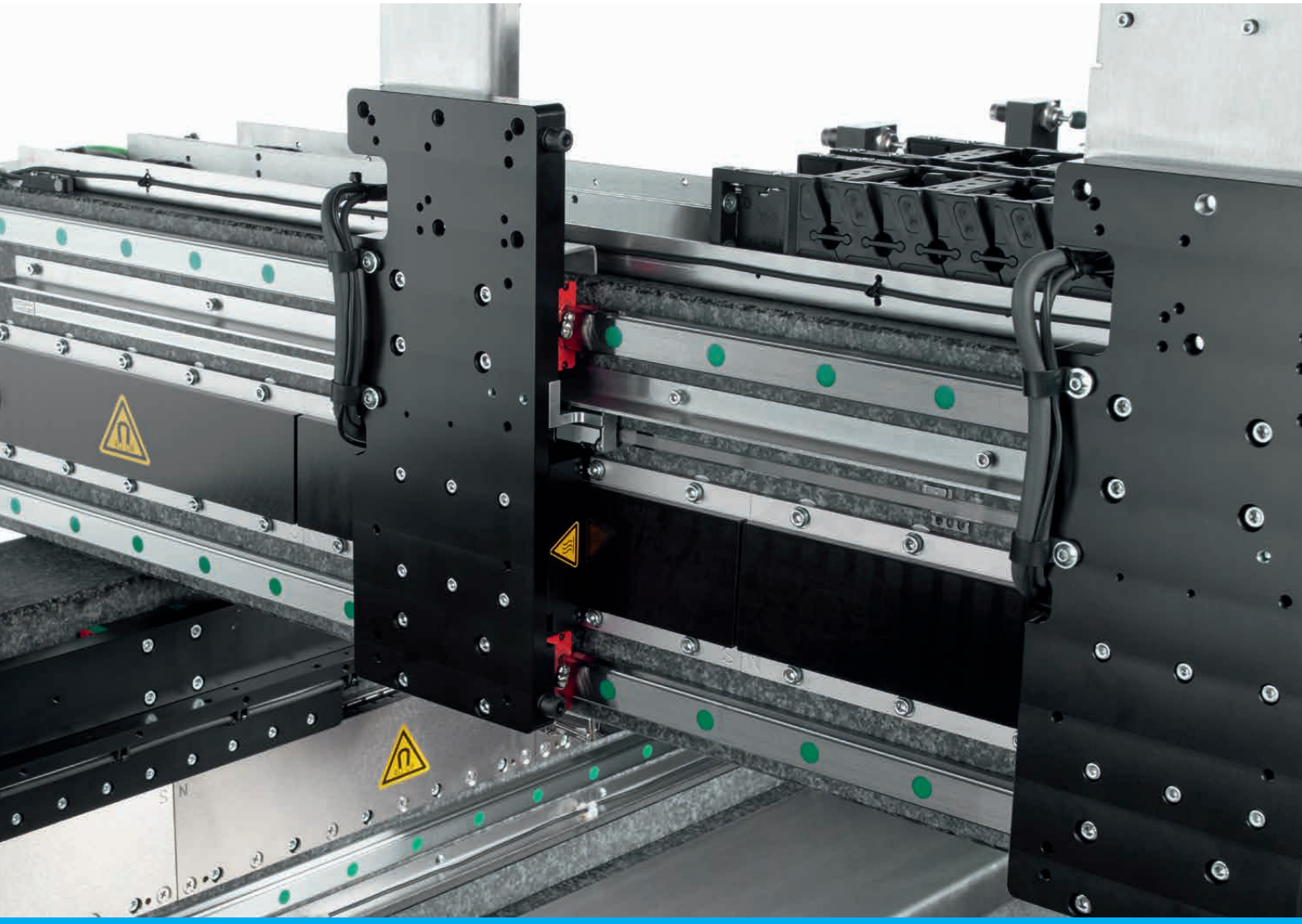
HIWIN®

Motion Control & Systems



Positioning Systems

Linear Motor Systems

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

Positioning Systems

Linear Motor Systems

HIWIN positioning systems facilitate positioning that is accurate in terms of time and location. These positioning systems 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.

Contents

1. Product overview

LMX1A

Page 12

- Complete axis with iron-core motor, type LMSA
- Ideal for applications with high continuous power requirements
- Optional enclosure by metal cover or bellow cover
- Stroke is measured via optical or magnetic distance measuring system incrementally or absolutely depending on requirements

LMSSA

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- Cost-optimised linear motor axis, based on standardised modular system with reduced number of variants
- With iron-core LMSA motors
- Stroke is measured depending on requirements via optical or magnetic incremental distance measuring systems

LMX1E

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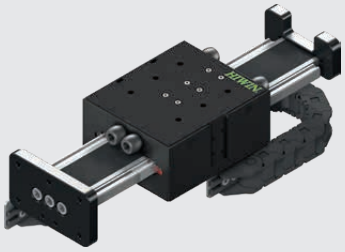
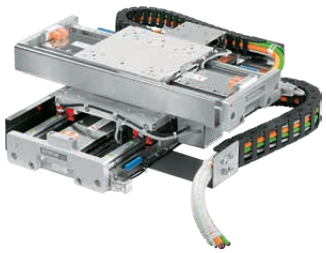
- Complete axis with coreless motor, type LMC
- Ideal for applications with a high degree of synchronization requirements
- Optional enclosure by metal cover or bellow cover
- Stroke is measured via optical distance measuring system incrementally or absolutely



LMV

Page 45

- Highly dynamic positioning axis, for vertical and horizontal applications
- Compact, zero-play setup
- Maximised mechanical rigidity
- Protected against dust



Cross tables

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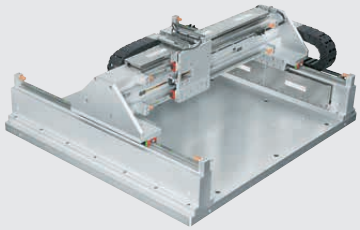
- Combination of axes from the LMX series
- With coreless or iron-core motors



Gantry systems

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

2. General information

2.1 Glossary

Acceleration
This is the speed change per time unit, that is
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.

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 lead errors, thermal expansion etc. Accuracy is calculated for all relevant target positions of an application using to the following formula:
Maximum of all sums of systematic target-actual deviations + 2 sigma (standard deviation). Accuracy must not be confused with **>** repeatability.

Back EMF constant 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.

Continuous torque, continuous force 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
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 results in motor warming of T_{max}.

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.

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.

Force, torque
Force (in linear movements) or torque (in rotational movements) is given for defined conditions, e.g. as continuous force or continuous torque at:
- 25 °C ambient temperature
- T_{max} 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
This is the winding-specific parameter used to calculate the resultant force as $F = I \times K_f$ by multiplication with the input current.

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 flatness (the accuracy external to the level of the table).

Increment
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.).

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

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.

Peak current I_p
It is used for short-term generation of peak power. HIWIN defines peak current as follows: Iron-core motors have three times the permitted continuous current of the LMS series as I_p, 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.

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.

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 work.

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.

Rigidity
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 rigidity) or the elastic deformation resistance that a component or assembly has against a dynamic force working from the outside (dynamic rigidity).

Single-Index
The magnetic scale is split in two tracks, incremental track and index track. Depending on the specification one or several reference marks are located on the index track over the entire travel distance. There are two sensors integrated in the encoder: A sensor for the incremental tracks A and B and a sensor for the Z track that outputs a reference signal when passing over one of the reference marks (single index). Single-index-scales are always custom-made

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.

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.

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 × R_{25}.

Winding temperature T_{max}
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.

2.2 Typical parameters

2.2.1 Winding-independent parameters

F_a Relatively 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 T_{max}.

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). 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: $P_v = F/K_m$.

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

and can only be determined if these variables are known.

2.2.2 Winding-independent parameters

I_c For generating the current flowing for continuous force.

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

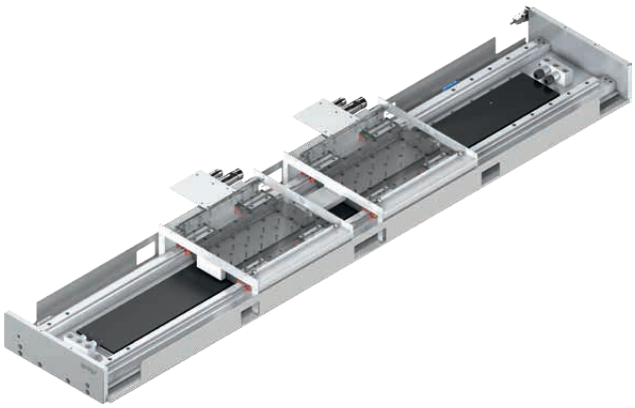
K_f Winding dimension, which produces the created force with the current: $F = I \times K_f$.

K_u Winding characteristic that in generator mode returns the armature back voltage generated at the motor terminals as a function of the speed: $U_g = K_u \times v$.

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

2.3 Typical properties of linear motor axes

HIWIN linear motor axes are directly driven axes 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 axes 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 axes are free from backlash, very dynamic, low maintenance and can also be equipped with several carriages.



- Several carriages per axis
- Can be combined with other axes
- 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

2.4 General layout of the linear motor axes

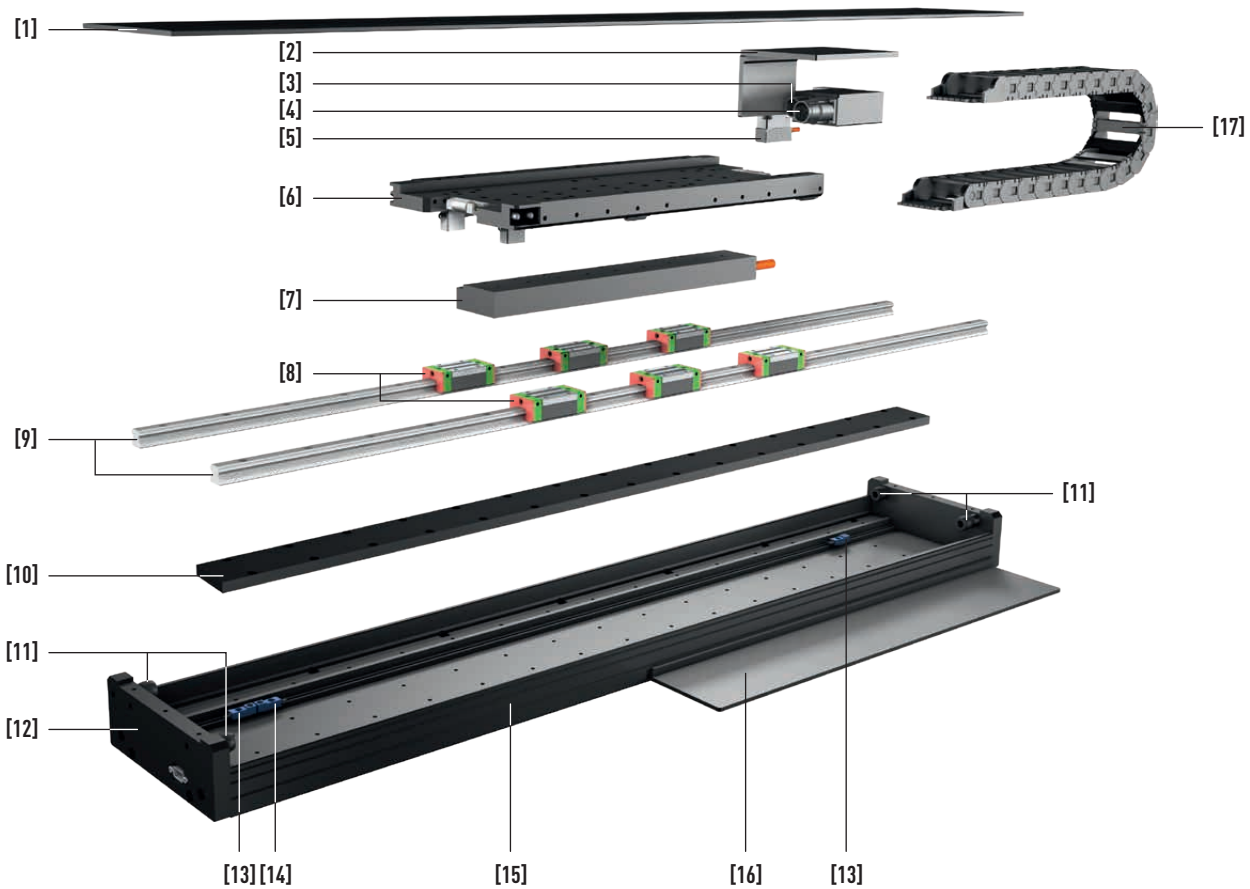


Table 2.1 **Main components of the linear motor axis system**

Pos.	Component	Pos.	Component
1	Sheet metal cover	10	Stator (secondary part of linear motor)
2	Holding plate for energy chain	11	Stopping buffer
3	Motor plug coupling	12	Profile end caps
4	Encoder plug coupling	13	Limit switch
5	Distance measuring system	14	Reference switch
6	Carriage (forcer carrier plate)	15	Basic profile
7	Forcer (primary part of linear motor)	16	Holding plate for energy chain
8	Linear guideway blocks	17	Energy chain
9	Profile rail		

2.5 Drive amplifiers for linear motor axes

The HIWIN linear motor axes can be operated with all conventional linear motor drivers. Some examples of realised projects are listed in the following.

2.6 General specifications for linear motor axes

Table 2.2 **General specifications for linear motor axes**

Name	Motor type	v_{max} [m/s]	a_{max} [m/s²]	Total length L_{max} [mm]	Repeatability [mm]	Accuracy [1] [mm/300 mm]	Straightness [mm]	Flatness [mm]	See
LMX1A-...	LMSA	5.0	50	4,000	±0.001	±0.002	±0.02/500 mm	±0.01/500 mm	Page 12
LMSSA-...	LMSA	5.0	100	3,000	±0.001	±0.002	±0.008/300 mm	±0.008/300 mm	Page 28
LMX1E-...	LMC	5.0	100	4,000	±0.001	±0.002	±0.01/300 mm	±0.01/300 mm	Page 35
LMV	LMSA	2.5	50	600	±0.005	±0.010	±0.01/300 mm	±0.01/300 mm	Page 45

[1] At 20 °C, depending on the particular distance measuring system

The distance measuring system is optical or magnetic, depending on the linear axis type or the customer's requirements. As standard, sin/cos 1 V_{PP} is processed as an output signal; a TTL signal is also possible.
The maximum operating voltage depends on the linear motor type in use. For iron-core motors the maximum permissible operating voltage is 400 VAC. For coreless motors the maximum operating voltage is 230 VAC.

3. Linear motor axis LMX1A

3.1 Properties of the LMX1A linear motor axes

LMX1A 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 LMX1A linear motor axis have a very compact design and are available in overall lengths up to 4,000 mm.

- Max. acceleration 50 m/s²
- Max. speed 5 m/s
- Up to 4,000 mm long

3.2 Order code for LMX1A linear motor axes

LM	X	1	A	SA21	1	0872	A	1	E	0	CL	XXX

Linear motor axis

Axis type:
X: Horizontal axis

Number of axes:
1: Single axis

Axis profile:
A: Iron-core motors (LMSA)

Motor type:
LMSAxx: Motor size

Number of carriages

Stroke length [mm]

Distance measuring system:
A: Optical, period 40 µm, analogous 1 V_{PP} sin/cos
E: Magnetic, digital TTL, resolution 1 µm
G: Optical, digital TTL, resolution 1 µm
K: Optical, digital TTL, resolution 0.1 µm
X: Magnetic, absolute with BiSS C interface
Magnetic, absolute with HIPERFACE interface
Optical, absolute, encapsulated with EnDat interface
Optical, absolute, encapsulated with DRIVE-CLiQ interface
Optical, absolute, encapsulated with FANUC interface

Limit switches:
0: None
1: Inductive, PNP (standard)
2: Inductive, NPN

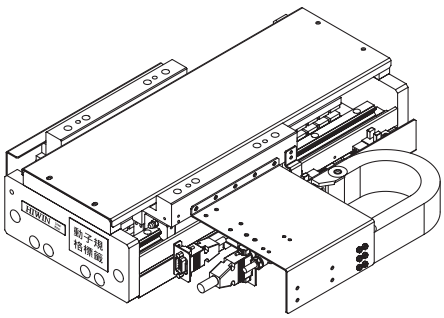
Limit switch connector:
E: Front side Sub-D connector
S: Side outlet, 300 mm Sub-D connector

Energy chain:
0: None
V1: Vertical, inside cross-section: 21 × 25 mm
V2: Vertical, inside cross-section: 21 × 38 mm
V3: Vertical, inside cross-section: 21 × 50 mm
V4: Vertical, inside cross-section: 21 × 68 mm
H1: Horizontal, inside cross-section: 21 × 25 mm
H2: Horizontal, inside cross-section: 21 × 38 mm

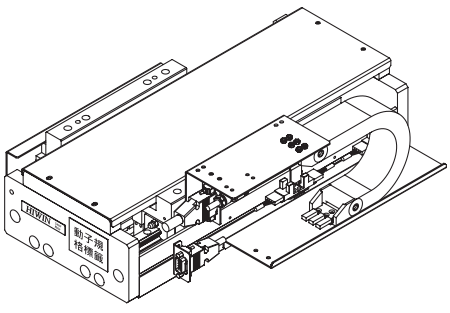
Central lubrication:
0: None
CL: With central lubrication

Job number of drawing, several forcers, hall sensor, weight compensation, brake, special mounting holes

3.3 Energy supply for linear motor axes LMX1A



Energy supply horizontal

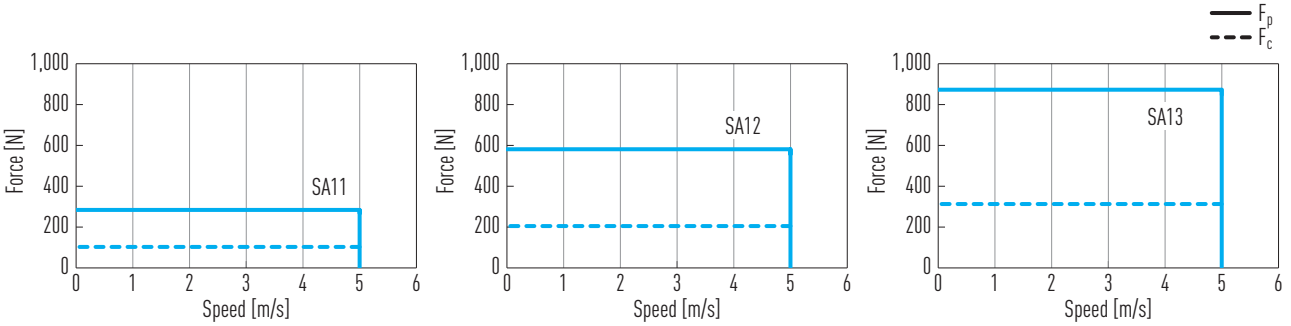


Energy supply vertical

3.4 Linear motor axis LMX1A specifications

3.4.1 Specifications LMX1A-SA11/SA12/SA13

Force as a function speed (DC bus voltage: 600 VDC)



Acceleration as a function of load capacity (DC bus voltage: 600 VDC)

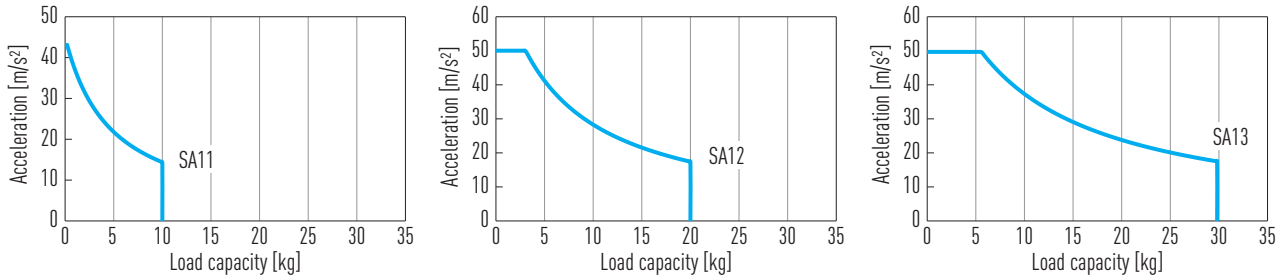


Table 3.1 **Technical data LMX1A-SA11/SA12/SA13**

	Symbol	Unit	LMX1A-SA11	LMX1A-SA12	LMX1A-SA13
Continuous force [1]	F_c	N	103	205	308
Peek force [1]	F_p	N	289	579	868
Stroke length		mm	100 – 4,000		
Resolution distance measuring system			Type E/G: 1 µm; Type K: 0.1 µm; Type A: 1 V_{SS}		
Repeatability		µm	Type E/G: ±1; Type K: ±0.5; Type A: ±1		
Accuracy		µm	Type E/G: ±2; Type K: ±1; Type A: ±2		
Horizontal straightness		µm	10/500 mm		
Vertical straightness		µm	20/500 mm		
Moved mass		kg	5	6	8
Typical load capacity		kg	10	20	30

[1] F_c: 100 % duty cycle, at 120 °C winding temperature; F_p: 1 s
Electrical parameters of linear motors: see catalogue "Linear Motors and Distance Measuring Systems"

3.4.2 LMX1A-SA11/SA12/SA13 dimensions

Table 3.2 **LMX1A-SA11 dimensions (dimensional drawings see Page 15)**

Stroke	100	200	300	400	500	600	700	800	900	1,000
N	4	4	4	5	6	6	7	8	8	9
Total length LT [mm]	400	500	600	700	800	900	1,000	1,100	1,200	1,300
LA [mm]	25	25	65	75	25	75	50	25	75	50
LB [mm]	–	–	–	–	750	750	900	1,050	1,050	1,200
LC [mm]	100	100	100	150	–	–	–	–	–	–
LC with energy chain V1/V2 [mm] [1)]	65									
LC with energy chain V3/V4 [mm] [1)]	95									
LD [mm]	150	250	270	250	–	–	–	–	–	–

[1)] Dimension LC is determined by energy chain inside cross-section (see order code on Page 12)

Table 3.3 **LMX1A-SA12 dimensions (dimensional drawings see Page 16)**

Stroke	100	200	300	400	500	600	700	800	900	1,000
N	4	4	4	6	6	7	8	8	9	10
Total length LT [mm]	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400
LA [mm]	25	65	75	25	75	50	25	75	50	25
LB [mm]	–	–	–	750	750	900	1,050	1,050	1,200	1,350
LC [mm]	100	100	150	–	–	–	–	–	–	–
LC with energy chain V1/V2 [mm] [1)]	65									
LC with energy chain V3/V4 [mm] [1)]	95									
LD [mm]	250	270	250	–	–	–	–	–	–	–

[1)] Dimension LC is determined by energy chain inside cross-section (see order code on Page 12)

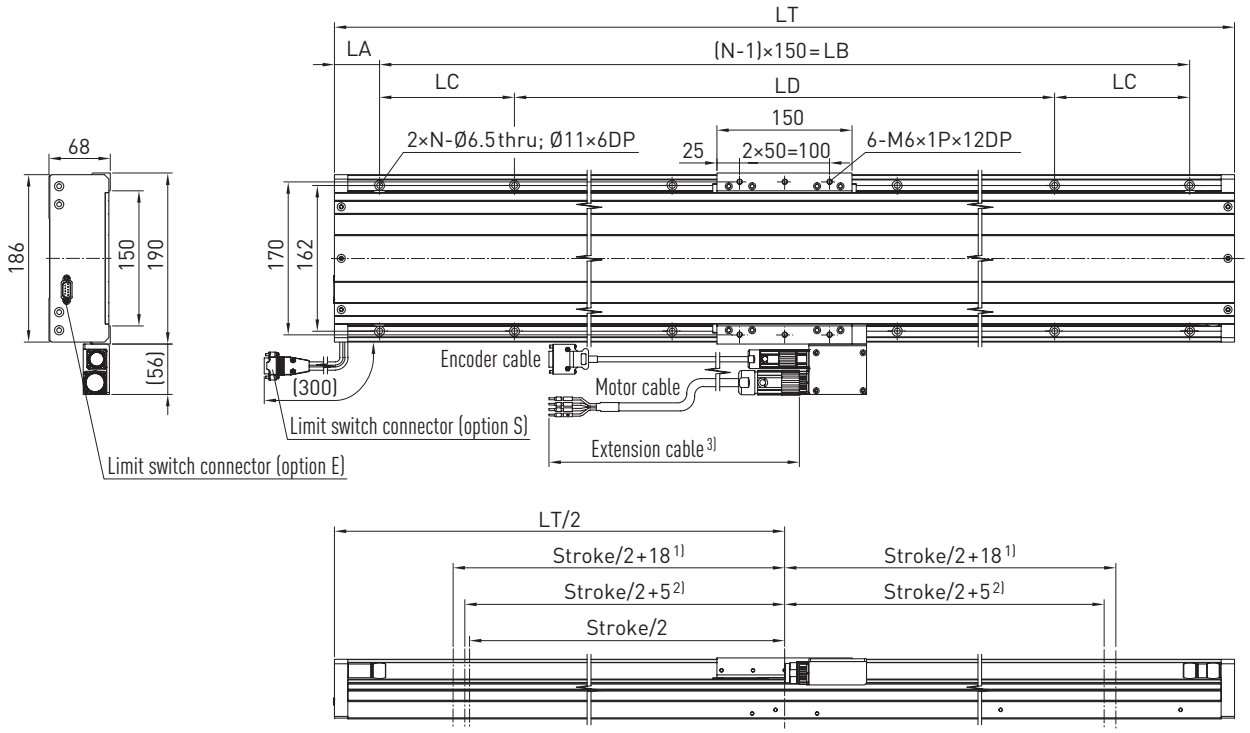
Table 3.4 **LMX1A-SA13 dimensions (dimensional drawings see Page 17)**

Stroke	100	200	300	400	500	600	700	800	900	1,000
N	4	4	6	6	7	8	8	9	10	10
Total length LT [mm]	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
LA [mm]	65	75	25	75	50	25	75	50	25	75
LB [mm]	–	–	750	750	900	1,050	1,050	1,200	1,350	1,350
LC [mm]	100	150	–	–	–	–	–	–	–	–
LC with energy chain V1/V2 [mm] [1)]	65									
LC with energy chain V3/V4 [mm] [1)]	95									
LD [mm]	270	250	–	–	–	–	–	–	–	–

[1)] Dimension LC is determined by energy chain inside cross-section (see order code on Page 12)

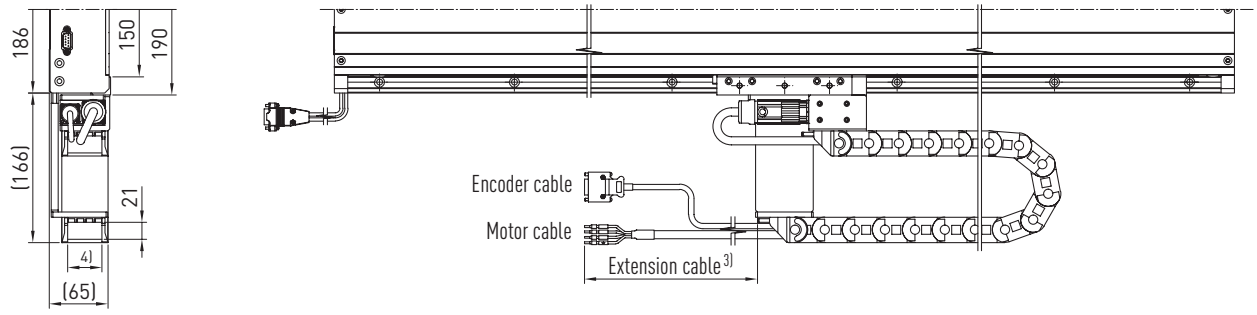
Dimensional drawings LMX1A-SA11

Without energy supply

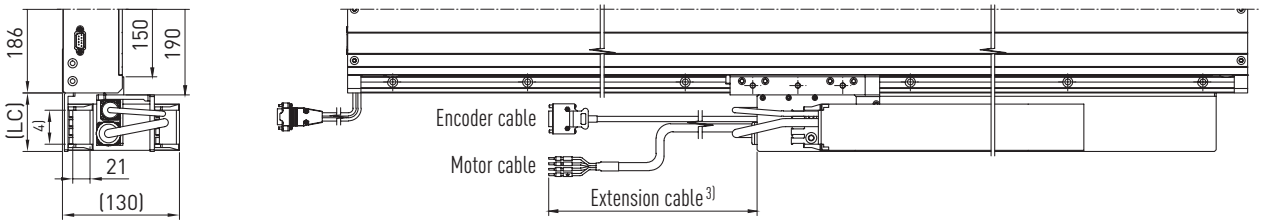


1) Stopping buffer position
2) Limit switch position

Energy supply horizontal



Energy supply vertical

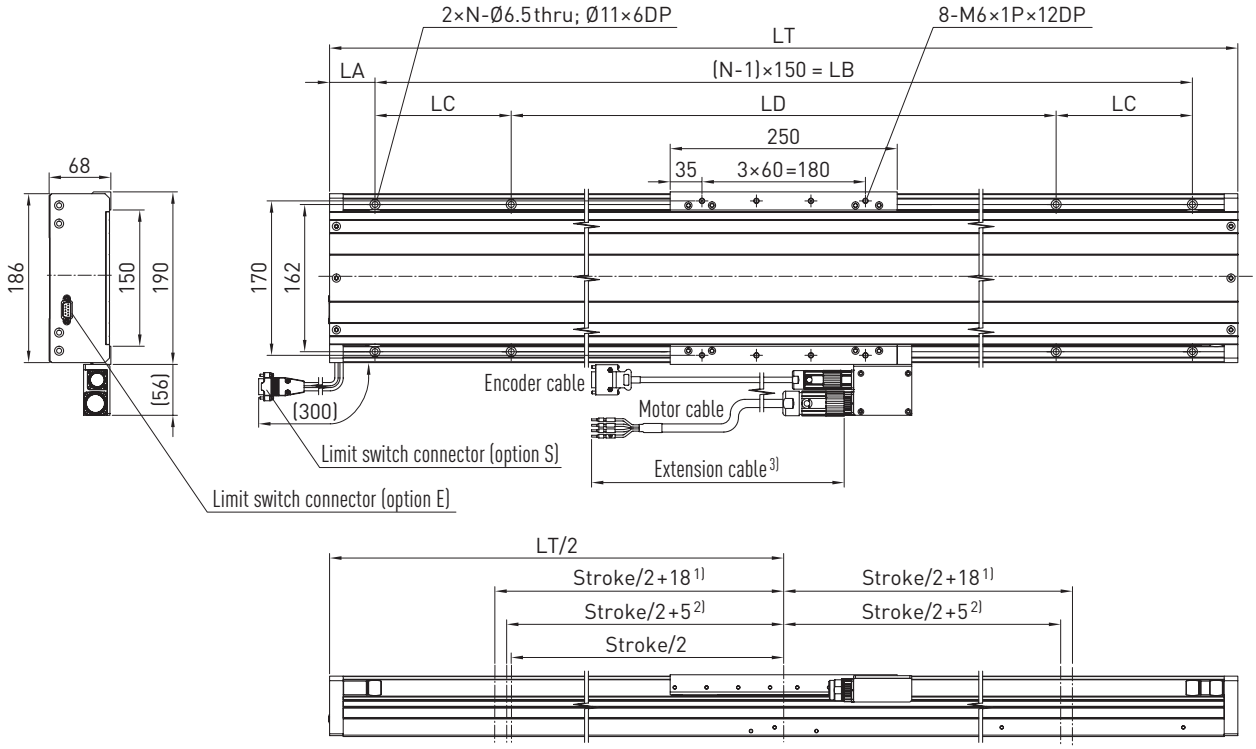


3) Optional
4) Inside width of energy chain: see order code on Page 12

All values in mm

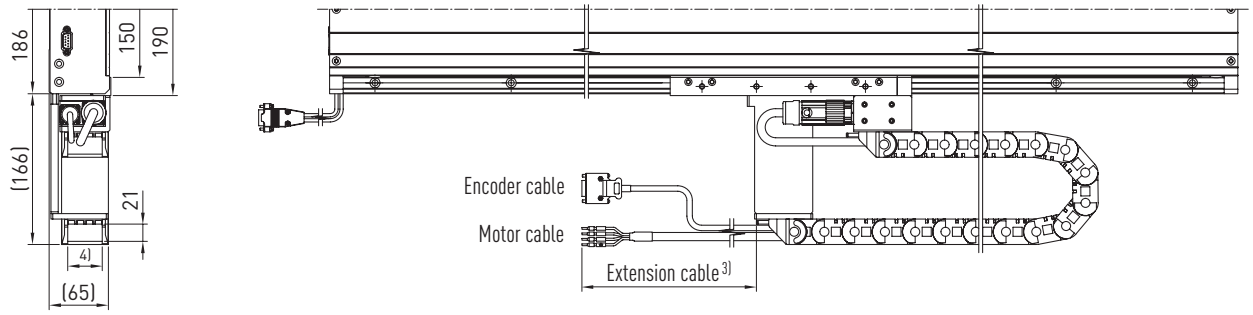
Dimensional drawings LMX1A-SA12

Without energy supply

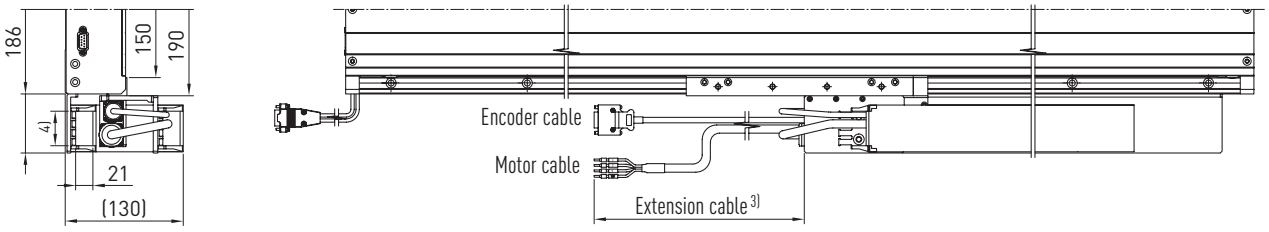


1) Stopping buffer position
2) Limit switch position

Energy supply horizontal



Energy supply vertical

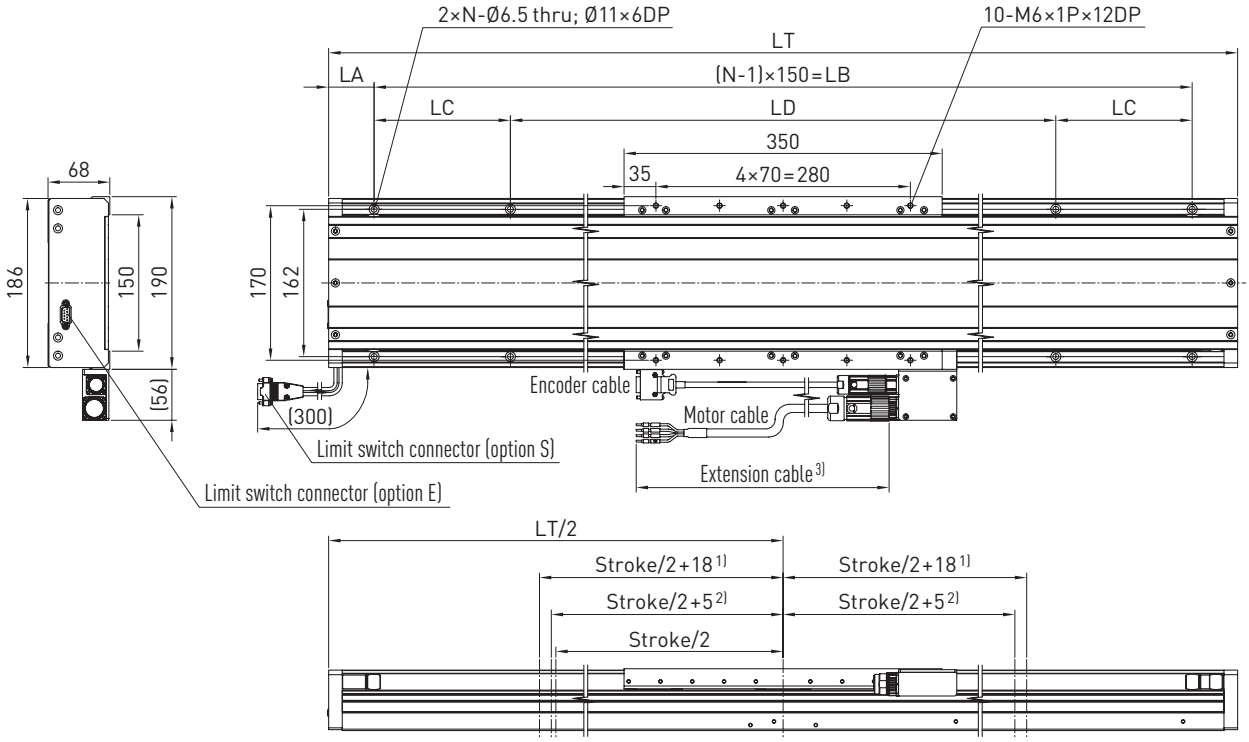


3) Optional
4) Inside width of energy chain: see order code on Page 12

All values in mm

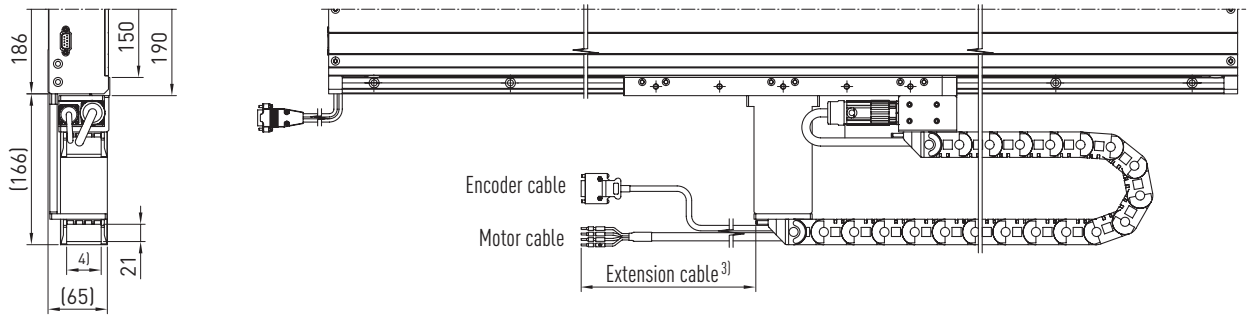
Dimensional drawings LMX1A-SA13

Without energy supply

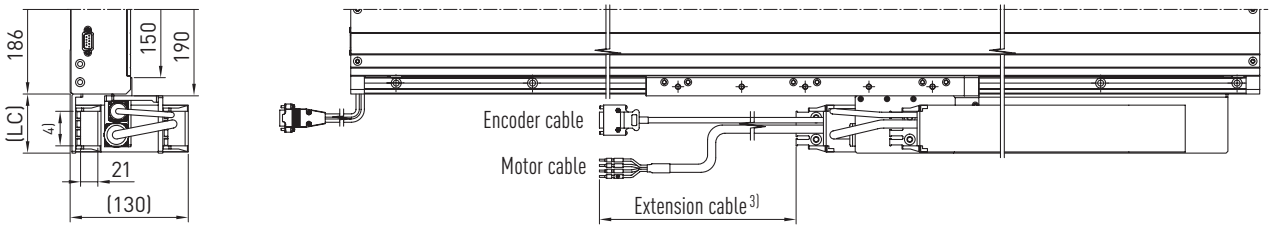


1) Stopping buffer position
2) Limit switch position

Energy supply horizontal



Energy supply vertical

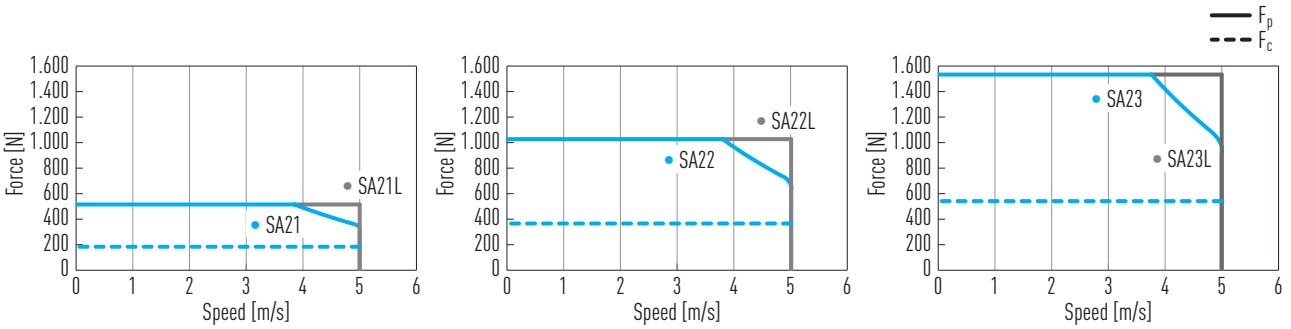


3) Optional
4) Inside width of energy chain: see order code on Page 12

All values in mm

3.4.3 Specifications LMX1A-SA21/SA22/SA23

Force as a function speed (DC bus voltage: 600 VDC)



Acceleration as a function of load capacity (DC bus voltage: 600 VDC)

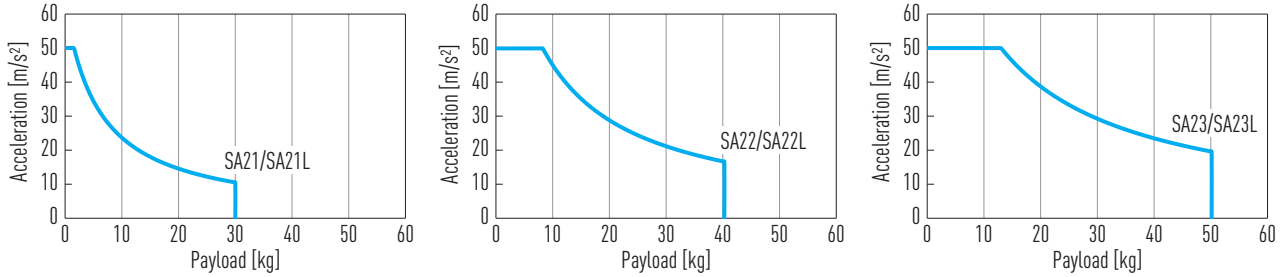


Table 3.5 **Technical data LMX1A-SA21/SA22/SA23**

	Symbol	Unit	LMX1A-SA21(L)	LMX1A-SA22(L)	LMX1A-SA23(L)
Continuous force [1]	F_c	N	181	362	544
Peek force [1]	F_p	N	512	1,023	1,535
Stroke length		mm	100 – 4,000		
Resolution distance measuring system			Type E/G: 1 µm; Type K: 0.1 µm; Type A: 1 V_{SS}		
Repeatability		µm	Type E/G: ±1; Type K: ±0.5; Type A: ±1		
Accuracy		µm	Type E/G: ±2; Type K: ±1; Type A: ±2		
Horizontal straightness		µm	10/500 mm		
Vertical straightness		µm	20/500 mm		
Moved mass		kg	6	8	11
Typical load capacity		kg	30	40	50

[1] F_c: 100 % duty cycle, at 120 °C winding temperature; F_p: 1 s
Electrical parameters of linear motors: see catalogue "Linear Motors and Distance Measuring Systems"

3.4.4 LMX1A-SA21/SA22/SA23 dimensions

Table 3.6 **LMX1A-SA21 dimensions (dimensional drawings see Page 20)**

Stroke	100	200	300	400	500	600	700	800	900	1,000
N	4	4	4	5	6	6	7	8	8	9
Total length LT [mm]	400	500	600	700	800	900	1,000	1,100	1,200	1,300
LA [mm]	25	25	65	75	25	75	50	25	75	50
LB [mm]	–	–	–	–	750	750	900	1,050	1,050	1,200
LC [mm]	100	100	100	150	–	–	–	–	–	–
LC with energy chain V1/V2 [mm] [1)]	65									
LC with energy chain V3/V4 [mm] [1)]	95									
LD [mm]	150	250	270	250	–	–	–	–	–	–

[1)] Dimension LC is determined by energy chain inside cross-section (see order code on Page 12)

Table 3.7 **LMX1A-SA22 dimensions (dimensional drawings see Page 21)**

Stroke	100	200	300	400	500	600	700	800	900	1,000
N	4	4	4	6	6	7	8	8	9	10
Total length LT [mm]	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400
LA [mm]	25	65	75	25	75	50	25	75	50	25
LB [mm]	–	–	–	750	750	900	1,050	1,050	1,200	1,350
LC [mm]	100	100	150	–	–	–	–	–	–	–
LC with energy chain V1/V2 [mm] [1)]	65									
LC with energy chain V3/V4 [mm] [1)]	95									
LD [mm]	250	270	250	–	–	–	–	–	–	–

[1)] Dimension LC is determined by energy chain inside cross-section (see order code on Page 12)

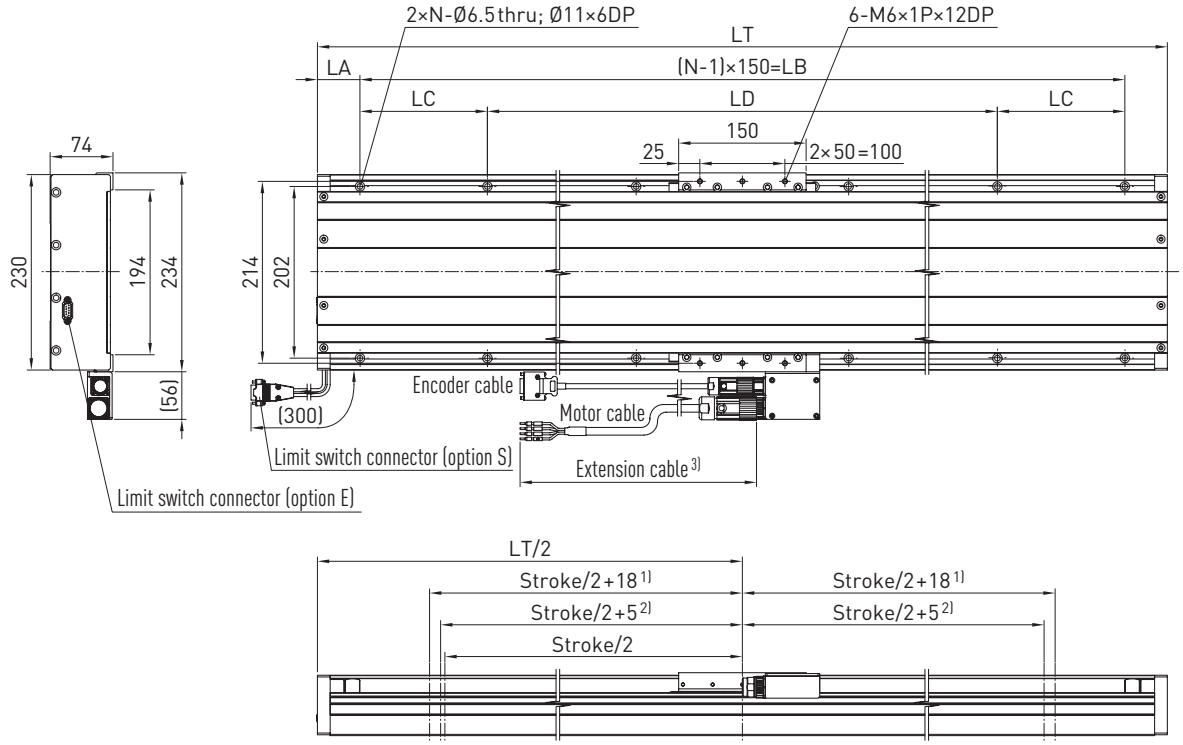
Table 3.8 **LMX1A-SA23 dimensions (dimensional drawings see Page 22)**

Stroke	100	200	300	400	500	600	700	800	900	1,000
N	4	4	6	6	7	8	8	9	10	10
Total length LT [mm]	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
LA [mm]	65	75	25	75	50	25	75	50	25	75
LB [mm]	–	–	750	750	900	1,050	1,050	1,200	1,350	1,350
LC [mm]	100	150	–	–	–	–	–	–	–	–
LC with energy chain V1/V2 [mm] [1)]	65									
LC with energy chain V3/V4 [mm] [1)]	95									
LD [mm]	270	250	–	–	–	–	–	–	–	–

[1)] Dimension LC is determined by energy chain inside cross-section (see order code on Page 12)

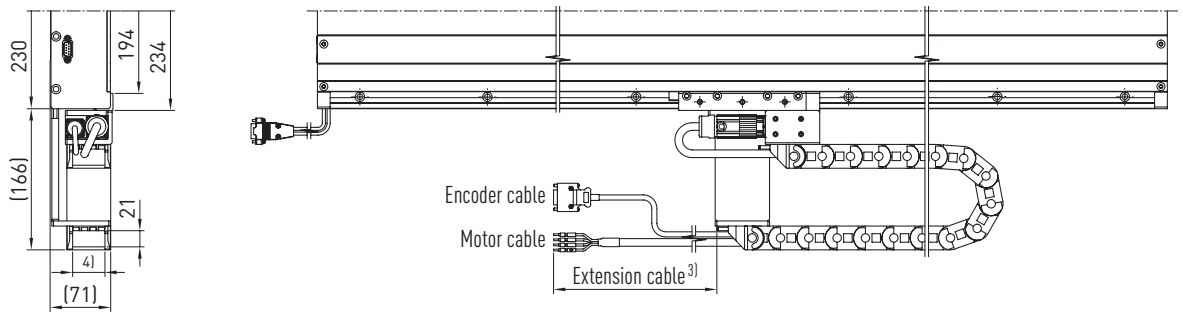
Dimensional drawings LMX1A-SA21

Without energy supply

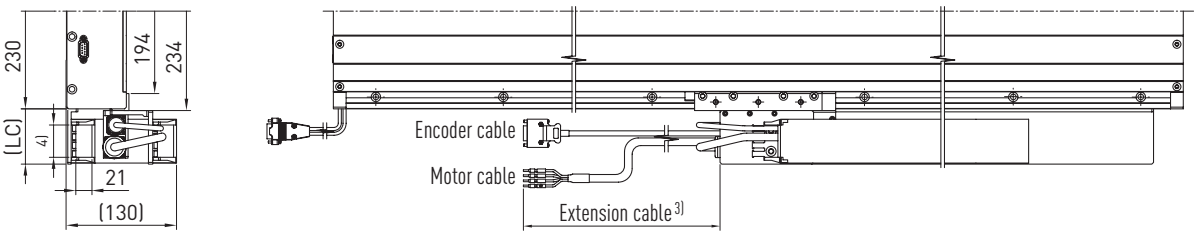


1) Stopping buffer position
2) Limit switch position

Energy supply horizontal



Energy supply vertical

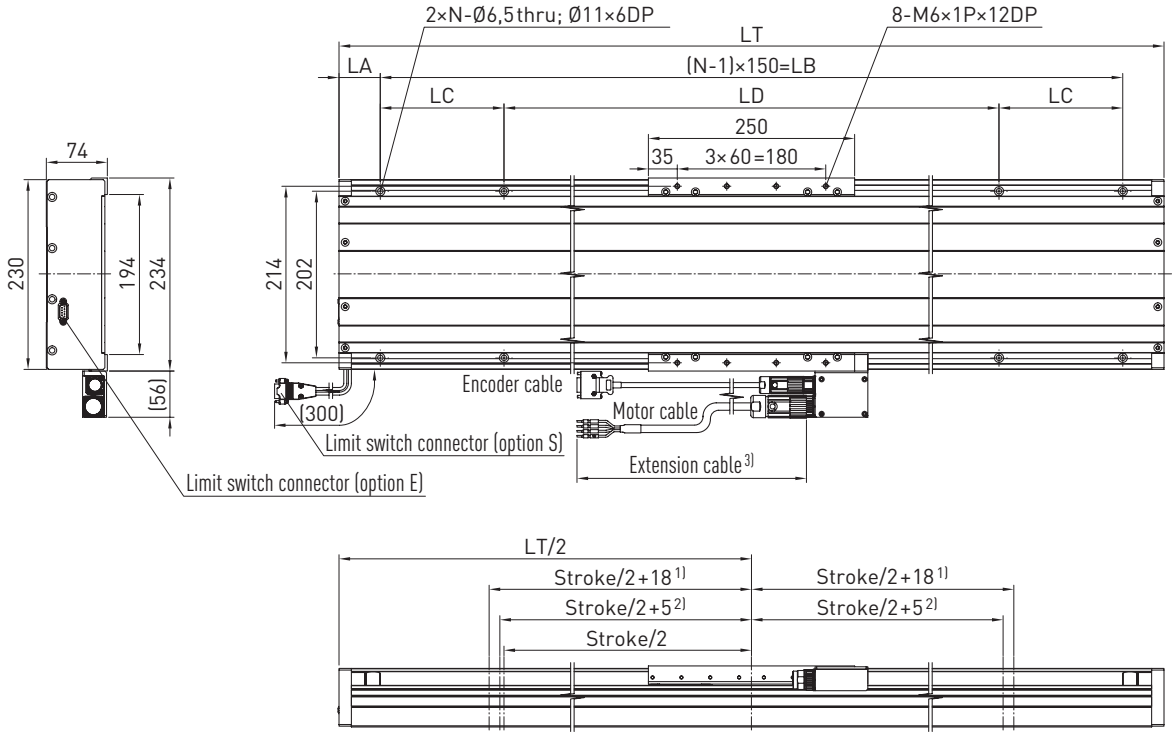


3) Optional
4) Inside width of energy chain: see order code on Page 12

All values in mm

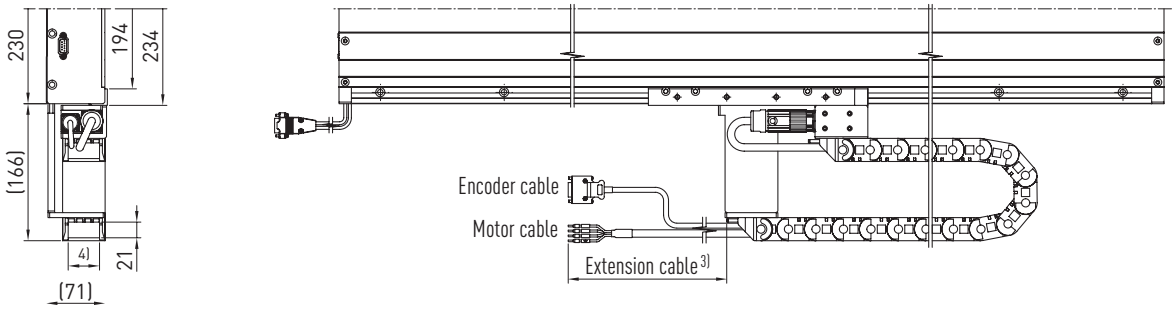
Dimensional drawings LMX1A-SA22

Without energy supply

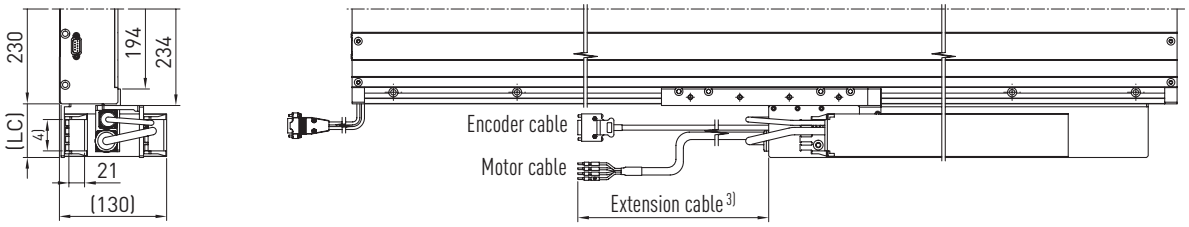


1) Stopping buffer position
2) Limit switch position

Energy supply horizontal



Energy supply vertical

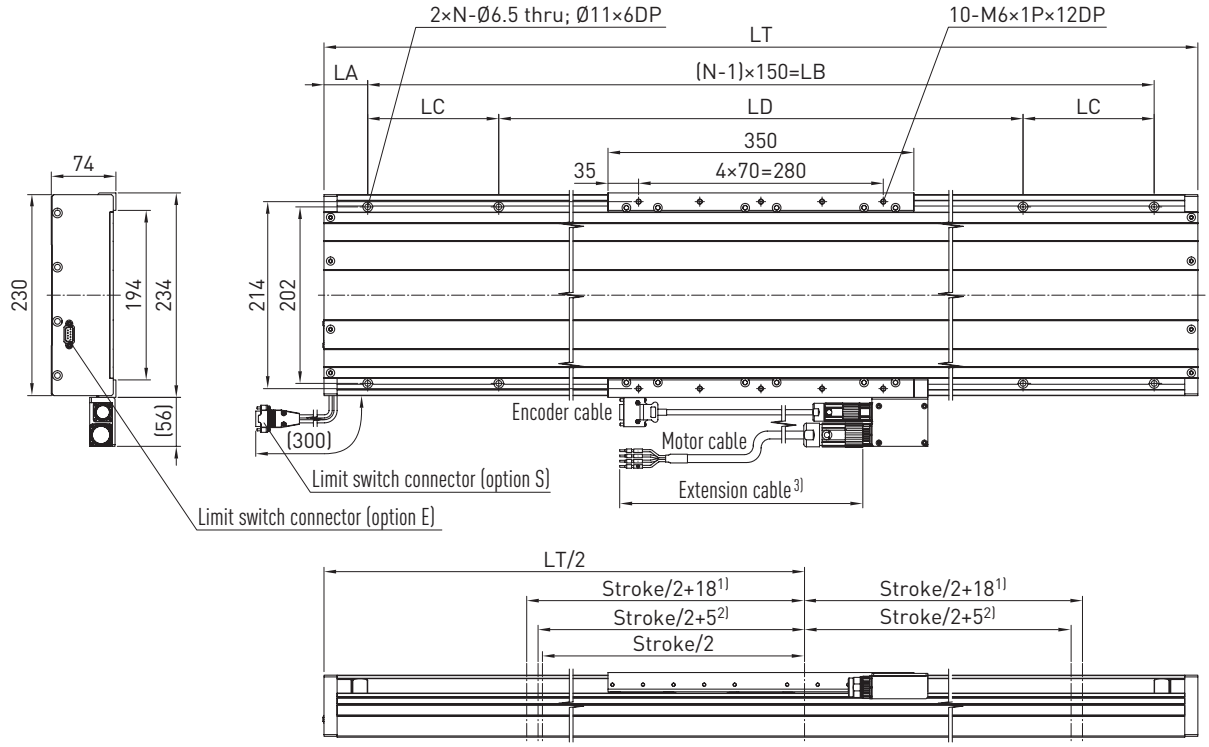


3) Optional
4) Inside width of energy chain: see order code on Page 12

All values in mm

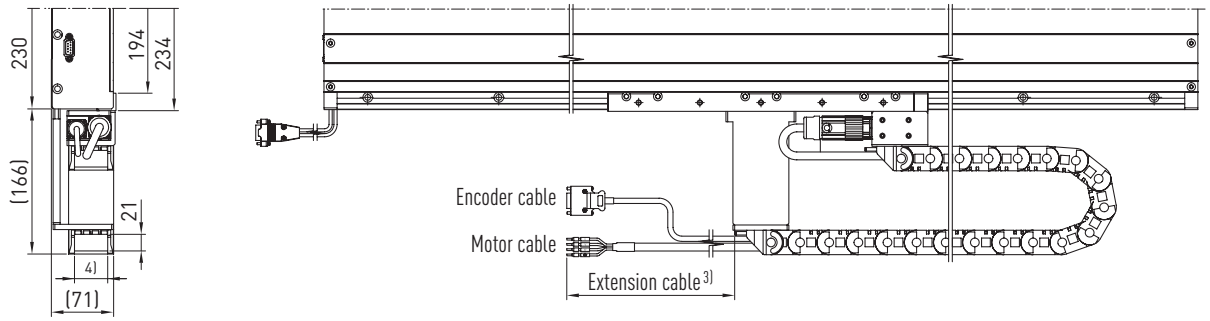
Dimensional drawings LMX1A-SA23

Without energy supply

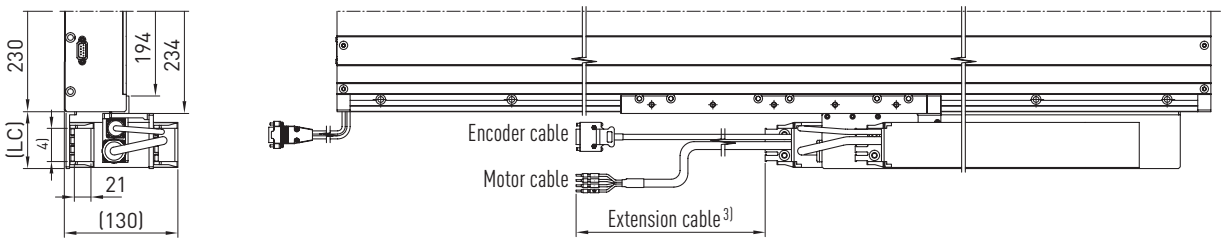


1) Stopping buffer position
2) Limit switch position

Energy supply horizontal



Energy supply vertical

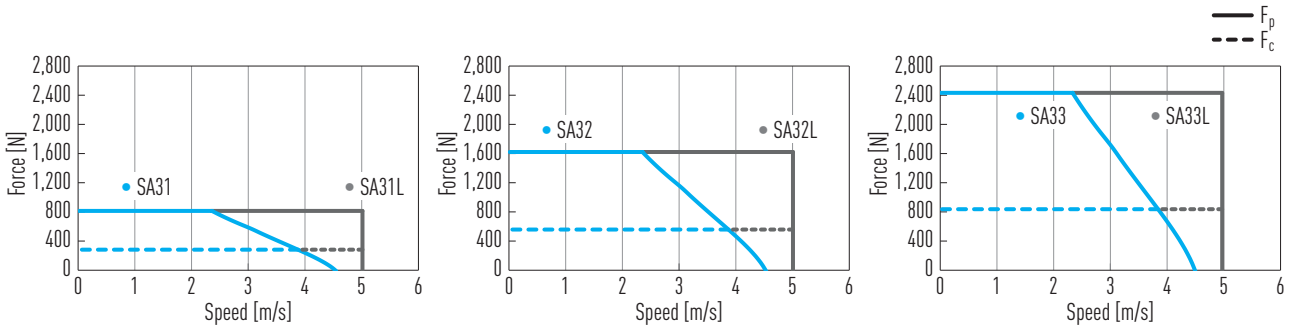


3) Optional
4) Inside width of energy chain: see order code on Page 12

All values in mm

3.4.5 Specifications LMX1A-SA31/SA32/SA33

Force as a function speed (DC bus voltage: 600 VDC)



Acceleration as a function of load capacity (DC bus voltage: 600 VDC)

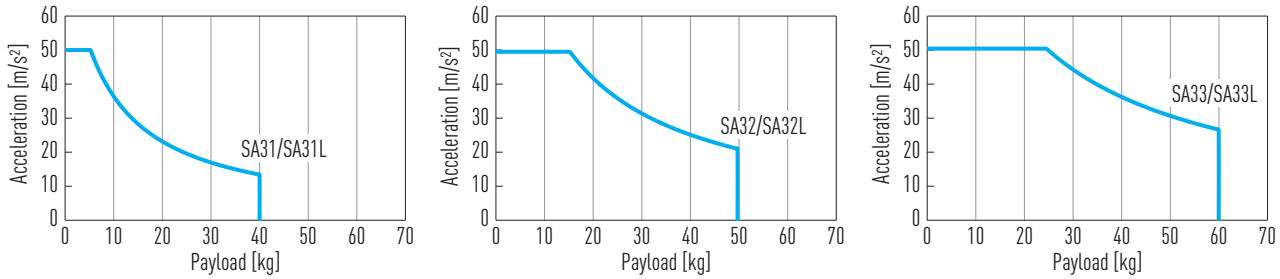


Table 3.9 **Technical data LMX1A-SA31/SA32/SA33**

	Symbol	Unit	LMX1A-SA31(L)	LMX1A-SA32(L)	LMX1A-SA33(L)
Continuous force [1]	F_c	N	292	583	875
Peek force [1]	F_p	N	823	1,646	2,469
Stroke length		mm	100 – 4,000		
Resolution distance measuring system			Type E/G: 1 µm; Type K: 0.1 µm; Type A: 1 V_{SS}		
Repeatability		µm	Type E/G: ±1; Type K: ±0.5; Type A: ±1		
Accuracy		µm	Type E/G: ±2; Type K: ±1; Type A: ±2		
Horizontal straightness		µm	10/500 mm		
Vertical straightness		µm	20/500 mm		
Moved mass		kg	7.5	10.5	14.5
Typical load capacity		kg	40	50	60

[1] F_c: 100 % duty cycle, at 120 °C winding temperature; F_p: 1 s
Electrical parameters of linear motors: see catalogue "Linear Motors and Distance Measuring Systems"

3.4.6 LMX1A-SA31/SA32/SA33 dimensions

Table 3.10 **LMX1A-SA31 dimensions (dimensional drawings see Page 25)**

Stroke	100	200	300	400	500	600	700	800	900	1,000
N	4	4	4	5	6	6	7	8	8	9
Total length LT [mm]	400	500	600	700	800	900	1,000	1,100	1,200	1,300
LA [mm]	25	25	65	75	25	75	50	25	75	50
LB [mm]	–	–	–	–	750	750	900	1,050	1,050	1,200
LC [mm]	100	100	100	150	–	–	–	–	–	–
LC with energy chain V1/V2 [mm] [1)]	65									
LC with energy chain V3/V4 [mm] [1)]	95									
LD [mm]	150	250	270	250	–	–	–	–	–	–

[1)] Dimension LC is determined by energy chain inside cross-section (see order code on Page 12)

Table 3.11 **LMX1A-SA32 dimensions (dimensional drawings see Page 26)**

Stroke	100	200	300	400	500	600	700	800	900	1,000
N	4	4	4	6	6	7	8	8	9	10
Total length LT [mm]	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400
LA [mm]	25	65	75	25	75	50	25	75	50	25
LB [mm]	–	–	–	750	750	900	1,050	1,050	1,200	1,350
LC [mm]	100	100	150	–	–	–	–	–	–	–
LC with energy chain V1/V2 [mm] [1)]	65									
LC with energy chain V3/V4 [mm] [1)]	95									
LD [mm]	250	270	250	–	–	–	–	–	–	–

[1)] Dimension LC is determined by energy chain inside cross-section (see order code on Page 12)

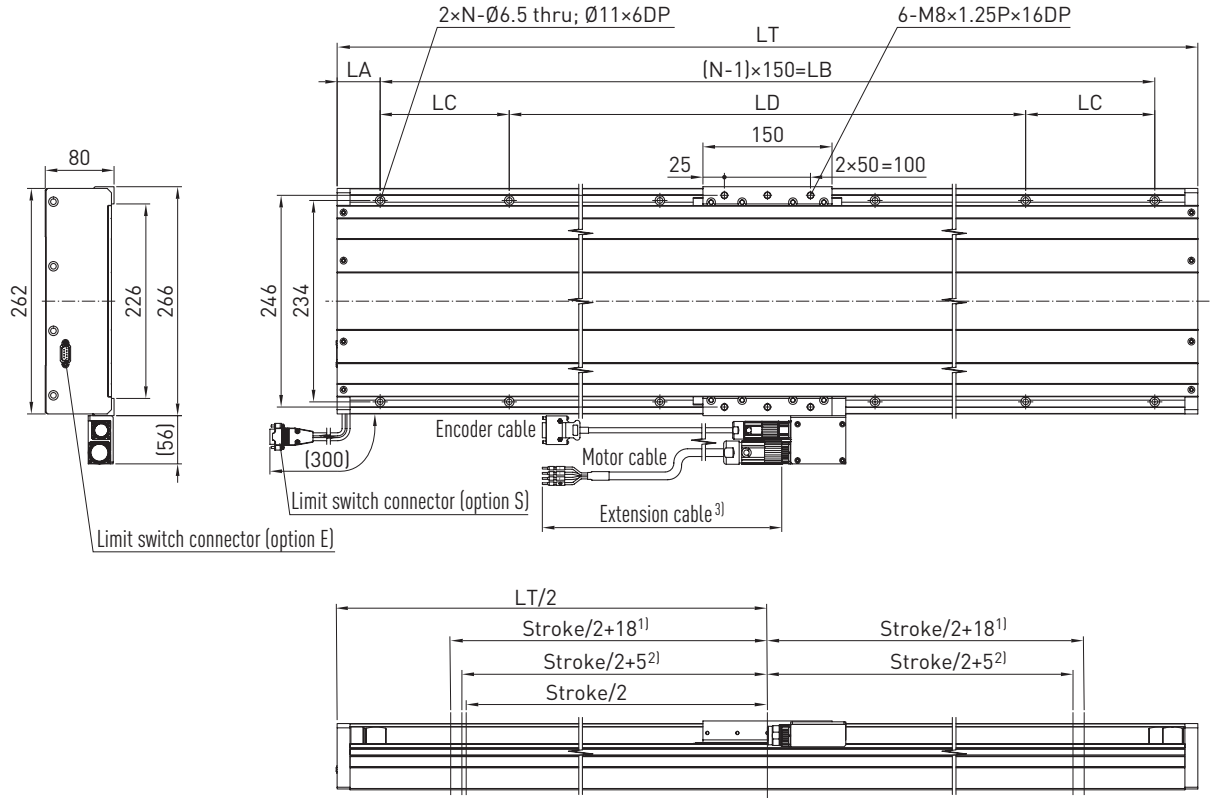
Table 3.12 **LMX1A-SA33 dimensions (dimensional drawings see Page 27)**

Stroke	100	200	300	400	500	600	700	800	900	1,000
N	4	4	6	6	7	8	8	9	10	10
Total length LT [mm]	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
LA [mm]	65	75	25	75	50	25	75	50	25	75
LB [mm]	–	–	750	750	900	1,050	1,050	1,200	1,350	1,350
LC [mm]	100	150	–	–	–	–	–	–	–	–
LC with energy chain V1/V2 [mm] [1)]	65									
LC with energy chain V3/V4 [mm] [1)]	95									
LD [mm]	270	250	–	–	–	–	–	–	–	–

[1)] Dimension LC is determined by energy chain inside cross-section (see order code on Page 12)

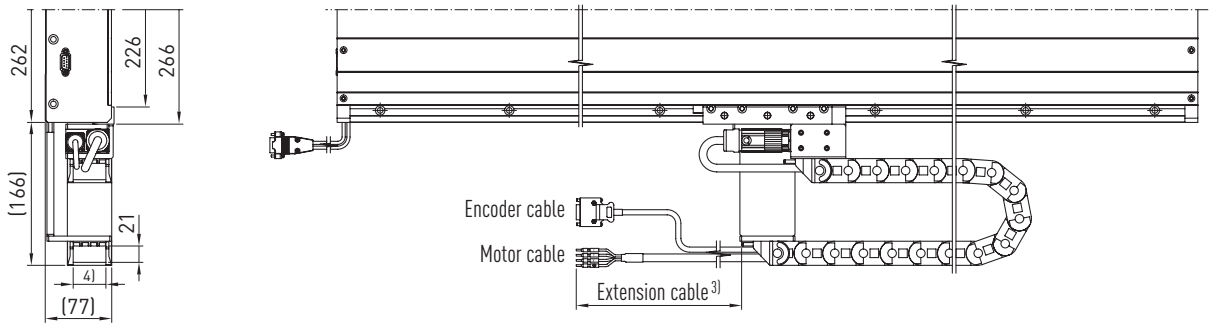
Dimensional drawings LMX1A-SA31

Without energy supply

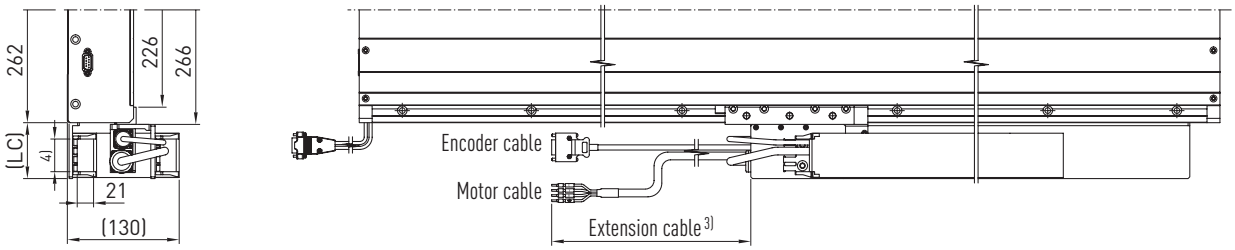


1) Stopping buffer position
2) Limit switch position

Energy supply horizontal



Energy supply vertical

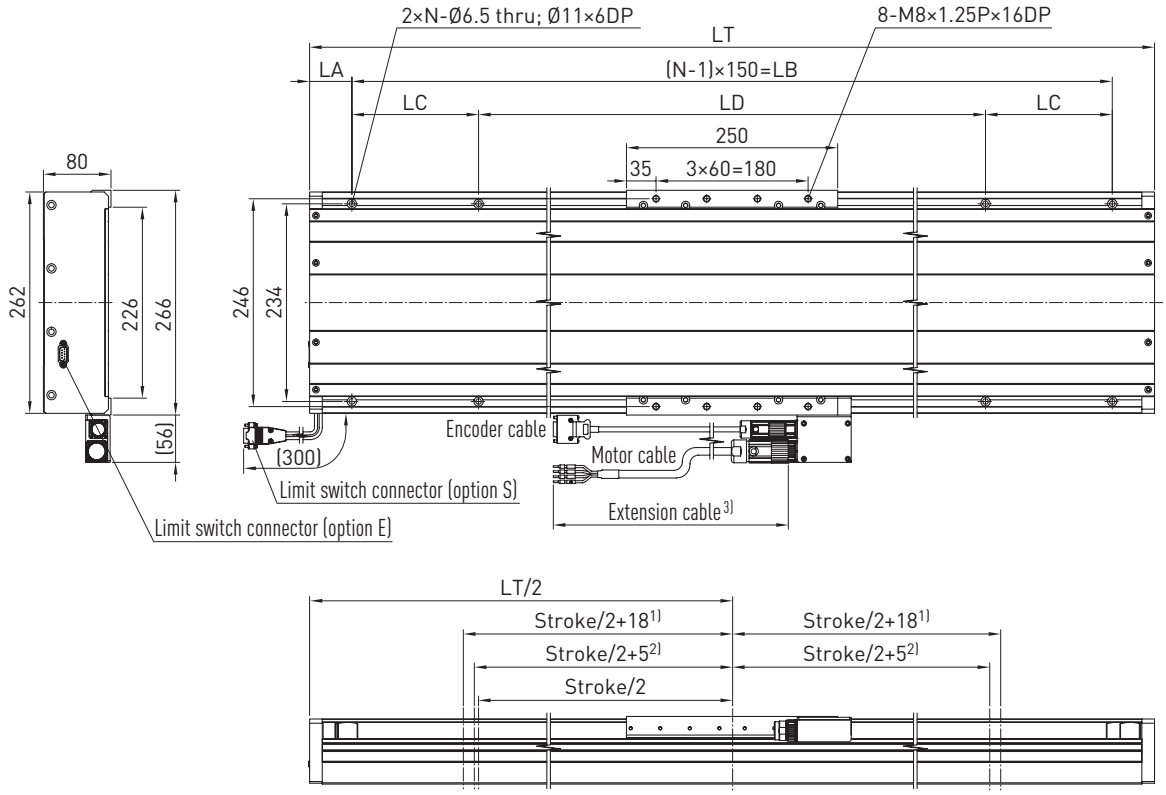


3) Optional
4) Inside width of energy chain: see order code on Page 12

All values in mm

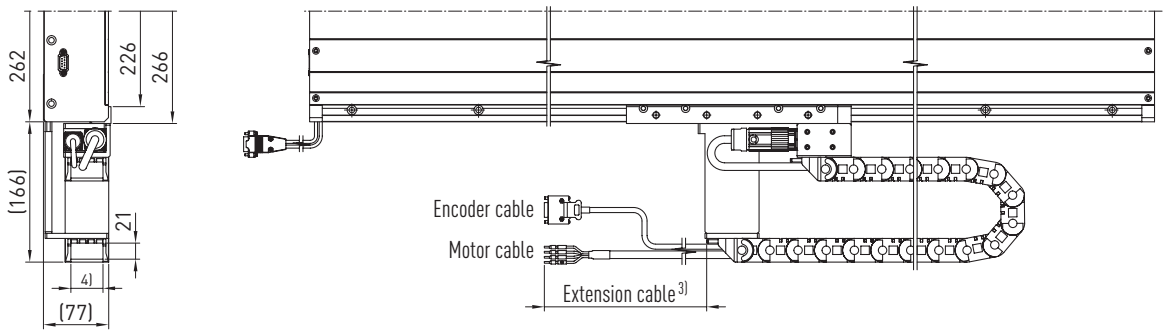
Dimensional drawings LMX1A-SA32

Without energy supply

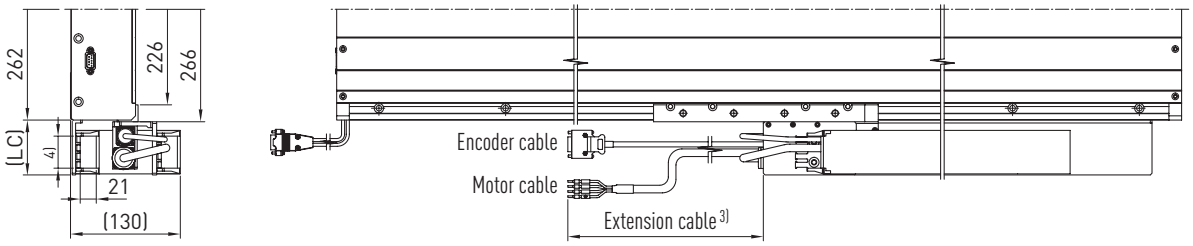


1) Stopping buffer position
2) Limit switch position

Energy supply horizontal



Energy supply vertical

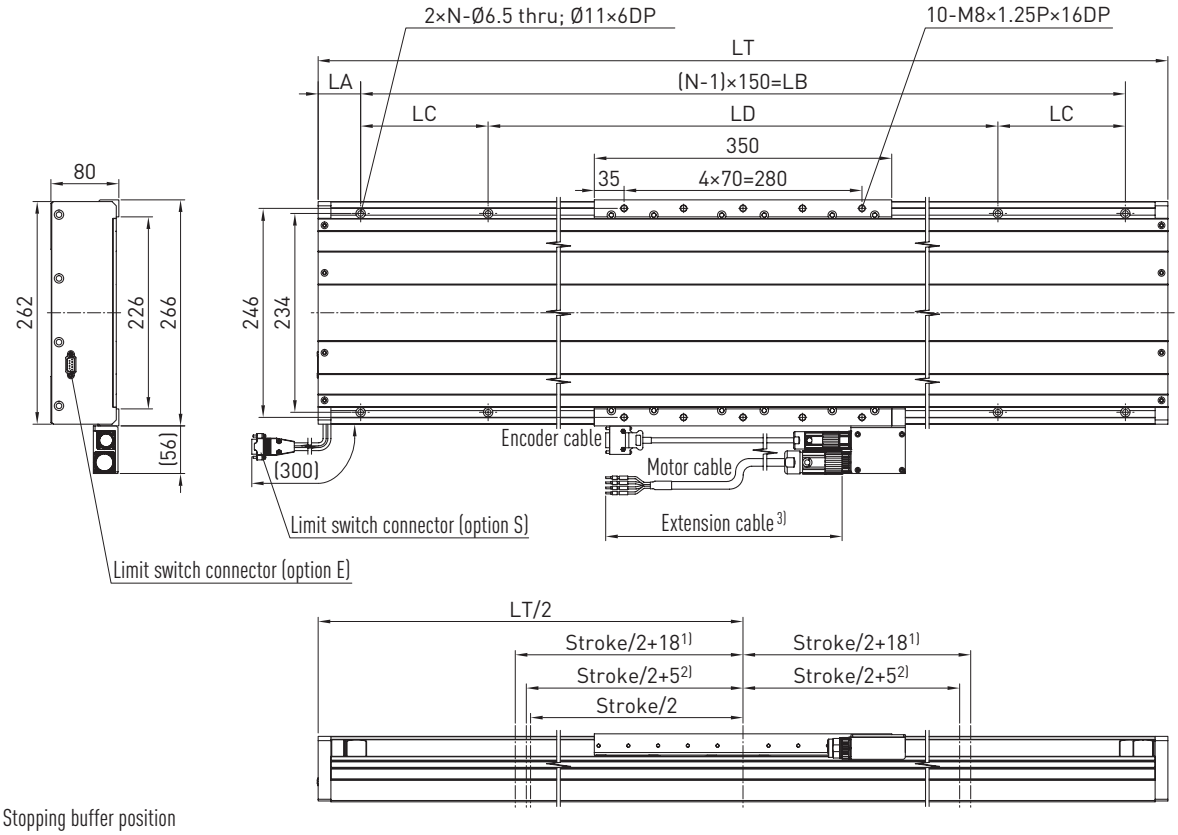


3) Optional
4) Inside width of energy chain: see order code on Page 12

All values in mm

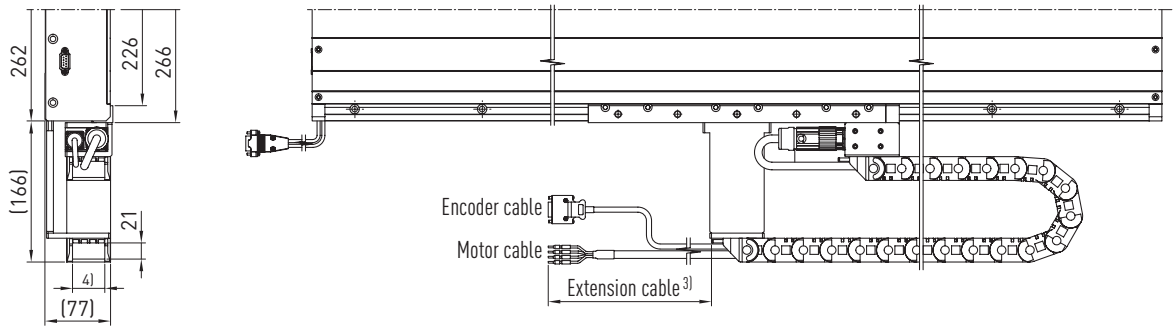
Dimensional drawings LMX1A-SA33

Without energy supply

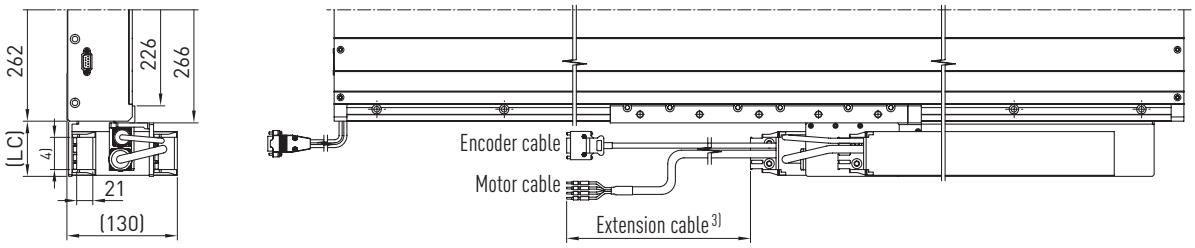


1) Stopping buffer position
2) Limit switch position

Energy supply horizontal



Energy supply vertical



3) Optional
4) Inside width of energy chain: see order code on Page 12

All values in mm

4. Linear motor axis LMSSA

4.1 Properties of the LMSSA linear motor axes

LMSSA linear motor axes are a cost-effective variant of this product group. The cost advantage is achieved by a consistent reduction to the essentials and a limitation of the options and variants available as standard. This allows manufacturing costs to be significantly reduced, while the LMSSA axes simultaneously offer all the advantages of a conventional linear motor axis.

- Max. acceleration 100 m/s^2
- Max. velocity 5 m/s
- Up to 3,000 mm long

4.2 Order code for LMSSA linear motor axes

LM	SSA	18	S	100	0800	G	S	S	NA0

Linear motor axis

Series

Profile width:
18
20

Motor type:
S: Iron-core LMSA motor

Nominal force [N]:
100
200
300
500

Stroke length [mm]
200–2,700 in 50 mm increments

Standard version

Cover:
S: Aluminium cover (standard)
N: None

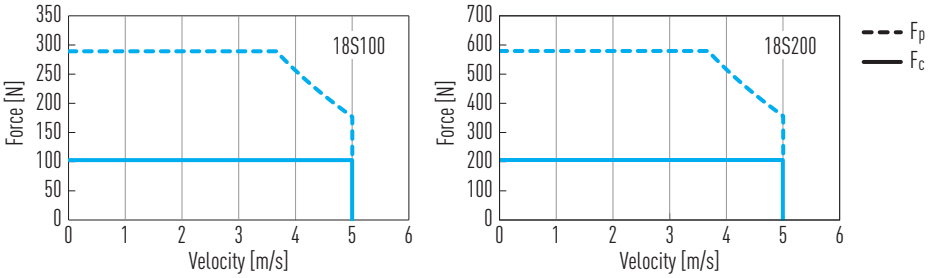
Cables and connectors:
S: Motor cable:
3,000 mm, open cable end
Limit switch:
300 mm, open cable end
Distance measuring system:
3,000 mm, Sub-D, 15-pin

Distance measuring system:
G: Optical, digital TTL, resolution 1 µm
K: Optical, digital TTL, resolution 0.1 µm
E: Magnetic, digital TTL, resolution 1 µm

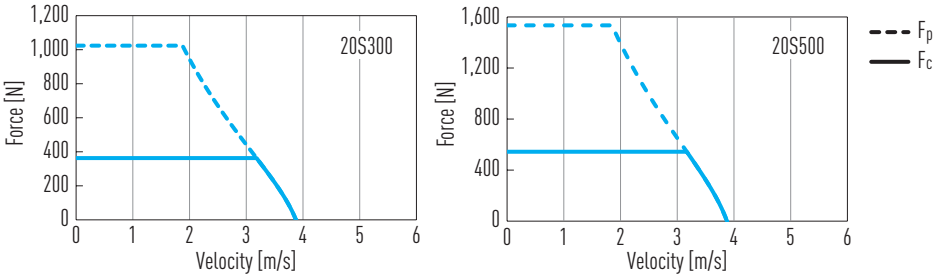
4.3 Linear motor axis LMSSA specifications

Force as a function of speed (DC bus voltage: 325 VDC)

LMSSA-18

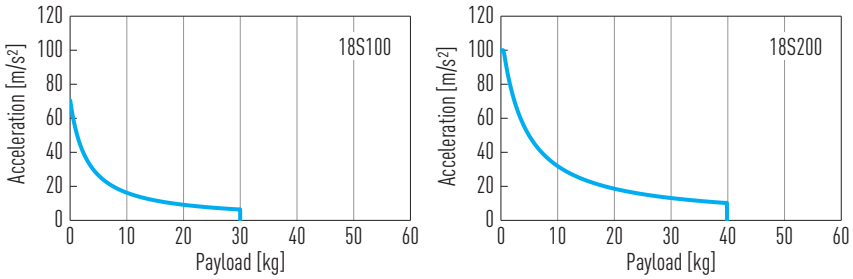


LMSSA-20



Acceleration as a function of load capacity (DC bus voltage: 325 VDC)

LMSSA-18



LMSSA-20

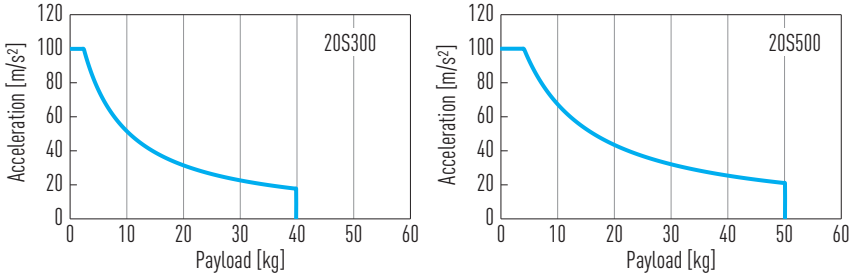
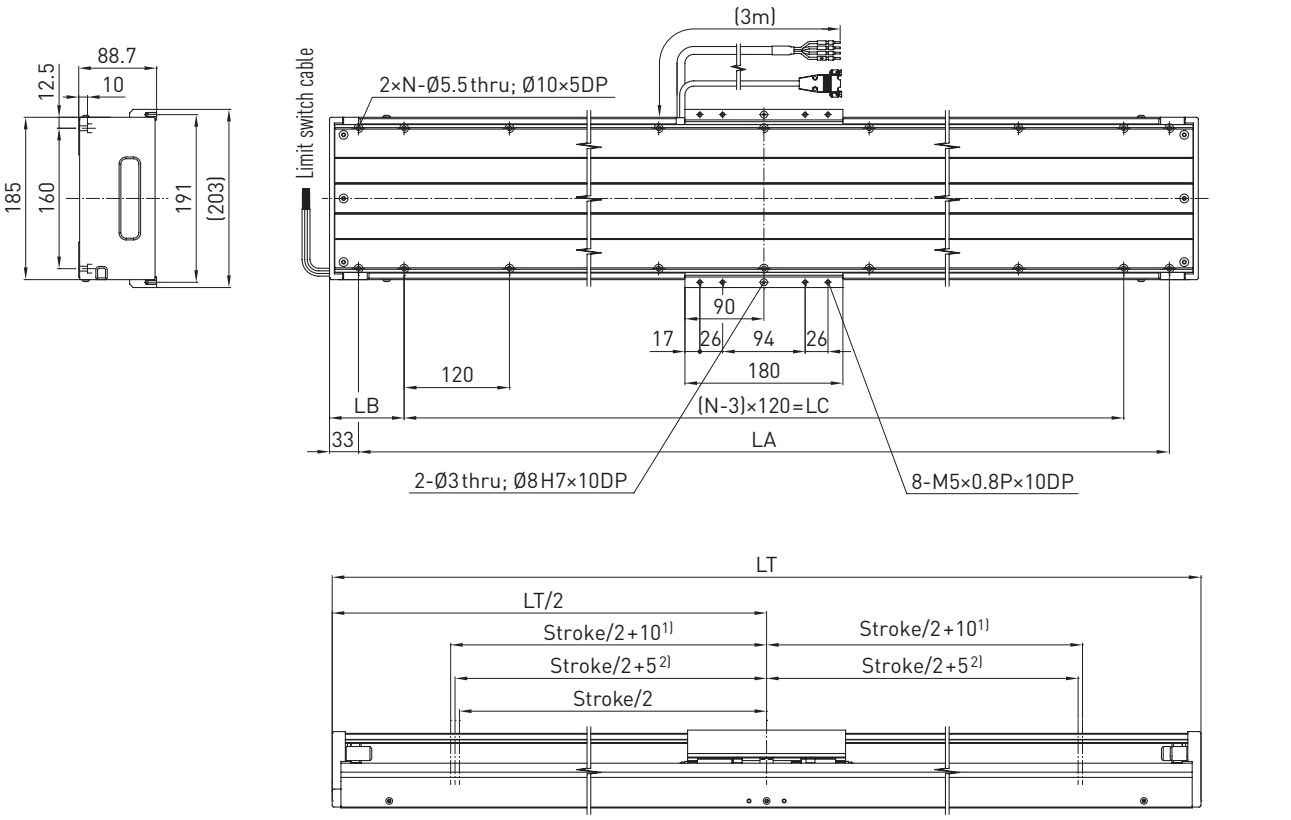


Table 4.1 **Technical data LMSSA**

	Symbol	Unit	LMSSA-18S100	LMSSA-18S200	LMSSA-20S300	LMSSA-20S500
Linear motor			LMSA11	LMSA12	LMSA22	LMSA23
Continuous force at T_{max}	F_c	N	103	205	362	544
Continuous current at T_{max}	I_c	A_{eff}	2.1	4.2	3.9	5.9
Peak force (for 1 s)	F_p	N	289	579	1,023	1,535
Peak current (for 1 s)	I_p	A_{eff}	6.3	12.7	11.8	17.6
Ultimate force (for 0.5 s)	F_u	N	379	759	1,341	2,011
Ultimate current (for 0.5 s)	I_u	A_{eff}	10.6	21.1	19.6	29.4
Force constant	K_f	N/A_{eff}	48.6		92.5	
Electrical time constant	K_e	ms	4.4	4.5	4.9	4.9
Resistance [1]	R_{25}	Ω	8.4	4.1	6.8	4.6
Inductance [1]	L	mH	37.1	18.5	33.0	22.4
Back EMF constant	K_u	$V_{eff}/(m/s)$	28.1		53.4	
Motor constant	K_m	$N/\sqrt{W}$	13.7	19.6	28.9	35.2
Thermal resistance	R_{th}	°C/W	1.23	0.63	0.44	0.29
Thermal time constant	T_{th}	s	1,830	2,720	4,060	5,080
Thermal switch			1× (3 PTC SNM 120 in series)			
Max. DC bus voltage		V	500			
Pole pair pitch	2τ	mm	30			
Max. winding temperature	T_{max}	°C	120			
Resolution of distance measuring system		µm	Type G: 1.0; Type K: 0.1 [2]; Type E: 1.0			
Repeatability		µm	Type G: ±3; Type K: ±1; Type E: ±3			
Horizontal straightness		µm	±8/300 mm			
Vertical straightness		µm	±8/300 mm			
Max. speed		m/s	5.0		4.0	
Max. acceleration		m/s^2	100			
Moved mass		kg	2.90	4.06	5.62	8.13
Stroke length		mm	200 – 2.700 (in 50 mm increments)			
Mass at 0 stroke		kg	8.41	10.57	13.55	18.50
Mass per 1 m stroke		kg/m	16.45	16.65	19.76	20.50

[1] Line to line
[2] Distance measuring system type K: maximum speed: 1.5 m/s
All specifications are in ± 10 % of tolerance at 25 °C ambient temperature

LMSSA-18S100 dimensions



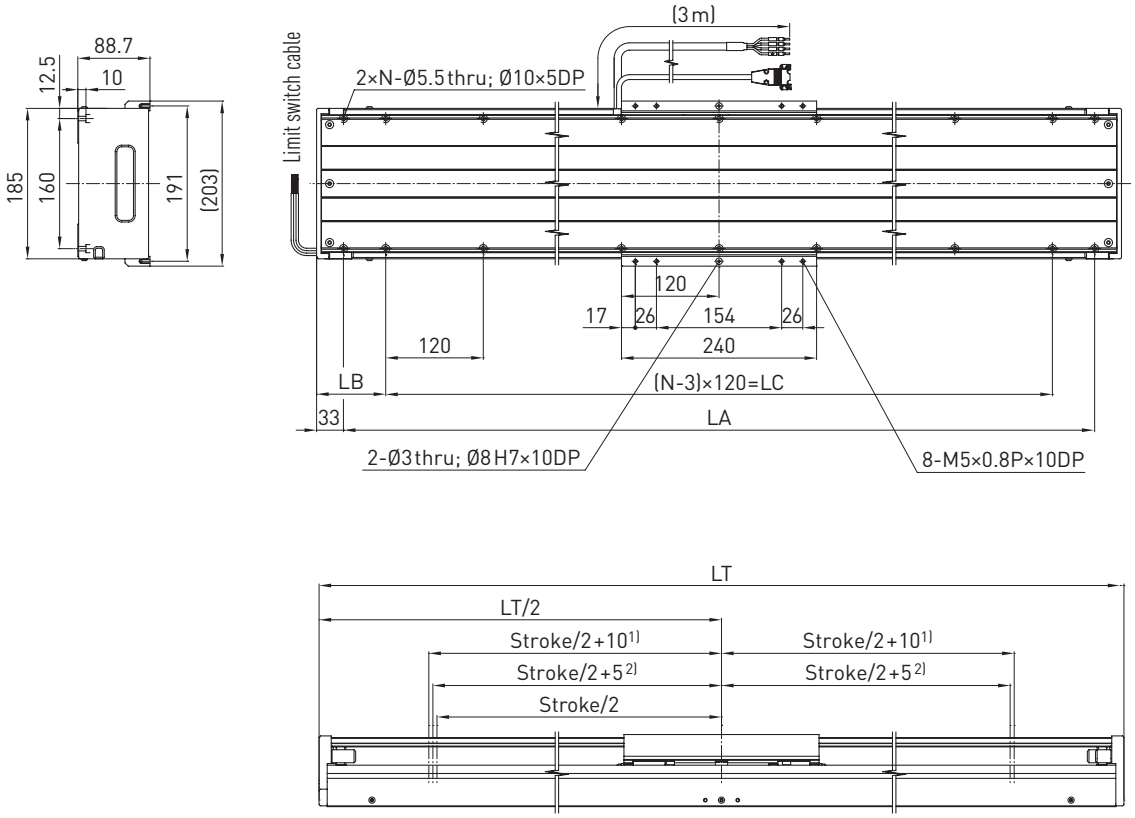
[1)] Stopping buffer position
[2)] Limit switch position

All values in mm

Table 4.2 **LMSSA-18S100 dimensions**

Stroke length [mm]	200	300	400	500	600	700	800	900	1,000	1,100	1,200
Total length LT [mm]	490	590	690	790	890	990	1,090	1,190	1,290	1,390	1,490
N [mm]	5	7	7	7	9	9	11	11	13	13	13
LA [mm]	424	524	624	724	824	924	1,024	1,124	1,224	1,324	1,424
LB [mm]	125	55	105	155	85	135	65	115	45	95	145
LC [mm]	240	480	480	480	720	720	960	960	1,200	1,200	1,200

LMSSA-18S200 dimensions



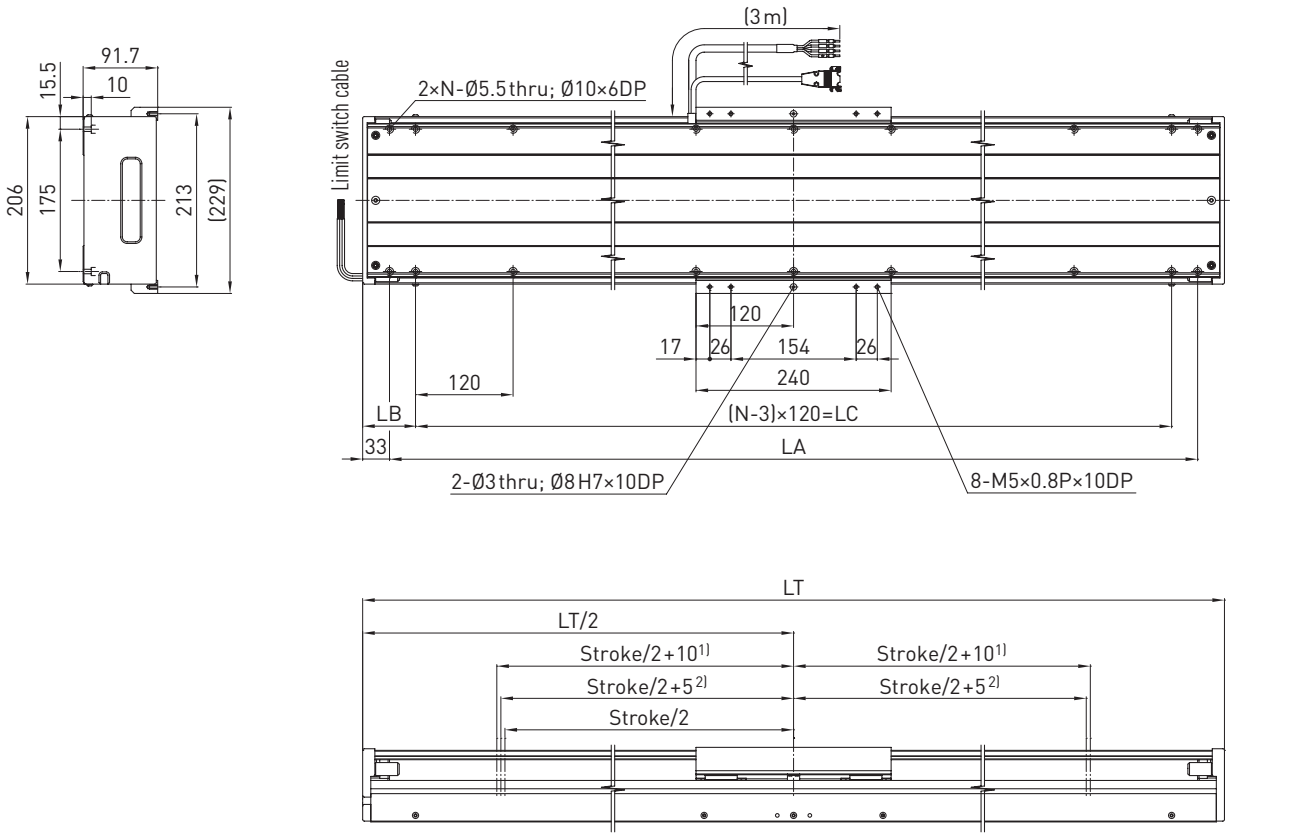
1) Stopping buffer position
2) Limit switch position

All values in mm

Table 4.3 **LMSSA-18S200 dimensions**

Stroke length [mm]	200	300	400	500	600	700	800	900	1,000	1,100	1,200
Total length LT [mm]	550	650	750	850	950	1,050	1,150	1,250	1,350	1,450	1,550
N [mm]	5	7	7	9	9	11	11	11	13	13	15
LA [mm]	484	584	684	784	884	984	1,084	1,184	1,284	1,384	1,484
LB [mm]	155	85	135	65	115	45	95	145	75	125	55
LC [mm]	240	480	480	720	720	960	960	960	1,200	1,200	1,440

LMSSA-20S300 dimensions



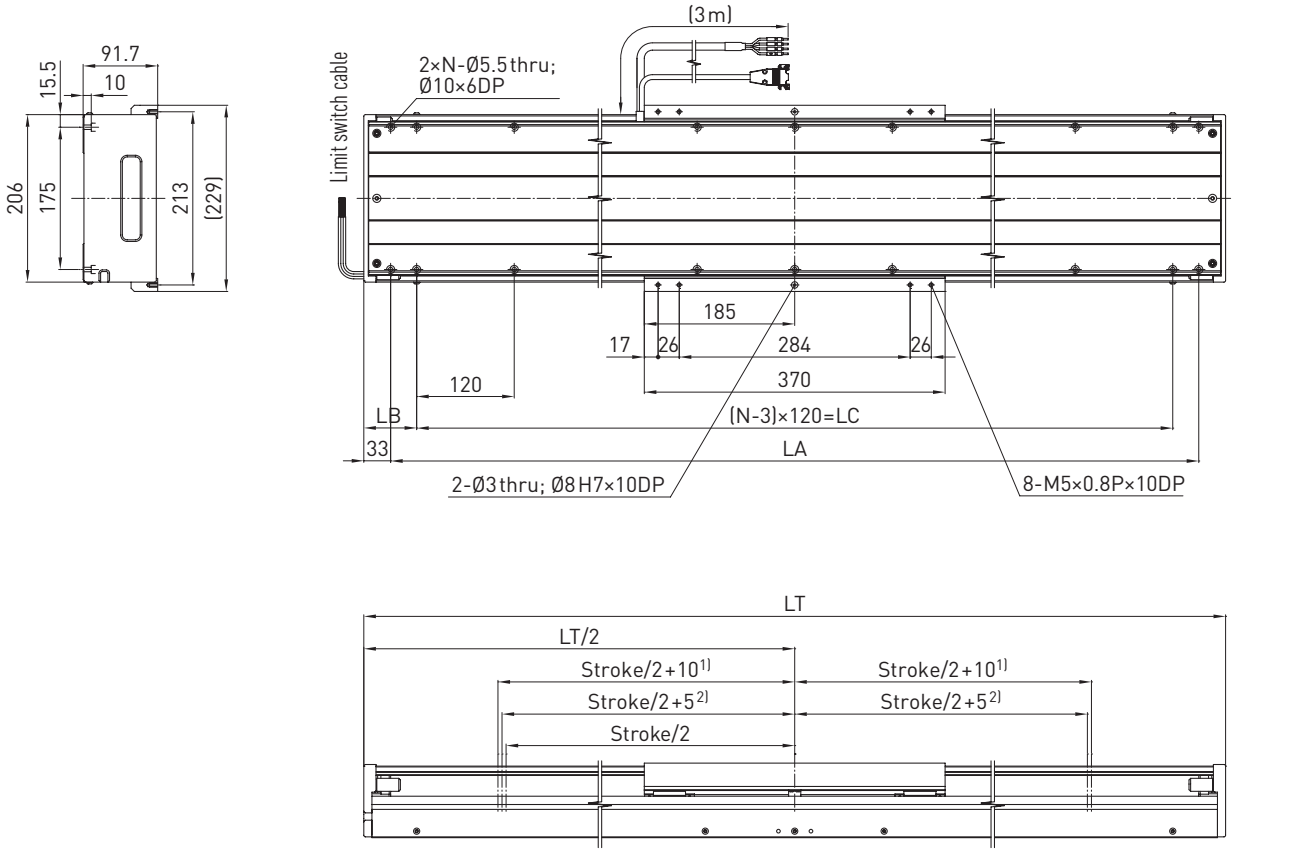
[1)] Stopping buffer position
[2)] Limit switch position

All values in mm

Table 4.4 **LMSSA-20S300 dimensions**

Stroke length [mm]	200	300	400	500	600	700	800	900	1,000	1,100	1,200
Total length LT [mm]	550	650	750	850	950	1,050	1,150	1,250	1,350	1,450	1,550
N [mm]	5	7	7	9	9	11	11	11	13	13	15
LA [mm]	484	584	684	784	884	984	1,084	1,184	1,284	1,384	1,484
LB [mm]	155	85	135	65	115	45	95	145	75	125	55
LC [mm]	240	480	480	720	720	960	960	960	1,200	1,200	1,440

LMSSA-20S500 dimensions



[1)] Stopping buffer position
[2)] Limit switch position

All values in mm

Table 4.5 **LMSSA-20S500 dimensions**

Stroke length [mm]	200	300	400	500	600	700	800	900	1,000	1,100	1,200
Total length LT [mm]	680	780	880	980	1,080	1,180	1,280	1,380	1,480	1,580	1,680
N [mm]	7	7	9	9	11	11	11	13	15	15	15
LA [mm]	614	714	814	914	1,014	1,114	1,214	1,314	1,414	1,514	1,614
LB [mm]	100	150	80	130	60	110	160	90	20	70	120
LC [mm]	480	480	720	720	960	960	960	1,200	1,440	1,440	1,440

5. Linear motor axis LMX1E

5.1 Properties of the LMX1E linear motor axes

LMX1E linear motor axes 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 axes have very high dynamics and are available in overall lengths up to 4,000 mm.

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

5.2 Order code for LMX1E linear motor axes

LM	X	1	E	CB5	1	0872	A	1	0	0	0	XXX

Linear motor axis

Axis type:
X: Horizontal axis

Number of axes:
1: Single axis

Axis profile:
E: Ironless motors (LMC)

Motor type:
LMCxx: Motor size

Number of carriages

Stroke length [mm]

Distance measuring system:
A: Optical, period 40 µm, analogous 1 V_{PP} sin/cos
C: HIWIN MAGIC: magnetic, period 1 mm, 1 V_{PP} sin/cos
D: HIWIN MAGIC-PG: magnetic, period 1 mm, 1 V_{PP} sin/cos
Magnetic scale integrated in guiding rail
E: Magnetic, digital TTL, resolution 1 µm
G: Optical, digital TTL, resolution 1 µm
K: Optical, digital TTL, resolution 0.1 µm
X: Magnetic, absolute with BiSS C interface
Magnetic, absolute with HIPERFACE interface
Optical, absolute, encapsulated with EnDat interface
Optical, absolute, encapsulated with DRIVE-CLiQ interface
Optical, absolute, encapsulated with FANUC interface

Limit switches:
0: None
1: Inductive, PNP (standard)
2: Optical, NPN

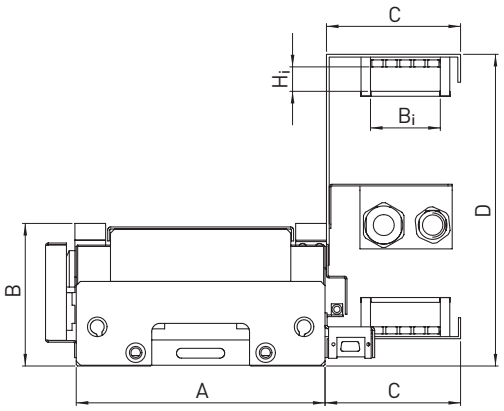
Cover:
0: None (standard)
A: Metal cover
B: Bellow cover

Energy supply alignment:
0: None (standard)
1: Horizontal alignment
2: Vertical alignment
C: Customer specific

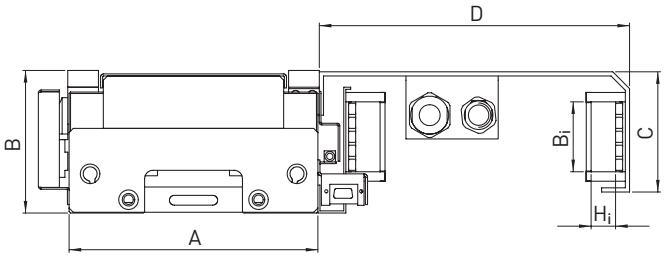
Energy supply size:
0: Standard for LMC axes
C: Customer specific

Job number of drawing, several forcers, hall sensor, weight compensation, brake, special mounting holes

5.3 Energy supply for linear motor axes LMX1A



Energy supply vertical



Energy supply horizontal

Table 5.1 **Dimensions of energy supply**

Energy supply alignment	C [mm]	D [mm]	Internal dimensions B_i × H_i [mm]
Vertical	97	170	50 × 21
Horizontal	79	170	50 × 21

5.4 Linear motor axis LMX1E specifications

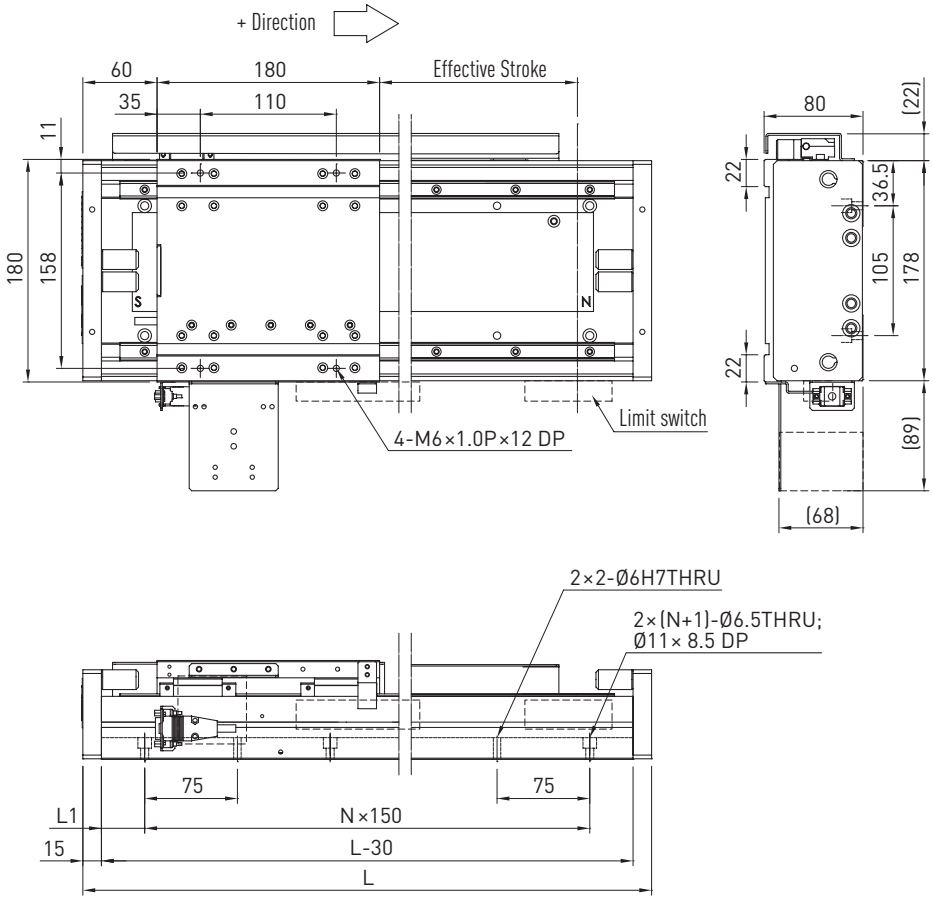
Table 5.2 **Technical data of LMX1E linear motor axes**

Description (order code) xxxx = travel distance [mm]	Motor type	F_c [N]	F_p [N]	Weight of carriage [kg]	Length of carriage [mm]	v_{max} [m/s]	a_{max} [m/s²]	Dimension A [mm]	Dimension B [mm]
LMX1E-CB5-1-xxxx-C100	LMCB5	91	364	2.3	180	5	100	178	80
LMX1E-CB6-1-xxxx-C100	LMCB6	109	436	3.3	210	5	100	178	80
LMX1E-CB7-1-xxxx-C100	LMCB7	128	512	3.8	240	5	100	178	80
LMX1E-CB8-1-xxxx-C100	LMCB8	145	580	4.5	280	5	100	178	80
LMX1E-CB5-1-xxxx-C1A0	LMCB5	91	364	2.5	180	5	100	178	95/105 [1)]
LMX1E-CB6-1-xxxx-C1A0	LMCB6	109	436	3.5	210	5	100	178	95/105 [1)]
LMX1E-CB7-1-xxxx-C1A0	LMCB7	128	512	4.0	240	5	100	178	95/105 [1)]
LMX1E-CB8-1-xxxx-C1A0	LMCB8	145	580	4.7	280	5	100	178	95/105 [1)]

F_c = Continuous power, 100 % duty cycle, at 100 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors see catalogue "Linear Motors and Distance Measuring Systems"
[1)] See dimensional tables Page 41 till Page 44

5.4.1 LMX1E linear motor axes without cover

Dimensions and weights of the LMX1E-CB5 linear motor axis without cover



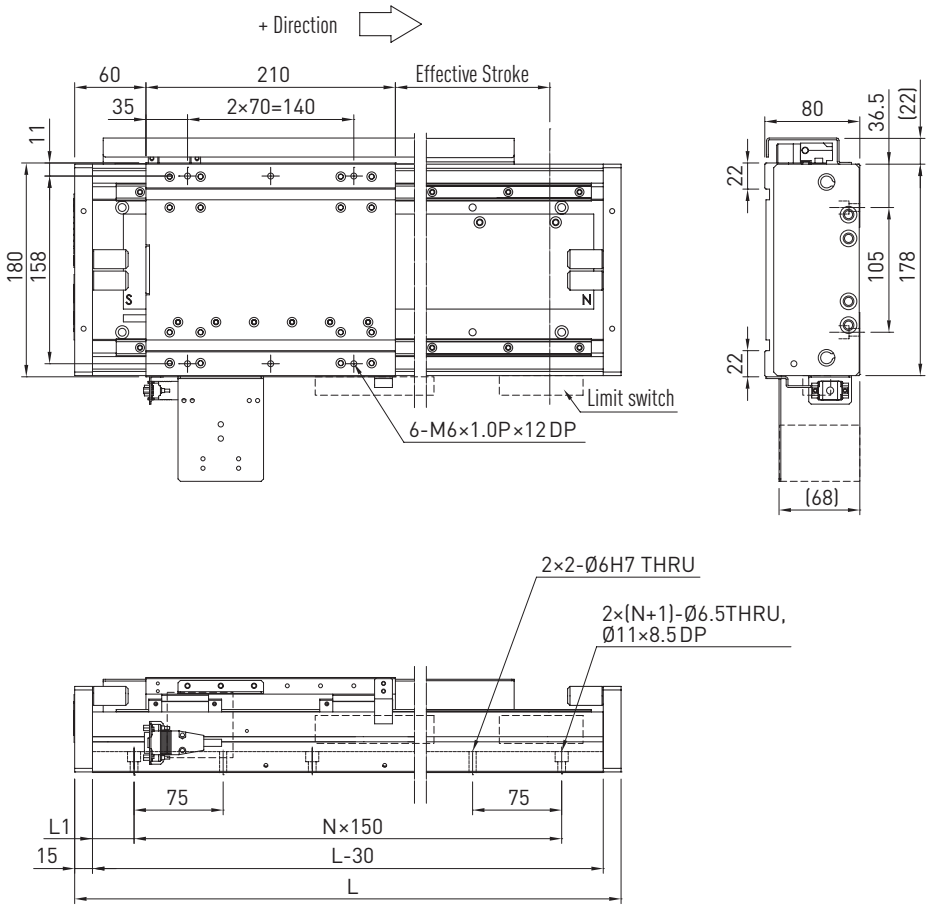
All values in mm

Table 5.3 **Dimensions and weights of LMX1E-CB5 without cover**

Stroke [mm]	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200
Total length L [mm]	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
L1 [mm]	35	85	60	35	85	60	35	85	60	35	85	60
N	1 [1)]	2	3	4	4	5	6	6	7	8	8	9
Weight [kg]	18	22	26	30	34	38	42	46	50	54	58	62

[1)] When stroke = 100 mm the mounting hole distance increases from 150 to 300 mm

Dimensions and weights of the LMX1E-CB6 linear motor axis without cover



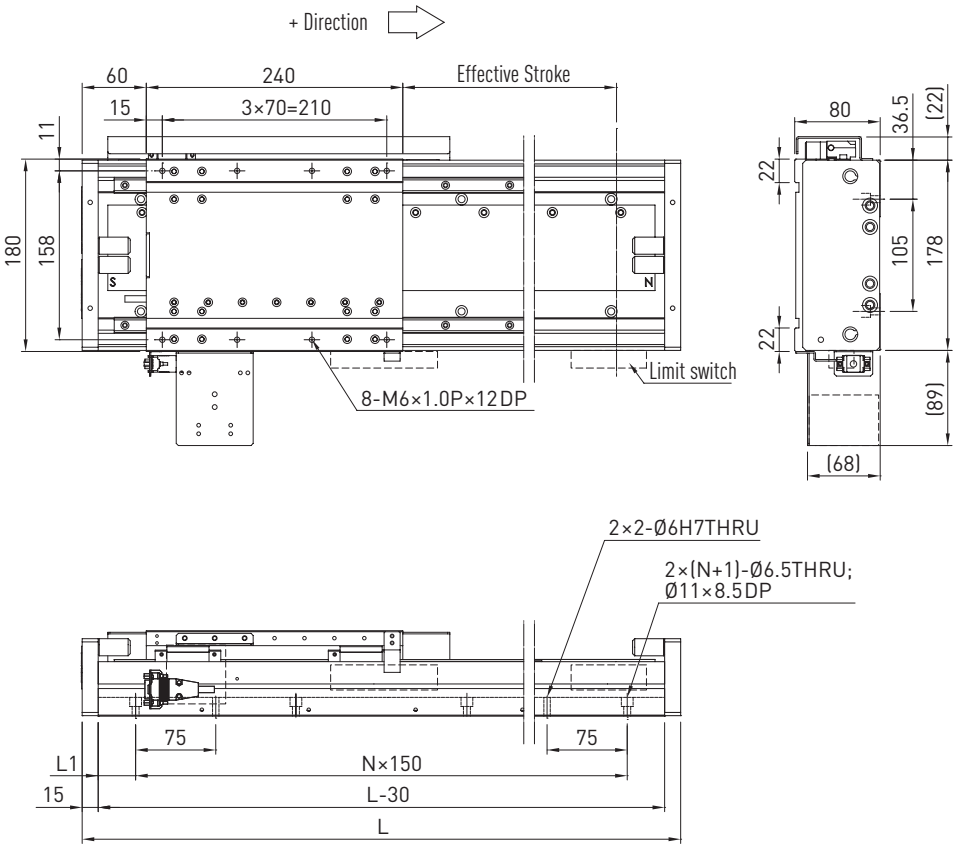
All values in mm

Table 5.4 **Dimensions and weights of LMX1E-CB6 without cover**

Stroke [mm]	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200
Total length L [mm]	430	530	630	730	830	930	1,030	1,130	1,230	1,330	1,430	1,530
L1 [mm]	50	25	75	50	25	75	50	25	75	50	25	75
N	1 [1)]	3	3	4	5	5	6	7	7	8	9	9
Weight [kg]	19	23	27	31	35	39	43	47	51	55	59	63

[1)] When stroke = 100 mm the mounting hole distance increases from 150 to 300 mm

Dimensions and weights of the LMX1E-CB7 linear motor axis without cover



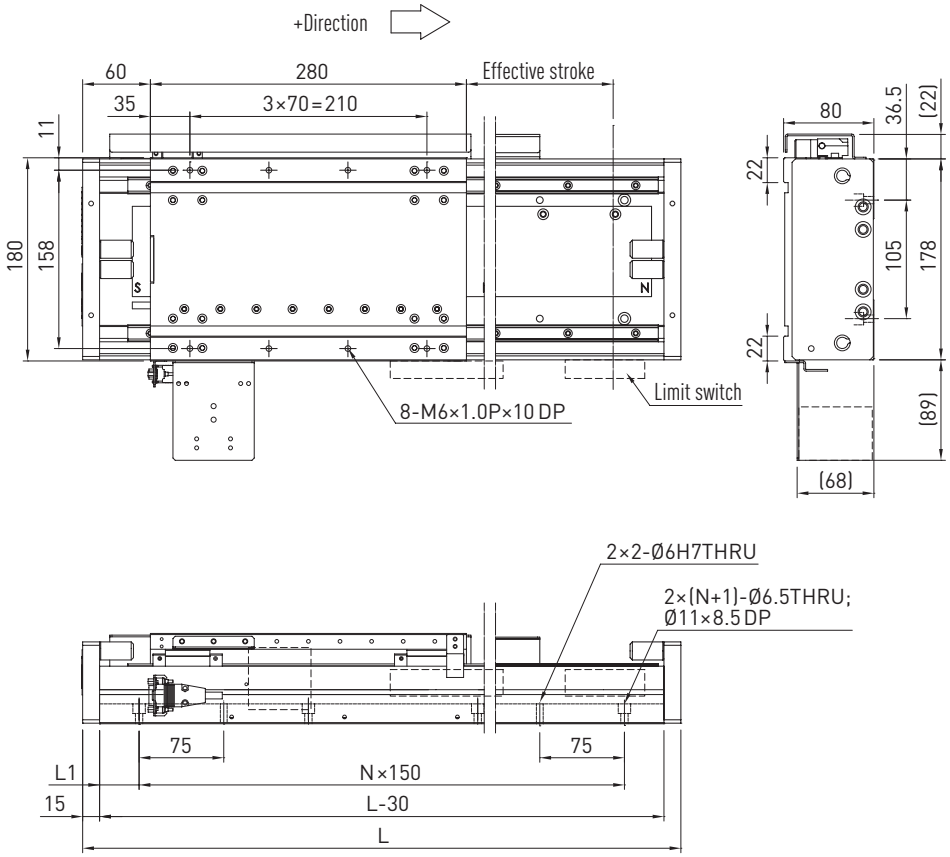
All values in mm

Table 5.5 **Dimensions and weights of LMX1E-CB7 without cover**

Stroke [mm]	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200
Total length L [mm]	460	560	660	760	860	960	1,060	1,160	1,260	1,360	1,460	1,560
L1 [mm]	65	40	90	65	40	90	65	40	90	65	40	90
N	1 [1)]	3	3	4	5	5	6	7	7	8	9	9
Weight [kg]	20	24	28	32	36	40	44	48	52	56	60	64

[1)] When stroke = 100 mm the mounting hole distance increases from 150 to 300 mm

Dimensions and weights of the LMX1E-CB8 linear motor axis without cover



All values in mm

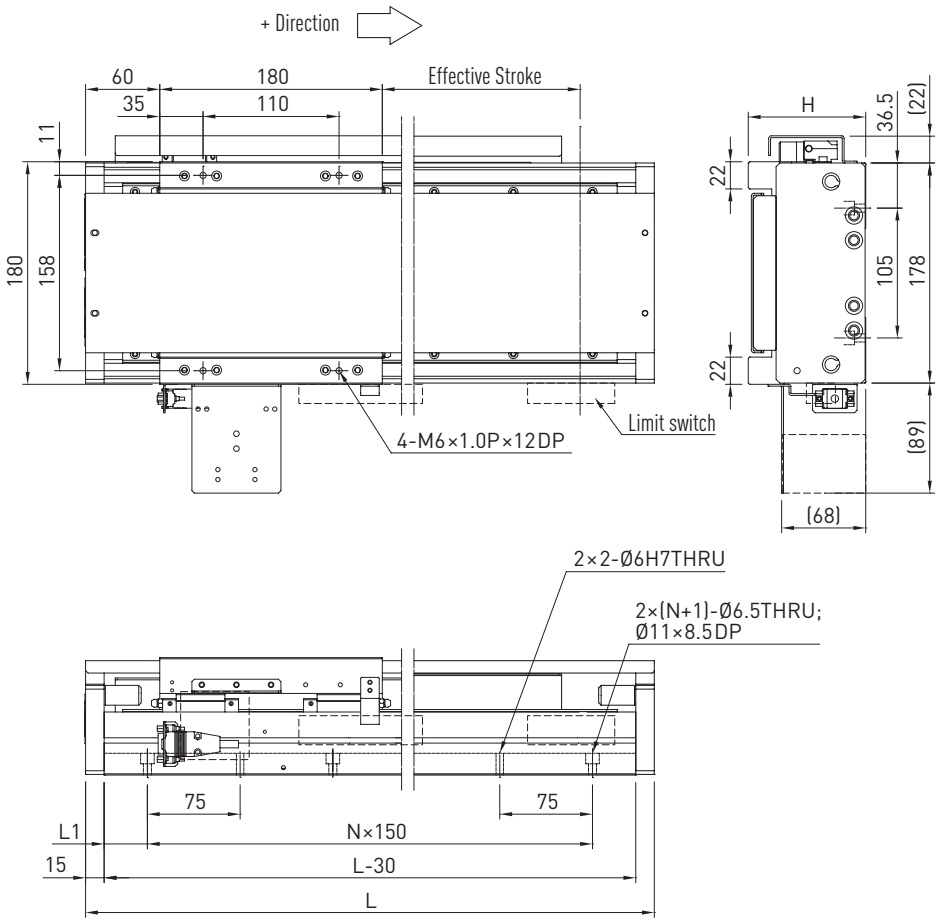
Table 5.6 **Dimensions and weights of LMX1E-CB8 without cover**

Stroke [mm]	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200
Total length L [mm]	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500	1,600
L1 [mm]	85	60	35	85	60	35	85	60	35	85	60	35
N	1 [1)]	3	4	4	5	6	6	7	8	8	9	10
Weight [kg]	21	25	29	33	37	41	45	49	53	57	61	65

[1)] When stroke = 100 mm the mounting hole distance increases from 150 to 300 mm

5.4.2 LMX1E linear motor axes with cover

Dimensions and weights of the LMX1E-CB5 linear motor axis with cover



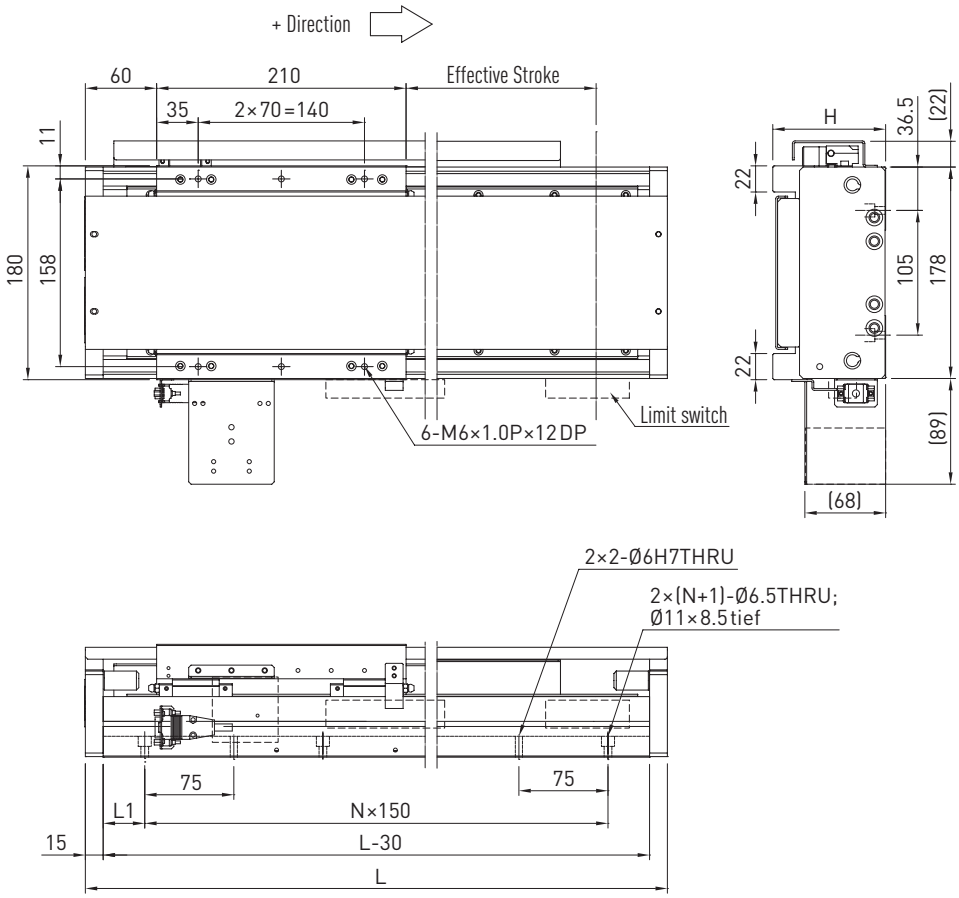
All values in mm

Table 5.7 **Dimensions and weights of LMX1E-CB5 with cover**

Stroke [mm]	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200
Total length L [mm]	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
L1 [mm]	35	85	60	35	85	60	35	85	60	35	85	60
N	1 [1)]	2	3	4	4	5	6	6	7	8	8	9
Weight [kg]	19	23	27	31	35	39	43	47	51	55	59	63
H [mm]	95	95	95	95	95	95	95	95	95	95	105	105

[1)] When stroke = 100 mm the mounting hole distance increases from 150 to 300 mm

Dimensions and weights of the LMX1E-CB6 linear motor axis with cover



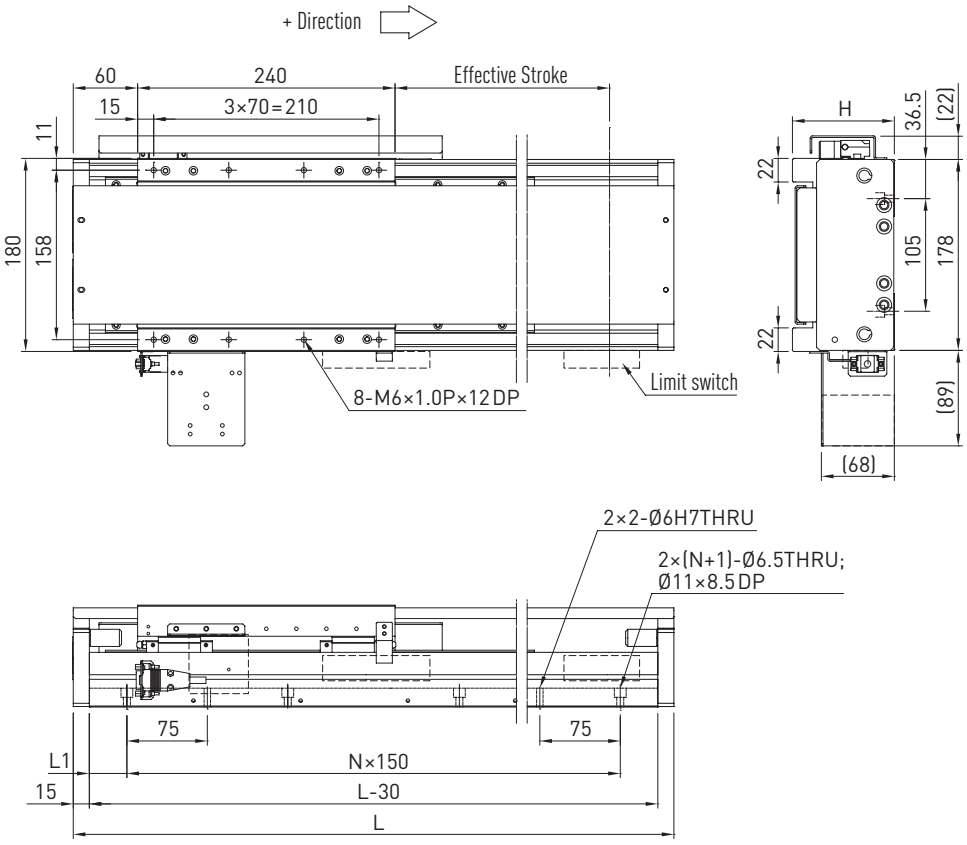
All values in mm

Table 5.8 **Dimensions and weights of LMX1E-CB6 with cover**

Stroke [mm]	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200
Total length L [mm]	430	530	630	730	830	930	1,030	1,130	1,230	1,330	1,430	1,530
L1 [mm]	50	25	75	50	25	75	50	25	75	50	25	75
N	1 [1)]	3	3	4	5	5	6	7	7	8	9	9
Weight [kg]	20	24	28	32	36	40	44	48	52	56	60	64
H [mm]	95	95	95	95	95	95	95	95	95	95	105	105

[1)] When stroke = 100 mm the mounting hole distance increases from 150 to 300 mm

Dimensions and weights of the LMX1E-CB7 linear motor axis with cover



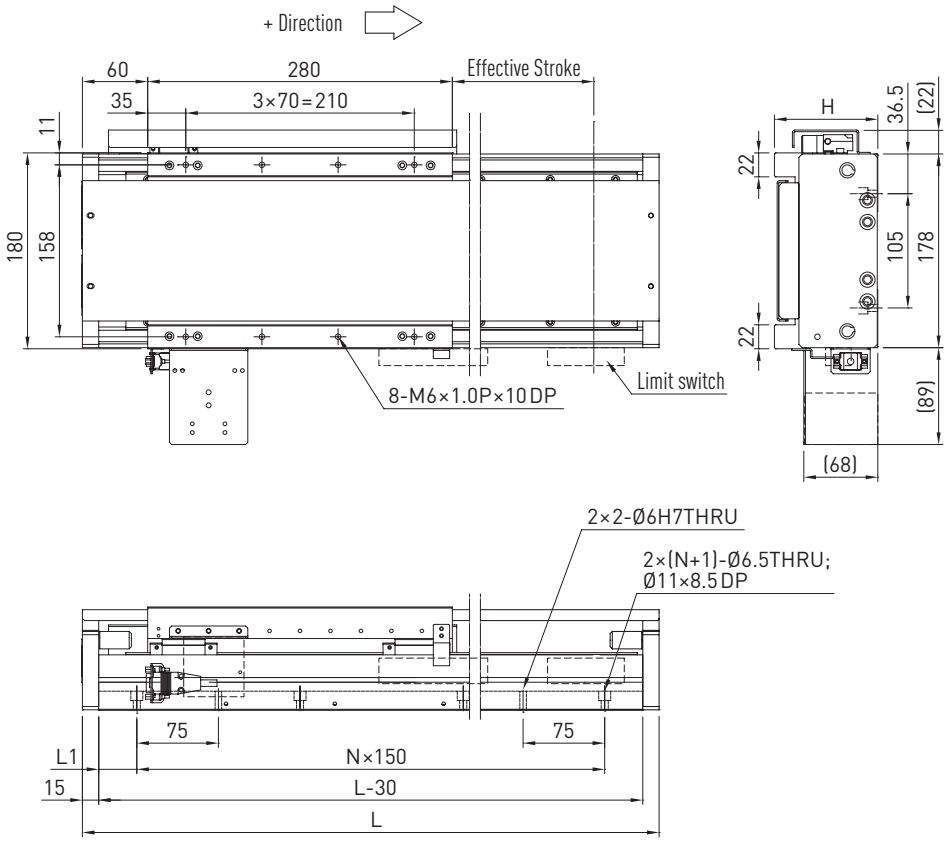
All values in mm

Table 5.9 **Dimensions and weights of LMX1E-CB7 with cover**

Stroke [mm]	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200
Total length L [mm]	460	560	660	760	860	960	1,060	1,160	1,260	1,360	1,460	1,560
L1 [mm]	65	40	90	65	40	90	65	40	90	65	40	90
N	1 [1)]	3	3	4	5	5	6	7	7	8	9	9
Weight [kg]	21	25	29	33	37	41	45	49	53	57	61	65
H [mm]	95	95	95	95	95	95	95	95	95	95	105	105

[1)] When stroke = 100 mm the mounting hole distance increases from 150 to 300 mm

Dimensions and weights of the LMX1E-CB8 linear motor axis with cover



All values in mm

Table 5.10 **Dimensions and weights of LMX1E-CB8 with cover**

Stroke [mm]	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200
Total length L [mm]	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500	1,600
L1 [mm]	85	60	35	85	60	35	85	60	35	85	60	35
N	1 [1)]	3	4	4	5	6	6	7	8	8	9	10
Weight [kg]	22	26	30	34	38	42	46	50	54	58	62	66
H [mm]	95	95	95	95	95	95	95	95	95	95	105	105

[1)] When stroke = 100 mm the mounting hole distance increases from 150 to 300 mm

6. High-speed linear motor axis LMV

6.1 Properties of the LMV linear motor axes

The new generation of small- to medium-load LMV linear motor axes was developed specifically for "more compact, lighter, and highly dynamic" solutions. The considerably reduced moving masses and the new linear motors from the LMSA series gave rise to a highly dynamic positioning axis that can bring its advantages to bear for both horizontal and vertical applications. Unlike other linear motor axes, the HIWIN linear motor axis LMV is characterised by maximised mechanical stability in a compact, weight-optimised design.
The QE series linear guideways featuring tried-and-tested SynchMotion™ technology have been optimised for high synchronism, speed, and acceleration; minimum noise emissions; and very long relubrication intervals. The extremely compact and virtually wear-free weight compensation operates with a magnetic constant force spring or pneumatic cylinder for the best dynamic properties in vertical applications.

Advantages of the LMV vertical axis

- Highly dynamic positioning axis, for vertical and horizontal applications
- Repeatability 0.005 mm with absolute distance measuring system
- Compact, zero-play setup
- Minimised cycle times
- Maximised mechanical rigidity
- Protected against dust
- Maximum process reliability and service life thanks to wear-free drive

6.2 Order code for LMV linear motor axes

LM	V	1	L	SA11	1	0872	C	1	0	0	0	XXX

Linear motor axis

Axis type:
V: Vertical axis

Number of axes:
1: Single axis

Axis profile:
L: Iron-core motors (LMSA)

Motor type:
LMSAxx: Motor size

Number of carriages

Stroke length [mm]

Distance measuring system:
C: HIWIN MAGIC: magnetic, period 1 mm, 1 V_{PP} sin/cos
X: Magnetic, absolute with BiSS C interface
Magnetic, absolute with HIPERFACE interface

Limit switches:
0: None
1: Inductive, PNP (standard)

Cover:
0: None (standard)

Energy supply alignment:
0: None (standard)
1: Horizontal alignment

Energy supply size:
0: Standard for LMV axes

Job number of drawing, hall sensor, weight compensation, clamping, special mounting holes

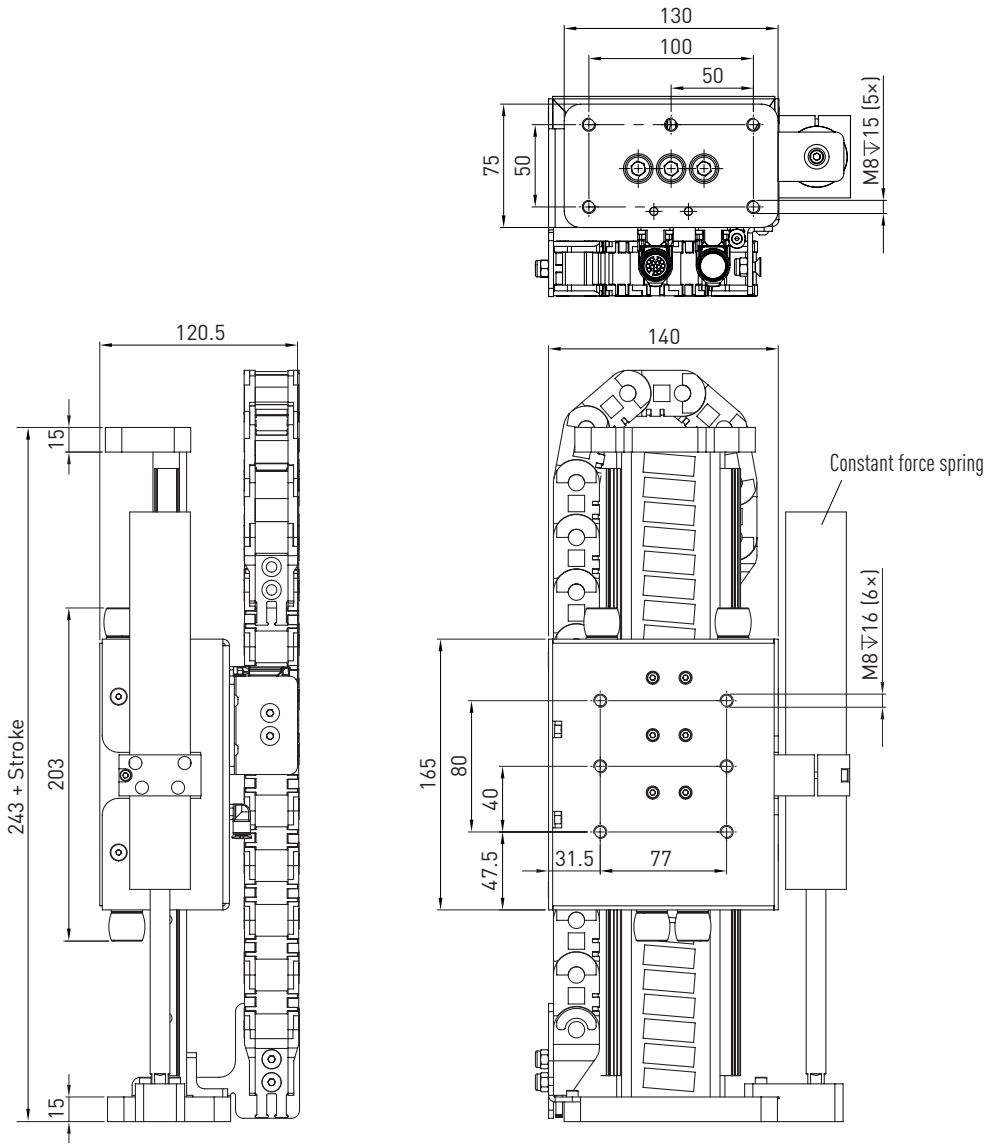
6.3 Linear motor axis LMV specifications

Table 6.1 **Specifications of linear motor axis LMV1L-SA11**

Stroke [mm]	50	180	300
Max. acceleration [m/s²]	50		
Max. velocity [m/s]	2.5		
Max. payload [kg]	3	30 [1)]	
Motor	LMSA11		
Continuous force [N]	103		
Peak force [N]	289		
Repeatability [mm]	0.005 [2)]		
Profile rail	QE15		
Distance measuring system	Absolute magnetic BiSS C; absolute magnetic HIPERFACE; incremental magnetic		
Clamping (optional)	Yes		
Weight compensation (optional)	Constant force spring	Constant force spring, pneumatic cylinder	
Energy chain (optional)	Yes		

[1)] With pneumatic weight compensation
[2)] With absolute distance measuring system

Dimensions of the linear motor axis LMV



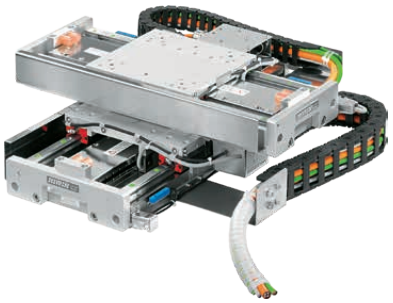
All values in mm

7. Cross table LMX2E

7.1 Properties of the LMX2E 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 X is possible. A cross table with LMX2E axis is shown in this chapter.

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



7.2 Order code for LMX2E cross tables

LM	X	2	E	CB5	CB8	232	280	A	1	XXX

Linear motor axis

Axis type:
X: Horizontal axis

Number of axes:
2: Two axes

Axis profile:
E: Ironless motors (LMC)
C: Customised

Motor type of upper axis:
LMCxx: Motor size

Motor type of lower axis:
LMCxx: Motor size

Stroke length of upper axis [mm]

Stroke length of lower axis [mm]

Job number of drawing, several forcers, hall sensor, weight compensation, brake, special mounting holes

Limit switches:
0: None
1: Inductive, PNP (standard)
2: Optical, NPN

Distance measuring system:
A: Optical, period 40 µm, analogue 1 V_{PP} sin/cos
C: HIWIN MAGIC: magnetic, period 1 mm, 1 V_{PP} sin/cos
D: HIWIN MAGIC-PG: magnetic, period 1 mm, 1 V_{PP} sin/cos
Magnetic scale integrated in guiding rail
X: Magnetic, absolute with BiSS C interface
Magnetic, absolute with HIPERFACE interface
Optical, absolute, encapsulated with EnDat interface
Optical, absolute, encapsulated with DRIVE-CLiQ interface
Optical, absolute, encapsulated with FANUC interface
Optical, digital TTL, resolution 1 µm

7.3 Cross table LMX2E specifications

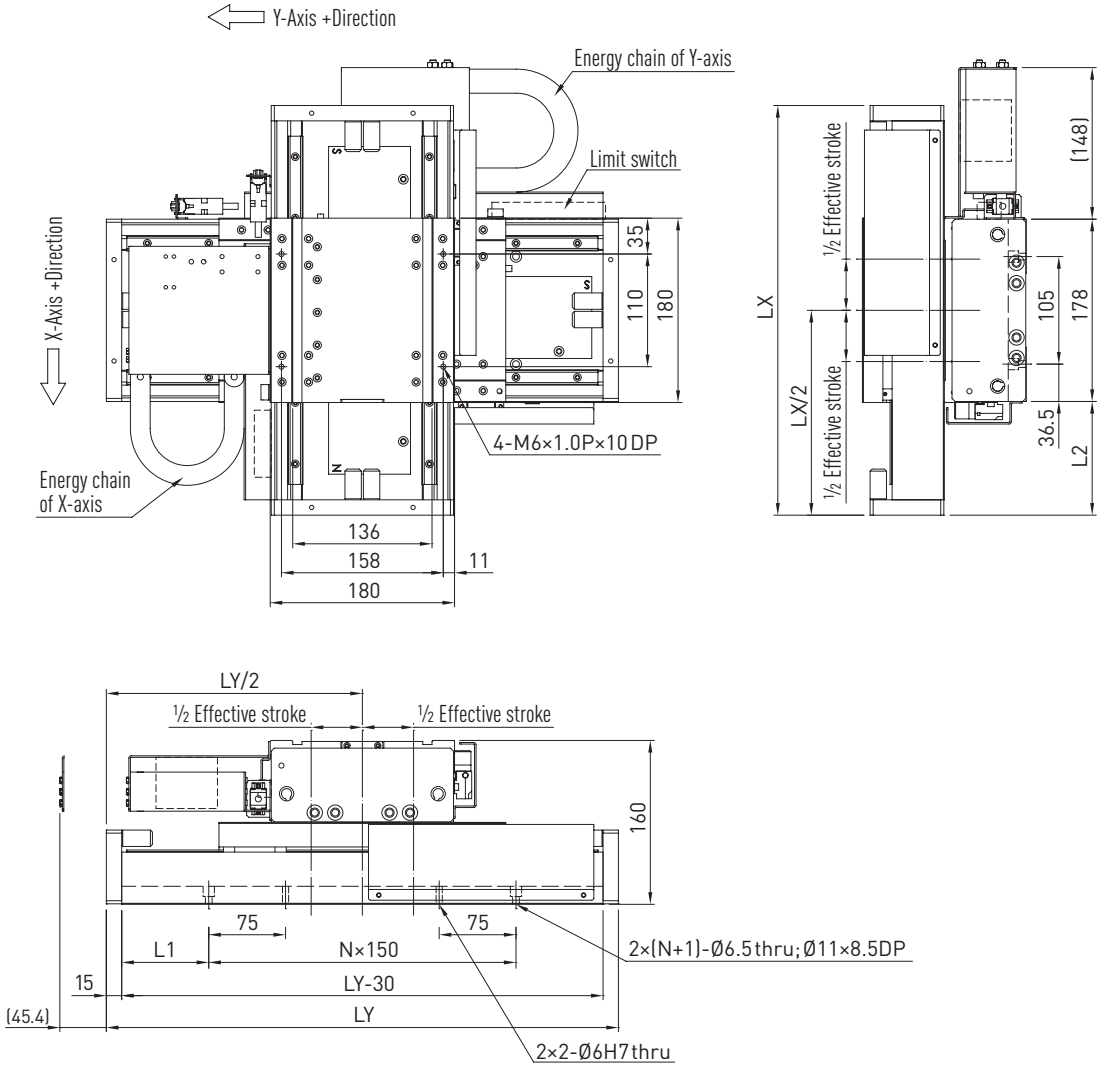
Table 7.1 **Technical data for LMX2E-CB5-CB8 cross table**

Name (article number) xxxx = stroke [mm]	Orthogonality [arc-sec]	Repeatability [mm]	v_{max} [m/s]	a_{max} [m/s²]	Motor type	F_c [N]	F_p [N]	Weight of carriage [kg]
LMX2E-CB5 CB8-xxxx-xxxx-A1	± 10	± 0.002	5	100	Upper axis: LMCB5	91	364	2.5
					Lower axis: LMCB8	145	580	Weight upper axis + 4.0

F_c = Continuous power, 100 % operating time (ED), at 100 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors: see catalogue "Linear Motors and Distance Measuring Systems"

7.3.1 LMX2E-CB5-CB8 cross table without cover

Dimensions and weights of the LMX2E-CB5-CB8 cross table without cover



All values in mm

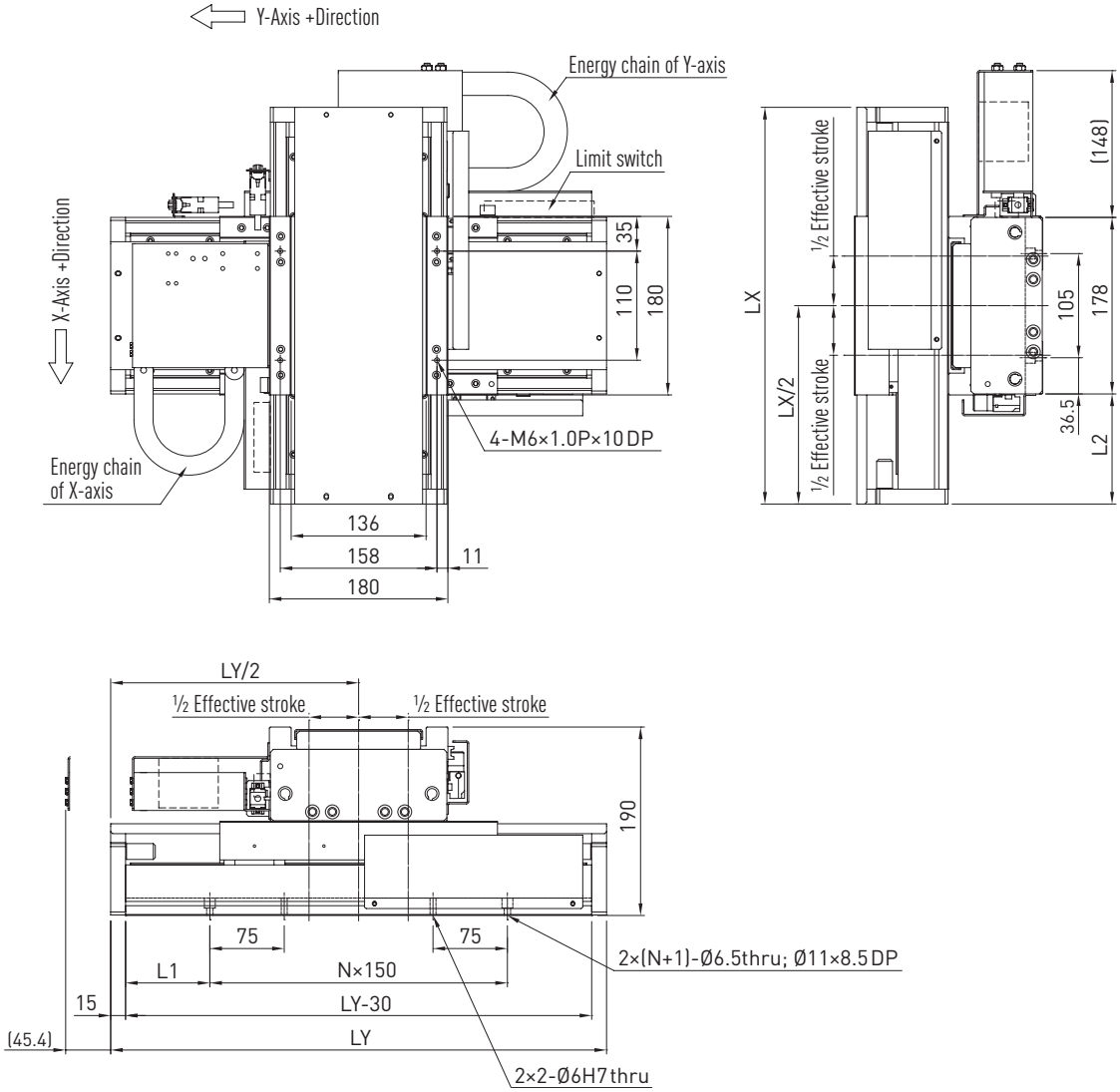
Table 7.2 **Dimensions and weights of LMX2E-CB5-CB8 without cover**

Stroke [mm]		Total length [mm]		L1 [mm]	L2 [mm]	N	Weight of carriage axis X [kg]	Weight of carriage axis Y [kg]	Total weight cross table [kg]
Axis X	**Axis Y**	**LX**	**LY**						
100	100	400	500	85	111	1 [1)]	2.5	20	44
100	200	400	600	60	111	3	2.5	20	46
200	200	500	600	60	161	3	2.5	22	48
100	300	400	700	35	111	4	2.5	20	48
200	300	500	700	35	161	4	2.5	22	50
300	300	600	700	35	211	4	2.5	24	52
100	400	400	800	85	111	4	2.5	20	50
200	400	500	800	85	161	4	2.5	22	52
300	400	600	800	85	211	4	2.5	24	54

[1)] When stroke = 100 mm the mounting hole distance increases from 150 to 300 mm

7.3.2 LMX2E-CB5-CB8 cross table with cover

Dimensions and weights of the LMX2E-CB5-CB8 cross table with cover



All values in mm

Table 7.3 **Dimensions and weights of LMX2E-CB5-CB8 with cover**

Stroke [mm]		Total length [mm]		L1 [mm]	L2 [mm]	N	Weight of carriage axis X [kg]	Weight of carriage axis Y [kg]	Total weight cross table [kg]
Axis X	**Axis Y**	**LX**	**LY**						
100	100	400	500	85	111	1 [1)]	2.5	20	44
100	200	400	600	60	111	3	2.5	20	46
200	200	500	600	60	161	3	2.5	22	48
100	300	400	700	35	111	4	2.5	20	48
200	300	500	700	35	161	4	2.5	22	50
300	300	600	700	35	211	4	2.5	24	52
100	400	400	800	85	111	4	2.5	20	50
200	400	500	800	85	161	4	2.5	22	52
300	400	600	800	85	211	4	2.5	24	54

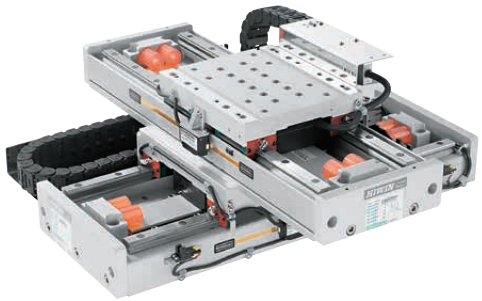
[1)] When stroke = 100 mm the mounting hole distance increases from 150 to 300 mm

8. Cross table LMX2L

8.1 Properties of the LMX2L 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 X is possible. A cross table with LMX2L axis is shown in this chapter.

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



8.2 Order code for LMX2L cross tables

LM	X	2	L	S23	S27	232	280	A	1	XXX

Linear motor axis

Axis type:
X: Horizontal axis

Number of axes:
2: Two axes

Axis profile:
L: Iron-core motors (LMS)
C: Customised

Motor type of upper axis:
LMSxx: Motor size

Motor type of lower axis:
LMSxx: Motor size

Stroke length of upper axis [mm]

Stroke length of lower axis [mm]

Job number of drawing, several forcers, hall sensor, weight compensation, brake, special mounting holes

Limit switches:
0: None
1: Inductive, PNP (standard)
2: Optical, NPN

Distance measuring system:
A: Optical, period 40 µm, analogue 1 V_{PP} sin/cos
C: HIWIN MAGIC: magnetic, period 1 mm, 1 V_{PP} sin/cos
D: HIWIN MAGIC-PG: magnetic, period 1 mm, 1 V_{PP} sin/cos
Magnetic scale integrated in guiding rail
X: Magnetic, absolute with BiSS C interface
Magnetic, absolute with HIPERFACE interface
Optical, absolute, encapsulated with EnDat interface
Optical, absolute, encapsulated with DRIVE-CLiQ interface
Optical, absolute, encapsulated with FANUC interface
Optical, digital TTL, resolution 1 µm

8.3 Cross table LMX2L specifications

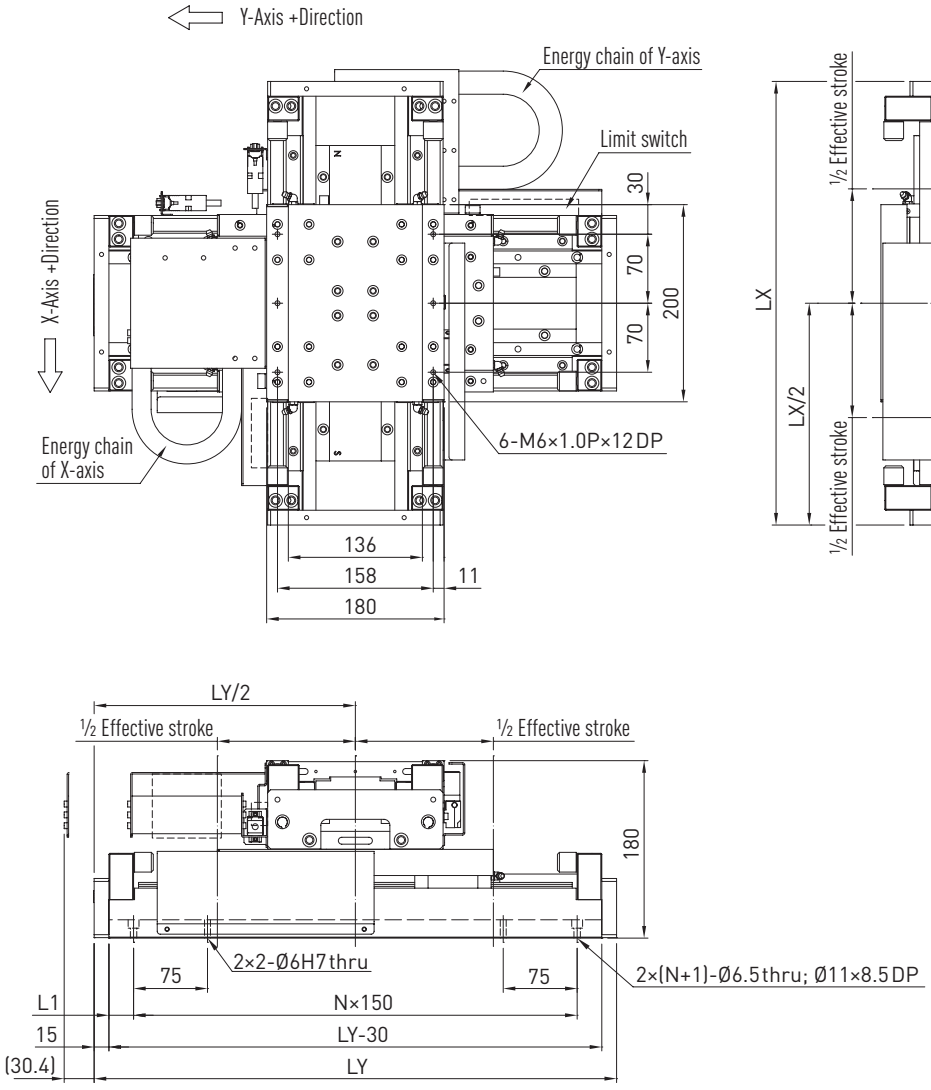
Table 8.1 **Technical data of LMX2L-S23-S27 cross table**

Name (article number) xxxx = stroke [mm]	Orthogonality [arc-sec]	Repeatability [mm]	v_{max} [m/s]	a_{max} [m/s²]	Motor type	F_c [N]	F_p [N]	Weight of carriage [kg]
LMX2L-S23 S27-xxxx-xxxx-A1	± 10	± 0.002	4	50	Upper axis: LMS23	240	480	7.5
					Lower axis: LMS27	382	764	Weight upper axis + 9.5

F_c = Continuous power, 100 % operating time (ED), at 120 °C winding temperature
F_p = Peak force (1 s)
Electrical parameters for linear motors: see catalogue "Linear Motors and Distance Measuring Systems and Distance Measuring Systems"

8.3.1 LMX2L-S23-S27 cross table without cover

Dimensions and weights of the LMX2L-S23-S27 cross table without cover



All values in mm

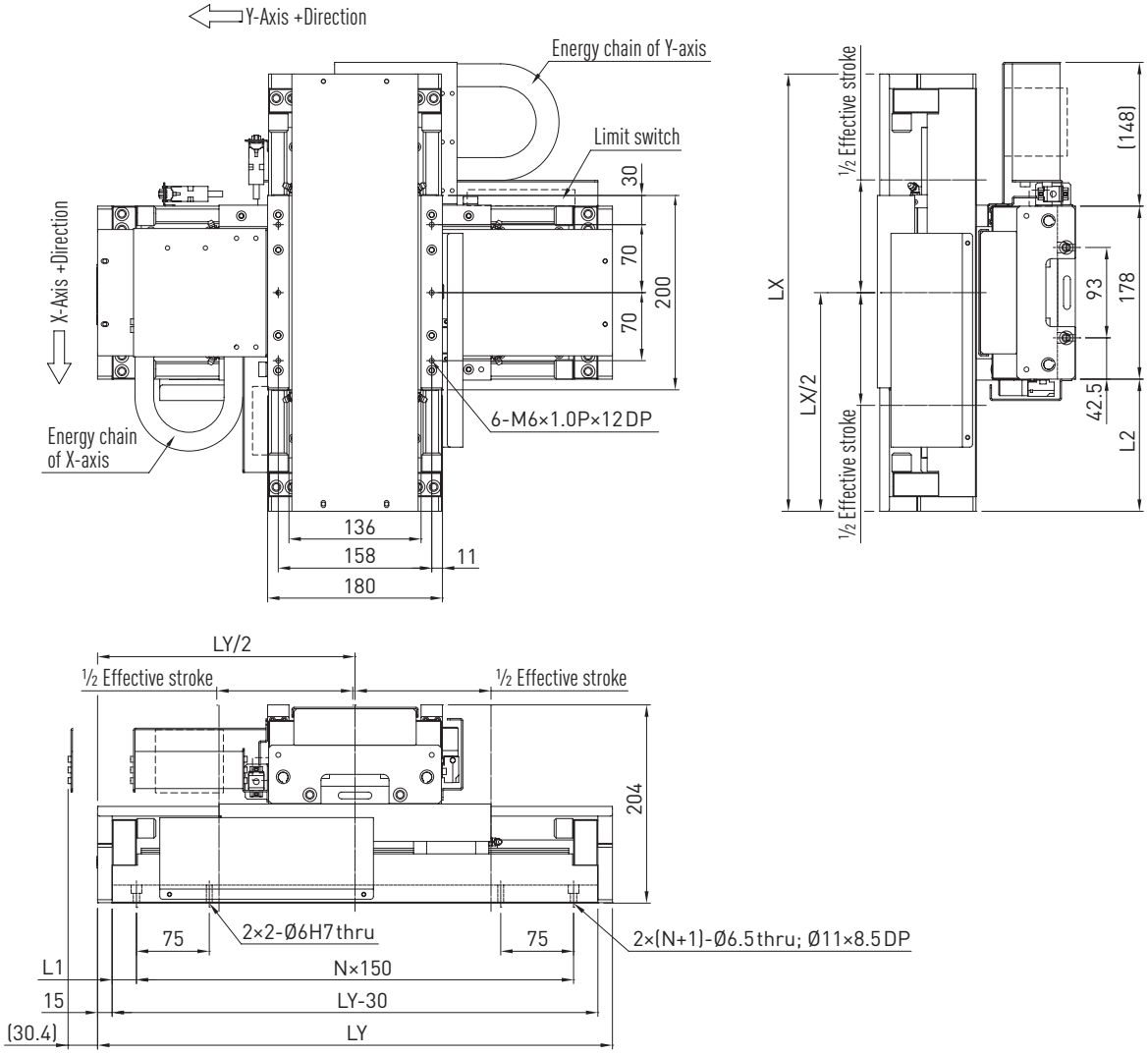
Table 8.2 **Dimensions and weights of LMX2L-S23-S27 without cover**

Stroke [mm]		Total length [mm]		L1 [mm]	L2 [mm]	N	Weight of carriage axis X [kg]	Weight of carriage axis Y [kg]	Total weight cross table [kg]
Axis X	**Axis Y**	**LX**	**LY**						
100	100	450	530	25	136	1 [1)]	7.5	22	48
100	200	450	630	75	136	3	7.5	22	50
200	200	550	630	75	186	3	7.5	24	52
100	300	450	730	50	136	4	7.5	22	52
200	300	550	730	50	186	4	7.5	24	54
300	300	650	730	50	236	4	7.5	26	56
100	400	450	830	25	136	5	7.5	22	54
200	400	550	830	25	186	5	7.5	24	56
300	400	650	830	25	236	5	7.5	26	58

[1)] When stroke = 100 mm the mounting hole distance increases from 150 to 300 mm

8.3.2 LMX2L-S23-S27 cross table with cover

Dimensions and weights of the LMX2L-S23-S27 cross table with cover



All values in mm

Table 8.3 **Dimensions and weights of LMX2L-S23-S27 with cover**

Stroke [mm]		Total length [mm]		L1 [mm]	L2 [mm]	N	Weight of carriage axis X [kg]	Weight of carriage axis Y [kg]	Total weight cross table [kg]
Axis X	**Axis Y**	**LX**	**LY**						
100	100	450	530	25	136	1 [1)]	7.5	22	48
100	200	450	630	75	136	3	7.5	22	50
200	200	550	630	75	186	3	7.5	24	52
100	300	450	730	50	136	4	7.5	22	52
200	300	550	730	50	186	4	7.5	24	54
300	300	650	730	50	236	4	7.5	26	56
100	400	450	830	25	136	5	7.5	22	54
200	400	550	830	25	186	5	7.5	24	56
300	400	650	830	25	236	5	7.5	26	58

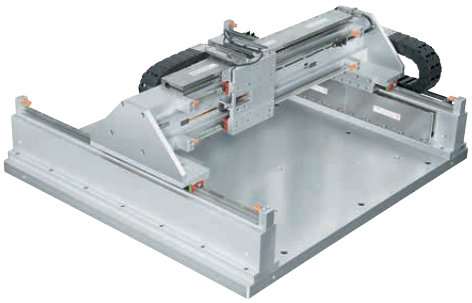
[1)] When stroke = 100 mm the mounting hole distance increases from 150 to 300 mm

9. Gantry system LMG2A-C

9.1 Properties of the LMG2A-C 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.

- Equipped with coreless linear motors
- Slight inertia and fast acceleration
- No cogging
- Stiff aluminium bridge



9.2 Order code for LMG2A-C gantry systems

LM	G	2	A	CB6	CB8	300	400	A	2	XXX

Linear motor axis

Axis type:
G: Gantry system

Number of axes:
2: Two axes

Axis profile:
A: Type A
C: Customised

Motor type of upper axis:
LMCxx: Motor size

Motor type of lower axis:
LMCxx: Motor size

Stroke length of upper axis [mm]

Stroke length of lower axis [mm]

Job number of drawing, several forcers, hall sensor, weight compensation, brake, special mounting holes

Limit switches:
0: None
1: Inductive, PNP (standard)
2: Optical, NPN

Distance measuring system:
A: Optical, period 40 µm, analogue 1 V_{PP} sin/cos
C: HIWIN MAGIC: magnetic, period 1 mm, 1 V_{PP} sin/cos
D: HIWIN MAGIC-PG: magnetic, period 1 mm, 1 V_{PP} sin/cos
Magnetic scale integrated in guiding rail
X: Magnetic, absolute with BiSS C interface
Magnetic, absolute with HIPERFACE interface
Optical, absolute, encapsulated with EnDat interface
Optical, absolute, encapsulated with DRIVE-CLiQ interface
Optical, absolute, encapsulated with FANUC interface
Optical, digital TTL, resolution 1 µm

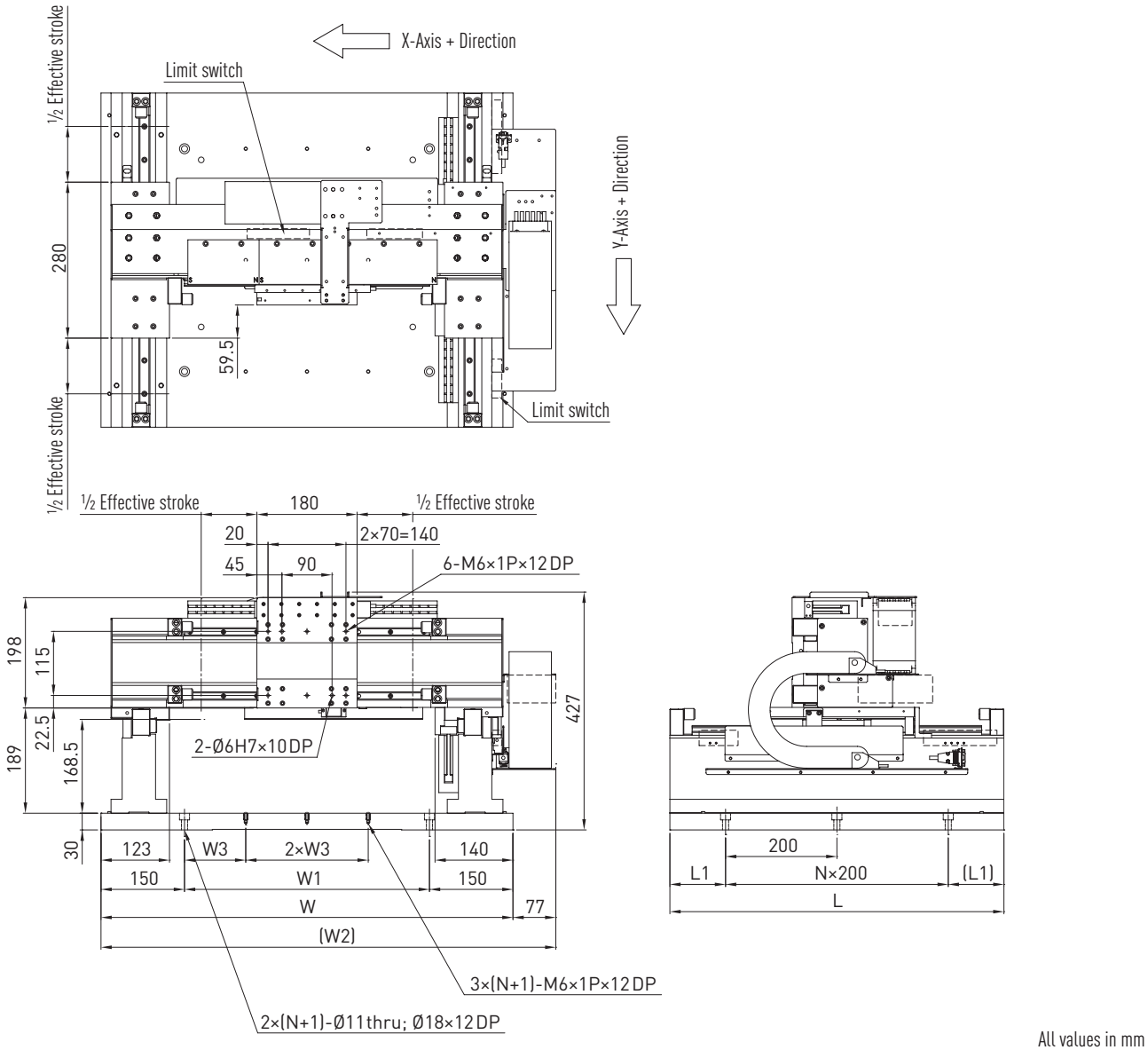
9.3 Gantry system LMG2A-C specifications

Table 9.1 **Technical data of LMG2A-CB6 CC8 gantry system**

Name (article number) xxxx = stroke [mm]	Orthogonality [arc-sec]	Repeatability [mm]	v_{max} [m/s]	a_{max} [m/s²]	Motor type	F_c [N]	F_p [N]	Weight of carriage [kg]
LMG2A-CB6 CC8-xxxx-xxxx-A1	± 10	± 0.002/0.004	5	100	Upper axis: LMCB6	109	436	3.0
					Lower axis: LMCC8	145	580	Weight upper axis + 3.5

Fc = Continuous power, 100 % operating time (ED), at 100 °C winding temperature
Fp = Peak force (1 s)
Electrical parameters for linear motors: see catalogue "Linear Motors and Distance Measuring Systems"

Dimensions and weights of the LMG2A-CB6 CC8 gantry system



All values in mm

Table 9.2 **Dimensions and weights of LMG2A-CB6 CC8 (axis X top)**

Stroke [mm]	W [mm]	W1 [mm]	W2 [mm]	W3 [mm]	Weight of carriage [kg]	Total weight axis X [kg]
200	740	440	817	110	5	25
300	840	540	917	135	5	29
400	940	640	1,017	160	5	33
500	1,040	740	1,117	185	5	37
600	1,140	840	1,217	210	5	41

Table 9.3 **Dimensions and weights of LMG2A-CB6 CC8 (axis X below)**

Stroke [mm]	N	L [mm]	L1 [mm]	Weight of carriage [kg]
200	2	600	100	Total weight axis X + 6
300	3	700	50	Total weight axis X + 6
400	3	800	100	Total weight axis X + 6
500	4	900	50	Total weight axis X + 6
600	4	1,000	100	Total weight axis X + 6

10. Gantry system LMG2A-S

10.1 Properties of the LMG2A-S gantry systems

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

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

10.2 Order code for LMG2A-S gantry systems

LM	G	2	A	S13	S27	300	400	A	2	XXX

Linear motor axis

Axis type:
G: Gantry system

Number of axes:
2: Two axes

Axis profile:
A: Type A
C: Customised

Motor type of upper axis:
LMSxx: Motor size

Motor type of lower axis:
LMSxx: Motor size

Stroke length of upper axis [mm]

Stroke length of lower axis [mm]

Job number of drawing, several forcers, hall sensor, weight compensation, brake, special mounting holes

Limit switches:
0: None
1: Inductive, PNP (standard)
2: Optical, NPN

Distance measuring system:
A: Optical, period 40 µm, analogue 1 V_{PP} sin/cos
C: HIWIN MAGIC: magnetic, period 1 mm, 1 V_{PP} sin/cos
D: HIWIN MAGIC-PG: magnetic, period 1 mm, 1 V_{PP} sin/cos
Magnetic scale integrated in guiding rail
X: Magnetic, absolute with BiSS C interface
Magnetic, absolute with HIPERFACE interface
Optical, absolute, encapsulated with EnDat interface
Optical, absolute, encapsulated with DRIVE-CLiQ interface
Optical, absolute, encapsulated with FANUC interface
Optical, digital TTL, resolution 1 µm

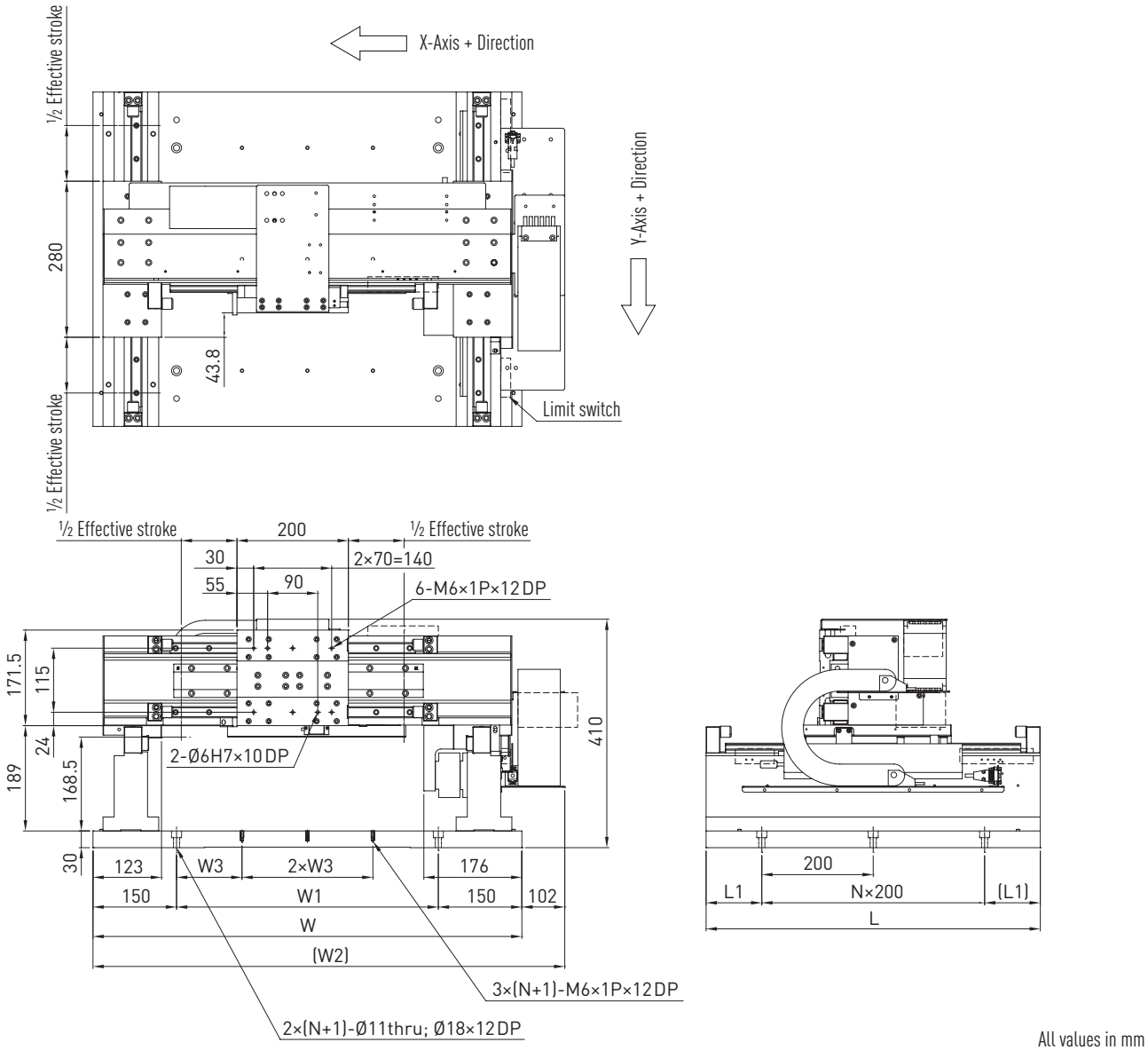
10.3 Gantry system LMG2A-S specifications

Table 10.1 **Technical data of LMG2A-S13 S27 gantry system**

Name (article number) xxxx = stroke [mm]	Orthogonality [arc-sec]	Repeatability [mm]	v_{max} [m/s]	a_{max} [m/s²]	Motor type	F_c [N]	F_p [N]	Weight of carriage [kg]
LMG2A-S13 S27-xxxx-xxxx-A1	± 10	± 0.002/0.004	4	50	Upper axis: LMS13	203	406	5.0
					Lower axis: LMS27	382	382	Weight upper axis + 7

Fc = Continuous power, 100 % operating time (ED), at 120 °C winding temperature
Fp = Peak force (1 s)
Electrical parameters for linear motors: see catalogue "Linear Motors and Distance Measuring Systems"

Dimensions and weights of the LMG2A-S13 S27 gantry system



All values in mm

Table 10.2 **Dimensions and weights of LMG2A-S13 S27 (axis X top)**

Stroke [mm]	W [mm]	W1 [mm]	W2 [mm]	W3 [mm]	Weight of carriage [kg]	Total weight axis X [kg]
200	770	470	847	117.5	7	24
300	870	570	947	142.5	7	27
400	970	670	1,047	167.5	7	30
500	1,070	770	1,147	192.5	7	33
600	1,170	870	1,247	217.5	7	36

Table 10.3 **Dimensions and weights of LMG2A-S13 S27 (axis X below)**

Stroke [mm]	N	L [mm]	L1 [mm]	Weight of carriage [kg]
200	2	600	100	Total weight axis X + 8
300	3	700	50	Total weight axis X + 8
400	3	800	100	Total weight axis X + 8
500	4	900	50	Total weight axis X + 8
600	4	1,000	100	Total weight axis X + 8

11. Customized positioning systems

The standardized positioning stages shown in this catalogue 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.

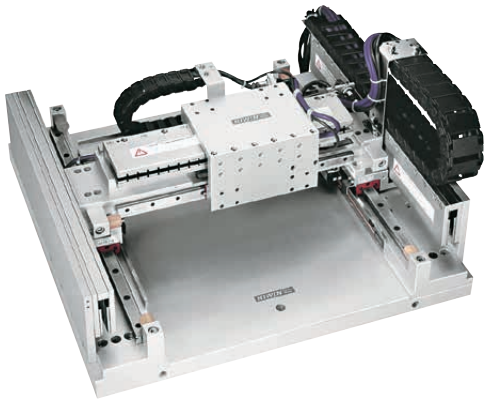
11.1 Examples

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

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

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

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



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

- Flatness ± 2 µm
- Repeatability ± 0.5 µm
- Accuracy ± 2 µm
- Resolution 5 nm

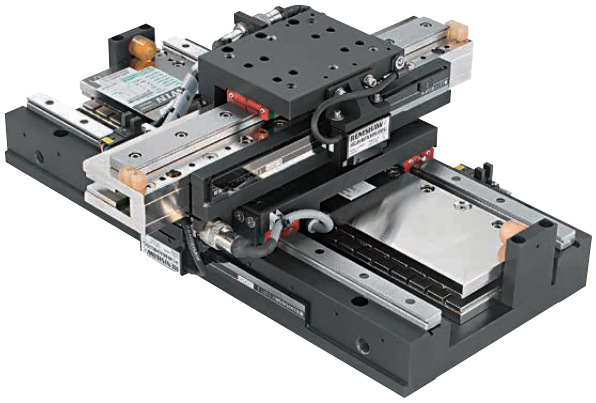
Linear Motor Systems

Customized positioning systems

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 X-Y Stages are ideal for these tasks.

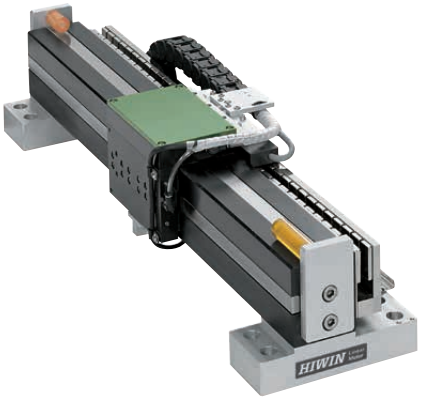
- Stroke 200 × 200 mm, optional 300 × 300 mm
- Flatness ± 4 µm across the complete stroke
- Repeatability ± 1 µm across both axes
- Accuracy ± 4 µm across both axes
- Clean room suitability class 100, optional class 10
- Optionally suitable for vacuums up to 10^{-3} mbar



Overview for laser scanners

High degree of synchronization and extended operating lives are a must for optical inspection systems such as laser scanners. Linear motors with air bearings fulfil these requirements.

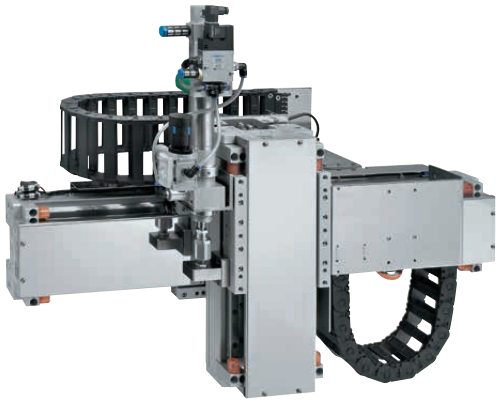
- No friction thanks to air bearings
- No cogging thanks to coreless linear motors
- Stroke up to 1,500 mm



Photovoltaic-panel assembly

High dynamic positioning of silicium cells for 24 hours each day.

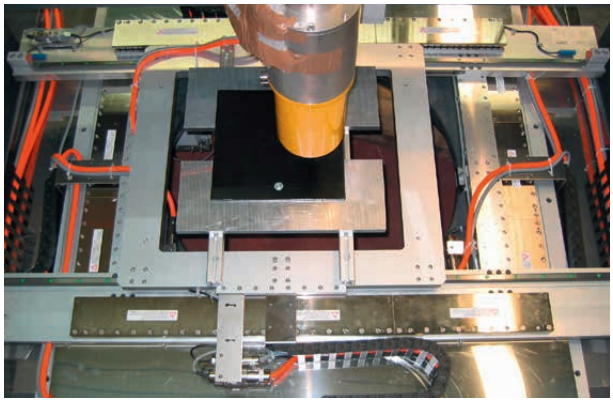
- Linear motors also in vertical axes enable a long durability
- Vertical axes with adjustable mass compensation and clamping element for emergency-stop



X-ray-inspection of printed circuit boards

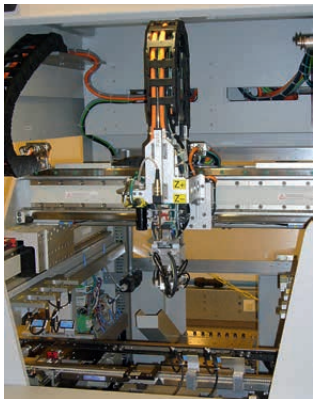
Delivery of the whole linear-motor-system consisting of Linear motor axis, drives, cables for an inline inspection machine.

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



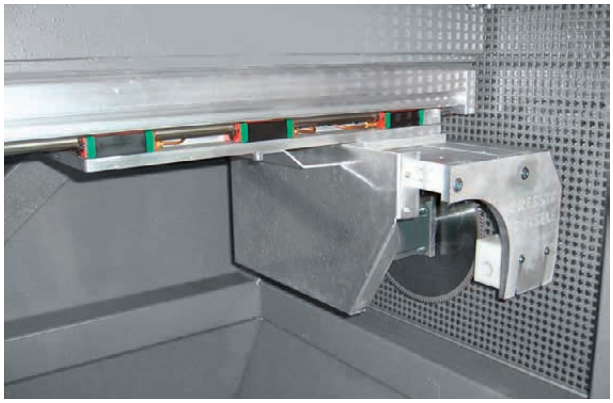
Automatic assembly
Dynamic Assembly of circuit boards in fully automated assembly lines.

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



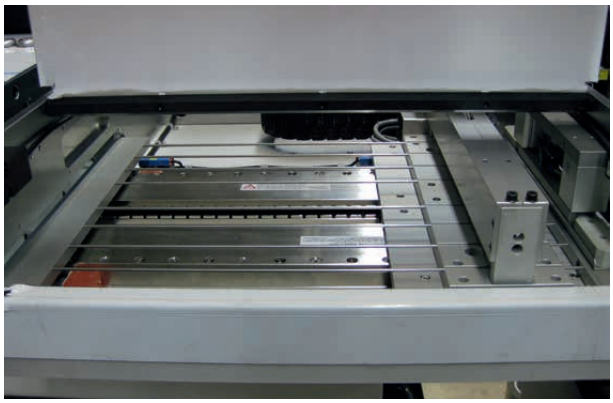
Moveable Saw
Linear motor axis enables the cutting during the transport of bars.

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



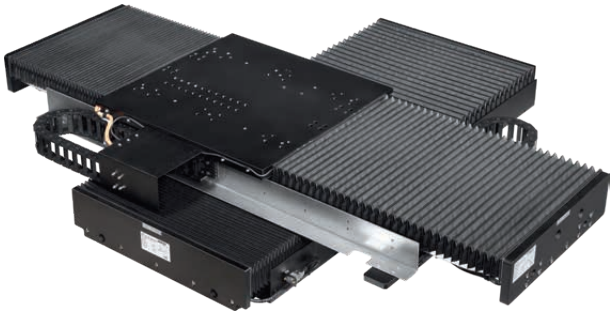
Film transport
Film transport Compact and flat linear motor axis with high power density integrated in the production line.

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



Laser trimming with maximum precision
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 arc-sec



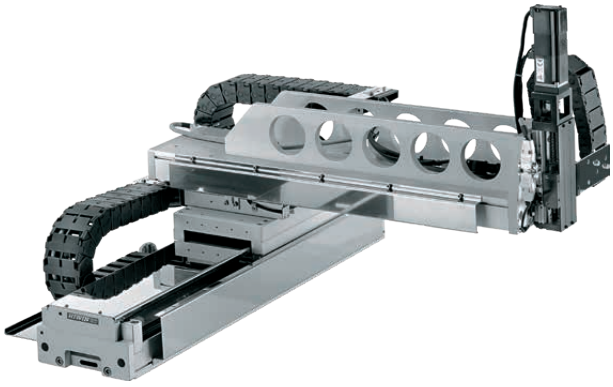
Linear Motor Systems

Customized positioning systems

Dispenser

Highest requirements on the flatness.

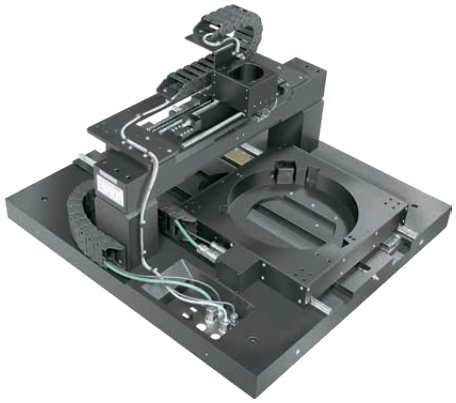
- Stroke of cross table: 150 × 250 × 60 mm
- High rigidity of the lower axis due to the steel frame
- Upper axis stiffened by aluminium profile
- Creation of a calibration chart to compensate the deviation of the flatness
- Flatness ± 10/300 mm
- Repeatability 5 µm



Laser scripting

High accuracy due the use of glass scales.

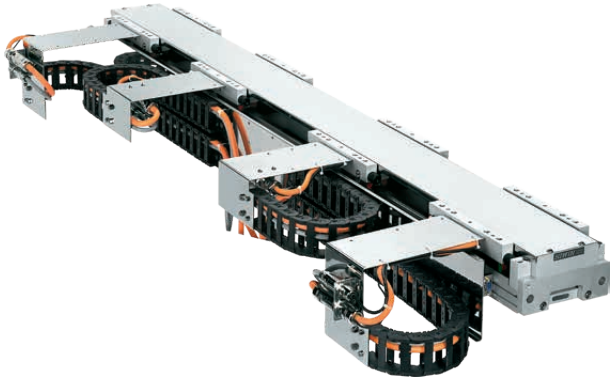
- Customised LMC linear motor system
- Stroke 400 × 110 mm
- Lower axis positions the workpiece. Upper axis operates the laser
- Repeatability ± 1 µm
- Rectangularity 8 µm
- Flatness ± 5 µm



Laser exposure

Excellent results enabled due to the very smooth motion of the coreless linear motor axis.

- 4 forcers on each axis
- High degree of synchronization due to the use of special linear guideways
- Optimised adaptation of the axis profile to the existing machine frame

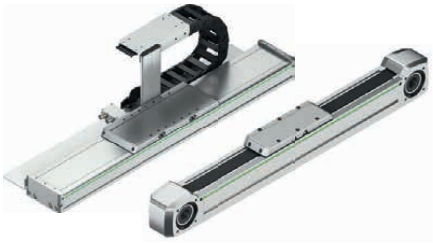


Notes

We live motion.

Linear Guideways

Ballscrews



Linear Axes

Linear Axis Systems

Torque Motors

Robots

Linear Motor Components

Rotary Tables

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