

Precision axes and precision systems

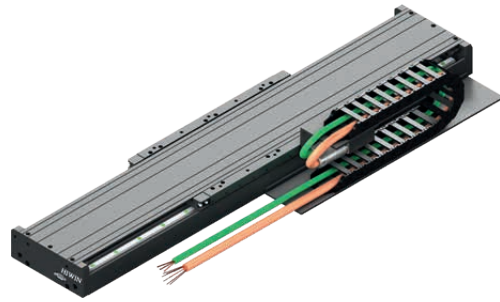
Linear motor axis LMX1A

7. Linear motor axis LMX1A

7.1 Properties of the LMX1A linear motor axis

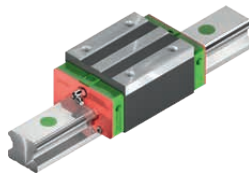
HIWIN LMX1A linear motor axes can be customised to a high degree, meaning they can be adapted to customer-specific movement tasks. They meet the highest precision requirements by integrating the guide system and linear motor into a solid ground precision strand casting profile. Thanks to high-resolution distance measuring systems, repeatability of $\pm 0.05 \mu\text{m}$ can be achieved.

Depending on the load capacity and requirement for dynamics, the motor type and size can be individually configured.



Linear guideway

A high-quality HIWIN double guide safely transfers forces and torques from the carriage to the axis profile. Four blocks are used per carriage, which are guided on two parallel, high-precision profile rails. SynchMotion™ technology with ball chain also ensures good synchronisation and very smooth running in all sizes.



Distance measuring systems

The distance measuring system is integrated into the inside of the axis to save space and determines the repeatability. Different measuring systems are available depending on the requirements for measuring method, interface and resolution.



Linear motor

The integrated HIWIN linear motors ensure dynamic and precise positioning. LMSA motors with iron core are the first choice when high feed forces are required. Ironless motors are the first choice for applications with the highest requirements for synchronisation.



Energy chain

Generously dimensioned energy chains provide space for safely carrying the supply lines. The axes are optionally available with horizontal or vertical energy supply.



7.2 Order code for LMX1A linear motor axes

LM	X	1	A	SA21	1	0872	A	1	E	0	CL	XXX
Linear motor axis	Axis version:	Number of axes:	Axis profile:	Motor type:	Number of travel carriages	Stroke length [mm]	Distance measuring system:	Limit switches:				Order number of the drawing, multiple forcers, Hall sensor, weight compensation, brake, special mounting holes
	X: Horizontal axis	1: Single axis	A: Motors with iron core (LMSA)	LMSAxx: Motor size			A: Optical, period 40 µm, analogue 1 V _{SS} 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	0: None 1: Inductive, PNP (standard) 2: Inductive, NPN				Central lubrication: 0: None CL: With central lubrication
												Energy chain: 0: None V1: Vertical, inner cross-section: 21 × 25 mm V2: Vertical, inner cross-section: 21 × 38 mm V3: Vertical, inner cross-section: 21 × 50 mm V4: Vertical, inner cross-section: 21 × 68 mm H1: Horizontal, inner cross-section: 21 × 25 mm H2: Horizontal, inner cross-section: 21 × 38 mm
												Limit switch connection: E: Front Sub-D connector S: Side outlet, 300 mm Sub-D connector

Precision axes and precision systems

Linear motor axis LMX1A

7.4 General dimensions and specifications for LMX1A precision axes

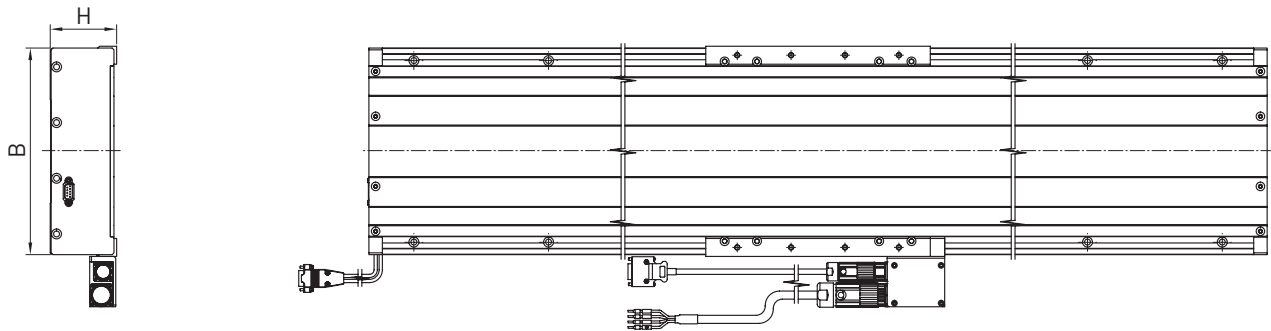


Table 7.2 General dimensions and specifications for LMX1A precision axes

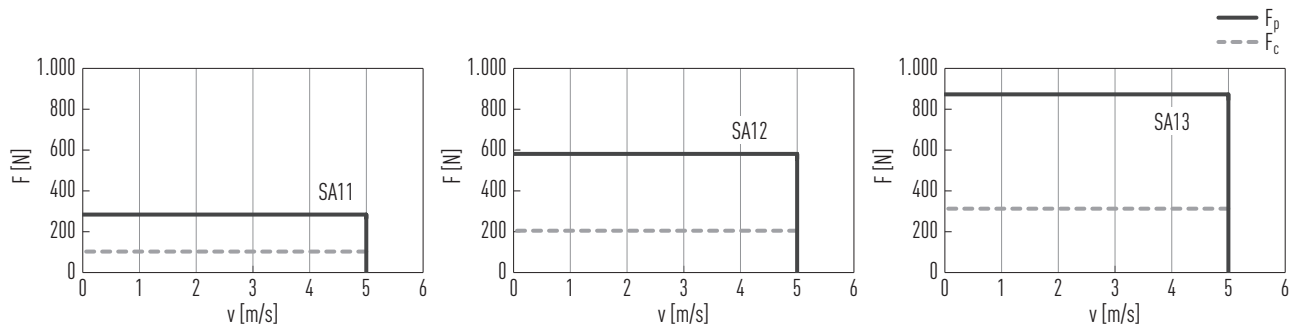
	Motor type	Max stroke length ST*	Profile width W	Profile height H
LMX1A-SA1	With iron core (LMSA)	4000	186	68
LMX1A-SA2	With iron core (LMSA)	4000	230	74
LMX1A-SA3	With iron core (LMSA)	4000	262	80

* Depending on the exact specification

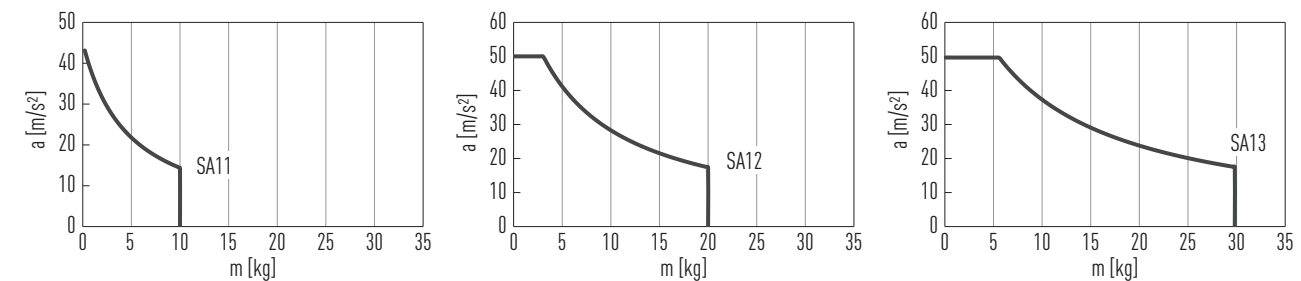
7.3 Dimensions and specifications for LMX1A precision axes

7.3.1 Characteristic curves of LMX1A-SA11/SA12/SA13

Force depending on speed (intermediate circuit voltage: 600 VDC)



Acceleration depending on load capacity (intermediate circuit voltage: 600 VDC)



7.3.2 Technical data for LMX1A -SA11/SA12/SA13

Table 7.1 Technical data for LMX1A-SA11/SA12/SA13

	Symbol	Unit	LMX1A-SA11	LMX1A-SA12	LMX1A-SA13
Continuous force¹⁾	F_c	N	103	205	308
Peak force¹⁾	F_p	N	289	579	868
Stroke length		mm	100 – 4,000		

Resolution of 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		
Precision		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 % cyclic duration factor (CDF), with 120 °C coil temperature; F_p: 1 s

For the electrical parameters for the linear motors see catalogue "Linear Motors and Distance Measuring Systems"

7.4.1 Dimensions of LMX1A-SA11/SA12/SA13

Table 7.3 Dimensions of LMX1A-SA11 (for dimensional drawing see Page 108)

Stroke length	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 depends on the inner cross-section of the energy chain (see order code on Page 105)

Table 7.4 Dimensions of LMX1A-SA12 (for dimensional drawing see Page 109)

Stroke length	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 depends on the inner cross-section of the energy chain (see order code on Page 105)

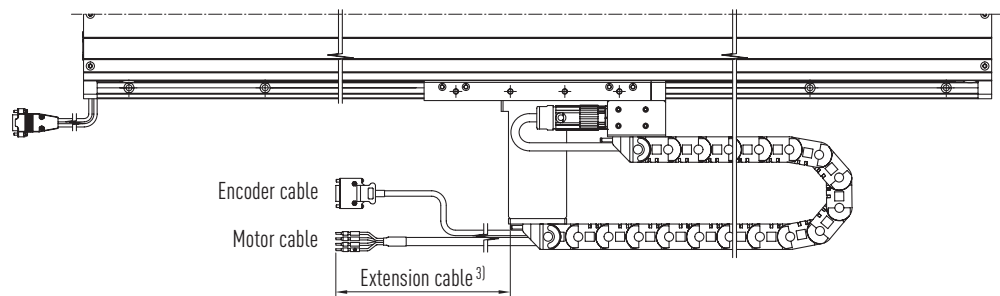
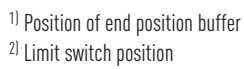
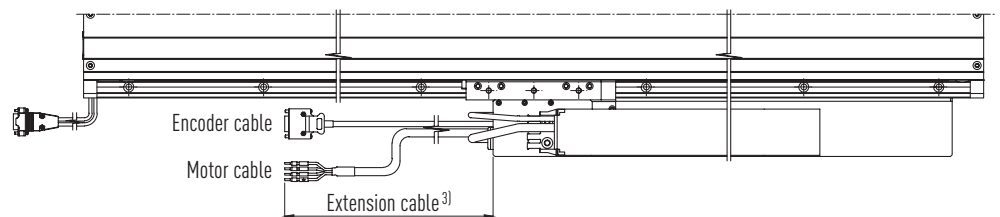
Table 7.5 Dimensions of LMX1A-SA13 (for dimensional drawing see Page 110)

Stroke length	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 depends on the inner cross-section of the energy chain (see order code on Page 105)

Linear motor axis LMX1A

Without energy supply

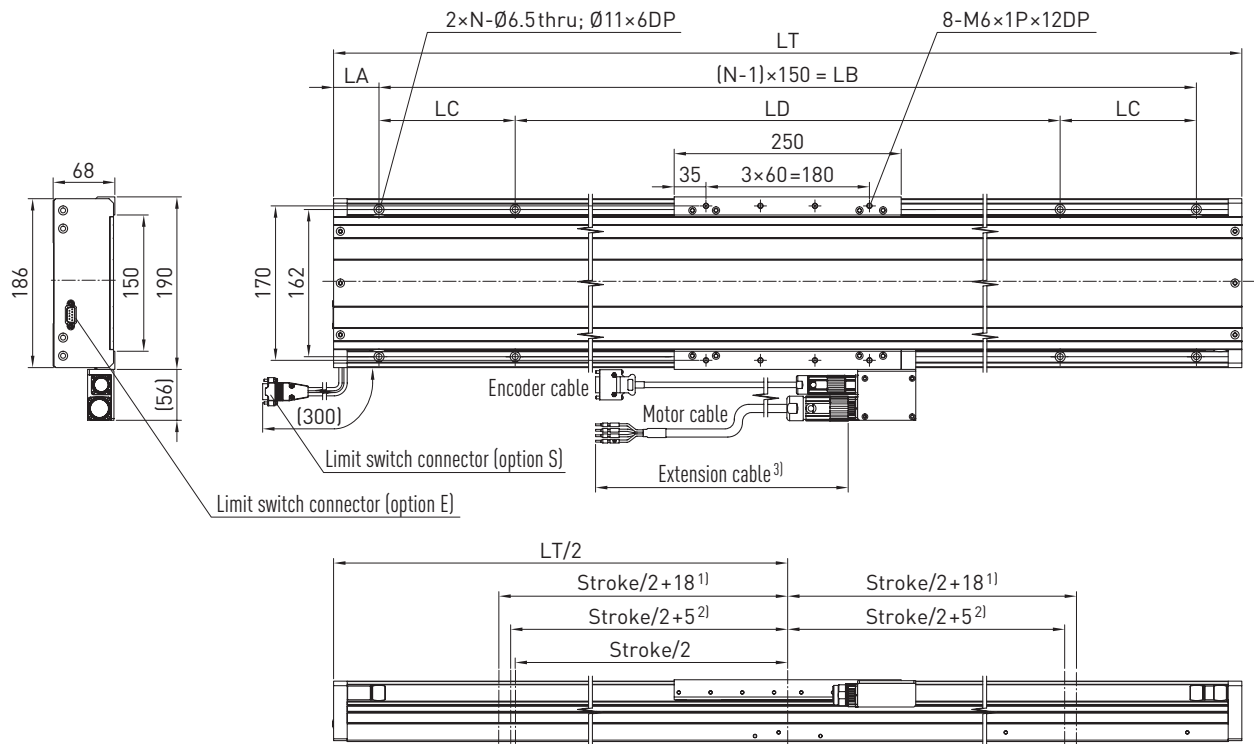
[illegible]

⁴⁾ For inner width of energy chain see order code on [Page 105](#)

All specifications in mm

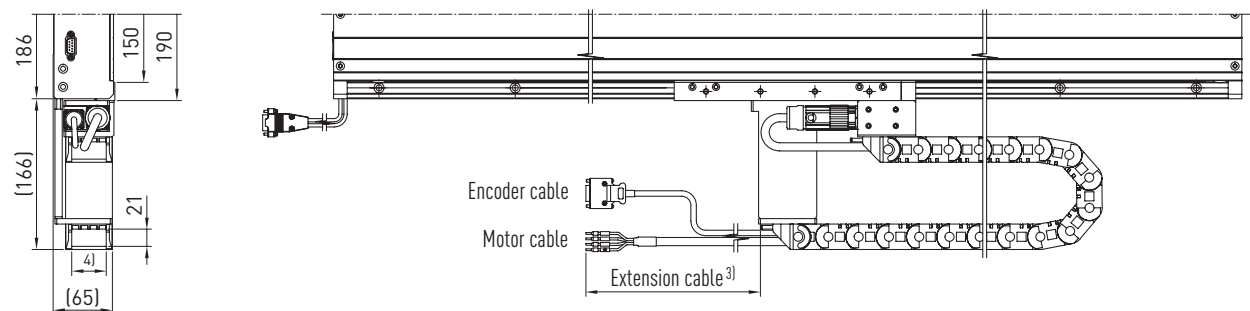
Dimensional drawing for LMX1A-SA12

Without energy supply

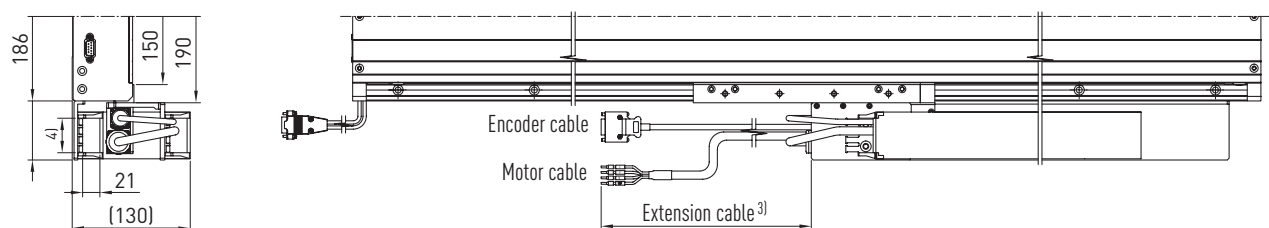
¹⁾ Position of end position buffer

2) Limit switch position

Horizontal energy supply



Vertical energy supply



3) Optional

⁴⁾ For inner width of energy chain see order code on Page 105

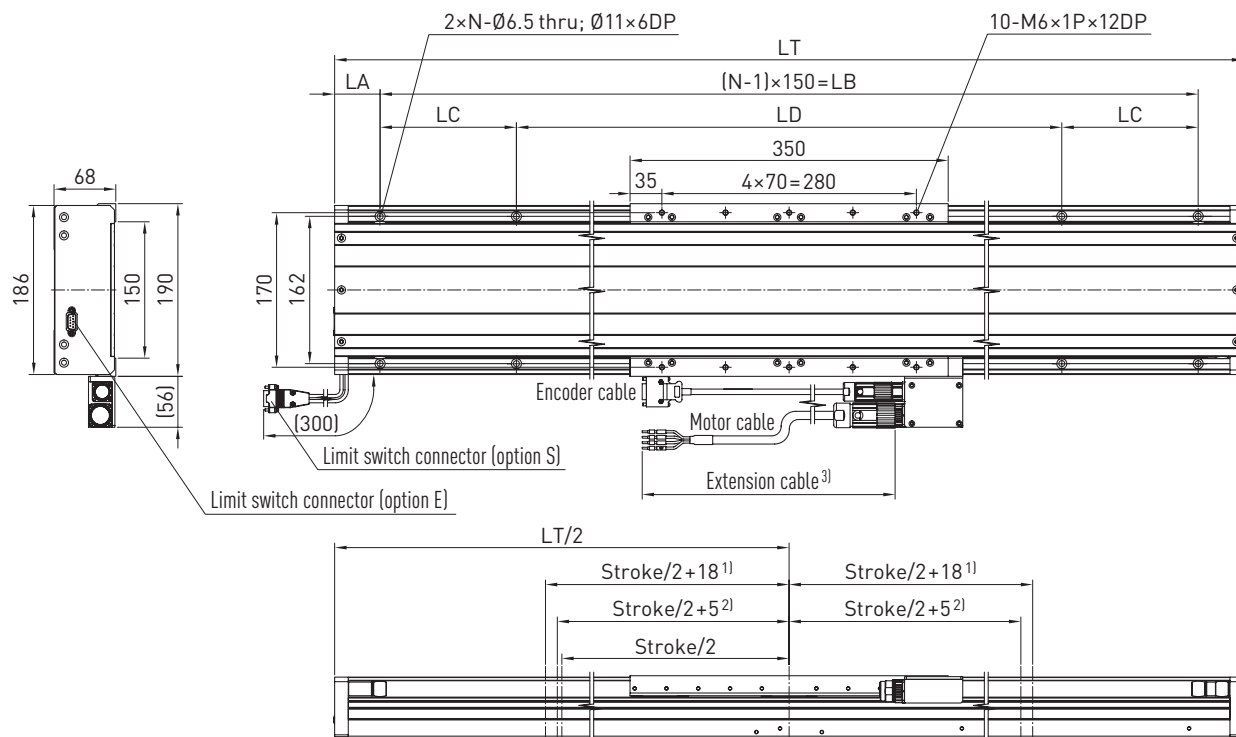
All specifications in mm

Precision axes and precision systems

Linear motor axis LMX1A

Dimensional drawing for LMX1A-SA13

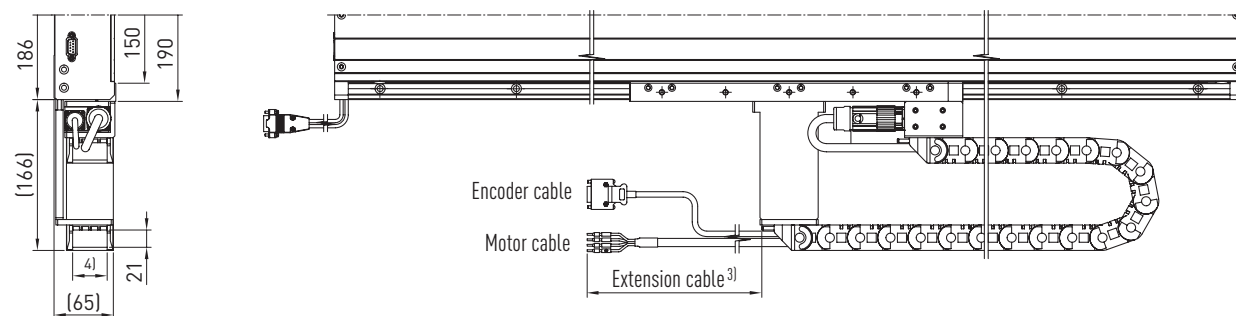
Without energy supply



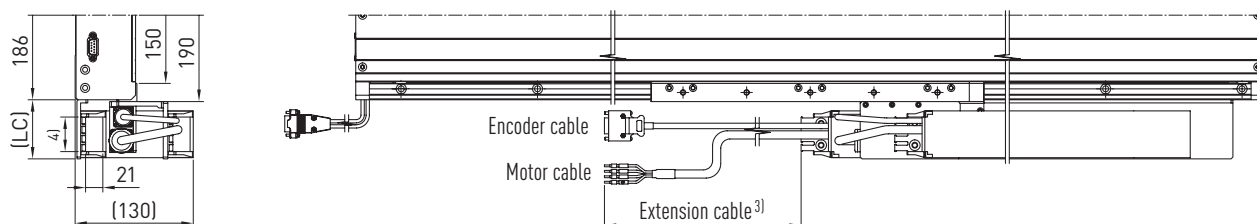
¹⁾ Position of end position buffer

²⁾ Limit switch position

Horizontal energy supply



Vertical energy supply



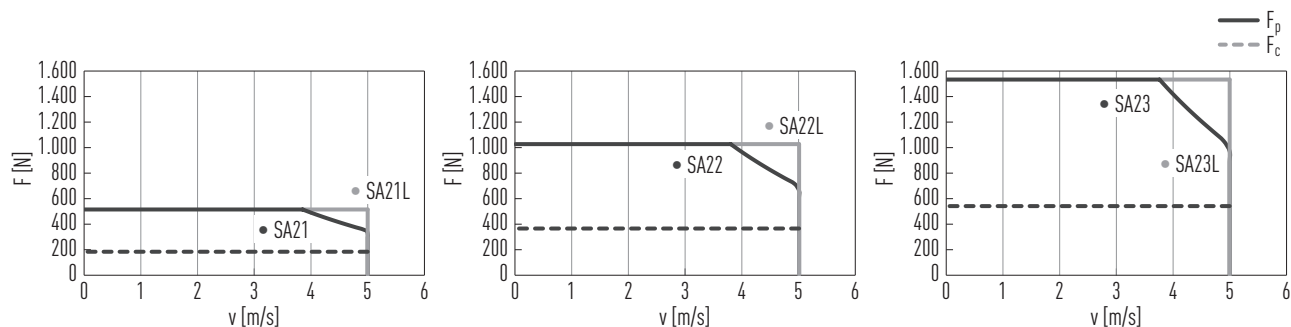
³⁾ Optional

⁴⁾ For inner width of energy chain see order code on Page 105

All specifications in mm

7.4.2 Specifications of LMX1A-SA21/SA22/SA23

Force depending on speed (intermediate circuit voltage: 600 VDC)



Acceleration depending on load capacity (intermediate circuit voltage: 600 VDC)

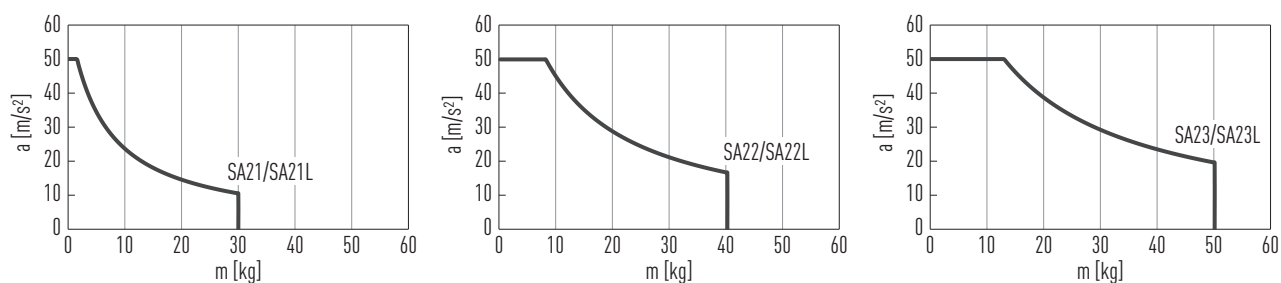


Table 7.6 Technical data for LMX1A-SA21/SA22/SA23

	Symbol	Unit	LMX1A-SA21(L)	LMX1A-SA22(L)	LMX1A-SA23(L)
Continuous force ¹⁾	F_c	N	181	362	544
Peak force ¹⁾	F_p	N	512	1,023	1,535
Stroke length		mm	100 – 4,000		
Resolution of 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		
Precision		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 % cyclic duration factor (CDF), with 120 °C coil temperature; F_p : 1 s

For the electrical parameters for the linear motors see catalogue "Linear Motors and Distance Measuring Systems"

Precision axes and precision systems

Linear motor axis LMX1A

7.4.3 Dimensions of LMX1A-SA21/SA22/SA23

Table 7.7 Dimensions of LMX1A-SA21 (for dimensional drawing see Page 113)

Stroke length	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 depends on the inner cross-section of the energy chain (see order code on Page 105)

Table 7.8 Dimensions of LMX1A-SA22 (for dimensional drawing see Page 114)

Stroke length	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 depends on the inner cross-section of the energy chain (see order code on Page 105)

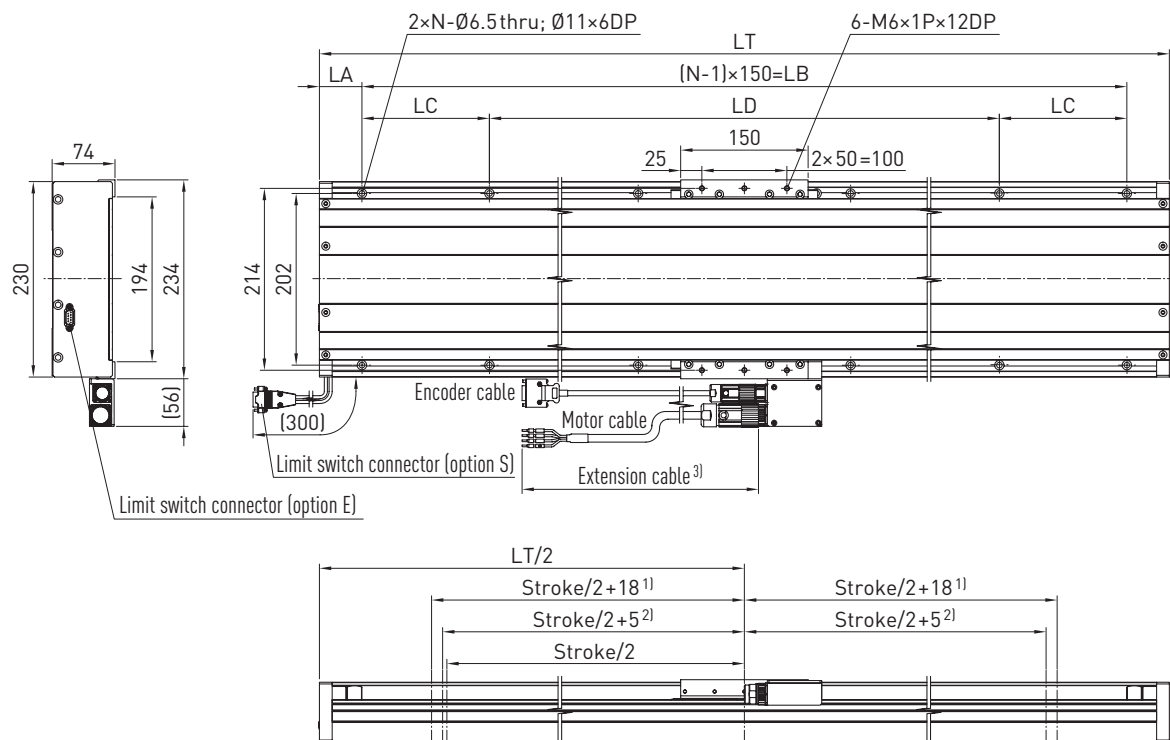
Table 7.9 Dimensions of LMX1A-SA23 (for dimensional drawing see Page 115)

Stroke length	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 depends on the inner cross-section of the energy chain (see order code on Page 105)

Dimensional drawing for LMX1A-SA21

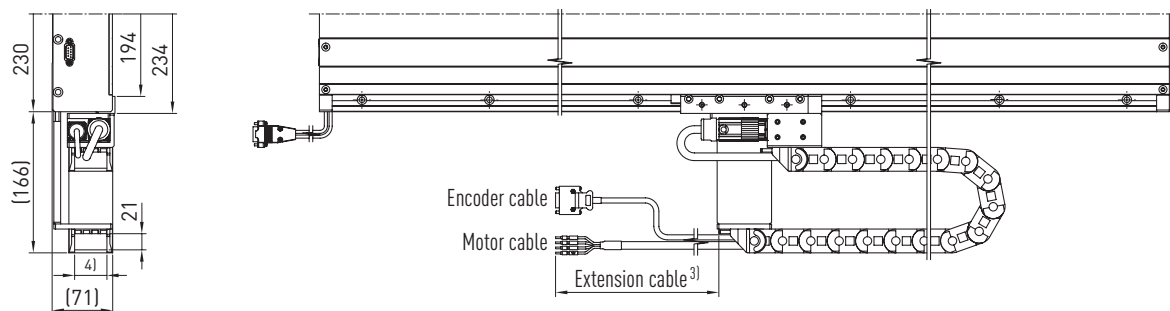
Without energy supply



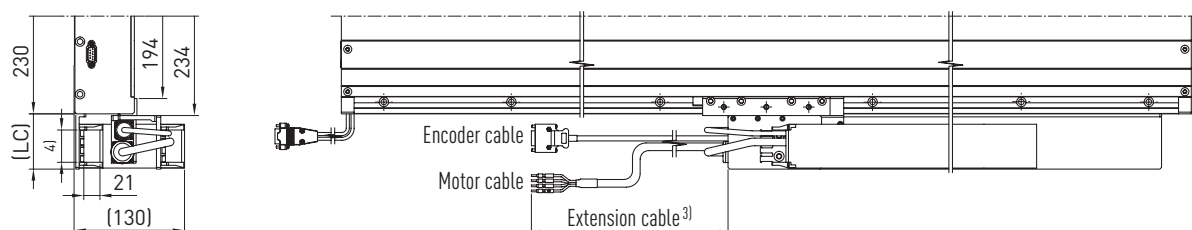
¹⁾ Position of end position buffer

²⁾ Limit switch position

Horizontal energy supply



Vertical energy supply



³⁾ Optional

⁴⁾ For inner width of energy chain see order code on Page 105

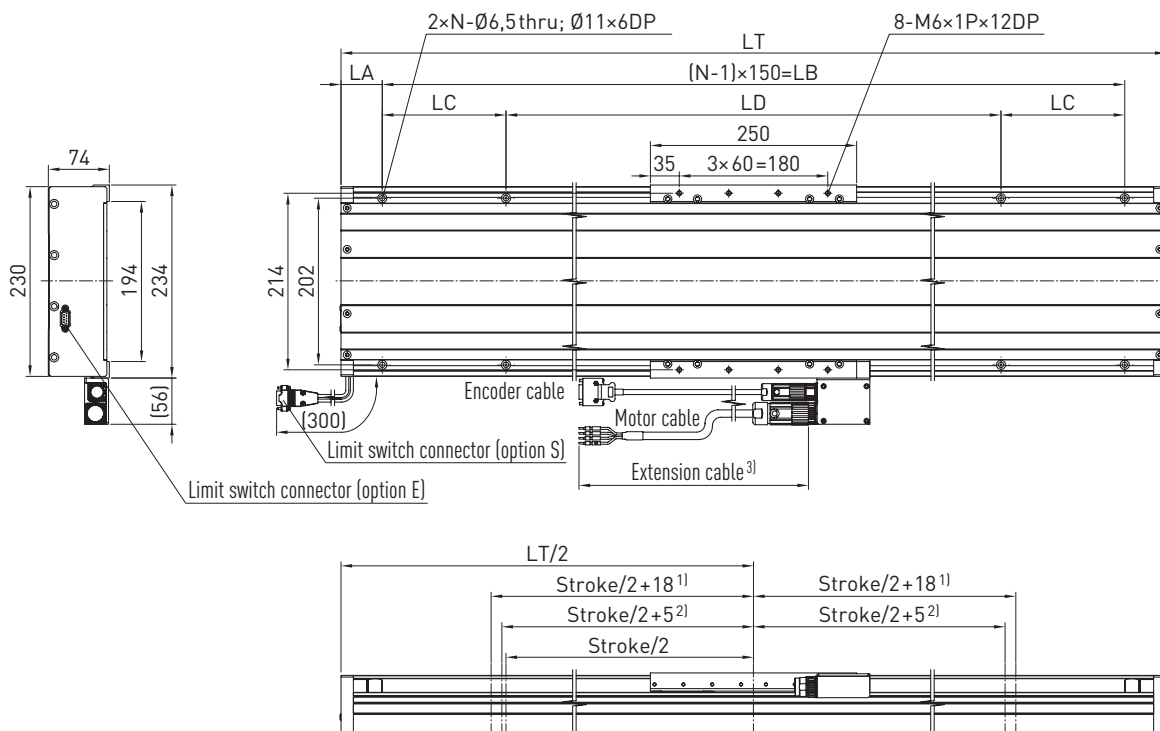
All specifications in mm

Precision axes and precision systems

Linear motor axis LMX1A

Dimensional drawing for LMX1A-SA22

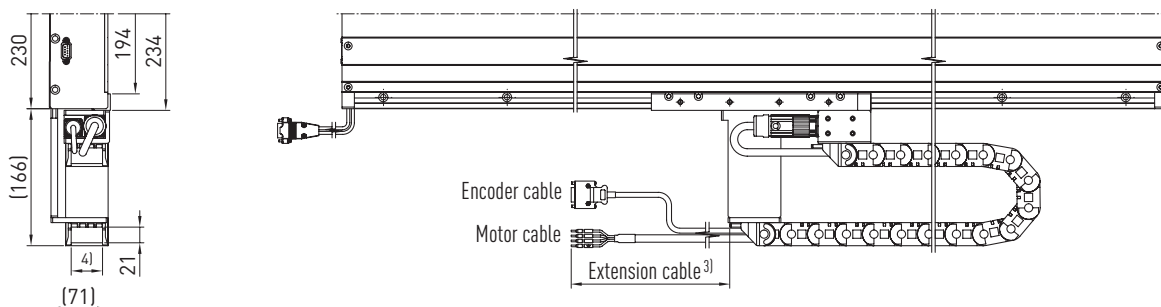
Without energy supply



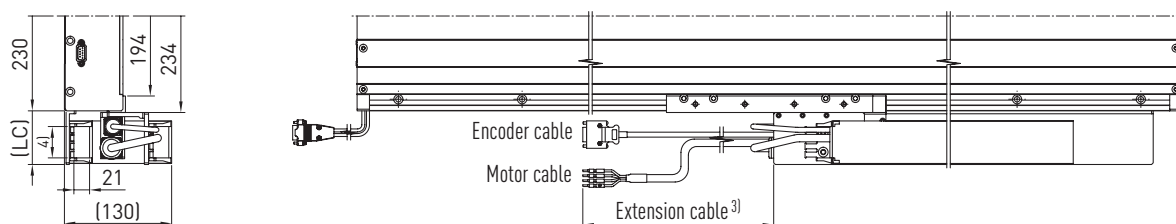
¹) Position of end position buffer

²) Limit switch position

Horizontal energy supply



Vertical energy supply



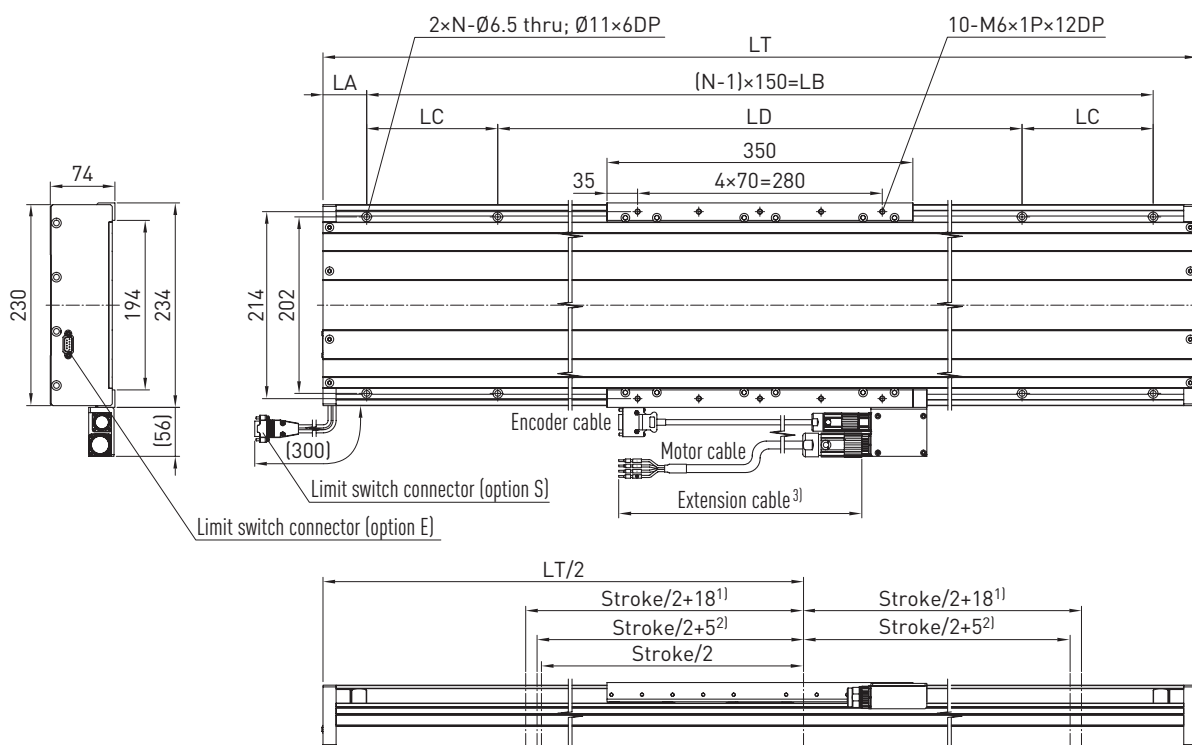
³) Optional

⁴) For inner width of energy chain see order code on [Page 105](#)

All specifications in mm

Dimensional drawing for LMX1A-SA23

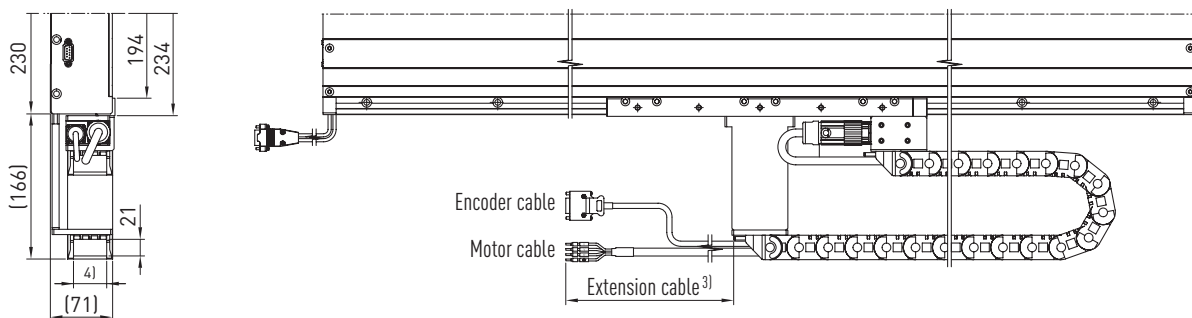
Without energy supply



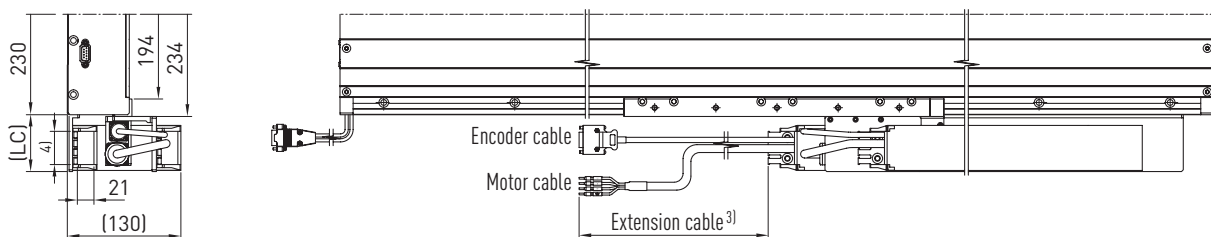
¹⁾ Position of end position buffer

²⁾ Limit switch position

Horizontal energy supply



Vertical energy supply



³⁾ Optional

⁴⁾ For inner width of energy chain see order code on Page 105

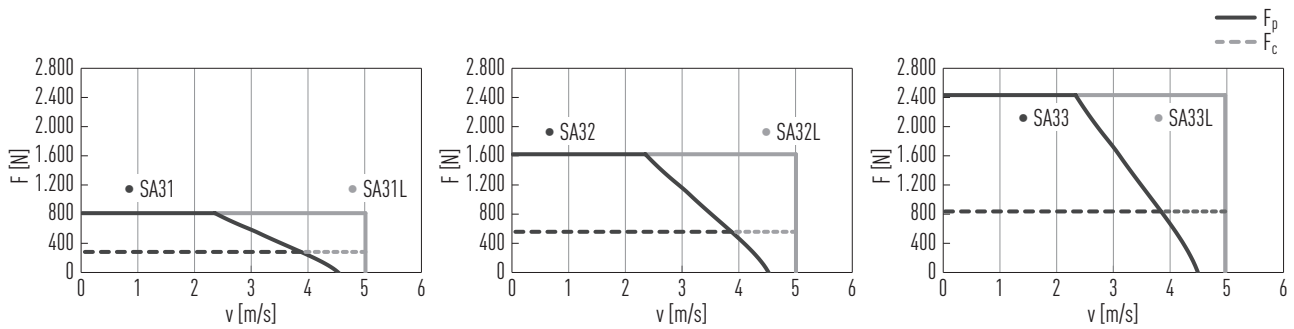
All specifications in mm

Precision axes and precision systems

Linear motor axis LMX1A

7.4.4 Specifications of LMX1A-SA31/SA32/SA33

Force depending on speed (intermediate circuit voltage: 600 VDC)



Acceleration depending on load capacity (intermediate circuit voltage: 600 VDC)

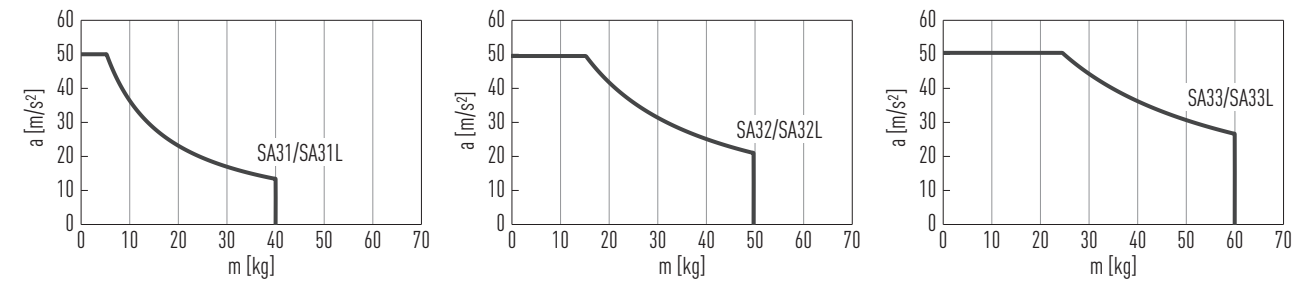


Table 7.10 Technical data for LMX1A-SA31/SA32/SA33

	Symbol	Unit	LMX1A-SA31(L)	LMX1A-SA32(L)	LMX1A-SA33(L)
Continuous force ¹⁾	F_c	N	292	583	875
Peak force ¹⁾	F_p	N	823	1,646	2,469
Stroke length		mm	100 – 4,000		
Resolution of 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		
Precision		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 % cyclic duration factor (CDF), with 120 °C coil temperature; F_p : 1 s

For the electrical parameters for the linear motors see catalogue "Linear Motors and Distance Measuring Systems"

7.4.5 Dimensions of LMX1A-SA31/SA32/SA33

Table 7.11 Dimensions of LMX1A-SA31 (for dimensional drawing see Page 118)

Stroke length	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 depends on the inner cross-section of the energy chain (see order code on Page 105)

Table 7.12 Dimensions of LMX1A-SA32 (for dimensional drawing see Page 119)

Stroke length	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 depends on the inner cross-section of the energy chain (see order code on Page 105)

Table 7.13 Dimensions of LMX1A-SA33 (for dimensional drawing see Page 120)

Stroke length	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	—	—	—	—	—	—	—	—

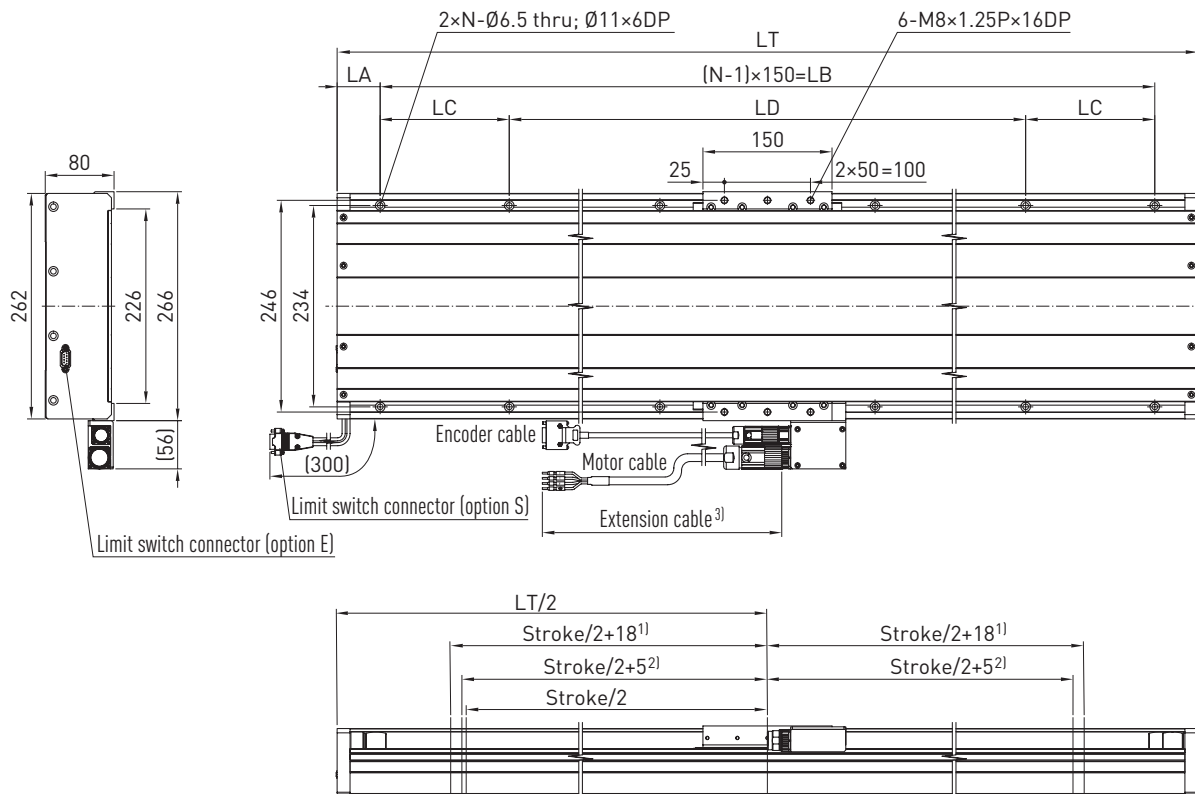
¹⁾ Dimension LC depends on the inner cross-section of the energy chain (see order code on Page 105)

Precision axes and precision systems

Linear motor axis LMX1A

Dimensional drawing for LMX1A-SA31

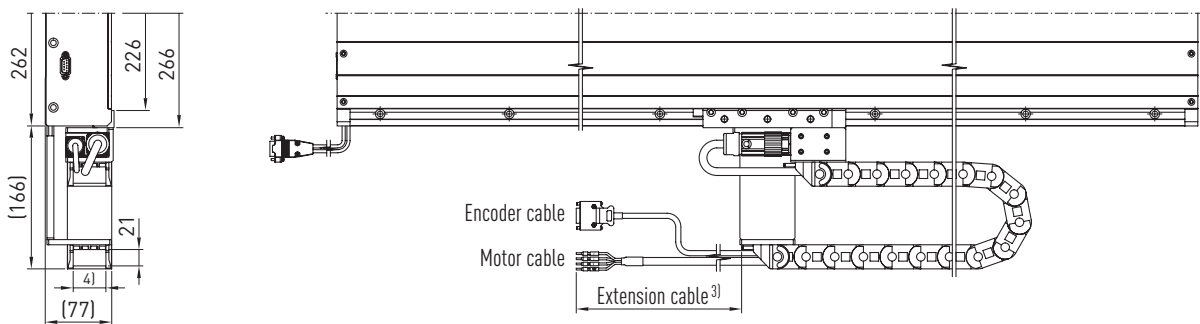
Without energy supply



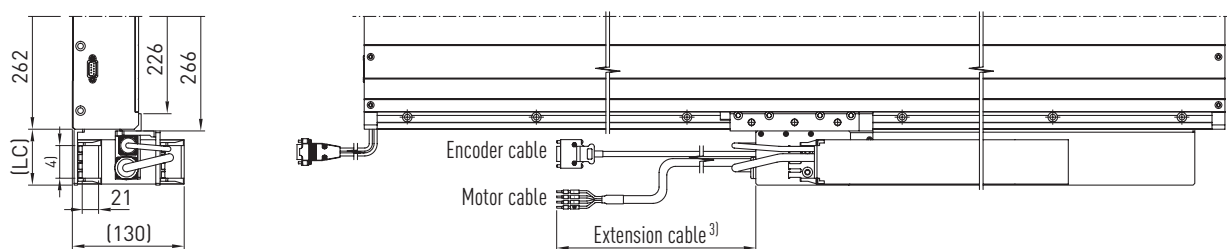
¹⁾ Position of end position buffer

²⁾ Limit switch position

Horizontal energy supply



Vertical energy supply



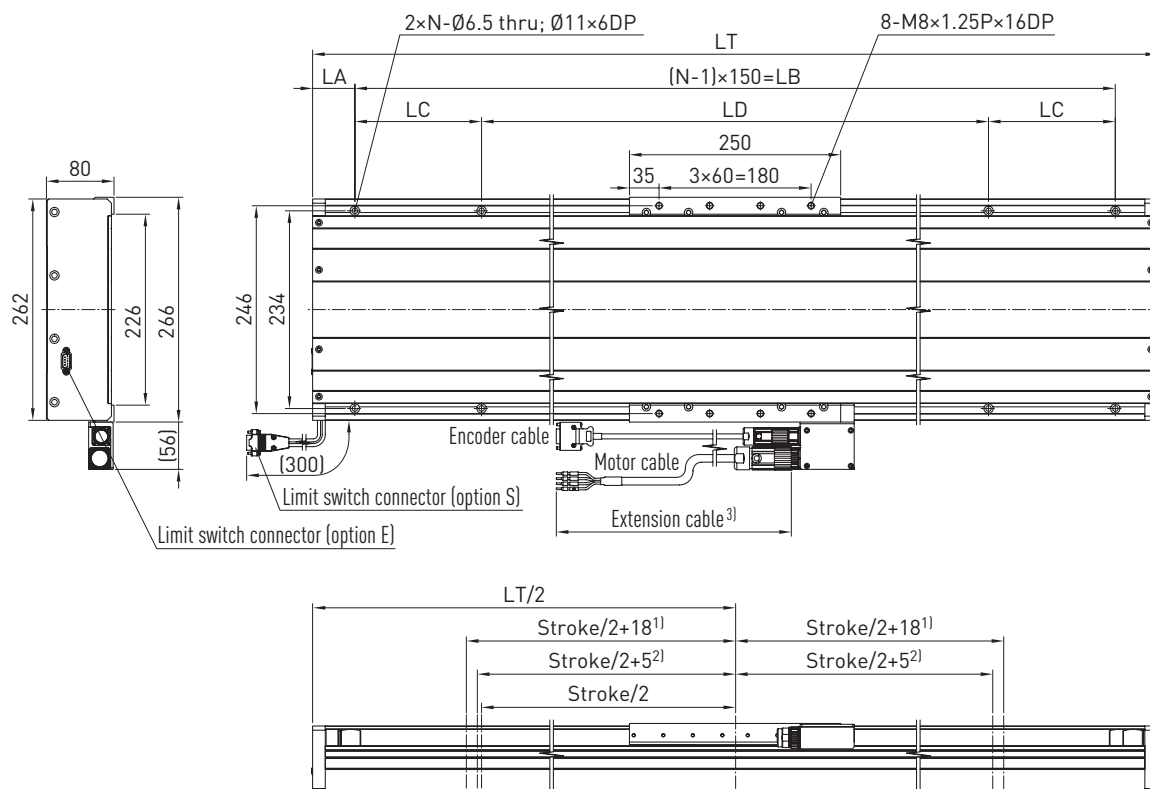
³⁾ Optional

⁴⁾ For inner width of energy chain see order code on Page 105

All specifications in mm

Dimensional drawing for LMX1A-SA32

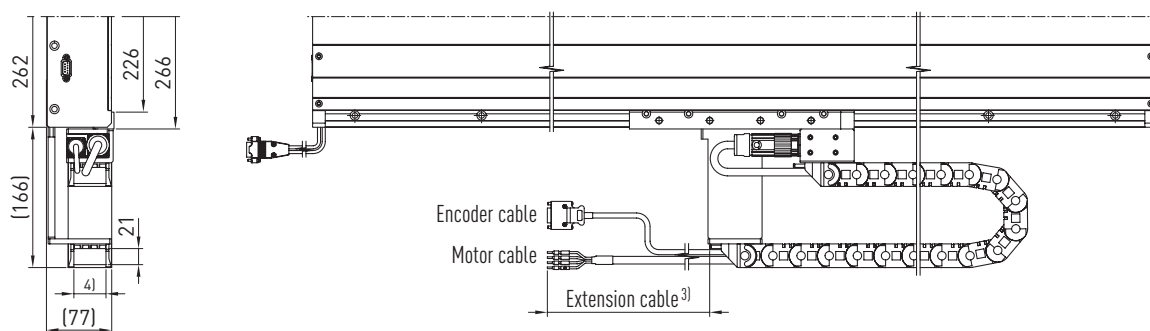
Without energy supply



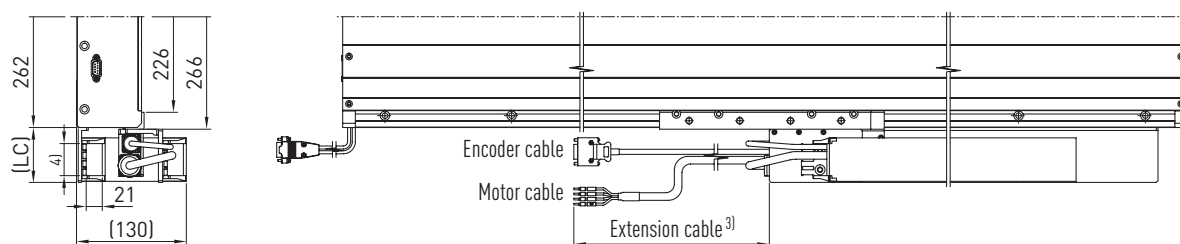
¹⁾ Position of end position buffer

²⁾ Limit switch position

Horizontal energy supply



Vertical energy supply



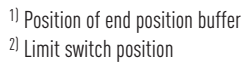
³⁾ Optional

⁴⁾ For inner width of energy chain see order code on [Page 105](#)

All specifications in mm

Linear motor axis LMX1A

Without energy supply



Technical drawing of the motor assembly. The left side shows a top view with dimensions: 262 (total width), 226 (inner width), 266 (outer width), 4 (flange thickness), 21 (motor body width), and (130) (mounting bracket width). The label [LC] is present. The right side shows a side view of the motor assembly with labels for 'Encoder cable', 'Motor cable', and 'Extension cable³⁾'.

⁴⁾ For inner width of energy chain see order code on Page 105

All specifications in mm