MDRIVE17™ MOTOR+DRIVER

MOTION CONTROL

FEATURES

- Integrated Microstepping Driver, Motion Controller and NEMA 17 High Torque 1.8° Stepping Motor
- +12 to +48 VDC Input Voltage
- Low Cost
- Extremely Compact
- Available Configurations:
  - Single Shaft
  - Linear Actuator*
  - Internal Magnetic Encoder for Closed Loop Control
  - Integrated Planetary Gearbox
- Three Rotary Stack Sizes Available
- Single Supply
- Microstep Resolution up to 51,200 Steps Per Rev
- Open Loop or Optional Closed Loop Control
- Programmable Motor Run and Hold Currents
- Four +5 to +24 VDC I/O Lines
- One 10 Bit Analog Input
- 0 to 5MHz Step Clock Rate Selectable in 0.59Hz Increments
- RS-485 Communications with Selectable Baud Rate to 115K
- 62 Software Addresses for Multi-Drop Communications
- Simple 1 to 2 Character Instructions
- 12.0" (30.5cm) Flying Lead Interface

* External Linear Actuator Only.
Consult Factory for Availability.

DESCRIPTION

The MDrive17 Motion Control offers the system designer a low cost, intelligent motion controller integrated with a NEMA 17 high torque stepping motor and a +12 to +48 volt microstepping driver.

The MDrive17 Motion Control adds a versatile array of functions by combining a complete, programmable motion controller with our already compact and cost effective standard MDrive17, adding little cost and no increase in size. Standard offerings include four +5 to +24 volt general purpose I/O lines, one 10 bit analog input, 0 to 5MHz step clock rate, microstep resolution up to 51,200 steps per revolution, and a full featured easy-to-program instruction set.

The MDrive17 Motion Control communicates over RS-485 which allows for point-to-point or multiple unit configurations utilizing one communication port. Addressing and hardware support up to 62 uniquely addressed units communicating over a single line. Baud rate is selectable from 4,800 to 115K.

The MDrive17 Motion Control is available with optional closed loop control. The closed loop configuration adds a 512 line (2048 edge) magnetic encoder with index mark, internal to the MDrive so there is no increase in length. Functionality increases with the addition of stall detection, position maintenance, and find index mark.

In addition to an encoder option, available motor configurations include a single shaft rotary motor and an external linear actuator with long life Acme screw*. Rotary versions are available in single, double and triple stack sizes: 13, 15 & 19. Interface connections are accomplished using 12.0" (30.5cm) flying leads.

The MDrive17 Motion Control is a compact, powerful and inexpensive solution that will reduce system cost, design and assembly time for a large range of stepping motor applications.

MDRIVE17 MOTION CONTROL SPECIFICATIONS

GENERAL SPECIFICATIONS

Input Voltage (+V)
Range ..... +12 to +48 VDC
Power supply current requirements = 2A (maximum) per MDrive17.
Actual power supply current will depend on voltage and load.

Analog Input
Resolution ..... 10 Bit
Voltage Range ..... 0 to +5 VDC or 4-20 mA

General Purpose I/O
Number / Type ..... 4 / Open Collector
Logic Range ..... +5 to +24 VDC
Output Sink Current ..... 700 mA
Protection ..... Over Temp, Short Circuit, Inductive Clamp

Communication
Type RS-485
Baud Rate ..... 4800 to 115K

Motion
Resolution – Open Loop Configuration
# of Settings 14
Steps Per Rev 400, 800, 1000, 1600, 2000, 3200, 5000, 6400, 10000, 12800, 25000, 25600, 50000, 51200
Resolution – Closed Loop Configuration (optional)
Steps Per Rev 51200
Encoder (optional)
Type ..... Internal, Magnetic
Resolution ..... 512 Lines / 2048 Edges Per Rev
Counters
Type ..... Position, Encoder / 32 Bits
Edge Rate (Max) 5MHz
Velocity
Range ..... +/- 5,000,000 Steps Per Second
Resolution ..... 0.5961 Steps Per Second
Accel / Decel
Range ..... 1.5×10^9 Steps Per Second^2
Resolution ..... 90.9 Steps Per Second^2

Software
Program and Data Storage ..... Nonvolatile
User Registers ..... (4) 32 Bit
User Program Labels and Variables 22
Math Functions ..... +, -, ×, ÷, >, =, <, <=, >=, AND, OR, XOR, NOT
Branch Functions ..... Branch & Call (conditional)
Predefined I/O Functions
Inputs ..... Home, Limit Plus, Limit Minus, Go, Stop, Pause, Jog Plus, Jog Minus, Analog In
Outputs ..... Moving, Fault, Stall, Velocity Change
Trip Functions ..... Trip on Input & Trip on Position
Party Mode Addresses 62
Encoder Functions ..... Stall Detection, Position Maintenance, Find Index

Thermal
Heat Sink Temperature (Max) ..... 85° C
Motor Temperature (Max) ..... 100° C

WIRE / PIN ASSIGNMENTS

CONNECTOR P1 – Flying Leads

FLYING LEADS	FUNCTION
White / Yellow	I/O 1
White / Orange	I/O 2
White / Violet	I/O 3
White / Blue	I/O 4
Green	ANALOG INPUT
Black	POWER GROUND
Red	+V (+12 TO +48 VDC)

CONNECTOR P2 (RS-485) – 10 Pin Pin-Header

PIN	FUNCTION
1-5	NO CONNECT
6	RX +
7	RX –
8	TX –
9	TX +
10	GROUND

MDRIVE17 MOTOR SPECIFICATIONS

MD1713 Single Stack

Holding Torque .....32 oz-in / 22.6 N-cm
Detent Torque .....1.66 oz-in / 1.17 N-cm
Rotor Inertia .... 0.00053 oz-in-sec^2 / 0.038 kg-cm^2
Weight (Motor+Driver)..... 9.8 oz / 277.8 g

MD1715 Double Stack

Holding Torque .....60.0 oz-in / 42.4 N-cm
Detent Torque .....2.08 oz-in / 1.47 N-cm
Rotor Inertia .... 0.00080 oz-in-sec^2 / 0.057 kg-cm^2
Weight (Motor+Driver)..... 10.5 oz / 297.7 g

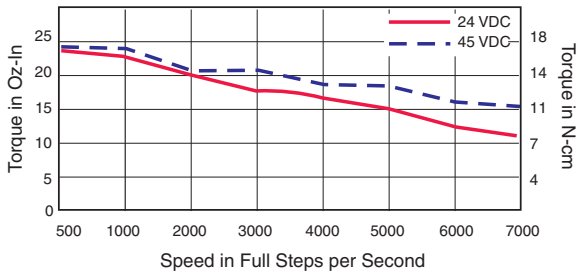
MD1719 Triple Stack

Holding Torque .....74.9 oz-in / 52.9 N-cm
Detent Torque .....3.47 oz-in / 2.45 N-cm
Rotor Inertia .... 0.00116 oz-in-sec^2 / 0.082 kg-cm^2
Weight (Motor+Driver)..... 15.1 oz / 428.1 g

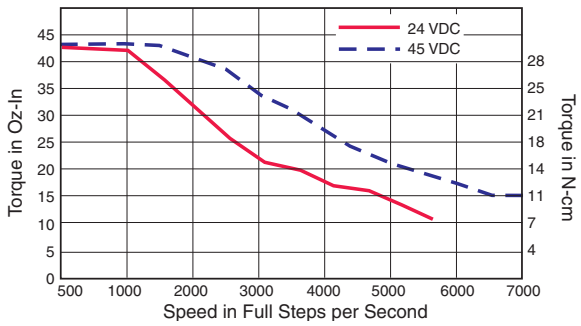
TORQUE-SPEED CURVES

Rotary Motor

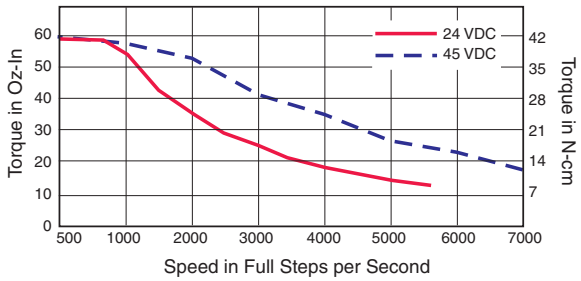
MD1713 Single Stack



MD1715 Double Stack



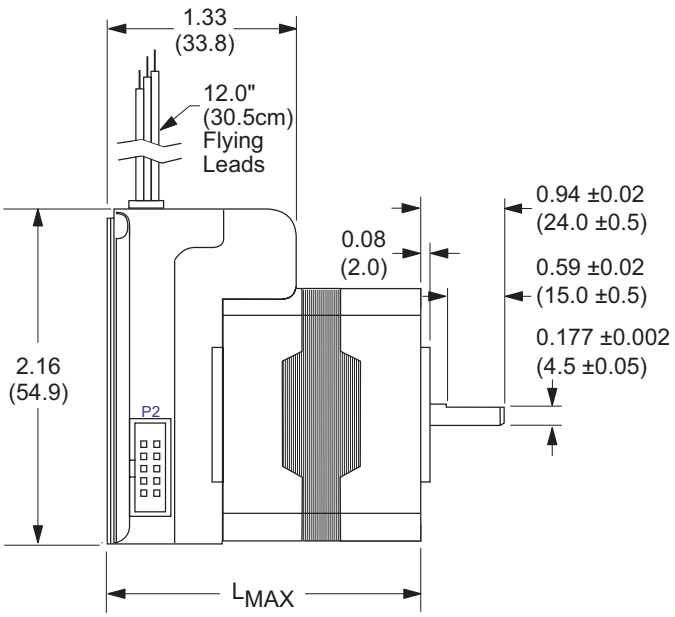
MD1719 Triple Stack

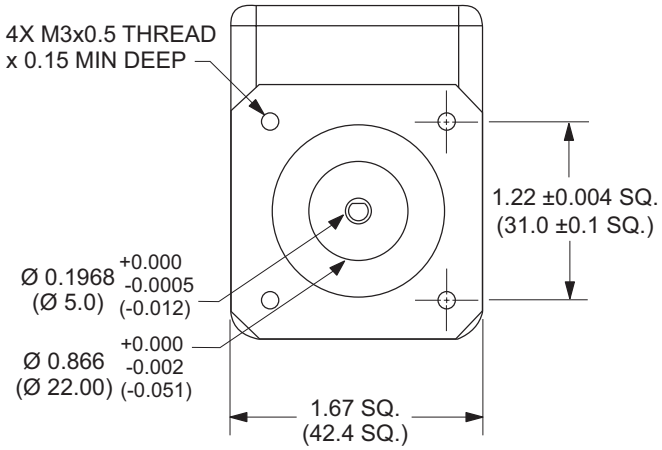


MDRIVE17 MOTION CONTROL – MECHANICAL SPECIFICATIONS

Dimensions in Inches (mm)

Rotary MDrive17: Single Shaft & Encoder Versions





LMAX MDrive Lengths *Inches (mm)*

Stack Size	SINGLE SHAFT or ENCODER VERSION
1713	2.20 (55.9)
1715	2.43 (61.7)
1719	2.75 (69.8)

MDRIVE17 WITH PLANETARY GEARBOX

The MDrive17 is available with a Planetary Gearbox option developed to increase torque at lower speeds, enable better inertia matching and produce finer positional resolutions. These efficient, low maintenance Planetary Gearbox come fully assembled with the MDrive and are offered in a large number of reduction ratios in 1-, 2- and 3-stage configurations. An optional NEMA Flange allows mounting the Planetary Gearbox to the load using a standard NEMA bolt circle. Planetary Gearbox may be combined with other MDrive17 options, however are unavailable on Linear Actuator versions.

Parameters	**1-Stage**	**2-Stage**	**3-Stage**
Permitted Output Torque (oz-in / Nm)	425 / 3.0	1062 / 7.5	2124 / 15.0
Gearbox Efficiency	0.80	0.75	0.70
Maximum Backlash (degree)	0.80°	0.85°	0.90°
Ouput Side with Ball Bearing			
Maximum Load, Radial (lb-force / N)	36 / 160	52 / 230	67.5 / 300
Maximum Load, Axial (lb-force / N)	11 / 50	18 / 80	25 / 110
Weight - Gearbox Only (oz / g)	14.3 / 406	17.9 / 508	21.5 / 609
Weight - Gearbox & NEMA Flange (oz / g)	14.8 / 420	18.5 / 525	22.2 / 630

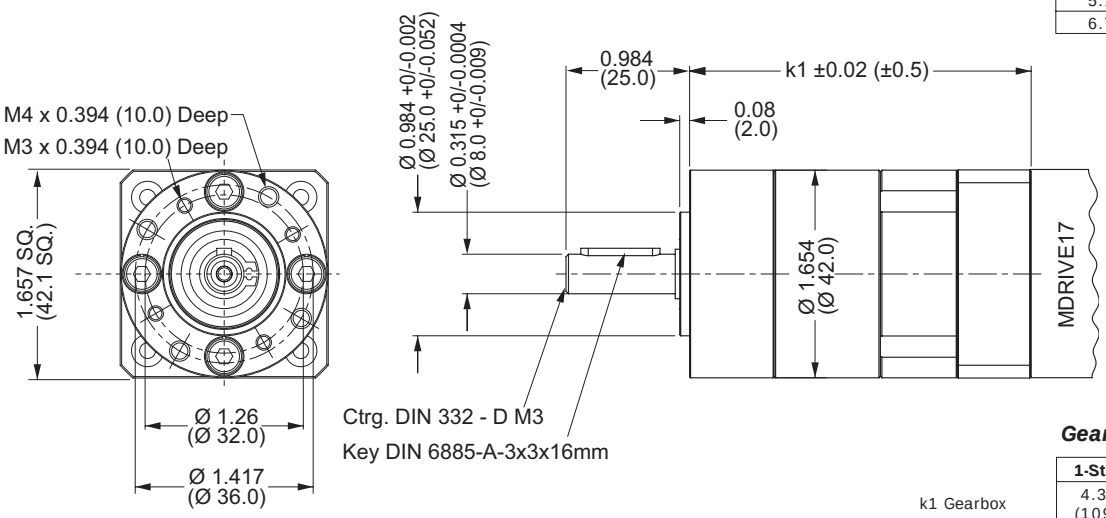
PLANETARY GEARBOX MECHANICAL SPECIFICATIONS

Dimensions in Inches (mm)

Gearbox Ratios (Rounded)

1-Stage	2-Stage	3-Stage
3.70:1	13.73:1	50.89:1
5.18:1	15.88:1	58.85:1
6.75:1	18.36:1	68.06:1
	19.20:1	71.16:1
	22.20:1	78.71:1
	25.01:1	92.70:1
	26.85:1	95.17:1
	28.93:1	99.50:1
	34.97:1	107.20:1
	45.56:1	115.07:1
		123.97:1
		129.62:1
		139.13:1
		149.90:1
		168.84:1
		181.24:1
		195.26:1
		236.09:1
		307.54:1

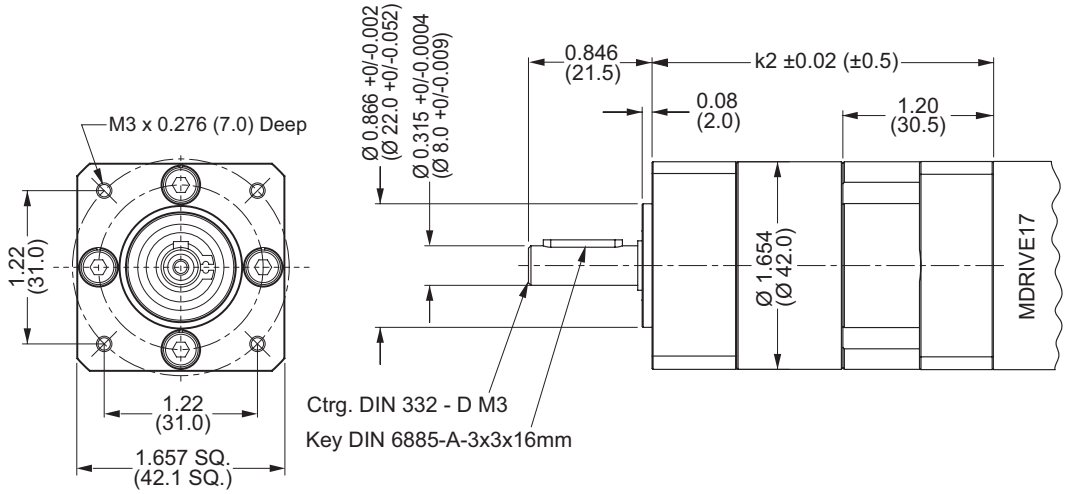
Planetary Gearbox for MDrive17



Gearbox Lengths *Inches (mm)*

	1-Stage	2-Stage	3-Stage
k1 Gearbox	4.315 (109.6)	5.169 (131.3)	6.024 (153.0)
k2 Gearbox w / NEMA Flange	4.433 (112.6)	5.287 (134.3)	6.142 (156.0)

Planetary Gearbox with Optional NEMA Output Flange



MDRIVE17 MOTION CONTROL – OPTIONS

Planetary Gearbox
Efficient, low maintenance Planetary Gearbox are offered assembled with the MDrive17. Details inside.

Encoder
The MDrive17 Motion Control is available with an internal 512-line magnetic encoder with index mark.

Linear Actuator - External
An External Linear Actuator with long life Acme Screw is a custom option. Consult factory for availability.

Communications Converter Cable
This convenient 6' (1.8m) accessory cable connects a PC's standard DB-9 Serial Comm Port to the MDrive's P2 Connector. An in-line RS-232 to RS-485 converter enables parameter setting to a single MDrive Motion Control. Purchase of this cable is recommended with first orders. Part No. MD-CC200-000.

ORDER INFORMATION

MDRIVE17 MOTION CONTROL
Stack Sizes 13 = Single Stack 15 = Double Stack 19 = Triple Stack **MDIF 17** ☐ OPTION
Example #1: Part Number **MDIF1719** is an **MD**rive17 Mot**I**on Control with **F**lying Leads, NEMA **17** motor, stack size **19**.

OPTIONS		
Planetary Gearbox	**G** ☐ Gearbox Ratio Rounded to Nearest Whole Number	**Example #3: MDIF1719G5** Rounding ratio to the nearest whole number, the above adds a Planetary Gearbox with 5.18:1 ratio to the part shown in example #1. Add -F if optional NEMA Flange is desired.
Internal Encoder	**E**	**Example #3: MDIF1719E** Adds a 512 line internal magnetic Encoder to the part shown in example #1.
Linear Actuator (External)	**L**	**Consult Factory for Availability**

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