	○	○		○
	Various transport robots	○	○		○		○
	Inspection/transport robots in clean rooms	○	○		○	○	○

## 5.2 TMS Rotary Tables

- Rotary table with hollow shaft
- Meets IP65 enclosure standards
- Extremely rigid support with cross-roll
- Integrated incremental or absolute shaft encoder
- Integrated brake is available as an option
- Brush-free drive

### Structure of the order number of TMS rotary tables

Series	Type	Size	Rotor height	TM S 3 4
S: Complete rotary table	3: External diameter 200 mm 7: External diameter 300 mm	4: 40 mm 6: 60 mm 8: 80 mm C: 120 mm		

# Positioning Systems

## Torque Motor Rotary Tables

### 5.2.1 TMS3 Rotary Tables

#### Dimensions of TMS3 rotary tables

(Values see Table 5.2.1)

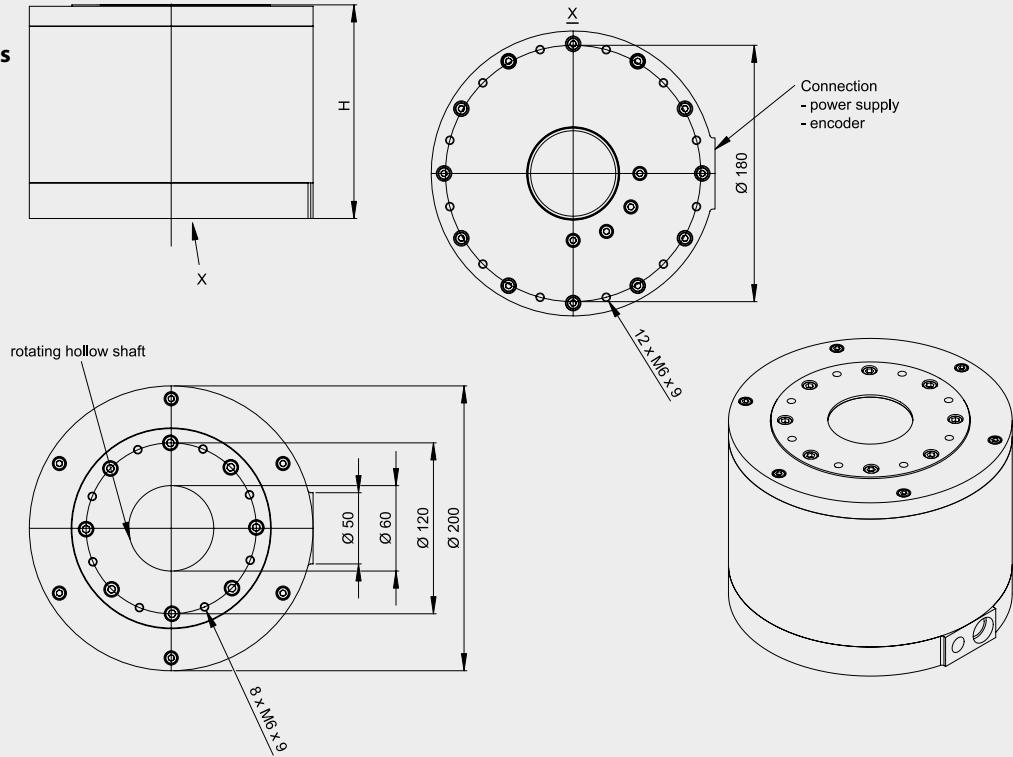


Table 5.2.1 Specifications for TMS3 rotary tables

	Symbol	Unit	TMS32	TMS34	TMS38	TMS3C
<b>Continuous torque (80 °C)</b>	T <sub>c</sub>	Nm	10	20	40	60
<b>Continuous current (80 °C)</b>	I <sub>c</sub>	A(rms)	3	3	3	3
<b>Peak torque for 1sec</b>	T <sub>p</sub>	Nm	25	50	100	150
<b>Peak current for 1sec</b>	I <sub>p</sub>	A(rms)	7.5	7.5	7.5	7.5
<b>Torque constant</b>	K <sub>t</sub>	Nm/A(rms)	3.5	7	14	21
<b>Electrical time constant</b>	T <sub>e</sub>	ms	3.9	3.9	3.9	3.9
<b>Resistance (line to line, 25 °C)</b>	R <sub>25</sub>	Ω	5.8	8.6	14.4	20.2
<b>Resistance (line to line, 100 °C)</b>	R <sub>100</sub>	Ω	6.8	10.2	17	24
<b>Inductance (line to line)</b>	L	mH	20	32	54	74
<b>Number of poles</b>	2p	-	22	22	22	22
<b>Back EMF constant (line to line)</b>	K <sub>v</sub>	Vrms/(rad/s)	1.6	3.2	6.4	9.6
<b>Motor constant (25 °C)</b>	K <sub>m</sub>	Nm/√W	1	2.1	3.4	4.2
<b>Thermal resistance</b>	R <sub>th</sub>	°C/W	0.7	0.58	0.41	0.29
<b>Inertia of rotating parts</b>	J	kg m <sup>2</sup>	0.014	0.020	0.026	0.035
<b>Mass of motor</b>	M <sub>m</sub>	kg	15	21	26	32
<b>Max. axial load</b>	F <sub>a</sub>	N	8000	8000	8000	8000
<b>Max. radial load</b>	F <sub>r</sub>	N	6500	6500	6500	6500
<b>Max. speed</b>	n	rpm	700	700	700	700
<b>Accuracy*</b>		Arc sec	50	50	50	50
<b>Repeatability</b>		Arc sec	5	5	5	5
<b>Wobble</b>		µm	4	4	4	4
<b>Height</b>	H	mm	130	150	190	230

\* with incremental encoder feedback

All specifications are  $\pm 10\%$

## 5.2.2 TMS7 Rotary Tables

### Dimensions of TMS7 rotary tables

(Values see Table 5.2.2)

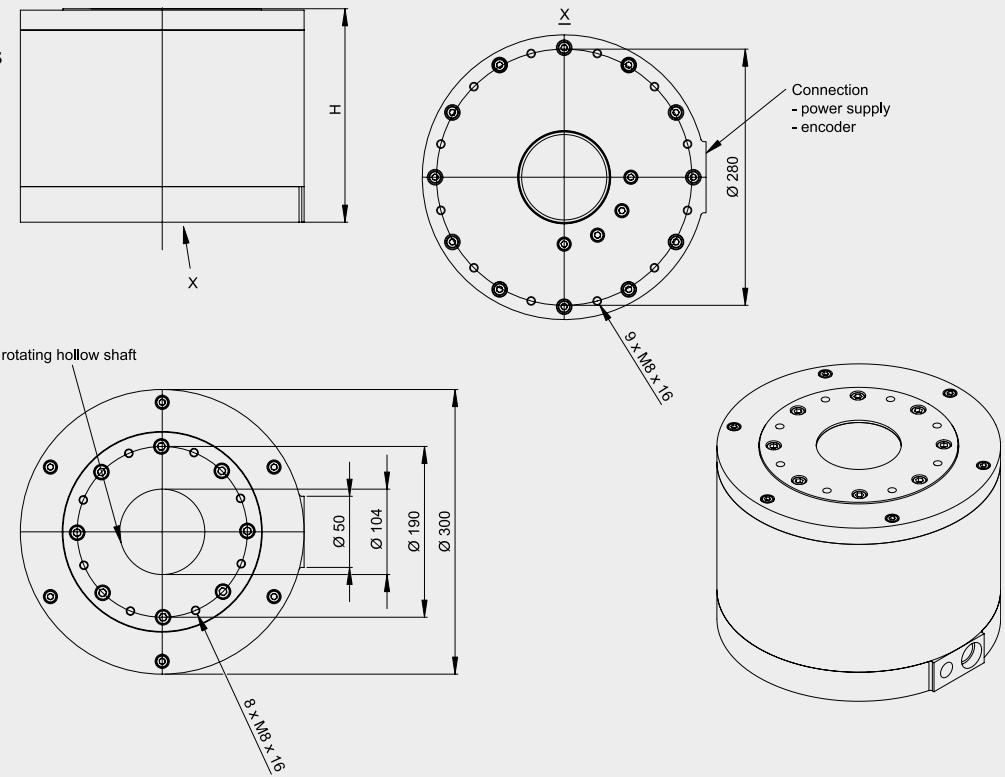


Table 5.2.2 Specifications for TMS7 rotary tables

	Symbol	Unit	TMS74	TMS76	TMS7C
<b>Continuous torque (80 °C)</b>	$T_c$	Nm	50	75	150
<b>Continuous current (80 °C)</b>	$I_c$	A(rms)	3.0	3.0	3.0
<b>Peak torque for 1sec</b>	$T_p$	Nm	130	190	380
<b>Peak current for 1sec</b>	$I_p$	A(rms)	8.0	8.0	8.0
<b>Torque constant</b>	$K_t$	Nm/A(rms)	16.9	25.3	50.1
<b>Electrical time constant</b>	$T_e$	ms	4.0	4.0	4.0
<b>Resistance (line to line, 25 °C)</b>	$R_{25}$	Ω	16	20.8	40.4
<b>Resistance (line to line, 100 °C)</b>	$R_{100}$	Ω	19	24.8	50
<b>Inductance (line to line)</b>	$L$	mH	64	84	168
<b>Number of poles</b>	2p	-	44	44	44
<b>Back EMF constant (line to line)</b>	$K_v$	Vrms/(rad/s)	7.2	10.8	21.6
<b>Motor constant (25 °C)</b>	$K_m$	Nm/√W	3.4	4.5	8.5
<b>Thermal resistance</b>	$R_{th}$	°C/W	0.31	0.25	0.18
<b>Inertia of rotating parts</b>	$J$	kg m <sup>2</sup>	0.152	0.174	0.241
<b>Mass of motor</b>	$M_m$	kg	39	44.5	61.5
<b>Max. axial load</b>	$F_a$	N	8000	8000	8000
<b>Max. radial load</b>	$F_r$	N	6500	6500	6500
<b>Max. speed</b>	$n$	rpm	500	500	400
<b>Accuracy*</b>		Arc sec	60	60	60
<b>Repeatability</b>		Arc sec	15	15	15
<b>Wobble</b>		µm	5	5	5
<b>Height</b>	$H$	mm	160	180	240

\* with incremental encoder feedback

All specifications are  $\pm 10\%$



## 6 Control and Drivers

### 6.1 Control Card PCI4P



Page 60

### 6.2 Drivers

- 6.2.1 Drivers for Linear Motor Stages
- 6.2.2 Drivers for Torque Motor Stages
- 6.2.3 Drivers Accessories



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# Positioning Systems

## Control and Drivers

### 6.1 Control Card PCI4P

The HIWIN control card PCI4P controls a driver with up to four axes. It can be used for stepping motors and for pulse-controlled

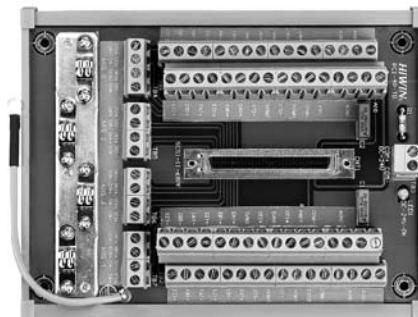
servo motors.

- 32 bit PCI card, Plug-and-Play
- Pulse train generation for 4 axes
- 13 digital inputs, 5 digital outputs
- Supports STEP/DIR, CW/CCW and A/B phase pulse format
- Differential pulse output reduces noise interference
- Linear interpolation for three axes
- Circular interpolation for two axes
- Supports speed profile T and S
- 4 x 32 bit counter for digital incremental encoder  
(Max. 1.76MHz after 4x evaluation)
- Encoder latch function
- DLL driver library for Windows, MCCL Motion Library for VC++/  
VB programming under Windows XP with 98 functions
- Referencing, limit switch, jog function
- Supports stepping motors, AC servo motors and linear motors
- MotionMaker™ user interface for convenient operation
- Power supply slot  
+5 V DC +/- 5 %, max. 900 mA via PCI-Bus in PC
- External power supply (input)  
+24 V DC +/- 5 %, max. 500 mA, prepared by user

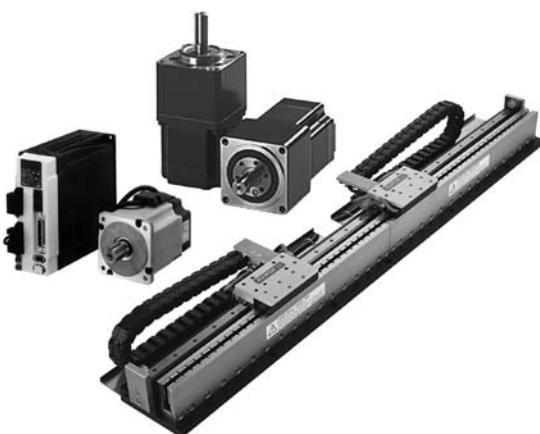


#### 6.1.1 Terminal Block PCI4P-TB

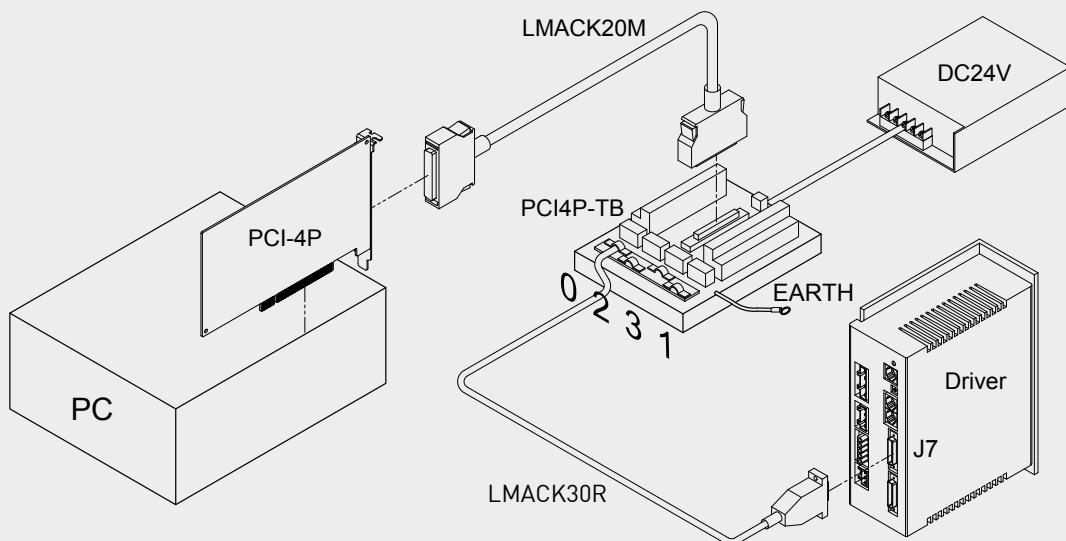
The terminal block PCI4P-TB provides clear connection options for pulse generators and all inputs and outputs of the control card.



Applicable for stepping motor,  
AC servo motors and linear servo motors etc.

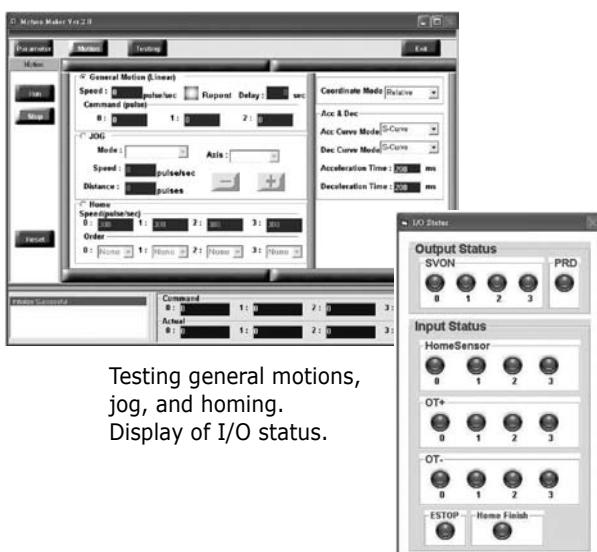


### Connection example

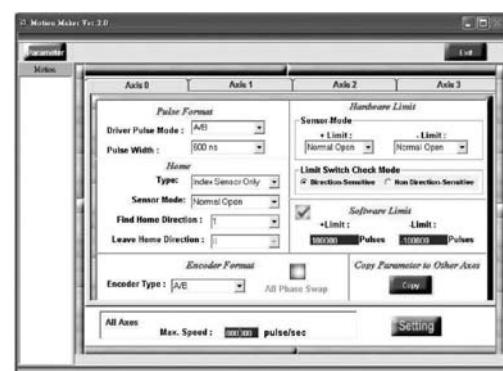


### Hiwin Motion Maker

Hiwin Motion Maker tool software is easy to use for the first step of building a motion system with PCI-4P. With its help, a user can check if the wiring and logic of switches are satisfactory and make test runs.



Testing general motions,  
jog, and homing.  
Display of I/O status.



Pulse formats, Homing,  
Hardware and software limits.

# Positioning Systems

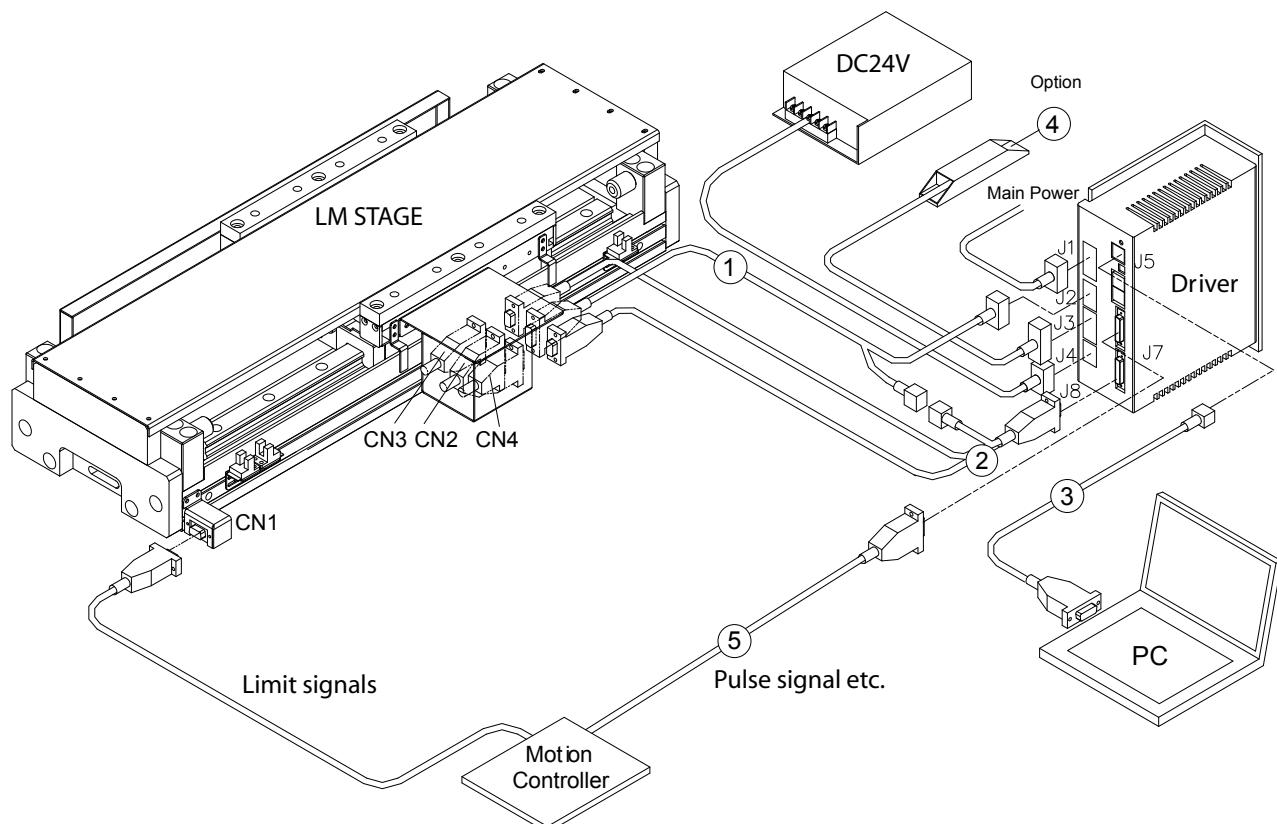
## Control and Drivers

### 6.2 Drivers

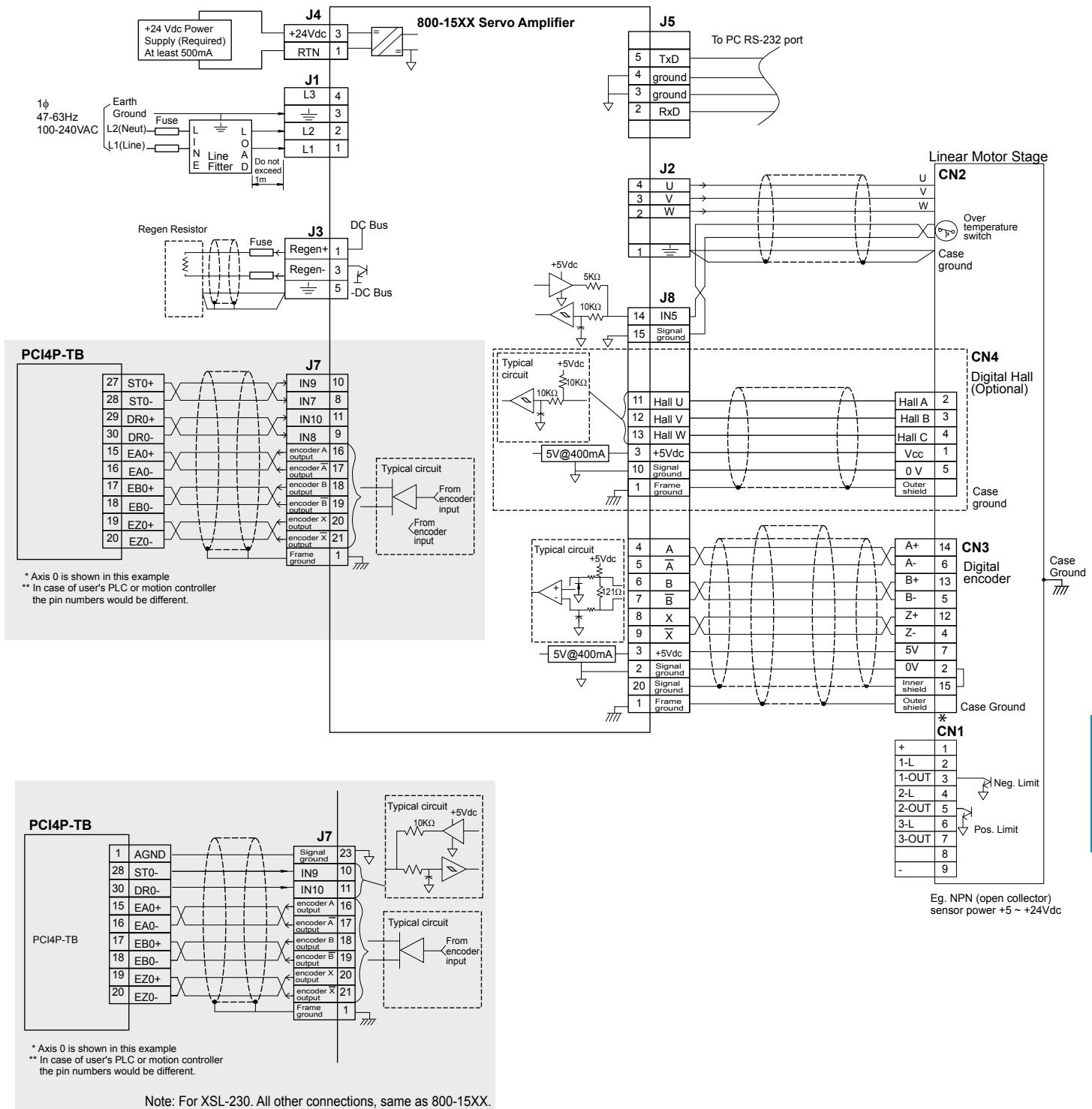
#### 6.2.1 Drivers for Linear Motor Stages

##### 800-15XX Servo Driver

- Digital amplifier
- Field oriented control
- Intuitive CME2 interface
- 100-240VAC input power
- CANopen
- Step/Direction
- Indexer
- Support analog and digital encoder



## Wiring examples



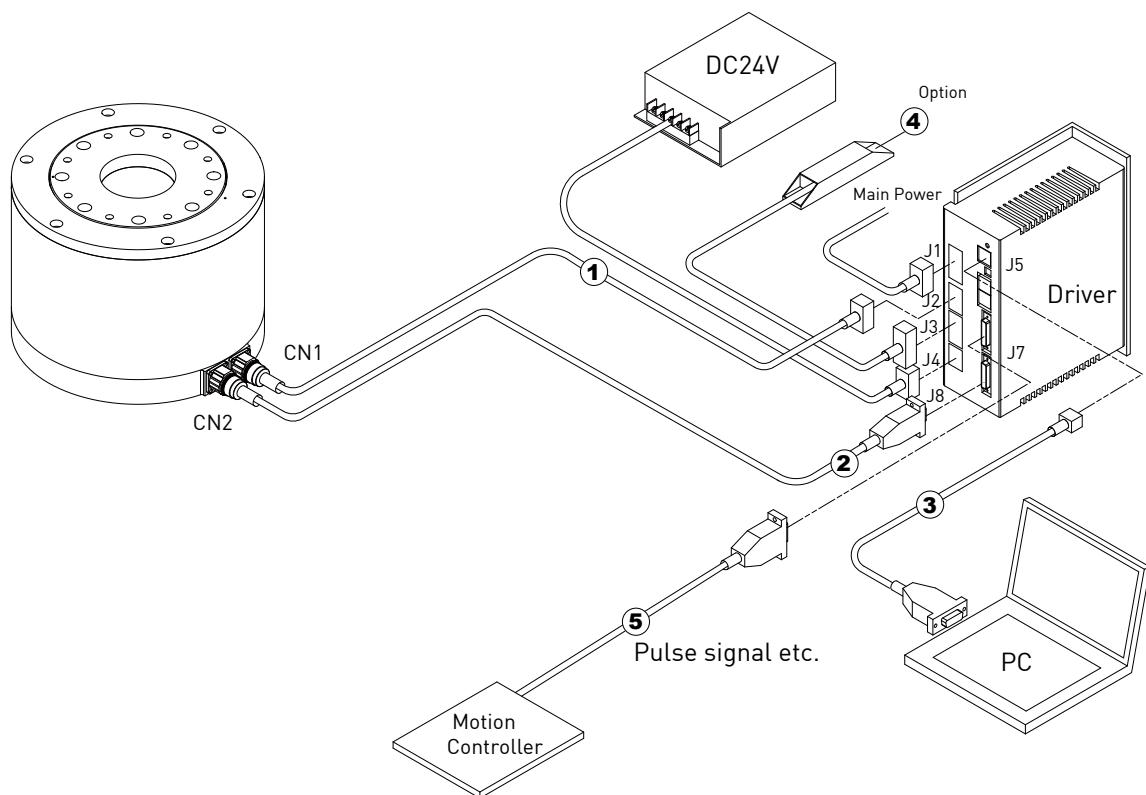
# Positioning Systems

## Control and Drivers

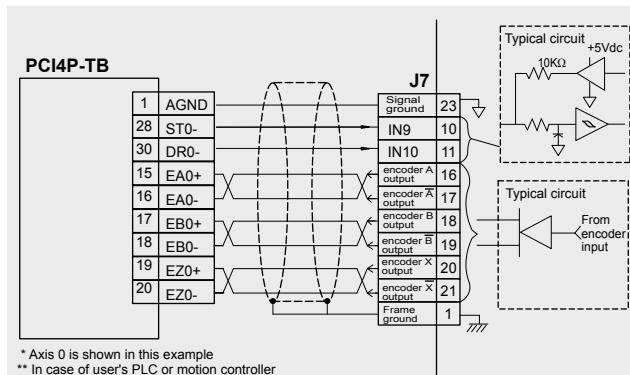
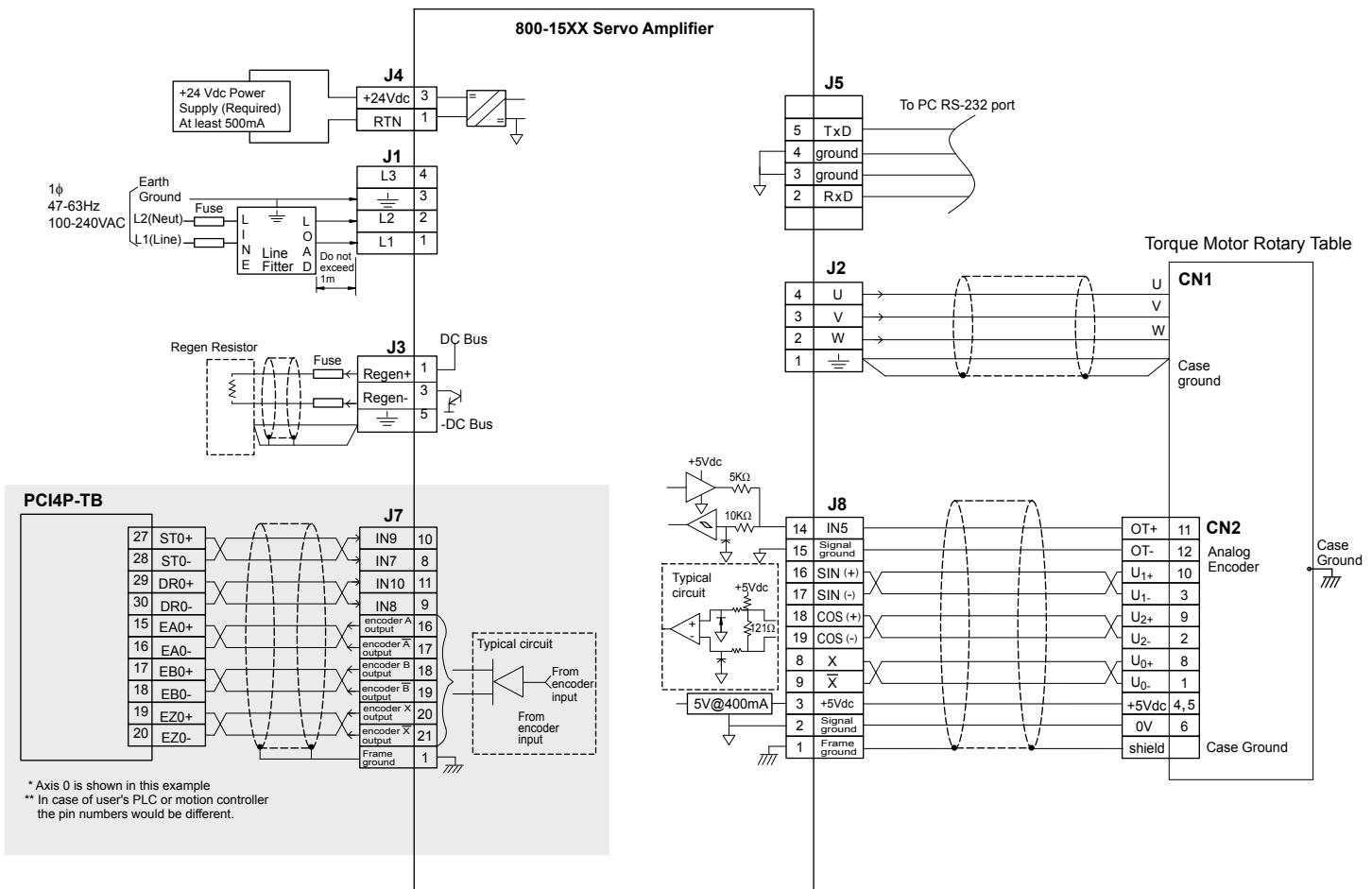
### 6.2.2 Drivers for Torque Motor Stages

#### 800-15XX Servo Driver

- Digital amplifier
- Field oriented control
- Intuitive CME2 interface
- 100-240VAC input power
- CANopen
- Step/Direction
- Indexer
- Support analog and digital encoder



## Wiring examples



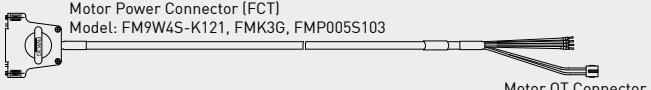
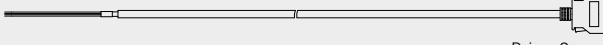
- \* Axis 0 is shown in this example
- \*\* In case of user's PLC or motion controller the pin numbers would be different.

Note: For XSL-230. All other connections, same as 800-15XX.

# Positioning Systems

## Control and Drivers

### 6.2.3 Driver Accessories

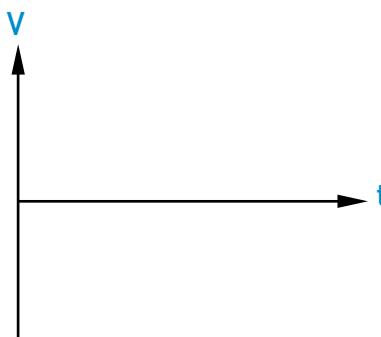
Part name	Model	Connector	Description
① Motor Power Cable UVW and Over Temp. Signal Cable	LMACS00D	J2, J8	<p><b>For LMS</b></p> 
	LMACS00E		<b>For LMC</b>
	LMACS00F		<b>For TMS</b>
② Encoder Cable	LMACE00D	J8	<p><b>For Renishaw Digital Encoder, motor OT</b></p> <p>Encoder Connector D-SUB 15 female</p>  <p>Motor OT Connector</p>
	LMACE00E		<p><b>For Renishaw Digital Encoder, motor OT, and digital hall sensors</b></p> <p>Encoder Connector D-SUB 15 female</p>  <p>Motor OT Connector</p> <p>Digital Hall Connector D-SUB 9 female</p> <p>Driver Connector (3M) Model: 10120-3000VE</p>
	LMACE00F		<p><b>For Renishaw Analog Encoder, motor OT</b></p> <p>Encoder Connector D-SUB 15 female</p>  <p>Motor OT Connector</p>
③ RS-232 cable	LMACR21D	J5	<p><b>To PC (about 2m long)</b></p> <p>D-SUB 15 female</p>  <p>Driver RS-232 RJ-11</p>
④ Regen resistor	050100700001	J3	
⑤ Controller Pulse cable	LMACK30R	J7	<p><b>To motion controller (about 3m long)</b></p>  <p>Driver Connector (3M) Model: 10120-3000VE</p>
Connectors kit	XSL-CK	J1-J8	
EMC accessory	S6EMC		Line Filter (AC 1 phase), Ferrite cores for power cable, motor cable and encoder cable
Heat sink	XSL-HL		Low profile
	XSL-HS		Standard
Digital Hall Sensor	LMAHS		For LMS and LMT
	LMAHC		For LMCA, LMCB and LMCC series
	LMAHC2		For LMCD and LMCE series

	Cable length (m)		Cable length (m)
03	3	07	7
04	4	08	8
05	5	09	9
06	6	10	10

Note: User must prepare one 24Vdc power supply for each driver.

# Linear Motor Inquiry Form

**Date:**

<b>Company name:</b> <b>Email:</b> <b>Tel:</b> <b>Fax:</b>		<b>Contact person:</b> <b>Title:</b>	
Load(kg)/Moment of inertia(kg-m <sup>2</sup> ) Acceleration (m/s <sup>2</sup> )/(rad/s <sup>2</sup> ) Max. speed (mm/s) (rad/s) Stroke (mm) Accuracy (mm)/(deg) Repeatability (mm)/(deg) Timing chart (bottom, right corner)		<b>Notes:</b> 	
<input type="checkbox"/> Yes <input type="checkbox"/> No			
Vertical movement			<input type="checkbox"/> Yes <input type="checkbox"/> No
Multiple forcer			<input type="checkbox"/> Yes <input type="checkbox"/> No Number : _____
Driver voltage			
Pulse format			<input type="checkbox"/> CW/CCW <input type="checkbox"/> STEP/DIR
Voltage command			<input type="checkbox"/> Yes <input type="checkbox"/> No
Need PC-based motion controller			<input type="checkbox"/> Yes <input type="checkbox"/> No
Application			<input type="checkbox"/> Point to point <input type="checkbox"/> Scan
Operational Environment			
Special measurement requirement			
Budget			
Quantity			
The information below is to be filled out by our authorized agents. <b>Recommended specification:</b>			
<b>Manager:</b> <b>Engineer:</b>			<b>Salesperson:</b>



# HIWIN®

Linear Motion Products & Technology



**HIWIN MIKROSYSTEM CORP.**  
No. 1, 6th Road  
Taichung Industrial Park  
Taichung 40755, TAIWAN  
Tel: +886-4-23550110  
Fax: +886-4-23550123  
[www.hiwinmikro.com.tw](http://www.hiwinmikro.com.tw)  
[business@mail.hiwinmikro.com.tw](mailto:business@mail.hiwinmikro.com.tw)

**HIWIN USA**  
•CHICAGO  
1400 Madeline Lane  
Elgin, IL, 60124, USA  
Tel: +1-847-8272270  
Fax: +1-847-8272291  
[www.hiwin.com](http://www.hiwin.com)  
[info@hiwin.com](mailto:info@hiwin.com)  
•SILICON VALLEY  
Tel: +1-510-4380871  
Fax: +1-510-4380873

**HIWIN GmbH**  
Brücklesbünd 2, D-77654  
Offenburg, GERMANY  
Tel: +49-781-93278-0  
Fax: +49-781-93278-90  
[www.hiwin.de](http://www.hiwin.de)  
[www.hiwin.eu](http://www.hiwin.eu)  
[info@hiwin.de](mailto:info@hiwin.de)

**HIWIN JAPAN**  
•KOBE  
3F. Sannomiya-Chuo Bldg.  
4-2-20 Goko-Dori, Chuo-Ku  
KOBE 651-0087, JAPAN  
Tel: +81-78-2625413  
Fax: +81-78-2625686  
[www.hiwin.co.jp](http://www.hiwin.co.jp)  
[info@hiwin.co.jp](mailto:info@hiwin.co.jp)

**HIWIN SCHWEIZ**  
Einsiedlerstrasse 535  
8810 Horgen, SWITZERLAND  
Tel: +41-44-7187000  
Fax: +41-44-7187007  
[www.hiwin.ch](http://www.hiwin.ch)  
[info@hiwin.ch](mailto:info@hiwin.ch)

**HIWIN CZECH**  
Kastanova 34  
CZ 62000 Brno,  
CZECH REPUBLIC  
Tel: +420-548-528238  
Fax: +420-548-220233  
[www.hiwin.cz](http://www.hiwin.cz)  
[info@hiwin.cz](mailto:info@hiwin.cz)