

LEM Brushless Linear Motor

Product Features

- Low force, epoxy core
- Integrated cooling for high duty cycle
- No cogging, no magnetic attraction
- Miniature design
- Ideal for high precision/smooth motion



Specifications

Performance Parameters	Symbol	Units	LEM-S-1			LEM-S-2-S			LEM-S-3-S			LEM-S-4-S		
Cooling Method			NC	AC	WC	NC	AC	WC	NC	AC	WC	NC	AC	WC
Continuous Force ^{1, 5, 6, 7}	F_{cTmax}	N (lb_f)	26 (6)	31 (7)	33 (7)	52 (12)	61 (14)	66 (15)	75 (17)	87 (20)	95 (21)	96 (22)	113 (25)	121 (27)
Peak Force ²	F_p	N (lb_f)	83 (19)	83 (19)	83 (19)	165 (37)	165 (37)	165 (37)	238 (53)	238 (53)	238 (53)	302 (68)	302 (68)	302 (68)
Motor Constant ¹	K_M	N/√W (lb_f/√W)	3.9 (0.9)	3.9 (0.9)	3.9 (0.9)	5.8 (1.3)	5.8 (1.3)	5.8 (1.3)	7.1 (1.6)	7.1 (1.6)	7.1 (1.6)	8.2 (1.8)	8.2 (1.8)	8.2 (1.8)
Thermal Resistance	R_{th}	°C/W	2.22	1.63	1.39	1.22	0.90	0.78	0.89	0.66	0.56	0.73	0.53	0.46
Max Power Dissipation	P_{cTmax}	W	45	62	72	82	111	129	113	152	177	136	190	217
Maximum Applied Bus Voltage	V_{DC}	Volts	325			325			325			325		
Electrical Cycle Length	E_c	mm	30			30			30			30		
Electrical Time Constant	τ_e	msec	0.5			0.5			0.5			0.5		
Maximum Coil Temperature	T_{max}	°C	125			125			125			125		
Force Constant ^{1, 8}	K_F	N/A_{pk} (lb_f/A_{pk})	5.3 (1.2)	5.3 (1.2)	5.3 (1.2)	11.0 (2.5)	11.0 (2.5)	11.0 (2.5)	16.7 (3.7)	16.7 (3.7)	16.7 (3.7)	22.2 (5.0)	22.2 (5.0)	22.2 (5.0)
Back EMF Constant p-p ^{3, 4, 8}	K_e	V_p/m/s (V_p/in/s)	6.3 (0.16)	6.3 (0.16)	6.3 (0.16)	13.0 (0.33)	13.0 (0.33)	13.0 (0.33)	19.7 (0.50)	19.7 (0.50)	19.7 (0.50)	26.3 (0.67)	26.3 (0.67)	26.3 (0.67)
Peak Current ^{1, 4}	I_p	A_{pk} (A_{rms})	15.6 (11.0)	15.6 (11.0)	15.6 (11.0)	15.0 (10.6)	15.0 (10.6)	15.0 (10.6)	14.3 (10.1)	14.3 (10.1)	14.3 (10.1)	13.6 (9.6)	13.6 (9.6)	13.6 (9.6)
Continuous Current ^{1, 4, 5, 6}	I_{cTmax}	A_{pk} (A_{rms})	4.9 (3.5)	5.8 (4.1)	6.3 (4.4)	4.8 (3.4)	5.5 (3.9)	6.0 (4.2)	4.5 (3.2)	5.2 (3.7)	5.7 (4.0)	4.3 (3.1)	5.1 (3.6)	5.4 (3.9)
Resistance p-p ^{3, 8} @25°C	R_{25}	ohm	1.8			3.5			5.3			7.1		
Inductance p-p ³	L	mH	0.9			1.8			2.7			3.6		
Mechanical Parameters														
Magnetic Attraction	F_a	N (lb_f)	0 (0)			0 (0)			0 (0)			0 (0)		
Coil Mass ⁵	M_c	kg (lb_m)	0.2 (0.3)	0.2 (0.3)	0.2 (0.3)	0.3 (0.7)	0.3 (0.7)	0.3 (0.7)	0.5 (1.0)	0.5 (1.0)	0.5 (1.0)	0.6 (1.4)	0.6 (1.4)	0.6 (1.4)
Magnetic Track Mass	M_n	kg/m (lb/in)	5.2 (0.29)			5.2 (0.29)			5.2 (0.29)			5.2 (0.29)		
Cooling Flow Rate	Q	LPM (SCFM/GPM)	n/a (n/a)	113.0 (3.9)	4.0 (1.1)	n/a (n/a)	108.0 (3.7)	4.0 (1.1)	n/a (n/a)	102.0 (3.5)	4.0 (1.1)	n/a (n/a)	93.0 (3.0)	4.0 (1.1)
Cooling Supply Pressure	P	kPa (PSIG)	n/a (n/a)	207 (30)	179 (26)	n/a (n/a)	207 (30)	193 (28)	n/a (n/a)	207 (30)	207 (30)	n/a (n/a)	207 (30)	276 (40)

Notes: Motor performance specifications are with sinusoidal commutation.

¹ Continuous forces, motor constant and currents listed are with coils at maximum temperature 125°C, mounted to a 254 x 254 x 25.4 mm (10" x 10" x 1") aluminum heat sink on top of coil, and at 25°C ambient.

² Max on time 1 sec., assuming correct rms Force and Current, consult Anorad.

³ All winding parameters listed are measured line-to-line (phase-to-phase).

⁴ All currents and voltages listed are measured 0-peak of the sine wave unless noted rms.

⁵ Continuous forces and currents are also based on coil moving with all phases sharing the same load in sinusoidal commutation.

⁶ For stand still conditions multiply continuous force and continuous current by 0.9.

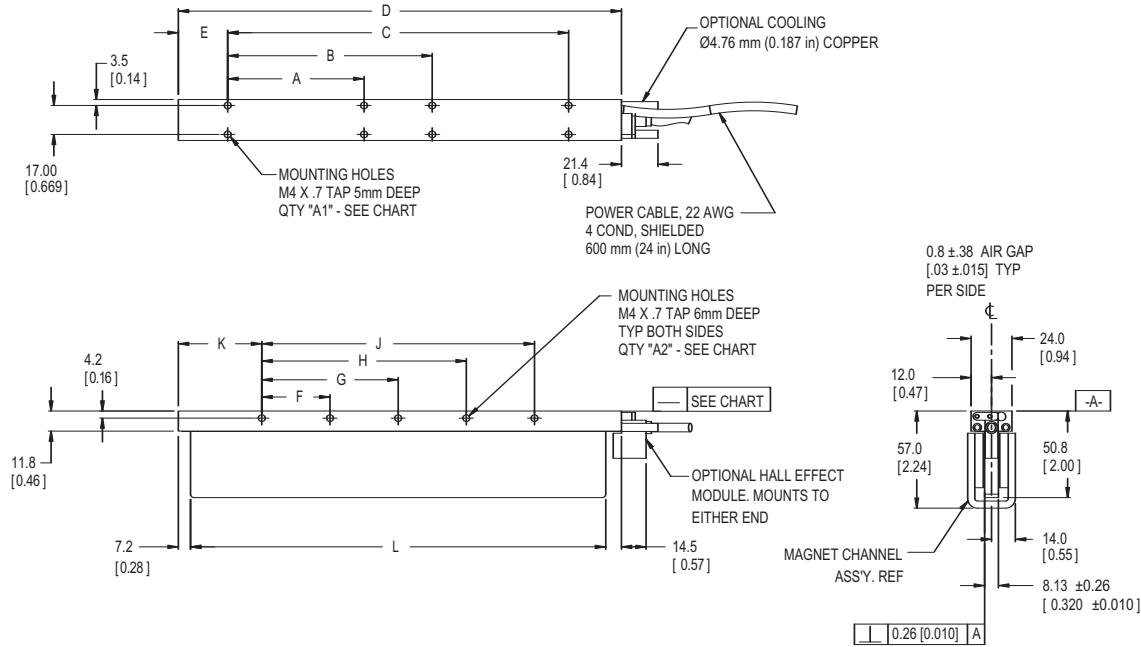
⁷ Coil mountings on either of the two narrow sides reduces continuous force by 20%.

⁸ All specifications are ±10%.

LEM Brushless Linear Motor Diagram

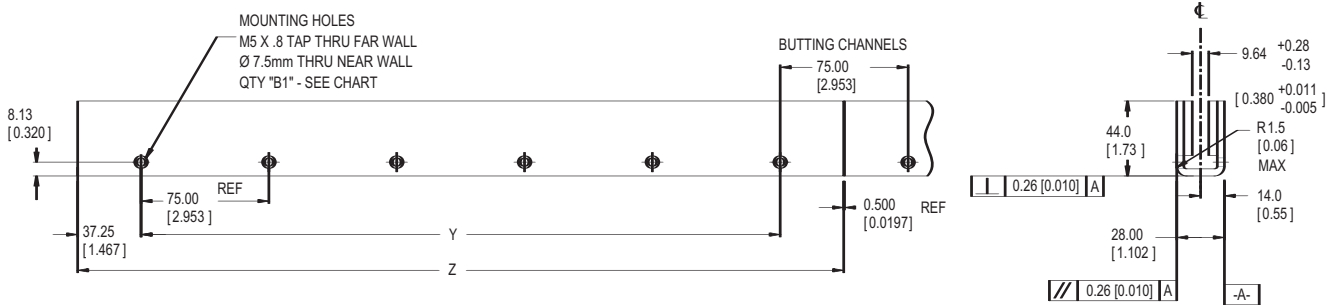
Dimensions mm [in]

Coil Assembly



Motor Coil Dimensions															
Coil Size	Unit	A	B	C	D	E	F	G	H	J	K	L	Straightness	A1	A2
LEM-S-1	mm (in)	40.00 (1.575)			80.0 (3.15)	19.0 (.75)	20.00 (.787)				29.0 (1.14)	63.5 (2.5)	0.25 (.010)	4	4
LEM-S-2	mm (in)	80.00 (3.150)			140.0 (5.51)	29.0 (1.14)	40.00 (1.575)				49.0 (1.93)	123.5 (4.86)	0.25 (.010)	4	4
LEM-S-3	mm (in)	40.00 (1.575)	100.00 (3.937)	140.00 (5.512)	200.0 (7.87)	29.0 (1.14)	40.00 (1.575)	60.00 (2.362)	100.00 (3.937)		49.0 (1.93)	183.5 (7.22)	0.25 (.010)	8	8
LEM-S-4	mm (in)	80.00 (3.150)	120.00 (4.724)	200.00 (7.874)	260.0 (10.24)	29.0 (1.14)	40.00 (1.575)	80.00 (3.150)	120.00 (4.724)	160.00 (6.299)	49.0 (1.93)	243.5 (9.59)	0.50 (.020)	8	10

Magnet Channel



Magnet Channel Dimensions				
Length	Unit	Y	Z	B1
225*	mm (in)	150.00 (5.906)	224.50 (8.839)	3
300	mm (in)	225.00 (8.858)	299.50 (11.791)	4
375*	mm (in)	300.00 (11.811)	374.50 (14.744)	5
450	mm (in)	375.00 (14.764)	449.50 (17.697)	6

Magnet Channel Dimensions				
Length	Unit	Y	Z	B1
525*	mm (in)	450.00 (17.717)	524.50 (20.650)	7
600	mm (in)	525.00 (20.669)	599.50 (23.602)	8
675*	mm (in)	600.00 (23.622)	674.50 (26.555)	9
750	mm (in)	675.00 (26.575)	749.50 (29.508)	10

* Magnet channels with an * can not be butted together since they have the same magnetic poles on each end. Additionally, magnet channels can only be butted from one side (contact factory).