


MDrive[®] EtherNet/IP[™]

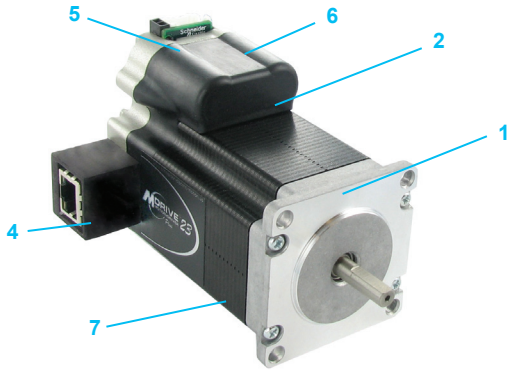
Integrated all-in-one motion systems
for industrial automation



MDrive 23 EtherNet/IP
Integrated rotary motor products

CE  **EtherNet/IP[™]**
conformance tested

Schneider
 **Electric**



- 1 stepper motor
- 2 microstepping drive
- 3 integrated controller version
- 4 EtherNet/IP protocol
- 5 internal encoder
- 6 4 I/O lines
- 7 control options: Plus or Hybrid Motion Technology

Product offer

MDrive® EtherNet/IP™ products are compact motion solutions, integrating a stepper motor and electronics all in one package. MDrive EtherNet/IP products are ODVA™ compliant and interface with many manufacturer's systems, including Rockwell, Omron and Schneider Electric.

MDrivePlus EtherNet/IP products combine a 1.8° 2-phase stepper motor with on-board I/O and motion controller, drive electronics and optional encoder.

MDrive Hybrid systems add Hybrid Motion Technology™ (HMT) and an integral encoder to MDrivePlus product features. HMT combines the best of servo and stepper motor technologies, while delivering unique capabilities and enhancements over both, including:

- real time closed loop control
- no loss of synchronization
- full use of motor torque
- torque mode control
- reduced motor heat (1)
- lower energy consumption (1)

EtherNet/IP is an extension of the CIP™ (Common Industrial Protocol), the same upper layer protocol and object model used in DeviceNet™ and ControlNet™ utilizing the standard TCP/IP stack. As an adapter class device, MDrive EtherNet/IP products are capable of explicit or implicit messaging.

Configuration utility

MDrive EtherNet/IP products have a configuration port provided for setting the IP address. Windows-based TCP/IP Configuration Utility sets parameters and assembly object mapping.

Application areas

The MDrive EtherNet/IP product is ideal for machine builders who want an optimized motor with on-board electronics and support for the widely used Ethernet industrial protocol. MDrive products are compact motion control solutions that can reduce system cost, design and assembly time for a wide range of motion applications.

Features

- Highly integrated microstepping drive and high torque NEMA 23 1.8° 2-phase stepper motor
- Hybrid Motion Technology version
- Advanced current control for exceptional performance and smoothness
- Single supply: from +12 up to +75 VDC
- Cost effective
- Extremely compact
- EtherNet/IP industrial protocol
- Standard TCP/IP stack with virtually unlimited nodes
- Dynamic mapping of assembly object
- Explicit and implicit messaging
- ODVA compliant
- 20 microstep resolutions to 51,200 steps/rev including: Degrees, Metric, Arc Minutes
- Auxiliary logic power supply input
- Open or optional closed loop control
- Programmable motor run and hold currents
- Four +5 to +24 VDC I/O lines accept sourcing or sinking inputs or outputs
- High speed position capture input or trip output
- One 10 bit analog input selectable: 0 to +10 VDC, 0 to +5 VDC, 0-20 mA, 4-20 mA
- 0 to 5 MHz step clock rate selectable in 0.59 Hz increments
- Long life linear actuator option (2)
- Several motor stack lengths available
- Graphical user interface provided for quick and easy configuration

(1) Achieved with Hybrid Motion Technology variable current control.

(2) See separate documentation.

Specifications			MDrive 23 Plus	MDrive 23 Hybrid	
Input power	Voltage		12 to 75 VDC (1)	12 to 60 VDC	
	Current maximum (2)		2A	3.5A	
Thermal	Operating temp non-condensing	Heat sink	-40° to +85°C		
		Motor	-40° to +100°C		
Aux. logic input	Voltage range (3)		+12 to +24 VDC		
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	Number		4		
	Type		Sourcing or sinking outputs/inputs		
	Logic range		Sourcing outputs +12 to 24 VDC, inputs&sinking outputs tolerant to +24 VDC, inputs TTL level compatible		
	Output sink/source current		Up to 600 mA		
Communication	Protection		Over temp, short circuit, transient, over voltage, inductive clamp		
	Type		Ethernet TCP/IP		
	Protocols		EtherNet/IP (ODVA compliant) MCode/TCP on configuration port		
	Baud rate		100 Mbps		
	Configuration port		503		
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		
	Closed loop configuration	Steps per revolution	512 lines/2048 edges per rev	1000 lines/4000 edges per rev	
		Encoder	Differential magnetic (requires option)	Differential magnetic	
	Electronic gearing	External clock in (4)	Range	0.001 to 2.000	
			Resolution	32 bit	
			Threshold	TTL	
		Input filter	Range	50 nS to 12.9 μS (10 MHz to 38.8 kHz)	
	Secondary clock out (4)	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)
	Trip output	Speed	Resolution	32 bit	
			Resolution	150 nS	
Threshold			TTL		
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			
EtherNet/IP	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		

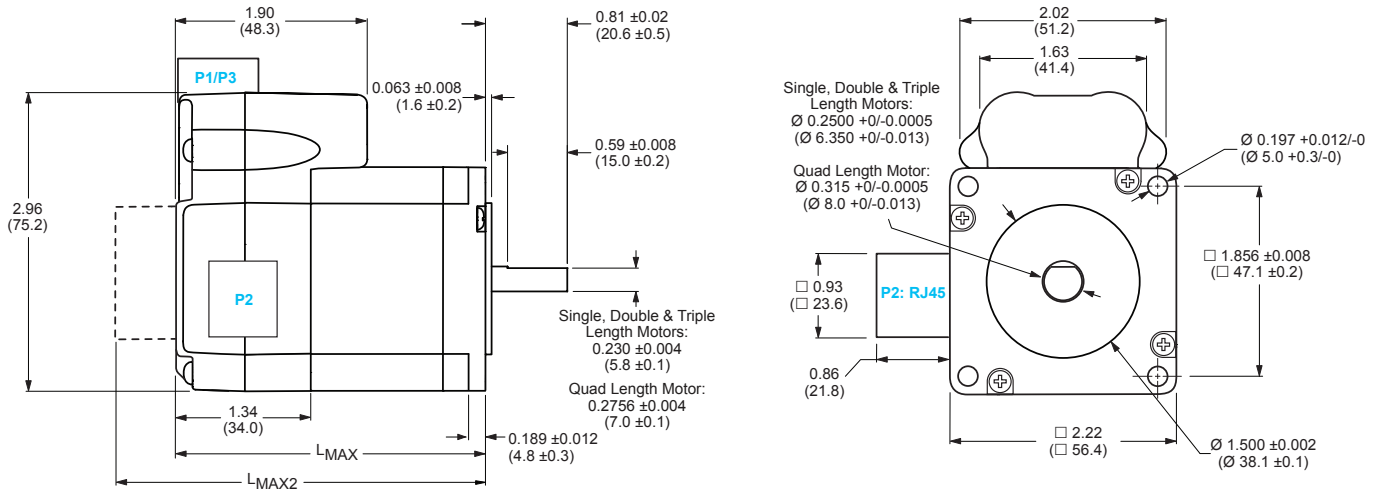
(1) All MDrivePlus motors have +12 to +75 VDC drives, except quad stack motors with +12 to +60 VDC.

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

(3) When input voltage is removed, maintains power only to control and feedback circuits.

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

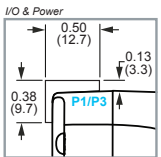
Mechanical specifications, dimensions in inches (mm)



Motor stack length	Lmax	Lmax2 (1)
Single	2.65 (67.31)	3.36 (85.34)
Double	3.02 (76.71)	3.73 (94.74)
Triple	3.88 (98.55)	4.59 (116.59)
Quad	5.28 (134.15)	5.99 (152.19)

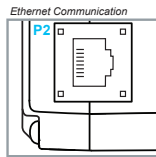
(1) Control knob option only available with MDrive Hybrid products.

P1/P3 connectors



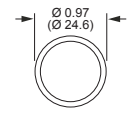
14- & 2-pin locking wire crimp connectors

P2 connector



RJ45 connector

Lmax2 option



control knob (1)

Installation accessories

Description	Length feet (m)	Part number
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QuickStart Kit

For rapid design verification, all-inclusive QuickStart Kits include connectivity, instructions and CD for MDrive product initial functional setup and system testing. Kit includes a 6.0' (1.8m) CAT5 cable with RJ45 ends, not sold alone.

- For MDrive EtherNet/IP products — add "K" to part number (1)

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	10.0 (3.0)	PD14-2334-FL3
■ Mates to 2-pin locking wire crimp connector for power	10.0 (3.0)	PD02-2300-FL3

Mating connector kit

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

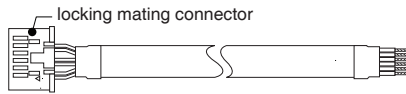
■ 14-pin locking wire crimp connector for I/O	—	CK-09
■ 2-pin locking wire crimp connector for power	—	CK-04

Drive protection module

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

- For all MDrive EtherNet/IP products — **DPM75**

(1) See next page.



PD14-2334-FL3



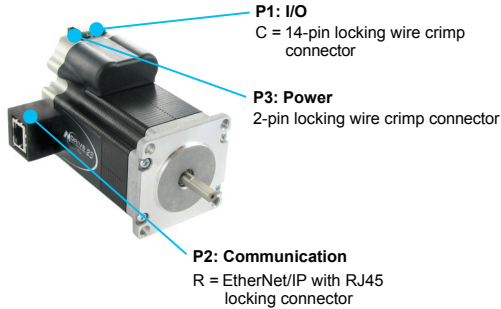
PD02-2300-FL3



MDrive® EtherNet/IP™

MDrive 23 Plus / MDrive 23 Hybrid

MDrive® 23 EtherNet/IP



Part numbers														
Example:	K	M	D	I	3	C	I	R	2	3	A	7	-EQ	-N
QuickStart Kit K = kit option, or leave blank if unwanted	K	M	D	I	3	C	I	R	2	3	A	7	-EQ	-N
MDrive version MDI = MDrive Plus MAI = MDrive Hybrid	K	M	D	I	3	C	I	R	2	3	A	7	-EQ	-N
Input 3 = expanded features	K	M	D	I	3	C	I	R	2	3	A	7	-EQ	-N
P1 connector C = wire crimp	K	M	D	I	3	C	I	R	2	3	A	7	-EQ	-N
Communication I = EtherNet/IP	K	M	D	I	3	C	I	R	2	3	A	7	-EQ	-N
P2 connector R = RJ45	K	M	D	I	3	C	I	R	2	3	A	7	-EQ	-N
Motor size 23 = NEMA 23 (2.3" / 57 mm)	K	M	D	I	3	C	I	R	2	3	A	7	-EQ	-N
Motor length A = single stack B = double stack C = triple stack D = quad stack (1)	K	M	D	I	3	C	I	R	2	3	A	7	-EQ	-N
Drive voltage 7 = +12 to +75 VDC (2) 6 = +12 to +60 VDC (1)	K	M	D	I	3	C	I	R	2	3	A	7	-EQ	-N
Encoder Differential magnetic encoder with index mark, internal to the product, so footprint is unchanged -EQ = MDrive Plus products option, 512-line; omit from part number if unwanted (3) -EJM = Included in all MDrive Hybrid products, 1000-line (4)	K	M	D	I	3	C	I	R	2	3	A	7	-EQ	-N
Option Leave blank if unwanted														-N

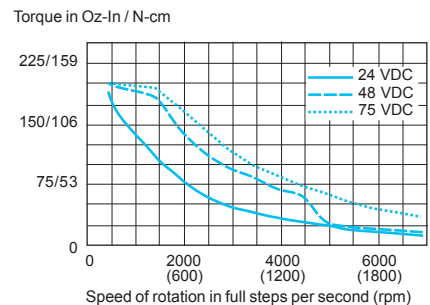
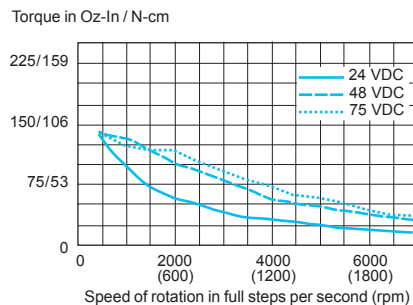
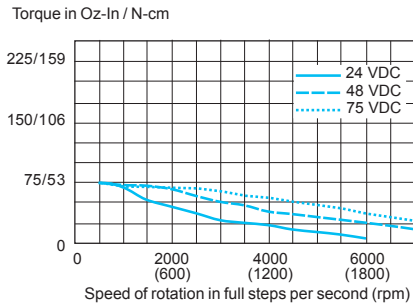
(1) Quad stack motors and all MDrive Hybrid products have +12 to +60 VDC drives.
 (2) MDrive Plus products with single, double and triple stack motors have +12 to +75 VDC drives.
 (3) Available for MDrive Plus products only.
 (4) Available for MDrive Hybrid products only.

Motor specifications MDrive 23

		Holding torque	Detent torque	Rotor inertia	Weight (motor + driver)
Motor stack length	Single	90.0 oz-in / 64.0 N-cm	3.9 oz-in / 2.7 N-cm	0.0025 oz-in-sec ² / 0.18 kg-cm ²	24 oz / 680 g
	Double	144.0 oz-in / 102.0 N-cm	5.6 oz-in / 3.92 N-cm	0.0037 oz-in-sec ² / 0.26 kg-cm ²	28 oz / 794 g
	Triple	239.0 oz-in / 169.0 N-cm	9.7 oz-in / 6.86 N-cm	0.0065 oz-in-sec ² / 0.46 kg-cm ²	41 oz / 1162 g
	Quad	283.0 oz-in / 200.0 N-cm	14.2 oz-in / 10.0 N-cm	0.0108 oz-in-sec ² / 0.76 kg-cm ²	63 oz / 1786 g

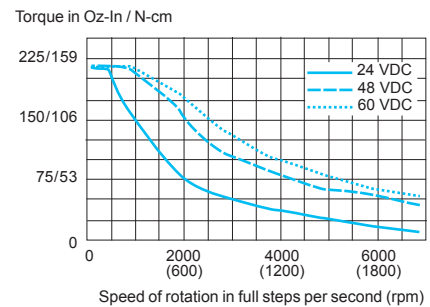
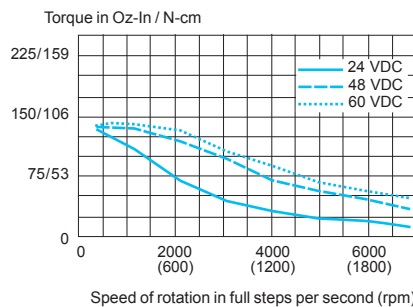
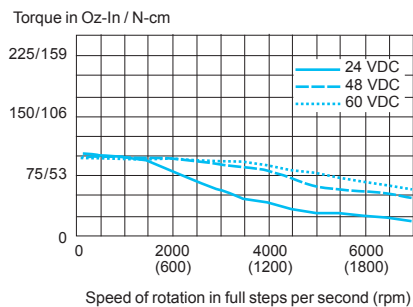
Speed torque characteristics MDrive 23 Plus

Single stack length Double stack length Triple stack length



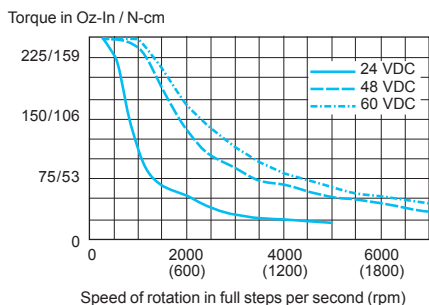
Speed torque characteristics MDrive 23 Hybrid

Single stack length Double stack length Triple stack length



Speed torque characteristics MDrive23 Plus & Hybrid

Quad stack length



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