

# MDrive®



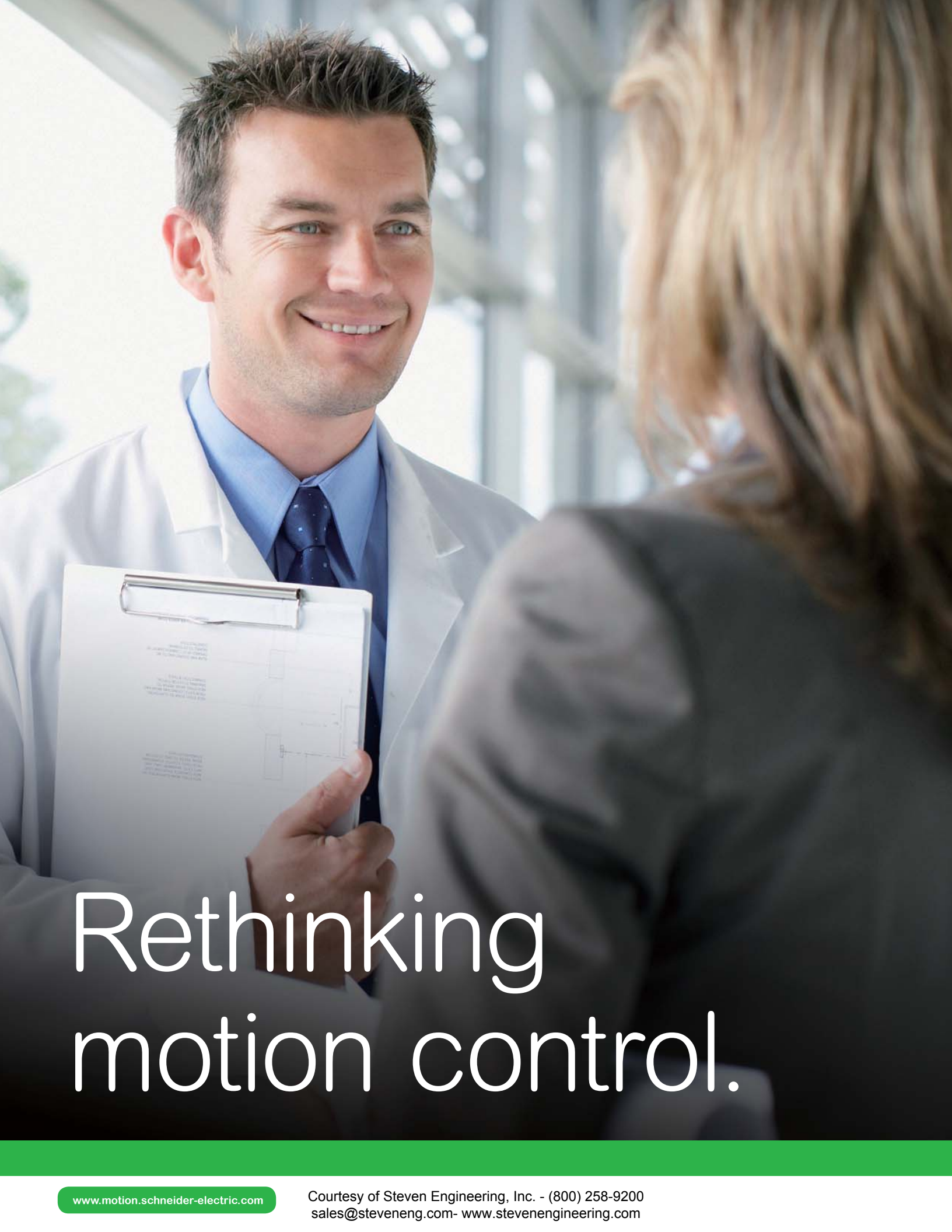
MDrive®: all-in-one integrated motor products.  
Rethinking motion control. Simplifying machine building.

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

Intelligent motion systems



Courtesy of Steven Engineering, Inc. - (800) 258-9200  
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# Rethinking motion control.



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# 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.

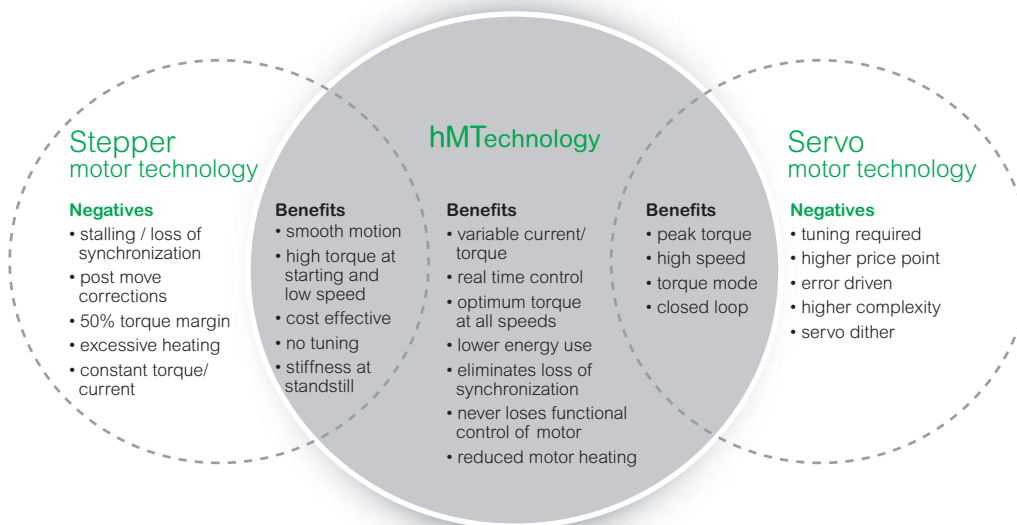
## hMT closed loop performance

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                                                                                      |                  |                 |
| Attention output | Voltage range                                        |                        | 0 ... +5 VDC, 0 ... +10 VDC, 0 ... 20 mA, 4 ... 20 mA                                       |                  |                 |
|                  |                                                      | Current                | 5.5 mA                                                                                      |                  |                 |
|                  |                                                      | Open collector/emitter | +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

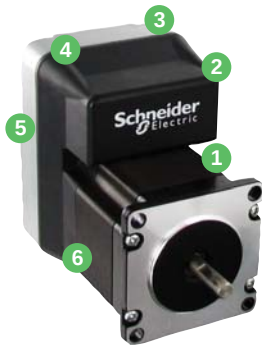
Lexium MDrive products include 2 LED signal indicators. The multi-color LEDs are programmed to indicate a range of pre-defined messages to aid users.

### Grounding

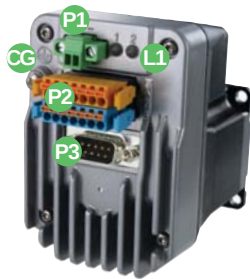
A screw lug #6-32 is provided for earth grounding.

### 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

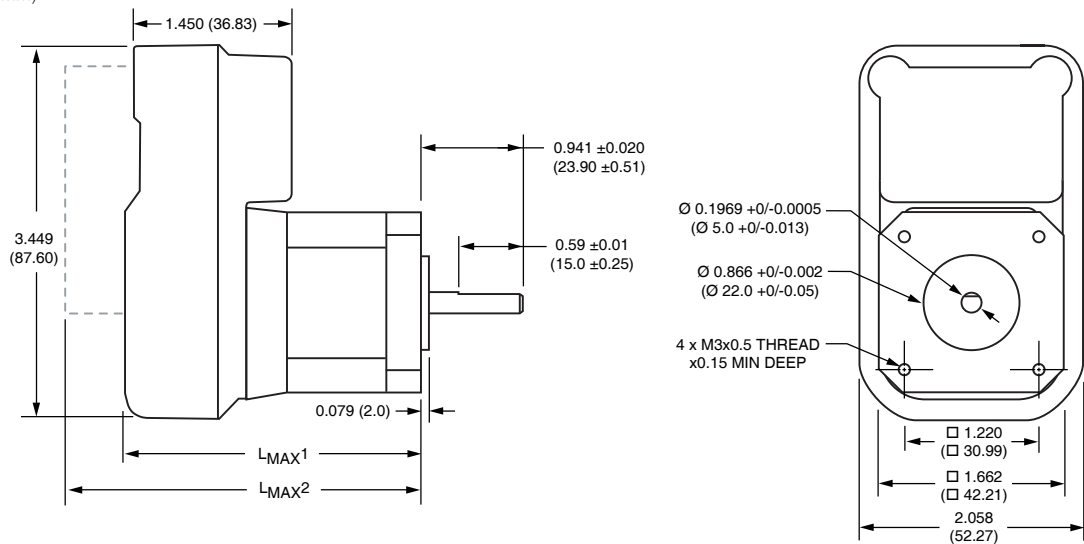


M12 connectors

### 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)  |

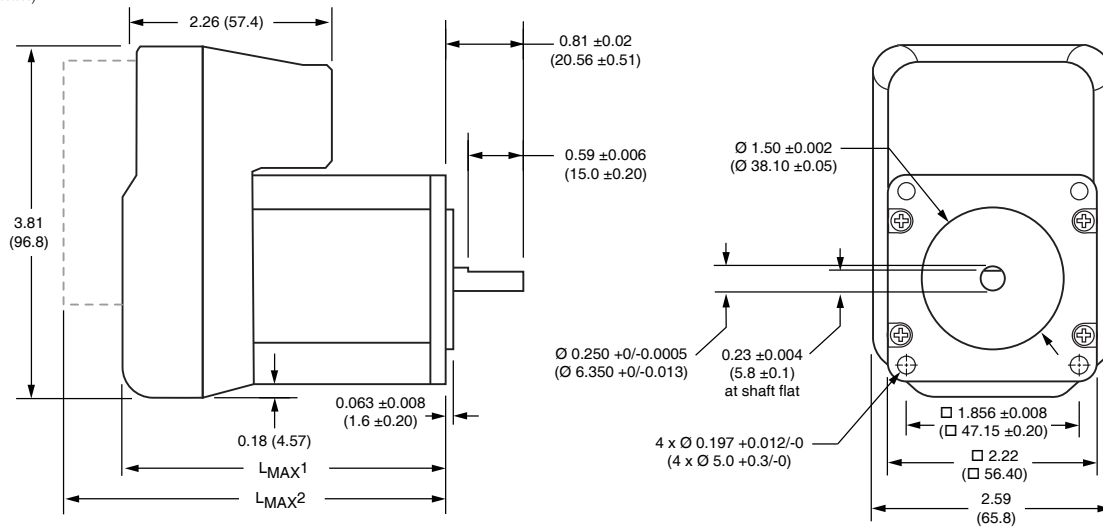
(1) Represents maximum dimension with connectors/options.

# Lexium MDrive®

## Dimensions

### LM•57 NEMA23 motor

inches (mm)

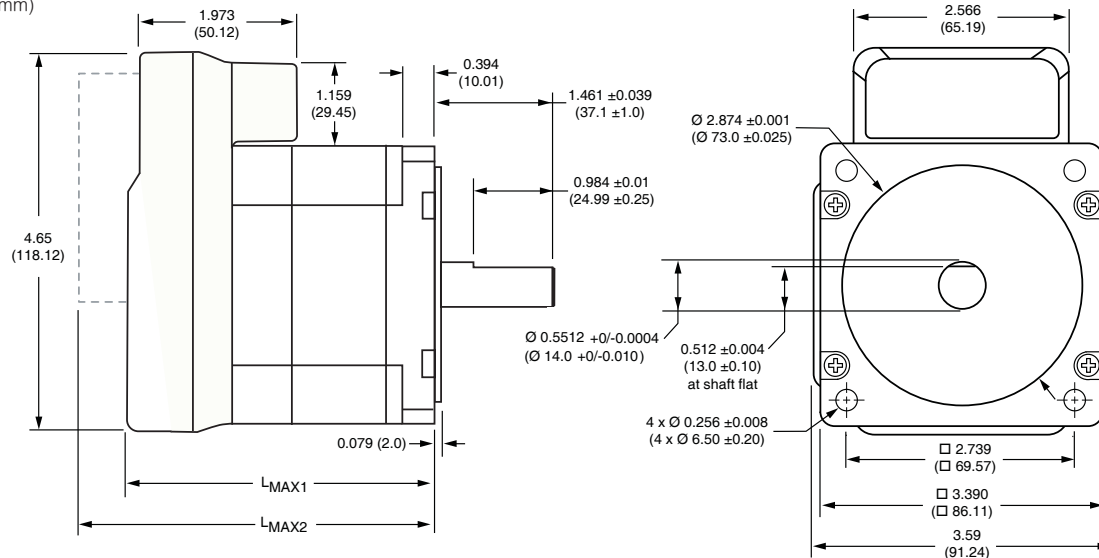


|                    | Lmax1               |               | Lmax2 (1)           |               | High torque motor additional length |
|--------------------|---------------------|---------------|---------------------|---------------|-------------------------------------|
| Motor stack length | Pluggable 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<br>(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<br>(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   |

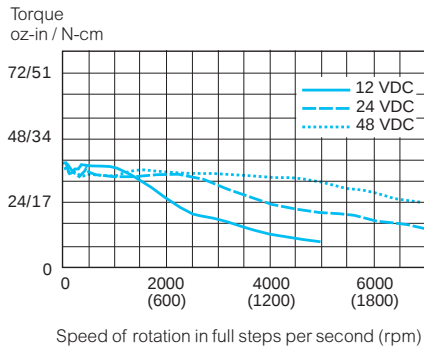
| LMD•85 NEMA 34 motor specifications                  | Motor | Stack length           | Single Single |  | Double | Triple |
|------------------------------------------------------|-------|------------------------|---------------|--|--------|--------|
|                                                      |       |                        |               |  |        |        |
| 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<br>(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®

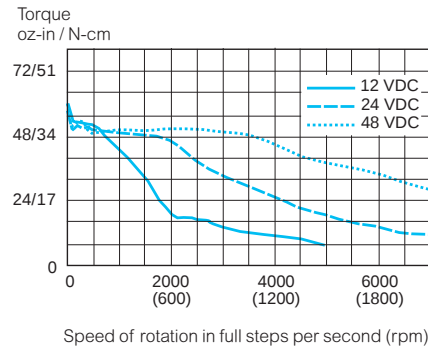
## Motor performance

### LMD•42 NEMA 17 speed torque (1)

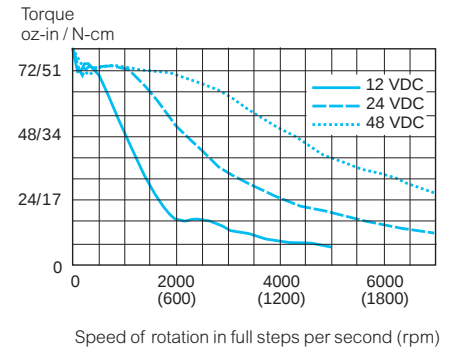
Single stack length



Double stack length

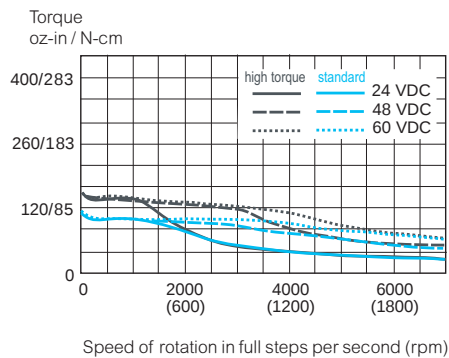


Triple stack length

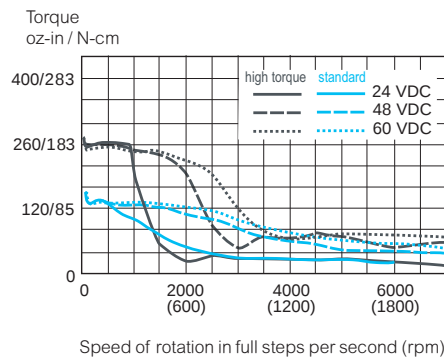


### LMD•57 NEMA 23 speed torque (1)

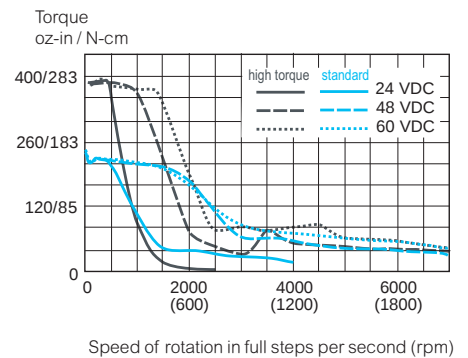
Single stack length



Double stack length

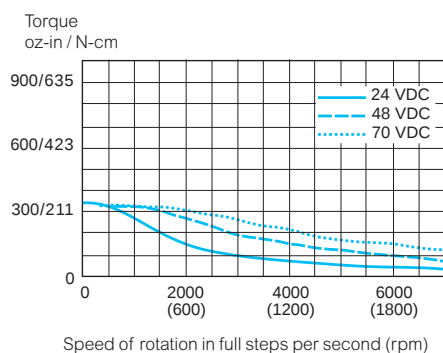


Triple stack length

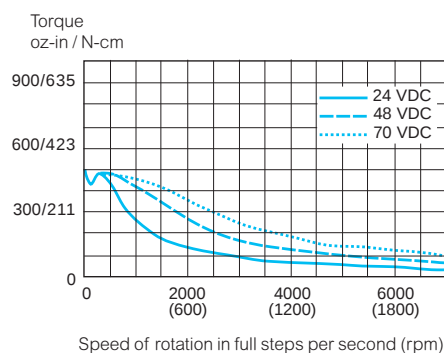


### LMD•85 NEMA 34 speed torque (1)

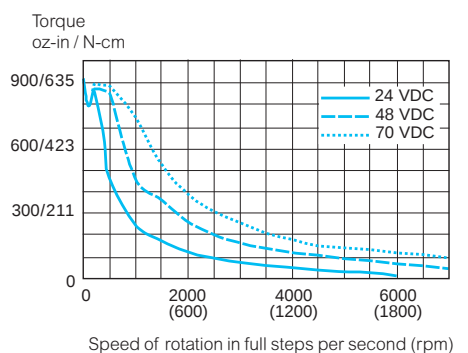
Single stack length



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



### Pluggable connector products

| description | length<br>m | length<br>feet | reference |
|-------------|-------------|----------------|-----------|
|-------------|-------------|----------------|-----------|

#### Communication Converter Kits

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<br>m | length<br>feet | reference |
|-------------|-------------|----------------|-----------|
|-------------|-------------|----------------|-----------|

#### Communication Converter Kits

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

|                                             |     |      |              |
|---------------------------------------------|-----|------|--------------|
| LM•P•C Pulse/Direction products             |     |      |              |
| 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 |
| LM•A•C CANopen products                     |     |      |              |
| 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 |
| LM•M•C Programmable Motion Control products |     |      |              |
| 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 |
| LM•E•C Ethernet products                    |     |      |              |
| 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.

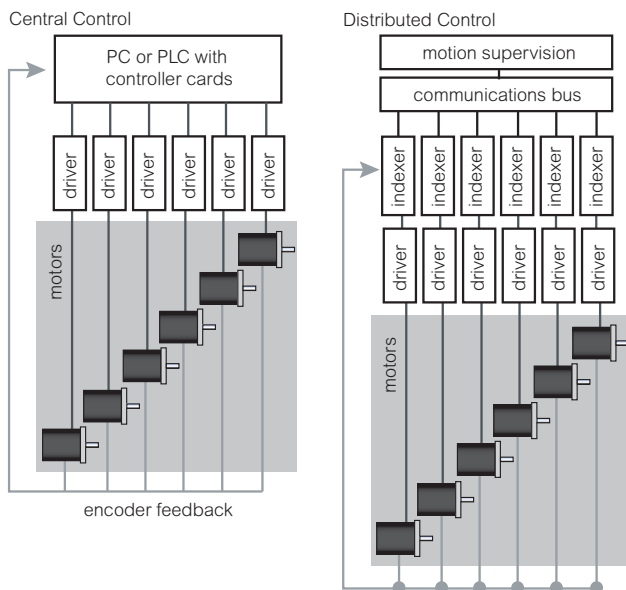
## Integrated motor system advantages

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:

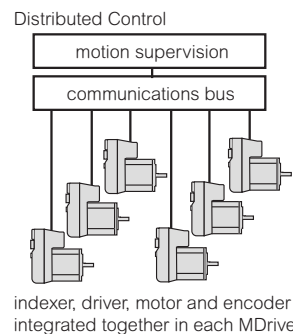
- Controller/PLC
- Driver
- Motor
- Wiring/cable harnessing
- Encoder and other accessories
- Power supply for drive/control electronics

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<br>+12 ...+48                                                                                                                                                                  | MD•17<br>+12 ...+48 | MD•23<br>+12 ...+75 | MD•23<br>+12 ...+60 | MD•34<br>+12 ...+75 | MD•34 AC version<br>—         |     |
|------------------|-------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|-------------------------------|-----|
|                  |                               | 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)

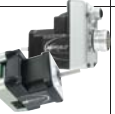
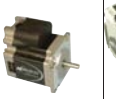
|                                              |                                       |                    | MD•14                                                                                    | MD•17 | MD•23 | MD•34 | MD•34 AC version |
|----------------------------------------------|---------------------------------------|--------------------|------------------------------------------------------------------------------------------|-------|-------|-------|------------------|
| 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 clockout | 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

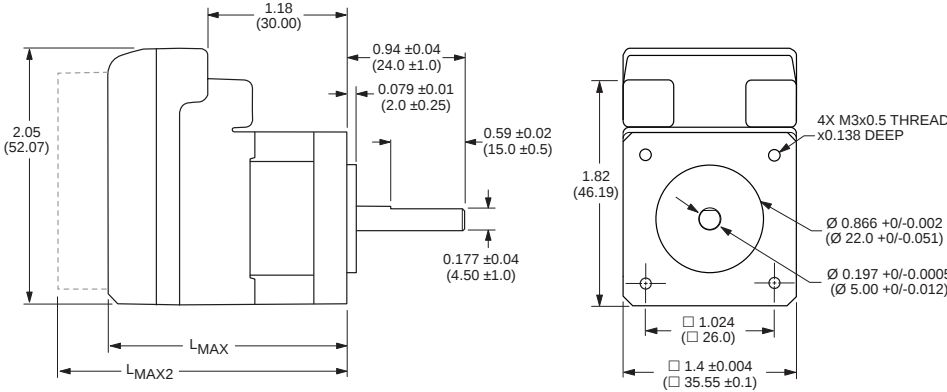
### Availability

| 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 | •<br> |                                                                                        | •<br>  |                                                                                        | •<br>  |                                                                                         | •<br> |                                                                                           | •<br> |                                                                                          |
| I – Motion Control | •<br> | •<br> | •<br>  | •<br> | •<br>  | •<br> | •<br> | •<br>  |                                                                                          | •<br> |
| I – CANopen        |                                                                                        | •<br> | •<br>  | •<br> | •<br>  | •<br> |                                                                                          | •<br>  |                                                                                          | •<br> |
| I – Ethernet       |                                                                                        |                                                                                        |                                                                                         |                                                                                        |                                                                                         | •<br> |                                                                                          |                                                                                           |                                                                                          |                                                                                          |
| O – Speed control  |                                                                                        |                                                                                        | •<br> |                                                                                        | •<br> |                                                                                         |                                                                                          | •<br> |                                                                                          |                                                                                          |

### 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) |

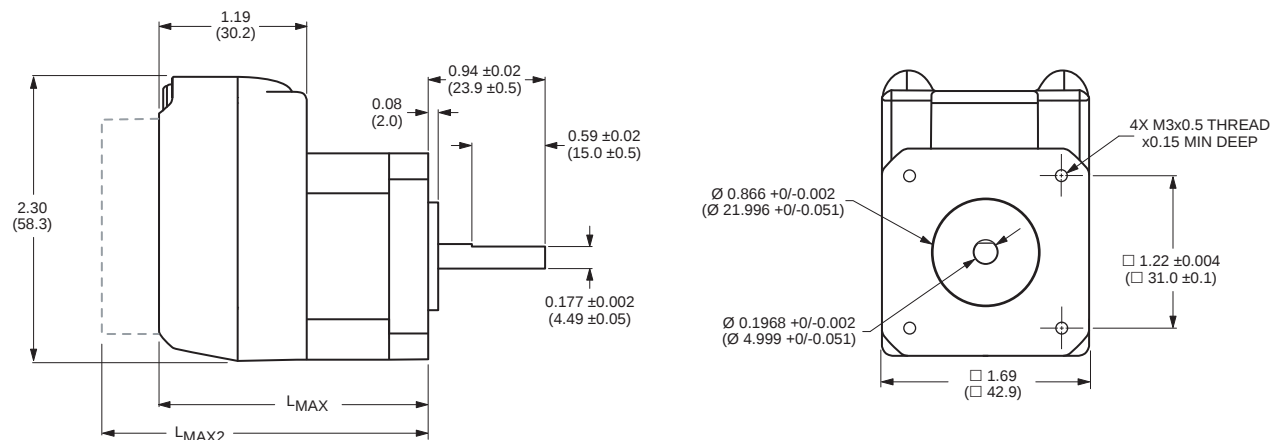
(1) Represents maximum dimension with connectors/options.

# MDrive Plus

## Dimensions

### MD•17 NEMA17 motor, IP20-rated

inches (mm)

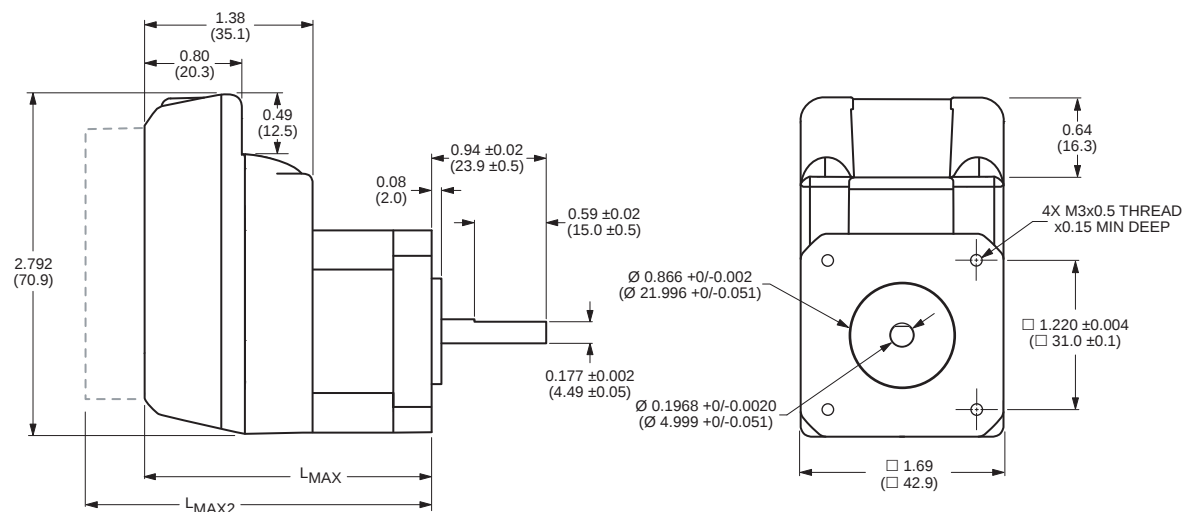


| Motor stack length | Lmax1       | Lmax2 (1)   |
|--------------------|-------------|-------------|
| Single             | 2.20 (55.9) | 2.79 (70.9) |
| Double             | 2.43 (61.7) | 3.02 (76.7) |
| Triple             | 2.77 (70.4) | 3.37 (85.6) |

(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) |

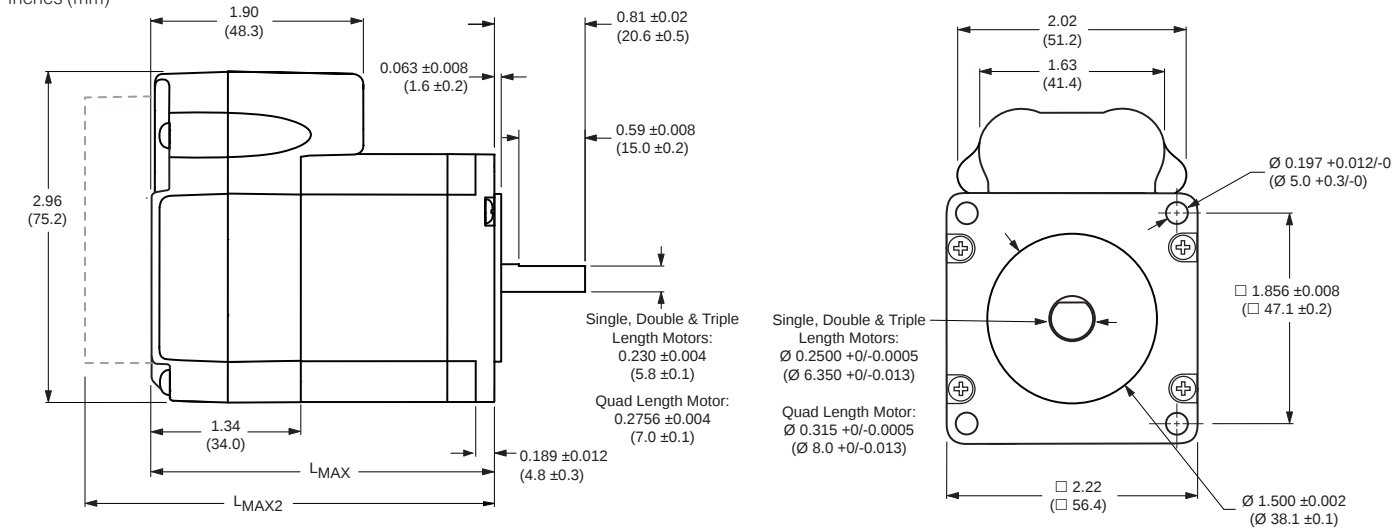
(1) Represents maximum dimension with connectors/options.

# MDrive Plus

## Dimensions

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

inches (mm)

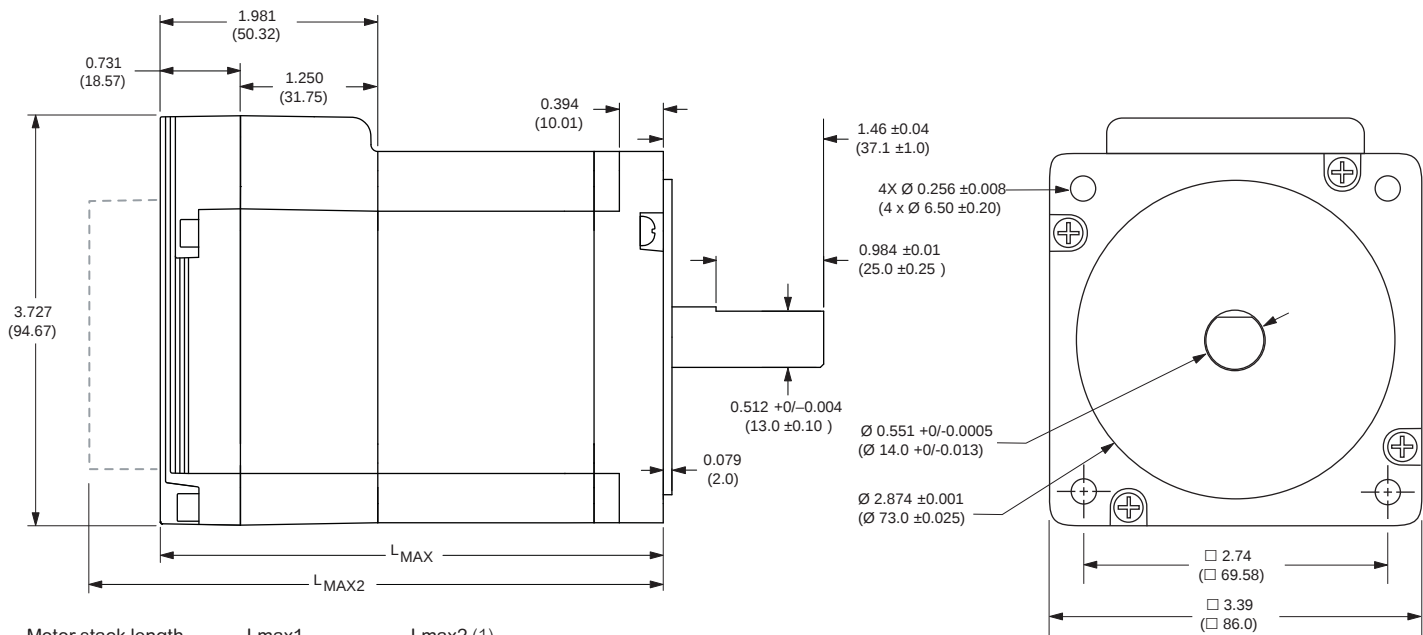


| Motor stack length | Lmax1         | Lmax2 (1)     |
|--------------------|---------------|---------------|
| Single             | 2.91 (73.63)  | 3.57 (90.39)  |
| Double             | 3.25 (82.26)  | 3.91 (99.03)  |
| Triple             | 4.11 (104.11) | 4.76 (120.62) |

(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) |

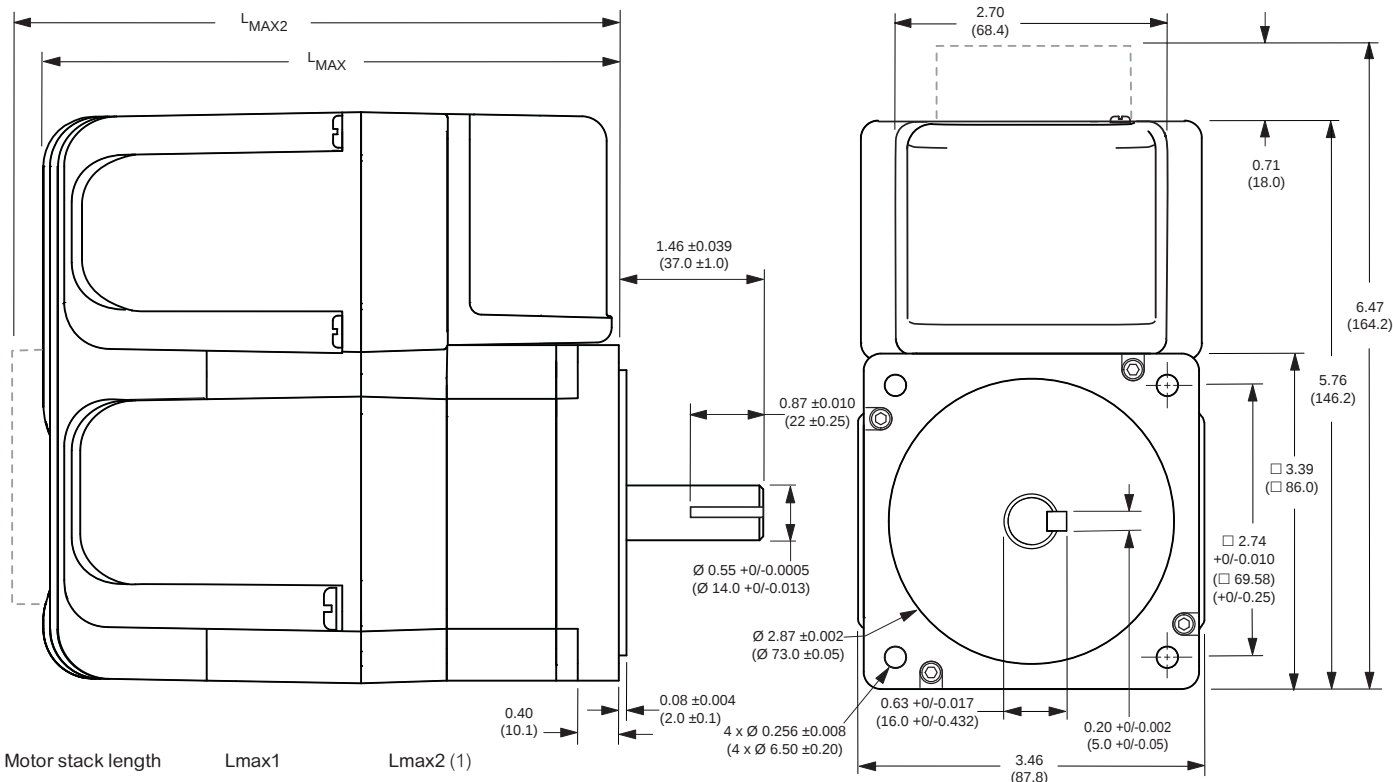
(1) Represents maximum dimension with connectors/options.

# MDrive Plus

## Dimensions

MD•34AC NEMA34 motor, IP54-rated

inches (mm)

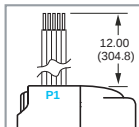


| Motor stack length | Lmax1       | Lmax2 (1)   |
|--------------------|-------------|-------------|
| Single             | 6.1 (155.0) | 7.1 (180.4) |
| Double             | 6.9 (174.3) | 7.9 (199.7) |
| Triple             | 8.4 (214.3) | 9.4 (239.7) |

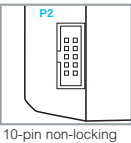
(1) Control knob option.

### IP20 connector examples

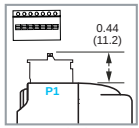
Flying leads



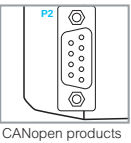
IDC



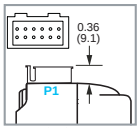
Pluggable



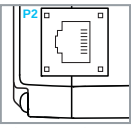
DB9



Wire crimp

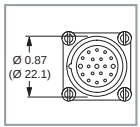


RJ45

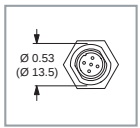


### IP54/65 connector examples

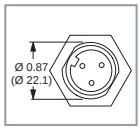
19-pin M23



5-pin M12

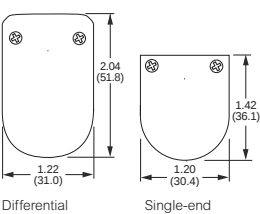


3-pin Euro AC

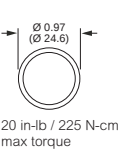


### Lmax2 option examples

External encoders



External control knob



# 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    |

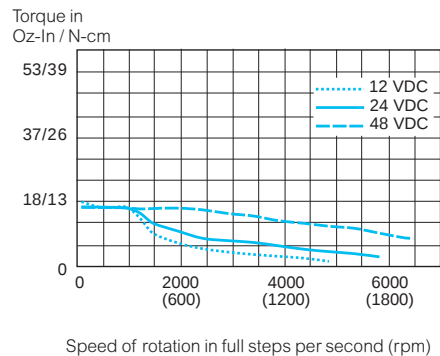
| MD•23 NEMA 23 motor specifications | Motor                 | Stack length           | Single | Double | Triple | Quad   |
|------------------------------------|-----------------------|------------------------|--------|--------|--------|--------|
|                                    | Holding torque        | 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     |

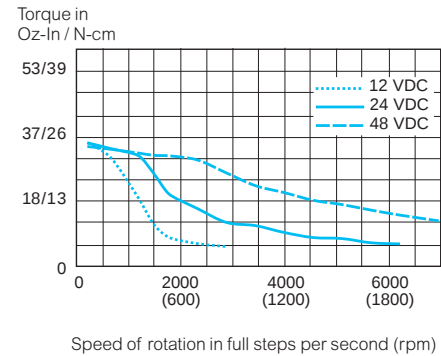
| MD•34AC NEMA 34 motor specifications | Motor                 | Stack length           | Single  | Double  | Triple  |
|--------------------------------------|-----------------------|------------------------|---------|---------|---------|
|                                      | Holding torque        | 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

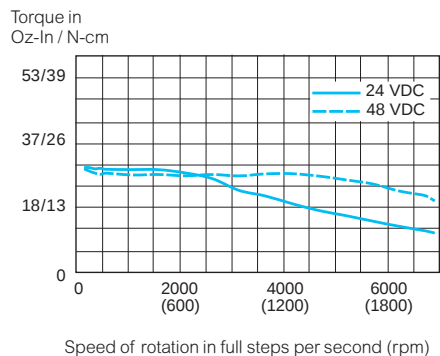


Triple stack length

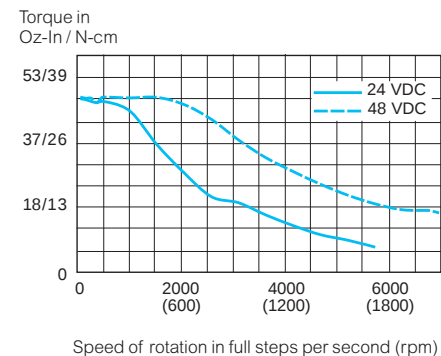


MD•17 NEMA 17 speed torque (1)

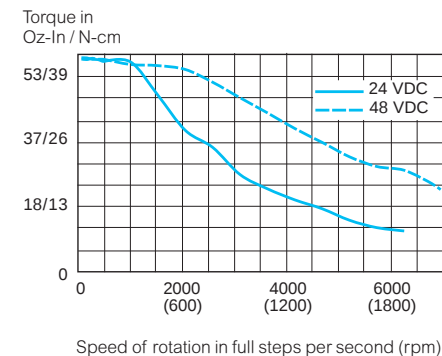
Single stack length



Double stack length

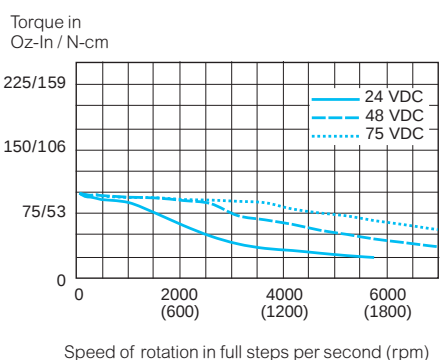


Triple stack length

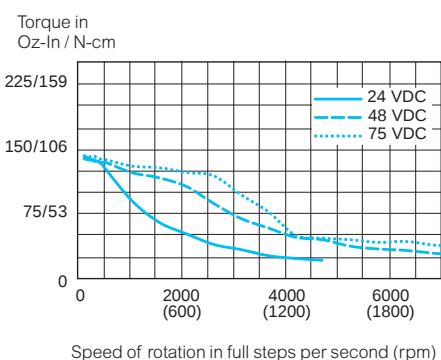


MD•23 NEMA 23 speed torque (1)

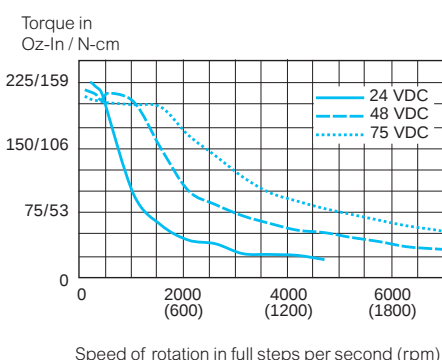
Single stack length



Double stack length



Triple stack length



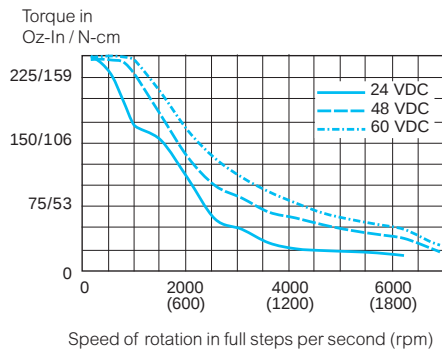
(1) Test conditions: 100% current with damper simulating load.

# MDrive® Plus

## Motor performance

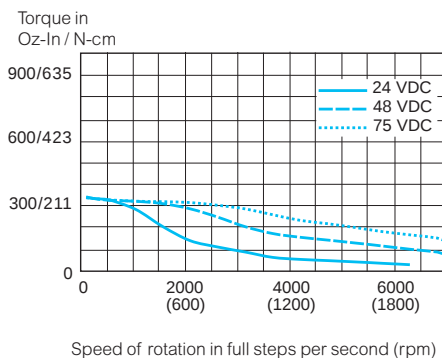
### MD•23 NEMA 23 speed torque (1)

Quad stack length

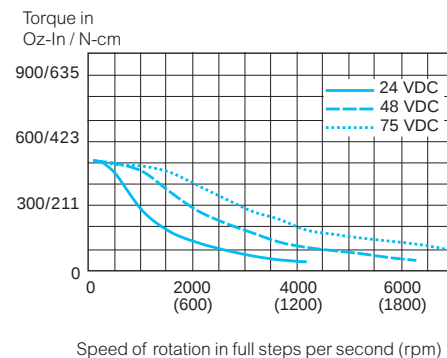


### MD•34 NEMA 34 speed torque (1)

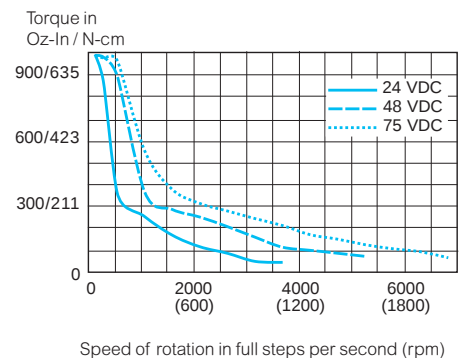
Single stack length



Double stack length

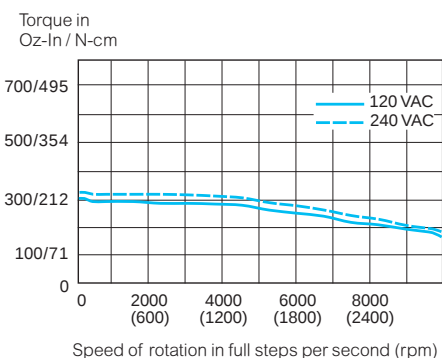


Triple stack length

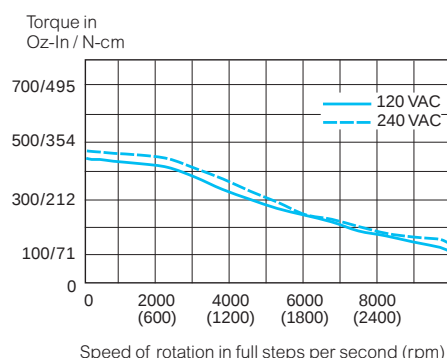


### MD•34AC NEMA 34 speed torque (1)

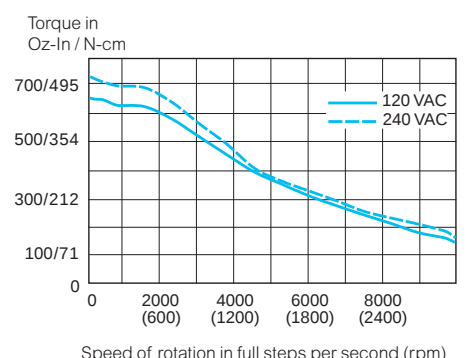
Single stack length



Double stack length



Triple stack length



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

## Part numbers

 availability by MDrive size

- (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.

[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><br>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><br>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><br>M2MSZ = Step/direction with SPI universal input<br>I4MRQ = RS-422/485 programmable motion control with expanded features (Plus <sup>2</sup> )<br>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><br>17 = NEMA 17    1.7 inch    42mm<br>23 = NEMA 23    2.3 inch    57mm                                                                                                                                      | K                           | M | D | M | 2 | M | S | Z | 1 | 7 | A | 4 -EQ |
| <b>Motor length</b><br>A = single stack<br>B = double stack<br>C = triple stack<br>D = quad stack — NEMA 23 motors only                                                                                                        | K                           | M | D | M | 2 | M | S | Z | 1 | 7 | A | 4 -EQ |
| <b>Drive voltage</b><br>4 = +12 to +48 VDC — NEMA 17 motors<br>6 = +12 to +60 VDC — NEMA 23 D quad length motor<br>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><br>Omit from part number, if unwanted.<br><br>-EQ = internal encoder, 512-line magnetic encoder with index mark<br>-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)<br>K = kit option, or leave blank if not wanted                                                                                                                            | K                          | M   | D   | M   | 2   | M   | S   | Z    | 3    | 4 | A | 1 | -N |
| MDrive product<br>MD = MDrivePlus with AC power, IP54-rating and industrial connectors                                                                                                        | K                          | M   | D   | M   | 2   | M   | S   | Z    | 3    | 4 | A | 1 | -N |
| Version<br>M2MSZ = Step/direction with SPI universal input<br>I4MRQ = RS-422/485 programmable motion control with expanded features (Plus²)<br>I4MCQ = CANopen with expanded features (Plus²) | K                          | M   | D   | M   | 2   | M   | S   | Z    | 3    | 4 | A | 1 | -N |
| Motor size<br>34 = NEMA 34    3.4 inch    85mm                                                                                                                                                | K                          | M   | D   | M   | 2   | M   | S   | Z    | 3    | 4 | A | 1 | -N |
| Motor length<br>A = single stack<br>B = double stack<br>C = triple stack                                                                                                                      | K                          | M   | D   | M   | 2   | M   | S   | Z    | 3    | 4 | A | 1 | -N |
| Drive voltage<br>1 = 120 VAC<br>2 = 240 VAC                                                                                                                                                   | K                          | M   | D   | M   | 2   | M   | S   | Z    | 3    | 4 | A | 1 | -N |
| Options<br>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                                                                                                                  |                            |     |     |     |     |     |     |      |      |   |   |   |    |
| 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<br>Step/<br>direction                     |    |    |    | I<br>Motion<br>Control |    |    |    | I<br>Ether<br>Net | I<br>CAN<br>open |    |    |    | O<br>Speed<br>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<br>0.3 m / 1.0 feet long   | ES-CABLE-2    | • | • | • |   |  |  |  |  |  |  |  |  |  | • | • |  |
| for external differential optical encoder<br>1.8 m / 6.0 feet long | ED-CABLE-6    | • | • | • |   |  |  |  |  |  |  |  |  |  | • | • |  |
| for internal differential optical encoder<br>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

| description | reference | compatibility with MDrive by version & size |    |      |                     |    |      |              |    |      |
|-------------|-----------|---------------------------------------------|----|------|---------------------|----|------|--------------|----|------|
|             |           | M<br>Step/direction                         |    |      | I<br>Motion Control |    |      | I<br>CANopen |    |      |
|             |           | 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 |  |   | • |   | • |   |   |   | • |

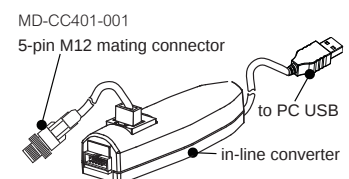
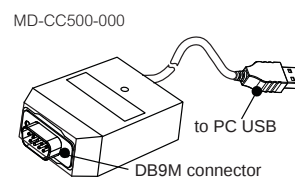
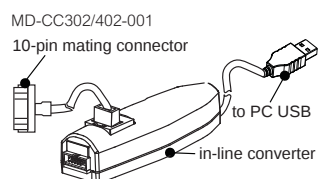
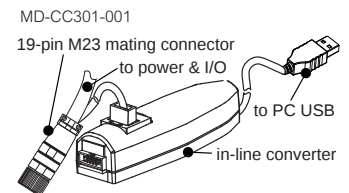
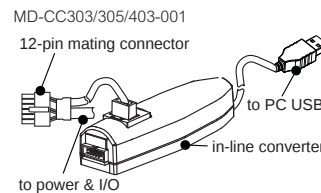
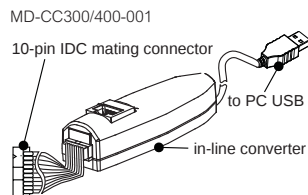
Drive protection module

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

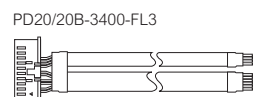
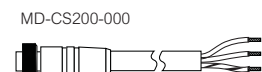
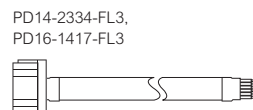
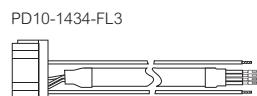
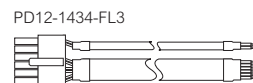
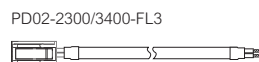
(1) Requires mating connector adapter and power supply, not provided.

|       |   |   |  |   |   |  |   |   |  |
|-------|---|---|--|---|---|--|---|---|--|
| DPM75 | • | • |  | • | • |  | • | • |  |
|-------|---|---|--|---|---|--|---|---|--|

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<br>+12...+48                                                                                                                                                                   | ML•17<br>+12...+48 | ML•23<br>+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<br>(2)    | Non-captive shaft                          | lbs                       | 50                                                                                                                                                                                   | 50                 | 200                |
|                          |                                            | 50                        | 22                                                                                                                                                                                   | 22                 | 91                 |
|                          | External shaft with<br>general purpose nut | lbs                       | 25                                                                                                                                                                                   | 25                 | 60                 |
|                          |                                            | kg                        | 11                                                                                                                                                                                   | 11                 | 27                 |
|                          | External shaft with<br>anti-backlash nut   | lbs                       | 5                                                                                                                                                                                    | 5                  | 25                 |
|                          |                                            | kg                        | 2                                                                                                                                                                                    | 2                  | 11                 |
| Maximum<br>repeatability | General purpose                            | inch                      | 0.005                                                                                                                                                                                |                    |                    |
|                          |                                            | mm                        | 0.127                                                                                                                                                                                |                    |                    |
|                          | Anti-backlash (3)                          | inch                      | 0.0005                                                                                                                                                                               |                    |                    |
|                          |                                            | mm                        | 0.0127                                                                                                                                                                               |                    |                    |
| Thermal                  | Operating temp<br>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.

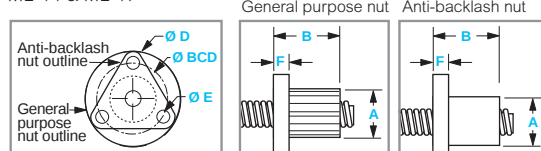
(4) When input voltage is removed, maintains power only to control and feedback circuits. Not applicable to Pulse/Direction products.

## Nuts

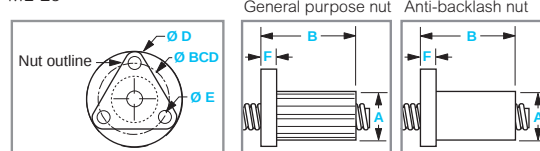
External shaft MDrive Linear Actuators employ a nut which moves axially along the threaded shaft as the screw rotates. Two nut styles are available: general purpose and anti-backlash. While anti-backlash nuts provide higher accuracy and low drag torque, general purpose nuts are rated for higher load 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<br>< 0.7 N-cm | free wheeling   | < 1.0 oz-in<br>< 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.

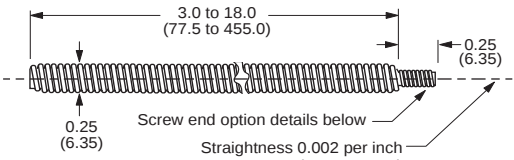
Customization of linear actuators and screws is available for volume opportunities.

| Screw lengths<br>(1) | minimum                               | inches  | ML•14                                                   |         | ML•17                                                   |         | ML•23                                                   |           |
|----------------------|---------------------------------------|---------|---------------------------------------------------------|---------|---------------------------------------------------------|---------|---------------------------------------------------------|-----------|
|                      |                                       |         | mm                                                      |         | mm                                                      |         | mm                                                      |           |
|                      | maximum                               | inches  | 18.0                                                    |         | 18.0                                                    |         | 24.0                                                    |           |
|                      |                                       |         | mm                                                      |         | mm                                                      |         | mm                                                      |           |
| Load limits<br>(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  |           |
|                      |                                       |         | #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    |
|                      |                                       | mm      | —                                                       | —       | —                                                       | —       | —                                                       | 9.525     |
|                      | 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    |

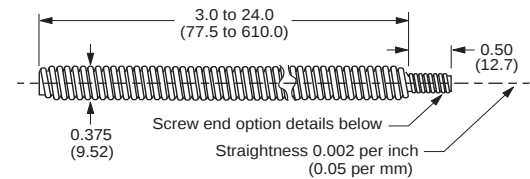
(1) Standard 0.1" / 2.5mm screw length increments are available.

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

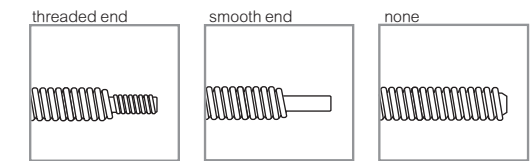
#### ML•14 & ML•17 screw dimensions



#### 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

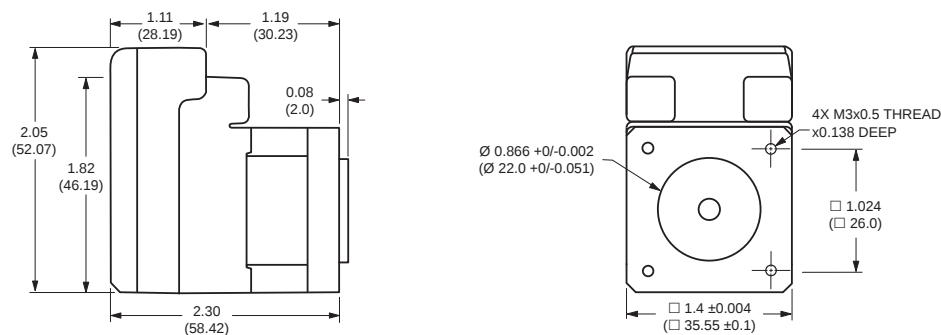
$$\begin{aligned} &\text{mounting surface} \\ &\text{plate thickness} \\ &- \\ &\text{screw length} \\ &- \\ &\text{nut length} \\ &= \\ &\text{available stroke length} \end{aligned}$$

# MDrive Linear Actuator

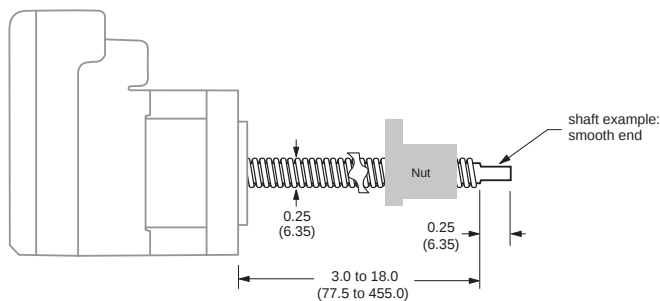
## Dimensions

ML•14 NEMA14 motor  
inches (mm)

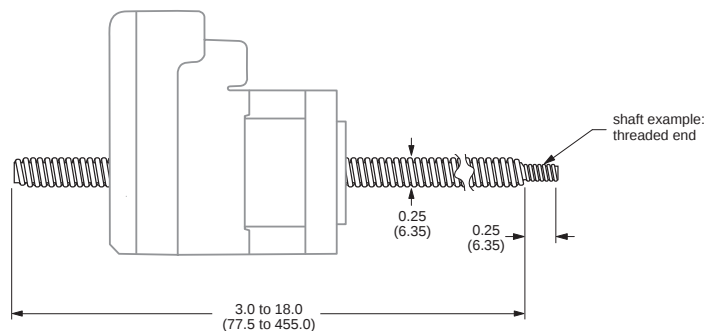
### MDrive body



### external shaft



### non-captive shaft

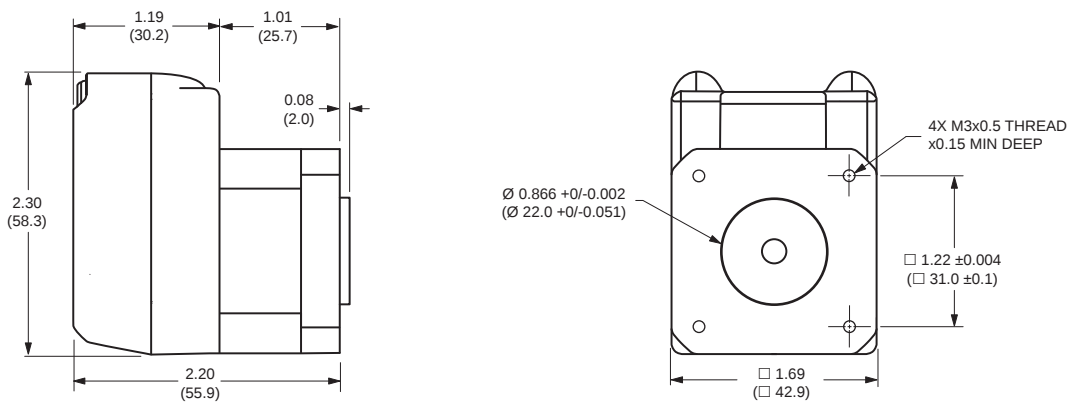


# MDrive Linear Actuator

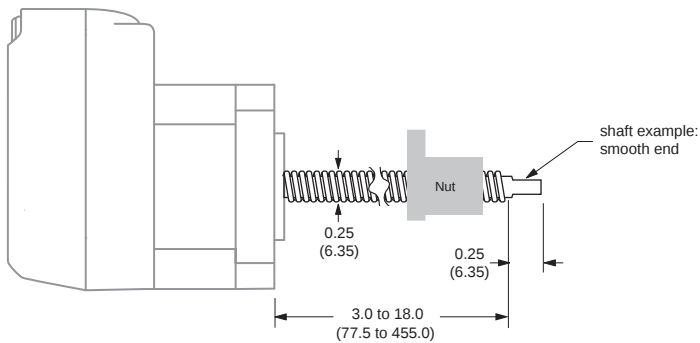
## Dimensions

ML•17 NEMA17 motor  
inches (mm)

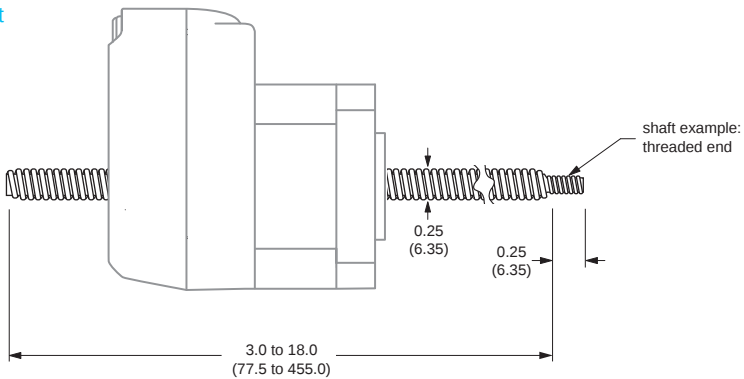
### MDrive body



### external shaft



### non-captive shaft



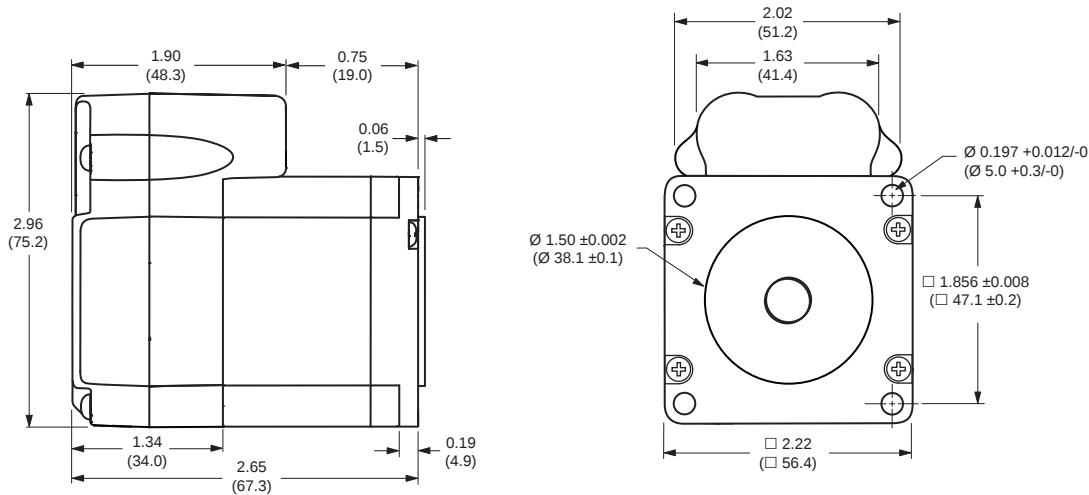
# MDrive Linear Actuator

## Dimensions

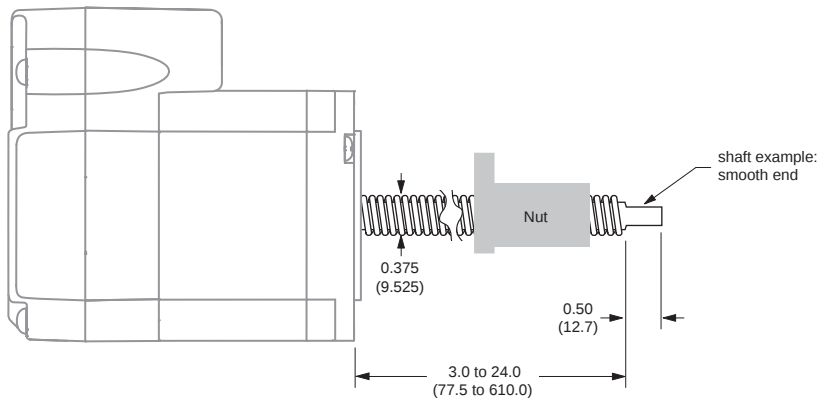
ML•23 NEMA23 motor

inches (mm)

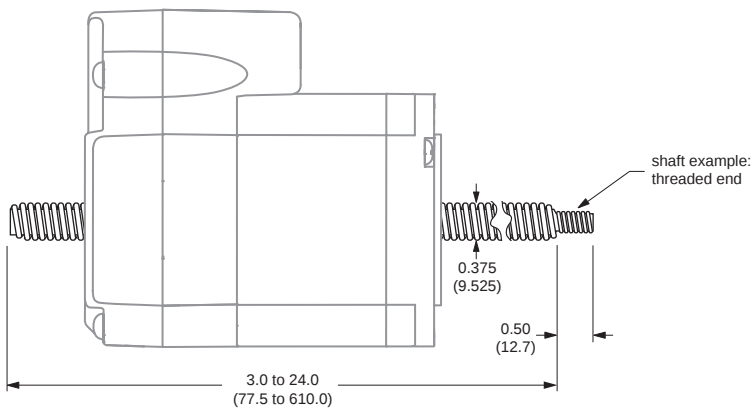
### MDrive body



### 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.

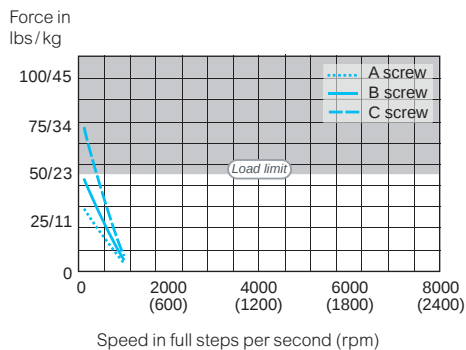
(2) Only applicable for External shaft linear actuator with anti-backlash nut.

# MDrive Linear Actuator

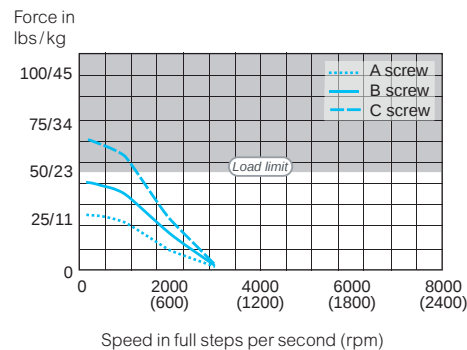
## Motor performance

### ML•14 NEMA 14 speed force (1) (2)

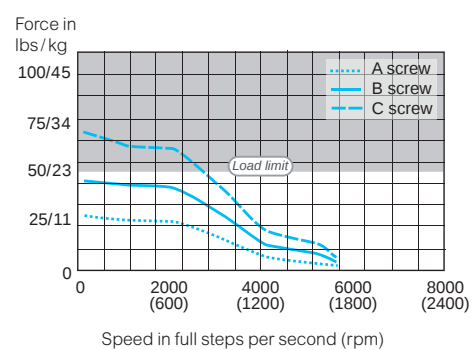
12 VDC



24 VDC

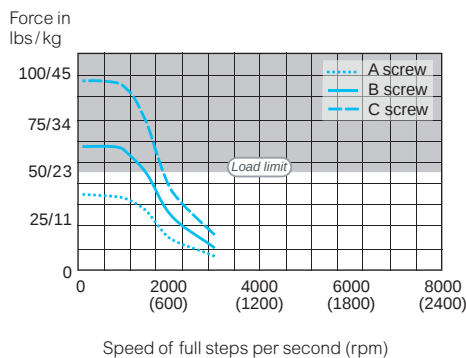


48 VDC

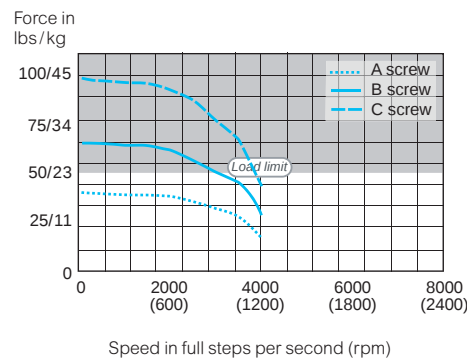


### ML•17 NEMA 17 speed force (1) (2)

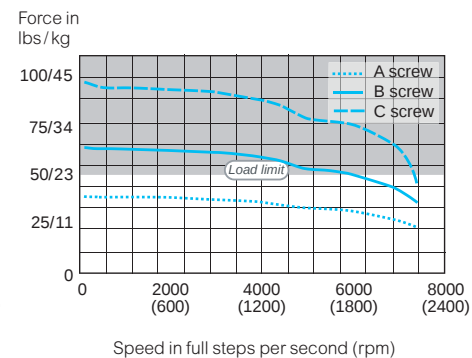
12 VDC



24 VDC

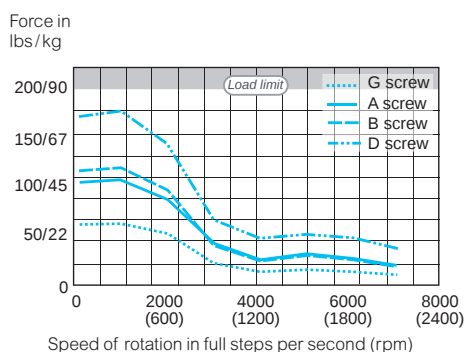


48 VDC

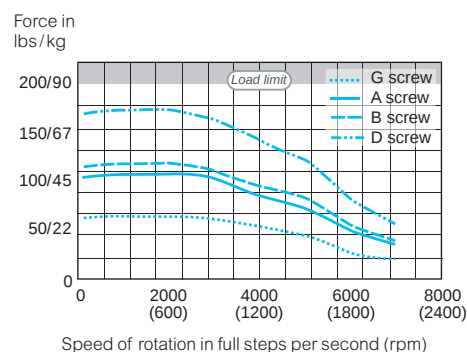


### MD•23 NEMA 23 speed force (1) (2)

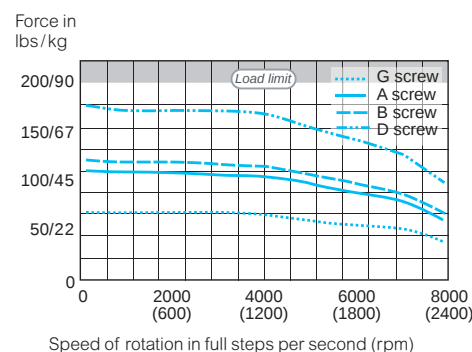
24 VDC



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

## Part numbers

### • Continued

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

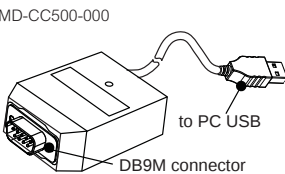
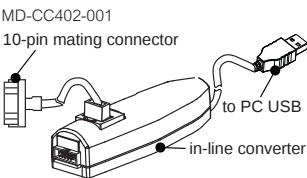
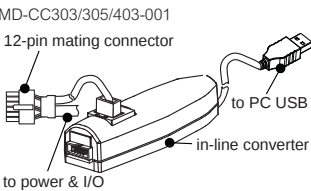
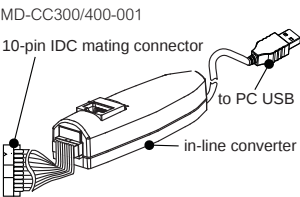
Limits surge current and voltage to a safe level  
when DC input power is switched on-and-off

|       |  |   |   |   |   |   |   |   |   |   |   |   |   |
|-------|--|---|---|---|---|---|---|---|---|---|---|---|---|
| DPM75 |  | • | • | • | • | • | • | • | • | • | • | • | • |
|-------|--|---|---|---|---|---|---|---|---|---|---|---|---|

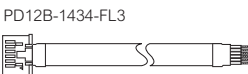
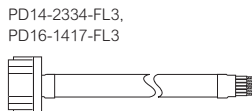
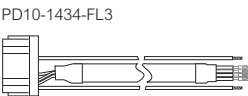
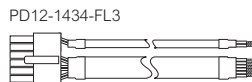
# MDrive Linear Actuator

## Accessories

### Communication converter examples



### Prototype development cable examples





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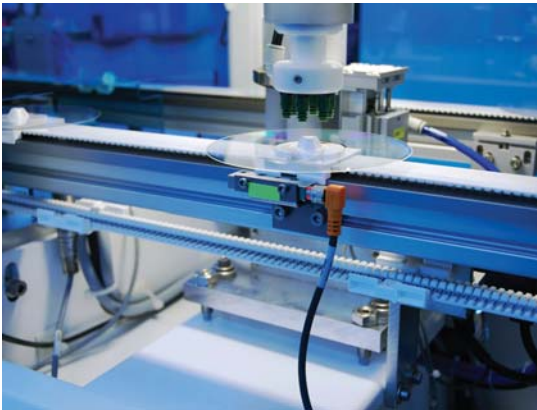
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