

MDrive® Linear Actuator

MLM•14 Step/direction input

Product overview

MDrive® Linear Actuators are compact linear motion systems. External or non-captive shaft linear mechanicals are integrated with stepper motor and electronics for reliable, repeatable motion. Customization is available for volume opportunities.

Step/direction input products integrate 1.8° 2-phase stepper motor linear actuator, drive electronics and optional encoder. Step/direction signals of a master controller, e.g. a motion controller, or A/B signals of an encoder are converted directly into motion. Settings may be changed on-the-fly or downloaded and stored in nonvolatile memory using provided software.

MDrive product's precision rolled lead screws are manufactured from premium grade stainless steel with optional Teflon® coating. Designed specifically for motion control applications, our high quality screws deliver long life and quiet operation.

Simplify machine design and reduce assembly time by replacing multiple components with a single compact integrated motor. Fewer individual system components eliminates multiple potential failure points, and lowers risk of electrical noise by eliminating cabling between motor and drive.



MDrive Linear Actuator MLM•14 Step/direction products: integrated NEMA14 motor, controls and mechanicals, non-captive and external shaft styles, IP20-rated

Specifications

Communication	Protocol type		SPI
Input power	Voltage	VDC	+12 ... +48
	Current maximum (1)	Amp	1.0
Motor	Frame size	NEMA	14
		inches	1.4
		mm	35
	Length	stack size	single
Maximum thrust (2)	Non-captive shaft	lbs	50
		kg	22
	External shaft with general purpose nut	lbs	25
		kg	11
External shaft with anti-backlash nut	lbs	5	
	kg	2	
Maximum repeatability	General purpose	inch	0.005
		mm	0.127
	Anti-backlash (3)	inch	0.0005
		mm	0.0127
Thermal	Operating temp non-condensing	Heat sink maximum	85°C
		Motor maximum	100°C
Protection	Type	IP rating	IP20
Motion	Microstep resolution	Number of settings	20
		Steps per revolution	200, 400, 800, 1000, 1600, 2000, 3200, 5000, 6400, 10000, 12800, 20000, 25000, 25600, 40000, 50000, 51200, 36000 (0.01 deg/μstep), 21600 (1 arc minute/μstep), 25400 (0.001mm/μstep)

(1) Actual power supply current will depend on voltage and load.

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

(3) Only applicable for External shaft linear actuator with anti-backlash nut.

See User Manual for complete details: www.motion.schneider-electric.com/manuals.html

MDrive Linear Actuator

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Screws (1)

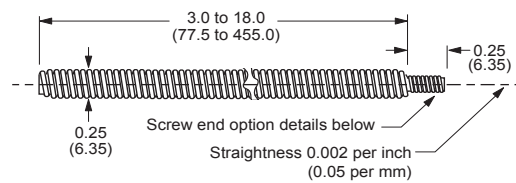
Screw lengths (2)	minimum	inches	3.0	
		mm	77.5	
	maximum	inches	18.0	
		mm	455.0	
Load limits (3)	non-captive shaft	lbs	50	
		kg	22	
	external shaft w/ general purpose nut	lbs	25	
		kg	11	
	external shaft w/ anti-backlash nut	lbs	5	
		kg	2	
End options	threaded	metric	M4 x 0.7 mm thread to within 0.03"/0.76 mm of shoulder	
		UNC	#8-32 UNC-2A thread to within 0.03"/0.76 mm of shoulder	
	smooth	inches	$\varnothing 0.1967 \pm 0.001$	
		mm	$\varnothing 5 \pm 0.003$	
	none	–	–	
		–	–	
Lead / pitch	screw A	travel	per rev	per full step
		inches	0.250	0.00125
		mm	6.350	0.0317
	screw B	inches	0.125	0.00063
		mm	3.175	0.0158
	screw C	inches	0.063	0.00031
		mm	1.588	0.0079

(1) Stainless steel rolled screws are corrosion resistant and non-magnetic, with Teflon coating available.

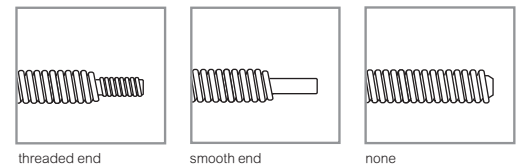
(2) Standard 0.1" / 2.5mm screw length increments are available.

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

screw dimensions



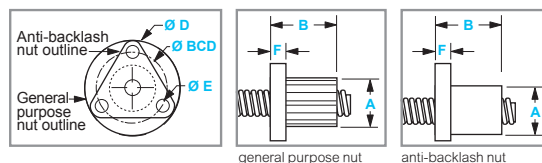
end options



Nuts (4)

			general purpose nuts	anti-backlash nuts
Dimensions	A	inches	0.50	0.50
		mm	12.7	12.7
	B	inches max	0.75	0.9
		mm max	19.1	22.86
	D	inches	1.0	1.0
		mm	25.4	25.4
	E	inches	0.14	0.14
		mm	3.6	3.6
	F	inches	0.15	0.18
		mm	3.81	4.57
BCD	inches	0.75	0.75	
	mm	19.1	19.1	
Load limit	lbs	25	5	
	kg	11	2	
Drag torque		free wheeling	< 1.0 oz-in	< 0.7 N-cm

(4) External shaft MDrive Linear Actuators employ a nut which moves axially along the threaded shaft as the screw rotates. Two nut styles are available: general purpose and anti-backlash. While anti-backlash nuts provide higher accuracy and low drag torque, general purpose nuts are rated for higher load limits.



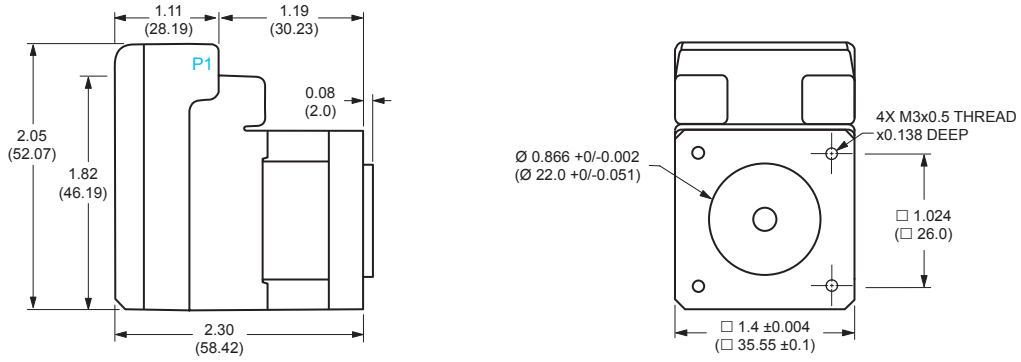
MDrive Linear Actuator

MLM•14 Step/direction input

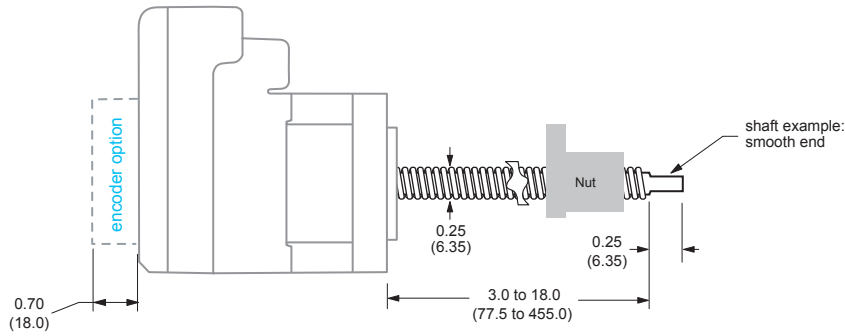
Dimensions

inches (mm)

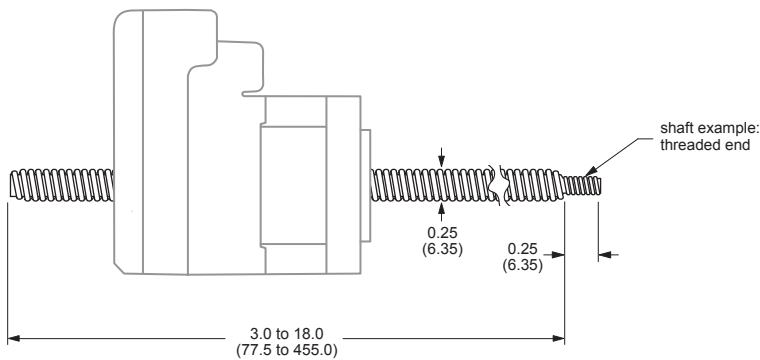
MDrive body



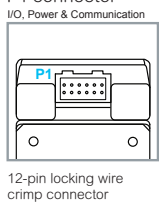
external shaft



non-captive shaft

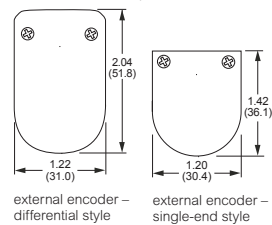


P1 connector



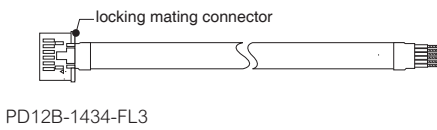
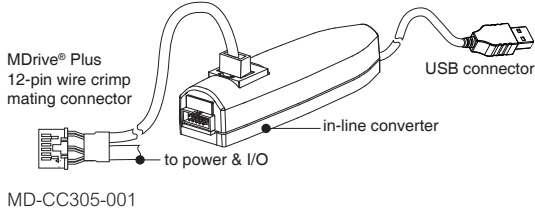
Encoder options

available for external shaft products



MDrive Plus

MLM•14 Step/direction input



Accessories

description	length feet (m)	part number
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QuickStart Kit

For rapid design verification, all-inclusive QuickStart Kits includes prototype development cables and a communication converter for MDrive Plus initial functional setup and system testing.

For all MLM•14 step/direction input products	—	add "K" to part number
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Communication converter

Electrically isolated, in-line converter pre-wired with mating connector to conveniently set/program communication parameters for a single MDrive Plus via a PC's USB port.

Mates to 12-pin locking wire crimp connector	12.0 (3.6)	MD-CC305-001
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Prototype development cable

Speed test/development with pre-wired mating connector with other cable end open.

Mates to 12-pin locking wire crimp connector for I/O, communication and power	10.0 (3.0)	PD12B-1434-FL3
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Encoder cables

Pre-wired mating connector with other cable end open.

For external single-end optical encoder with non-locking connector	1.0 (0.3)	ES-CABLE-2
For external differential optical encoder with locking connector	6.0 (1.8)	ED-CABLE-6

Mating connector kits

Connectors for assembly of cables, cable material not supplied. Sold in lots of 5. Manufacturer's crimp tool recommended for crimp connectors.

12-pin locking wire crimp connector for I/O, communication and power	—	CK-08
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Drive protection module

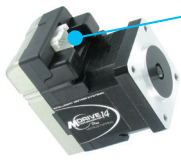
Limits surge current and voltage to a safe level when DC input power is switched on-and-off to MDrive product.

For all MDrive Plus linear actuator products	—	DPM75
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MDrive Plus

MLM•14 Step/direction input

MDrive® 14 Plus IP20



P1: I/O, Power & Communication
C = 12-pin locking wire crimp connector

Part numbers

IP20-rated products

example part number	K M L M 1 C S Z 1 4 A 4 -E1 -●
QuickStart Kit K = kit option, omit from part number if unwanted	K M L M 1 C S Z 1 4 A 4 -E1 -●
MDrive Linear Actuator version MLM = Step/direction input	K M L M 1 C S Z 1 4 A 4 -E1 -●
Input 1 = Plus version with universal input 5 = Plus version with differential CW/CCW input	K M L M 1 C S Z 1 4 A 4 -E1 -●
P1 connector C = wire crimp	K M L M 1 C S Z 1 4 A 4 -E1 -●
Communication type S = SPI	K M L M 1 C S Z 1 4 A 4 -E1 -●
P2 connector Z = none	K M L M 1 C S Z 1 4 A 4 -E1 -●
Motor size 14 = NEMA 14 1.4" / 35mm	K M L M 1 C S Z 1 4 A 4 -E1 -●
Motor length A = single stack	K M L M 1 C S Z 1 4 A 4 -E1 -●
Drive voltage 4 = +12 to +48 VDC	K M L M 1 C S Z 1 4 A 4 -E1 -●
Options — omit from part number if unwanted	-E1 -●
-E_ = externally-mounted optical encoder w/ index mark	
line count	100 200 250 256 400 500 512 1000 1024
single-end part #	E1 E2 E3 EP E4 E5 EQ E6 ER
differential part #	EAL EBL ECL EWL EDL EHL EXL EYL
Linear actuator specifications Complete the part number from the table below	●



Non-captive shaft style



External shaft style

-● continued

example part number — linear actuator specifications	-L A 1 M 0 6 0 Z T
Linear actuator -L	-L A 1 M 0 6 0 Z T
Screw lead / pitch by travel per rev A = 0.250" / 6.35mm B = 0.125" / 3.175mm C = 0.063" / 1.588mm	-L A 1 M 0 6 0 Z T
Shaft style 1 = non-captive (1) 3 = external (2)	-L A 1 M 0 6 0 Z T
Screw end finish M = metric threaded U = UNC threaded S = smooth Z = none	-L A 1 M 0 6 0 Z T
Screw length (3) 030 = minimum 3.0" / 77.5mm 180 = maximum 18.0" / 455.0mm	-L A 1 M 0 6 0 Z T
Nut Z = none — for non-captive shaft products G = general purpose — for external shaft products A = anti-backlash — for external shaft products	-L A 1 M 0 6 0 Z T
Coating T = Teflon® Z = none	-L A 1 M 0 6 0 Z T

- (1) Unsupported loads and side loading are not recommended.
- (2) Loads must be supported. Side loading is not recommended.
- (3) Screw lengths specified in 0.1" / 2.5mm increments.

MDrive Plus

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Motor performance

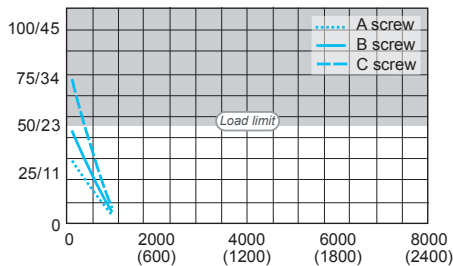
ML•14 NEMA 14 motor specifications		Motor	Stack length	Single
Holding torque			oz-in	18
			N-cm	13
Rotor inertia			oz-in-sec ²	0.0003
			kg-cm ²	0.021
Weight without screw			oz	8.0
			g	230.0
Maximum screw misalignment			°	±1
Maximum thrust (1)	Non-captive shaft		lbs	50
			kg	22
	External shaft with general purpose nut		lbs	25
			kg	11
	External shaft with anti-backlash nut		lbs	5
			kg	2
Maximum repeatability	General purpose		inch	0.005
			mm	0.127
	Anti-backlash (2)		inch	0.0005
			mm	0.0127

(1) Performance data for maximum force/load is based on a static load and will vary with a dynamic load.
 (2) Only applicable for External shaft linear actuator with anti-backlash nut.

ML•14 NEMA 14 speed force

12 VDC

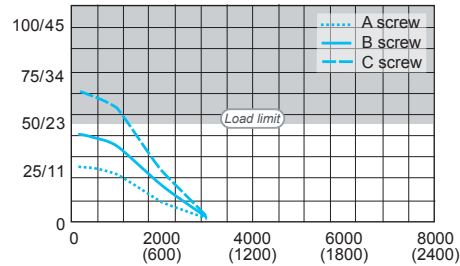
Force in lbs/kg



Speed of full steps per second (rpm)

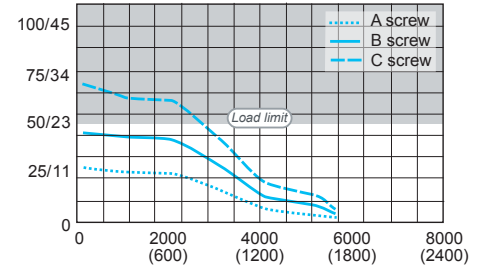
24 VDC

Force in lbs/kg



Speed in full steps per second (rpm)

48 VDC



Speed in full steps per second (rpm)

Test conditions: maximum force/load is based on a static load. This will vary with a dynamic load.

Load limits – non-captive shaft: 50lbs/22kg
 – external shaft: determined by selected nut

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Intelligent motion systems

