

# P-Series Ironless Linear Motors

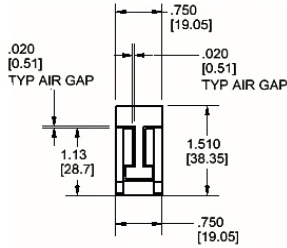
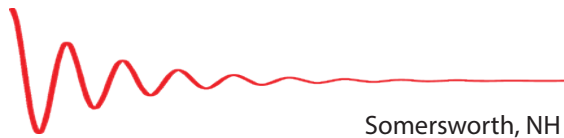
## P-12 Performance Series



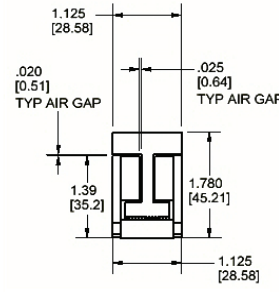
## The Airex Advantage - High Density Coils

- Linear Motor force is produced by the interaction of the fixed field created by permanent magnets and the current flowing through each conductor in the coil (Lorentz Force).
- The concept is simple...more conductors equals more force...and that means faster acceleration and a more responsive linear motion system.
- Conventional linear motor coils are "bobbin wound" resulting in less active copper.
- Airex achieves the highest coil density in the industry through a proprietary winding design and process perfected over 20 years.
- Airex Ironless Linear Motors produce 20-60% more force per mm of coil length.
- If you care about performance, let the Airex Advantage empower your success.

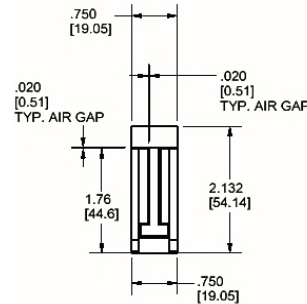
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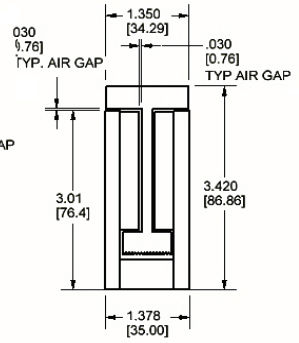
P12 Coil and Magnet Track Assembly



P15 Coil and Magnet Track Assembly



P16 Coil and Magnet Track Assembly



P20 Coil and Magnet Track Assembly

Order your Airex Linear Motor with the part numbers as described below. A complete motor consists of a Linear Motor Coil (LMC) and one or more Linear Motor Magnet Tracks (LMDT), each ordered separately. Magnet Tracks can be assembled end to end to achieve desired travel length.

LINEAR MOTOR COIL	MOTOR SERIES	# OF POLES	COMMUTATION	INTERNAL CONNECTION	CABLE LENGTH	THERMAL DEVICE
<b>L M C</b>	<b>- P 1 2</b>	<b>- 1</b>	<b>3</b>	<b>S</b>	<b>72</b>	<b>P</b>
LMC	C10 C12 C16 P12 P15 P16 P20	1 - 4 1 - 4 1 - 4 1 - 4 1 - 5 1 - 5 1 - 6	1 = coil only 3 = coil with 120° Hall Effect Device	** Y or D = C series only S = series connection P=parallel Connection *D=double parallel	72 = 72" (1.8 m) Standard	X = none L/F = NC/NO thermostat (P15 & P20) N/P = Negative/Positive temperature coefficient thermistor (standard) C = temperature to current thermistor

LINEAR MOTOR TRACK	MOTOR SERIES	TRACK LENGTH	MAGNET	PROFILE
<b>L M D T</b>	<b>- P 1 2</b>	<b>- 12 . 0</b>	<b>F</b>	<b>S</b>
LMDT- For P series LMST- For C series	C10 C12 C16 P12 P15 P16 P20	Length in inches (i.e. 12.0 = 12.0" ) C10,C12, C16,P12,P15 & P16 have 1.20" [30.5 mm] increments P20 has 2.40" [61.0 mm] increments	F = standard for C12, P12,P15 & P16 B = standard for P20 series	S = standard



P12 Series Connected Coil Performance Specification

General and 6 Lead Motor Specifications		UNITS	Dash #	0.5	1	2	3	4
Force Constant	lb <sub>f</sub> /A			0.9	1.8	3.7	5.5	7.3
	N/A			4.1	8.1	16.3	24.4	32.6
Max Operating Temperature	°C			130	130	130	130	130
Maximum Temp. Rise	°C			105	105	105	105	105
Coil Resistance (6 lead @ 25°C)	Ω			4.3	8.7	17.4	26.1	34.7
Coil Resistance (6 lead @ Max. °C)	Ω			6.1	12.3	24.6	36.8	49.1
Inductance @ 1kHz	mH			0.8	1.6	3.2	4.8	6.4
Thermal Resistance (Bracket Top Mount)	°C/W			3.00	1.50	0.75	0.50	0.38
Continuous Power top mount (Max. °C)*	W			35	70	140	210	280
Thermal Resistance, side mount (SP23, 1" hole spacing)	°C/W			3.38	1.69	0.84	0.56	0.42
Continuous Power using Side Mount (Max. °C)	W			31	62	124	187	249
Continuous Power, top mount to plate**(Max. °C)	W			24.6	40.9	67.2	90.9	113.6
Motor Constant	lb <sub>f</sub> /sqrt(W)			0.5	0.6	0.9	1.1	1.3
	N/sqrt(W)			2.01	2.85	4.03	4.93	5.69
Peak Power (Max. °C, 10% Duty)	W			350	700	1400	2100	2800
Back EMF Constant	V/inch/s			0.10	0.21	0.41	0.62	0.83
	V/m/s			4.1	8.1	16.3	24.4	32.6
Electrical Time Constant (@ 25°C)	ms			0.19	0.19	0.19	0.19	0.19
(@ 130°C)	ms			0.13	0.13	0.13	0.13	0.13
Maximum Line to Line Voltage	V <sub>rms</sub>			500	500	500	500	500
Coil Weight (HED adds 15g,[.033lb])	Pounds			0.08	0.17	0.34	0.51	0.68
	Kilograms			0.04	0.08	0.15	0.23	0.31
Coil length (inside magnet track without HED)	inch			1.21	2.41	4.81	7.21	9.61
HED increases coil length by 1.48 inch (37.6mm)	mm			30.7	61.2	122.2	183.1	244.1
Coil bracket length (without HED option)	inch			2.41	3.61	6.01	8.41	10.81
HED increases bracket length by .28inch, (7.1mm)	mm			61.2	91.7	152.7	213.6	274.6
Standard Cable Peak Current Limit	A			17.0	17.0	17.0	17.0	17.0
Delta Connected Specifications		UNITS	Dash #	0.5	1	2	3	4
Force Constant	lb <sub>f</sub> /A			0.9	1.8	3.7	5.5	7.3
	N/A			4.1	8.1	16.3	24.4	32.6
Phase Resistance (Δ @ 25°C)	Ω			2.9	5.8	11.6	17.4	23.2
Phase Resistance (Δ @ Max. °C)	Ω			4.1	8.2	16.4	24.6	32.8
Inductance @ 1kHz	mH			0.5	1.1	2.1	3.2	4.3
Continuous Force	lb <sub>f</sub>			2.7	5.4	10.7	16.1	21.4
	N			11.9	23.8	47.6	71.4	95.3
Continuous Current	A			2.92	2.92	2.92	2.92	2.92
Peak Force*	lb <sub>f</sub>			8	17	34	51	68
	N			38	75	151	226	301
Peak Current*	A			9.2	9.2	9.2	9.2	9.2
Continuous Force, aluminum plate heat sink** (see below)	lb <sub>f</sub>			2.2	4.1	7.4	10.6	13.6
	N			10.0	18.2	33.0	47.0	60.7
Back EMF Constant	V/inch/s			0.1	0.2	0.4	0.6	0.8
	V/m/s			4.1	8.1	16.3	24.4	32.6
WYE connected Specifications		UNITS	Dash #	0.5	1	2	3	4
Force Constant	lb <sub>f</sub> /A			1.6	3.2	6.3	9.5	12.7
	N/A			7.1	14.1	28.2	42.3	56.4
Phase Resistance (Ψ @ 25°C)	Ω			8.7	17.4	34.7	52.1	69.5
Phase Resistance (Ψ @ Max. °C)	Ω			12.3	24.6	49.1	73.7	98.3
Inductance @ 1kHz	mH			1.6	3.2	6.4	9.6	12.9
Continuous Force	lb <sub>f</sub>			2.7	5.4	10.7	16.1	21.4
	N			11.9	23.8	47.6	71.4	95.3
Continuous Current	A			1.69	1.69	1.69	1.69	1.69
Peak Force*	lb <sub>f</sub>			8	17	34	51	68
	N			38	75	151	226	301
Peak Current*	A			5.34	5.34	5.34	5.34	5.34
Continuous Force, aluminum plate heat sink** (see below)	lb <sub>f</sub>			2.2	4.1	7.4	10.6	13.6
	N			10.0	18.2	33.0	47.0	60.7
Back EMF Constant	V/inch/s			0.2	0.4	0.7	1.1	1.4
	V/m/s			7.1	14.1	28.2	42.3	56.4
* Notes:								
Specifications based on heat sink maintained within 10°C of ambient temperature at motor bracket interface.								
Dash 5 and larger coils may be constructed in multiple segments. Contact factory for availability.								
On time of "Peak Power" (duration) less than 10 seconds.								
Back EMF plus IR drop must not exceed "Maximum Terminal Voltage" listed.								
Electrical cycle length is 1.2 inch (30.5mm).								
Resistance Specifications do not include the cable resistance.								
Custom cable required for peak current exceeding 17 ampere.								
Cable adds 0.22Ω/m to 6-lead resistance, 0.146Ω/m to Delta resistance and 0.44Ω/m to WYE resistance.								
** Heat Sink is a 12" wide, 1/2" thick aluminum plate, extending 2" beyond each end of the coil bracket, in 258C free air.								
Magnet Track weight is 2.95kg/m (2 pounds/foot).								



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P12 Parallel Connected Coil Performance Specification						
General and 6 Lead Motor Specifications	UNITS	Dash #	1	2	3	4
Force Constant	lb <sub>f</sub> /A		0.9	1.8	2.7	3.7
	N/A		4.1	8.15	12.2	16.3
Max Operating Temperature	°C		130	130	130	130
Maximum Temp. Rise	°C		105	105	105	105
Coil Resistance (6 lead @ 25°C)	Ω		2.2	4.3	6.5	8.7
Coil Resistance (6 lead @ Max. °C)	Ω		3.1	6.1	9.2	12.3
Inductance @ 1kHz	mH		0.4	0.8	1.2	1.6
Thermal Resistance (Bracket Top Mount)	°C/W		1.50	0.75	0.50	0.38
Continuous Power Top Mount (Max. °C)	W		70	140	210	280
Thermal Resistance, side mount (SP23, 1" hole spacing)	°C/W		1.69	0.84	0.56	0.42
Continuous Power using Side Mount (Max. °C)	W		62	124	187	249
Continuous Power, top mount to plate**(Max. °C)	W		40.9	67.2	90.9	113.6
Motor Constant	lb <sub>f</sub> /sqrt(W)		0.64	0.91	1.11	1.28
	N/sqrt(W)		2.85	4.03	4.93	5.69
Peak Power (Max. °C, 10% Duty)	W		700	1400	2100	2800
Back EMF Constant	V/inch/s		0.10	0.21	0.31	0.41
	V/m/s		4.1	8.1	12.2	16.3
Electrical Time Constant (@ 25°C)	ms		0.19	0.19	0.19	0.19
(@ 130°C)	ms		0.13	0.13	0.13	0.13
Maximum Line to Line Voltage	Vrms		500	500	500	500
Coil Weight	Pounds		0.17	0.34	0.51	0.68
	Kilograms		0.08	0.15	0.23	0.31
Coil length (inside magnet track without HED)	inch		2.41	4.81	7.21	9.61
HED increases coil length by 1.48 inch (37.6mm)	mm		61.2	122.2	183.1	244.1
Coil bracket length (without HED option)	inch		3.61	6.01	8.41	10.81
HED increases bracket length by .28inch, (7.1mm)	mm		91.7	152.7	213.6	274.6
Standard Cable Peak Current Limit	A		17.0	17.0	17.0	17.0
Delta Connected Specifications	UNITS	Dash #	1	2	3	4
Force Constant	lb <sub>f</sub> /A		0.9	1.8	2.7	3.7
	N/A		4.1	8.1	12.2	16.3
Phase Resistance (Δ @ 25°C)	Ω		1.45	2.90	4.34	5.79
Phase Resistance (Δ @ Max. °C)	Ω		2.05	4.09	6.14	8.19
Inductance @ 1kHz	mH		0.3	0.5	0.8	1.1
Continuous Force	lb <sub>f</sub>		5.4	10.7	16.1	21.4
	N		23.8	47.6	71.4	95.3
Continuous Current	A		5.85	5.85	5.85	5.85
Peak Force*	lb <sub>f</sub>		16	31	47	62
	N		69	138	208	277
Peak Current*	A		17.0	17.0	17.0	17.0
Continuous Force, aluminum plate heat sink** (see below)	lb <sub>f</sub>		4.1	7.4	10.6	13.6
	N		18.2	33.0	47.0	60.7
Back EMF Constant	V/inch/s		0.1	0.2	0.3	0.4
	V/m/s		4.1	8.1	12.2	16.3
WYE connected Specifications	UNITS	Dash #	1	2	3	4
Force Constant	lb <sub>f</sub> /A		1.6	3.2	4.8	6.3
	N/A		7.1	14.1	21.2	28.2
Phase Resistance (Ψ @ 25°C)	Ω		4.34	8.69	13.03	17.37
Phase Resistance (Ψ @ Max. °C)	Ω		6.14	12.28	18.42	24.56
Inductance @ 1kHz	mH		0.7	1.4	2.1	2.8
Continuous Force	lb <sub>f</sub>		5.4	10.7	16.1	21.4
	N		23.8	47.6	71.4	95.3
Continuous Current	A		3.38	3.38	3.38	3.38
Peak Force*	lb <sub>f</sub>		17	34	51	68
	N		75	151	226	301
Peak Current*	A		10.68	10.68	10.68	10.68
Continuous Force, aluminum plate heat sink** (see below)	lb <sub>f</sub>		4.1	7.4	10.6	13.6
	N		18.2	33.0	47.0	60.7
Back EMF Constant	V/inch/s		0.2	0.4	0.5	0.7
	V/m/s		7.1	14.1	21.2	28.2
* Notes:						
Specifications based on heat sink maintained within 10°C of ambient temperature at motor bracket interface.						
Dash 5 and larger coils may be constructed in multiple segments. Contact factory for availability.						
On time of "Peak Power" (duration) less than 10 seconds.						
Back EMF plus IR drop must not exceed "Maximum Terminal Voltage" listed.						
Electrical cycle length is 1.2 inch (30.5mm).						
Resistance Specifications do not include the cable resistance.						
Custom cable required for peak current exceeding 17 ampere.						
Cable adds 0.22Ω/m to 6-lead resistance, 0.146Ω/m to Delta resistance and 0.44Ω/m to WYE resistance.						
** Heat Sink is a 12" wide, 1/2" thick aluminum plate, extending 2" beyond each end of the coil bracket, in 25°C free air.						
Magnet Track weight is 2.95kg/m (2 pounds/foot).						





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P12 Double Parallel Connected Coil Performance Specification						
General and 6 Lead Motor Specifications	UNITS	Dash #	2	4	6	8
Force Constant	lb <sub>f</sub> /A		0.9	1.8	2.7	3.7
	N/A		4.1	8.1	12.2	16.3
Max Operating Temperature	°C		130	130	130	130
Maximum Temp. Rise	°C		105	105	105	105
Coil Resistance (6 lead @ 25°C)	Ω		1.1	2.2	3.3	4.3
Coil Resistance (6 lead @ Max. °C)	Ω		1.5	3.1	4.6	6.1
Inductance @ 1kHz	mH		0.2	0.4	0.6	0.8
Thermal Resistance, (bracket top mount)	°C/W		0.75	0.38	0.25	0.19
Continuous Power, top mount (Max. °C)	W		140	280	420	560
Thermal Resistance, side mount (SP23, 1" hole spacing)	°C/W		0.84	0.42	0.28	0.21
Continuous Power, using side mount (Max. °C)	W		124	249	373	498
Continuous Power, top mount to plate**(Max. °C)	W		67.2	113.6	157.9	201.6
Motor Constant	lb <sub>f</sub> /sqrt(W)		0.91	1.28	1.57	1.81
	N/sqrt(W)		4.03	5.69	6.97	8.05
Peak Power (Max. °C, 10% Duty)	W		1400	2800	4200	5600
Back EMF Constant	V/inch/s		0.10	0.21	0.31	0.41
	V/m/s		4.1	8.1	12.2	16.3
Electrical Time Constant (@ 25°C)	ms		0.19	0.19	0.19	0.19
(@ 130°C)	ms		0.13	0.13	0.13	0.13
Maximum Line to Line Voltage	Vrms		500	500	500	500
Coil Weight	Pounds		0.17	0.34	0.51	0.68
	Kilograms		0.08	0.15	0.23	0.31
Coil length (inside magnet track without HED)	inch		4.81	7.21	9.61	19.21
HED increases coil length by 1.48 inch (37.6mm)	mm		122.2	122.2	183.1	244.1
Coil bracket length (without HED option)	inch		6.01	10.81	15.61	20.41
HED increases bracket length by .28inch, (7.1mm)	mm		152.7	274.6	396.5	518.4
Standard Cable Peak Current Limit	A		17.0	17.0	17.0	17.0
Delta Connected Specifications	UNITS	Dash #	2	4	6	8
Force Constant	lb <sub>f</sub> /A		0.9	1.8	2.7	3.7
	N/A		4.1	8.1	12.2	16.3
Phase Resistance (Δ @ 25°C)	Ω		0.72	1.45	2.17	2.90
Phase Resistance (Δ @ Max. °C)	Ω		1.02	2.05	3.07	4.09
Inductance @ 1kHz	mH		0.1	0.3	0.4	0.5
Continuous Force	lb <sub>f</sub>		10.7	21.4	32.1	42.8
	N		47.6	95.3	142.9	190.5
Continuous Current	A		11.70	11.70	11.70	11.70
Peak Force*	lb <sub>f</sub>		16	31	47	62
	N		69	138	208	277
Peak Current*	A		17.0	17.0	17.0	17.0
Continuous Force, aluminum plate heat sink** (see below)	lb <sub>f</sub>		7.4	13.6	19.7	25.7
	N		33.0	60.7	87.6	114.3
Back EMF Constant	V/inch/s		0.1	0.2	0.3	0.4
	V/m/s		4.1	8.1	12.2	16.3
WYE connected Specifications	UNITS	Dash #	2	4	6	8
Force Constant	lb <sub>f</sub> /A		1.6	3.2	4.8	6.3
	N/A		7.1	14.1	21.2	28.2
Phase Resistance (Ψ @ 25°C)	Ω		2.17	4.34	6.52	8.69
Phase Resistance (Ψ @ Max. °C)	Ω		3.07	6.14	9.21	12.28
Inductance @ 1kHz	mH		0.3	0.7	1.0	1.4
Continuous Force	lb <sub>f</sub>		10.7	21.4	32.1	42.8
	N		47.6	95.3	142.9	190.5
Continuous Current	A		6.75	6.75	6.75	6.75
Peak Force*	lb <sub>f</sub>		27	54	81	108
	N		120	240	360	480
Peak Current*	A		17.00	17.00	17.00	17.00
Continuous Force, aluminum plate heat sink** (see below)	lb <sub>f</sub>		7.4	13.6	19.7	25.7
	N		33.0	60.7	87.6	114.3
Back EMF Constant	V/inch/s		0.2	0.4	0.5	0.7
	V/m/s		7.1	14.1	21.2	28.2
<p>* Notes:</p> <p>Specifications based on heat sink maintained within 10°C of ambient temperature at motor bracket interface.</p> <p>Dash 5 and larger coils may be constructed in multiple segments. Contact factory for availability.</p> <p>On time of "Peak Power" (duration) less than 10 seconds.</p> <p>Back EMF plus IR drop must not exceed "Maximum Terminal Voltage" listed.</p> <p>Electrical cycle length is 1.2 inch (30.5mm).</p> <p>Resistance Specifications do not include the cable resistance.</p> <p>Custom cable required for peak current exceeding 17 ampere.</p> <p>Cable adds 0.22Ω/m to 6-lead resistance, 0.146Ω/m to Delta resistance and 0.44Ω/m to WYE resistance.</p> <p>** Heat Sink is a 12" wide, 1/2" thick aluminum plate, extending 2" beyond each end of the coil bracket, in 28°C free air.</p> <p>Shaded columns represent "Special" models</p> <p>Magnet Track weight is 2.95kg/m (2 pounds/foot).</p>						