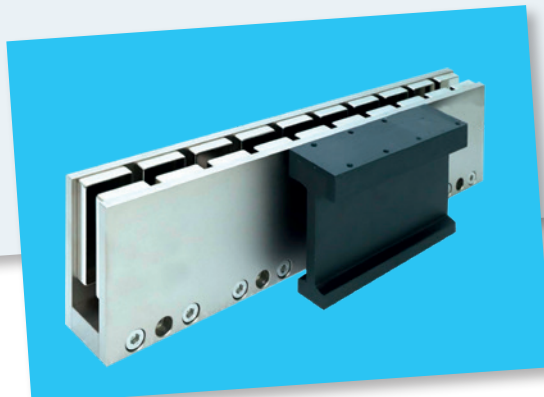
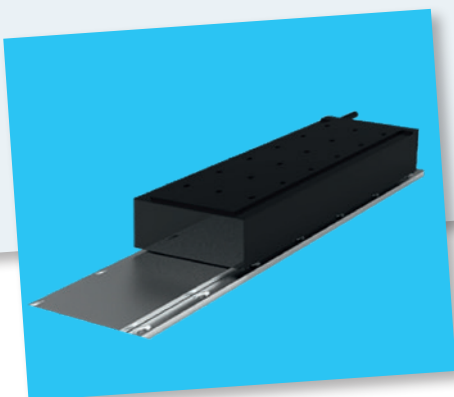
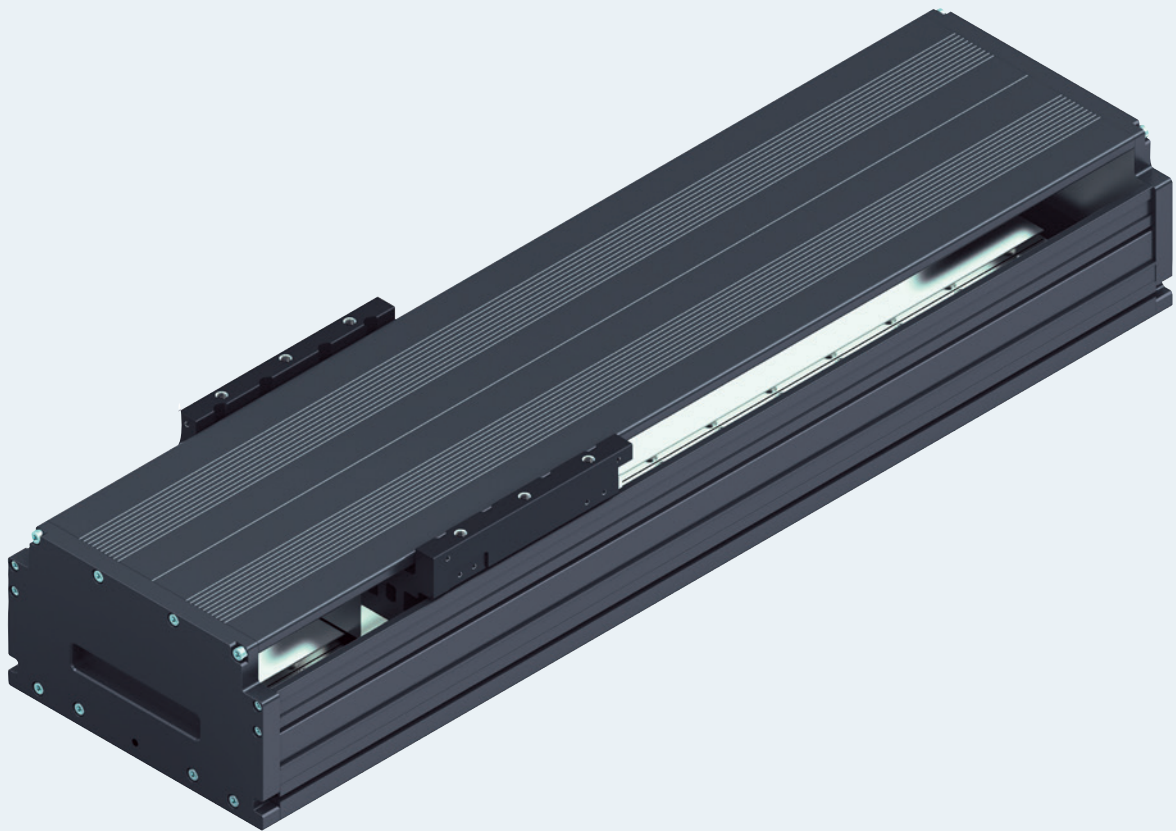


Linear Motor Modules LMM

with Ball Rail Systems and Linear Motor



Type overview, structure

Type designation
(Size)

Example	LMM	-	180	-	NN	-	1
Linear <u>M</u> otor <u>M</u> odule							
Size	=	140 / <u>180</u> / 220					
Version	=	<u>NN</u> - Normal version					
Generation	=	Product generation <u>1</u>					

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Product overview

Product description

Bosch Rexroth offers ready-to-install linear axis with integrated linear motors for the highest requirements in terms of dynamics and precision with their Linear Motor Modules LMM. Unlike conventional linear axes from the Bosch Rexroth family, the LMM is driven directly (i.e., without transmission elements) by a linear motor consisting of a primary and secondary part. The combination of ironless or iron-core linear motors, ball rail system (consisting of guide rails, runner blocks), length measuring systems, and the carriage greatly simplifies the normally complex construction of a linear axis. With the LMM, there is no need for mechanical transmission elements to convert rotary into linear motion, resulting in a wear-free and backlash-free drive.

Linear Motor Modules are particularly suitable for applications that require

- ▶ high dynamics, speed, and acceleration
- ▶ high accuracy, positioning and repeatability
- ▶ excellent synchronization performance
- ▶ direct force transfer without mechanical transmission elements
- ▶ short cycle times

ALMOST UNLIMITED FIELDS OF APPLICATION FOR LINEAR MOTOR MODULES



Pick & Place



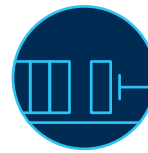
Positioning



Palletizing



Feeding



Move



Parts placement



Stacking



Dispensing



Sorting



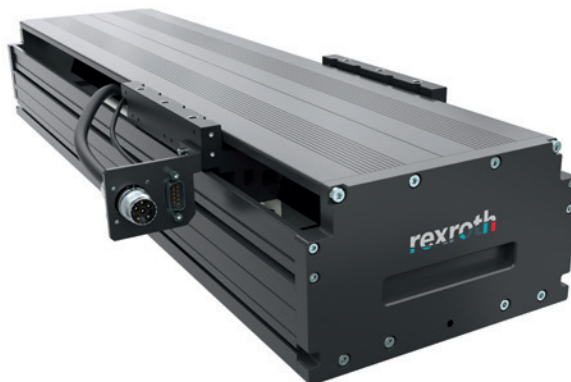
Checking



Mounting



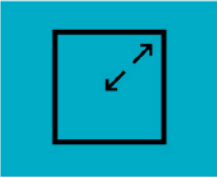
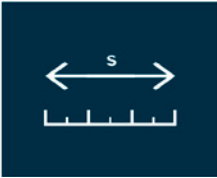
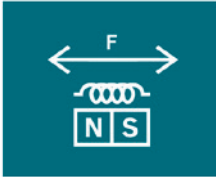
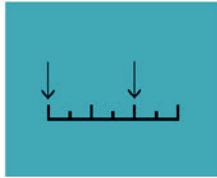
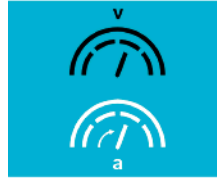
Bolting

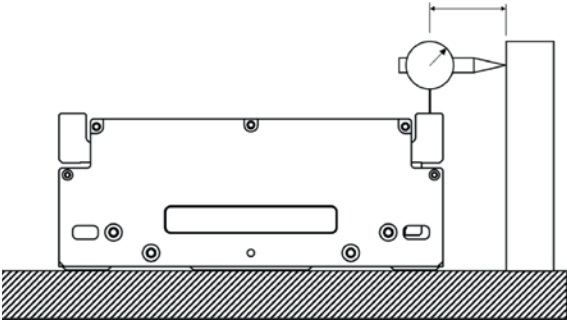
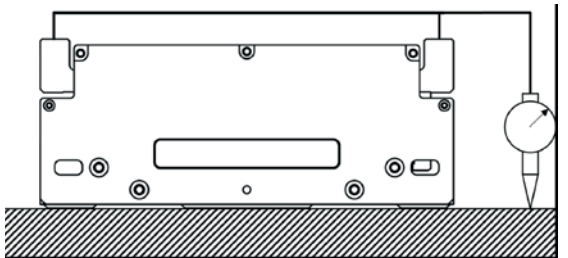


Typical industrial sectors

- ▶ semiconductor technology (e.g. wafer inspection and bonding)
- ▶ electronics, assembly technology, and manufacturing technology
- ▶ battery manufacturing (e.g. stacking or handling)
- ▶ warehouse automation and intralogistics
- ▶ consumer packaged goods (CPG)
- ▶ medical technology (e.g. transport of pipettes)
- ▶ solar technology (e.g. laser deposition)
- ▶ welding technology (e.g. handling welding head)
- ▶ machine tools (e.g. process steps in electrochemical metal processing)
- ▶ measurement technology (e.g. laser scanning)
- ▶ precision and ultra-precision machining
- ▶ and many more.

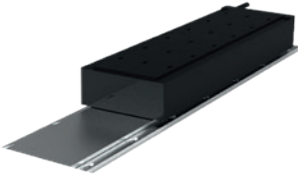
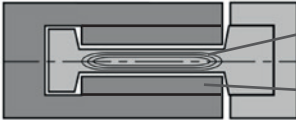
Outstanding properties

					
3 sizes	Max. travel range $s_{\max} = 3500 \text{ mm}$	Max. force $F_{\max} = 2400 \text{ N}$	Repeatability $\pm 1,0 \text{ }\mu\text{m}$	$v_{\max} = 5 \text{ m/s}$ $a_{\max} > 10 \text{ g}$	One carriage, more on request

	
Straightness: $10 \text{ }\mu\text{m} / 500 \text{ mm}$	Flatness: $20 \text{ }\mu\text{m} / 500 \text{ mm}$

Functional principle of linear motor

The Linear Motor Modules LMM are available with two different motor variants, ironless or iron-core linear motors. In principle, a linear motor works in the same way as an electric motor. It consists of a primary part (coil, optionally with iron core) and one or more secondary parts (permanent magnets). Linear motion is generated by electromagnetic forces.

Ironless linear motor (LMM-IL)		Iron-core linear motor (LMM-IC)	
			
 Coil/primary part Magnet/secondary part		 Coil Iron core Magnet/secondary part Primary part	

In iron-core linear motors, the coils are wound around an iron core. This maximises the magnetic forces and results in high power density. The presence of iron creates attractive forces between the primary part/coil unit and the secondary part/magnets. This leads to cogging forces. However, due to the specially designed winding of the coils in iron core linear motors, the cogging forces can be significantly minimised.

Form of delivery

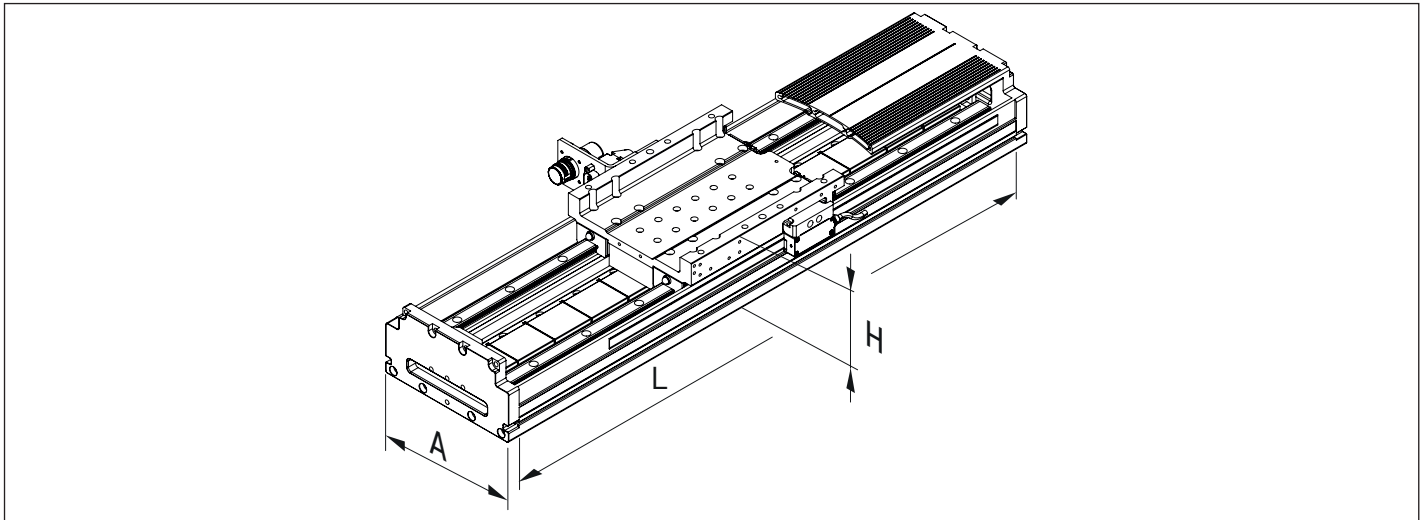
Linear Motor Modules are delivered completely assembled.

- Accessories: Controller and cables
- Lubrication: Lubrication version LSS: factory standard basic greasing, suitable for normal ambient conditions.
Easy relubrication using a hand grease gun. For further information on lubricants, see the Lubrication chapter.
- Documentation: Each linear motor module is supplied with the necessary installation and maintenance instructions, safety information and a declaration of incorporation.

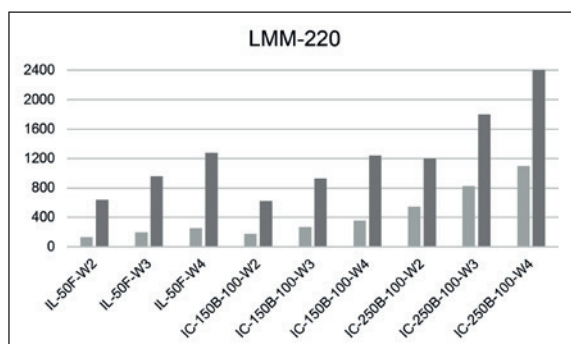
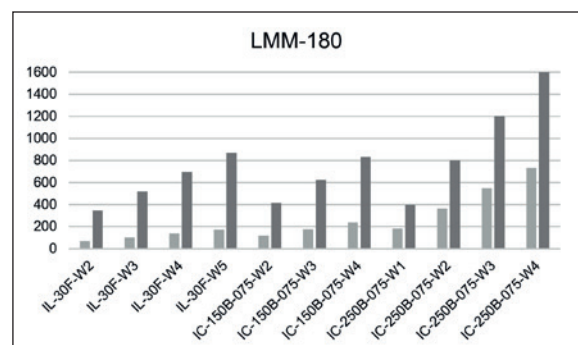
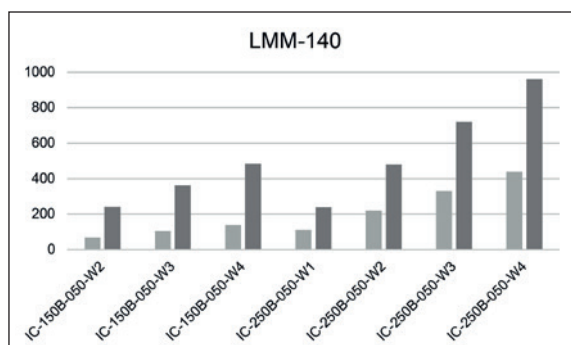
Type designation, sizes

Linear Motor Modules	Type	Guide	Drive Linear motor	Size	Motor	Dimension A x H (mm)	L _{max} ¹⁾ (mm)	Dynamic load capacity C (N)
	LMM	 Ball - rail - system	 with iron-core	LMM-140	IC-150B	140 x 74	1760	32035
					IC-250B	140 x 101	1936	32035
			 ironless	LMM-180	IL-30F	180 x 81	1866	32035
					IC-150B	180 x 81	1760	32035
					IC-250B	180 x 108	1936	47111
				LMM-220	IL-50F	225 x 91.7	1806	32035
					IC-150B	225 x 91.7	1760	47111
					IC-250B	225 x 105	1936	92922

¹⁾ Standard, longer on request

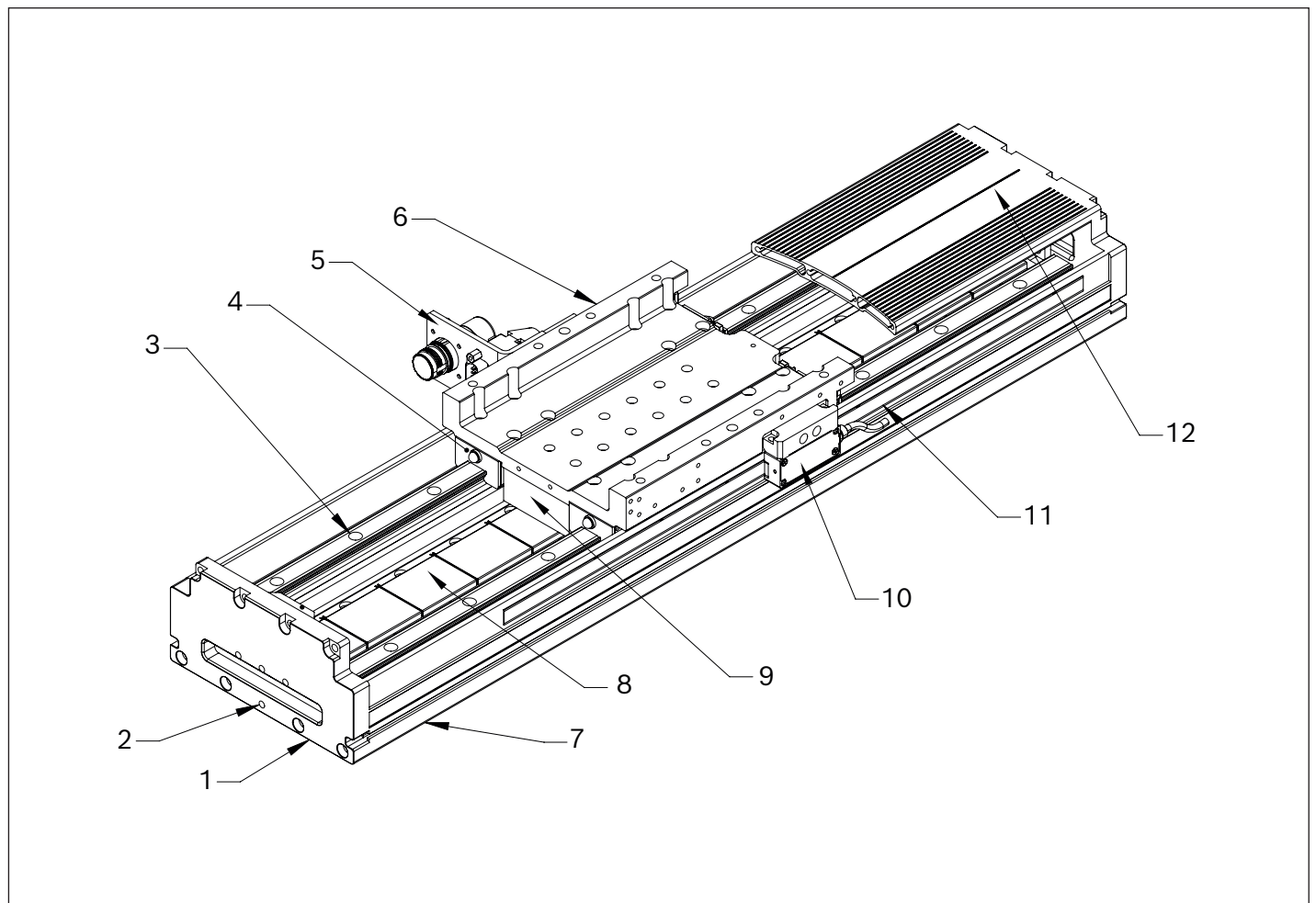


Overview of motor forces



■ Continuous rated force F_{dN} (N)
■ Maximum force F_{max} (N)

Construction



- | | |
|--|--------------------------------------|
| 1 End block | 7 Frame |
| 2 Ground connection (without screw) | 8 Linear motor/secondary part |
| 3 Guide rail | 9 Linear motor/primary part |
| 4 Runner block | 10 Encoder |
| 5 Connectors | 11 Scale |
| 6 Carriage | 12 Cover |

Calculation principles

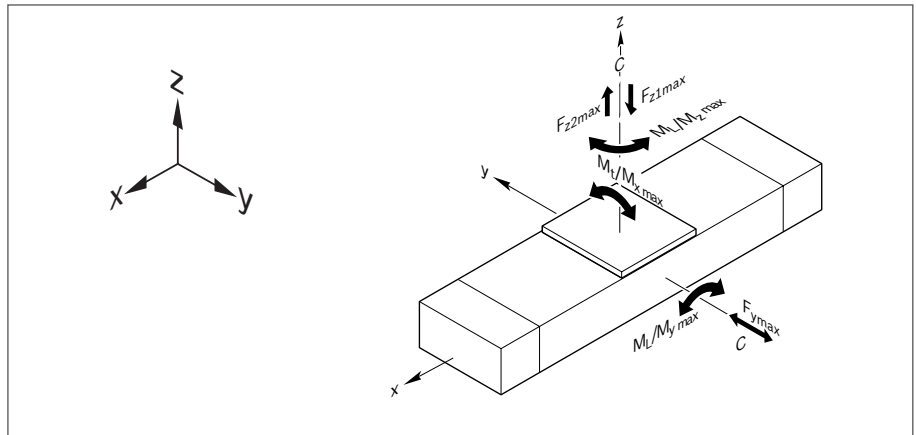
Note on dynamic load capacities and moments

Determination of the dynamic load capacities and moments is based on a total travel of 100.000 m. Often only 50.000 m of total travel are actually stipulated. For comparison: Multiply values C , M_t and M_L by a factor of 1.26.

Combined equivalent bearing load

$$F_{\text{comb}} = |F_y| + |F_z| + C \cdot \frac{|M_x|}{M_t} + C \cdot \frac{|M_y|}{M_L} + C \cdot \frac{|M_z|}{M_L}$$

Due to the system, there is a permanent force on the guides of the iron-core linear motor module LMM-IC. This must be taken into account when calculating the service life.



Service life

Nominal service life in meters:

$$L_{10} = \left(\frac{C}{F_{\text{comb}} + 0,1 \cdot C} \right)^3 \cdot 10^5$$

Nominal service life in hours:

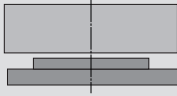
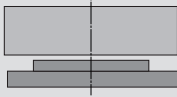
$$L_{10h} = \frac{L}{3600 \cdot v_m}$$

Excess travel:

Excess travel must be greater than braking distance. The acceleration travel can be adopted as the guideline value for the braking distance.

Technical data

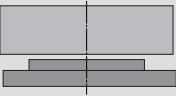
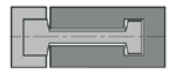
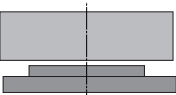
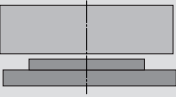
General technical data

LMM	Motor		Attractive force of the motor	Carriage length	Dynamic characteristics		
					Dynamic load capacity C	Dynamic load moments	
			F_{att} (N)	L_{ca} (mm)	Guide (N)	M_t (Nm)	M_L (Nm)
-140	with Iron-core 	IC-150B-050-W2	420	132	32035	1394	1217
		IC-150B-050-W3	630	174			1890
		IC-150B-050-W4	840	216			2563
		IC-250B-050-W1	500	140			1313
		IC-250B-050-W2	1000	224			2659
		IC-250B-050-W3	1500	308			4004
		IC-250B-050-W4	2000	392			5350
-180	ironless 	IL-30F-W2	---	130	32035	1986	1089
		IL-30F-W3	---	190			2050
		IL-30F-W4	---	250			3011
		IL-30F-W5	---	310			3972
	with Iron-core 	IC-150B-075-W2	720	132	32035	1986	1121
		IC-150B-075-W3	1080	174			1794
		IC-150B-075-W4	1440	216			2467
		IC-250B-075-W1	820	140			1731
		IC-250B-075-W2	1640	224	47111	2803	3710
		IC-250B-075-W3	2460	308			5689
		IC-250B-075-W4	3280	392			7667
-220	ironless 	IL-50F-W2	---	130	32035	2307	1171
		IL-50F-W3	---	190			2132
		IL-50F-W4	---	250			3093
	with Iron-core 	IC-150B-100-W2	1080	132	47111	3392	1614
		IC-150B-100-W3	1620	174			2532
		IC-150B-100-W4	2160	216			3522
		IC-250B-100-W2	2480	224	92922	7062	6458
		IC-250B-100-W3	3720	308			10361
		IC-250B-100-W4	4960	392			14263

¹⁾ Standard, longer on request

	Maximum permissible loads			Minium travel range	Maximum travel range	Length increments
	Maximum permissible moments					
	M _{xmax} (Nm)	M _{ymax} (Nm)	M _{zmax} (Nm)			
	120	60	60	84	1528	84
	120	151	151			
	120	205	205			
	120	105	105			
	120	213	213			
	120	241	241			
	120	321	321			
	171	87	87	60	1540	60
	171	164	164			
	171	241	241			
	171	318	318			
	171	90	90	84	1528	84
	171	144	144			
	171	198	198			
	174	100	100			
	174	215	215			
	174	247	247			
	174	333	333			
	198	94	94	60	1540	60
	198	171	171			
	198	183	183			
	211	89	89	84	1528	84
	211	147	147			
	211	204	204			
	231	197	197			
	231	316	316			
	231	326	326			

Drive data

LMM	Motor		Carriage length	Continuous nominal force at 100 °C	Maximum force ¹⁾	Moved mass of system of carriage	Moved external load ²⁾	Basic friction force	
			L _{ca} (mm)	F _{dN} (N)	F _{max} (N)	m _{ca} (kg)	m _{ex} (kg)	F _{Rs} (N)	
-140	with Iron-core 	IC-150B-050-W2	132	69	242	1.9	10	60	
		IC-150B-050-W3	174	104	363	2.3	20	60	
		IC-150B-050-W4	216	139	484	2.7	20	61	
		IC-250B-050-W1	140	110	240	3.1	10	60	
		IC-250B-050-W2	224	220	480	4.7	20	61	
		IC-250B-050-W3	308	330	720	6.7	20	63	
		IC-250B-050-W4	392	440	960	8.3	30	64	
-180	ironless 	IL-30F-W2	130	69	347	2.0	10	66	
		IL-30F-W3	190	104	521	2.6	15	66	
		IL-30F-W4	250	139	695	3.3	20	66	
		IL-30F-W5	310	174	869	3.9	30	66	
	with Iron-core 	IC-150B-075-W2	132	119	416	2.4	10	69	
		IC-150B-075-W3	174	178	624	3.0	15	70	
		IC-150B-075-W4	216	238	832	3.7	20	71	
		IC-250B-075-W1	140	183	400	4.7	10	69	
		IC-250B-075-W2	224	366	800	7.4	20	71	
		IC-250B-075-W3	308	549	1200	10.6	40	74	
		IC-250B-075-W4	392	733	1600	13.3	50	76	
-220	ironless 	IL-50F-W2	130	128	638	2.6	10	72	
		IL-50F-W3	190	192	958	3.5	20	72	
		IL-50F-W4	250	255	1277	4.4	30	72	
	with Iron-core 	IC-150B-100-W2	132	177	620	3.7	15	75	
		IC-150B-100-W3	174	266	930	4.7	20	76	
		IC-150B-100-W4	216	355	1240	5.7	25	78	
		IC-250B-100-W2	224	548	1200	9.0	30	79	
		IC-250B-100-W3	308	823	1800	12.1	60	83	
		IC-250B-100-W4	392	1097	2400	15.9	90	86	

¹⁾ Maximum force and current: 4% duty cycle and 1 second duration

²⁾ Recommended payload based on an acceleration of 10 m/s². Center of gravity position centered 100 mm above the center of the carriage

	Maximum permissible speed	Maximum acceleration	Continuous current at 100 °C	Maximum current ¹⁾	DC bus voltage	Back-EMF constant
	$v_{\max}$ (m/s)	$a_{\max}$ (m/s ²)	I_{dN} (A _{eff})	$I_{\max}$ (A _{eff})	V_{DC} (V)	K_{EMK} (V _{eff} s/m)
	5	250	2.3	9.0	600	17.4
			2.3	9.0		26.1
			4.6	18.0		17.4
			4.8	14.4		13.2
			4.8	14.4		26.4
			4.8	14.4		39.7
			9.6	28.8		26.4
	5	250	4.0	20.0	330	10.0
			4.0	20.0		15.0
			4.0	20.0		20.0
			4.0	20.0		25.0
	5		2.3	9.0	600	29.8
			2.3	9.0		44.8
			4.6	18.0		29.8
	3		4.8	14.4		22.0
			4.8	14.4		44.0
			4.8	14.4		66.0
			9.6	28.9		44.0
	5		250	4.0	20.0	330
		4.0		20.0	27.6	
		4.0		20.0	36.8	
	3	2.3		9.0	600	44.5
		2.3		9.0		66.8
		4.6		18.0		44.5
		4.8		14.4		66.0
		4.8		14.4		99.0
		9.6		28.8		66.0

LMM-140: Travel, Length, Mass

LMM-140	Iron-core linear motor					
Motor	IC-150B-050-W2		IC-150B-050-W3		IC-150B-050-W4	
Carriage length L_{ca} (mm)	132		174		216	
Travel s_{max} (mm)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)
184	356	7	398	7.9	440	8.9
268	440	8	482	8.9	524	9.9
352	524	9	566	9.9	608	10.8
436	608	10	650	10.9	692	11.8
520	692	11	734	11.9	776	12.8
604	776	12	818	12.9	860	13.8
688	860	13	902	13.9	944	14.8
772	944	14	986	14.9	1028	15.8
856	1028	15	1070	15.9	1112	16.8
940	1112	15.9	1154	16.9	1196	17.8
1024	1196	16.9	1238	17.9	1280	18.8
1108	1280	17.9	1322	18.9	1364	19.8
1192	1364	18.9	1406	19.9	1448	20.8
1276	1448	19.9	1490	20.9	1532	21.8
1360	1532	20.9	1574	21.9	1616	22.8
1444	1616	21.9	1658	22.9	1700	23.8
1528	1700	22.9	1742	23.9	1784	24.8

LMM-140	Iron-core linear motor							
Motor	IC-250B-050-W1		IC-250B-050-W2		IC-250B-050-W3		IC-250B-050-W4	
Carriage length L_{ca} (mm)	140		224		308		392	
Travel s_{max} (mm)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)
184	364	8.4	448	11.1	532	14	616	16.6
268	448	9.4	532	12	616	14.9	700	17.6
352	532	10.4	616	13	700	15.9	784	18.5
436	616	11.4	700	14	784	16.9	868	19.5
520	700	12.4	784	15	868	17.9	952	20.5
604	784	13.4	868	16	952	18.9	1036	21.5
688	868	14.4	952	17	1036	19.9	1120	22.5
772	952	15.3	1036	18	1120	20.9	1204	23.5
856	1036	16.3	1120	19	1204	21.8	1288	24.5
940	1120	17.3	1204	19.9	1288	22.8	1372	25.4
1024	1204	18.3	1288	20.9	1372	23.8	1456	26.4
1108	1288	19.3	1372	21.9	1456	24.8	1540	27.4
1192	1372	20.3	1456	22.9	1540	25.8	1624	28.4
1276	1456	21.3	1540	23.9	1624	26.8	1708	29.4
1360	1540	22.3	1624	24.9	1708	27.8	1792	30.4
1444	1624	23.3	1708	25.9	1792	28.8	1876	31.4
1528	1708	24.3	1792	26.9	1876	29.8	1960	32.4

LMM-180: Travel, Length, Mass

LMM-180	Ironless linear motor							
Motor	IL-30F-W2		IL-30F-W3		IL-30F-W4		IL-30F-W5	
Carriage length L_{ca} (mm)	130		190		250		310	
Travel s_{max} (mm)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)
160	330	9.8	390	11.7	450	13.6	510	15.4
220	390	11.1	450	12.9	510	14.8	570	16.7
280	450	12.3	510	14.2	570	16.0	630	17.9
340	510	13.6	570	15.4	630	17.3	690	19.2
400	570	14.8	630	16.6	690	18.5	750	20.4
460	630	16.0	690	17.9	750	19.8	810	21.6
520	690	17.3	750	19.1	810	21.0	870	22.9
580	750	18.5	810	20.4	870	22.3	930	24.1
640	810	19.8	870	21.6	930	23.5	990	25.4
700	870	21.0	930	22.8	990	24.7	1050	26.6
760	930	22.3	990	24.1	1050	26.0	1110	27.8
820	990	23.5	1050	25.3	1110	27.2	1170	29.1
880	1050	24.7	1110	26.6	1170	28.5	1230	30.3
940	1110	26.0	1170	27.8	1230	29.7	1290	31.6
1000	1170	27.2	1230	29.1	1290	31.0	1350	32.8
1060	1230	28.5	1290	30.3	1350	32.2	1410	34.1
1120	1290	29.7	1350	31.5	1410	33.4	1470	35.3
1180	1350	31.0	1410	32.8	1470	34.7	1530	36.5
1240	1410	32.2	1470	34.0	1530	35.9	1590	37.8
1300	1470	33.5	1530	35.3	1590	37.2	1650	39.1
1360	1530	34.8	1590	36.6	1650	38.5	1710	40.4
1420	1590	36.1	1650	37.9	1710	39.8	1770	41.7
1480	1650	37.4	1710	39.2	1770	41.1	1830	43.0
1540	1710	38.7	1770	40.5	1830	42.4	1890	44.3

LMM-180	Iron-core linear motor					
Motor	IC-150B-075-W2		IC-150B-075-W3		IC-150B-075-W4	
Carriage length L_{ca} (mm)	132		174		216	
Travel s_{max} (mm)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)
184	356	9.6	398	11	440	12.4
268	440	11.1	482	12.5	524	13.8
352	524	12.5	566	13.9	608	15.3
436	608	14.0	650	15.3	692	16.7
520	692	15.4	734	16.8	776	18.1
604	776	16.9	818	18.2	860	19.6
688	860	18.3	902	19.7	944	21.0
772	944	19.7	986	21.1	1028	22.5
856	1028	21.2	1070	22.6	1112	23.9
940	1112	22.6	1154	24.0	1196	25.4
1024	1196	24.1	1238	25.4	1280	26.8
1108	1280	25.5	1322	26.9	1364	28.2
1192	1364	27.0	1406	28.3	1448	29.7
1276	1448	28.5	1490	29.8	1532	31.2
1360	1532	30.0	1574	31.3	1616	32.7
1444	1616	31.5	1658	32.8	1700	34.2
1528	1700	33.0	1742	34.3	1784	35.7

LMM-180	Iron-core linear motor							
Motor	IC-250B-075-W1		IC-250B-075-W2		IC-250B-075-W3		IC-250B-075-W4	
Carriage length L_{ca} (mm)	140		224		308		392	
Travel s_{max} (mm)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)	Length L (mm)	Mass m_s (kg)
184	364	12.5	448	16.8	532	21.5	616	25.7
268	448	14.1	532	18.3	616	23.0	700	27.3
352	532	15.6	616	19.8	700	24.5	784	28.8
436	616	17.1	700	21.4	784	26.1	868	30.3
520	700	18.6	784	22.9	868	27.6	952	31.8
604	784	20.2	868	24.4	952	29.1	1036	33.4
688	868	21.7	952	25.9	1036	30.6	1120	34.9
772	952	23.2	1036	27.4	1120	32.2	1204	36.4
856	1036	24.7	1120	29.0	1204	33.7	1288	37.9
940	1120	26.3	1204	30.5	1288	35.2	1372	39.4
1024	1204	27.8	1288	32.0	1372	36.7	1456	41.0
1108	1288	29.3	1372	33.5	1456	38.3	1540	42.5
1192	1372	30.8	1456	35.1	1540	39.8	1624	44.0
1276	1456	32.4	1540	36.7	1624	41.4	1708	45.6
1360	1540	34.0	1624	38.3	1708	43.0	1792	47.2
1444	1624	35.6	1708	39.9	1792	44.6	1876	48.8
1528	1708	37.2	1792	41.5	1876	46.2	1960	50.4

LMM-220: Travel, Length, Mass

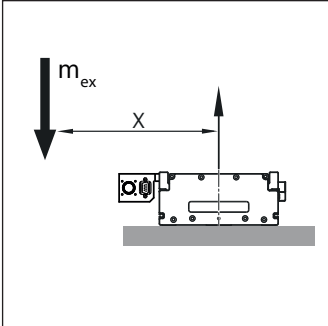
LMM-220	Ironless linear motor					
Motor	IL-50F-W2		IL-50F-W3		IL-50F-W4	
Carriage length L_{ca} (mm)	130 mm		190 mm		250 mm	
Travel s_{max} (mm)	Length (mm)	Mass (kg)	Length (mm)	Mass (kg)	Length (mm)	Mass (kg)
160	330	14.6	390	17.5	450	20.4
220	390	16.5	450	19.4	510	22.3
280	450	18.5	510	21.4	570	24.3
340	510	20.5	570	23.4	630	26.3
400	570	22.5	630	25.4	690	28.3
460	630	24.5	690	27.4	750	30.2
520	690	26.4	750	29.3	810	32.2
580	750	28.4	810	31.3	870	34.2
640	810	30.4	870	33.3	930	36.2
700	870	32.4	930	35.3	990	38.2
760	930	34.3	990	37.2	1050	40.1
820	990	36.3	1050	39.2	1110	42.1
880	1050	38.3	1110	41.2	1170	44.1
940	1110	40.3	1170	43.2	1230	46.1
1000	1170	42.2	1230	45.1	1290	48.0
1060	1230	44.2	1290	47.1	1350	50.0
1120	1290	46.2	1350	49.1	1410	52.0
1180	1350	48.2	1410	51.1	1470	54.0
1240	1410	50.1	1470	53.0	1530	55.9
1300	1470	52.1	1530	55.0	1590	57.9
1360	1530	54.1	1590	57.0	1650	59.9
1420	1590	56.1	1650	59.0	1710	61.9
1480	1650	58.1	1710	61.0	1770	63.9
1540	1710	60.1	1770	63.0	1830	65.9

LMM-220	Iron-core linear motor					
Motor	IC-150B-100-W2		IC-150B-100-W3		IC-150B-100-W4	
Carriage length L_{ca} (mm)	132 mm		174 mm		216 mm	
Travel s_{max} (mm)	Length (mm)	Mass (kg)	Length (mm)	Mass (kg)	Length (mm)	Mass (kg)
184	356	14.4	398	16.4	440	18.5
268	440	16.5	482	18.6	524	20.7
352	524	18.7	566	20.8	608	22.8
436	608	20.9	650	22.9	692	25.0
520	692	23.1	734	25.1	776	27.2
604	776	25.2	818	27.3	860	29.4
688	860	27.4	902	29.5	944	31.5
772	944	29.6	986	31.6	1028	33.7
856	1028	31.8	1070	33.8	1112	35.9
940	1112	33.9	1154	36.0	1196	38.1
1024	1196	36.1	1238	38.2	1280	40.2
1108	1280	38.3	1322	40.4	1364	42.4
1192	1364	40.5	1406	42.5	1448	44.6
1276	1448	42.7	1490	44.7	1532	46.8
1360	1532	44.9	1574	46.9	1616	49.0
1444	1616	47.1	1658	49.1	1700	51.2
1528	1700	49.3	1742	51.3	1784	53.4

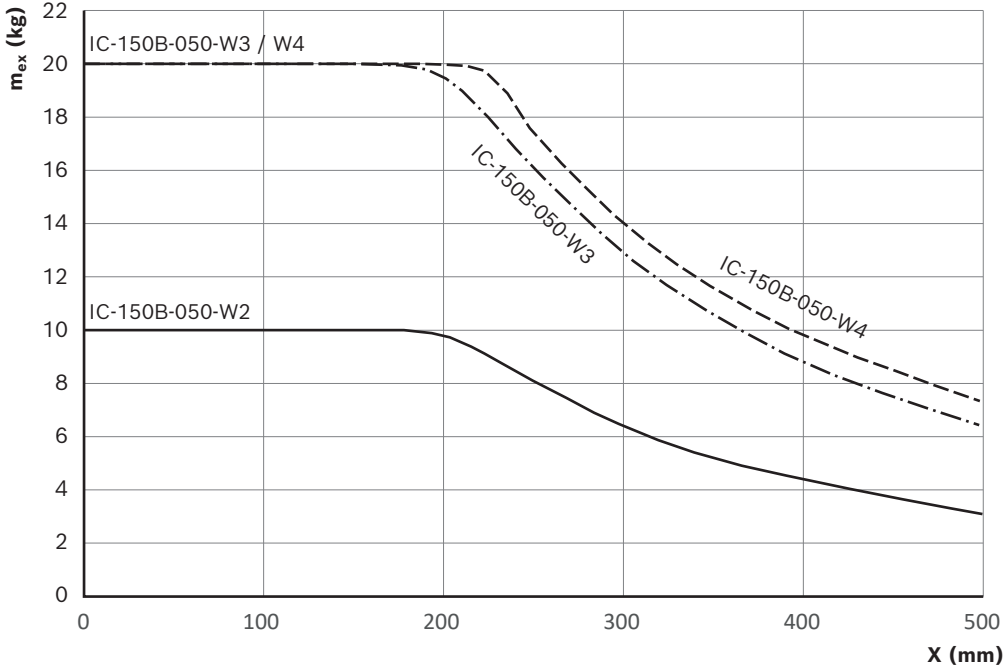
LMM-220	Iron-core linear motor					
Motor	IC-250B-100-W2		IC-250B-100-W3		IC-250B-100-W4	
Carriage length L_{ca} (mm)	224		308		392	
Travel s_{max} (mm)	Length (mm)	Mass (kg)	Length (mm)	Mass (kg)	Length (mm)	Mass (kg)
184	448	22.7	532	28.0	616	34.1
268	532	24.9	616	30.3	700	36.3
352	616	27.2	700	32.5	784	38.6
436	700	29.5	784	34.8	868	40.9
520	784	31.7	868	37.1	952	43.1
604	868	34.0	952	39.3	1036	45.4
688	952	36.3	1036	41.6	1120	47.7
772	1036	38.6	1120	43.9	1204	50.0
856	1120	40.8	1204	46.1	1288	52.2
940	1204	43.1	1288	48.4	1372	54.5
1024	1288	45.4	1372	50.7	1456	56.8
1108	1372	47.6	1456	53.0	1540	59.0
1192	1456	49.9	1540	55.2	1624	61.3
1276	1540	52.2	1624	57.5	1708	63.6
1360	1624	54.5	1708	59.8	1792	65.9
1444	1708	56.8	1792	62.1	1876	68.2
1528	1792	59.1	1876	64.4	1960	70.5

Diagrams: Cantilever Load - Horizontal Mounting

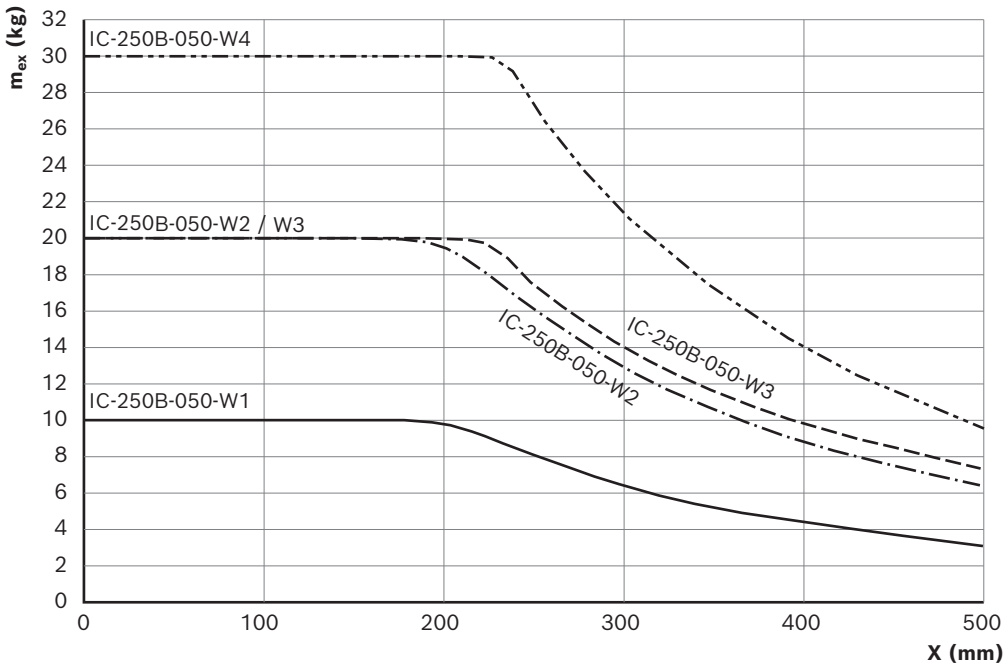
LMM-140-IC-150B-050-WX



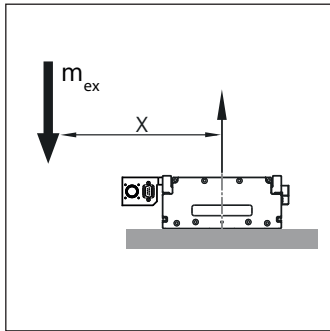
▲ Horizontal Mounting



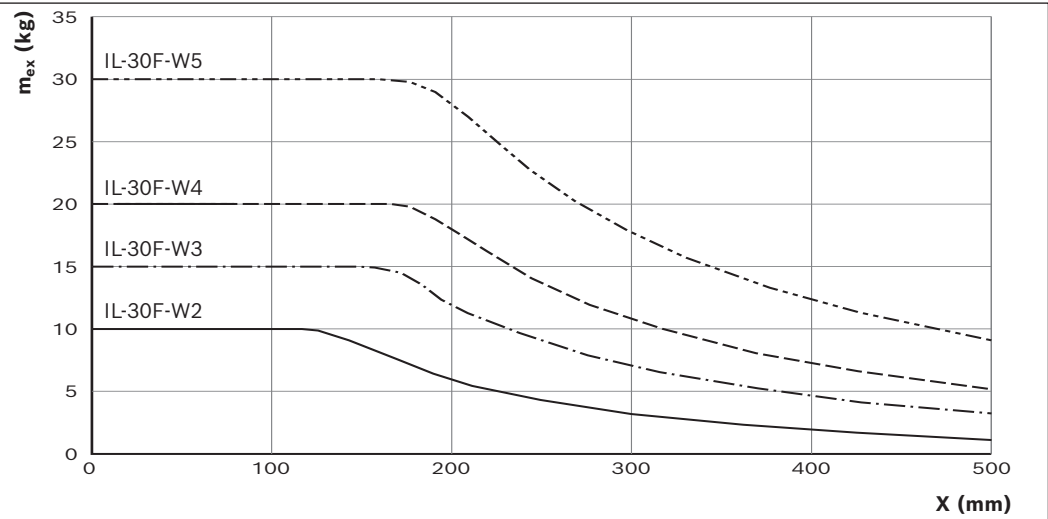
LMM-140-IC-250B-050-WX



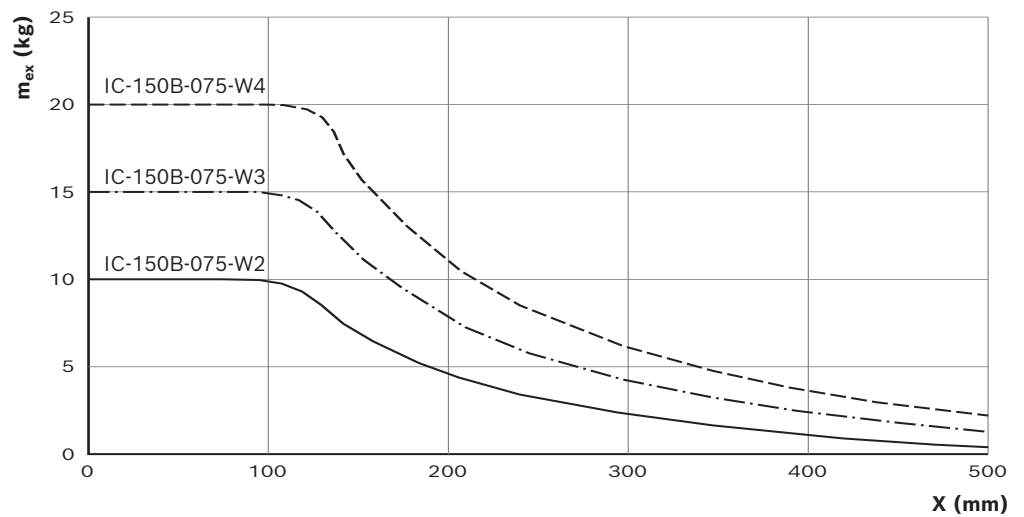
LMM-180-IL-30F-WX



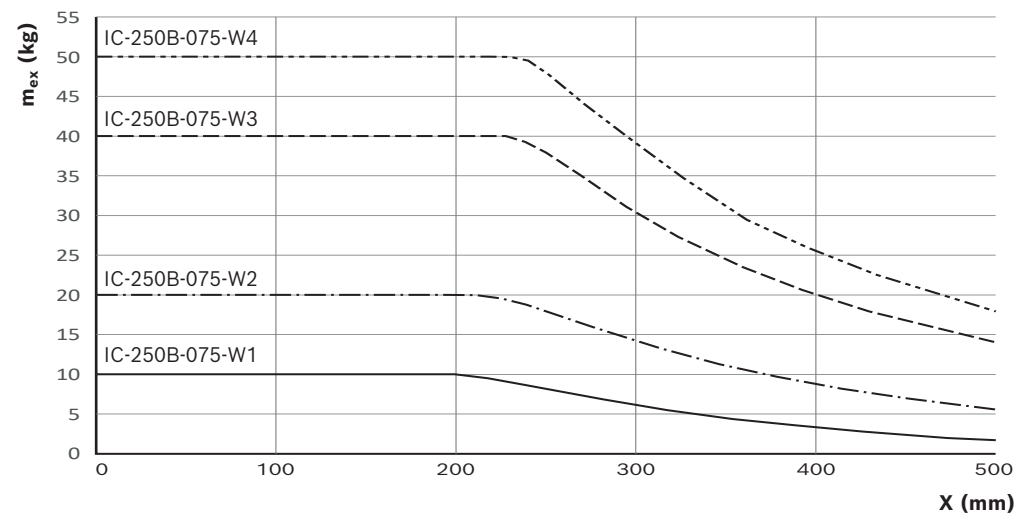
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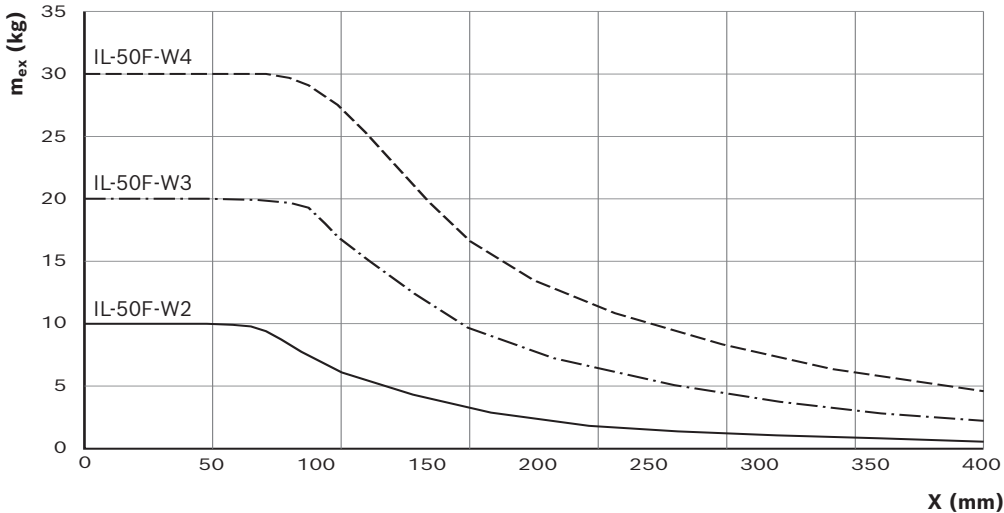
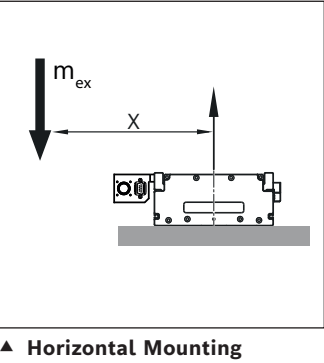
LMM-180-IC-150B-075-WX



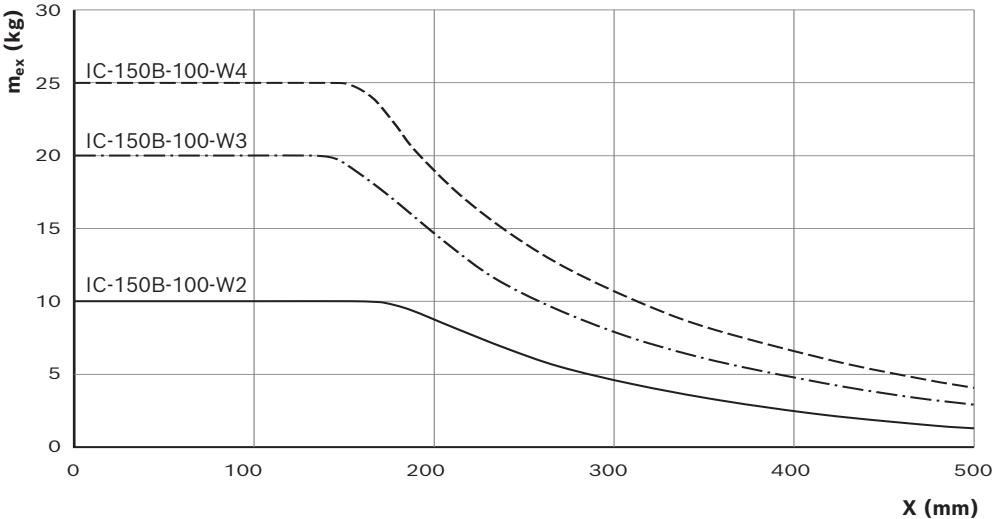
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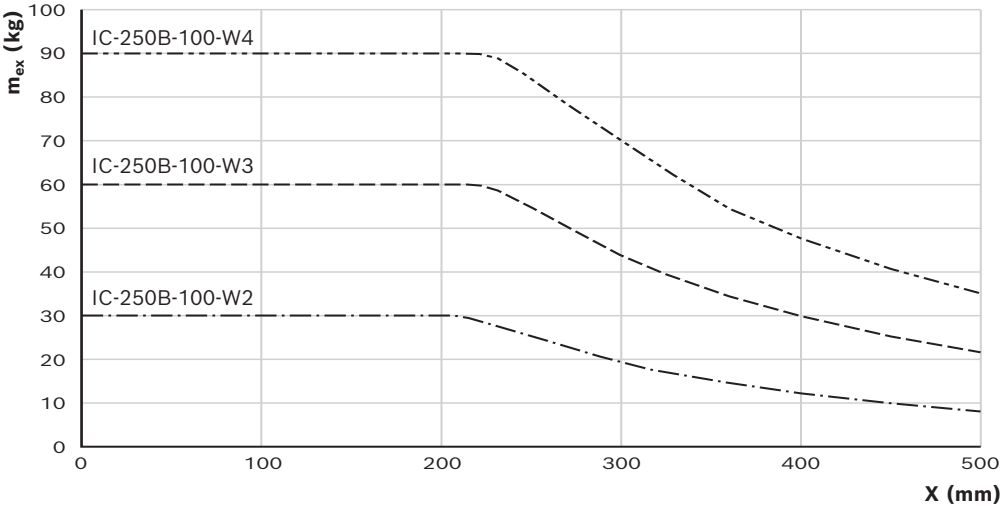
LMM-220-IL-50F-WX



LMM-220-IC-150B-100-WX

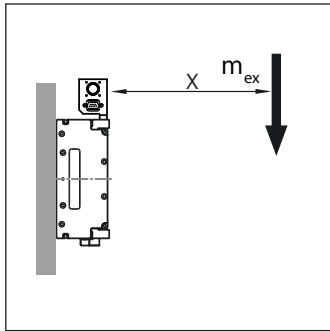


LMM-220-IC-250B-100-WX

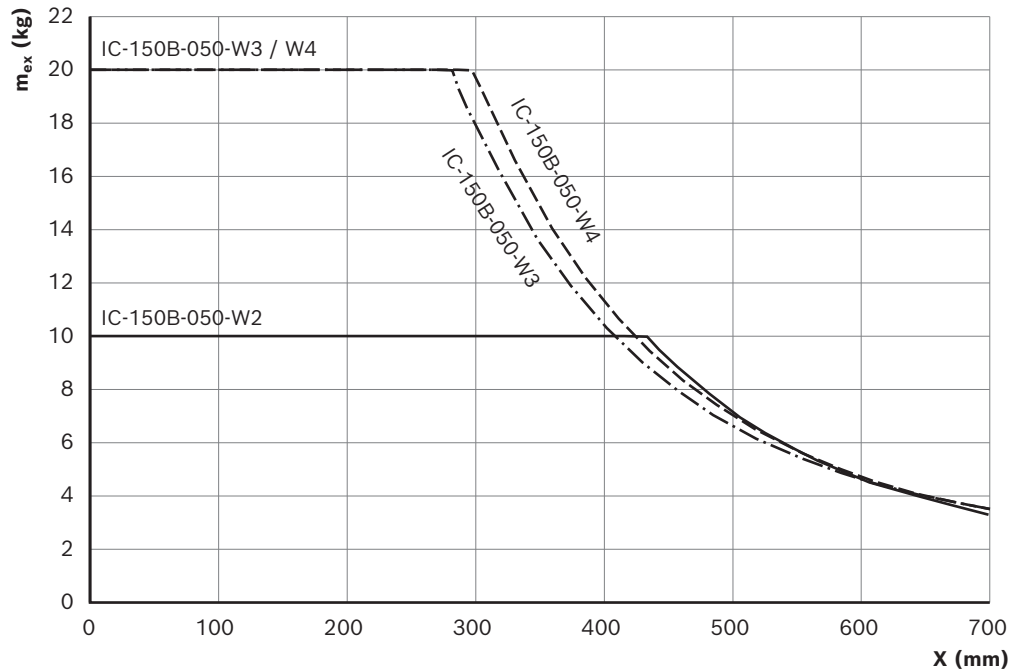


Diagrams: Cantilever load - Wall mounting

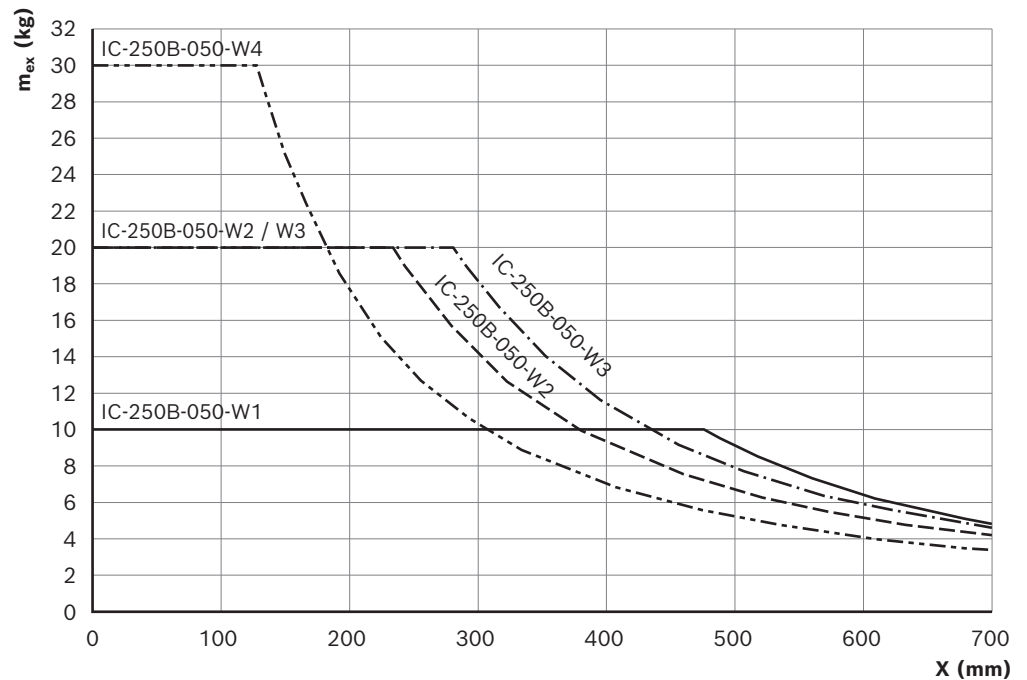
LMM-140-IC-150B-050-WX



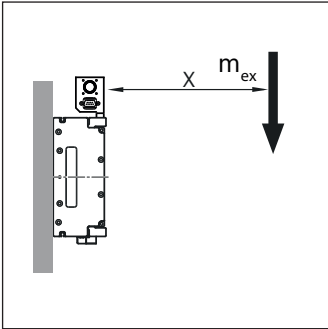
▲ Wall mounting



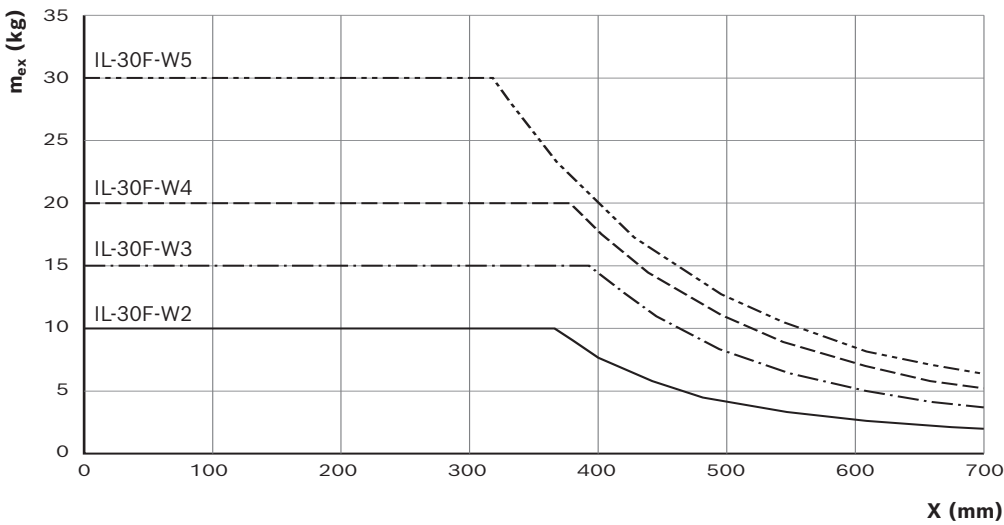
LMM-140-IC-250B-050-WX



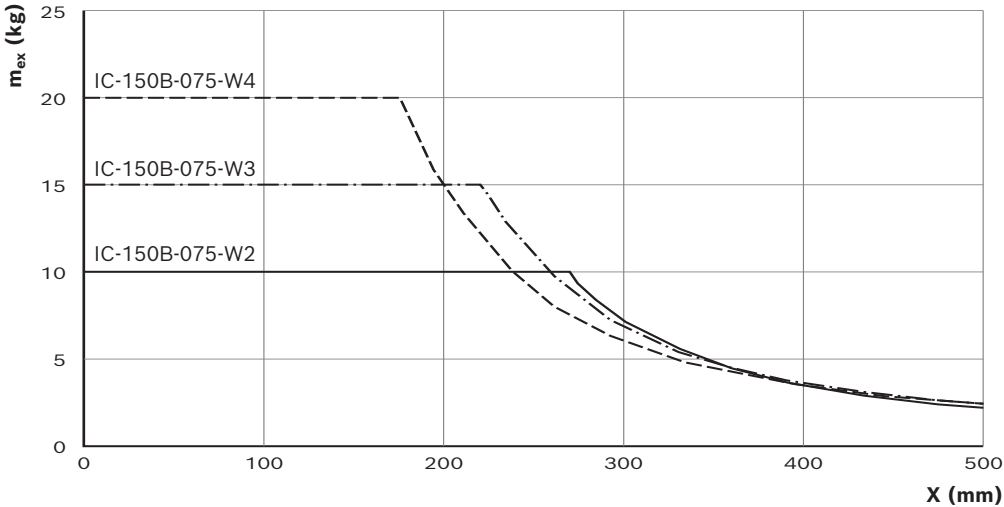
LMM-180-IL-30F-WX



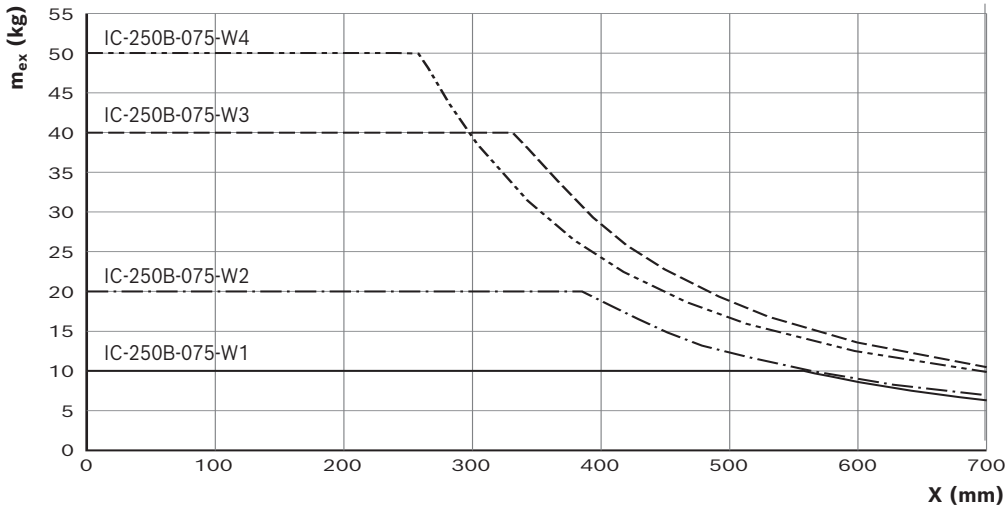
▲ Wall mounting



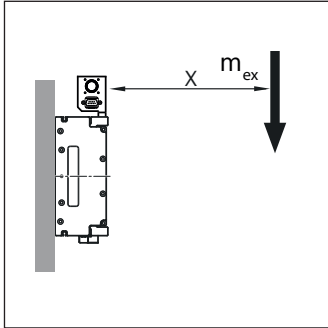
LMM-180-IC-150B-075-WX



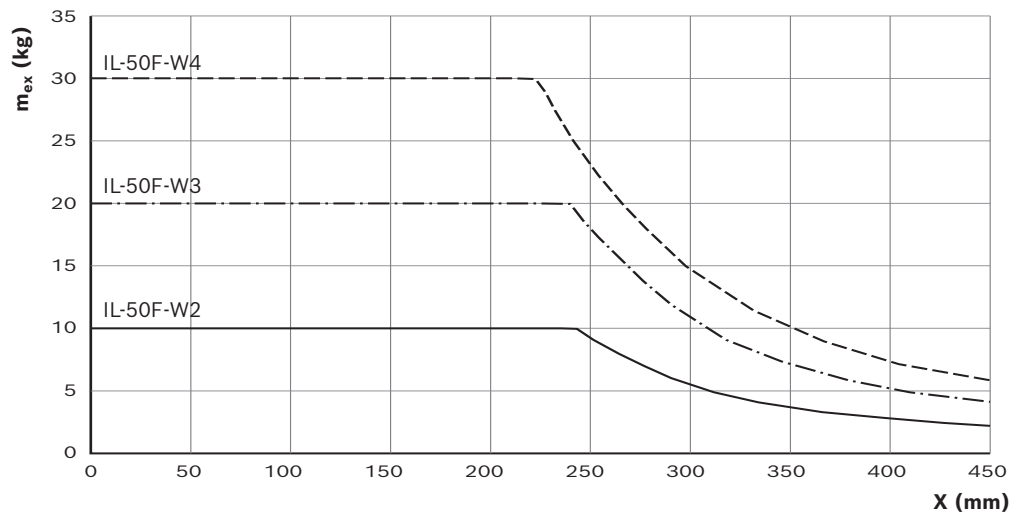
LMM-180-IC-250B-075-WX



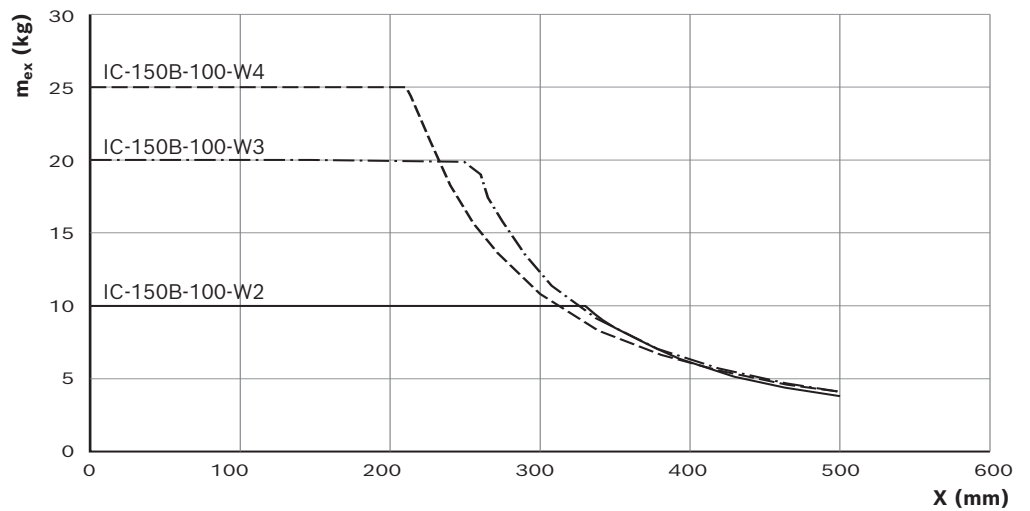
LMM-220-IL-50F-WX



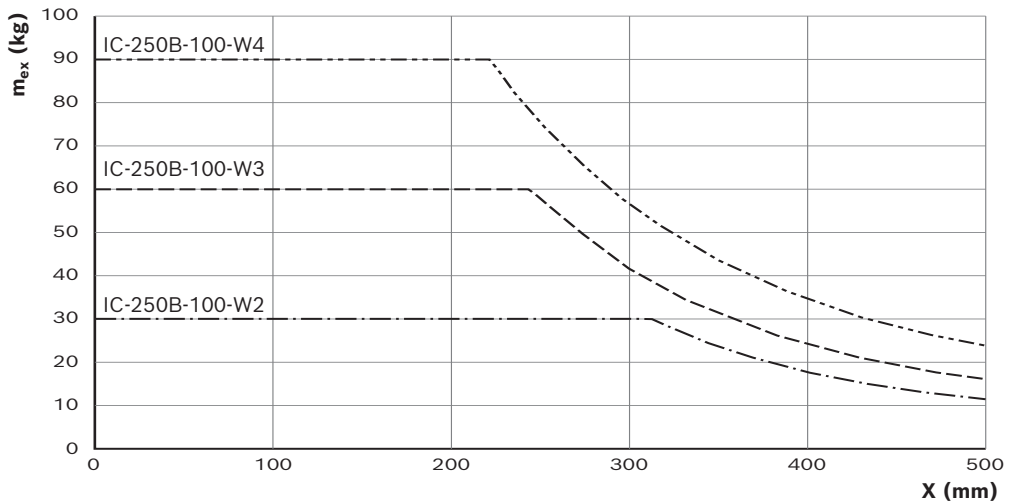
▲ Wall mounting



LMM-220-IC-150B-100-WX



LMM-220-IC-250B-100-WX

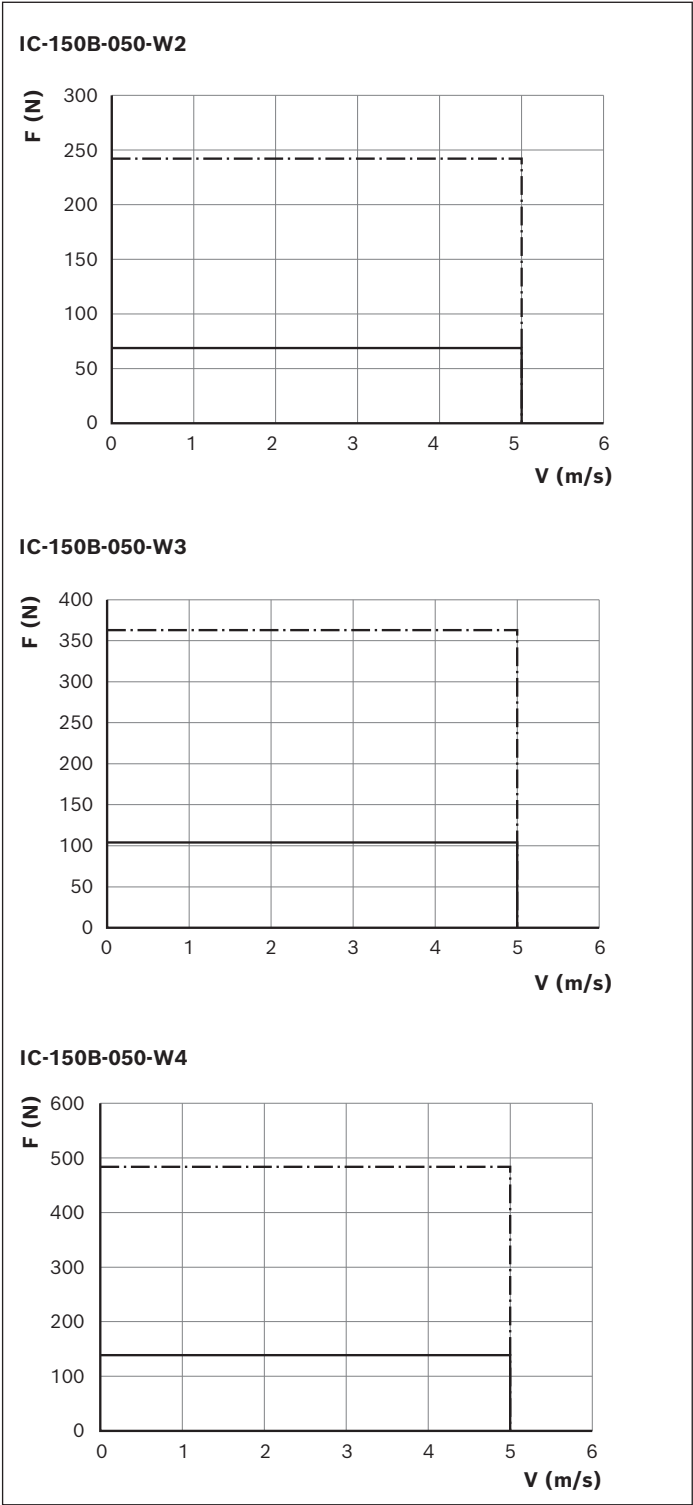


Motor characteristic curves: force - speed

The achievable motor force (F) depends on the drive controller used. The reference value for specifying the technical data and displaying the motor characteristics is the DC bus voltage V_{DC} .

LMM-140-IC-150B-050-WX

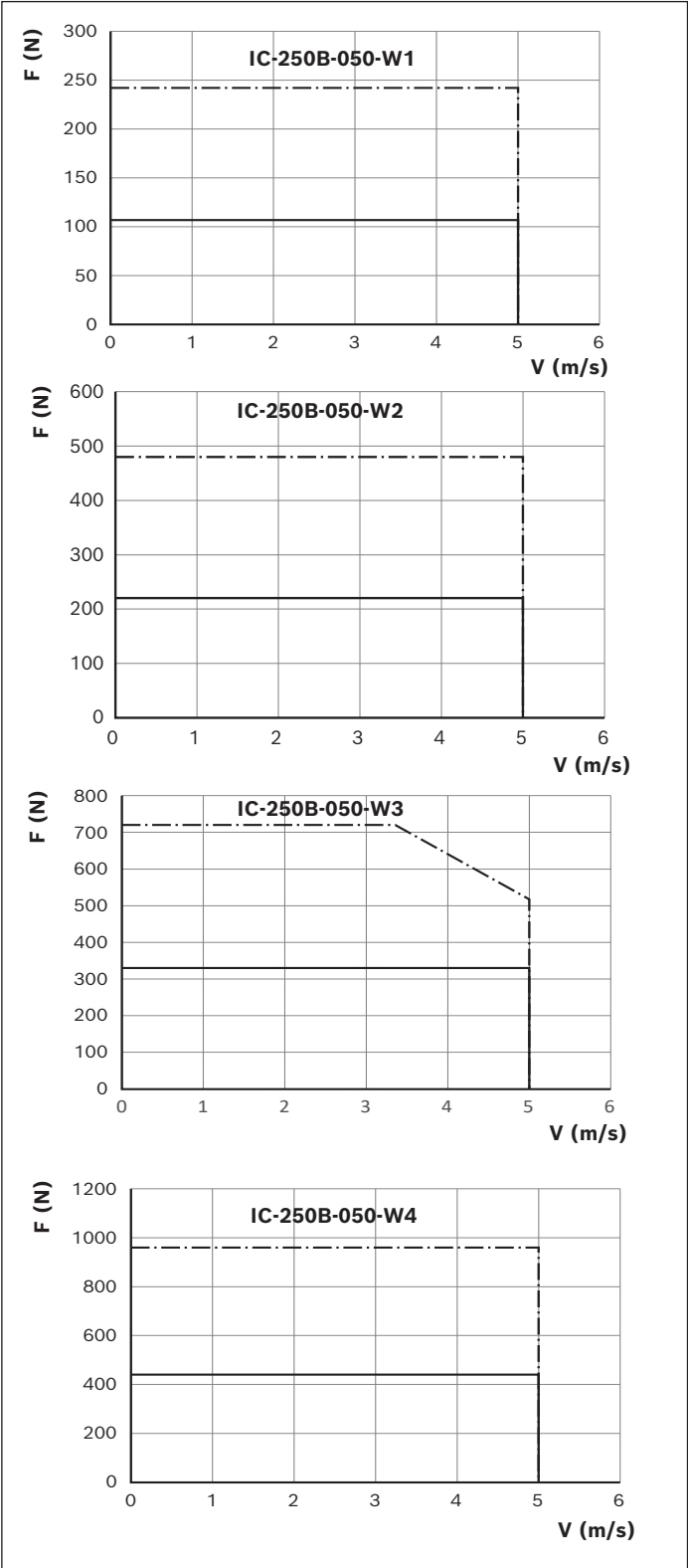
DC bus voltage $V_{DC} = 600\text{ V}$



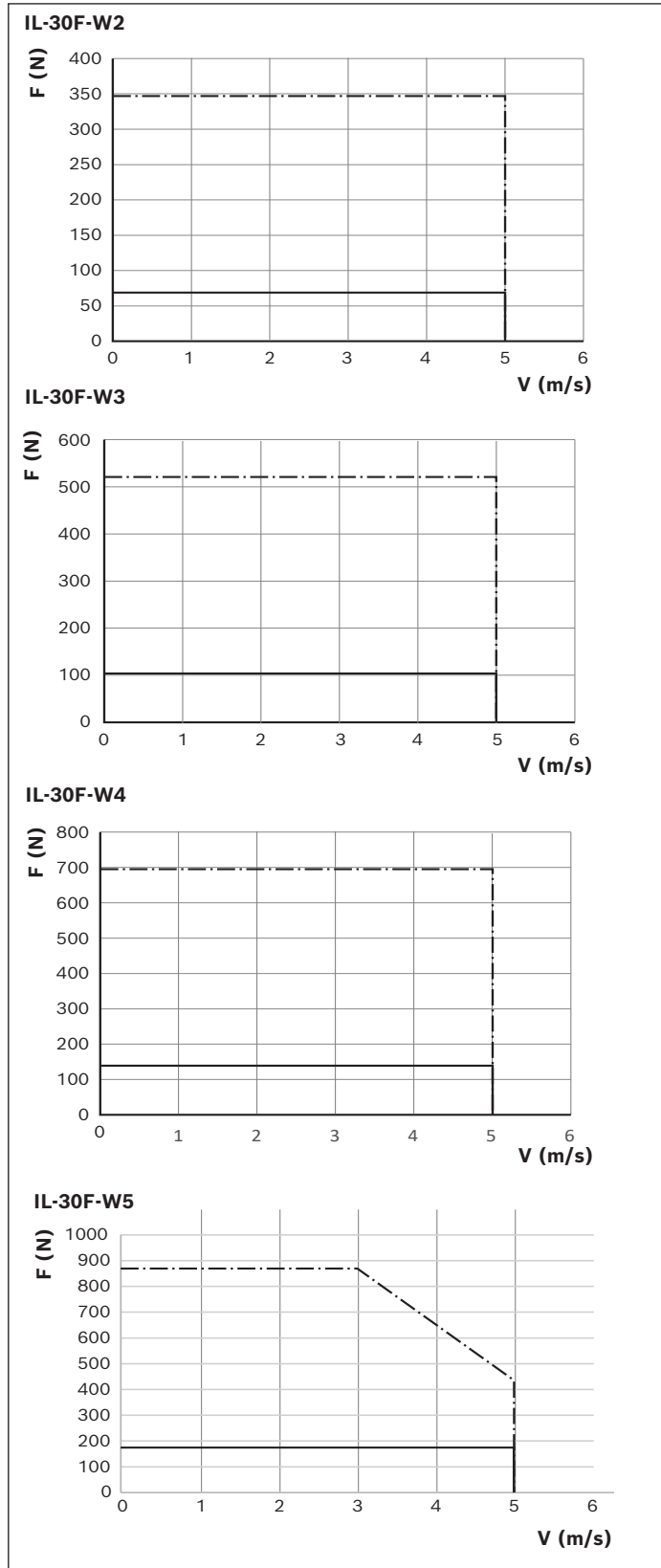
— Continuous rated force F_{dN} (N)
- · - Maximum force F_{max} (N)

LMM-140-IC-250B-050-WX

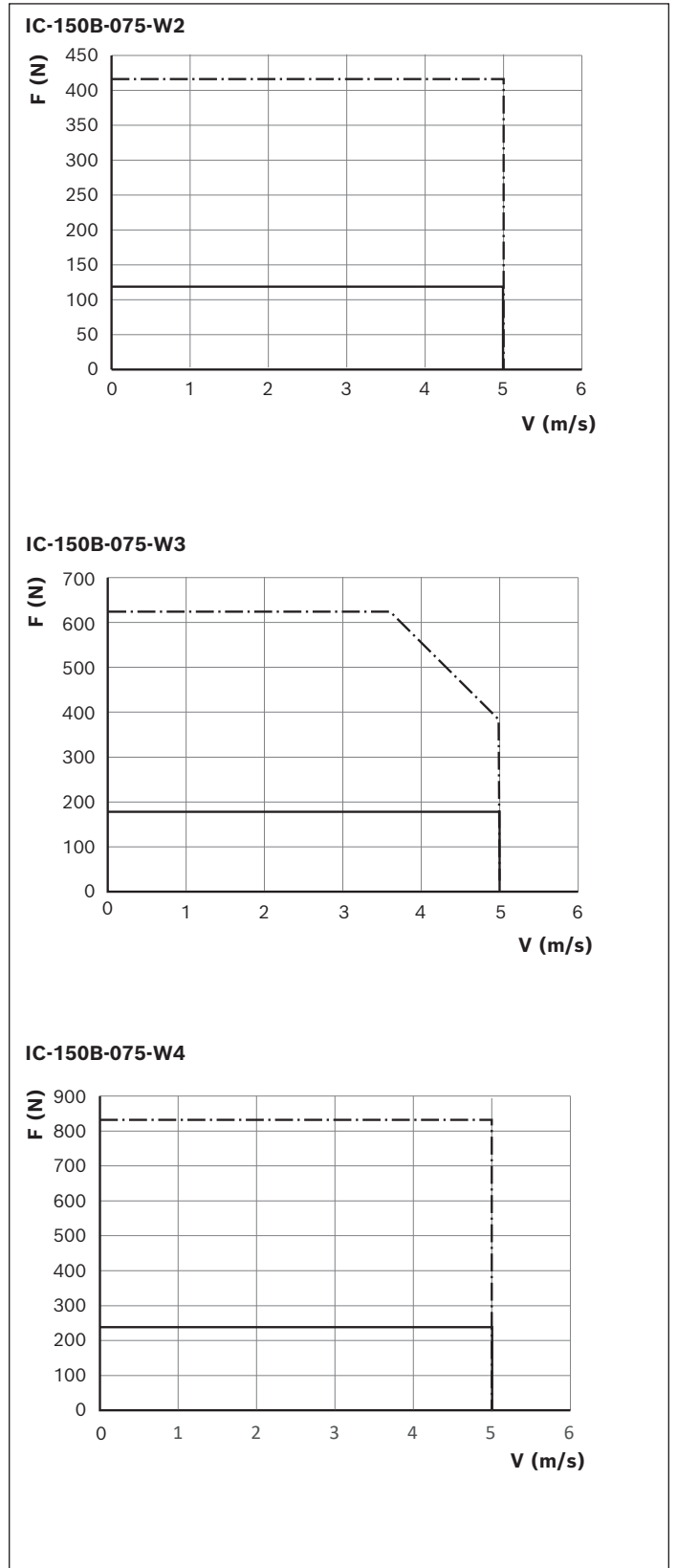
DC bus voltage $V_{DC} = 600\text{ V}$



LMM-180-IL-30F-WX
DC bus voltage $V_{DC} = 330\text{ V}$

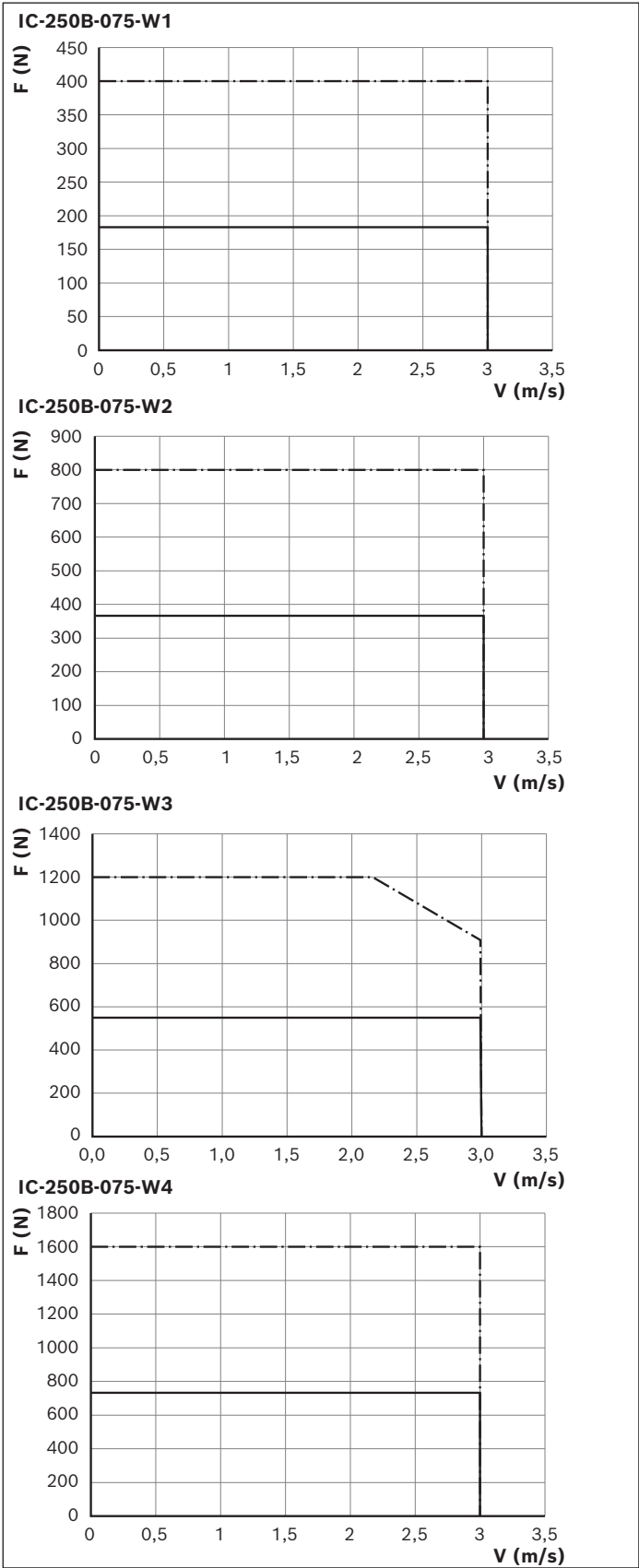


LMM-180-IC-150B-075-WX
DC bus voltage $V_{DC} = 600\text{ V}$

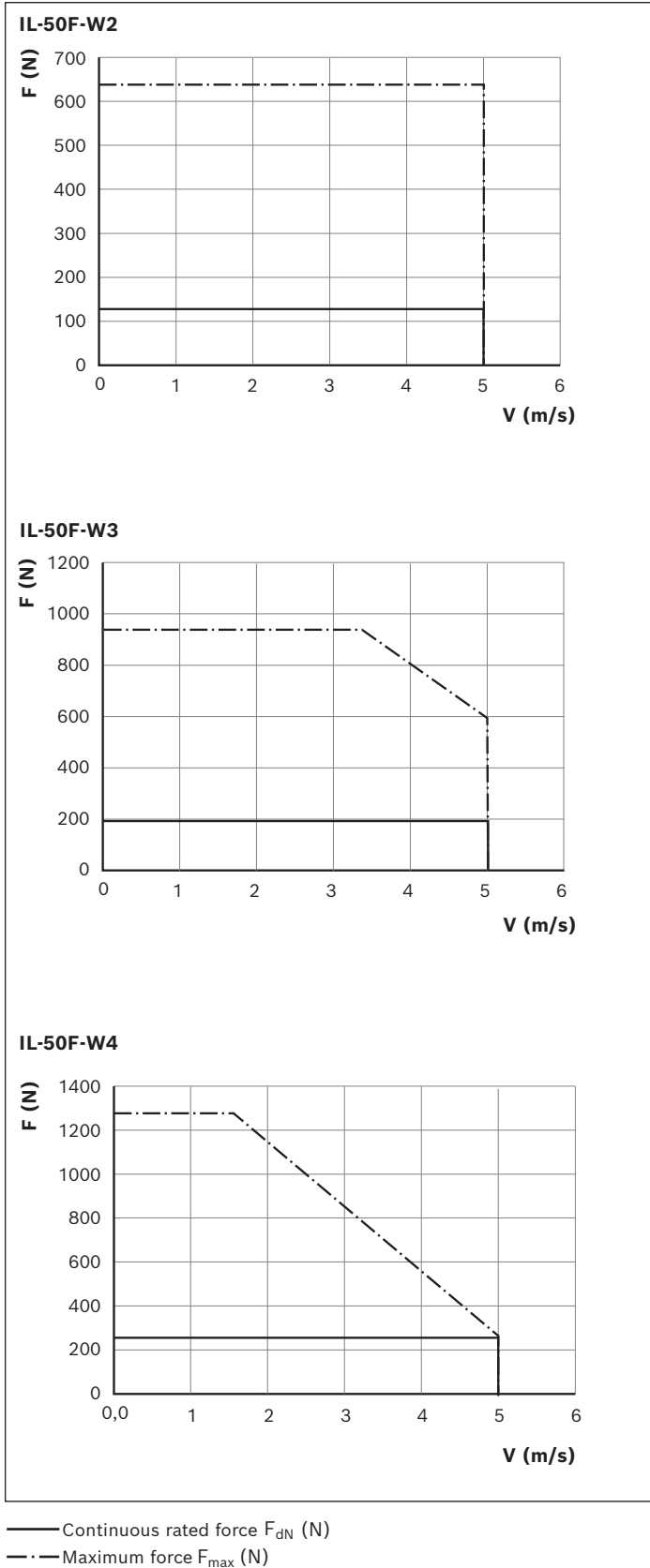


— Continuous rated force F_{dN} (N)
- · - Maximum force F_{max} (N)

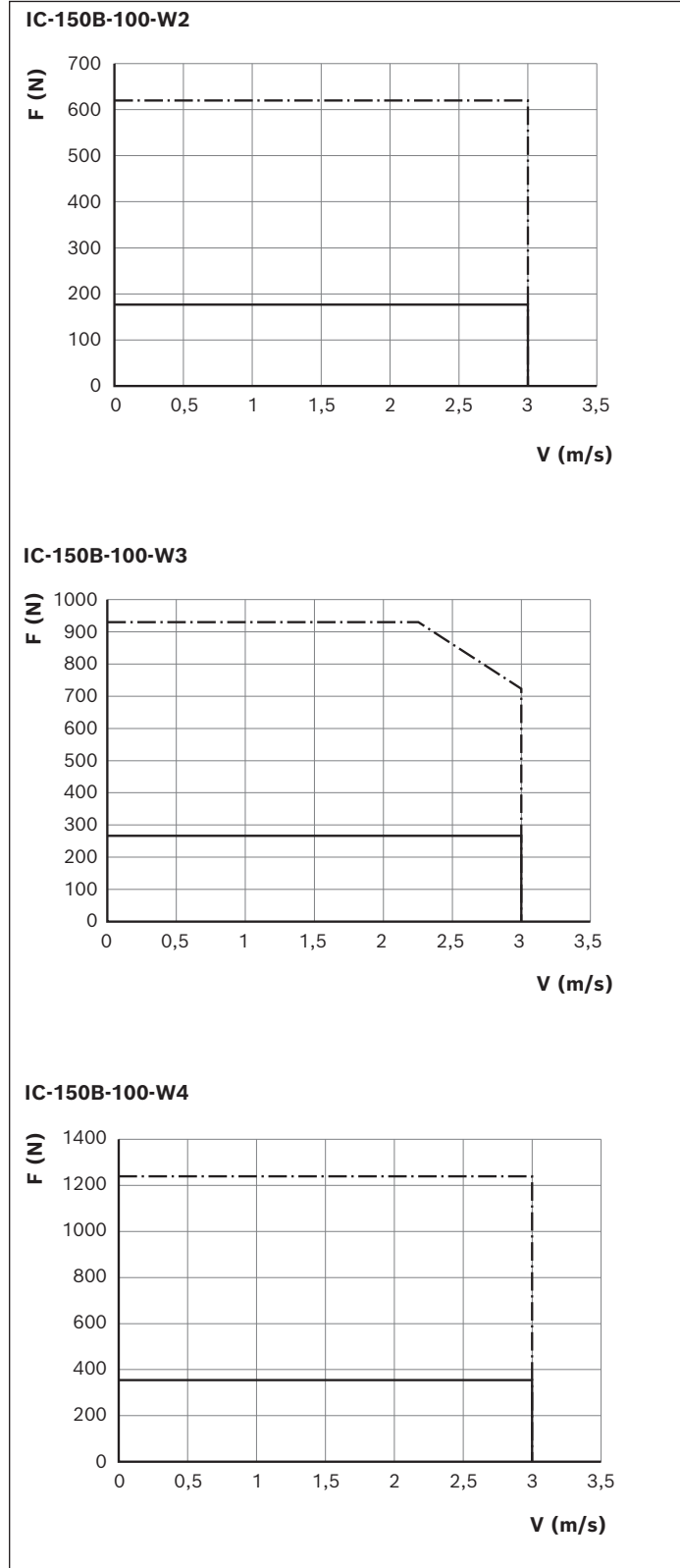
LMM-180-IC-250B-WX
 DC bus voltage $V_{DC} = 600\text{ V}$



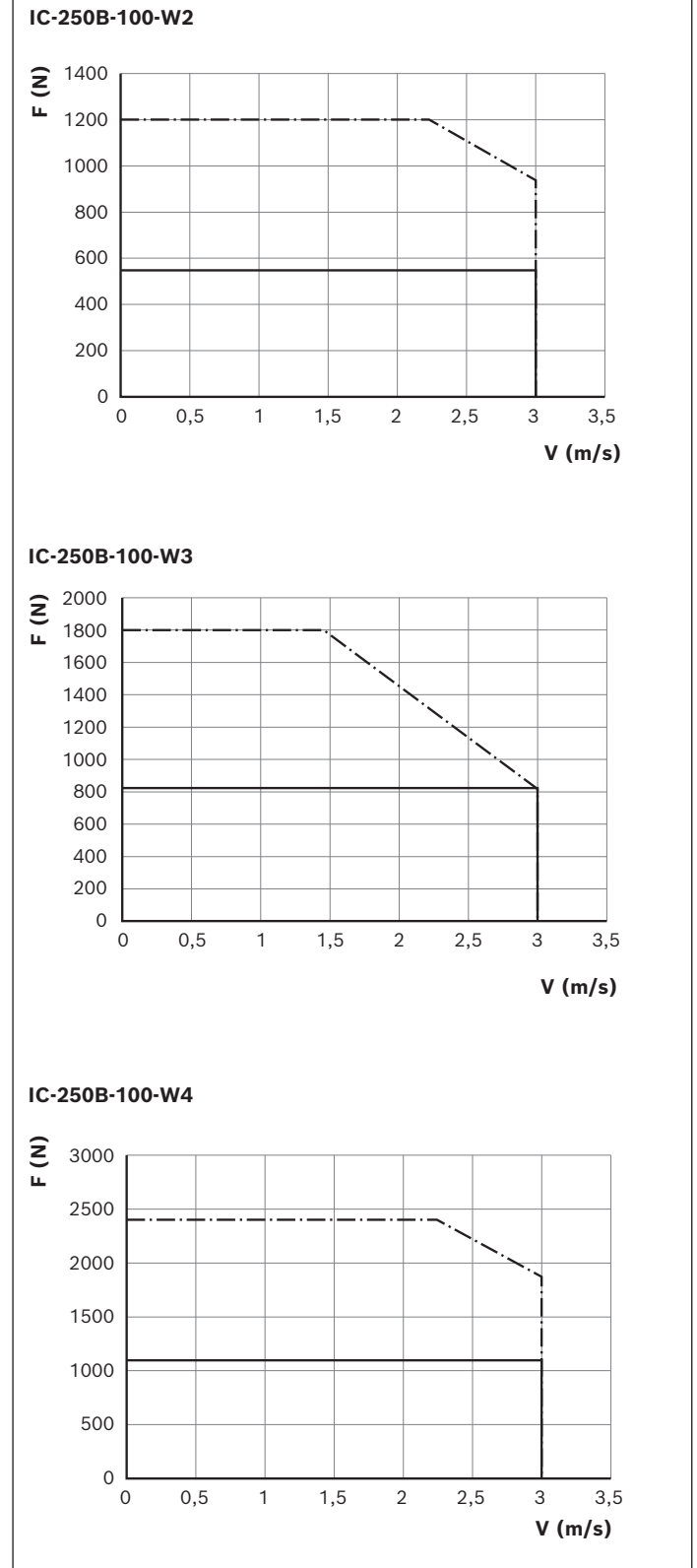
LMM-220-IL-50F-WX
 DC bus voltage $V_{DC} = 330\text{ V}$



LMM-220-IC-150B-100-WX
DC bus voltage $V_{DC} = 600\text{ V}$



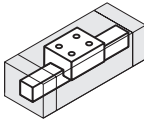
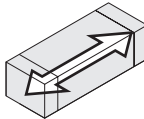
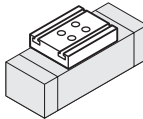
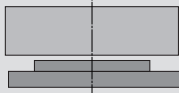
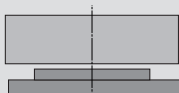
LMM-220-IC-250B-100-WX
DC bus voltage $V_{DC} = 600\text{ V}$



— Continuous rated force F_{dN} (N)
- · - Maximum force F_{max} (N)

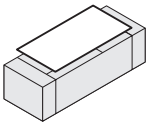
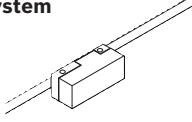
Configuration, order

LMM-140-180-220-NN-1

Short description	Version	Guideway 	Drive 			Carriage 		
			Motor			L _{ca} (mm)		
LMM-140	MA01	001	Iron-core 	IC-150B-050-W2	032	132	032	
				IC-150B-050-W3	033	174	033	
				IC-150B-050-W4	034	216	034	
				IC-250B-050-W1	051	140	051	
				IC-250B-050-W2	052	224	052	
				IC-250B-050-W3	053	308	053	
				IC-250B-050-W4	054	392	054	
LMM-180	MA01	001	Ironless 	IL-30F-W2	002	130	002	
				IL-30F-W3	003	190	003	
				IL-30F-W4	004	250	004	
				IL-30F-W5	005	310	005	
			Iron-core 	IC-150B-075-W2	032	132	032	
				IC-150B-075-W3	033	174	033	
				IC-150B-075-W4	034	216	034	
				IC-250B-075-W1	051	140	051	
				IC-250B-075-W2	052	224	052	
				IC-250B-075-W3	053	308	053	
				IC-250B-075-W4	054	392	054	
LMM-220	MA01	001	Ironless 	IL-50F-W2	002	130	002	
				IL-50F-W3	003	190	003	
				IL-50F-W4	004	250	004	
			Iron-core 	IC-150B-100-W2	032	132	032	
				IC-150B-100-W3	033	174	033	
				IC-150B-100-W4	034	216	034	
				IC-250B-100-W2	052	224	052	
				IC-250B-100-W3	053	308	053	
				IC-250B-100-W4	054	392	054	

¹⁾ Lubrication ➔ Chapter „Lubrication“.

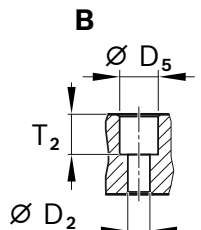
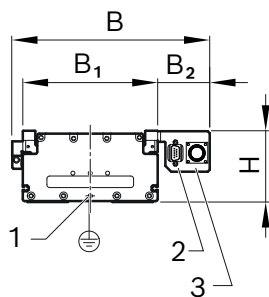
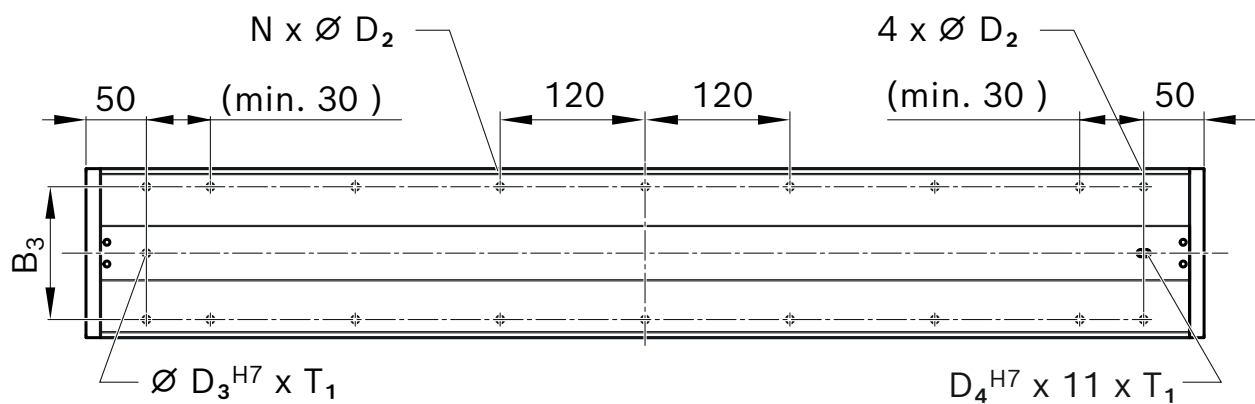
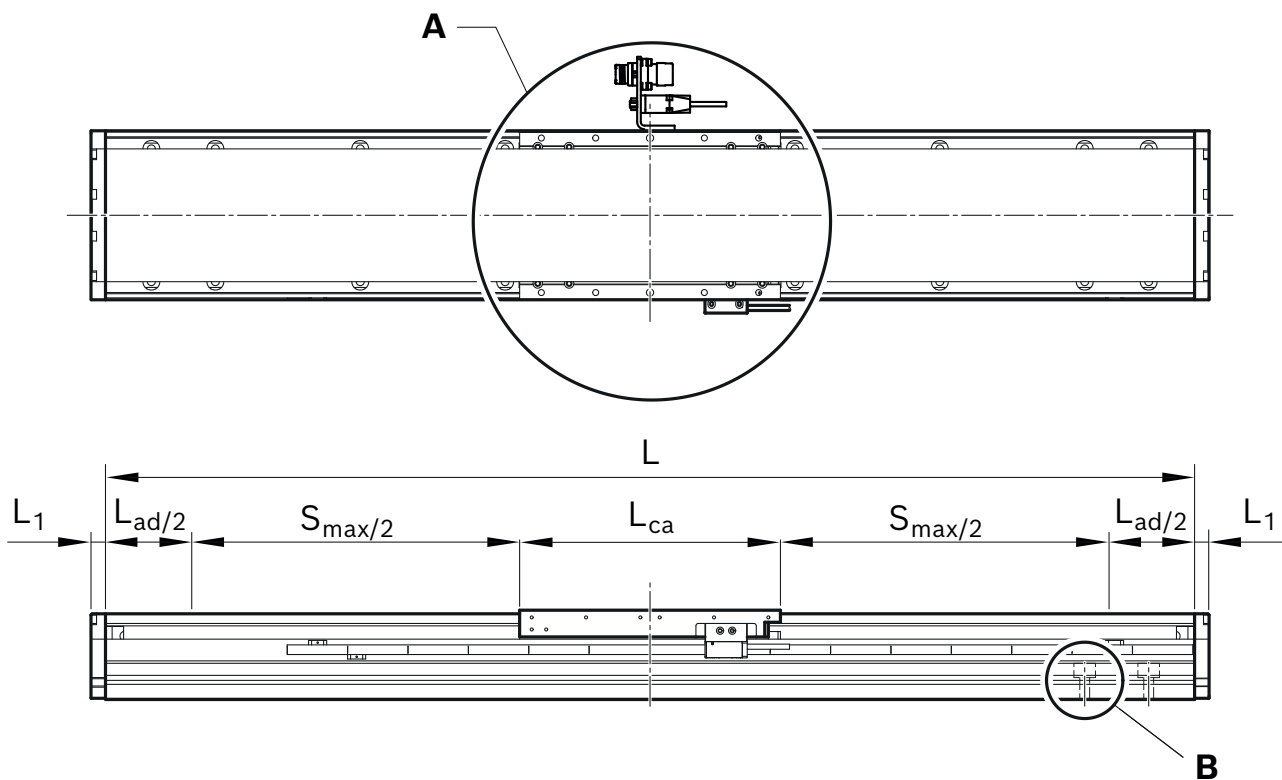
²⁾ Standard, longer on request

	Cover 	Position measuring system 	Lubrication 	Travel (mm)			Documentation 
				s _{min}	s _{max} ²⁾	Length increments	Standard report
	001	005	LSS ¹⁾	184	1528	84	001
	001	005	LSS ¹⁾	160	1540	60	001
				184	1528	84	
	001	005	LSS ¹⁾	160	1540	60	001
				184	1528	84	

Dimension drawings

Dimension drawings LMM

Motor	LMM-140		LMM-180			LMM-220		
	IC-150B-050	IC-250B-050	IL-30F	IC-150B-075	IC-250B-075	IL-50F	IC-150B-100	IC-250B-100
B	211.5	211.5	251.5	251.5	251.5	285	285	285
B ₁	140	140	180	180	180	225	225	225
B ₂	60	60	60	60	60	60	60	60
B ₃	110		152			205		
H	74	101	81	81	108	91.7	91.7	105
Ø D ₂	6.6		7			6.6		
Ø D ₃	6		8			8		
D ₄	6		8			8		
Ø D ₅	14		12			11		
T ₁ (deep)	9		10			10		
T ₂	43		43.5			6.4		
L _{ad}	40		40			40		
L ₁	12		12			12		



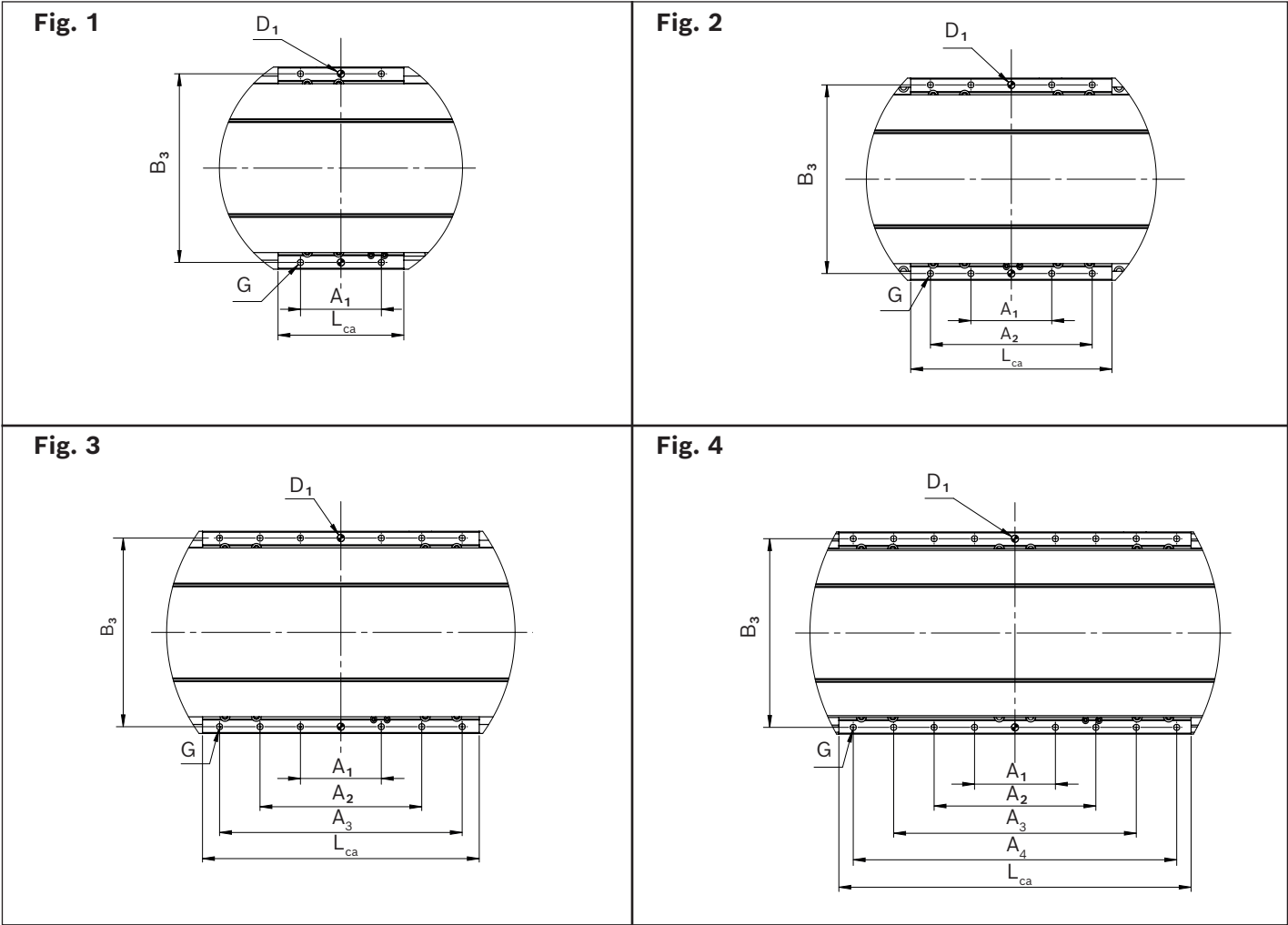
A ➡ Dimension drawings of carriage next page

- 1 M5 x 10 deep (on both sides)
- 2 Encoder connection
- 3 Motor connection

Dimension drawings carriages

LMM	Motor	Dimension in (mm)					B ₃	D ₁	G	Figure
		L _{ca}	A ₁	A ₂	A ₃	A ₄				
-140	IC-150B-050-W2	132	40	90	-	-	128	2 x Ø 6 H7 x 10	8 x M6 x 12	2
	IC-150B-050-W3	174	40	140	-	-				
	IC-150B-050-W4	216	90	180	-	-				
	IC-250B-050-W1	140	90	-	-	-			4 x M6 x 12	1
	IC-250B-050-W2	224	90	180	-	-			8 x M6 x 12	2
	IC-250B-050-W3	308	90	180	270	-			12 x M6 x 12	3
	IC-250B-050-W4	392	90	180	270	360			16 x M6 x 12	4
-180	IL-30F-W2	130	60	90	-	-	168	2 x Ø 6 H7 x 10	8 x M6 x 12	2
	IL-30F-W3	190	60	160	-	-				3
	IL-30F-W4	250	60	160	210	-				3
	IL-30F-W5	310	60	160	260	-			8 x M6 x 12	2
	IC-150B-075-W2	132	40	90	-	-				2
	IC-150B-075-W3	174	40	140	-	-				
	IC-150B-075-W4	216	90	180	-	-				
	IC-250B-075-W1	140	90	-	-	-			4 x M6 x 12	1
	IC-250B-075-W2	224	90	180	-	-			8 x M6 x 12	2
	IC-250B-075-W3	308	90	180	270	-			12 x M6 x 12	3
	IC-250B-075-W4	392	90	180	270	360			16 x M6 x 12	4
-220	IL-50F-W2	130	60	90	-	-	210	2 x Ø 8 H7 x 10	8 x M6 x 12	2
	IL-50F-W3	190	60	160	-	-			12 x M6 x 12	3
	IL-50F-W4	250	60	160	210	-			8 x M6 x 12	2
	IC-150B-100-W2	132	40	90	-	-				
	IC-150B-100-W3	174	40	140	-	-				
	IC-150B-100-W4	216	90	180	-	-				
	IC-250B-100-W1	140	90	-	-	-			4 x M8 x 13,8	1
	IC-250B-100-W2	224	90	180	-	-			8 x M8 x 13,8	2
	IC-250B-100-W3	308	90	180	270	-			12 x M8 x 13,8	3
	IC-250B-100-W4	392	90	180	270	360			16 x M8 x 13,8	4

A



Attachment parts

Assignment: motor, controller, cable

LMM	Motor	Controller	Mains filter	Power cable	Encoder-cabel
-140	IC-150B-050-W2	HCS01E-W0018-A-03	NFD03.1-480-007 R911286917 3-phase AC 480 V – 7 A _{eff}	Power cable: RKL4801/xxx,x Power extension cable: RKL4802/xxx,x	Encoder-cable: LMM-CE-H-xx,x Encoder extension cable: LMM-CE-E-xx,x
	IC-150B-050-W3				
	IC-150B-050-W4				
	IC-250B-050-W1				
	IC-250B-050-W2				
	IC-250B-050-W3				
	IC-250B-050-W4	HCS01E-W0028-A-03	NFD03.1-480-016 R911286918 3-phase AC 480 V – 16 A _{eff}		
-180	IL-30F-W2	HCS01E-W0018-A-02 ¹⁾	NFE02.1-230-008 R911266399 1-phase AC 230 V – 8 A _{eff}		
	IL-30F-W3				
	IL-30F-W4				
	IL-30F-W5				
	IC-150B-075-W2	HCS01E-W0018-A-03	NFD03.1-480-007 R911286917 3-phase AC 480 V – 7 A _{eff}		
	IC-150B-075-W3				
	IC-150B-075-W4				
	IC-250B-075-W1				
	IC-250B-075-W2				
	IC-250B-075-W3				
	IC-250B-075-W4	HCS01E-W0028-A-03	NFD03.1-480-016 R911286918 3-phase AC 480 V – 16 A _{eff}		
-220	IL-50F-W2	HCS01E-W0018-A-02 ¹⁾	NFE02.1-230-008 R911266399 1-phase AC 230 V – 8 A _{eff}		
	IL-50F-W3				
	IL-50F-W4				
	IC-150B-100-W2	HCS01E-W0018-A-03	NFD03.1-480-007 R911286917 3-phase AC 480 V – 7 A _{eff}		
	IC-150B-100-W3				
	IC-150B-100-W4				
	IC-250B-100-W2				
	IC-250B-100-W3				
		IC-250B-100-W4	HCS01E-W0028-A-03	NFD03.1-480-016 R911286918 3-phase AC 480 V – 16 A _{eff}	

¹⁾ The controller selection includes a 10% Performance loss

Cable

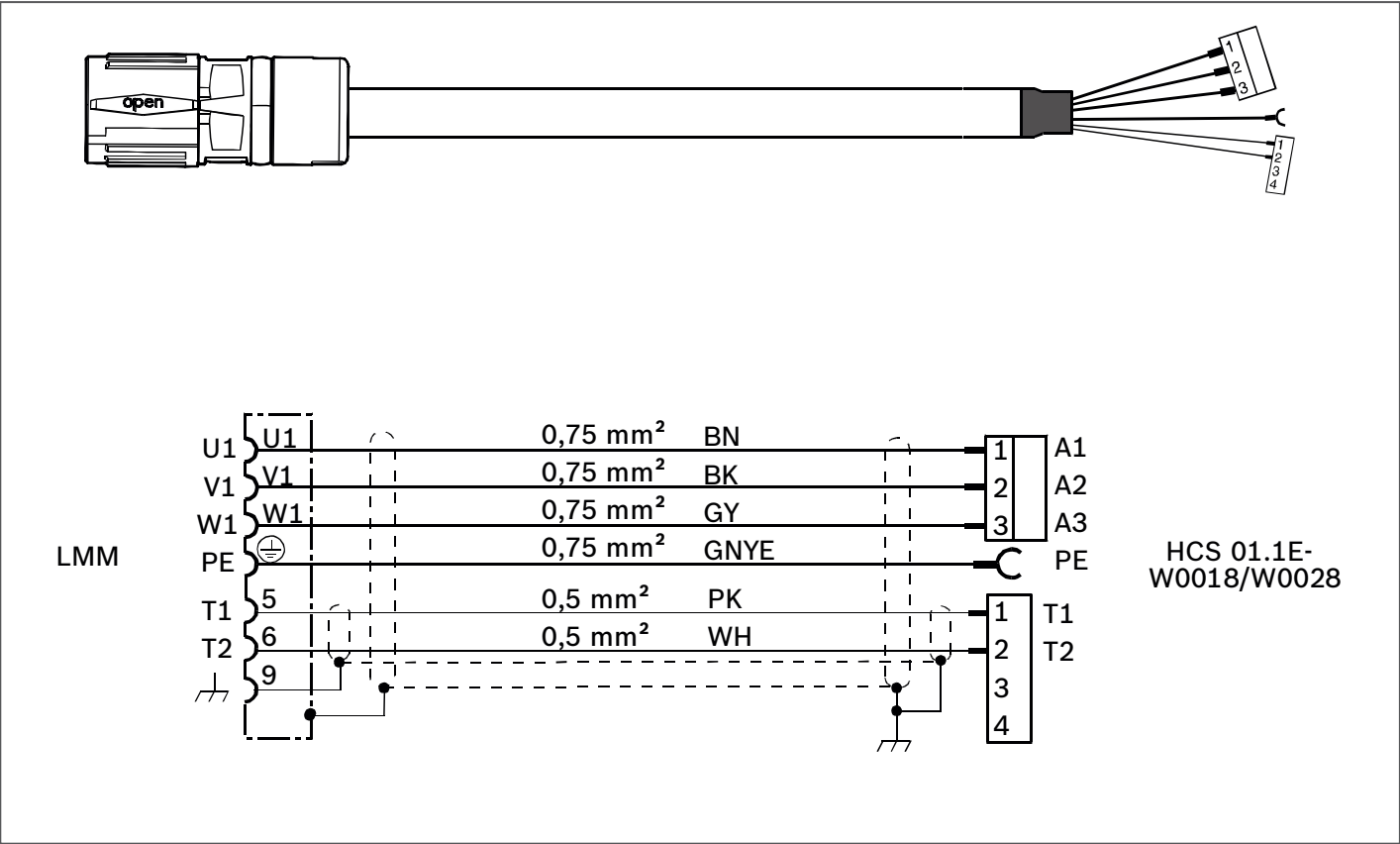
Cable	Description	Cable weight (g/m)	Cable outside diameter D (mm)	Bending radius minimum		Bending cycles
				fixed installation	flexible installation	
Power cable	RKL4801/xxx,x	132	10,0	5 x D (50,0 mm)	7,5 x D (75,00 mm)	5 Mio.
Encoder-cable	LMM-CE-H-xx,x	76	7,5	4 x D (30,0 mm)	7,5 x D (56,25 mm)	

Cable		Cable length		
		5 m	10 m	15 m
Power cable	Description	RKL4801/005,0	RKL4801/010,0	RKL4801/015,0
	Material number	R911346023	R911346026	R911346027
Encoder-cable	Description	LMM-CE-H-05,0	LMM-CE-H-10,0	LMM-CE-H-15,0
	Material number	R901591425	R901591426	R901591427

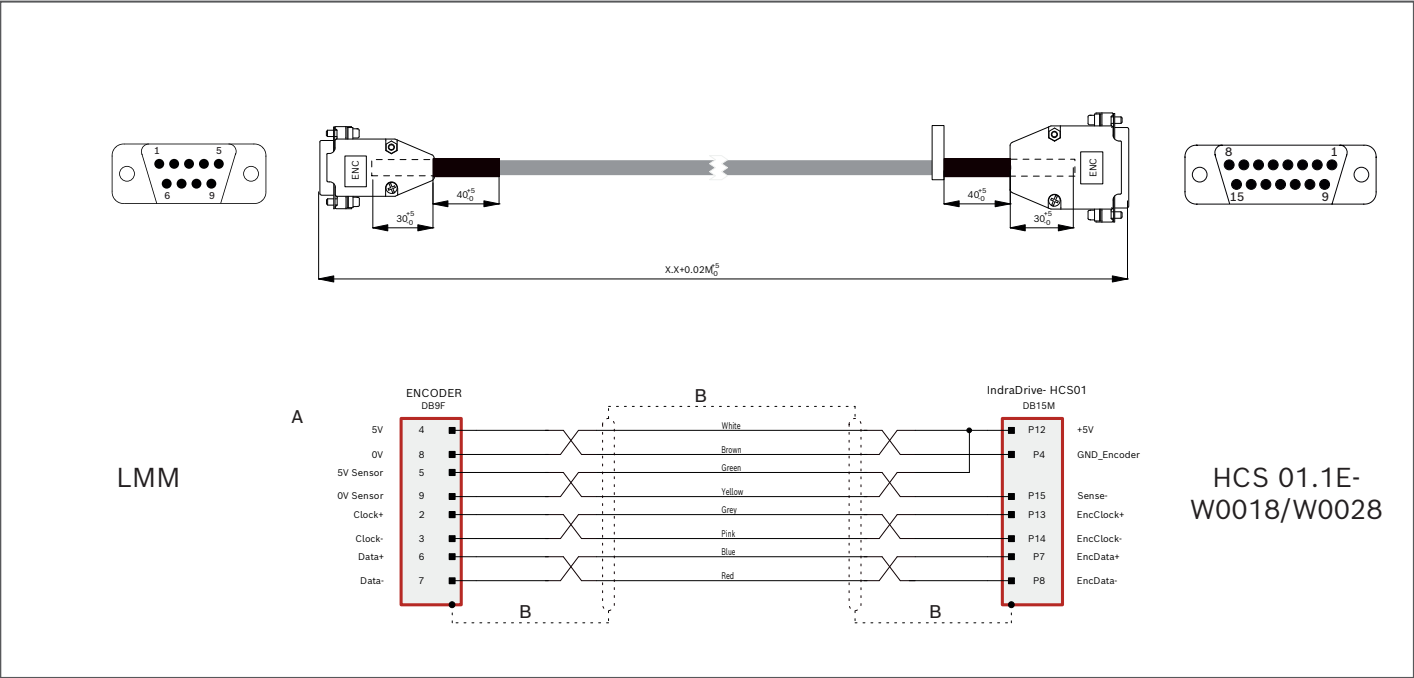
Extension cable		Cable length		
		1 m	2 m	3 m
Power extension cable	Bezeichnung	RKL4802/001,0	RKL4802/002,0	RKL4802/003,0
	Materialnummer	R911405906	R911409489	R911405197
Encoder extension cable	Bezeichnung	LMM-CE-E-01,0	LMM-CE-E-02,0	LMM-CE-E-03,0
	Materialnummer	R901598062	R901598126	R901598146

Power cable for Drive HCS01.1-W0018 and HCS01.1-W0028

RKL4801/xxx,x



Encoder-cable



Position measuring system

Absolute optical measuring system with an absolute coded scale. The necessary electronic and optical components are integrated in a single housing. The absolute measuring system measures the machine position directly digitally.

The linear position measuring system has the following key features:

- High speed and high accuracy for optimal performance.
- No homing required as the absolute position information is recognized immediately after the system is switched on.

Absolutely optical measuring method:

- The non-contact absolute linear encoder uses interferometry to obtain precise and direct measurements of position through the interference of light.

Specification

Measuring Standard	Steel tape with 20 µm incremental track and two absolute tracks
Protocol	BiSS-C
Steel tape thermal expansion coefficient	10.1 µm/m/°C
Measuring resolution	0.05 µm
Supply voltage	5V±10%
Current input	< 250 mA
Reader head protection	IP 40
Accuracy	±10 µm/m
Vibration (55 – 2000 Hz)	200 m/s²
Shock (11 ms)	1000 m/s²
Number of bits	32

Accessories

Documentation/ Mounting

Documentation

Standard report

The standard report serves to confirm that the checks listed in the report have been carried out and that the measured values lie within the permissible tolerances.

Option 01

Checks listed in the standard report:

- ▶ Functional checks of mechanical components
- ▶ Functional checks of electrical components
- ▶ Design as per order confirmation

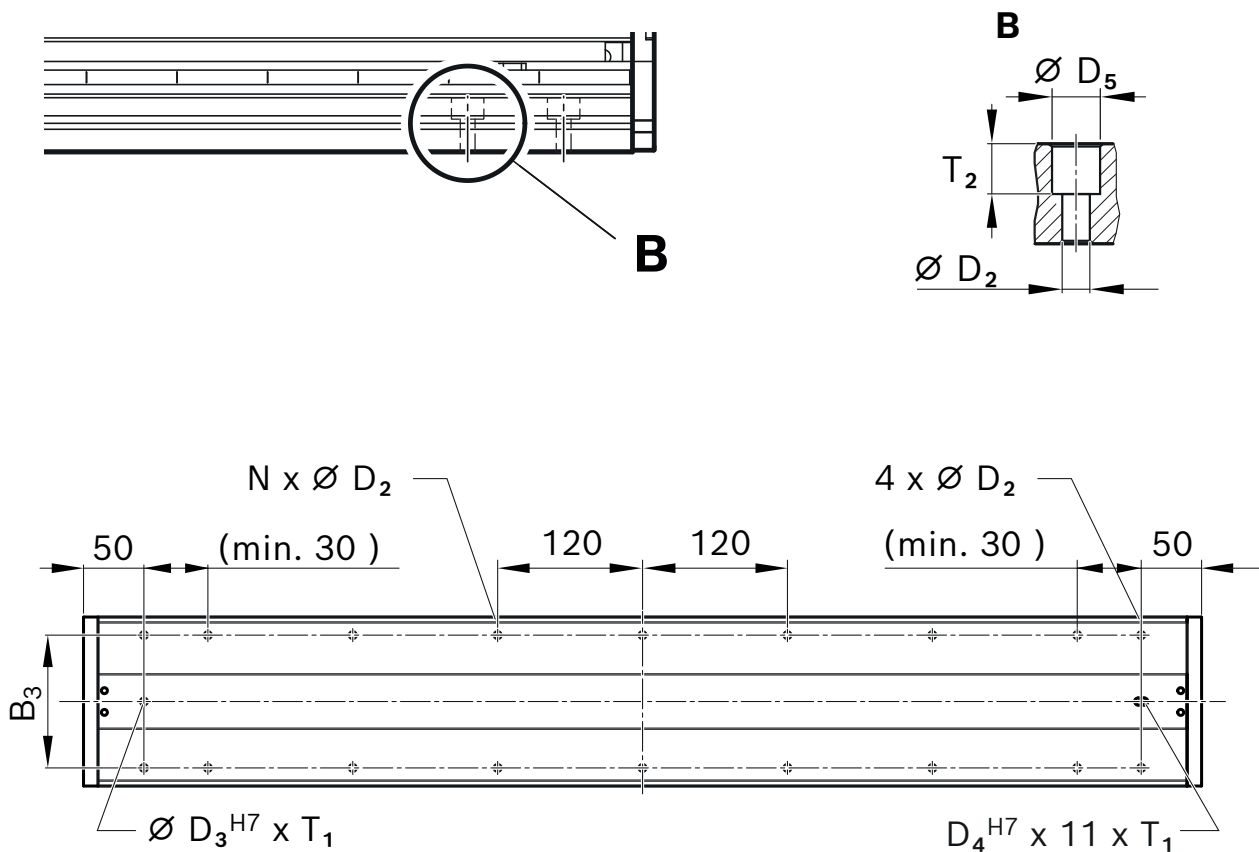
Mounting

General information on mounting

The LMM Linear Motor Modules can only be screwed on from above.

The fastening screws are not included in the scope of delivery.

The connection dimensions can be found in the respective dimensional drawings.



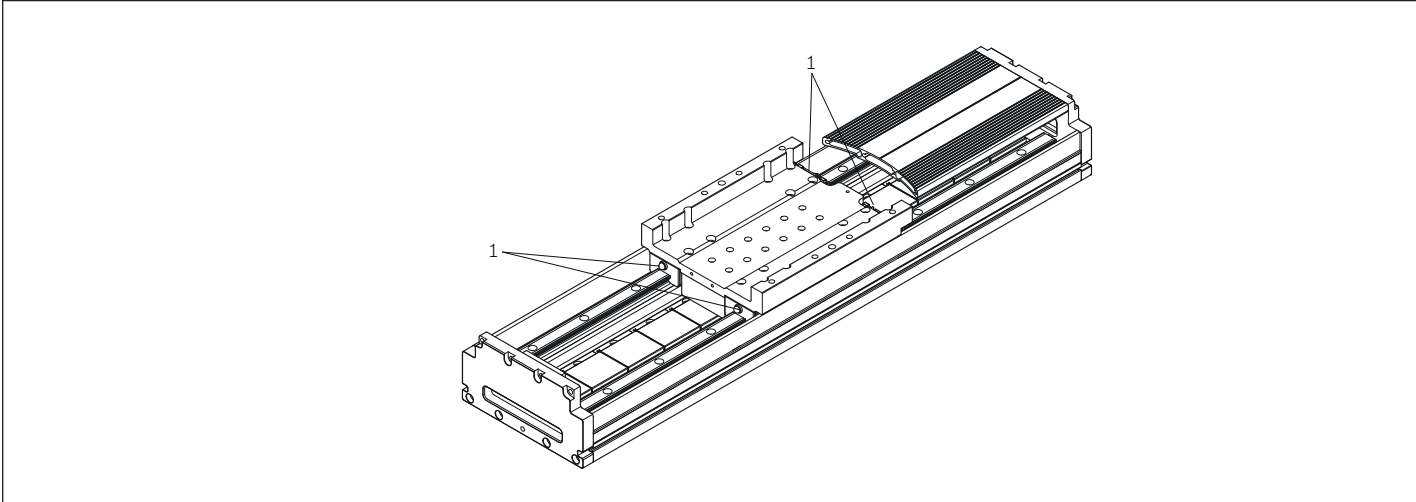
Example

Lubrication

The basic lubrication is done by the manufacturer. The Linear Motor Modules LMM are designed for grease lubrication with a hand grease gun. Maintenance is limited to relubrication of all runner blocks via the installed grease nipple (1). Greases containing solid lubricants (e.g. graphite or MoS₂) must not be used.

Lubricant

Lubricating version	Grease lubrication	
Basic lubrication	Tribol GR 100-2 PD	
Consistency class	NLGI 2 (DIN 51818)	
Identification	KP2K-20 (DIN 51825)	
Lubrication with hand grease gun	yes	
Prepared for connection to central lubrication systems	-	
Recommended lubricants	Dynalub 510 (Grease lubrication) Tribol GR 100-2 PD Elkalub GLS 135/N2 (NLGI2 DIN 51818)	
Features	• Good water resistance • Corrosion protection	
Material numbers	Dynalub	R3416 037 00 (400 g cartridge)
		R3416 035 00 (25 kg container)
	Tribol	R3416 031 00
	Elkalub	R9130 187 10

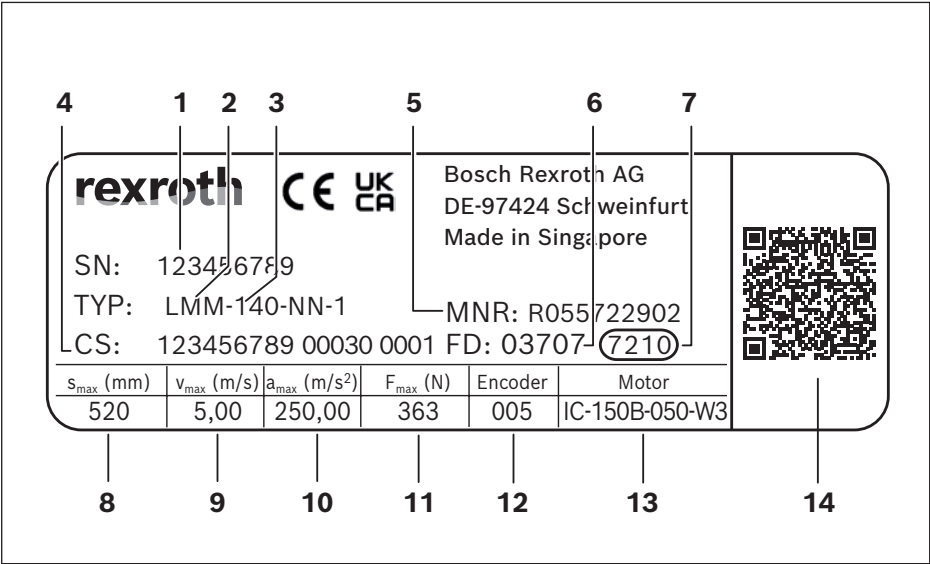


LMM	Funnel grease nipple	Relubrication quantity (cm ³)	Relubrication interval (km) or after 2 years
-140	DIN 3405-A M3x5	0,4 (2x)	6000
-180-IL			10000
-180-IC-150B			6000
-180-IC-250B	DIN 3405-B M3x5	0,7 (1x)	3500
-220-IL	DIN 3405-A M3x5	0,4 (2x)	6000
-220-IC-150B	DIN 3405-B M3x5	0,7 (1x)	3500
-220-IC-250B		1,4 (1x)	10000

Example: LMM-140 relubrication quantity 0.4 cm³ (2x) = Grease all ball runner blocks with a portion of 0.4 cm³ via grease nipples. Move the carriage over the maximum travel distance s_{max}. Then repeat the lubrication process.

Parameterization (commissioning)

The nameplate contains reference information on the production of the linear motion system as well as technical commissioning parameters.



1	SN	Customer order number
2	TYP	Short description
3	140	Size
4	CS	Customer information
5	MNR	Material number
6	FD	Manufacturing date
7	7210	Manufacturing location
8	s _{max}	Maximum travel range
9	v _{max}	Maximum speed
10	a _{max}	Maximum acceleration
11	F _{max}	Maximum force
12		Encoder
13		Motor
14		QR-Code

Further specific data and parameters for commissioning of the Linear Motor Module LMM can be found on the link below:

[Homepage Linear Motor Modules](#)

Ordering example/Operating conditions/Service and information

Ordering example

Linear Motor Modules LMM-180-NN-1	
Size	180
Length (L)	1280 mm
Maximum travel	1108 mm
Version	MA01 - with linear motor
Guide	001 - frame with ball rail guide
Drive	032 - linear motor with iron core, type IC-150B-075-W2
Carriage	032 - carriagelength 132 mm
Cover	001 - with cover plate
Length measuring system	005 - optical, absolute, resolution 0.05 µm, BiSS-C Interface
Lubrication	LSS - standard lubrication
Documentation	001 - Standard report

Operating conditions

Normal operating conditions

Ambient temperature	0 °C ... 40 °C, loss of performance above 40 °C
Ambient temperature for mechanical system (no undershooting the dew point)	−10 °C ... 60 °C
Travel range $s_{min}^{1)}$	See the “technical data” table
Soiling	not permissible
Motor insulation class	130 (B)

¹⁾ Minimum travel range to ensure a reliable lubrication distribution.

Required and supplementary documentation

For further instructions and information, please refer to the documentation for this product.

You can find PDF files of these documents on the Internet at www.boschrexroth.com/mediadirectory

If you are unsure about using this product, please contact Bosch Rexroth.

Further information

<u>Homepage Bosch Rexroth Lineartechnik</u>	
<u>Homepage Linear Motor Modules</u>	

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