

# MDrive®



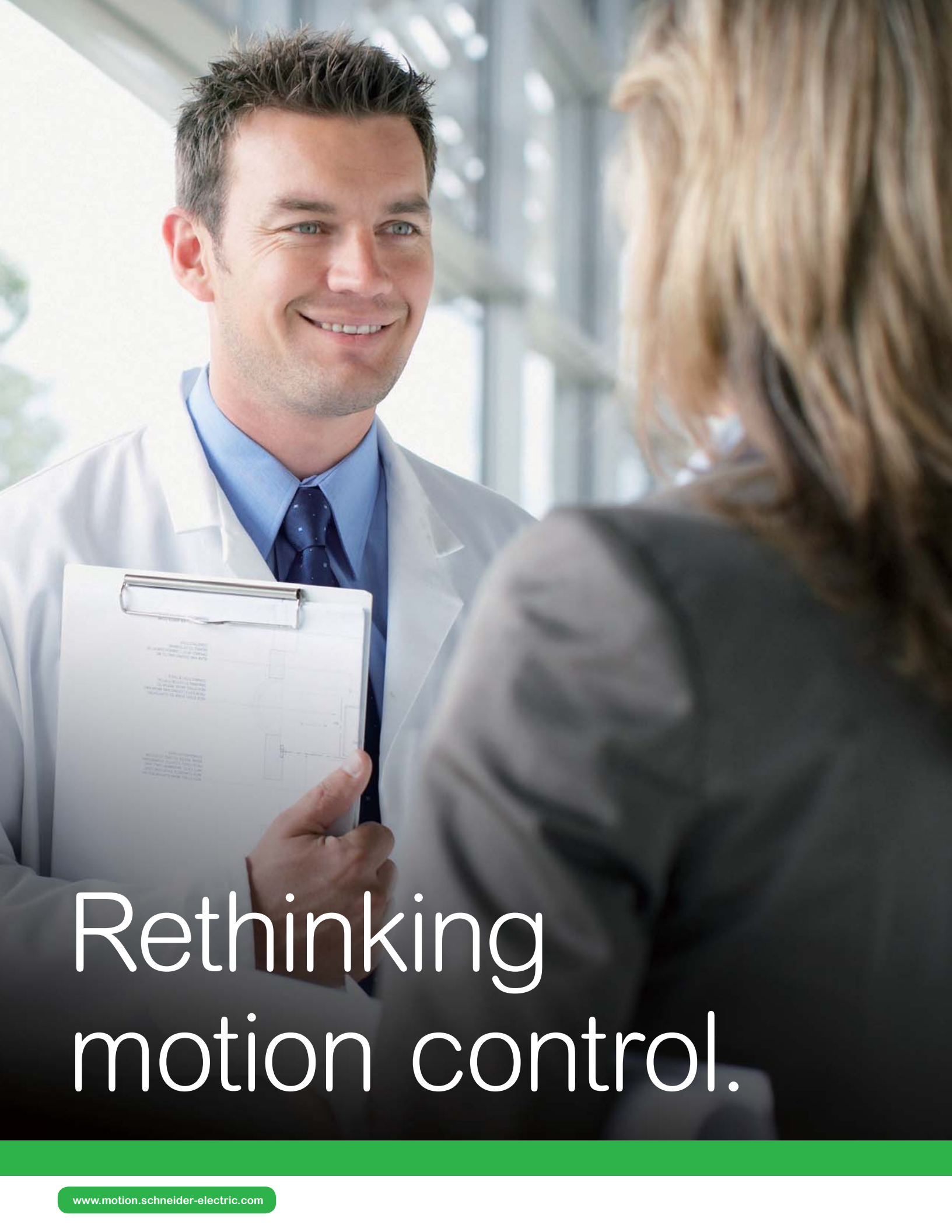
MDrive®: all-in-one integrated motor products.  
Rethinking motion control. Simplifying machine building.

[www.motion.schneider-electric.com](http://www.motion.schneider-electric.com)

Intelligent motion systems







# Rethinking motion control.





# Contents

Overview	MDrive® integrated motors	5
Section I	Lexium MDrive	6
	hMT closed loop technology	7
	specifications	8
	dimensions	10
	motor performance	12
	part numbers	14
	accessories	15
Section II	MDrive Plus	16
	integrated motor system advantages	17
	specifications	18
	dimensions	19
	motor performance	23
	part numbers	26
	accessories	28
Section III	MDrive Linear Actuator	30
	specifications	31
	dimensions	33
	motor performance	36
	part numbers	38
	accessories	40





# Simplifying machine building.



# MDrive<sup>®</sup> integrated motors

MDrive is the world leader in integrated motor technology.  
Delivering reliable performance to a wide range of motion applications.  
Reducing machine complexity, size, and cost for machine builders.

MDrive products integrate motor, driver, controller, internal encoder and closed loop performance, all in one compact package. Units are programmable and networkable, satisfying the motion control requirements of many new and existing applications. And with fewer individual system components, you save space, reduce wiring, and eliminate multiple potential failure points.

The family of MDrive integrated motors includes:



## Lexium MDrive

Robust Lexium MDrive products are especially well suited for industrial applications, including an IP65 rated version with circular M12 connectors. Communication protocol choices include Profinet, EtherNet/IP, ModbusTCP, CANopen, and serial RS-422/485 with programmable memory. Closed loop functionality delivers enhanced performance and energy savings.



## MDrive Plus

Applications with extremely limited space may find these products the best fit. Ultra compact MDrivePlus rotary motor products are offered with a wide range of features and options. Match these to your system requirements for products built to order, with quick turn shipping available, delivering your best solution.



## MDrive Linear Actuator

MDrive Linear Actuator products are built on the same integrated technology platform as MDrivePlus products, with the addition of linear mechanicals. These products deliver long life, high accuracy and repeatability in external shaft and non-captive shaft styles.

# 25%

Cut installation time up to 25% by replacing multiple individual components with an MDrive integrated motor.

# 40%

Reduce system wiring up to 40% with integrated motors, while simplifying the EMC concept and improving machine reliability.



# Lexium MDrive®

## Robust products for industrial OEMs

### Intelligent motors

OEMs who want to reduce machine size, cost and complexity will find robust Lexium MDrive products deliver exceptional performance and value for many applications, both stepper and servo.

### Lexium MDrive®

Robust Lexium MDrive products integrate 1.8° 2-phase stepper motors with on-board drive electronics, a controller with up to 8 I/O, and 1000 line (4000 count/rev) internal encoder with hMT closed loop performance. This high degree of integration can reduce machine complexity, size and cost in many stepper and servo motor applications. Delivering exceptional performance and smoothness with advanced current control.

Ideal for machine builders who want an optimized motor with on-board electronics, Lexium MDrive products are well suited for industrial applications. Supported communication protocols include:

- Ethernet: EtherNet/IP, Profinet, ModbusTCP
- CANopen
- RS-422/485

### Features

- Built-in protection circuitry
- IP65 rating with M12 connectors
- Input power range from +12 up to +70 VDC
- Auxiliary logic power supply input
- 20 microstep resolutions to 51,200 steps/rev
- Programmable motor run and hold currents
- Extended product warranty

Motor sizes include NEMA 17, 23 & 34, all available in 3 stack lengths. Premium high torque motors are also an option.

Products are offered in two connector versions:

- 1) Pluggable Style - includes mating connectors for direct wiring
- 2) M12 Circular Connector Style - IP65-rated against water and dust ingress



Robust Lexium MDrive products are especially well suited for industrial applications, including an IP65 rated version with circular M12 connectors. All with an industry-leading warranty,

Pictured: NEMA 17, 23 & 34 motor sizes



## hMT closed loop function

Delivers energy savings and enhanced performance.

Increases available motor torque without increasing motor size.

# 50%

Eliminates 50% motor derating typical in preventing stalling, as hMT never loses functional motor control.

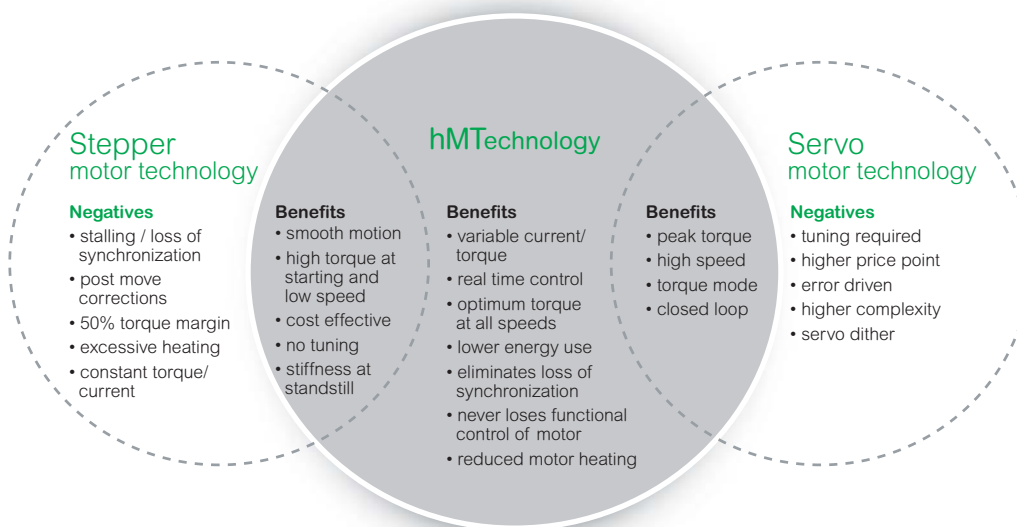
## hMT closed loop performance

Closed loop performance with Hybrid Motion Technology/hMT is available in Lexium MDrive products with encoders. hMT is a proprietary hardware-based system that monitors motor shaft position in sub-microsecond increments, delivering real time closed loop benefits including:

- preventing loss of synchronization/stalling
- allowing use of motor's full torque range
- delivering torque mode control
- reducing motor heat (1)
- lowering energy consumption (1)

(1) Achieved with hMTechnology variable current control.

Product commissioning, parameterization and monitoring are accomplished via a user-friendly software GUI, included free as part of the Lexium MDrive Software Suite. Settings can be downloaded and stored in the product's nonvolatile memory. Optional communication accessories are offered to expedite connecting and prototyping.



Stepper or servo motor? System designers can now have the best of both using Lexium MDrive products with hMT. Closed loop products combine benefits of both stepper and servo motor technologies, while delivering additional capabilities.



# Lexium MDrive®

## Specifications

### Specifications – General

			LM•42	LM•57	LM•85
Input power	Voltage	VDC	+12 ... +48	+12 ... +60	+12 ... +70
	Current maximum (1)	Amp	2.0	3.5	4.0
Motor	Frame size	NEMA	17	23	34
		mm	42	57	85
	Holding torque	oz-in	44 ... 88	103 ... 425	336 ... 920
		N-cm	31 ... 62	73 ... 300	237 ... 650
	Premium high torque motor	Option	no	yes	yes - custom
Thermal	Length	Stack sizes	1, 2 & 3	1, 2 & 3	1, 2 & 3
	Operating temp non-condensing	Heat sink maximum	85°C		
		Motor maximum	100°C		
Protection	Type	Temp warning	0 ... 84°C, user selectable		
		Earth grounding	via product chassis ground lug		
		IP ratings	IP20, IP65		
Aux. logic input	Voltage range (2)	VDC	+12 ... +24		
Motion	Microstep resolution	Number of settings	20		
		Steps per revolution	200, 400, 800, 1000, 1600, 2000, 3200, 50 00, 6400, 10000, 12800, 20000, 25000, 25600, 40000, 50000, 51200, 36000 (0.01 deg/μstep), 21600 (1 arc minute/μstep), 25400 (0.001mm/μstep)		
	Encoder (3)	Line count	1000 lines/4000 edges per rev		
		Style	internal, magnetic		
Hardware I/O sourcing or sinking	Analog input	Resolution	12 bit		
		Voltage range	0 ... +5 VDC, 0 ... +10 VDC, 0 ... 20 mA, 4 ... 20 mA		
	Signal inputs	Voltage range	+5 ... +24 VDC, TTL level compatible		
		Protection	current limited 5-20 volts		
	Power outputs	Current rating	-100 ... +100mA		
		Voltage range	-24 ... +24 VDC		
		Protection	over current, transient voltage suppression, inductive clamp		
	High-speed signal output	Current open collector/emitter	5.5 mA		
		Voltage open collector	+60 VDC		
		Voltage open emitter	+7 VDC		
Communication	Protocol type	Ethernet TCP/IP	Profinet, EtherNet/IP (ODVA compliant), ModbusTCP, MCode/TCP on configuration port 503		
		CANopen	CANopen CiA DS301, DSP402, 2.0B active with features: node guarding, heartbeat, SDOs, PDOs (variable mapping)		
		RS-422/485	Baud rate 4.8 ... 115.2 kbps		

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

(2) When input voltage is removed, maintains power only to control and feedback circuits. Not applicable to Pulse/Direction products.

(3) Only with Lexium MDrive closed loop/encoder products.



# Lexium MDrive®

## Specifications

### Specifications – Programmable Motion Control, CANopen & Ethernet products

I/O sourcing or sinking	Number of I/O (1)		LM•M/A/E42 (NEMA 17)	LM•M/A/E57 (NEMA 23)	LM•M/A/E85 (NEMA34)
	Analog input	Analog input	1	1	1
		Signal inputs	3	4	4
		Power outputs	0	2	2
		Signal outputs	1	1	1
	Analog input	Resolution	12 bit		
		Voltage range	0 ... +5 VDC, 0 ... +10 VDC, 0 ... 20 mA, 4 ... 20 mA		
	Signal inputs	Voltage range	+5 ... +24 VDC, TTL level compatible		
		Protection	current limited 5-20 volts		
	Power outputs	Current rating	-100 ... +100mA		
		Voltage range	-24 ... +24 VDC		
		Protection	over current, transient voltage suppression, inductive clamp		
	High-speed signal output	Current open collector/emitter	5.5 mA		
		Voltage open collector	+60 VDC		
		Voltage open emitter	+7 VDC		
Motion	Counters	Type	position, encoder/32 bit		
		Edge rate maximum	5 MHz		
	Velocity	Range	+/- 2,560,000 steps per second		
		Resolution	0.5961 steps per second		
	Accel/Decel	Range	1.5 x 10 <sup>9</sup> steps per second <sup>2</sup>		
		Resolution	90.9 steps per second <sup>2</sup>		

(1) Not applicable to Ethernet products.

### Specifications – Pulse/Direction products

			LM•P42 (NEMA 17)	LM•P57 (NEMA 23)	LM•P85 (NEMA34)
Signal inputs	Number		2		
	Voltage range, isolated		+5 ... +24 VDC sourcing or sinking		
Analog input	Number		1		
	Resolution		12 bit		
	Voltage range		0 ... +5 VDC, 0 ... +10 VDC, 0 ... 20 mA, 4 ... 20 mA		
Attention output	Current	Open collector/emitter	5.5 mA		
		Open collector	+60 VDC		
		Open emitter	+7 VDC		
Motion	Open loop configuration	Operating modes	pulse/direction, speed control, velocity mode		
	Closed loop configuration, requires LMD with encoder	Operating modes	pulse/direction input, variable speed control, constant velocity mode, variable torque mode		
	Encoder	Outputs	6 TTL level compatible		
	Digital filter range		50 nS ... 12.9 µS (10 MHz ... 38.8 kHz)		
	Clock types (step mode)		Step/direction, quadrature, step up/step down, clockwise/counterclockwise		
	Step frequency	Maximum	2.56 MHz		
		Minimum pulse width	100 ns		



# Lexium MDrive®

## Dimensions

### Software interface

The free Lexium MDrive Software Suite includes an intuitive user interface for product commissioning and programming via a PC. Installation accessories, including cables, cordsets and communication converters, speed product prototyping.

### Status indicators

Lexium MDrive products include 2 LED signal indicators. The multi-color LEDs are programmed to indicate a range of pre-defined messages to aid users.

### Grounding

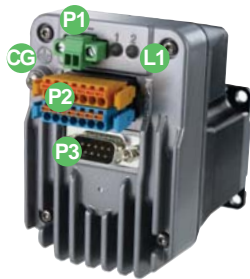
A screw lug #6-32 is provided for earth grounding.

### Connectors

Lexium MDrive products have 2 connector styles:  
1) Standard products with pluggable connectors.  
2) IP65 products with sealed M12 connectors.



- 1 rotary step motors: NEMA 17, 23 & 34 with premium high torque motor option
  - 2 microstepping drive
  - 3 motion controller
  - 4 up to 8 I/O lines
  - 5 internal encoder option
  - 6 closed loop performance
- 
- CG chassis ground screw
  - L1 signal indicators
  - P1 power
  - P2 I/O & multifunction
  - P3 communication portal for: EtherNet/IP, ModbusTCP, Profinet, serial RS-422/485, CANopen



pluggable connectors

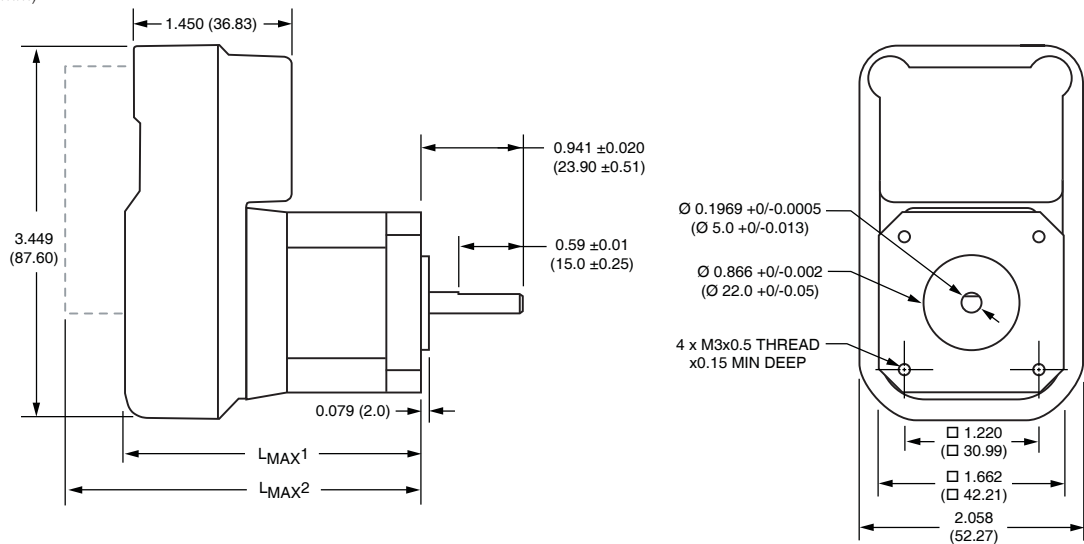


M12 connectors

### Dimensions

#### LM•42 NEMA17 motor

inches (mm)



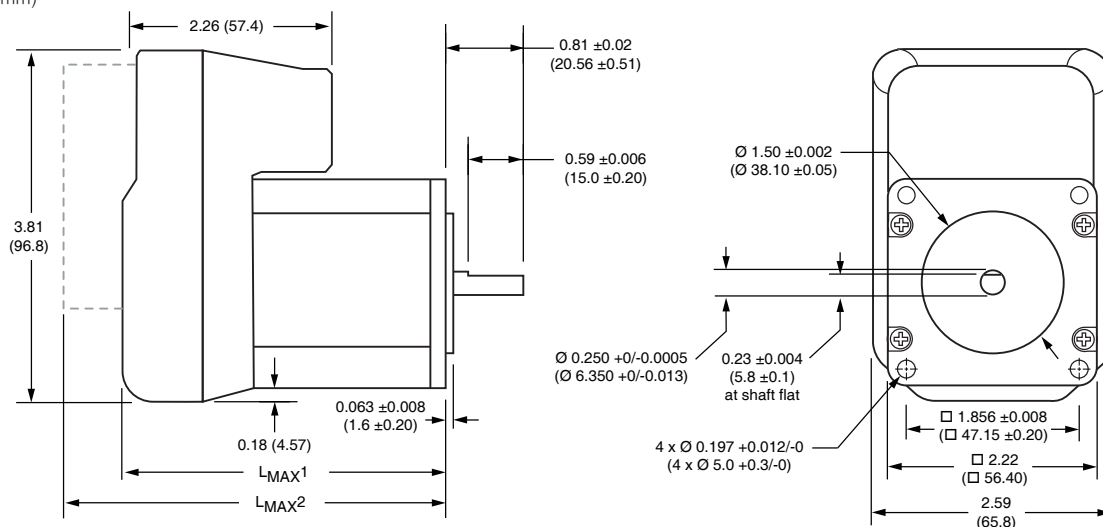
	Lmax1		Lmax2 (1)	
Motor stack length	Pluggable connector	M12 connector	Pluggable connector	M12 connector
Single	2.40 (61.0)	2.78 (70.7)	3.22 (81.8)	3.39 (86.0)
Double	2.64 (67.0)	2.98 (75.7)	3.46 (88.0)	3.58 (91.0)
Triple	2.96 (75.3)	3.33 (84.7)	3.78 (96.0)	3.94 (100.0)

(1) Represents maximum dimension with connectors/options.



### LM•57 NEMA23 motor

inches (mm)

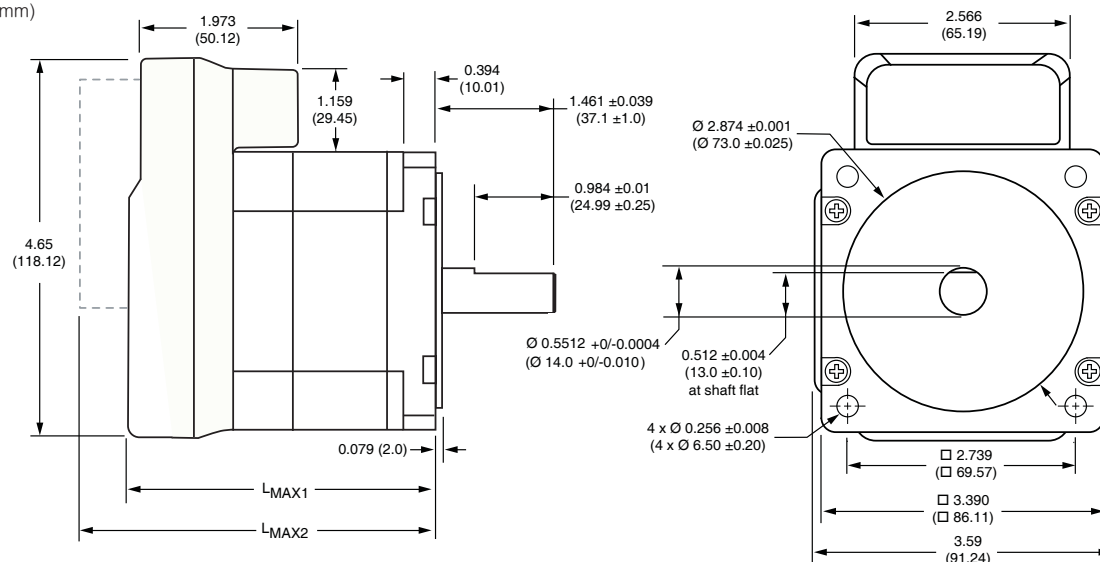


	Lmax1		Lmax2 (1)		High torque motor additional length
Motor stack length	Pluggable connector	M12 connector	Pluggable connector	M12 connector	
Single	3.17 (80.5)	3.32 (84.3)	3.91 (99.3)	4.01 (101.8)	0.15 (3.8)
Double	3.52 (89.4)	3.73 (94.8)	4.26 (108.2)	4.36 (110.7)	0.21 (5.4)
Triple	4.38 (111.3)	4.60 (116.8)	5.13 (130.3)	5.23 (133.0)	0.22 (5.5)

(1) Represents maximum dimension with connectors/options.

### LM•85 NEMA34 motor

inches (mm)



	Lmax1		Lmax2 (1)		
Motor stack length	Pluggable connector	M12 connector	Pluggable connector	M12 connector	
Single	3.76 (95.5)	4.04 (102.7)	4.41 (112.0)	4.65 (118.2)	
Double	4.33 (110.0)	4.57 (116.2)	4.98 (126.5)	5.18 (131.7)	
Triple	5.90 (149.9)	6.14 (156.1)	6.55 (166.4)	6.75 (171.5)	

(1) Represents maximum dimension with connectors/options.



# Lexium MDrive®

## Motor performance

LMD•42 NEMA 17 motor specifications	Motor	Stack length	Single		Double	Triple
Holding torque		oz-in	43.9		58.1	87.8
		N-cm	31		41	62
Detent torque		oz-in	1.7		2.1	3.5
		N-cm	1.2		1.5	2.5
Rotor inertia		oz-in-sec <sup>2</sup>	0.0005		0.0008	0.0012
		kg-cm <sup>2</sup>	0.038		0.057	0.082
Radial load limit, center of shaft		lbs	8.5		8.5	8.5
		kg	3.8		3.8	3.8
Axial load limit @ 1500 rpm (5000 full steps/sec)		lbs	10		10	10
		kg	4.5		4.5	4.5
Weight (motor+driver)		oz	13.6		16.0	18.4
		g	385		454	522

LMD•57 NEMA 23 motor specifications	Motor	Stack length	Single		Double		Triple	
			Torque level					
Holding torque		oz-in	103	152	159	264	242	416
		N-cm	73	107	112	186	171	294
Detent torque		oz-in	3.9	8.5	5.6	14.2	9.72	21.2
		N-cm	2.7	6.0	3.9	10.0	6.86	15.0
Rotor inertia		oz-in-sec <sup>2</sup>	0.0025	0.0019	0.0037	0.0030	0.0065	0.0052
		kg-cm <sup>2</sup>	0.18	0.14	0.26	0.22	0.46	0.37
Radial load limit, center of shaft		lbs	15	15	15	15	15	15
		kg	6.8	6.8	6.8	6.8	6.8	6.8
Axial load limit @ 1500 rpm (5000 full steps/sec)		lbs	20	20	20	20	20	20
		kg	9	9	9	9	9	9
Weight (motor+driver)		oz	26.4	26.4	31.2	31.2	44.0	44.0
		g	748	748	885	885	1247	1247

LMD•85 NEMA 34 motor specifications	Motor	Stack length	Single Single		Double	Triple
Holding torque		oz-in	336.0		480.0	920.0
		N-cm	237.0		339.0	650.0
Detent torque		oz-in	10.9		14.16	19.83
		N-cm	7.7		10.0	14.0
Rotor inertia		oz-in-sec <sup>2</sup>	0.0127		0.0191	0.0382
		kg-cm <sup>2</sup>	0.90		1.35	2.70
Radial load limit, center of shaft		lbs	65		65	65
		kg	29.4		29.4	29.4
Axial load limit @ 1500 rpm (5000 full steps/sec)		lbs	20		20	20
		kg	9		9	9
Weight (motor+driver)		lb	4.45		5.65	9.0
		kg	2.02		2.56	4.08

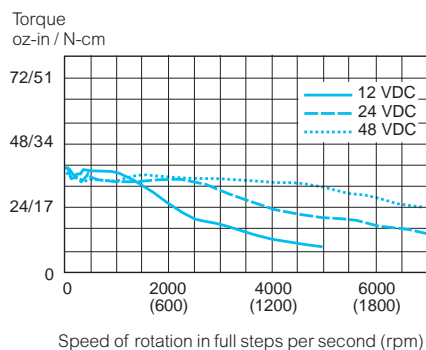


# Lexium MDrive®

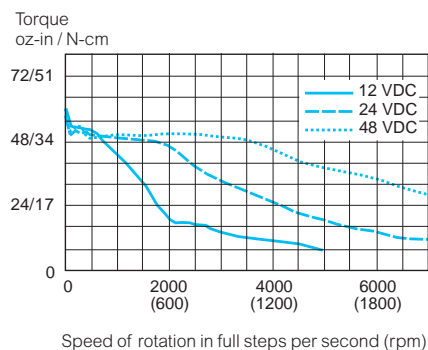
## Motor performance

### LMD•42 NEMA 17 speed torque (1)

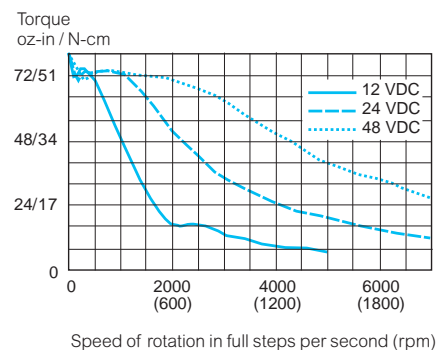
Single stack length



Double stack length

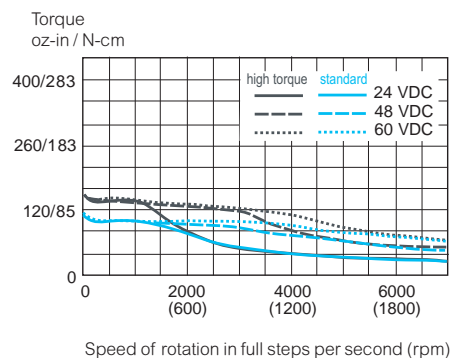


Triple stack length

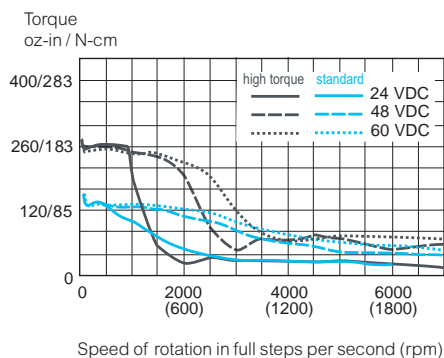


### LMD•57 NEMA 23 speed torque (1)

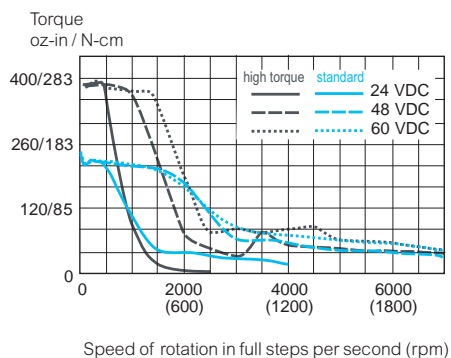
Single stack length



Double stack length

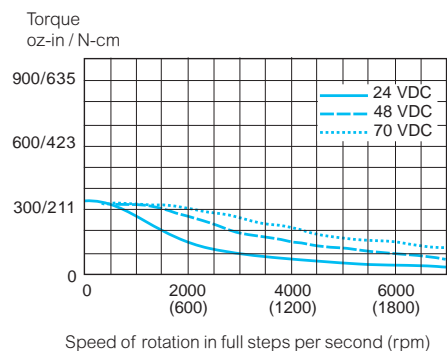


Triple stack length

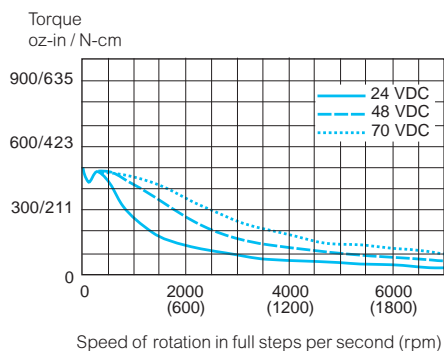


### LMD•85 NEMA 34 speed torque (1)

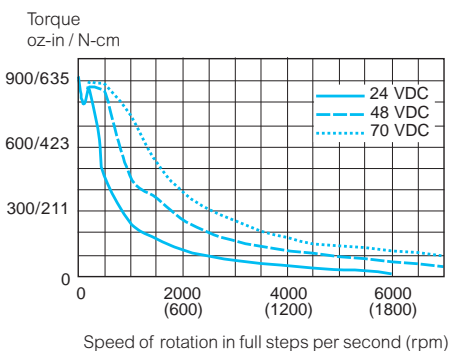
Single stack length



Double stack length



Triple stack length



(1) Test conditions: 100% current with damper simulating load.



# Lexium MDrive®

## Part numbers



example part number	L	M	D	C	A	4	2	1	_
<b>MDrive product</b> LM = Lexium MDrive	L	M		D	C	A	4	2	1
<b>Motor</b> D = hybrid stepper, 1.8° H = premium high torque stepper, 1.8° (1)	L	M	D		C	A	4	2	1
<b>Control type</b> C = Closed loop / with hMT and encoder (2) O = Open loop / no hMT or encoder	L	M	D	C		A	4	2	1
<b>Communication type</b> A = CANopen serial interface M = Programmable Motion Control via RS-422/485 serial interface P = Pulse/Direction via RS-422/485 serial interface E = EtherNet/IP, ModbusTCP, MCode/TCP and Profinet	L	M	D	C	A		4	2	1
<b>Flange size</b> 42 = NEMA 17    1.7 inch    42mm 57 = NEMA 23    2.3 inch    57mm 85 = NEMA 34    3.4 inch    85mm	L	M	D	C	A	4	2	1	_
<b>Motor length</b> 1 = single stack 2 = double stack 3 = triple stack	L	M	D	C	A	4	2	1	
<b>Variation</b> - only include for M12 IP65 products, otherwise omit C = IP65 with M12 circular connectors									C

(1) Premium high torque motor option only available in NEMA 23 size.  
(2) Closed loop control delivers encoder feedback and hMT enhanced motor performance.

For best fit and function in each application, a range of product configurations is offered. To ensure optimum performance in your system, expert technical support is available pre/post sale, free of charge. From application engineering to field service, we are committed to your success.

### Product versions

#### Pulse/Direction

##### Product communication type "P"

Lexium MDrive Pulse/Direction products have an RS-422/485 serial interface. Products operate in 4 modes: pulse/direction input, variable speed control, constant velocity drive, and variable torque control in closed loop products only. Operating in pulse/direction mode requires a separate motion control master. Features include 0 to 2.56 MHz step clock rate selectable in 0.59 Hz increments.

#### Programmable Motion Control

##### Product communication type "M"

Lexium MDrive Motion Control products with RS-422/485 serial interface include fully programmable integrated motion controller and on-board I/O. They are stand-alone motion control solutions that can be used without an external controller. Programming is with MCode, simple 1 to 2 character instructions, using the Lexium MDrive Software Suite provided free of charge.

#### Ethernet

##### Product communication type "E"

Lexium MDrive® Ethernet TCP/IP products are an adapter class device capable of explicit or implicit messaging. These ODVA™ compliant, compact motion control solutions interface with many manufacturer's systems including Siemens, Rockwell, Omron and Schneider Electric. The Ethernet controller supports multi-protocols selected by the user, including: EtherNet/IP, Profinet, and ModbusTCP.

#### CANopen

##### Product communication type "A"

Lexium MDrive Motion CANopen products support CiA DS301 and DSP402 Device Profile for Drives and Motion Control. Interface to CANopen networks is easy with direct configuration of Lexium MDrive products via layer setting services. A Communication Converter Kit (part # MD-CC502-000) with CAN dongle, cables and configuration utility is available to facilitate prototyping.



# Lexium MDrive®

## Accessories



MD-CC404-000



MD-CC501-000



MD-CC405-000



MD-CC502-000



MD-CS660-000

PLG-M12TP



MD-CS600-000



MD-CS610-000



MD-CS620-000



MD-CS630-000



MD-CS640-000



MD-CS650-000

## Pluggable connector products

description	length m	length feet	reference
<b>Communication Converter Kits</b>			
USB-pluggable converters set/program communication parameters in 32- or 64-bit. Pre-wired DB9 mating cable included			
USB to RS — for RS-422/485 pluggable products	1.8	6.0	MD-CC404-000
USB to CAN — for CANopen pluggable products	1.8	6.0	MD-CC501-000

## Replacement Mating Connector Kits

Kits include one 2-pin power mate, and one set (2 pieces) 7-pin multifunction mates

LM•P• Pulse/Direction products	CK-14		
LM•A• CANopen products	CK-15		
LM•M• Programmable Motion Control products	CK-15		
LM•E• Ethernet products	CK-15		

## M12 circular connector products

description	length m	length feet	reference
<b>Communication Converter Kits</b>			
USB-pluggable converters set/program communication parameters in 32- or 64-bit. Kits include pre-wired shielded cable with M12 connector. CANopen kits also include dongle & terminating resistor			
USB to RS — for RS-422/485 pluggable products	1.5	5.0	MD-CC405-000
USB to CAN — for CANopen pluggable products	1.8	6.0	MD-CC502-000

## Daisy chain, CANopen

Connect multiple CAN units together in sequence with this Y cable. A termination plug is required at end of run.

Y cable mates to M12 communication connector	0.3	1.0	MD-CS660-000
M12 bus termination (resistor) plug	—	—	PLG-M12TP

## Cordsets

Pre-wired shielded cables with straight M12 connectors

<b>LM•P•C Pulse/Direction products</b>			
Communication	3.0	10.0	MD-CS600-000
Power	3.0	10.0	MD-CS620-000
I/O	3.0	10.0	MD-CS630-000
<b>LM•A•C CANopen products</b>			
Communication	2.0	6.5	MD-CS650-000
Power	3.0	10.0	MD-CS620-000
I/O	3.0	10.0	MD-CS610-000
<b>LM•M•C Programmable Motion Control products</b>			
Communication	3.0	10.0	MD-CS600-000
Power	3.0	10.0	MD-CS620-000
I/O	3.0	10.0	MD-CS610-000
<b>LM•E•C Ethernet products</b>			
Communication	2.0	6.5	MD-CS640-000
Power	3.0	10.0	MD-CS620-000
I/O	3.0	10.0	MD-CS610-000



# MDrive® Plus

## Ultra-compact integrated motors

### Integrated motors

These compact, cost-effective motion control solutions can reduce design and assembly time for a wide range of motion applications, from medical and laboratory to packaging and machinery.

### MDrive® Plus

For both new and existing applications, if space is extremely limited, MDrive Plus products may be your best fit. These ultra-compact, integrated motor products are offered with a wide range of features and options. Matching these to your system requirements, you get products built-to-order at competitive prices with quick turn shipping available, delivering your best solution.

MDrive Plus products integrate electronics onto 1.8° 2-phase stepper motors, NEMA sizes 14 to 34. Control types range from CANopen and Ethernet to serial RS-422/485 with up to 8 I/O, +5 to +24 VDC, and programmable memory.

### Features

- Input power ranges from +12 up to +75 VDC
- Auxiliary logic power supply input
- 20 microstep resolutions to 51,200 steps/rev
- IP54 & IP65 products available
- Up to 8 I/O, with choice of standard (Plus) or expanded (Plus²) performance

### Networks

Supported communication protocols include:

- RS-422/485 Programmable Motion Control
- CANopen
- Ethernet
- SPI Step/direction & Speed Control versions



MDrive is the world's top integrated motor brand, offering the widest breadth of products. You receive high quality from our USA factory, competitive pricing, and on-time delivery.

Pictured: 34AC, 34, 23, 17 & 14 NEMA motor sizes



Integrated motors can reduce space requirements up to

1/2

that of traditional motion solutions. Fewer individual system components also eliminate multiple potential failure points.

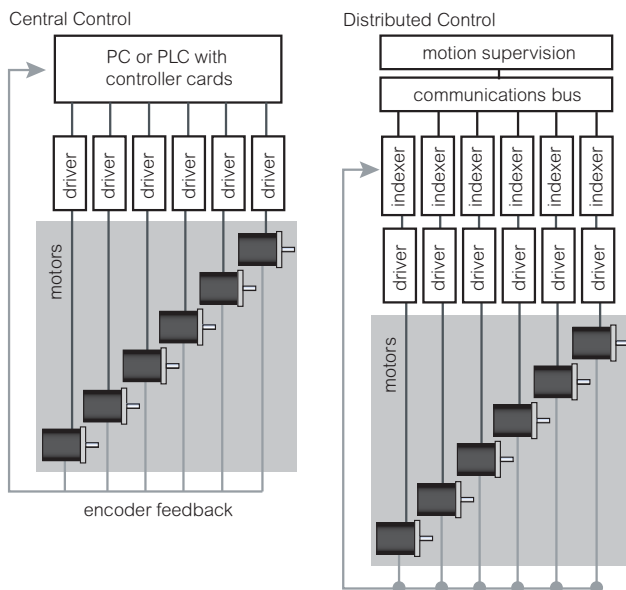
## Integrated motor system advantages

System integrators may be able to reduce machine size, cost and complexity by replacing multiple motion components with an MDrive integrated motor solution. These intelligent motors integrate standard motion system components all-in-one:

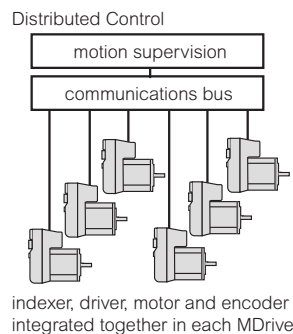
- Controller/PLC
- Driver
- Motor
- Wiring/cable harnessing
- Encoder and other accessories
- Power supply for drive/control electronics

MDrive integrated motors eliminate the tedious task of sourcing various system components, plus troubleshooting compatibility, performance and wiring issues. With MDrive products delivering complete, fully optimized motion solutions in one, engineers can focus their time and effort on other critical tasks. Fewer components and connections in a system also increase system reliability by reducing potential failure points.

Multiple Component Systems



Intelligent Motor System



Simplify the complexity of motion control systems with intelligent motor solutions. Above, traditional control systems using multiple separate components are compared alongside a streamlined MDrive integrated motor solution.



# MDrive Plus

## Specifications

### Specifications – General

Input power	Voltage	VDC	MD•14 +12 ...+48	MD•17 +12 ...+48	MD•23 +12 ...+75	MD•23 +12 ...+60	MD•34 +12 ...+75	MD•34 AC version —	
		VAC	—	—	—	—	—	120	240
	Current maximum (1)	Amp	1.0	2.0	2.0	3.5	4.0	—	—
VAC @ 50/60 Hz		—	—	—	—	—	95 to 132	95 to 264	
Motor	Frame size	NEMA	14	17	23	23	34	34	
		mm	35	42	57	57	85	85	
	Holding torque	oz-in	18...36	32 ... 75	90 ... 169	283	408 ... 1090	330 ... 750	
		N-cm	13 ... 25	23 ... 53	64 ... 169	200	288 ... 770	233 ... 529	
	Length	stack sizes	1 & 3	1, 2 & 3	1, 2 & 3	4	1, 2 & 3	1, 2 & 3	
Thermal	Operating temp non-condensing	Heat sink maximum	85°C	85°C	85°C	85°C	75°C	75°C	
		Motor maximum	100°C	100°C	100°C	100°C	90°C	90°C	
Protection	Type	Temp warning	na	na	na	na	na	thermal, over voltage/current	
		IP ratings	IP20	IP20, IP65	IP20, IP65	IP20, IP65	IP20	IP54	
Aux. logic input	Voltage range (2)	VDC	+12 ...+24						
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)						
	Encoder	Optional	availability determined by product version and size						
Communication	Protocol type	RS-422/485	Programmable Motion Control products, baud rate 4.8... 115.2 kbps						
		CANopen	CANopen CiA DS301, DSP402, 2.0B active with features: node guarding, heartbeat, SDOs, PDOs (variable mapping)						
		SPI	Step/Direction and Speed Control products						
		Ethernet	EtherNet/IP (ODVA compliant), ModbusTCP, MCode/TCP – only available with Nema 23 MDrive						

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

(2) When input voltage is removed, maintains power only to control and feedback circuits. Not applicable to Pulse/Direction and Speed Control products.

### Specifications – Step/direction products

Isolated input	Universal	MD•14	MD•17	MD•23	MD•34	MD•34 AC version
		Voltage range: +5 to +24 VDC sourcing or sinking step clock, direction and enable				
Motion	Differential	Voltage range: +5 VDC clockwise and counterclockwise				
	Step frequency	2 MHz default / 5 MHz maximum				
	Digital filter range	50 nS to 12.9 μS (10 MHz to 38.8 kHz)				
	Clock types	Step/direction, quadrature, step up/step down, clockwise/counterclockwise				Step/direction, quadrature, step up/step down

### Specifications – Programmable Motion Control, CANopen & Ethernet products (1)

			MD•14	MD•17	MD•23	MD•34	MD•34 AC version
Motion	Counters	Type	Position, encoder / 32 bit, 5MHz edge rate maximum				
	Velocity	Range / resolution	+ / – 5,000,000 steps per second / 0.5961 steps per second				
	Acceleration/deceleration	Range / resolution	1.5 x 10 <sup>9</sup> steps per second <sup>2</sup> / 90.9 steps per second <sup>2</sup>				
Motion Plus <sup>2</sup> – expanded features	Electronic gearing	Input filter range	50 nS to 12.9 μS (10 MHz to 38.8 kHz)				
		External clock in	Range: 0.001 to 2.0 / resolution: 32 bit / threshold: TTL				
		Secondary clock out	Range: 1 to 1				
	High speed I/O	Position capture	Resolution: 32 bit / input filter range: 50 nS to 12.9 μS (10 MHz to 38.8 kHz)				
		Trip output	Speed: 150 nS / resolution: 32 bit / threshold: TTL				
General purpose I/O	Output sinking current		Up to 600 mA				
	Plus – standard features	Number	4				
		Type	Sourcing or sinking inputs, or sinking outputs				
		Logic range	Inputs and outputs tolerant to +24 VDC				
	Plus <sup>2</sup> – expanded features	Number	8 (or 4 with either remote encoder option or ModbusTCP protocol)				
		Type	Sourcing or sinking outputs/inputs				
		Logic range	Sourcing outputs +12 to +24 VDC, inputs and sinking outputs tolerant to +24 VDC				
	Inputs	TTL level	Compatible				


























(1) EtherNet/IP only available with MDrive23 Plus<sup>2</sup> products.



# MDrive Plus

## Dimensions

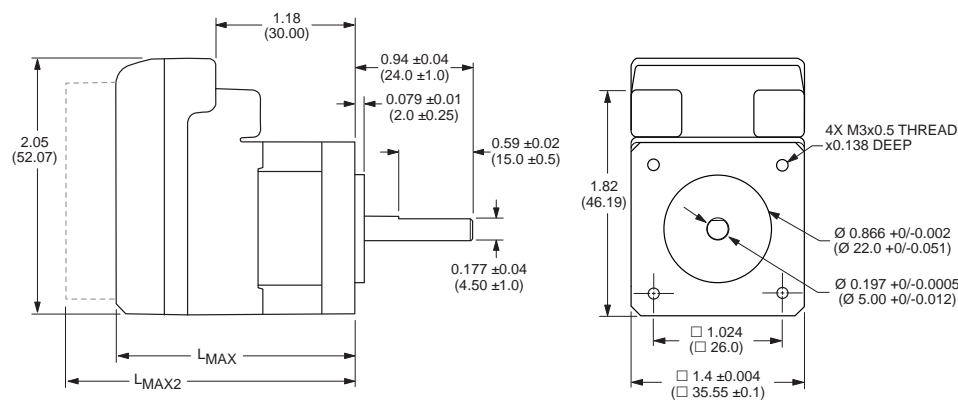
### Availability

by size & version	14		17		23		34		34ac	
	Plus	Plus <sup>2</sup>	Plus	Plus <sup>2</sup>	Plus	Plus <sup>2</sup>	Plus	Plus <sup>2</sup>	Plus	Plus <sup>2</sup>
M – Step/direction										
I – Motion Control										
I – CANopen										
I – Ethernet										
O – Speed control										

### Dimensions

MD•14 NEMA14 motor, IP20-rated

inches (mm)



Motor stack length	Lmax1	Lmax2 (1)
Single	1.93 (49.02)	2.62 (66.55)
Triple	3.03 (76.96)	3.73 (94.74)

(1) Represents maximum dimension with connectors/options.

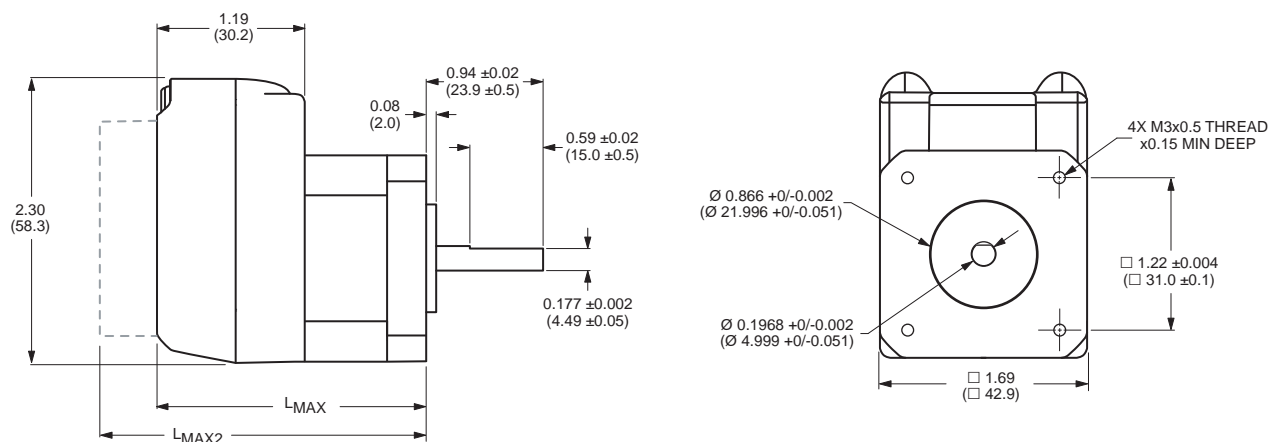


## MDrive Plus

## Dimensions

## MD•17 NEMA17 motor, IP20-rated

inches (mm)

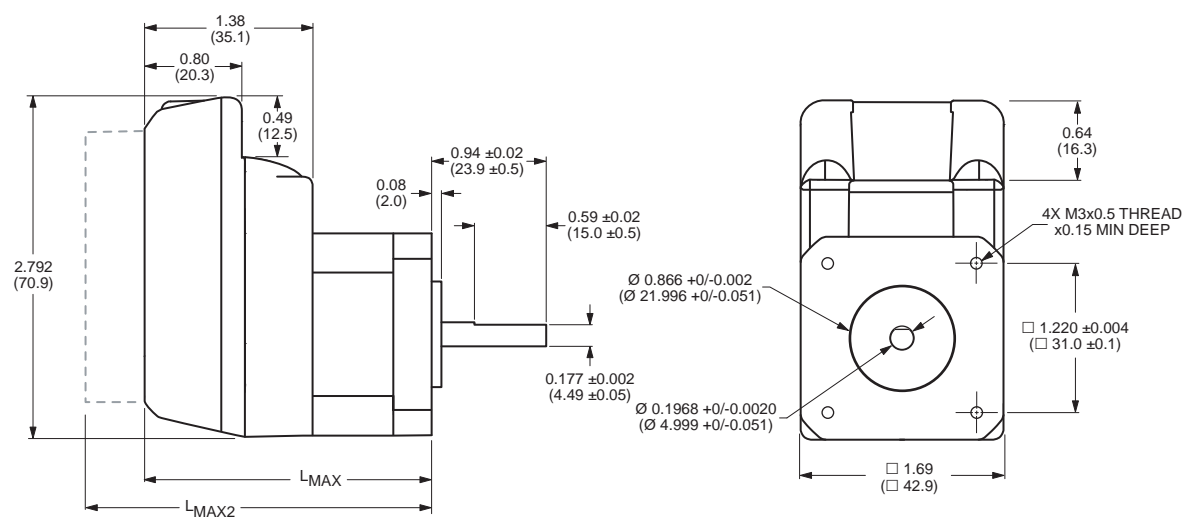


Motor stack length	Lmax1	Lmax2 (1)
Single	2.20 (55.9)	2.79 (70.9)
Double	2.43 (61.7)	3.02 (76.7)
Triple	2.77 (70.4)	3.37 (85.6)

(1) Represents maximum dimension with connectors/options.

## MD•17 NEMA17 motor, IP65-rated

inches (mm)



Motor stack length	Lmax1	Lmax2 (1)
Single	2.48 (62.71)	3.15 (79.72)
Double	2.71 (68.55)	3.38 (85.57)
Triple	3.05 (77.18)	3.72 (94.20)

(1) Represents maximum dimension with connectors/options.

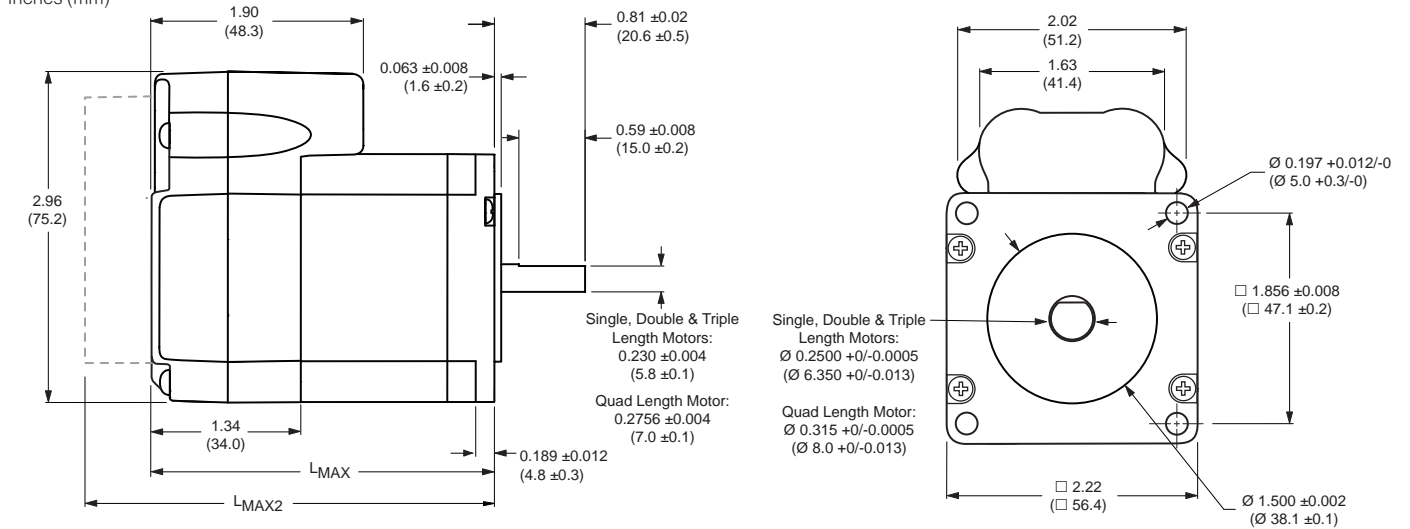


# MDrive Plus

## Dimensions

### MD•23 NEMA23 motor, IP20 and IP65-rated

inches (mm)

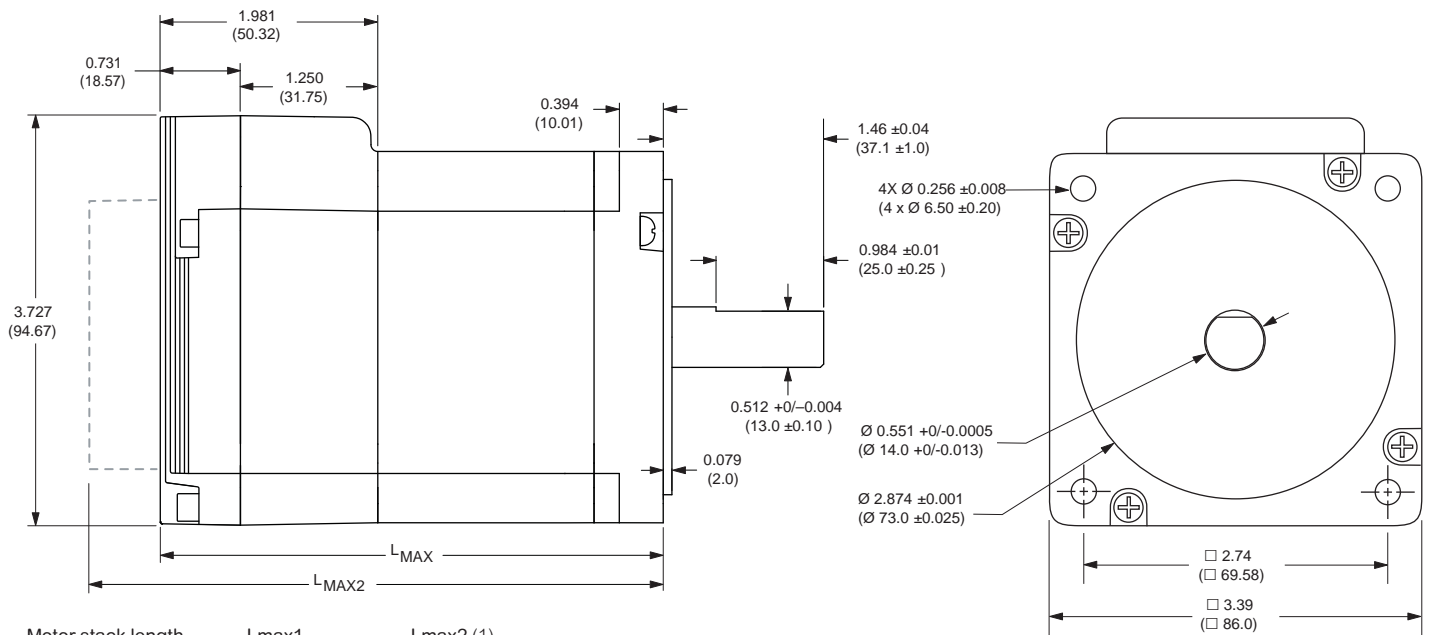


Motor stack length	Lmax1	Lmax2 (1)
Single	2.91 (73.63)	3.57 (90.39)
Double	3.25 (82.26)	3.91 (99.03)
Triple	4.11 (104.11)	4.76 (120.62)

(1) Represents maximum dimension with connectors/options.

### MD•34 NEMA34 motor, IP20-rated

inches (mm)



Motor stack length	Lmax1	Lmax2 (1)
Single	3.81 (96.77)	4.52 (114.81)
Double	4.60 (116.84)	5.31 (134.87)
Triple	6.17 (156.72)	6.88 (174.75)

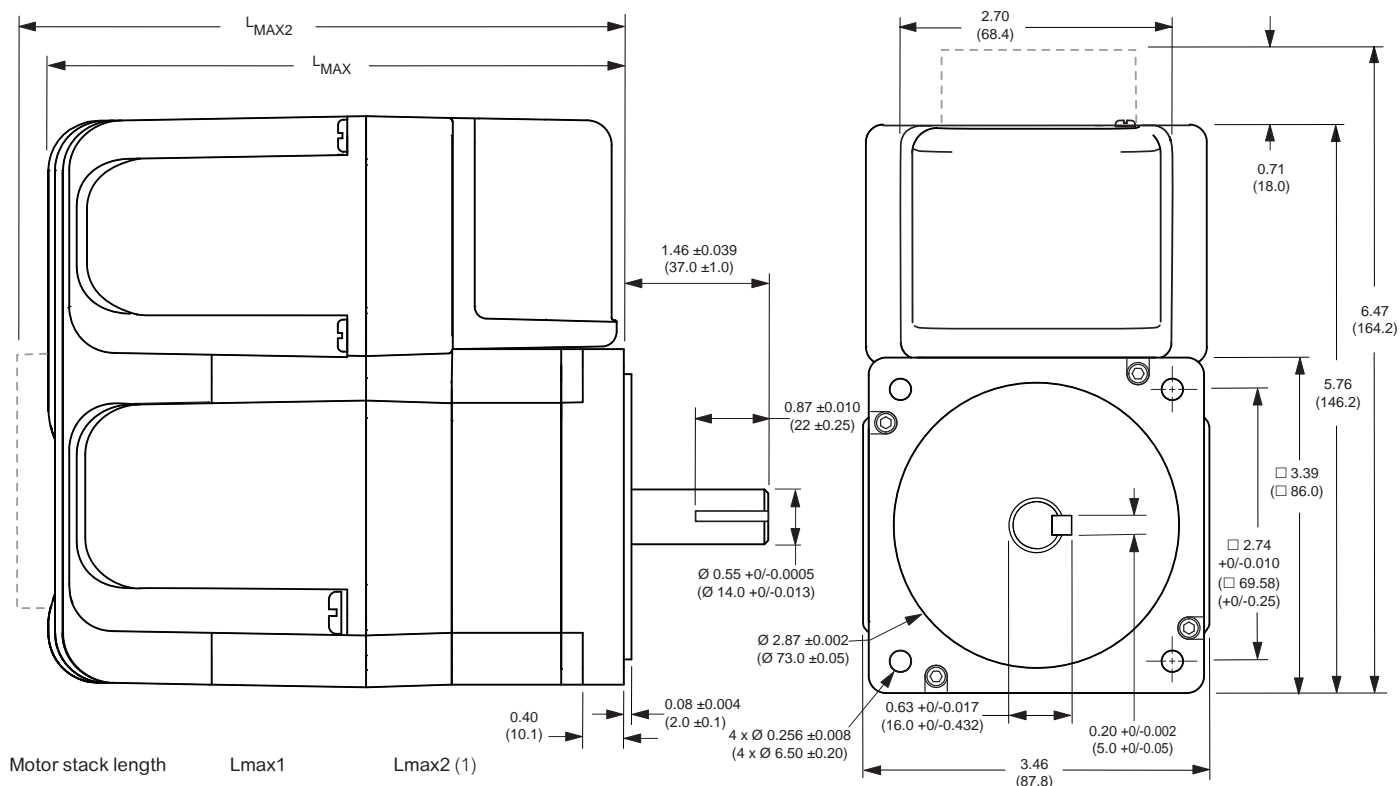
(1) Represents maximum dimension with connectors/options.



## Dimensions

## MD•34AC NEMA34 motor, IP54-rated

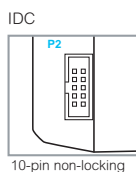
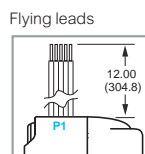
inches (mm)



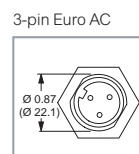
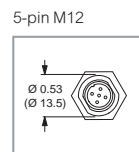
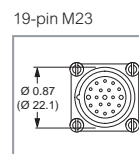
Motor stack length	Lmax1	Lmax2 (1)
Single	6.1 (155.0)	7.1 (180.4)
Double	6.9 (174.3)	7.9 (199.7)
Triple	8.4 (214.3)	9.4 (239.7)

(1) Control knob option.

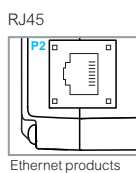
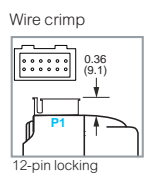
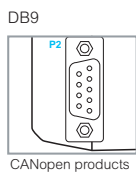
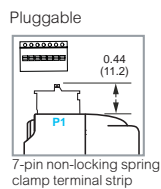
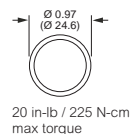
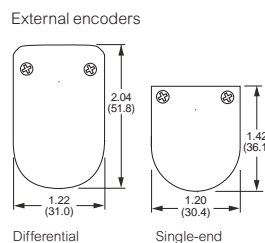
## IP20 connector examples



## IP54/65 connector examples



## Lmax2 option examples





# MDrive® Plus

## Motor performance

MD•14 NEMA 14 motor specifications	Motor	Stack length	Single		Triple
	Holding torque	oz-in	18		36
		N-cm	13		25
	Detent torque	oz-in	2.0		4.4
		N-cm	1.4		3.1
	Rotor inertia	oz-in-sec <sup>2</sup>	0.000198		0.000801
		kg-cm <sup>2</sup>	0.014		0.0566
	Weight (motor+driver)	oz	5.29		12.8
		g	150		380

MD•17 NEMA 17 motor specifications	Motor	Stack length	Single	Double	Triple
	Holding torque	oz-in	32	60	75
		N-cm	23	42	53
	Detent torque	oz-in	1.7	2.1	3.5
		N-cm	1.2	1.5	2.5
	Rotor inertia	oz-in-sec <sup>2</sup>	0.0005	0.0008	0.0012
		kg-cm <sup>2</sup>	0.038	0.057	0.082
	Weight (motor+driver)	oz	10.4	12.0	15.2
		g	295	340	431

MD•23 NEMA 23 motor specifications	Motor	Stack length	Single	Double	Triple	Quad
	Holding torque	oz-in	90	144	239	283
		N-cm	64	102	169	200
	Detent torque	oz-in	3.9	5.6	9.7	14.2
		N-cm	2.7	3.9	6.9	10.0
	Rotor inertia	oz-in-sec <sup>2</sup>	0.0025	0.0037	0.0065	0.0108
		kg-cm <sup>2</sup>	0.18	0.26	0.46	0.76
	Weight (motor+driver)	oz	21.6	26.4	39.2	62
		g	612	748	1111	1746

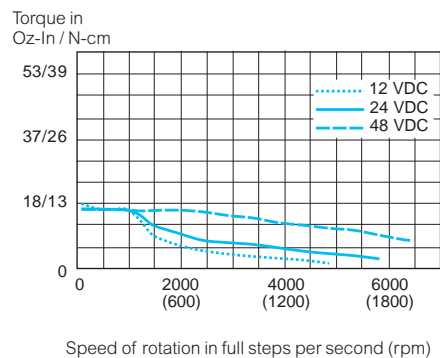
MD•34 NEMA 34 motor specifications	Motor	Stack length	Single	Double	Triple
	Holding torque	oz-in	408	574	1090
		N-cm	288	405	770
	Detent torque	oz-in	10.9	14.16	19.83
		N-cm	7.7	10.0	14.0
	Rotor inertia	oz-in-sec <sup>2</sup>	0.01275	0.01924	0.03849
		kg-cm <sup>2</sup>	0.90	1.35	2.70
	Weight (motor+driver)	lb	4.1	5.5	8.8
		kg	1.9	2.5	4.0

MD•34AC NEMA 34 motor specifications	Motor	Stack length	Single	Double	Triple
	Holding torque	oz-in	330	500	750
		N-cm	233	353	529
	Detent torque	oz-in	10.9	14.16	19.83
		N-cm	7.7	10.0	14.0
	Rotor inertia	oz-in-sec <sup>2</sup>	0.01416	0.02266	0.04815
		kg-cm <sup>2</sup>	1.0	1.6	3.4
	Weight (motor+driver)	lb	6.4	7.7	11.0
		kg	2.9	3.5	5.0

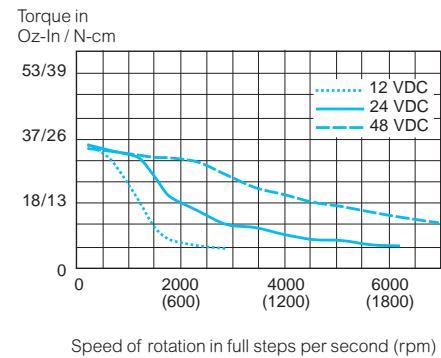


MD•14 NEMA 14 speed torque (1)

Single stack length

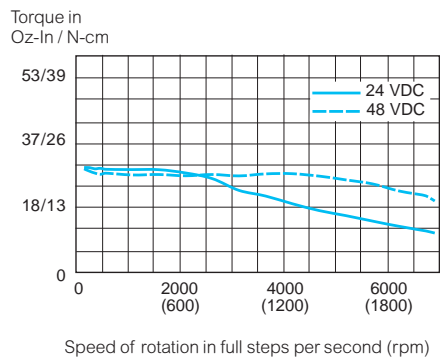


Triple stack length

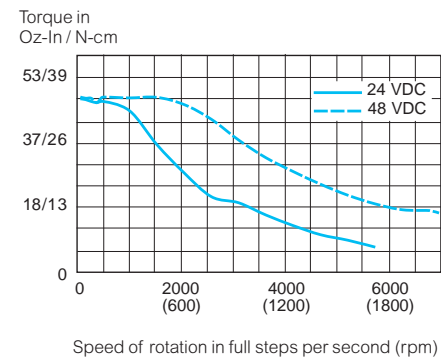


MD•17 NEMA 17 speed torque (1)

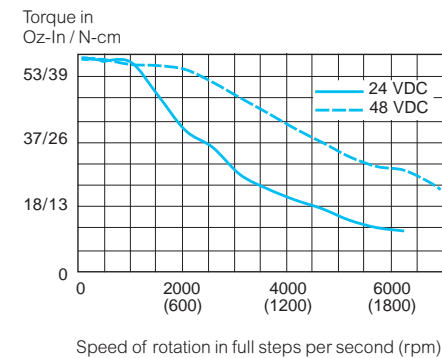
Single stack length



Double stack length

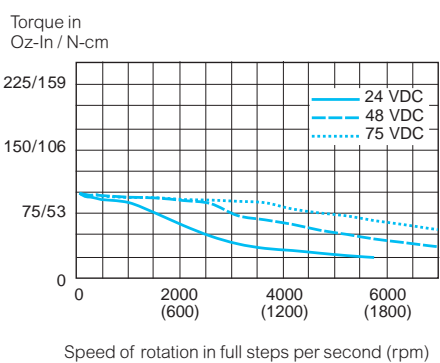


Triple stack length

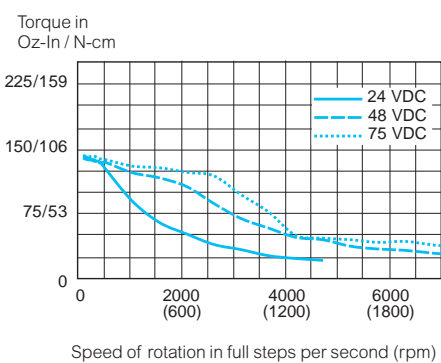


MD•23 NEMA 23 speed torque (1)

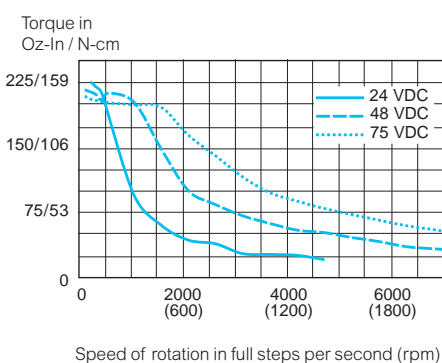
Single stack length



Double stack length



Triple stack length



(1) Test conditions: 100% current with damper simulating load.

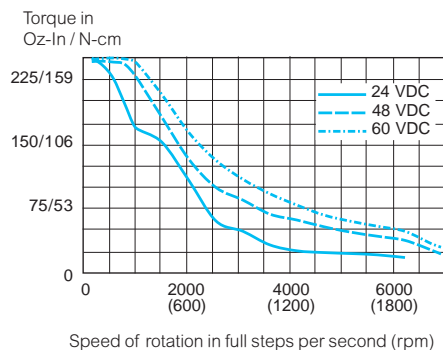


# MDrive® Plus

## Motor performance

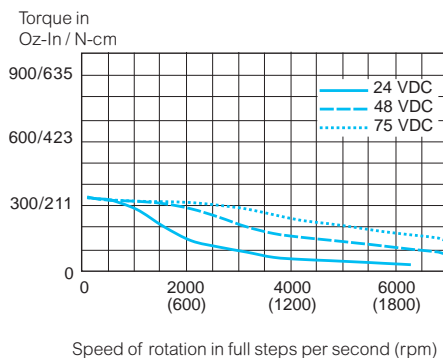
### MD•23 NEMA 23 speed torque (1)

#### Quad stack length

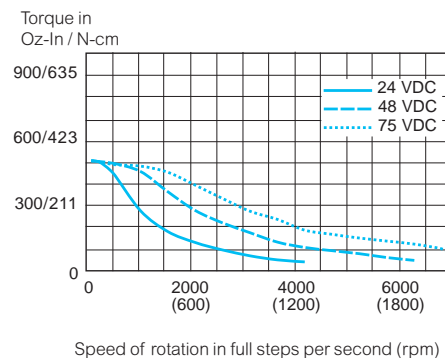


### MD•34 NEMA 34 speed torque (1)

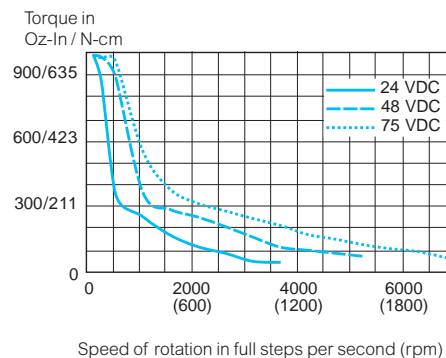
#### Single stack length



#### Double stack length

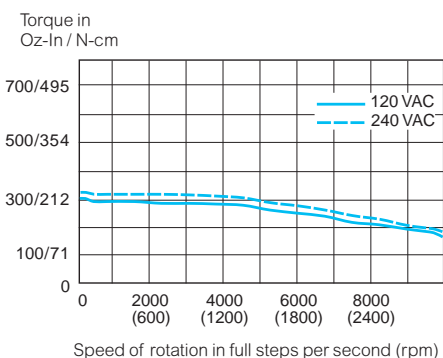


#### Triple stack length

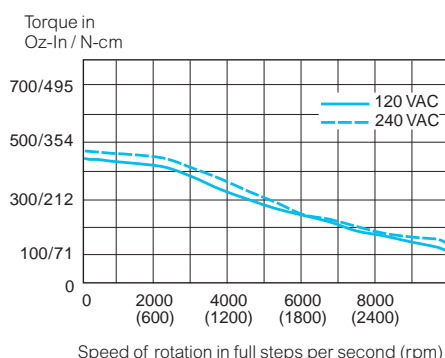


### MD•34AC NEMA 34 speed torque (1)

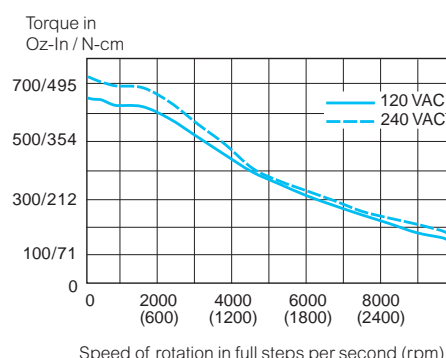
#### Single stack length



#### Double stack length



#### Triple stack length



(1) Test conditions: 100% current with damper simulating load.



## Part numbers

## IP20-rated products

 availability by MDrive size

example part number											motor size			
											14	17	23	34
<b>QuickStart Kit (1)</b> K = kit option, or leave blank if not wanted														
<b>MDrive product</b> MD = MDrive Plus IP20-rated products														
<b>Version</b> M = Step/direction input I = Intelligent motors, via • RS-422/485 programmable Motion Control • Ethernet • CANopen O = Speed control														
<b>Input</b> 1 = standard (Plus) 3 = expanded features (Plus²) 5 = differential CW/CCW input – only Step/direction products														
<b>P1 connector</b> F = flying leads 12.0" / 305mm P = pluggable C = wire crimp														
<b>Communication type</b> S = SPI R = RS-422/485 I = EtherNet/IP — only NEMA 23 motors E = ModbusTCP — only NEMA 23 motors C = CANopen														
<b>P2 connector</b> D = IDC Z = none L = wire crimp B = DB9 – only CANopen products R = RJ45 – only Ethernet & Modbus products														
<b>Motor size</b> 14 = NEMA 14 1.4" / 36mm 17 = NEMA 17 1.7" / 42mm 23 = NEMA 23 2.3" / 57mm 34 = NEMA 34 3.4" / 85mm														
<b>Motor length</b> A = single stack B = double stack C = triple stack D = quad stack — only NEMA 23 motors														
<b>Drive voltage</b> 4 = +12 to +48 VDC — NEMA 14 & 17 motors 6 = +12 to +60 VDC — only NEMA 23 quad stack motor 7 = +12 to +75 VDC — NEMA 23 & 34 motors														
<b>Options</b> Omit from part number, if unwanted.											-N			
-N (2) = rear control knob, may be combined with internal encoder option														
-E__ (3) = for step/direction & speed control products: optical encoder w/ index mark														
	line count	100	200	250	256	400	500	512	1000	1024				
NEMA 17, 23, 34	single-end part #	E1	E2	E3	EP	E4	E5	EQ	E6	ER				
NEMA 17 & 23	differential part #	EAL	EBL	ECL	EWL	EDL	EHL	EXL	EJL	EYL				
NEMA 34	differential part #	EA	EB	EC	EW	ED	EH	EX	EJ	EY				
-EQ = for Version I products: internal 512-line magnetic encoder with index mark														
-EE = remote encoder interface for select Plus² products, differential encoder not provided														

(1) QuickStart Kits include connectivity and instructions for setup and testing.

(2) Max torque: 20 in-lb (225 N-cm)

(3) External encoder style provided with NEMA 17 & 23 products; internal encoder with NEMA34 products.

MDRIVE PART BUILDER is an interactive, easy-to-use online tool:

[motion.schneider-electric.com/mdrive\\_part\\_builder/](http://motion.schneider-electric.com/mdrive_part_builder/)

We recommend using it to confirm valid part numbers, as the above table does not detail all possible combinations.



# MDrive® Plus

## Part numbers

### IP65-rated products

example part number	K M D M 2 M S Z 1 7 A 4 -EQ											
<b>QuickStart Kit (1)</b> K = kit option, or leave blank if not wanted	K	M	D	M	2	M	S	Z	1	7	A	4 -EQ
<b>MDrive product</b> MD = MDrive Plus IP65-rated products with industrial connectors	K	M	D	M	2	M	S	Z	1	7	A	4 -EQ
<b>Version</b> M2MSZ = Step/direction with SPI universal input I4MRQ = RS-422/485 programmable motion control with expanded features (Plus <sup>2</sup> ) I4MCQ = CANopen with expanded features (Plus <sup>2</sup> )	K	M	D	M	2	M	S	Z	1	7	A	4 -EQ
<b>Motor size</b> 17 = NEMA 17 1.7 inch 42mm 23 = NEMA 23 2.3 inch 57mm	K	M	D	M	2	M	S	Z	1	7	A	4 -EQ
<b>Motor length</b> A = single stack B = double stack C = triple stack D = quad stack — NEMA 23 motors only	K	M	D	M	2	M	S	Z	1	7	A	4 -EQ
<b>Drive voltage</b> 4 = +12 to +48 VDC — NEMA 17 motors 6 = +12 to +60 VDC — NEMA 23 D quad length motor 7 = +12 to +75 VDC — NEMA 23 A, B & C length motors	K	M	D	M	2	M	S	Z	1	7	A	4 -EQ
<b>Options – encoders (2)</b> Omit from part number, if unwanted.  -EQ = internal encoder, 512-line magnetic encoder with index mark -EE = remote encoder interface, differential encoder not provided												-EQ

(1) QuickStart Kits include connectivity and instructions for setup and testing.

(2) Unavailable with step/direction products.

### IP54-rated AC power products

example part number												K	M	D	M	2	M	S	Z	3	4	A	1	-N																				
QuickStart Kit (1) K = kit option, or leave blank if not wanted												K	M	D	M	2	M	S	Z	3	4	A	1	-N																				
MDrive product MD = MDrivePlus with AC power, IP54-rating and industrial connectors												K	M	D	M	2	M	S	Z	3	4	A	1	-N																				
Version M2MSZ = Step/direction with SPI universal input I4MRQ = RS-422/485 programmable motion control with expanded features (Plus²) I4MCQ = CANopen with expanded features (Plus²)												K	M	D	M	2	M	S	Z	3	4	A	1	-N																				
Motor size 34 = NEMA 34    3.4 inch    85mm												K	M	D	M	2	M	S	Z	3	4	A	1	-N																				
Motor length A = single stack B = double stack C = triple stack												K	M	D	M	2	M	S	Z	3	4	A	1	-N																				
Drive voltage 1 = 120 VAC 2 = 240 VAC												K	M	D	M	2	M	S	Z	3	4	A	1	-N																				
Options Omit from part number, if unwanted.																								-N																				
-N    = rear control knob, not IP54-rated, may be combined with encoder																																												
-E_    = for step/direction products: internal optical encoder with index mark																																												
<table><tr><td>line count</td><td>100</td><td>200</td><td>250</td><td>256</td><td>400</td><td>500</td><td>512</td><td>1000</td><td>1024</td></tr><tr><td>differential part #</td><td>EA</td><td>EB</td><td>EC</td><td>EW</td><td>ED</td><td>EH</td><td>EX</td><td>EJ</td><td>EY</td></tr></table>												line count	100	200	250	256	400	500	512	1000	1024	differential part #	EA	EB	EC	EW	ED	EH	EX	EJ	EY													
line count	100	200	250	256	400	500	512	1000	1024																																			
differential part #	EA	EB	EC	EW	ED	EH	EX	EJ	EY																																			
-EQ    = for motion control & CANopen products: internal 512-line magnetic encoder with index mark																																												
-EE    = for motion control products: remote encoder interface, differential encoder not provided																																												

(1) QuickStart Kits include connectivity and instructions for setup and testing.



## For IP20-rated products

For IP20-rated products		compatibility with MDrive by version & size															
		M Step/ direction				I Motion Control				I Ether Net	I CAN open				O Speed control		
description	reference	14	17	23	34	14	17	23	34	23	14	17	23	34	17	23	34

### Communication converters

Set/program communication parameters with these  
USB-pluggable, electrically isolated in-line  
converters, pre-wired with mating connector  
3.6 m / 12.0 feet long

10-pin non-locking IDC connector mate	MD-CC300-001		•	•	•											•	•	•
	MD-CC400-001						•	•	•									
10-pin friction lock wire crimp connector mate	MD-CC302-001		•	•	•											•	•	•
	MD-CC402-001						•	•	•	•								
12-pin locking wire crimp connector mate	MD-CC303-001		•	•	•													
	MD-CC305-001	•																
	MD-CC403-001						•											
DB9 connector mate <i>requires power supply, not provided</i>	MD-CC500-000										•	•	•	•				

### Encoder cables

Cables are pre-wired with mating connectors

for external single-end optical encoder 0.3 m / 1.0 feet long	ES-CABLE-2		•	•	•											•	•	
for external differential optical encoder 1.8 m / 6.0 feet long	ED-CABLE-6		•	•	•											•	•	
for internal differential optical encoder 1.8 m / 6.0 feet long	PD10-3400-FL3				•													

### Prototype development cables

To speed your test/development, these cables are  
pre-wired with mating connectors  
3.0 m / 10.0 feet long

2-pin locking wire crimp connector mate	PD02-2300-FL3							•		•			•					
	PD02-3400-FL3				•			•					•					•
10-pin friction lock wire crimp connector mate	PD10-1434-FL3					•	•	•	•									
12-pin locking wire crimp connector mate	PD12B-1434-FL3	•				•												
	PD12B-2334-FL3																	•
	PD12-1434-FL3		•	•	•													
14-pin locking wire crimp connector mate	PD14-2334-FL3				•			•	•	•			•	•				
16-pin locking wire crimp connector mate	PD16-1417-FL3					•	•				•	•						
20-pin locking wire crimp connector mate	PD20-3400-FL3							•					•					
	PD20B-3400-FL3													•				•

### Mating connector kits

For making your own mating cables. Included:  
5 connectors per kit. Cable material and crimp tool  
not supplied

10-pin non-locking IDC connector	CK-01		•	•	•		•	•	•							•	•	•
10-pin friction lock wire crimp connector	CK-02				•	•	•	•	•							•	•	•
12-pin locking wire crimp connector	CK-03		•	•	•													
2-pin locking wire crimp connector	CK-04							•		•			•					
2-pin locking wire crimp connector	CK-05				•								•					•
12-pin locking wire crimp connector	CK-08	•				•												•
14-pin locking wire crimp connector	CK-09							•		•			•	•				
16-pin locking wire crimp connector	CK-10					•	•				•	•						
20-pin locking wire crimp connector	CK-11							•					•					•

### Drive protection module

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

DPM75	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
-------	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---



For IP54- and IP65-rated products

		compatibility with MDrive by version & size								
		M Step/direction			I Motion Control			I CANopen		
description	reference	17	23	34ac	17	23	34ac	17	23	34ac

Communication converters

Set/program communication parameters with these  
USB-pluggable, electrically isolated in-line converters,  
pre-wired with mating connector  
3.6 m / 12.0 feet long

19-pin M23 industrial connector mate	MD-CC301-001	•	•	•						
5-pin M12 industrial connector mate	MD-CC401-001				•	•	•			
5-pin M12 industrial connector mate (1)	MD-CC500-000							•	•	•

Prototype development cables

To speed your test/development, these cables  
are pre-wired with mating connectors  
4.0 m / 13.0 feet long

19-pin M23 industrial connector, straight termination mate	MD-CS100-000		•	•	•	•	•	•	•	•
19-pin M23 industrial connector, right angle mate	MD-CS101-000		•	•	•	•	•	•	•	•
3-pin Euro AC industrial connector, straight termination mate	MD-CS200-000			•			•			•
3-pin Euro AC industrial connector, right angle mate	MD-CS201-000			•			•			•

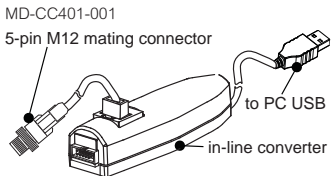
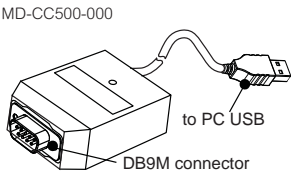
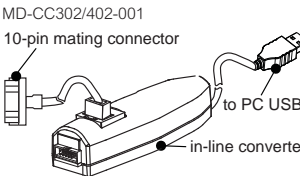
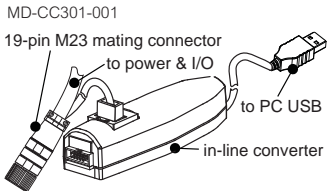
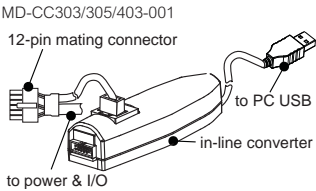
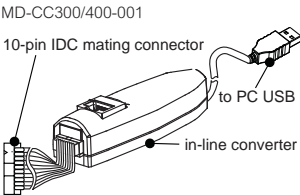
Drive protection module

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

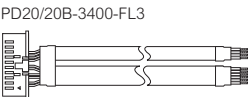
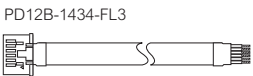
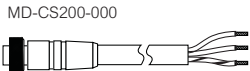
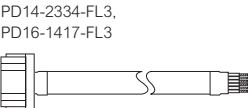
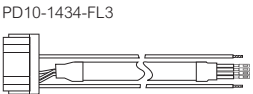
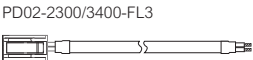
DPM75	•	•		•	•		•	•	
-------	---	---	--	---	---	--	---	---	--

(1) Requires mating connector adapter and power supply, not provided.

Communication converter examples



Prototype development cable examples





# MDrive® Linear Actuator

## All-in-one linear motion systems

### Intelligent linear motors

MDrive Linear Actuators are built on the MDrivePlus integrated motor technology platform, with the addition of linear motion mechanicals.

### MDrive® Linear Actuator

These all-in-one linear motion systems combine leading integrated motor technology with linear mechanicals to deliver long life, high accuracy and repeatability. Two linear shaft styles are available: non-captive shaft and external shaft.

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.

### Features

- Motor sizes include NEMA 14, 17 and 23
- Standard screw lengths range from 3-24"
- Customization is available
- Maximum thrust from 50 up to 200 lbs

### Networks

Supported communication protocols include:

- RS-422/485 programmable Motion Control
- CANopen
- Ethernet
- SPI Step/direction



MDrive Linear Actuators are compact linear motion systems that integrate external and non-captive shaft linear mechanicals with 1.8° stepper motors and electronics for reliable, repeatable motion.

Pictured: NEMA 14, 17 & 23 motor sizes



## Specifications – General

Input power	Voltage	VDC	ML•14 +12...+48	ML•17 +12...+48	ML•23 +12...+75
	Current maximum (1)	Amp	1.0	2.0	2.0
Motor	Frame size	NEMA	14	17	23
		mm	35	42	57
	Length	stack size	single	single	single
	Protection	ingress protection rating	IP20	IP20	IP20
Maximum thrust (2)	Non-captive shaft	lbs	50	50	200
		50	22	22	91
	External shaft with general purpose nut	lbs	25	25	60
		kg	11	11	27
	External shaft with anti-backlash nut	lbs	5	5	25
		kg	2	2	11
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		
Aux. logic input	Voltage range (4)	VDC	+12...+24		
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)		
	Encoder	Optional	availability determined by product version and size		

(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.

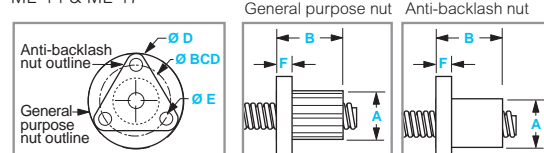
(4) When input voltage is removed, maintains power only to control and feedback circuits. Not applicable to Pulse/Direction products.

## Nuts

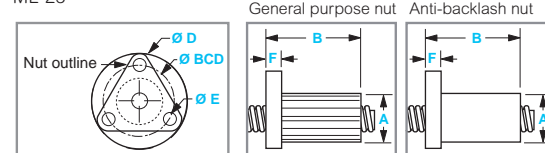
External shaft MDrive Linear Actuators employ a nut which moves axially along the threaded shaft as the screw rotates. Two nut styles are available: general purpose and anti-backlash. While anti-backlash nuts provide higher accuracy and low drag torque, general purpose nuts are rated for higher load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

Letters relate to diagrams below		ML•14		ML•17		ML•23	
		general purpose	anti-backlash	general purpose	anti-backlash	general purpose	anti-backlash
A	inches	0.50	0.50	0.50	0.50	0.71	0.82
	mm	12.7	12.7	12.7	12.7	18.0	20.8
B	inches max	0.75	0.9	0.75	0.9	1.5	1.875
	mm max	19.1	22.86	19.1	22.86	38.1	47.63
D	inches	1.0	1.0	1.0	1.0	1.5	1.5
	mm	25.4	25.4	25.4	25.4	38.1	38.1
E	inches	0.14	0.14	0.14	0.14	0.20	0.20
	mm	3.6	3.6	3.6	3.6	5.08	5.08
F	inches	0.15	0.18	0.15	0.18	0.20	0.20
	mm	3.81	4.57	3.81	4.57	5.08	5.08
BCD	inches	0.75	0.75	0.75	0.75	1.125	1.125
	mm	19.1	19.1	19.1	19.1	28.6	28.6
Load limit	lbs	25	5	25	5	60	25
	kg	11	2	11	2	27	11
Drag torque		free wheeling	< 1.0 oz-in < 0.7 N-cm	free wheeling	< 1.0 oz-in < 0.7 N-cm	free wheeling	1-to-3

ML•14 & ML•17



ML•23





# MDrive Linear Actuator

## Specifications

### Screws

Precision rolled screws are designed specifically for motion control applications, delivering maximum life and quiet operation. Manufactured from stainless steel, screws are corrosion resistant and non-magnetic.

An optional Teflon® screw coating is available for smooth operation and extended life.

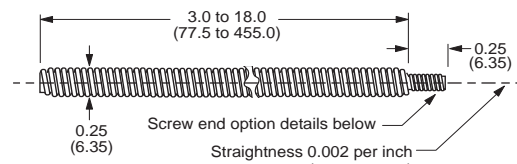
Customization of linear actuators and screws is available for volume opportunities.

			ML•14		ML•17		ML•23	
Screw lengths (1)	minimum	inches	3.0		3.0		3.0	
		mm	77.5		77.5		77.5	
	maximum	inches	18.0		18.0		24.0	
		mm	455.0		455.0		610.0	
Load limits (2)	non-captive shaft	lbs	50		50		200	
		kg	22		22		91	
	external shaft w/ general purpose nut	lbs	25		25		60	
		kg	11		11		27	
	external shaft w/ anti-backlash nut	lbs	5		5		25	
		kg	2		2		11	
End options	threaded	metric	M4 x 0.7 mm thread to within 0.03"/0.76 mm of shoulder		M4 x 0.7 mm thread to within 0.03"/0.76 mm of shoulder		M6 x 1.0 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		#8-32 UNC-2A thread to within 0.03"/0.76 mm of shoulder		1/4-20 UNC-2A thread to within 0.05"/1.3 mm of shoulder	
	smooth	inches	Ø 0.1967 ±0.001		Ø 0.1967 ±0.001		Ø 0.2362 ±0.001	
		mm	Ø 5 ±0.003		Ø 5 ±0.003		Ø 6 ±0.003	
	none		—		—		—	
Lead / pitch	travel	per rev		per full step	per rev	per full step	per rev	per full step
	screw G	inches	—	—	—	—	0.3750	0.001875
		mm	—	—	—	—	9.525	0.0476
	screw A	inches	0.250	0.00125	0.250	0.00125	0.3750	0.001875
		mm	6.350	0.0317	6.350	0.0317	9.525	0.0476
	screw B	inches	0.125	0.00063	0.125	0.00063	0.1670	0.000835
		mm	3.175	0.0158	3.175	0.0158	4.233	0.0212
	screw C	inches	0.063	0.00031	0.063	0.00031	—	—
		mm	1.588	0.0079	1.588	0.0079	—	—
	screw D	inches	—	—	—	—	0.0833	0.0004165
		mm	—	—	—	—	2.116	0.0106

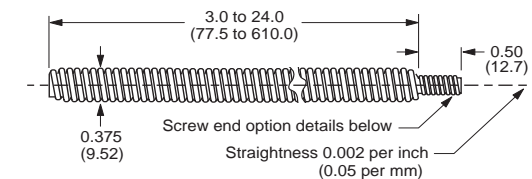
(1) Standard 0.1" / 2.5mm screw length increments are available.

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

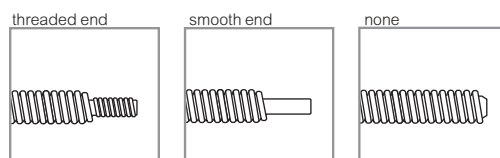
ML•14 & ML•17 screw dimensions



ML•23 screw dimensions



Screw end options



### Length calculations

#### Non-captive shaft products

$$\begin{aligned} &\text{mounting surface} \\ &\text{plate thickness} \\ &+ \\ &\text{desired stroke length} \\ &+ \\ &\text{(A/B/C)} \\ &= \\ &\text{screw length} \end{aligned}$$

(A) ML•14: add 1.4" / 35.6mm  
(B) ML•17: add 1.4" / 35.6mm  
(C) ML•23: add 1.8" / 45.7mm

#### External shaft products

$$\begin{aligned} &\text{mounting surface} \\ &\text{plate thickness} \\ &- \\ &\text{screw length} \\ &- \\ &\text{nut length} \\ &= \\ &\text{available stroke length} \end{aligned}$$

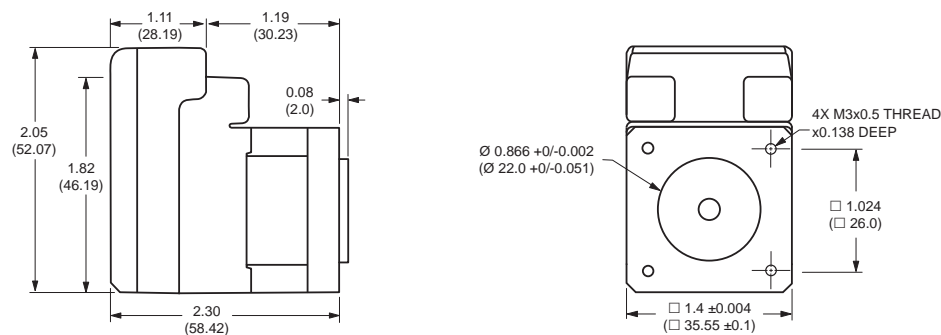


# MDrive Linear Actuator

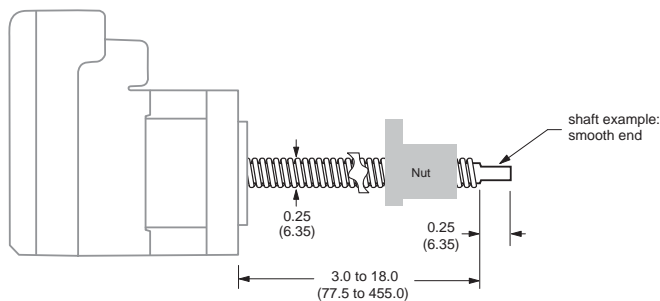
## Dimensions

ML•14 NEMA14 motor  
inches (mm)

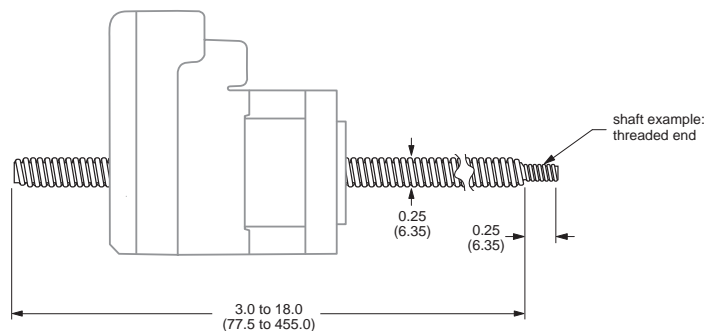
### MDrive body



### external shaft



### non-captive shaft



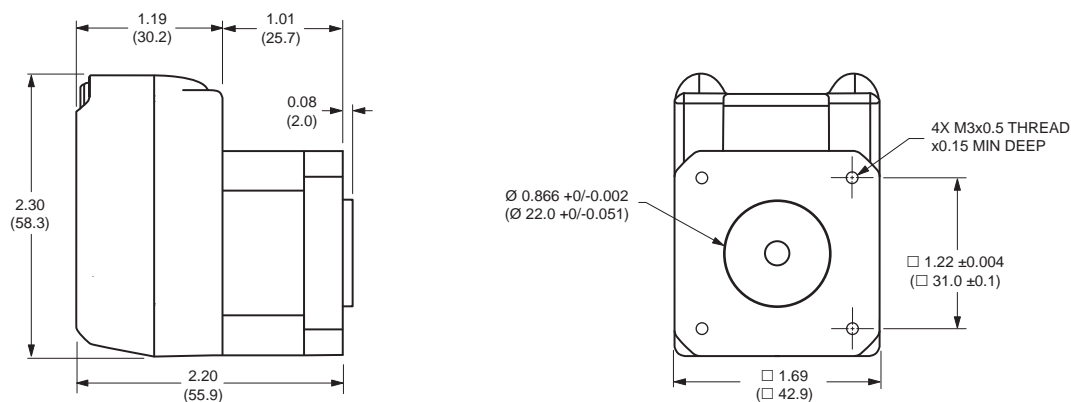


# MDrive Linear Actuator

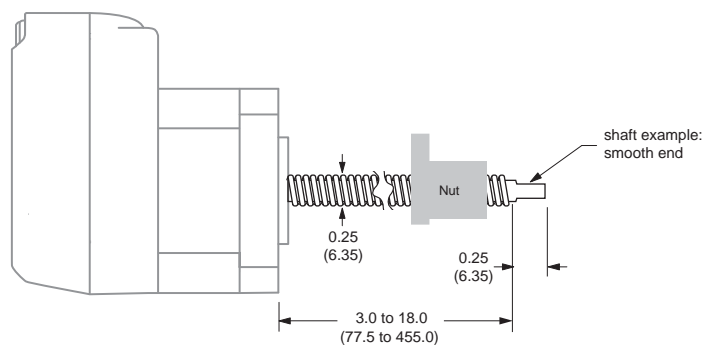
## Dimensions

ML•17 NEMA17 motor  
inches (mm)

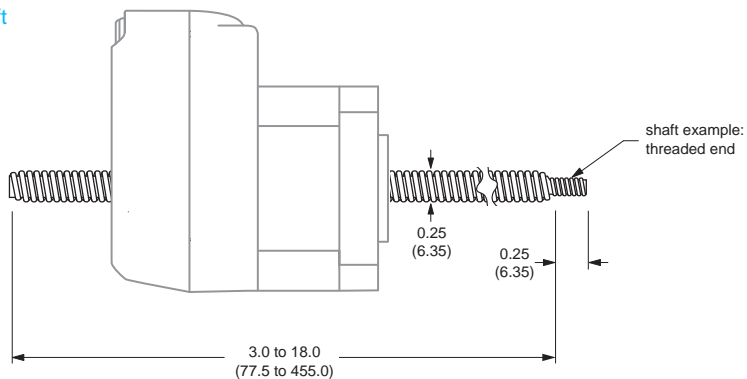
### MDrive body



### external shaft



### non-captive shaft



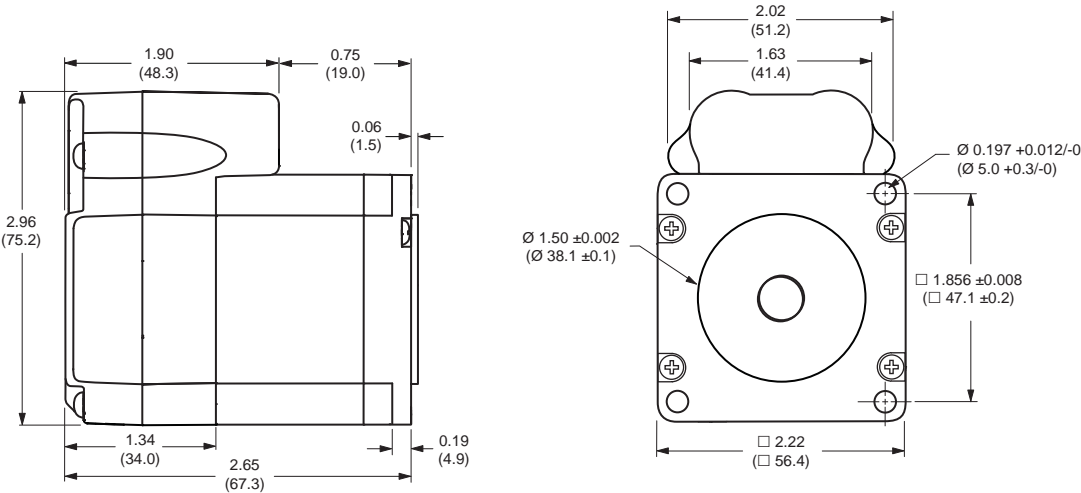


# MDrive Linear Actuator

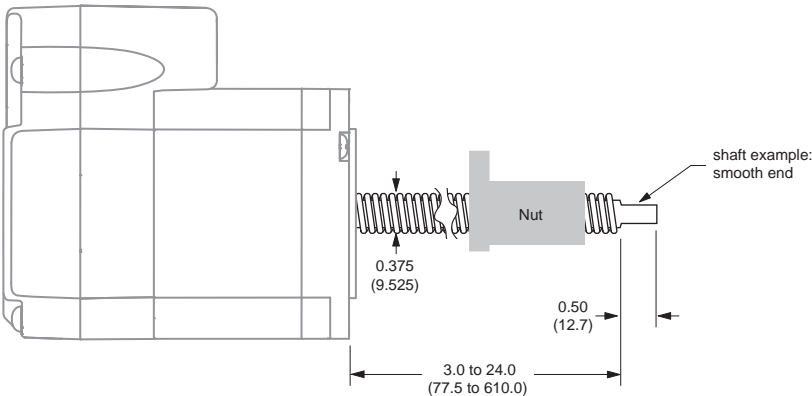
## Dimensions

ML•23 NEMA23 motor  
inches (mm)

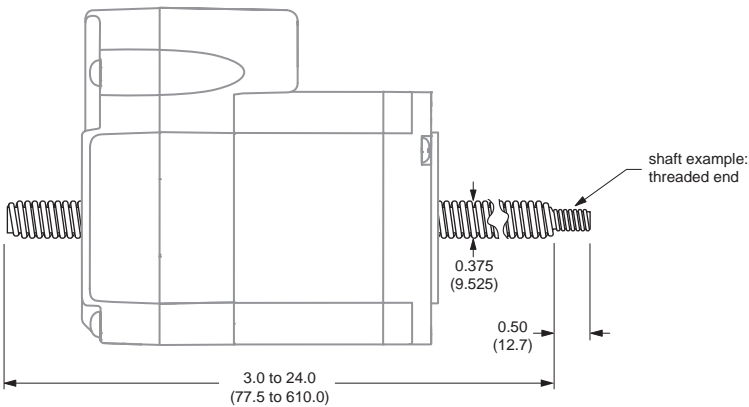
### MDrive body



### external shaft



### non-captive shaft





# MDrive Linear Actuator

## 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 <sup>2</sup>	0.0003
			kg-cm <sup>2</sup>	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

ML•17 NEMA 17 motor specifications		Motor	Stack length	Single
	Holding torque		oz-in	29
			N-cm	20
	Rotor inertia		oz-in-sec <sup>2</sup>	0.0005
			kg-cm <sup>2</sup>	0.034
	Weight (motor+driver)		oz	9.6
			g	272.2
	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

ML•23 NEMA 23 motor specifications		Motor	Stack length	Single
	Holding torque		oz-in	90
			N-cm	64
	Rotor inertia		oz-in-sec <sup>2</sup>	0.0025
			kg-cm <sup>2</sup>	0.18
	Weight (motor+driver)		oz	22.0
			g	625.0
	Maximum screw misalignment		°	±1
	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	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.

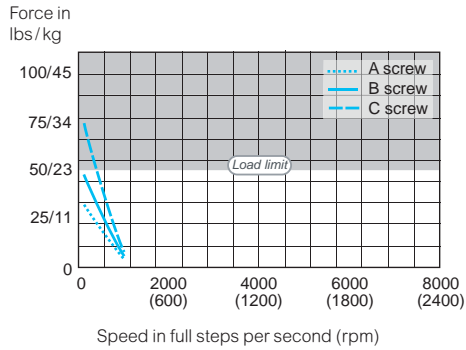


# MDrive Linear Actuator

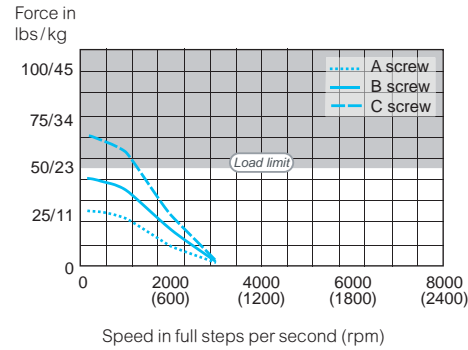
## Motor performance

### ML•14 NEMA 14 speed force (1) (2)

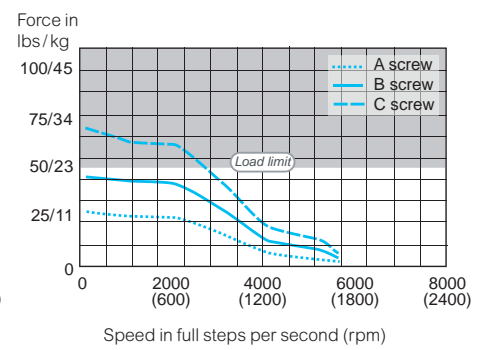
12 VDC



24 VDC

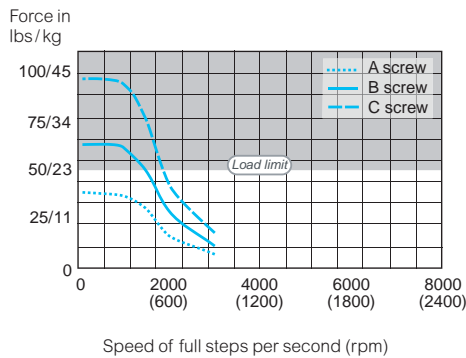


48 VDC

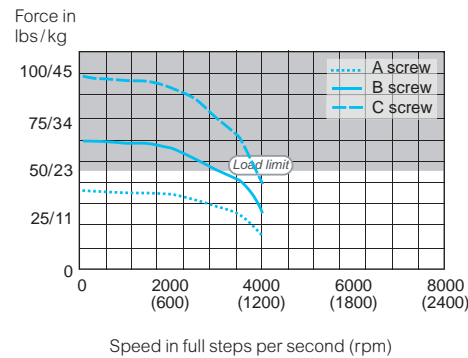


### ML•17 NEMA 17 speed force (1) (2)

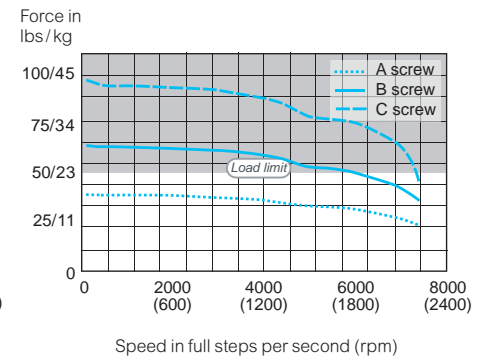
12 VDC



24 VDC

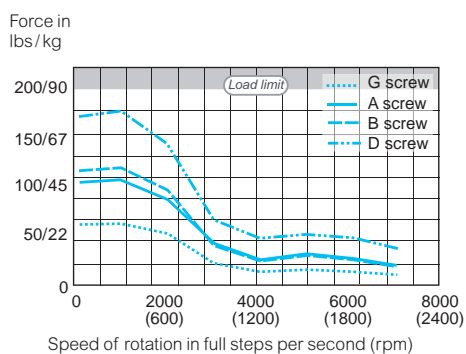


48 VDC

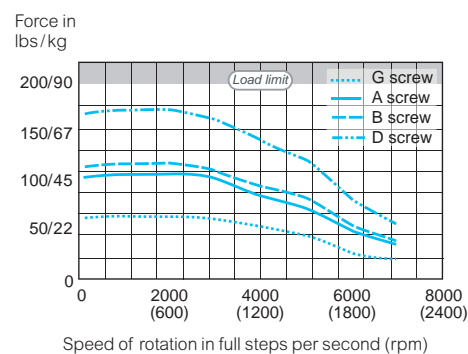


### MD•23 NEMA 23 speed force (1) (2)

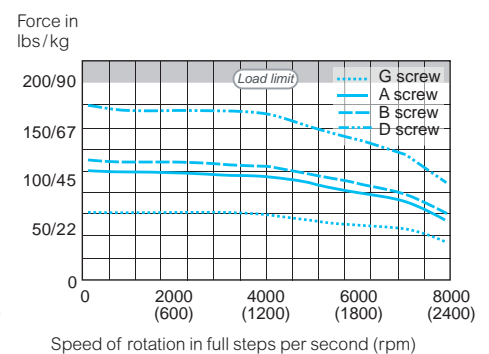
24 VDC



48 VDC



75 VDC



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

(2) Load limits – non-captive shaft: 50lbs/22kg for sizes 14 & 17, 200 lbs/91kg for size 23  
– external shaft: determined by the nut selected



# MDrive Linear Actuator

## Part numbers



example part number	K	M	L	M	1	F	S	D	1	7	A	4	-E1	-	•	14	17	23
<b>QuickStart Kit (1)</b> K = kit option, or leave blank if not wanted	K	M	L	M	1	F	S	D	1	7	A	4	-E1	-	•	•	•	•
<b>MDrive product</b> ML = MDrive Linear Actuator	M	L														•	•	•
<b>Version</b> M = Step/direction input I = Intelligent motors, via • RS-422/485 programmable Motion Control • Ethernet • CANopen	K	M	L	M	1	F	S	D	1	7	A	4	-E1	-	•	•	•	•
<b>Input</b> 1 = standard (Plus) 3 = expanded features (Plus²) 5 = differential CW/CCW input – only Step/direction products	K	M	L	M	1	F	S	D	1	7	A	4	-E1	-	•	•	•	•
<b>P1 connector</b> F = flying leads 12.0" / 305mm P = pluggable C = wire crimp	K	M	L	M	1	F	S	D	1	7	A	4	-E1	-	•	•	•	•
<b>Communication type</b> S = SPI R = RS-422/485 I = EtherNet/IP — only NEMA 23 motors C = CANopen	K	M	L	M	1	F	S	D	1	7	A	4	-E1	-	•	•	•	•
<b>P2 connector</b> D = IDC Z = none L = wire crimp B = DB9 – only CANopen products R = RJ45 – only EtherNet/IP products	K	M	L	M	1	F	S	D	1	7	A	4	-E1	-	•	•	•	•
<b>Motor size</b> 14 = NEMA 14 1.4" / 36mm 17 = NEMA 17 1.7" / 42mm 23 = NEMA 23 2.3" / 57mm	K	M	L	M	1	F	S	D	1	7	A	4	-E1	-	•	•	•	•
<b>Motor length</b> A = single stack	K	M	L	M	1	F	S	D	1	7	A	4	-E1	-	•	•	•	•
<b>Drive voltage</b> 4 = +12 to +48 VDC — NEMA 14 & 17 motors 7 = +12 to +75 VDC — NEMA 23 motors	K	M	L	M	1	F	S	D	1	7	A	4	-E1	-	•	•	•	•
<b>Options</b> Omit from part number, if unwanted. -E__ = for step/direction products: externally mounted optical encoder w/ index mark													-E1	-	•	•	•	•
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	EJL	EYL							•	•	•
-EQ = for Version I products: internal 512-line magnetic encoder with index mark																•	•	•
-EE = remote encoder interface for select Plus² products, differential encoder not provided																•	•	•
<b>Linear actuator specifications</b> complete the part number from the table on the next page															-	•		

(1) QuickStart Kits include connectivity and instructions for setup and testing.



MDRIVE PART BUILDER is an interactive, easy-to-use online tool:

[motion.schneider-electric.com/mdrive\\_part\\_builder/](https://motion.schneider-electric.com/mdrive_part_builder/)

We recommend using it to confirm valid part numbers, as the above table does not detail all possible combinations.



# MDrive Linear Actuator

## Part numbers

### • Continued

example part number — linear actuator specifications	-L A 1 M 0 6 0 Z T
<b>Linear actuator</b> -L	-L A 1 M 0 6 0 Z T
<b>Screw lead/pitch by travel per rev</b> 14 & 17 products      23 products A = 0.250" / 6.35mm      0.200" / 5.08mm B = 0.125" / 3.175mm      0.167" / 4.233mm C = 0.063" / 1.588mm      na D = na      0.083" / 2.116mm G = na      0.375" / 9.525mm	-L A
<b>Shaft style</b> 1 = non-captive 3 = external	-L A 1 M 0 6 0 Z T
<b>Screw end finish</b> M = metric threaded U = UNC threaded S = smooth Z = none	-L A 1 M 0 6 0 Z T
<b>Screw length (1)</b> 030 = minimum 3.0" / 77.5mm all products 180 = maximum 18.0" / 455.0mm 14 & 17 products 240 = maximum 24.0" / 610.0mm 23 products	-L A 1 M 0 6 0 Z T
<b>Nut</b> 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
<b>Coating</b> T = Teflon® Z = none	-L A 1 M 0 6 0 Z T

(1) Screw lengths specified in 0.1" / 2.5mm increments.



# MDrive Linear Actuator

## Accessories

description	reference	compatibility with MDrive by version & size											
		M			I			I			I		
		Step/direction			Motion Control			EtherNet			CANopen		
		14	17	23	14	17	23	23			14	17	23

### Communication converters

Set/program communication parameters with these  
USB-pluggable, electrically isolated in-line  
converters, pre-wired with mating connector  
3.6 m / 12.0 feet long

10-pin non-locking IDC connector mate	MD-CC300-001		•	•									
	MD-CC400-001					•	•						
10-pin friction lock wire crimp connector mate	MD-CC402-001				•	•	•						
12-pin locking wire crimp connector mate	MD-CC303-001		•	•									
	MD-CC305-001	•											
	MD-CC403-001				•								
DB9 connector mate <i>requires power supply, not provided</i>	MD-CC500-000										•	•	•

### External optical encoder cables

Cables are pre-wired with mating connectors

single-end encoder 0.3 m / 1.0 feet long	ES-CABLE-2	•	•	•									
differential encoder 1.8 m / 6.0 feet long	ED-CABLE-6	•	•	•									

### Prototype development cables

To speed your test/development, these cables are  
pre-wired with mating connectors  
3.0 m / 10.0 feet long

2-pin locking wire crimp connector mate	PD02-2300-FL3						•	•					•
10-pin friction lock wire crimp connector mate	PD10-1434-FL3				•	•	•						
12-pin locking wire crimp connector mate	PD12B-1434-FL3	•			•								
	PD12-1434-FL3		•	•									
14-pin locking wire crimp connector mate	PD14-2334-FL3						•	•					•
16-pin locking wire crimp connector mate	PD16-1417-FL3				•	•					•	•	

### Mating connector kits

For making your own mating cables. Included:  
5 connectors per kit. Cable material and crimp tool  
not supplied

10-pin non-locking IDC connector	CK-01		•	•		•	•						
10-pin friction lock wire crimp connector	CK-02				•	•	•						
12-pin locking wire crimp connector	CK-03		•	•									
2-pin locking wire crimp connector	CK-04						•	•					•
12-pin locking wire crimp connector	CK-08	•			•								
14-pin locking wire crimp connector	CK-09						•	•					•
16-pin locking wire crimp connector	CK-10				•	•					•	•	

### Drive protection module

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

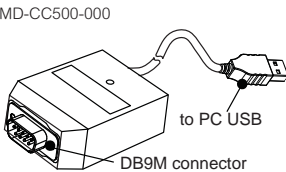
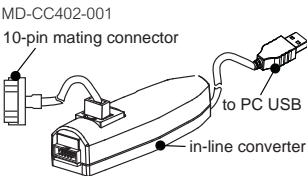
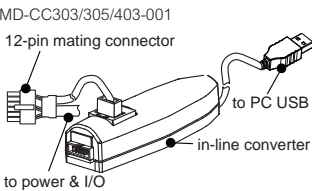
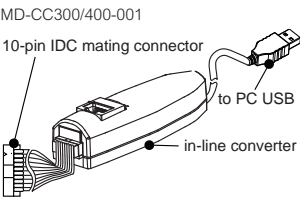
DPM75	•	•	•	•	•	•	•	•	•	•	•	•	•
-------	---	---	---	---	---	---	---	---	---	---	---	---	---



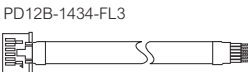
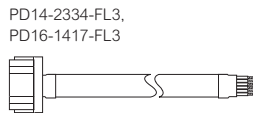
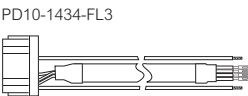
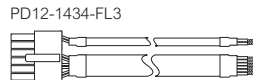
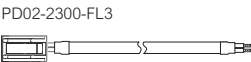
# MDrive Linear Actuator

## Accessories

### Communication converter examples



### Prototype development cable examples









Ordering

Our extensive, worldwide network of Distributors offer local application support in addition to sales. To locate an authorized Distributor near you, go to the contacts page at [www.motion.schneider-electric.com](http://www.motion.schneider-electric.com).

Warranty

To obtain warranty service for products purchased from an Schneider Electric Motion USA Distributor, please contact that Distributor to obtain a Returned Material Authorization (RMA). If the Product was purchased directly from Schneider Electric Motion USA, please contact Customer Service at [info@imshome.com](mailto:info@imshome.com) or 860-295-6102 (Eastern Time Zone).

Customer shall prepay shipping charges for Products returned to Schneider Electric Motion USA for warranty service, and Schneider Electric Motion USA will pay for return of Products to Customer by ground transportation. However, Customer shall pay all shipping charges, duties and taxes for Products returned to Schneider Electric Motion USA from outside the United States.

Technical Support

We pride ourselves on our ability to provide first-rate technical support. Our friendly and helpful technical staff have both the knowledge and desire to answer all your technical inquiries.

Tel. . . . . +00 (1) 860 295-6102  
e-mail . . . . . [etech@imshome.com](mailto:etech@imshome.com)

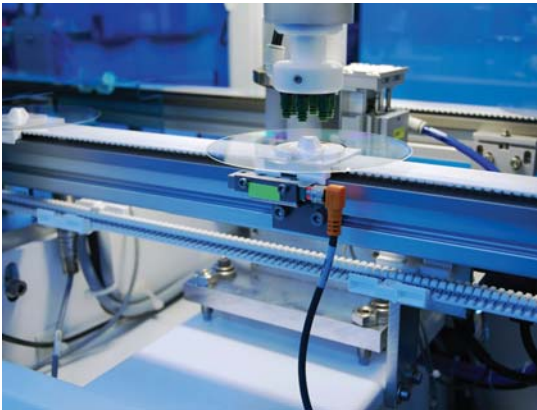
Customer Service

The Schneider Electric Motion USA Customer Service Department is open from 8:30 A.M. to 5:00 P.M., Monday through Friday (Eastern Time Zone).

Tel. . . . . +00 (1) 860 295-6102  
Fax . . . . . +00 (1) 860 295-6107  
e-mail . . . . . [info@imshome.com](mailto:info@imshome.com)  
web site . . . . . [www.motion.schneider-electric.com](http://www.motion.schneider-electric.com)

DISCLAIMER: The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for inaccuracies.

Schneider Electric Motion USA reserves the right to make changes without further notice to any products herein to improve reliability, function, or design. Schneider Electric Motion USA does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights of others.



Electronics Manufacture, Material Handling



Medical Technology



Packaging, Printing, Paper



Laboratory Automation



Schneider Electric Motion USA

370 North Main Street  
Marlborough, CT 06447  
Phone: (860) 295-6102  
Fax: (860) 295-6107  
[www.motion.schneider-electric.com](http://www.motion.schneider-electric.com)

