

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 <i>Power supply current requirements = 2A (maximum) per MDrive17. Actual power supply current will depend on voltage and load.</i>
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 x 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 +, -, x, ÷, >, =, <, <=, >=, 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		CONNECTOR P2 (RS-485) – 10 Pin Pin-Header	
FLYING LEADS	FUNCTION	PIN	FUNCTION
White/Yellow	I/O 1	1-5	NO CONNECT
White/Orange	I/O 2	6	RX +
White/Violet	I/O 3	7	RX -
White/Blue	I/O 4	8	TX -
Green	ANALOG INPUT	9	TX +
Black	POWER GROUND	10	GROUND
Red	+V (+12 TO +48 VDC)		

MDRIVE17 MOTOR SPECIFICATIONS

MD1713 Single Stack

Holding Torque32 oz-in / 22.6 N-cm
 Detent Torque1.66 oz-in / 1.17 N-cm
 Rotor Inertia 0.00053 oz-in-sec² / 0.038 kg-cm²
 Weight (Motor+Driver)..... 9.8 oz / 277.8 g

MD1715 Double Stack

Holding Torque60.0 oz-in / 42.4 N-cm
 Detent Torque2.08 oz-in / 1.47 N-cm
 Rotor Inertia 0.00080 oz-in-sec² / 0.057 kg-cm²
 Weight (Motor+Driver)..... 10.5 oz / 297.7 g

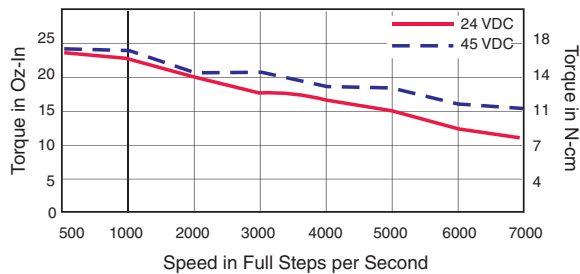
MD1719 Triple Stack

Holding Torque74.9 oz-in / 52.9 N-cm
 Detent Torque3.47 oz-in / 2.45 N-cm
 Rotor Inertia 0.00116 oz-in-sec² / 0.082 kg-cm²
 Weight (Motor+Driver)..... 15.1 oz / 428.1 g

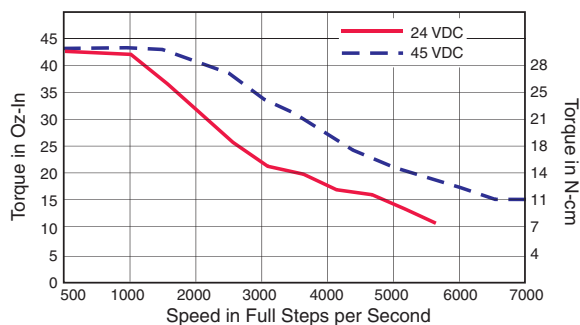
TORQUE-SPEED CURVES

Rotary Motor

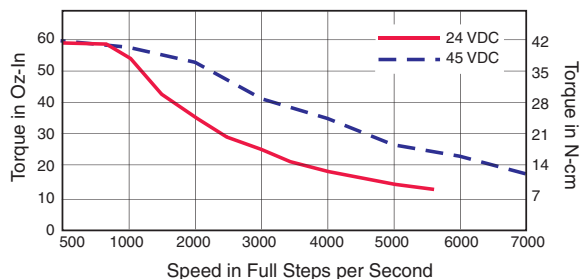
MD1713 Single Stack



MD1715 Double Stack



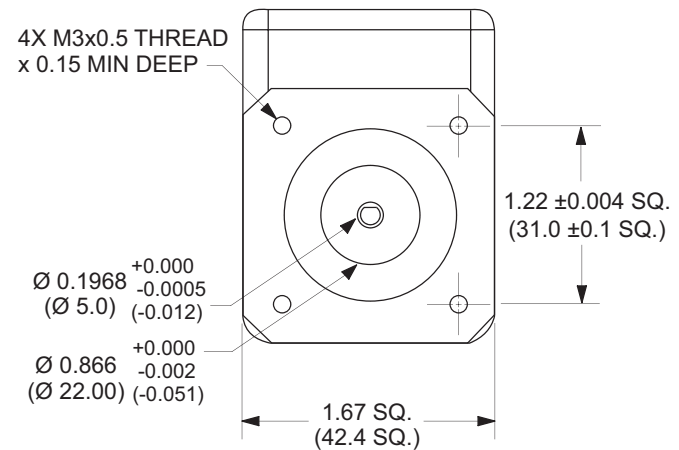
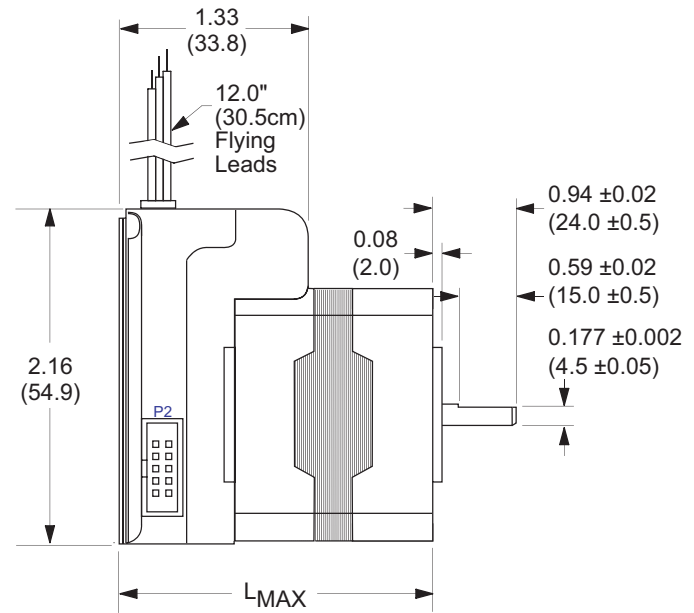
MD1719 Triple Stack



MDRIVE17 MOTION CONTROL – MECHANICAL SPECIFICATIONS

Dimensions in Inches (mm)

Rotary MDrive17: Single Shaft & Encoder Versions



L_{MAX} 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°

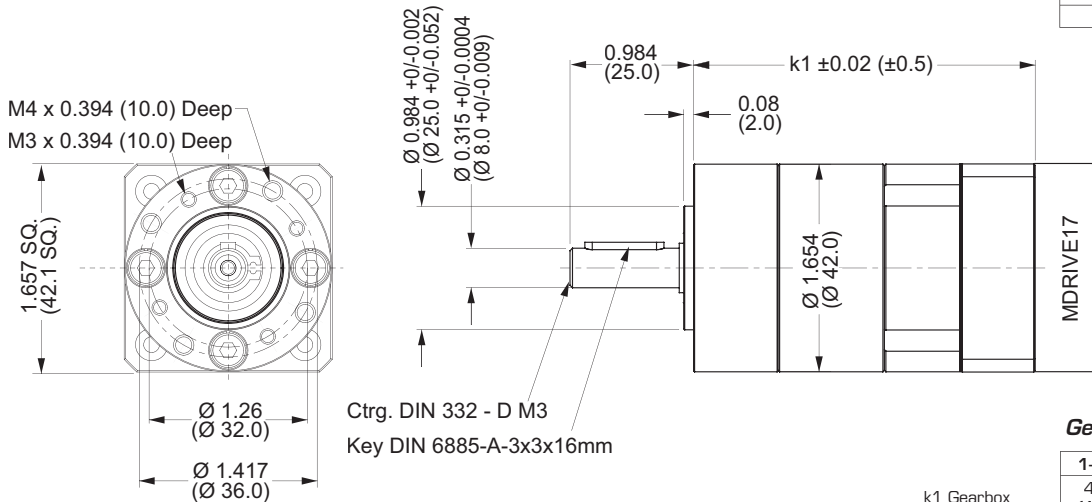
Output Side with Ball Bearing

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)

Planetary Gearbox for MDrive17



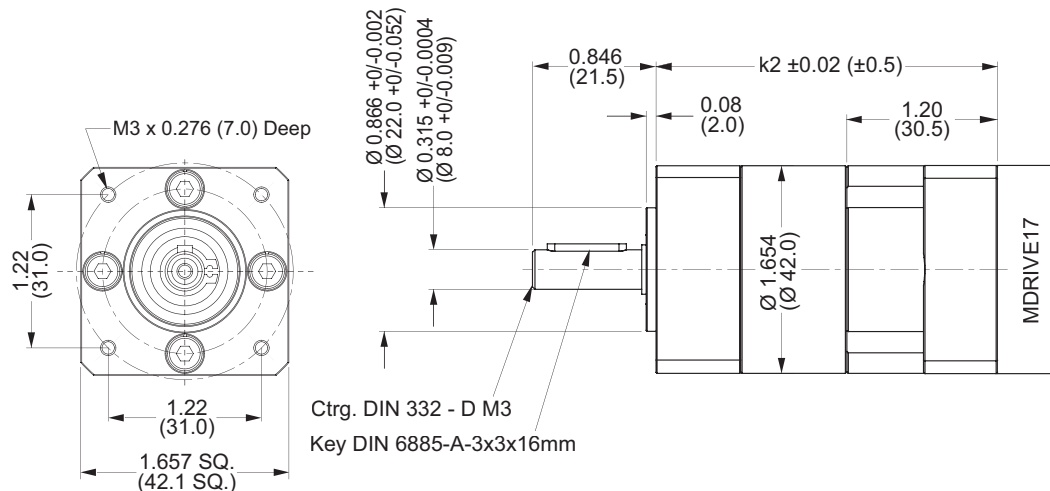
Gearbox Ratios (Rounded)

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	

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.


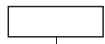
Linear Actuator - External

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		OPTIONS	
Stack Sizes 13 = Single Stack 15 = Double Stack 19 = Triple Stack MDIF 17  OPTION		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.
Example #1: Part Number MDIF1719 is an MDrive17 Motion Control with Flying Leads, NEMA 17 motor, stack size 19.		Linear Actuator (External) L	Consult Factory for Availability

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