

Linear Motors & Distance Measuring Systems

HIWIN LMC linear motors

3. HIWIN LMC linear motors

3.1 Special characteristics of the LMC linear motors

The HIWIN LMC synchronous linear motors are the dynamic sprinters of linear actuators. With the light, ironlessforcer and the U-shaped design of the stators with opposing magnets, no cogging torques occur between forcers and stators, and no magnetic forces are introduced into the guiding system. The linear motors in the LMC series thus achieve extremely high synchronism and high acceleration due to the minimal forcer mass. The LMC linear motors are optionally available as a vacuum system. The benefits of the LMC linear motors make them the preferred choice in fields where small masses with a maximum number of cycles need to be positioned very precisely. Due to their very high synchronism, the LMC linear motors are also suitable for application in testing and measuring machines.



Key features of the LMC linear motors:

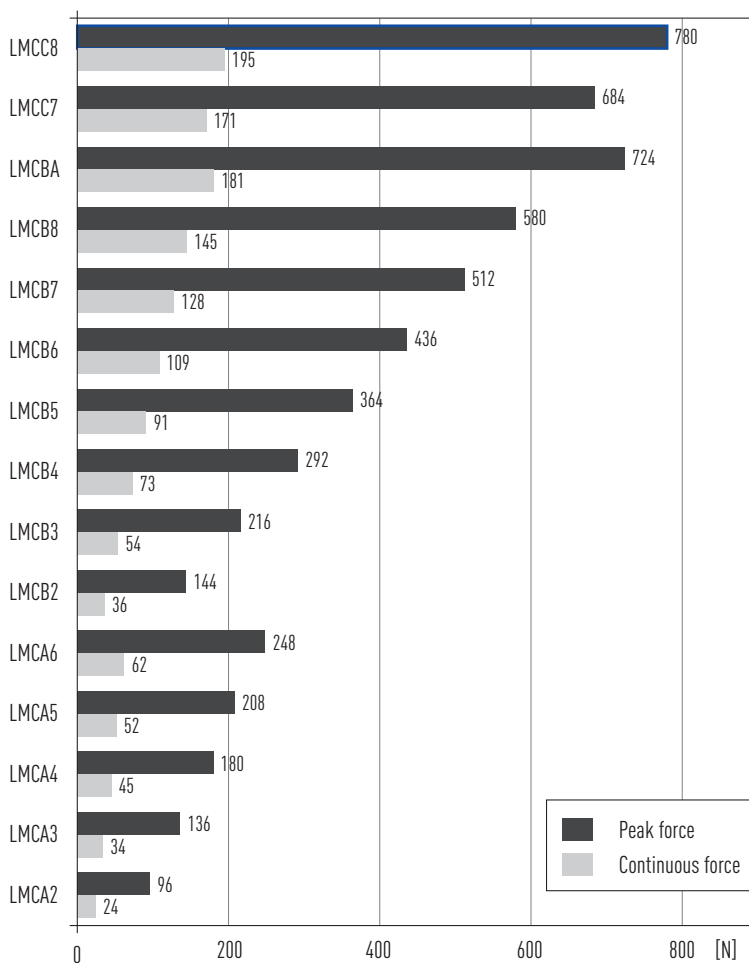
- Extremely dynamic
- No cogging, thus highest synchronous operation
- No magnetic pull in the guiding system
- Optional: design for vacuum applications
- Optional: version with Hall sensor

Typical fields of application of the LMC linear motors:

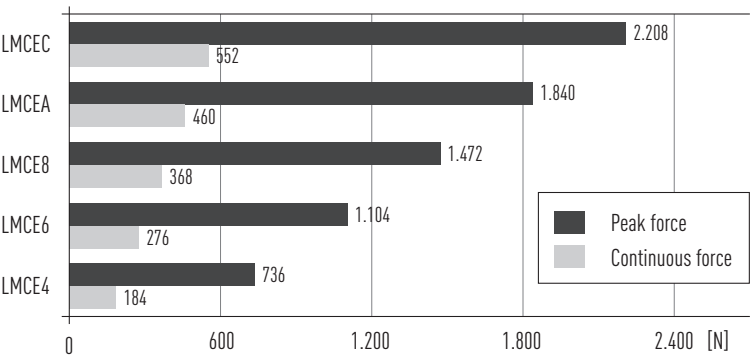
- Pick-and-place machines in semiconductor technology
- Air bearing axes
- Wafer structuring
- Pick-and-place machines
- High-precision measuring and testing machines
- Semiconductors

3.2 Force chart for LMC linear motors

Force chart for linear motors LMCA, LMCB, LMCC

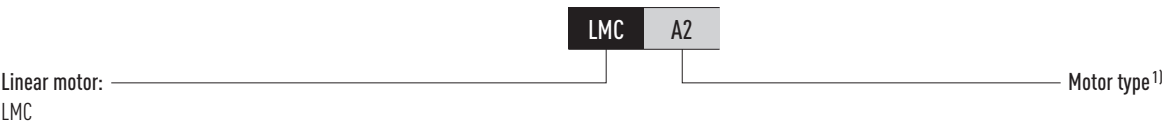


Force chart for linear motors LMCE



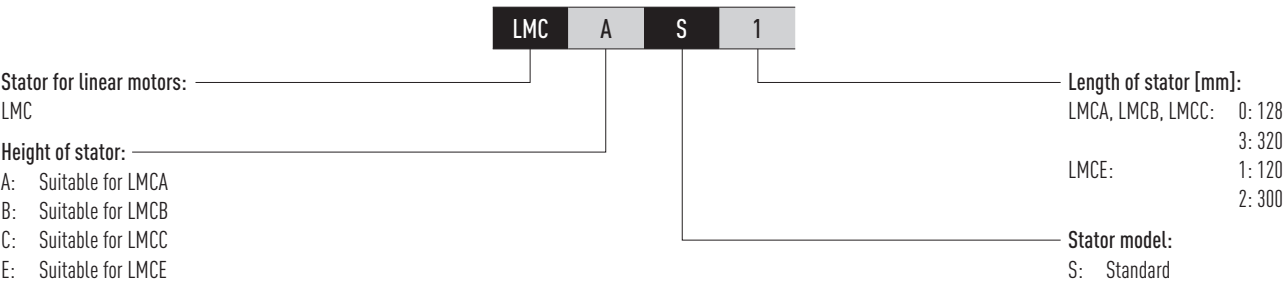
3.3 Order code LMC linear motors

3.3.1 Order code of primary part (forcer)



¹⁾ See Table 3.1 (LMCA)
Table 3.3 (LMCB)
Table 3.5 (LMCC)
Table 3.7 (LMCE)

3.3.2 Order code of magnet track (stator)



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3.4 LMC linear motor specifications

3.4.1 LMCA linear motor specifications

Force-velocity curves (DC bus voltage: 330 VDC)

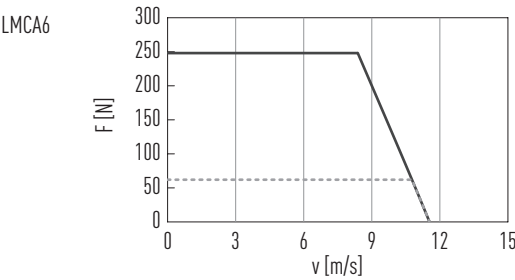
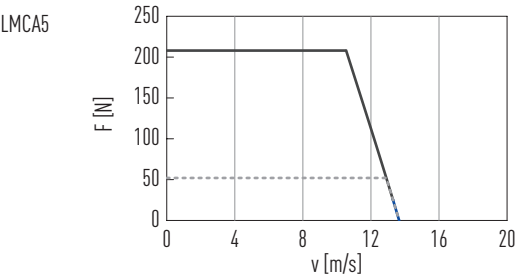
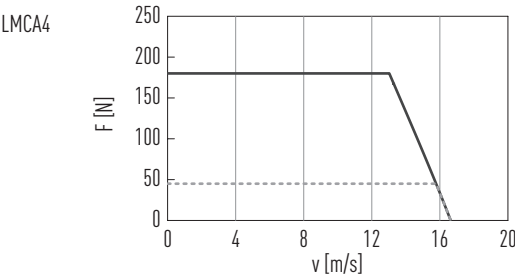
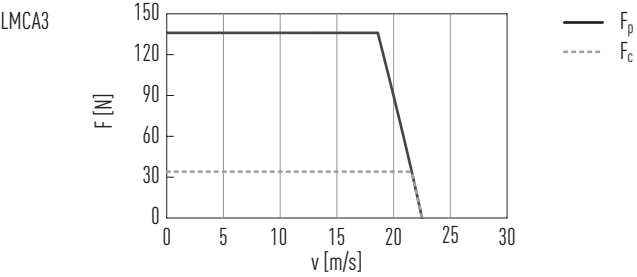
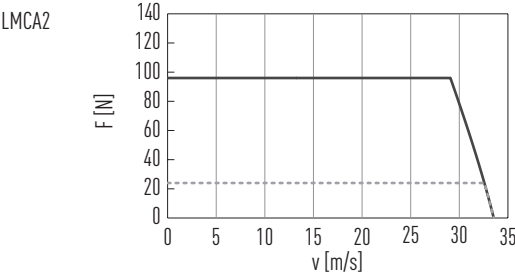


Table 3.1 Technical data for LMCA

	Symbol	Unit	LMCA2	LMCA3	LMCA4	LMCA5	LMCA6
Forces and electrical parameters							
Continuous force at T _{max}	F _c	N	24	34	45	52	62
Continuous current at T _{max}	I _c	A _{eff}	2.3	2.1	2.1	1.8	1.8
Peak force (for 1 s)	F _p	N	96	136	180	208	248
Peak current (for 1 s)	I _p	A _{eff}	9.2	8.4	8.4	7.2	7.2
Force constant	K _f	N/A _{eff}	10.6	15.8	21.2	28.2	33.8
Electrical time constant	K _e	ms	0.4	0.3	0.3	0.3	0.3
Resistance ¹⁾	R ₂₅	Ω	2.7	4.1	5.4	6.7	8.2
Inductance ¹⁾	L	mH	1.0	1.4	1.9	2.3	2.8
Back EMF constant	K _u	V _{eff} /(m/s)	5.9	8.8	11.9	14.5	17.4
Motor constant	K _m	N/√W	5.2	6.5	7.5	9.1	9.8
Thermal resistance	R _{th}	°C/W	2.80	2.21	1.68	1.84	1.50
Thermal switch			3 PTC SNM 100 in series				
Max. DC bus voltage		V	330				
Mechanical parameters							
Max. bending radius of motor cable	R _{bend}	mm	37.5				
Pole pair pitch	2τ	mm	32				
Max. winding temperature	T _{max}	°C	100				
Mounting holes (forcer)	n		2	3	4	5	6
Weight of forcer	M _F	kg	0.15	0.23	0.31	0.38	0.45
Length of forcer	L _F	mm	66	98	130	162	194
Unit mass of stator	M _S	kg/m	7				
Stator length/mounting holes	L _S	mm	128 mm/N = 2; 320 mm/N = 5				

All specifications are in ± 10 % of tolerance at 25 °C ambient temperature

¹⁾ Line to line

Table 3.2 LMCA motor cable assignment

Motor cable	Signal	Diameter [mm]
Brown	U	7.5
White	V	
Grey	W	
Black	GND	
Yellow	T+	
Green	T-	

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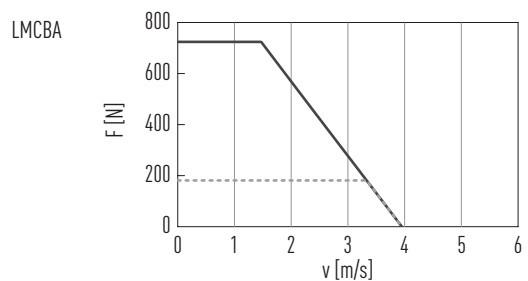
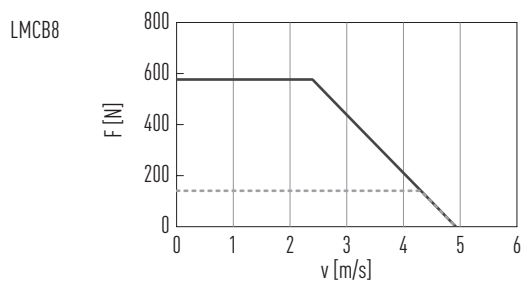
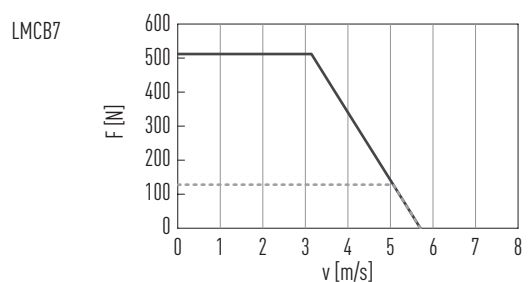
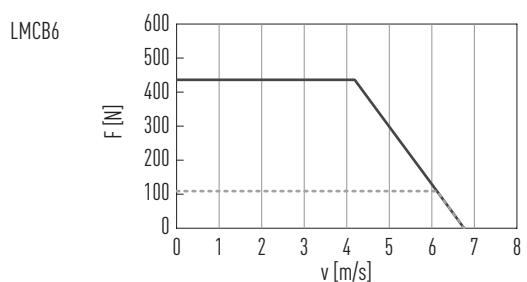
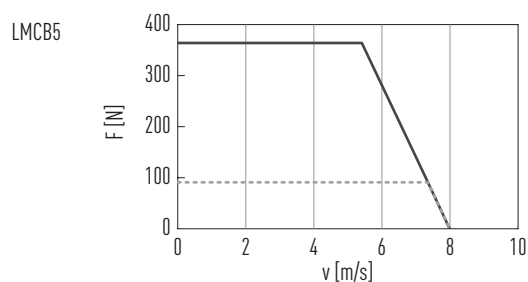
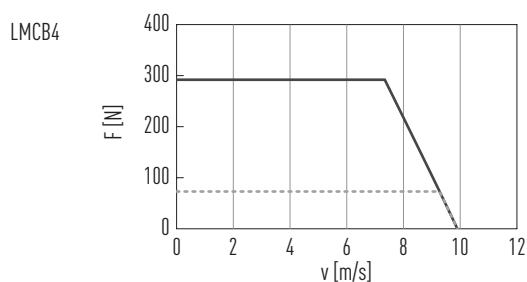
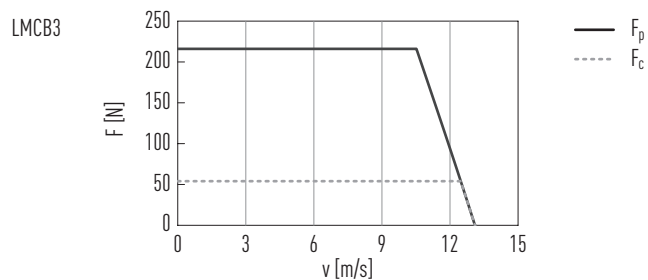
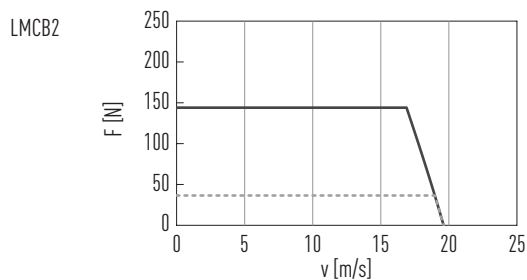
Technical drawing of a rectangular plate with the following dimensions and specifications:

- Overall width: L_5
- Overall height: 60
- Distance from left edge to first hole center: 22,5
- Distance between hole centers: $(N-1) \times 64$
- Distance from last hole center to right edge: 22,5
- Top hole diameter: $2-\varnothing 4$ thru
- Bottom hole diameter: $N-\varnothing 5,5$ thru; $\varnothing 9,5 \times 8DP$
- Right side detail: 31,2

Technical drawing of a motor assembly cross-section. The drawing shows a central rotor (F) with a diameter of 31.2, mounted on a stator (S). The total height of the assembly is 74.5 ± 0.1. The stator has a height of 60. The rotor has a height of 1. The air gap (AG) between the rotor and stator is specified as ≥ 0.4. The drawing includes a legend: F Forcer, S Stator, AG Air gap.

3.4.2 LMCB linear motor specifications

Force-velocity curves (DC bus voltage: 330 VDC)



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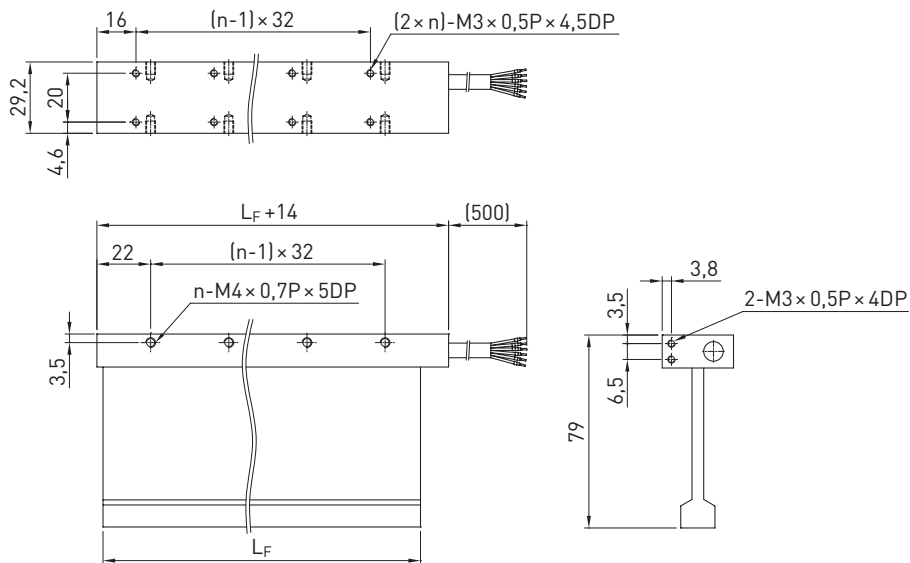
	Symbol	Unit	LMCB2	LMCB3	LMCB4	LMCB5	LMCB6	LMCB7	LMCB8	LMCBA
Forces and electrical parameters										
Continuous force at T _{max}	F _c	N	36	54	73	91	109	128	145	181
Continuous current at T _{max}	I _c	A _{eff}	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Peak force (for 1 s)	F _p	N	144	216	292	364	436	512	580	724
Peak current (for 1 s)	I _p	A _{eff}	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Force constant	K _f	N/A _{eff}	18.1	27.2	36.3	45.4	54.5	63.5	72.5	90.6
Electrical time constant	K _e	ms	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3
Resistance ¹⁾	R ₂₅	Ω	3.6	5.4	7.1	9.0	10.7	12.6	14.6	17.9
Inductance ¹⁾	L	mH	1.4	1.9	2.6	3.2	3.8	4.4	5.0	6.2
Back EMF constant	K _u	V _{eff} /(m/s)	10.1	15.2	20.0	24.8	29.3	34.7	40.0	50.0
Motor constant	K _m	N/√W	7.7	9.5	11.2	12.4	13.6	14.7	15.5	17.5
Thermal resistance	R _{th}	°C/W	2.77	1.85	1.41	1.11	0.93	0.79	0.68	0.56
Thermal switch			3 PTC SNM 100 in series							
Max. DC bus voltage		V	330							
Mechanical parameters										
Max. bending radius of motor cable	R _{bend}	mm	37.5							
Pole pair pitch	2τ	mm	32							
Max. winding temperature	T _{max}	°C	100							
Mounting holes (forcer)	n		2	3	4	5	6	7	8	10
Weight of forcer	M _F	kg	0.20	0.29	0.38	0.48	0.58	0.68	0.72	0.88
Length of forcer	L _F	mm	66	98	130	162	194	226	258	322
Unit mass of stator	M _S	kg/m	12							
Stator length/mounting holes	L _S	mm	128 mm/N = 2; 320 mm/N = 5							

All specifications are in $\pm 10\%$ of tolerance at $25^{\circ}C$ ambient temperature

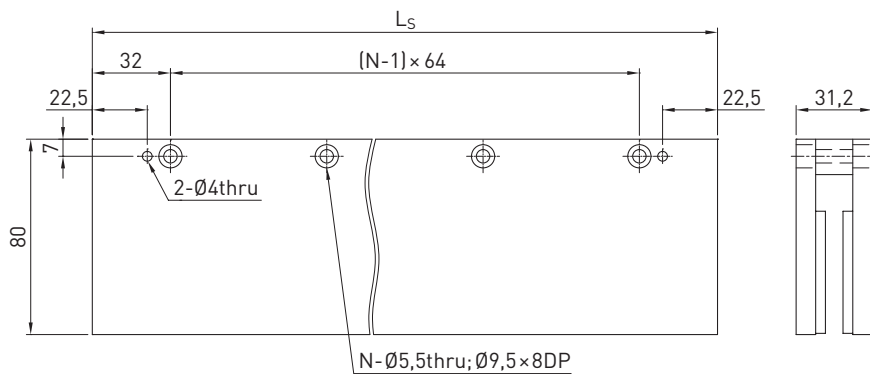
¹⁾ Line to line

Table 3.4 LMCB motor cable assignment		
Motor cable	Signal	Diameter [mm]
Brown	U	7.5
White	V	
Grey	W	
Black	GND	
Yellow	T+	
Green	T-	

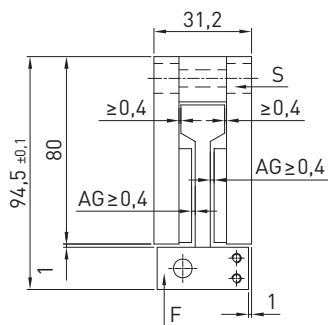
Dimensions of forcer



Dimensions of stator



Mounting tolerances



F	Forcer
S	Stator
AG	Air gap

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3.4.3 LMCC linear motor specifications

Force-velocity curves (DC bus voltage: 330 VDC)

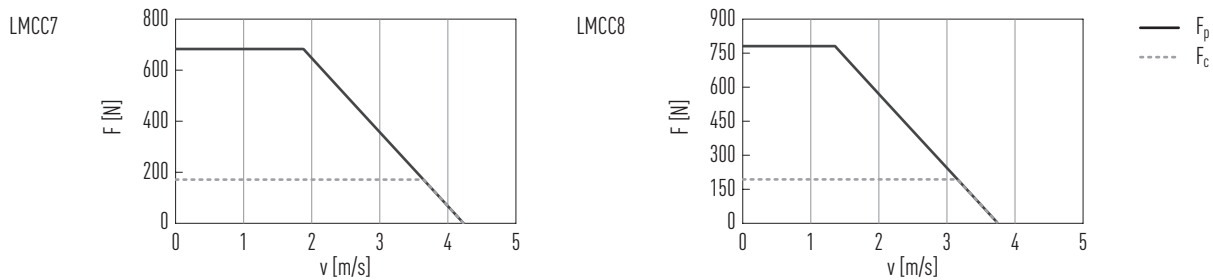


Table 3.5 Technical data for LMCC

	Symbol	Unit	LMCC7	LMCC8
Forces and electrical parameters				
Continuous force at T _{max}	F _c	N	171	195
Continuous current at T _{max}	I _c	A _{eff}	2.0	2.0
Peak force (for 1 s)	F _p	N	684	780
Peak current (for 1 s)	I _p	A _{eff}	8.0	8.0
Force constant	K _f	N/A _{eff}	85.4	97.5
Electrical time constant	K _e	ms	0.3	0.3
Resistance ¹⁾	R ₂₅	Ω	15.8	18.2
Inductance ¹⁾	L	mH	5.5	6.3
Back EMF constant	K _u	V _{eff} /(m/s)	45.4	51.9
Motor constant	K _m	N/√W	17.6	18.7
Thermal resistance	R _{th}	°C/W	0.63	0.55
Thermal switch			3 PTC SNM 100 in series	
Max. DC bus voltage		V	330	
Mechanical parameters				
Max. bending radius of motor cable	R _{bend}	mm	37.5	
Pole pair pitch	2τ	mm	32	
Max. winding temperature	T _{max}	°C	100	
Mounting holes (forcer)	n		7	8
Weight of forcer	M _F	kg	0.74	0.76
Length of forcer	L _F	mm	226	258
Unit mass of stator	M _S	kg/m	21	
Stator length/mounting holes	L _S	mm	128 mm/N = 2; 320 mm/N = 5	

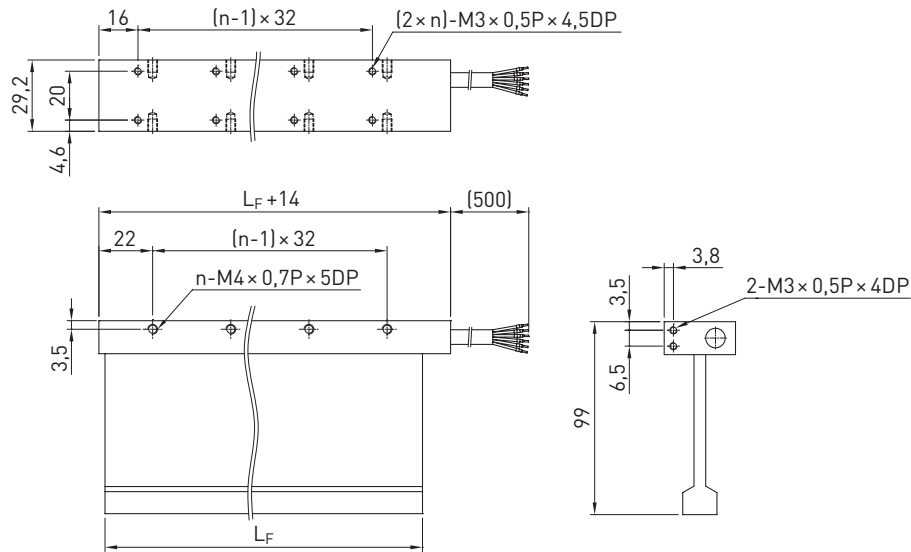
All specifications are in $\pm 10\%$ of tolerance at $25^{\circ}C$ ambient temperature

¹⁾ Line to line

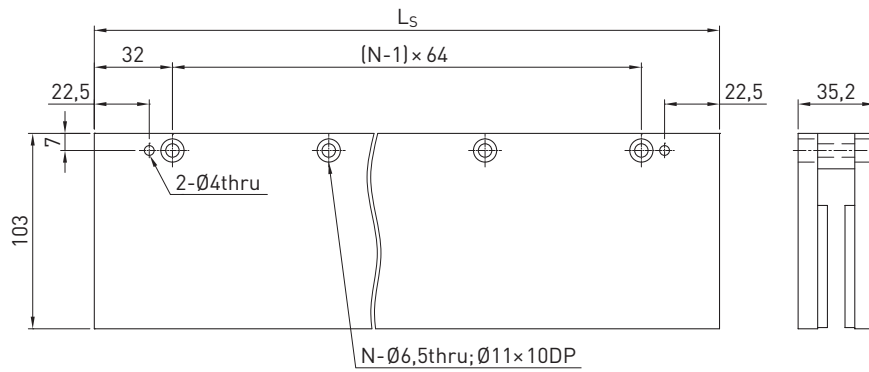
Table 3.6 LMCC motor cable assignment

Motor cable	Signal	Diameter [mm]
Brown	U	7.5
White	V	
Grey	W	
Black	GND	
Yellow	T+	
Green	T-	

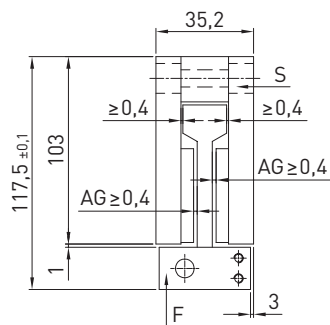
Dimensions of forcer



Dimensions of stator



Mounting tolerances



F Forcer
S Stator
AG Air gap

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3.4.4 LMCE linear motor specifications

Force-velocity curves (DC bus voltage: 330 VDC)

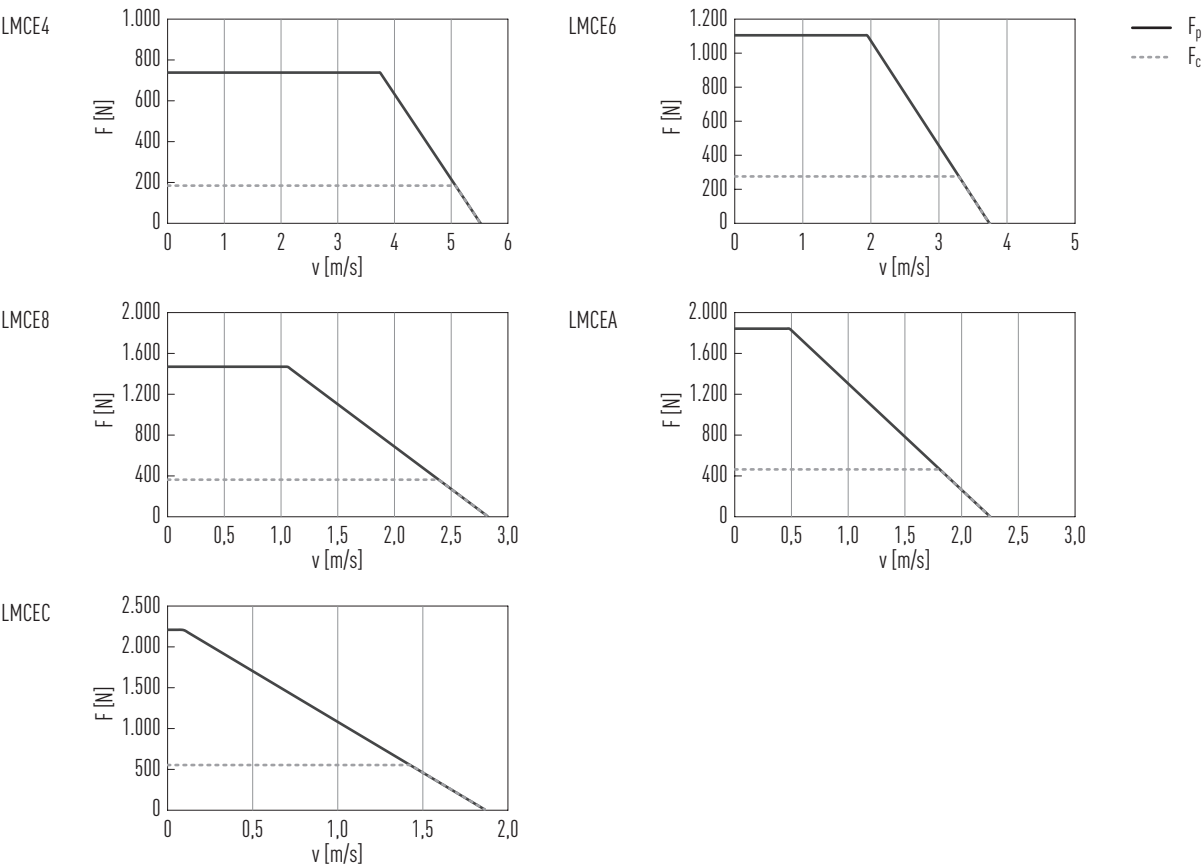


Table 3.7 Technical data for LMCE

	Symbol	Unit	LMCE4	LMCE6	LMCE8	LMCEA	LMCEC
Forces and electrical parameters							
Continuous force at $T_{\max}$	F_c	N	184	276	368	460	552
Continuous current at $T_{\max}$	I_c	A_{eff}	3.25	3.25	3.25	3.25	3.25
Peak force (for 1 s)	F_p	N	736	1,104	1,472	1,840	2,208
Peak current (for 1 s)	I_p	A_{eff}	13	13	13	13	13
Force constant	K_f	N/A_{eff}	56.6	84.9	113.2	141.5	169.8
Electrical time constant	K_e	ms	0.5	0.5	0.5	0.5	0.5
Resistance ¹⁾	R_{25}	Ω	5.6	8.4	11.0	13.8	16.7
Inductance ¹⁾	L	mH	2.9	4.4	5.9	7.3	8.8
Back EMF constant	K_u	$V_{\text{eff}}/(m/s)$	35	53	70	88	106
Motor constant	K_m	$N/\sqrt{W}$	19.1	23.4	27.0	30.2	33.2
Thermal resistance	R_{th}	$^{\circ}\text{C}/W$	0.68	0.45	0.34	0.27	0.23
Thermal switch			3 PTC SNM 100 in series				
Max. DC bus voltage		V	330				
Mechanical parameters							
Max. bending radius of motor cable	R_{bend}	mm	37.5				
Pole pair pitch	2τ	mm	60				
Max. winding temperature	$T_{\max}$	$^{\circ}\text{C}$	100				
Mounting holes (forcer)	n		7	10	13	16	19
Weight of forcer	M_F	kg	1.23	1.84	2.46	3.08	3.70
Length of forcer	L_F	mm	260	380	500	620	740
Unit mass of stator	M_S	kg/m	20				
Stator length/mounting holes	L_S	mm	120 mm/N = 2; 300 mm/N = 5				

All specifications are in $\pm 10\%$ of tolerance at 25 °C ambient temperature

¹⁾ Line to line

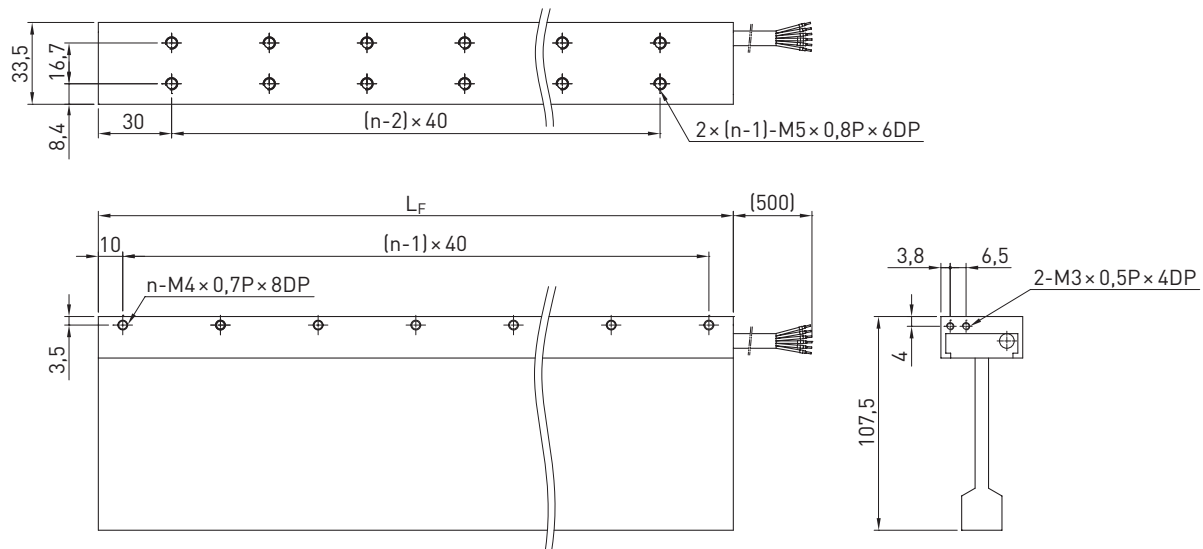
Table 3.8 LMCE motor cable assignment

Motor cable	Signal	Diameter [mm]
Brown	U	7.5
White	V	
Grey	W	
Black	GND	
Yellow	T+	
Green	T-	

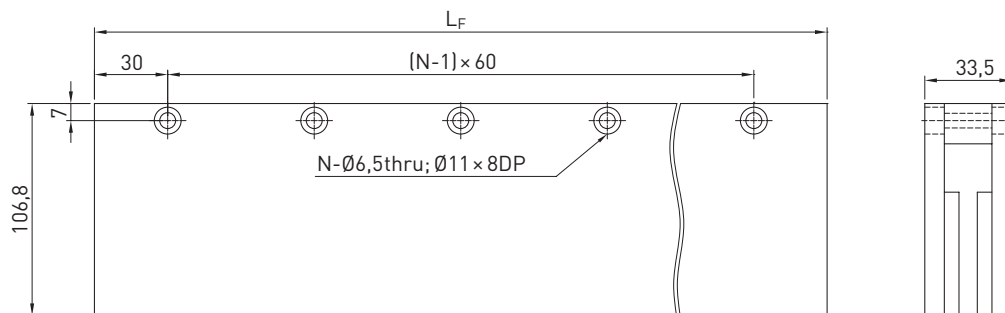
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Dimensions offorcer



Dimensions of stator



Mounting tolerances

