High-Precision, Direct-Drive Linear Servo Systems

CE (EMC and LVD) pending

The Linearserv is a direct drive linear actuator servo system. Each complete system consists of a brushless linear servo motor, microprocessor-based servo drive with integrated power supply, precision linear guide with rugged square rail bearings and an optical linear encoder for servo feedback.

The primary benefit of the Linearserv system is the simplicity of the design. The Linearserv provides precise linear motion without belts and pulleys, gearboxes, leadscrews or other rotary-to-linear conversion devices that introduce inaccuracies and system complexities.

The performance difference between the LM1000 and LM5000 Series are maximum force, positional accuracy, maximum speed, encoder resolution and repeatability.

Linearserv Drive Features

- Two input power range versions
  - 100–115VAC or
  - 200–230VAC
- Compatible with all Compumotor controllers
  - Step-and-direction input for position mode
  - ±10VDC analog input for velocity mode
  - ±8VDC analog input for force mode
- Seven segment LED for drive status and system diagnostics
- Internal mechanical resonance filter
- Can operate in Class 10 clean room applications with proper preparation
- Smooth linear motion at slow speeds
- Ability to operate in position, velocity or force control mode

LM1000 Series

- Three motor sizes available:
  - LM1050 provides 50 N of maximum linear force
  - LM1100 provides 100 N of maximum linear force
  - LM1300 provides 300 N of maximum linear force
- Linear stroke lengths from 50 mm to 1,500 mm
- Standard speeds up to 0.83 m/s
- Positional repeatability of ±0.5 µm
- Positional accuracy of 10 µm
- Encoder resolution of 0.5 µm
- Ultra precision version improves repeatability and resolution by a factor of 5
- High rigidity models are available for increased load and moment capabilities

LM5000 Series

- Three motor sizes available:
  - LM5040 provides 40 N of maximum linear force
  - LM5090 provides 90 N of maximum linear force
  - LM5270 provides 270 N of maximum linear force
- Linear stroke lengths from 50 mm to 1,500 mm
- Standard speeds up to 2 m/s
- Positional repeatability of ±1.0 µm
- Positional accuracy of 50 +(50/1,000) * L_s[µm] (L_s = stroke length in mm)
- Encoder resolution of 1.0 µm
- High rigidity models are available for increased load and moment capabilities

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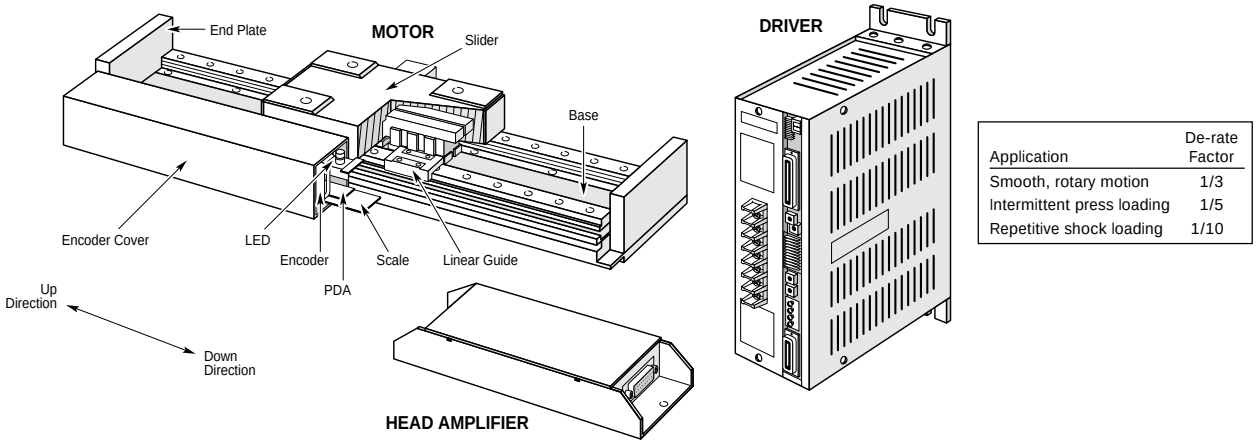
LM1000 Series Motor Specifications

LM1000 Series Motor Data

		LM1050	LM1100	LM1300
Performance				
Maximum force	lb N	11.25 50	22.5 100	67.5 300
Positional accuracy[B]	in x 10^{-4} µm	3.9[C] 10[C]	3.9[C] 10[C]	3.9[C] 10[C]
Maximum speed	in/s m/s	32 (6)[A] 0.83 (0.16)[A]	32 (6)[A] 0.83 (0.16)[A]	32 (6)[A] 0.83 (0.16)[A]
Encoder resolution	in x 10^{-5}/pulse µm/pulse	1.95 (0.39)[A] 0.5 (±0.1)[A]	1.95 (0.39)[A] 0.5 (±0.1)[A]	1.95 (0.39)[A] 0.5 (±0.1)[A]
Repeatability	in x 10^{-5} µm	±1.95 (±0.39)[A] ±0.5 (±0.1)[A]	±1.95 (±0.39)[A] ±0.5 (±0.1)[A]	±1.95 (±0.39)[A] ±0.5 (±0.1)[A]
Parallelism	in x 10^{-5} µm	39 10	39 10	39 10
Max load*	lb N	45 200	45 200	225 1,000
Max transportable moment loads*				
Rolling moment	ft-lb N-m	3.69 5.0	5.16 7.0	45.73 62.0
Pitching moment	ft-lb N-m	5.16 7.0	5.16 7.0	45.73 62.0
Yaw moment	ft-lb N-m	5.16 7.0	5.16 7.0	45.73 62.0
Slider weight	lb kg	2.2 1.0	3.1 1.4	11.0 5.0
Rail weight	lb/in kg/m	0.73 13	0.84 15	1.40 25
Z-channel	pulse/in pulse/mm	1/0.0806 1/2.048	1/0.0806 1/2.048	1/0.0806 1/2.048
Stroke length	in mm	1.9–59 50–1,500	1.9–59 50–1,500	1.9–59 50–1,500
Life	km	[2,000/(200÷W/4)]^3 x 50 W: Load (N)	[2,000/(200÷W/4)]^3 x 50 W: Load (N)	[8,330/(600÷W/4)]^3 x 50 W: Load (N)

Notes:
- A Shown the specification of ±0.1 (µm) version, which can be requested through Custom Products.
- B Shown the value at 22°C (coefficient of linear expansion 8 x 10^{-6}/°C)
- C Shown here is the positional accuracy for $L_s \leq 700$ mm (27.5 in), positional accuracy for $L_s \geq 800$ mm (31.5 in) = 50 + (50/1,000) * L_s [µm]
  English units are provided for convenience.
- * When designing a system, de-rate the maximum loads to the values specified.

Linear Series Standard Product Configuration



Application	De-rate Factor
Smooth, rotary motion	1/3
Intermittent press loading	1/5
Repetitive shock loading	1/10

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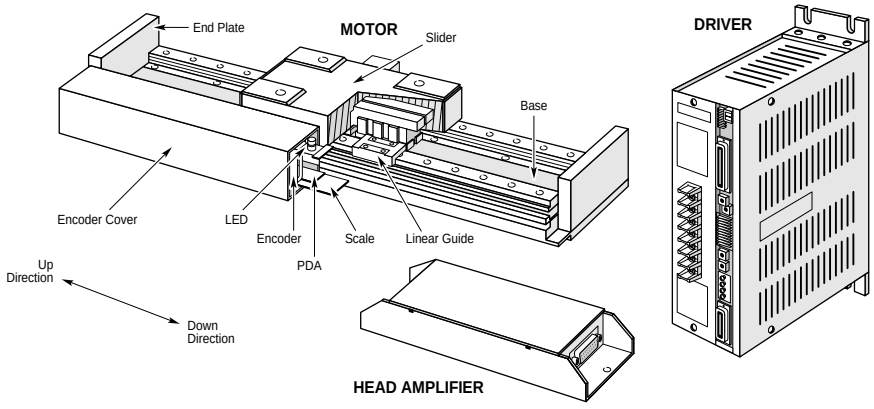
LM5000 Series Motor Specifications

LM5000 Series Motor Data

		LM5040	LM5090	LM5270
Performance				
Maximum force	lb N	9.0 40	20.2 90	60.7 270
Positional accuracy[B]	in x 10^{-4} µm	19.5 + (0.0195) * L_s^C 50 + (50/1,000) * L_s^A	19.5 + (0.0195) * L_s^C 50 + (50/1,000) * L_s^A	19.5 + (0.0195) * L_s^C 50 + (50/1,000) * L_s^A
Maximum speed	in/s m/s	78 2.0	78 2.0	78 2.0
Encoder resolution	in x 10^{-5}/pulse µm/pulse	3.9 1.0	3.9 1.0	3.9 1.0
Repeatability	in x 10^{-5} µm	±3.9 ±1	±3.9 ±1	±3.9 ±1
Parallelism	in x 10^{-5} µm	39 10	39 10	39 10
Max load*	lb N	45 200	45 200	225 1,000
Max transportable moment loads*				
Rolling moment	ft-lb N-m	3.69 5.0	5.16 7.0	45.73 62.0
Pitching moment	ft-lb N-m	5.16 7.0	5.16 7.0	45.73 62.0
Yaw moment	ft-lb N-m	5.16 7.0	5.16 7.0	45.73 62.0
Slider weight	lb kg	2.2 1.0	3.1 1.4	11.0 5.0
Rail weight	lb/in kg/m	0.73 13	0.84 15	1.40 25
Z-channel	pulse/in pulse/mm	1/0.161 1/4.096	1/0.161 1/4.096	1/0.161 1/4.096
Stroke length	in mm	1.9–59 50–1,500	1.9–59 50–1,500	1.9–59 50–1,500
Life	km	[2,000/(200÷W/4)]^3 x 50 W: Load (N)	[2,000/(200÷W/4)]^3 x 50 W: Load (N)	[8,330/(600÷W/4)]^3 x 50 W: Load (N)

Notes:
[A] L_s = stroke length in mm
[B] Shown the value at 22°C (Coefficient of linear expansion 8 x 10^{-6}/°C)
[C] L_s = stroke length in inches
English units are provided for convenience.
* When designing a system, de-rate the maximum loads to the values specified.

Linear Series Standard Product Configuration



Application	De-rate Factor
Smooth, rotary motion	1/3
Intermittent press loading	1/5
Repetitive shock loading	1/10

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Driver Specifications

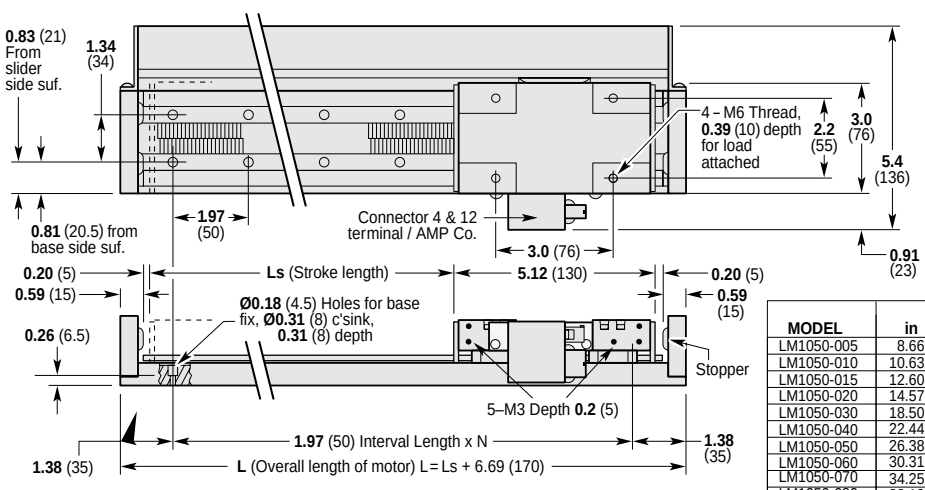
	LM1050/LM5040	LM1100/LM5090	LM1300/LM5270
Input Signal			
Command Interface			
Position mode	Step Input: Low going, low pulse, 150 nanoseconds minimum pulse width, 1.6 MHz max (LM1000) or 2.0 MHz max (LM5000) Direction Input: Logic high = UP direction; Logic low = DOWN direction		
Velocity mode	Analog Input: ±10VDC command signal		
Force mode	Analog Input: ±8VDC command signal		
Output Signal			
Speed signal	+6V (UP direction); -6V (DOWN direction)		
Encoder signal	Track A/B (4,000 kHz max.), Z-channel signal: 1 pulse/2.048 mm (LM1000) or 1 pulse/4.096 mm (LM5000)		
Alarm signal	Over current, over voltage, over temperature of heat sink; Under voltage, encoder abnormal, CPU abnormal		
Monitor	2.5 Hz step response output (test mode)		
Power source	100–115VAC or 200–230VAC. +10–15%, 50/60 kHz		
Maximum power consumption	LM1000 Series—300VA; LM5000 Series—450VA		
Weight	4 lbs 1.8 kg		

Environmental Specifications

	Motor	Driver	Note
Operation Temperature	0–45°C	0–50°C	
Operation Humidity	20–85% RH	20–90% RH	No condensing
Storage Temperature	-20–85°C	-20–85°C	
Storage Humidity	20–85% RH	20–90% RH	No condensing
Environment	No corrosive gases; dust-free atmosphere		

LM1050/LM5040 Motor Dimensions

Dimensions in inches (mm)



MODEL	L in	L mm	Ls in	Ls mm	N	No. of Holes
LM1050-005	8.66	220	1.97	50		2 x 2
LM1050-010	10.63	270	3.94	100		2 x 4
LM1050-015	12.60	320	5.91	150	5	2 x 6
LM1050-020	14.57	370	7.87	200	6	2 x 7
LM1050-030	18.50	470	11.81	300	8	2 x 9
LM1050-040	22.44	570	15.75	400	10	2 x 11
LM1050-050	26.38	670	19.69	500	12	2 x 13
LM1050-060	30.31	770	23.62	600	14	2 x 15
LM1050-070	34.25	870	27.56	700	16	2 x 17
LM1050-080	38.19	970	31.50	800	18	2 x 19
LM1050-090	42.13	1070	35.43	900	20	2 x 21
LM1050-100	46.06	1170	39.37	1000	22	2 x 23
LM1050-110	50.00	1270	43.31	1100	24	2 x 25
LM1050-120	53.94	1370	47.24	1200	26	2 x 27
LM1050-130	57.87	1470	51.18	1300	28	2 x 29
LM1050-140	61.81	1570	55.12	1400	30	2 x 31
LM1050-150	65.75	1670	59.06	1500	32	2 x 33

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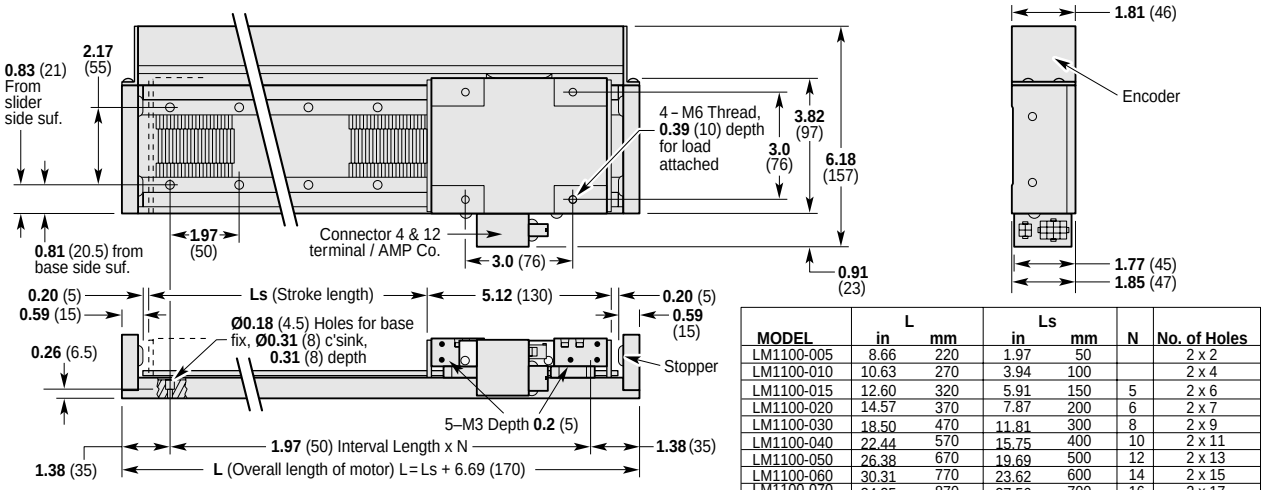
Linearserv Dimensional Drawings

LM1100/LM5090 Motor Dimensions

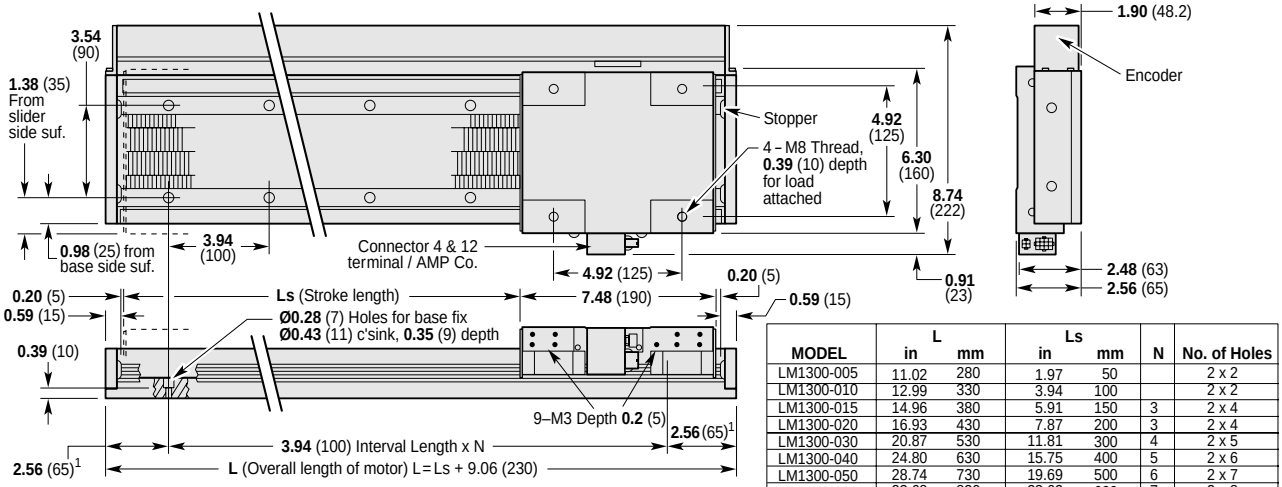
Dimensions in inches (mm)



MODEL	L in	L mm	Ls in	Ls mm	N	No. of Holes
LM1100-005	8.66	220	1.97	50		2 x 2
LM1100-010	10.63	270	3.94	100		2 x 4
LM1100-015	12.60	320	5.91	150	5	2 x 6
LM1100-020	14.57	370	7.87	200	6	2 x 7
LM1100-030	18.50	470	11.81	300	8	2 x 9
LM1100-040	22.44	570	15.75	400	10	2 x 11
LM1100-050	26.38	670	19.69	500	12	2 x 13
LM1100-060	30.31	770	23.62	600	14	2 x 15
LM1100-070	34.25	870	27.56	700	16	2 x 17
LM1100-080	38.19	970	31.50	800	18	2 x 19
LM1100-090	42.13	1070	35.43	900	20	2 x 21
LM1100-100	46.06	1170	39.37	1000	22	2 x 23
LM1100-110	50.00	1270	43.31	1100	24	2 x 25
LM1100-120	53.94	1370	47.24	1200	26	2 x 27
LM1100-130	57.87	1470	51.18	1300	28	2 x 29
LM1100-140	61.81	1570	55.12	1400	30	2 x 31
LM1100-150	65.75	1670	59.06	1500	32	2 x 33

LM1300/LM5270 Motor Dimensions

Dimensions in inches (mm)



MODEL	L in	L mm	Ls in	Ls mm	N	No. of Holes
LM1300-005	11.02	280	1.97	50		2 x 2
LM1300-010	12.99	330	3.94	100		2 x 2
LM1300-015	14.96	380	5.91	150	3	2 x 4
LM1300-020	16.93	430	7.87	200	3	2 x 4
LM1300-030	20.87	530	11.81	300	4	2 x 5
LM1300-040	24.80	630	15.75	400	5	2 x 6
LM1300-050	28.74	730	19.69	500	6	2 x 7
LM1300-060	32.68	830	23.62	600	7	2 x 8
LM1300-070	36.61	930	27.56	700	8	2 x 9
LM1300-080	40.55	1030	31.50	800	9	2 x 10
LM1300-090	44.49	1130	35.43	900	10	2 x 11
LM1300-100	48.43	1230	39.37	1000	11	2 x 12
LM1300-110	52.36	1330	43.31	1100	12	2 x 13
LM1300-120	58.30	1430	47.24	1200	13	2 x 14
LM1300-130	60.24	1530	51.18	1300	14	2 x 15
LM1300-140	64.17	1630	55.12	1400	15	2 x 16
LM1300-150	68.11	1730	59.06	1500	16	2 x 17

Note:[1] Dimensions for LM1300-005 and LM1300-015 are 1.57 (40) instead of 2.56 (65).

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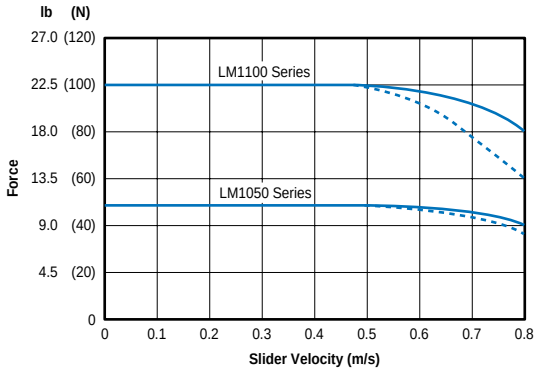
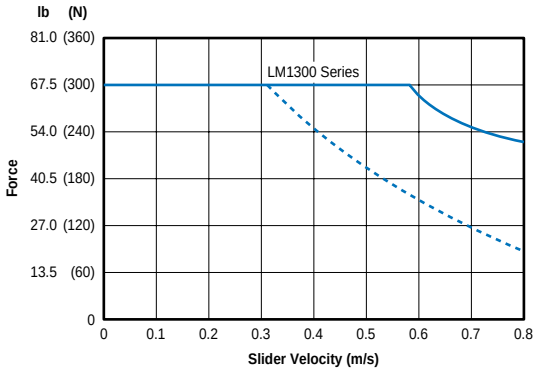
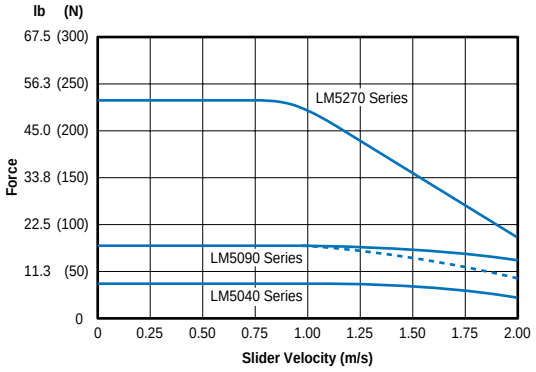
Linearserv Speed-Force Performance Curves



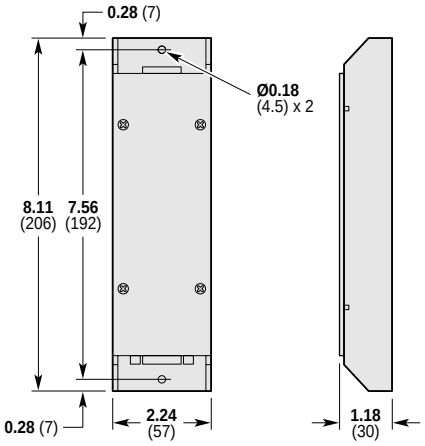




The speed-force curves represent peak force available; continuous forces are approximately 2/3 of the peak force value.

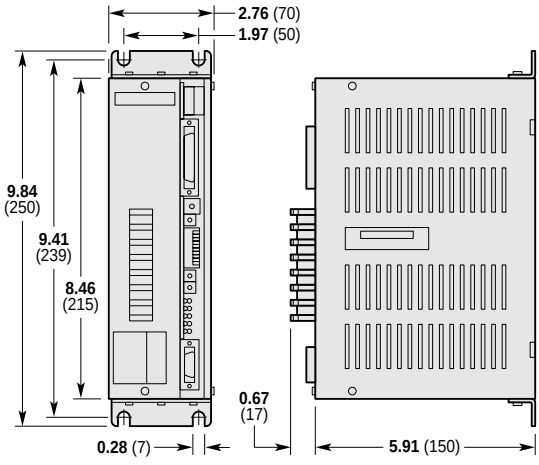
Head Amplifier

Dimensions in inches (mm)



Drive Dimensions

Dimensions in inches (mm)



Cable Option #1