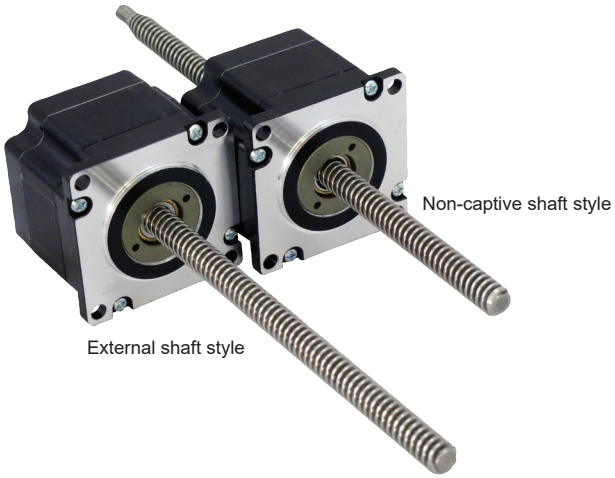
NEMA23 linear actuator

1.8° 2-phase stepper motors



Linear actuator stepper motors deliver long life, high accuracy and unsurpassed repeatability in a package that is extremely compact and low cost. These 1.8° 2-phase linear actuator stepper motors with NEMA 23 (2.22" / 56.4mm square flange) can be operated at very high resolutions, dependent on the stepper motor drive.

Shaft styles

To meet the needs of a wide range of linear motion applications, two (2) linear actuator shaft styles are offered:

Non-captive shaft

A threaded shaft extends through the motor, moving axially as the motor rotates.

External shaft

A threaded shaft, integral to the motor's rotor, rotates to move a nut axially along it. Two nut styles are offered: general purpose and anti-backlash.

Lead screw characteristics

Precision rolled screws are designed specifically for motion control applications, delivering maximum life and quiet operation. Manufactured from premium grade stainless steel, screws are corrosion resistant and non-magnetic. An optional Teflon® coating is available for smooth operation and extended life.

Customization of linear actuators and screws is available for volume opportunities.

Drive systems

For compact, high performance linear motion systems, combine motors with SEM drives:

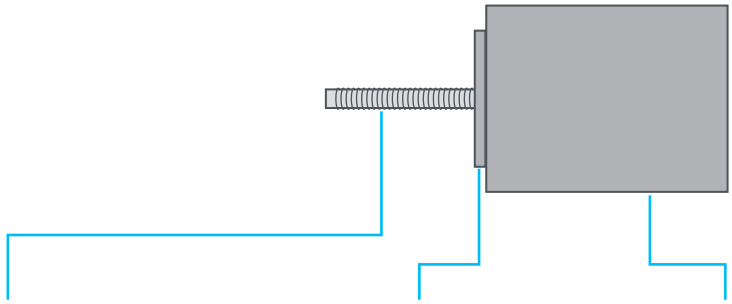
MForce – available in 3.0 A and 5.0 A versions, with choices of:
• Motion Control (programmable motion control units, RS-485 or CANopen interface)
• Microstepping (drive-only units programmed via pulse/direction interface)

Liberty Motion Module (LMM) – ultra-compact programmable motion controller, RS-485 or CANopen interface, up to 48 VDC. Offered with starter kits and development boards.

Linear actuator stepper motors
Size 23

			Size 23
Motor	Frame size	NEMA	23
		inches	2.22
		mm	56.4
	Length	stack size	single
Maximum thrust (1)	Non-captive shaft	lbs	200
		kg	91
	External shaft with general purpose nut	lbs	60
		kg	27
	External shaft with anti-backlash nut	lbs	25
		kg	11
Maximum repeatability	Non-captive shaft	inch	0.005
		mm	0.127
	External shaft with general purpose nut	inch	0.005
		mm	0.127
	External shaft with anti-backlash nut	inch	0.0005
		mm	0.0127
Phase current		amps	3.0
Number of leads			4
Phase resistance		ohms	0.65
Phase inductance		mH	1.5
Weight (without screw)		oz/g	18/510
Step angle α		°	1.8

(1) Performance data for maximum force/load is based on a static load and will vary with a dynamic load.

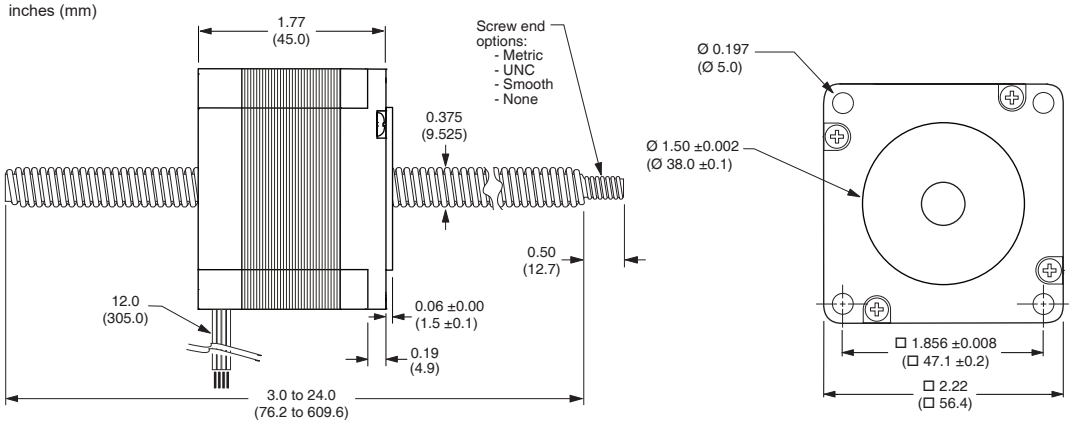


Lead screw		Centering collar	Flange size	Length (without screw)	Winding	Motor connection
Size 23						
Acme-style lead screw with end finish options	Ø 0.375" / Ø 9.525 mm	Ø 1.50" / Ø 38.0 mm	NEMA 23 2.22" / 56.4 mm	1.77" / 45.0 mm	2-phase full coil for bi-polar operation	Flying leads

Linear actuator stepper motors
Size 23

Size 23 Non-captive shaft

inches (mm)

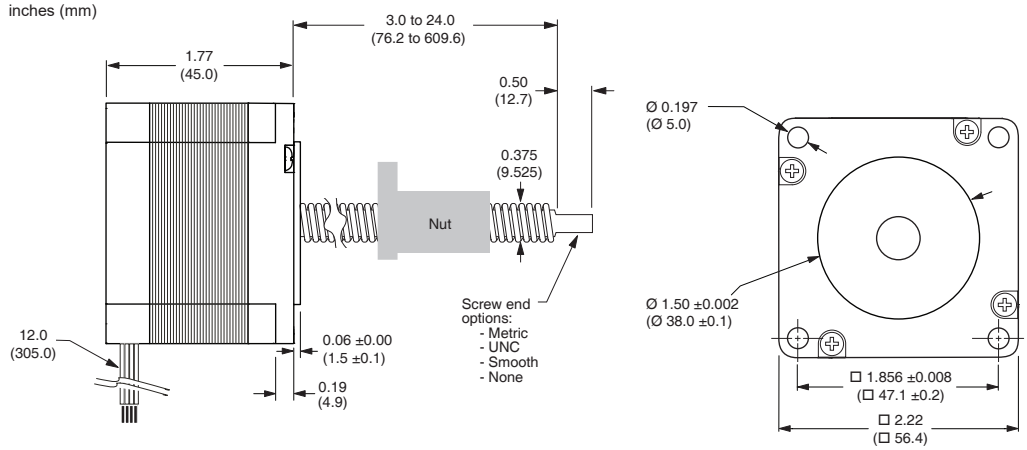


NOTE

Unsupported loads and side loading are not recommended for non-captive shaft linear actuators.

Size 23 External shaft

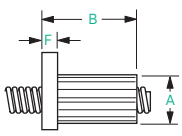
inches (mm)



NOTE

Cantilevered loads for external shaft linear actuators MUST BE supported. Side loading is not recommended.

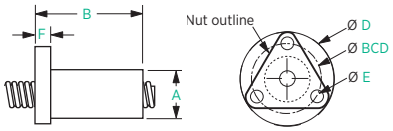
Nut specifications for external shaft linear actuators



General purpose nut

For applications not requiring anti-backlash and wear compensation.

Flange shape: round



Anti-backlash nut

Purpose: backlash free operation for high accuracy and low drag torque.

Flange shape: triangle

inches (mm)	A	B	D	E	F	BCD	drag torque
General purpose	0.71 (18.0)	1.50 (38.1)	1.5 (38.1)	0.20 (5.08)	0.20 (5.08)	1.125 (28.6)	free wheeling
Anti-backlash	0.82 (20.8)	1.875 (47.63)	1.5 (38.1)	0.20 (5.08)	0.20 (5.08)	1.125 (28.6)	1-to-3 oz-in / 0.7-2.1 Ncm

Lead screw specifications

			Screw G	Screw A	Screw B	Screw D
Travel	Per revolution		0.375" / 9.525 mm	0.20" / 5.08 mm	0.167" / 4.233 mm	0.0833" / 2.116 mm
	Per full step		0.001875" / 0.0476 mm	0.001" / 0.0254 mm	0.000835" / 0.0212 mm	0.0004165" / 0.0106 mm
Load limit*	Non-captive shaft		200 lbs / 91 kg			
	External shaft nuts	General purpose	60 lbs / 27 kg			
		Anti-backlash	25 lbs / 11 kg			

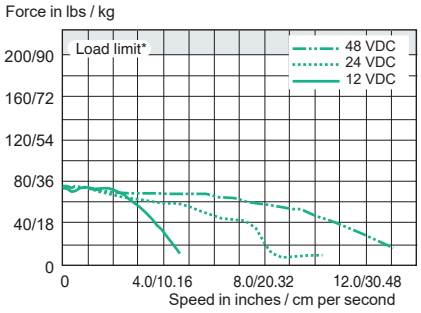
*Performance data for maximum force/load is based on a *static* load and will vary with a *dynamic* load.

Threaded end	Metric end: M6 x 1.0mm thread to within 0.03"/ 0.76 mm of shoulder	UNC end: 1/4-20 UNC-2A thread to within 0.05"/ 1.3 mm of shoulder
Smooth end	Ø 0.2362" ±0.001 Ø 6mm ±0.003	
None	—	

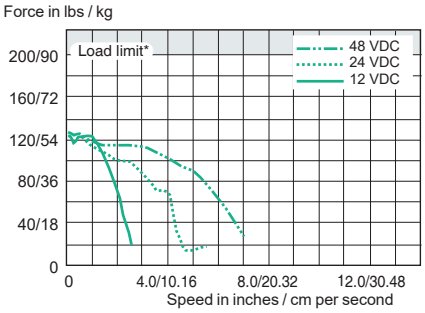
Linear actuator stepper motors
Size 23

Size 23 speed-force curves

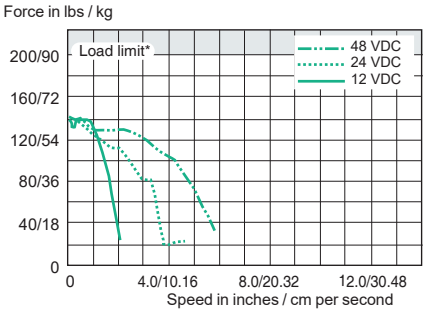
Screw G — 0.375" / 9.525 mm travel per revolution



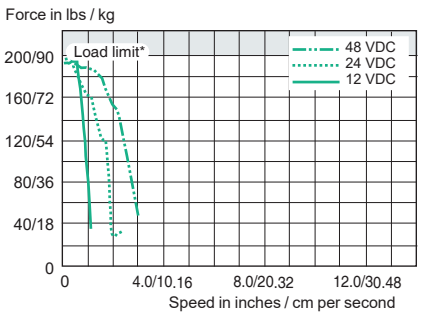
Screw A — 0.20" / 5.08 mm travel per revolution



Screw B — 0.167" / 4.233 mm travel per revolution



Screw D — 0.083" / 2.116 mm travel per revolution



**Load limit for non-captive shaft linear actuators is 200 lbs / 91 kg. Load limit for external shaft linear actuators is determined by selected nut.*
NOTE: Above performance data for maximum force/load is based on a static load *and will vary with a* dynamic load.

Size 23 part numbers

		example part number	L	M	2	3	A	3	0	0	A	1	M	0	6	0	Z	T
Motor type	**LM** = linear actuator stepper motor		**L**	**M**	2	3	A	3	0	0	A	1	M	0	6	0	Z	T
Frame size	**23** = NEMA 23 / 57 mm square flange		L	M	**2**	**3**	A	3	0	0	A	1	M	0	6	0	Z	T
Motor length	**A** = single stack		L	M	2	3	**A**	**3**	0	0	A	1	M	0	6	0	Z	T
Phase current	**300** = 3.0 A		L	M	2	3	A	**3**	**0**	**0**	A	1	M	0	6	0	Z	T
Screw lead	**G** = 0.375" / 9.525 mm **A** = 0.20" / 5.08 mm **B** = 0.167" / 4.233 mm **D** = 0.083" / 2.116 mm		L	M	2	3	A	3	0	0	**A**	1	M	0	6	0	Z	T
Shaft style	**1** = non-captive shaft **3** = external shaft		L	M	2	3	A	3	0	0	A	**1**	M	0	6	0	Z	T
Screw end finish	**M** = metric **U** = UNC **S** = smooth **Z** = none		L	M	2	3	A	3	0	0	A	1	**M**	0	6	0	Z	T
Screw length *(1) (2)*	*lengths may vary from:* **030** = 03.0" / 76 mm minimum **240** = 24.0" / 610 mm maximum Note: lengths in even or 0.1" increments		L	M	2	3	A	3	0	0	A	1	M	**0**	**6**	**0**	Z	T
Nut	**Z** = default (non-captive shaft only) **G** = general purpose (external shaft only) **A** = anti-backlash (external shaft only)		L	M	2	3	A	3	0	0	A	1	M	0	6	0	**Z**	T
Screw coating	**T** = Teflon® **Z** = none		L	M	2	3	A	3	0	0	A	1	M	0	6	0	Z	**T**

(1) To calculate screw length for non-captive shaft linear motors: screw length = [mounting surface plate thickness] + 2.0" / 51 mm + [desired stroke length]
(2) To calculate screw length for external shaft linear motors: screw length = [desired stroke length] + [nut length] + [mounting surface plate thickness]

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