

# MDrive® Plus

## MDI•14 programmable Motion Control

### Product overview

MDrive® Plus Motion Control products integrate 1.8° 2-phase stepper motor, fully programmable motion controller, drive electronics and optional encoder. Products with encoders include stall detection, position maintenance, and find index mark.

Programming for these stand-alone motion control solutions is via RS-422/485 interface with MCode software using simple 1 to 2 character instructions.

### Application areas

MDrive Plus products deliver reliable performance for new and existing motion control applications. Satisfying the requirements for a wide range of machine builders.

Simplify your machine design and reduce cabinet size by replacing multiple components with a single compact integrated motor. Fewer individual system components eliminates multiple potential

failure points, and lowers risk of electrical noise by eliminating cabling between motor and drive.

These compact, powerful and cost effective motion control solutions deliver exceptional smoothness and performance that can reduce system cost, design and assembly time for a large range of 2-phase stepper motor applications.



MDI•14 MDrive Plus programmable Motion Control products: integrated NEMA14 motor and controls, IP20-rated

### General features

Compact integrated microstepping drive, programmable motion controller and NEMA14 1.8° 2-phase stepper motor	
Advanced current control for exceptional performance and smoothness	
+12 to +48 VDC single supply	
20 microstep resolutions up to 51,200 steps per rev including: Degrees, Metric, Arc Minutes	
Auxiliary logic power supply input	
0 to 5 MHz step clock rate selectable in 0.59 Hz increments	
Up to 8 I/O lines	
One 10 bit selectable analog input	
Communication	RS-422/485
Protection	IP20 rating
Programmable	Motor run/hold current
Available options	Motor stack lengths
	Long life linear actuators (1)
	Encoders
	Rear control knob for manual positioning
Graphical user interface provided for quick and easy parameter setup	

(1) Refer to MDrive Linear Actuator documentation.

# MDrive Plus

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### Specifications

Communication	Protocol type	RS-422/485	4.8 to 115.2 kbps baud rate	
Input power	Voltage	VDC	+12...+48	
	Current maximum (1)	Amp	1.0	
Motor	Frame size	NEMA	14	
		inches	1.4	
		mm	35	
	Holding torque	oz-in	18...36	
		N-cm	13...25	
Length	stack sizes	1 & 3		
Thermal	Operating temp non-condensing	Heat sink maximum	85°C	
		Motor maximum	100°C	
Protection	Type	IP rating	IP20	
		I/O warnings	Over temp, short circuit, transient, over voltage, inductive clamp	
Auxiliary logic input	Voltage range		+12 to +24 VDC When input voltage is removed, maintains power only to control and feedback circuits.	
Analog input	Resolution		10 bit	
	Voltage range		0 to +5 VDC, 0 to +10 VDC, 0-20 mA, 4-20 mA	
General purpose I/O	Output sinking current		Up to 600 mA	
	Plus products	Number	4	
		Type		Sourcing or sinking inputs, or sinking outputs
		Logic range		Inputs and outputs tolerant to +24 VDC, inputs TTL level compatible
	Plus <sup>2</sup> products	Number		8 or 4 (2)
		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	
Motion	Open loop configuration	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)	
	Counters	Type		Position, encoder / 32 bit
		Edge rate maximum		5 MHz
	Velocity	Range		+/- 5,000,000 steps per second
		Resolution		0.5961 steps per second
	Accel/Decel	Range		1.5 to 10 <sup>9</sup> steps per second <sup>2</sup>
		Resolution		90.9 steps per second <sup>2</sup>
	Position feedback	Optional		Encoder required
	Expanded motion Plus <sup>2</sup> products only	Electronic gearing external clock in (3)	Range	0.001 to 2.000
			Resolution	32 bit
Threshold			TTL	
High speed I/O		Position capture		Input filter range 50 nS to 12.9 μS (10 MHz to 38.8 kHz) Resolution 32 bit
		Trip output		Speed 150 nS Resolution 32 bit Threshold TTL
				Remote encoder interface required
Software		Program storage	Type/size	Flash/6384 bytes
	User registers		Four 32 bit	
	User program labels & variables		192	
	Math functions		+, -, x, ÷, >, <, <=, >=, AND, OR, XOR, NOT	
	Branch functions		Branch and Call	
	General purpose I/O functions	Inputs	home, limit plus, limit minus, go, stop, pause, jog plus, jog minus, general purpose	
		Outputs	moving, fault, stall, velocity change, general purpose	
	Trip functions		Trip on input, trip on position, trip on time, trip capture, trip on relative position	
	Party mode addresses		62	
	Encoder functions		Stall detection, position maintenance, find index	

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

(2) I/O is reduced from 8 to 4 for products with remote encoder option.

(3) Adjusting the microstep resolution can increase the range.

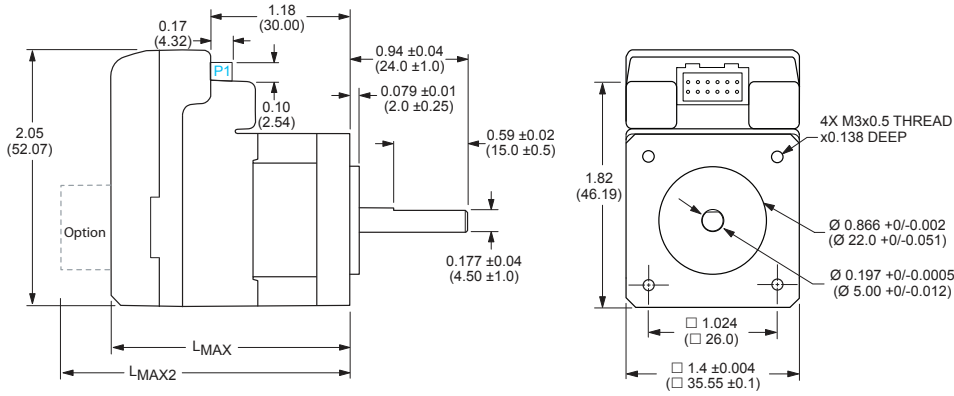
# MDrive Plus

## MDI•14 programmable Motion Control

### Dimensions

#### MDI•14 NEMA14 motor, IP20-rated, Plus version

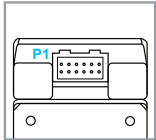
inches (mm)



Motor stack length	L <sub>max</sub>	L <sub>max2</sub>
Single	1.93 (49.02)	2.62 (66.55)
Triple	3.03 (76.96)	3.73 (94.74)

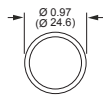
#### P1 connector

I/O, Power & Communication



12-pin locking wire crimp connector

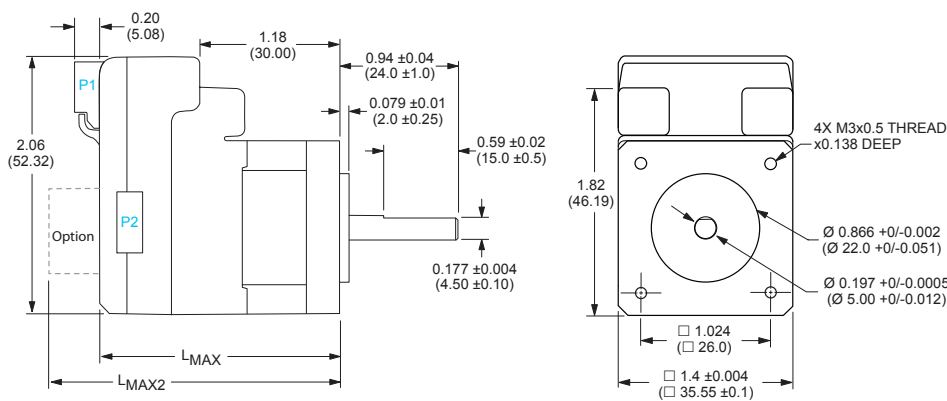
#### L<sub>max2</sub> option



control knob – 20 in-lb / 225 N-cm max torque

#### MDI•14 NEMA14 motor, IP20-rated, Plus<sup>2</sup> version

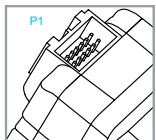
inches (mm)



Motor stack length	L <sub>max</sub>	L <sub>max2</sub>
Single	1.93 (49.02)	2.62 (66.55)
Triple	3.03 (76.96)	3.73 (94.74)

#### P1 connector

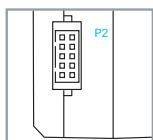
I/O, Power, Remote encoder



16-pin locking wire crimp connector

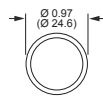
#### P2 connector

Communication



10-pin friction lock wire crimp connector

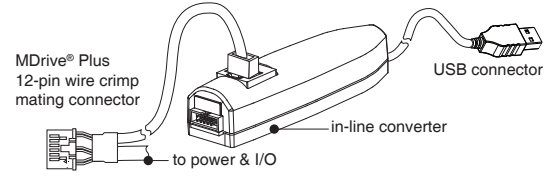
#### L<sub>max2</sub> option



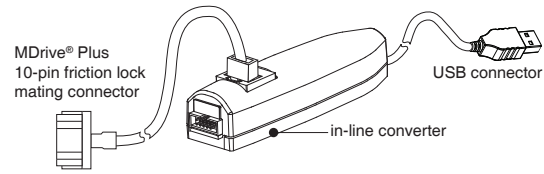
control knob – 20 in-lb / 225 N-cm max torque

# MDrive Plus

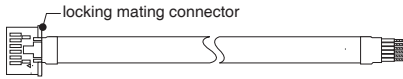
## MDI•14 programmable Motion Control



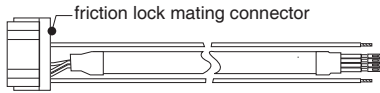
MD-CC403-001



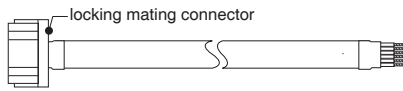
MD-CC402-001



PD12B-1434-FL3



PD10-1434-FL3



PD16-1417-FL3

### Accessories

description	length feet (m)	part number
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#### QuickStart Kit

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

For all MDrive14 programmable Motion Control products	—	add "K" to part number
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#### Communication converter

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

Mates to 12-pin locking wire crimp connector	12.0 (3.6)	MD-CC403-001
Mates to 10-pin friction lock wire crimp connector	12.0 (3.6)	MD-CC402-001

#### Prototype development cable

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

Mates to 12-pin locking wire crimp connector for I/O, power and communication	10.0 (3.0)	PD12B-1434-FL3
Mates to 10-pin friction lock wire crimp connector for comm	10.0 (3.0)	PD10-1434-FL3
Mates to 16-pin locking wire crimp connector for I/O, power and remote encoder option	10.0 (3.0)	PD16-1417-FL3

#### Mating connector kits

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

12-pin locking wire crimp connector for I/O, power and communication	—	CK-08
10-pin friction lock wire crimp connector for communication	—	CK-02
16-pin locking wire crimp connector for I/O, power and remote encoder option	—	CK-10

#### Drive protection module

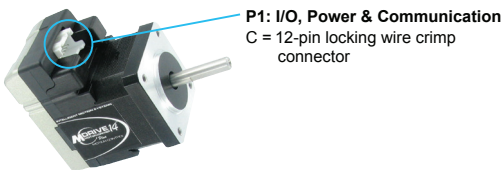
Limits surge current and voltage to a safe level when DC input power is switched on-and-off to an MDrivePlus.

For all MDrive14 programmable Motion Control products	—	DPM75
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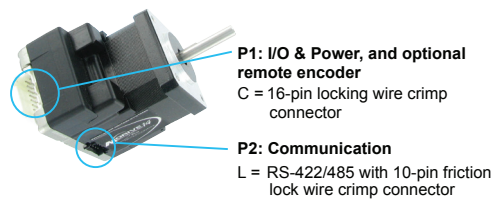
# MDrive Plus

## MDI•14 programmable Motion Control

MDrive® 14 Plus IP20



MDrive® 14 Plus<sup>2</sup> IP20



### Part numbers

#### IP20-rated products

example part number	K	M	D	I	1	C	R	Z	1	4	A	4	-N
<b>QuickStart Kit</b> K = kit option, omit from part number if unwanted	K	M	D	I	1	C	R	Z	1	4	A	4	-N
<b>MDrivePlus version</b> MDI = Intelligent — programmable Motion Control	K	M	D	I	1	C	R	Z	1	4	A	4	-N
<b>Input</b> 1 = Plus version with standard features 3 = Plus <sup>2</sup> version with expanded features	K	M	D	I	1	C	R	Z	1	4	A	4	-N
<b>P1 connector</b> C = wire crimp	K	M	D	I	1	C	R	Z	1	4	A	4	-N
<b>Communication type</b> R = RS-422/485	K	M	D	I	1	C	R	Z	1	4	A	4	-N
<b>P2 connector</b> Z = none (only for Plus products) L = wire crimp (only for Plus <sup>2</sup> products)	K	M	D	I	1	C	R	Z	1	4	A	4	-N
<b>Motor size</b> 14 = NEMA 14 1.4" / 36mm	K	M	D	I	1	C	R	Z	1	4	A	4	-N
<b>Motor length</b> A = single stack C = triple stack	K	M	D	I	1	C	R	Z	1	4	A	4	-N
<b>Drive voltage</b> 4 = +12 to +48 VDC	K	M	D	I	1	C	R	Z	1	4	A	4	-N
<b>Options</b> — omit from part number if unwanted													-N
-N = rear control knob for manual positioning													
-EQ = internal 512-line magnetic encoder w/ index mark													
-EE (1) = remote differential encoder interface; encoder not supplied													

(1) Only available with Plus<sup>2</sup> products.

# MDrive Plus

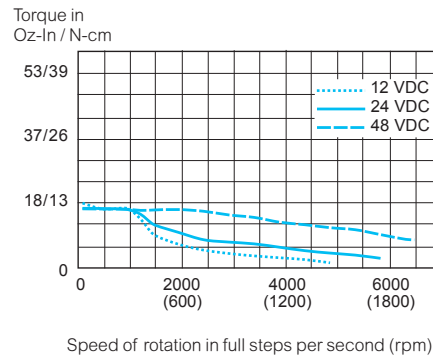
## MDI•14 programmable Motion Control

### Motor performance

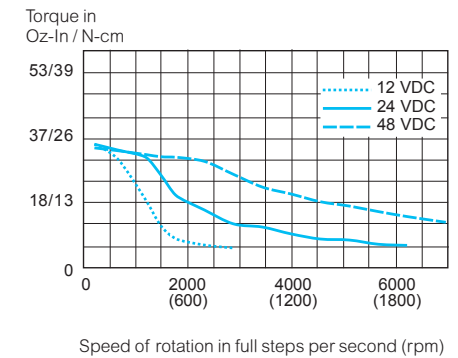
MD•14 NEMA 14 motor specifications	Motor	Stack length	Single	Triple
Holding torque		oz-in	18	36
		N-cm	13	25
Detent torque		oz-in	2.0	4.4
		N-cm	1.4	3.1
Rotor inertia		oz-in-sec <sup>2</sup>	0.000198	0.000801
		kg-cm <sup>2</sup>	0.014	0.0566
Weight (motor+driver)		oz	5.29	12.8
		g	150	380

### MD•14 NEMA 14 speed torque (1)

Single stack length



Triple stack length



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