



## Slotless Linear Servo Motor

Compumotor's SL Series brushless linear servo motors feature the same slotless winding design made popular by our SM and SE Series rotary servo motors. Along with reduced manufacturing costs, the slotless design creates several performance advantages when compared to traditional ironcore and ironless linear servo motors:

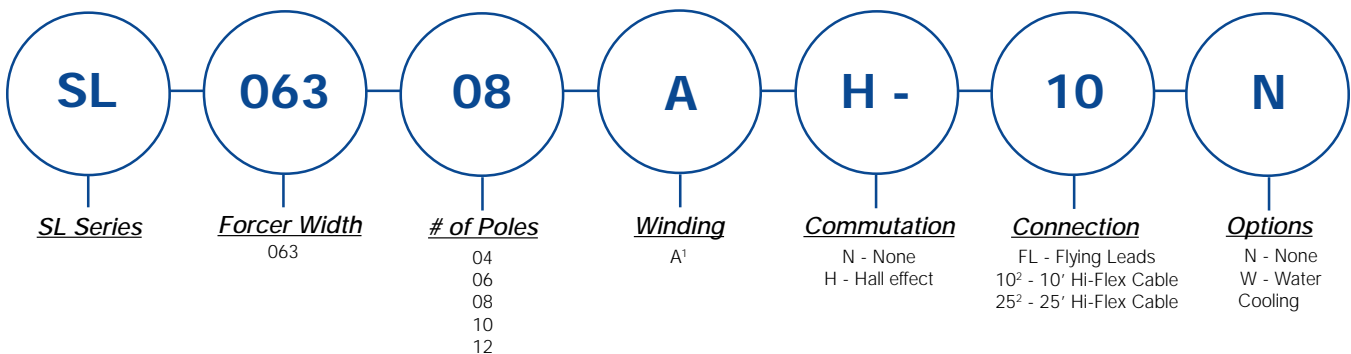
- Single-row magnet bar
- Lower cost and weight (compared to ironless design)
- Better heat dissipation (compared to ironless design)
- More force per package size (compared to ironless design)
- Lighter weightforcer (compared to ironcore design)
- Lower attractive forces (compared to ironcore design)
- Less cogging force (compared to ironcore design)

### The Linear Motor Concept

The idea is simple enough. Take a conventional rotary servo motor and unwrap it. What was the stator is now a forcer and the rotor becomes a magnet bar. With this design, the motor is connected directly to the load. Direct linear motion is achieved without any rotary to linear transmission devices. The direct coupling of the forcer to the load provides these performance benefits:

- High Speeds
- Zero Backlash
- Fast Response
- High Precision
- High Stiffness
- Low Maintenance

### Forcer Part Numbering System



<sup>1</sup> Special windings can be designed to meet customer specifications. Please consult factory.  
<sup>2</sup> For motors without hall effect commutation, motor phase and temperature switch wires are located in a single cable. For motors with hall effect commutation, motor phase wires are in one cable, hall effect and temperature switch wires are in a second cable

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SERVO MOTORS

SL063, Uncooled<sup>1</sup>, Specifications

Parameter	Symbol	Units	SL06304A	SL06306A	SL06308A	SL06310A	SL06312A
Peak Force <sup>3</sup>	$T_{pk}$	N	122	183	240	283	342
		lbf	27	41	54	64	77
Continuous Stall Force <sup>1</sup>	$F_{cs}$	N	41	61	80	94	114
		lbf	9	14	18	21	26
Peak Current <sup>2,3,4</sup>	$I_{pk}(\text{sine})$	Amps Peak	11.0	11.0	10.8	10.2	10.3
Stall Current Continuous <sup>1,2,4</sup>	$I_{cs}(\text{sine})$	Amps Peak	3.7	3.7	3.6	3.4	3.4
Thermal Resistance <sup>1</sup>	$R_{th}$	°C/watt	1.38	0.92	0.71	0.64	0.53

SL063, Air Cooled<sup>1</sup>, Specifications

Parameter	Symbol	Units	SL06304A	SL06306A	SL06308A	SL06310A	SL06312A
Peak Force <sup>3</sup>	$T_{pk}$	N	122	183	240	283	342
		lbf	27	41	54	64	77
Continuous Stall Force <sup>1</sup>	$F_{cs}$	N	46	64	86	105	125
		lbf	10	14	19	24	28
Peak Current <sup>2,3,4</sup>	$I_{pk}(\text{sine})$	Amps Peak	11.0	11.0	10.8	10.2	10.3
Stall Current Continuous <sup>1,2,4</sup>	$I_{cs}(\text{sine})$	Amps Peak	4.1	3.8	3.9	3.8	3.8
Thermal Resistance <sup>1</sup>	$R_{th}$	°C/watt	1.08	0.84	0.61	0.52	0.44

SL063, Water Cooled<sup>1</sup>, Specifications

Parameter	Symbol	Units	SL06304A	SL06306A	SL06308A	SL06310A	SL06312A
Peak Force <sup>3</sup>	$T_{pk}$	N	122	183	240	283	342
		lbf	27	41	54	64	77
Continuous Stall Force <sup>1</sup>	$F_{cs}$	N	53	86	119	148	182
		lbf	12	19	27	33	41
Peak Current <sup>2,3,4</sup>	$I_{pk}(\text{sine})$	Amps Peak	11.0	11.0	10.8	10.2	10.3
Stall Current Continuous <sup>1,2,4</sup>	$I_{cs}(\text{sine})$	Amps Peak	4.8	5.2	5.4	5.3	5.5
Thermal Resistance <sup>1</sup>	$R_{th}$	°C/watt	0.81	0.47	0.32	0.26	0.21

<sup>1</sup> @ 25°C ambient, 125°C winding temperature  
Uncooled: motor connected to an aluminum heatsink  
(Heat sink size: 10" wide x 1" thick and equal in length to forcer)  
Air cooled: 60 psi air  
Water cooled: 20 psi water @ 25°C

<sup>2</sup> @40°C ambient derate phase currents and torques by 12%.  
Value is measured peak of sine wave.

<sup>3</sup> Initial winding temperature must be 60°C or less before Peak Current is Applied.

<sup>4</sup> Peak of the sinusoidal current in any phase for a sinusoidally commutated motor.

Note: These specifications are based on theoretical motor performance and are not specific to any amplifier.

SL063, General Specifications (Preliminary)

Parameter	Symbol	Units	SL06304A	SL06306A	SL06308A	SL06310A	SL06312A
Voltage Constant <sup>1,2</sup>	$K_b$	Volts/m/s	12.8	19.2	25.6	32.0	38.4
		Volts/in/s	0.33	0.49	0.65	0.81	0.98
Force Constant <sup>8</sup>	$K_f$ (sine)	N/Amp Peak	11.09	16.63	22.17	27.71	33.26
		lbf/Amp Peak	2.49	3.74	4.99	6.23	7.48
Resistance <sup>1</sup>	R	Ohms	5.2	7.7	10.3	12.9	15.4
Inductance <sup>3</sup>	L	mH	1.96	2.94	3.92	4.90	5.88
Maximum Bus Voltage	$V_m$	Volts DC	340	340	340	340	340
Motor Constant	$K_m$	N/ $\sqrt$ watt	5.63	6.90	7.97	8.91	9.79
Motor Thermal Time Constant	$\tau_{th}$	minutes	37	37	37	37	37
Electrical Time Constant	$\tau_{elec}$	milliseconds	0.38	0.38	0.38	0.38	0.38
Mechanical Time Const.	$\tau_{mch}$	milliseconds	0.013	0.012	0.011	0.010	0.010
Intermittent Force Duration <sup>4</sup>	$F_{2x}$	seconds	13	13	16	15	17
Peak Force Duration <sup>5</sup>	$F_{3x}$	seconds	5	5	6	6	6
Magnetic Attraction <sup>6</sup>	$F_a$	N	224	336	448	560	672
		lbf	50	75	100	125	150
Electrical Pitch <sup>7</sup>	$P_e$	mm	42	42	42	42	42
Forcer Mass	$M_f$	kg	0.41	0.55	0.69	0.80	0.95
		lb	0.09	1.2	1.5	1.8	2.1
Rated Winding Temperature	$T_{max}$	°C	125	125	125	125	125
Winding Class			H	H	H	H	H

<sup>1</sup> Measured Line to Line, +/- 10%.

<sup>2</sup> Value is measured peak of sine wave.

<sup>3</sup> +/-30%, Line-to-Line, inductance bridge measurement @1Khz.

<sup>4</sup> Maximum Time duration with 2 times rated current applied with initial winding temp at 60°C.

<sup>5</sup> Maximum Time duration with 3 times rated current applied with initial winding temp at 60°C.

<sup>6</sup> Measured with a 0.76mm gap

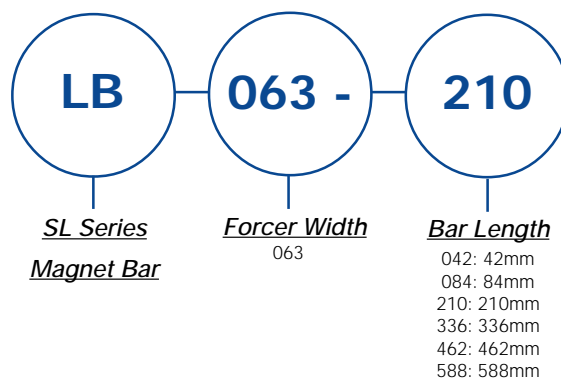
<sup>7</sup> Distance from the leading edge of a north pole to the leading edge of the next north pole

<sup>8</sup> Total motor torque per peak of the sinusoidal amps measured in any phase, +/-10%.

Note: These specifications are based on theoretical motor performance and are not specific to any amplifier.

### Magnet Bar Part Numbering System

Magnet bars and forcer are purchased separately. Multiple magnet bars can be stacked end-to-end to produce any desired travel length.



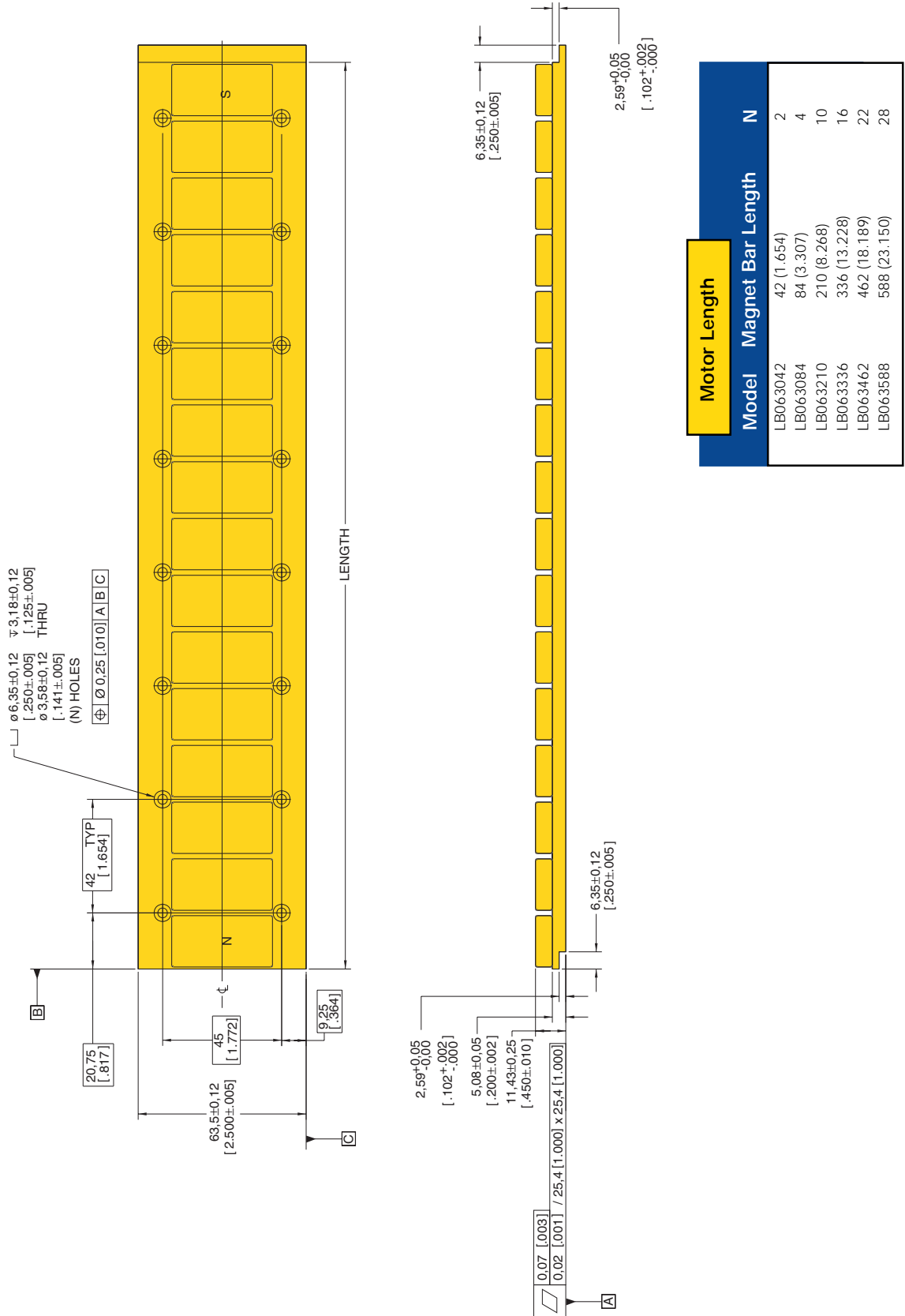
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# SL Series Dimensional Drawings

## SL063 Magnet Bar Dimensional Drawing

Dimensions in mm (inches)



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SL063 Magnet Bar