

# MDrive® Plus

## MDI•23 Ethernet

### Product overview

MDrive® Plus Ethernet products integrate 1.8° 2-phase stepper motor, motion controller, drive electronics and optional encoder.

MDrive products are EtherNet/IP adapter class devices capable of explicit or implicit messaging. ODVA compliance also enables standardized interface with many other manufacturer systems.

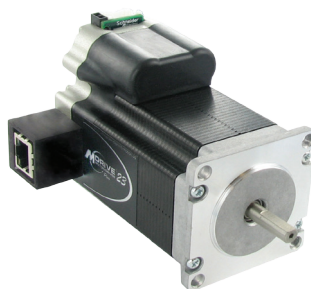
ModbusTCP protocol is also supported, operating in immediate mode, not programmable products. Communication may also be via MCode/TCP, a version of the MCode instruction set used for RS-422/485 serial communication products, adapted to utilize TCP/IP message formatting.

### 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.



MDrive Plus MDI•23 Ethernet products: integrated NEMA23 motor and controls, IP20-rated

### General features

Compact integrated microstepping drive, motion controller and NEMA23 1.8° 2-phase stepper motor	
ODVA compliant EtherNet/IP protocol with standard TCP/IP stack and virtually unlimited nodes	
Dynamic mapping of assembly object	
Explicit and implicit messaging	
Advanced current control for exceptional performance and smoothness	
+12 to +75 VDC single supply	
20 microstep resolutions up to 51,200 steps per rev including: Degrees, Metric, Arc Minutes	
0 to 5 MHz step clock rate selectable in 0.59 Hz increments	
One 10 bit selectable analog input	
Communication	EtherNet/IP, ModbusTCP, MCode/TCP
Protection	IP20 rating
Available options	Motor stack lengths
	Encoder
Graphical user interface provided for quick and easy parameter setup	

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### Specifications

Communication	Protocol types		EtherNet/IP (ODVA compliant)	
			ModbusTCP	
			MCode/TCP on configuration port	
	Baud rate		100 Mbps	
	Configuration port		503	
Input power	Voltage	VDC	+12...+75 for motor stack lengths: single, double, triple +12...+60 for motor stack length: quad	
	Current maximum (1)	Amp	2.0 for motor stack lengths: single, double, triple 3.5 for motor stack length: quad	
Motor	Frame size	NEMA	23	
		inches	2.3	
		mm	57	
	Holding torque	oz-in	90...283	
N-cm		64 ... 200		
Length	stack sizes	1, 2, 3 & 4		
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	
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 sink/source current		Up to 600 mA	
	Number		4	
	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	
	Electronic gearing external clock in (2)	Range	0.001 to 2.000	
		Resolution	32 bit	
		Threshold	TTL	
		Secondary clock out range	1 to 1	
	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	
Software	Device class		Adapter	
	Message types		Explicit or implicit	
	Assembly object 0x04	Output (T→O)	Instance	100
		Output (O→T)	Instance	112
		Mapping to MCode		Dynamic
	Device profile	Identity object		0x01
		Assembly object		0x04
		TCP object		0x05
Ethernet link object		0xF6		
Manufacturer specific objects		0x64: Setup 0x65: Miscellaneous 0x66: Motion 0x67: Hardware inputs/outputs 0x68: Position 0x69: Encoder		
		0x64: Setup 0x65: Miscellaneous 0x66: Motion 0x67: Hardware inputs/outputs 0x68: Position 0x69: Encoder 0x6A: Hybrid Motion Technology		

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

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



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### Accessories

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

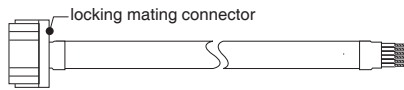
For rapid design verification, all-inclusive QuickStart Kits includes prototype development cables and a communication converter for MDrivePlus initial functional setup and system testing.

For all MDrive23 Ethernet products	—	add "K" to part number
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#### Prototype development cable

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

Mates to 14-pin locking wire crimp connector for I/O and remote encoder option	10.0 (3.0)	PD14-2334-FL3
Mates to 2-pin locking wire crimp connector for power	10.0 (3.0)	PD02-2300-FL3



PD14-2334-FL3



PD02-2300-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.

14-pin locking wire crimp connector for I/O and remote encoder option	—	CK-09
2-pin locking wire crimp connector for power	—	CK-04

#### Drive protection module

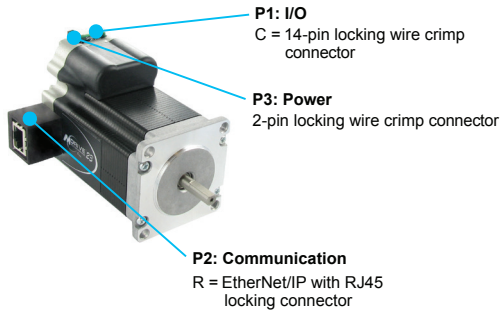
Limits surge current and voltage to a safe level when DC input power is switched on-and-off to an MDrivePlus.

For all MDrive23 Ethernet products	—	DPM75
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# MDrive Plus

## MDI•23 Ethernet

MDrive® 23 EtherNet/IP IP20



### Part numbers,

#### IP20-rated products

example part number	K M D I 3 C I R 2 3 A 7 -EQ
<b>QuickStart Kit</b> K = kit option, omit from part number if unwanted	K M D I 3 C I R 2 3 A 7 -EQ
<b>MDrivePlus version</b> MDI = Intelligent — Ethernet	K M D I 3 C I R 2 3 A 7 -EQ
<b>Input</b> 3 = Plus <sup>2</sup> version with expanded features	K M D I 3 C I R 2 3 A 7 -EQ
<b>P1 connector</b> C = wire crimp	K M D I 3 C I R 2 3 A 7 -EQ
<b>Communication type</b> I = Ethernet	K M D I 3 C I R 2 3 A 7 -EQ
<b>P2 connector</b> R = RJ45	K M D I 3 C I R 2 3 A 7 -EQ
<b>Motor size</b> 23 = NEMA 23 2.3" / 57mm	K M D I 3 C I R 2 3 A 7 -EQ
<b>Motor length</b> A = single stack B = double stack C = triple stack D = quad stack	K M D I 3 C I R 2 3 A 7 -EQ
<b>Drive voltage (3)</b> 7 = +12 to +75 VDC 6 = +12 to +60 VDC	K M D I 3 C I R 2 3 A 7 -EQ
<b>Options</b> — omit from part number if unwanted -EQ = internal 512-line magnetic encoder w/ index mark	-EQ

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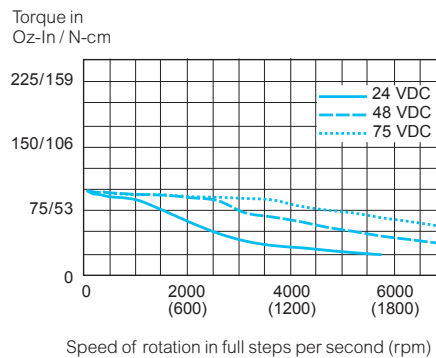
## MDI•23 Ethernet

### Motor performance

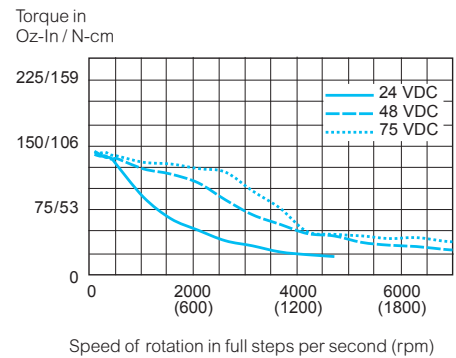
MD•23 NEMA 23 motor specifications	Motor	Stack length	Single	Double	Triple	Quad
			Holding torque	oz-in	90	144
		N-cm	64	102	169	200
Detent torque		oz-in	3.9	5.6	9.7	14.2
			N-cm	2.7	3.9	6.9
Rotor inertia		oz-in-sec <sup>2</sup>	0.0025	0.0037	0.0065	0.0108
		kg-cm <sup>2</sup>	0.18	0.26	0.46	0.76
Weight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

### MD•23 NEMA 23 speed torque (1)

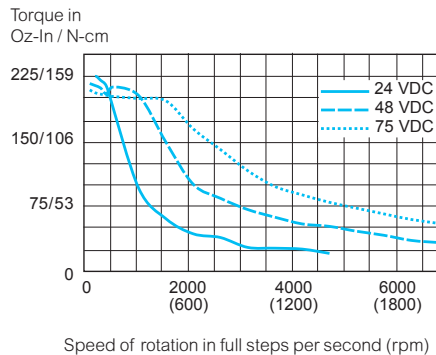
Single stack length



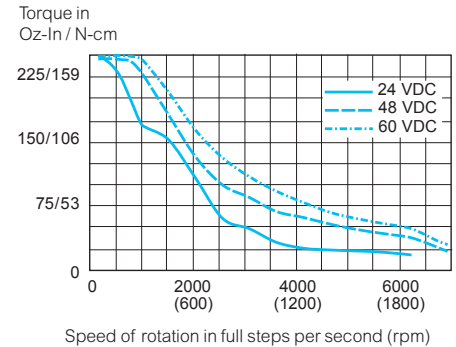
Double stack length



Triple stack length



Quad stack length



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

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Intelligent motion systems

