Dual-Axis Stepper

The open-loop linear stepper motor provides the most economical linear motor positioning package. The compact dual-axis stepper motor provides travel along two axes in a single plane. The dual axis package is comprised of two components: a moving forcer (with bearings) and a stationary platen. A position verification system is available to close the loop.

Design Specifications

- Two-axis motion in a single plane
- Acceleration to 2g [19.6 m/s^2]
- High repeatability 0.0002 in [5.08 µm]
- Flatness = 0.0005 in/ft. [12.7 µm/300 m]
- Resolution = $\frac{\text{Full Step}}{\text{Number of microsteps}}$

  2-phase min. 0.0002 in [5 µm]

  4-phase min. 0.0001 in [2.5 µm]
- Platens up to 36 in x 59 in [914 mm x 1,498 mm]

Features

- For open position loop systems
- No tuning necessary
- Multiple forcers with overlapping trajectories on a single platen
- High stiffness air bearings
- Mount face up or inverted.
- Required control: Microstepping driver
- Lowest cost dual-axis positioning stage

The dual-axis linear stepper motor is designed for two-axis open loop positioning. It is a two axis stage with integrated air bearings and positioning system.

The moving primary 2 or 4-phase dual-axis linear stepper motor consists of a moving forcer and a stationary platen. The forcer is made of four single-axis coil assemblies. Two of the forcer assemblies are mounted in series to provide a thrust in the X direction and the other two are mounted orthogonal (at 90 deg.) to the first two assemblies to provide thrust in the Y direction. The forcer assemblies are encapsulated in a hard anodized aluminum housing. The motor's surface is lapped to provide a flat surface for the air bearing. The floating height of the air bearing is less than 0.001 in [25 µm]. The forcer is available in eight sizes, depending on the application's force requirements.

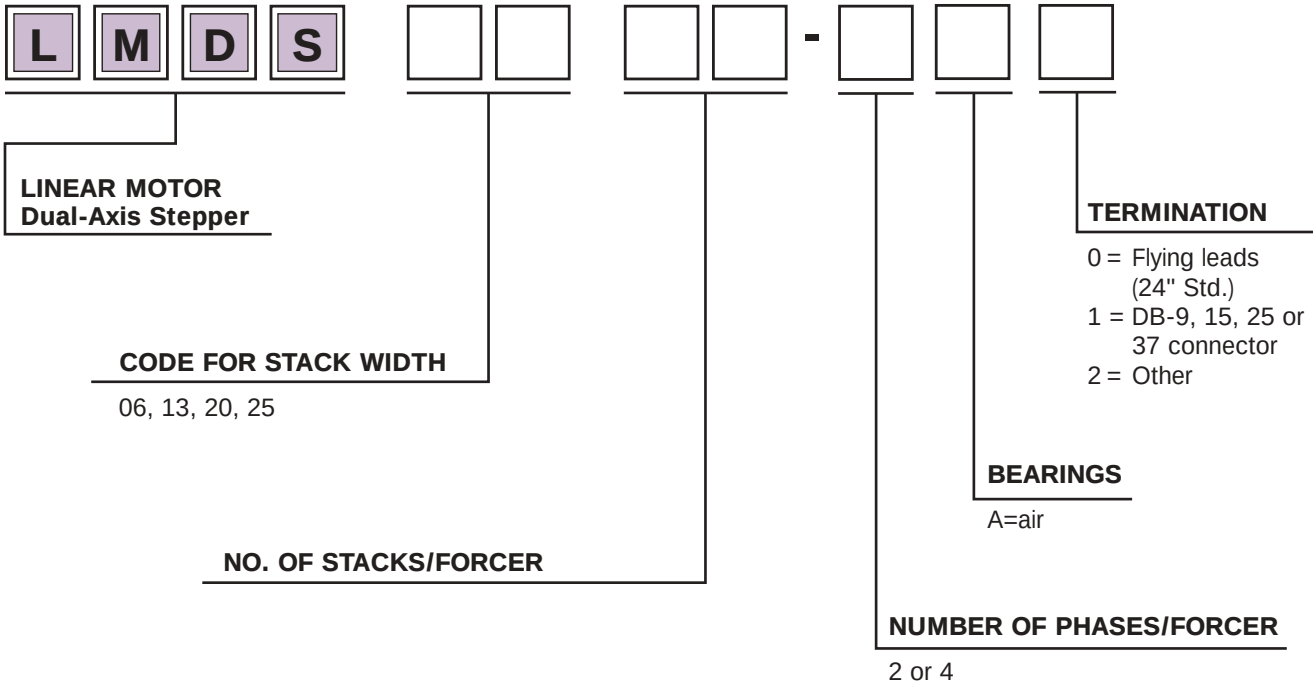
The platen is a photo-chemically etched steel plate that is filled with epoxy and ground. Standard mounting holes are provided on forcer and platen. The platen is available in sizes up to 36 in x 59 in [0.24m x 0.34m]. Preload for the bearing system is provided by the magnetic-attractive force between the forcer and the platen. The customer must bring power to the forcer with a cable, and provide the bearing air supply.

Dual-Axis Linear Stepper Motor Technical Data

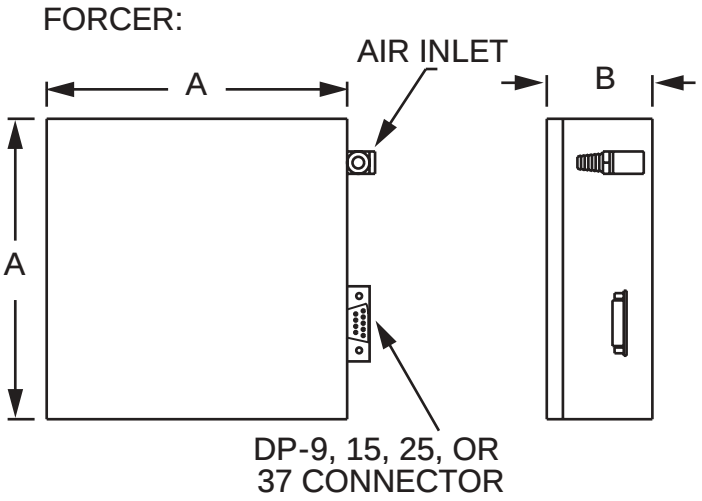
CATALOG NO.	Units	LMDS0602-2A0	LMDS1302-2A0	LMDS2002-2A0	LMDS1304-2A0	LMDS2004-2A0	LMDS2504-2A0
Number of Phases①		2	2	2①	2①	2①	2①
Static Force	Lbs [N]	3.0 [13.3]	6 [26.7]	9 [40.0]	15 [66.7]	24 [106]	30 [133]
Force @ 30 in/sec	Lbs [N]	1.5 [6.65]	3 [13.3]	4.5 [20.0]	7.5 [33.4]	12 [53.3]	15 [66.7]
Resistance/Phase	ohms	3.1	4.2	6.5	2.2	3.2	3.8
Inductance/Phase	mH	2.35	5.2	6.6	2.6	3.3	4.4
Amps/Phase	amps	2.0	2.0	2.0	4.0	4.0	4.0
Weight	Lbs [kg]	8 [3.6]	1.1 [0.50]	1.6 [0.72]	3.2 [1.4]	4.5 [2.0]	5.1 [2.3]
Airflow	CFM[L/min]	1.5 [42]	2.0 [56]	2.5 [70]	3.0 [84]	3.5 [98]	4.0 [112]
Attractive Force	Lbs [N]	36 [160]	90 [400]	162 [721]	203 [903]	324 [1,441]	405 [1,801]

NOTES: ① Four phase is available with the same force ratings and physical size. Typically, a 4-phase motor has twice the resolution as a 2-phase. The maximum 4-phase resolution is about ±1 µm.
Bi-directional repeatability= ±0.0002 in (±5 µm). Unidirection repeatability better than .0001 inch.
Resolution = 0.0002 in (2.5 µm), Cyclic error= ±0.0002 in(±5 µm) dependent on drive electronics and system implementation
Standard Pitch 0.040 in, Optional Pitch 0.020 in.
Air Bearing Airgap = 0.0008 in (20 µm), Air Pressure= 60-80 psi with a 3 micron filter.
All specifications are for reference only.

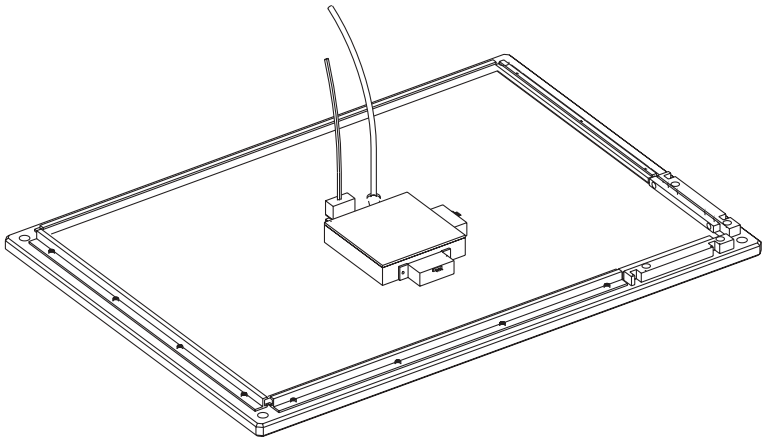
Dual-Axis Forcer Catalog Identification Matrix

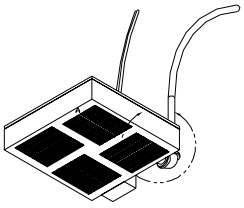


Dual-Axis Forcer Dimensions Inches [mm]



Dual-Axis Forcer Dimensions (Inches [mm])		
Catalog Number	**A**	**B**
LMDS-0602	3.15 [80.0]	1.1 [28]
LMDS-1302	3.80 [96.5]	1.2 [30]
LMDS-2002	4.75 [120.7]	1.2 [30]
LMDS-1304	5.88 [149.4]	1.2 [30]
LMDS-2004	6.50 [165.1]	1.2 [30]
LMDS-2504	7.00 [177.8]	1.45 [37]





Dual-Axis Forcer
(bottom view)

Dual-Axis Platen Catalog Identification Matrix

L T D S - ☐ ☐ - ☐

LINEAR PLATEN
Dual-Axis Stepper

BASE TYPE
1 = Honeycomb (All Stainless)
2 = 1" Solid Steel
3 = Special (Cast Iron, Granite, etc.)

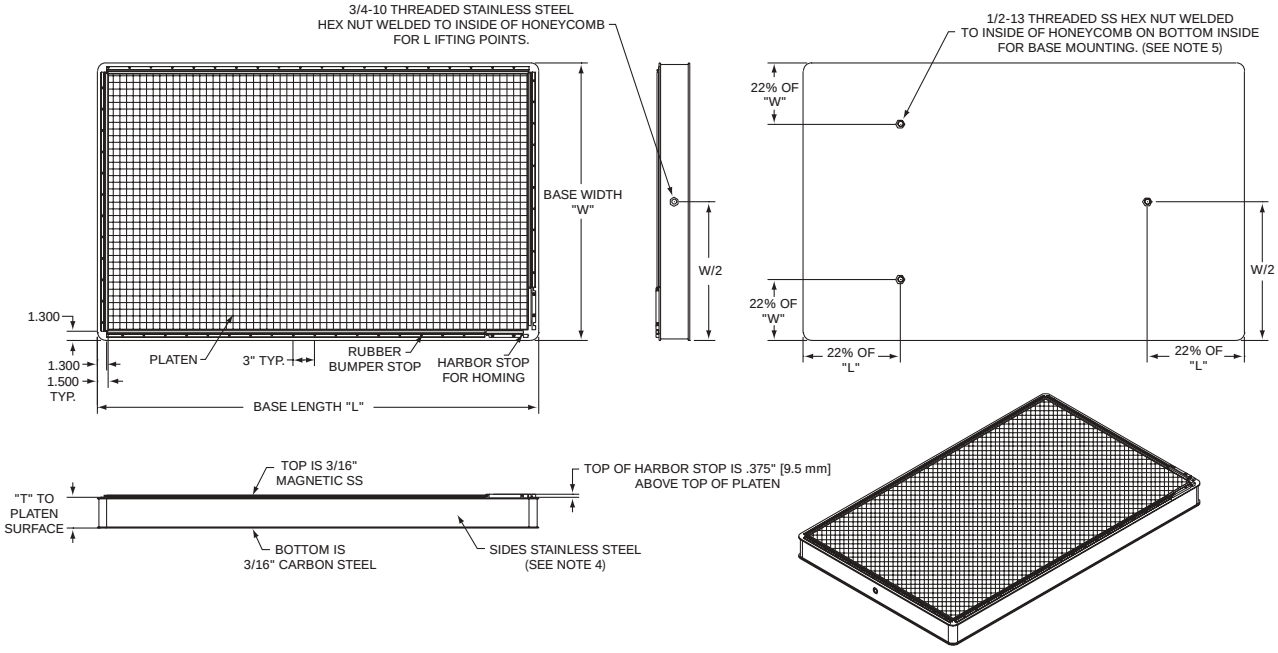
FEATURES
S = Standard Features (w/Max. size)
C = Custom (Size, bumpers, mtg. holes, stop, carbon steel, etc.

Size Class	Overall Size (Inch)	Travel Area (Inch)
D = Double	62 X 39	59 X 36
L = Long	55 X 35	52 X 31.25 (Honeycomb only)
F = Full	43 X 33	40 X 30
T = 3 Quarters	33 X 33	30 X 30
H = Half	33 X 23	30 X 20
Q = Quarter	23 X 18	20 X 15
S = Sixth	18 X 16.33	15 X 13.33
E = Eighth	18 X 13	15 X 10

Size Class is dependent on Base Size. Maximum dimensions for the size classes are shown. Larger size choices will fall into next size class.Usable Platen Area is 3" less than dimensions shown.

Dual-Axis Platen Dimensions
Stainless Steel Platens

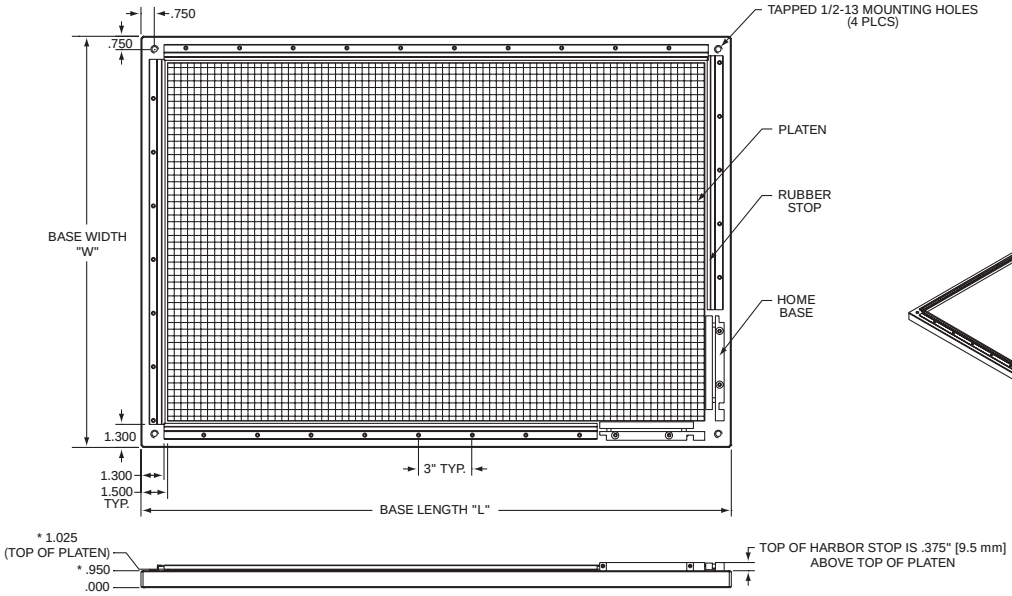
(Inches [mm])

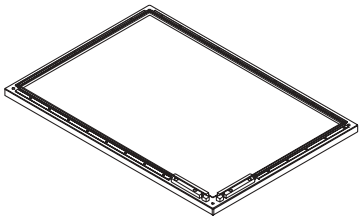


CATALOG NO.		LTDS-E1-S	LTDS-S1-S	LTDS-Q1-S	LTDS-H1-S	LTDS-T1-S	LTDS-F1-S	LTDS-L1-S	LTDS-D1-S
Overall	Inch	18.00	18.00	23.00	33.00	33.00	43.00	55.00	62.00
Length	meter	0.46	0.46	0.58	0.84	0.84	1.09	1.41	1.57
Overall	Inch	13.00	16.33	18.00	23.00	33.00	33.00	35.00	39.00
Width	Meter	0.33	0.41	0.46	0.58	0.84	0.84	089	0.99
Platen	Inch	2.37	2.37	2.37	2.37	2.37	4.37	4.37	4.37
Thickness	mm	60.1	60.1	60.1	60.1	60.1	114	114	114
Usable	Inch	15.00	15.00	20.00	30.00	30.00	40.00	52.5	59.00
Length	Meter	0.38	0.38	0.51	0.76	0.76	1.02	1.33	1.50
Usable	Inch	10.00	13.33	15.00	20.00	30.00	30.00	32.00	36.00
Width	Meter	0.25	0.34	0.38	0.51	0.76	0.76	0.81	0.91
Platen	Lbs	49	61	78	135	170	325	425	487
Weight	Kg	22	28	35	61	77	148	193	221

NOTE: 1. Stainless steel top, sides and bottom
2. Flatness: Top: ± 0-.0005 inch/foot [12.7 microns/305mm] typical
3. Flatness: Bottom: ± 0.005 inch/foot [127 microns/305mm] typical
4. Add 0.40 inch [12mm] thickness for bumpers (Std. on all platens with two harbor stop homing devices at right corner)
5. Parallelism of top to bottom: ± 0.10 inch [0.254mm] typical
6. Larger size platens available on request

Dual-Axis Platen Dimensions
Carbon Steel Platens (Inches [mm])





NOTES: 1) Hard Chrome-Plated Base
2) Flatness Top ± .0005 Inch/Foot [12 microns/305 mm] Typ.
3) Parallelism of Top to Bottom ±.010" Typ.
4) * + .050
– .000

CATALOG NO.		LTDS-E2-S	LTDS-S2-S	LTDS-Q2-S	LTDS-H2-S	LTDS-T2-S	LTDS-F2-S
Overall Length	Inch	18.00	18.00	23.00	33.00	33.00	43.00
	[Meter]	[0.46]	[0.46]	[0.58]	[0.84]	[0.84]	[1.09]
Overall Width	Inch	13.00	16.33	18.00	23.00	33.00	33.00
	[Meter]	[0.33]	[0.41]	[0.46]	[0.58]	[0.84]	[0.84]
Usable Length	Inch	15.00	15.00	20.00	30.00	30.00	40.00
	[Meter]	[0.38]	[0.38]	[0.51]	[0.76]	[0.76]	[1.02]
Usable Width	Inch	10.00	13.33	15.00	20.00	30.00	30.00
	[Meter]	[0.25]	[0.34]	[0.38]	[0.51]	[0.76]	[0.76]
Platen Weight	Lbs	65	82	116	214	308	402
	[Kg]	[30]	[36]	[53]	[97]	[140]	[183]

Stepper Positioning Sensor

The Stepper Positioning Sensor (SPS) provides closed-loop operation of single and dual-axis linear steppers. The sensor operates as an incremental encoder in conjunction with the motor platen to recognize lost steps. The output signal can be used by the controller to shut the system down, re-home or move to the desired position.

Typically, the SPS closed-loop repeatability is the same as open-loop repeatability. Resolution is 400 or 200 µm. Output signal is phase A/B square waves.

The Stepper Positioning Sensor is a factory installed option.

Design Specifications

- Provides position verification for open position loop systems
- Converts an open loop stepper motor system to a closed loop system
- Operates as an incremental encoder in conjunction with the motor platen

Features

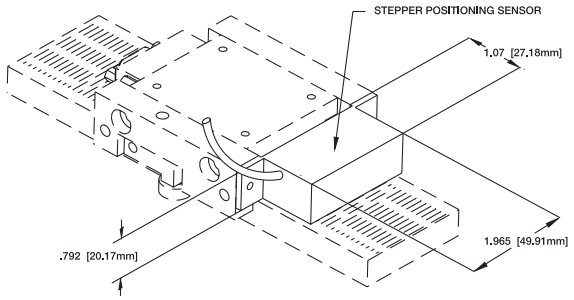
- Senses lost steps to the controller
- Signal can be used to shut down, re-home or move to the desired position
- Can be used for single and dual-axis linear stepper motors
- Encoder scale not required

Stepper Positioning Sensor Technical Data

Catalog Number	Units	LMSVS-200	LMSPS-400
Resolution	in [µm]	0.0002 [5.8]	0.0004 [10.16]
Power Supply	VDC	5 ± 5%	5 ± 5%
Output Signal		TTL Quadrature Output	TTL Quadrature Output
Weight	oz. [gms]	2.75 [77]	2.75 [77]
Construction		Metal Shell	Metal Shell

Stepper Positioning Sensor Dimensions (Inches [mm])

Single-Axis Stepper



Dual-Axis Stepper