MDrive® EtherNet/IP™

Integrated all-in-one motion systems for industrial automation

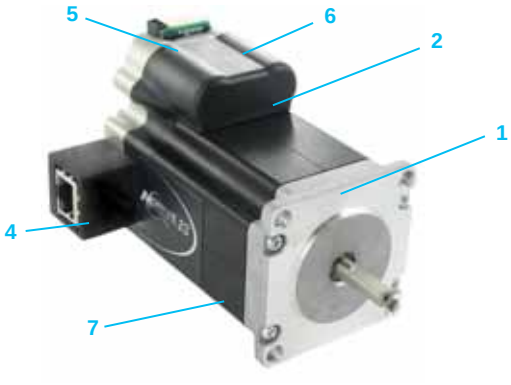
MDrive 23 EtherNet/IP
Integrated rotary motor products

CE RoHS EtherNet/IP™ conformance tested

Schneider Electric

MDrive® EtherNet/IP™

MDrive 23 Plus / MDrive 23 Hybrid



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.

MDrive Plus 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 MDrive Plus 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.

MDrive® EtherNet/IP™

MDrive 23 Plus / MDrive 23 Hybrid

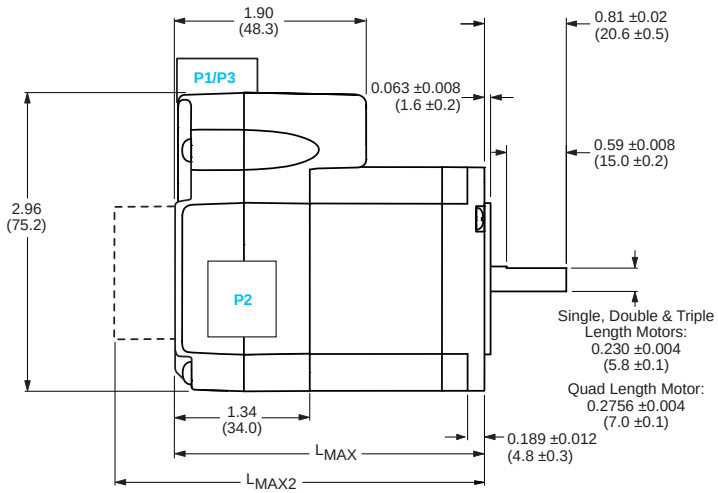
Specifications

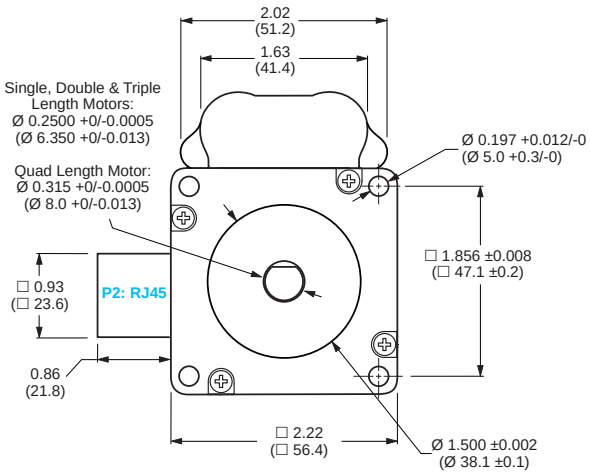
				MDrive 23 Plus	MDrive 23 Hybrid
Input power	Voltage			12 to 75 VDC *(1)*	12 to 60 VDC
	Current maximum *(2)*			2A	3.5A
Thermal	Operating temp non-condensing	Heat sink		–40° to +85°C	
		Motor		–40° to +100°C	
Aux. logic input	Voltage range *(3)*			+12 to +24 VDC	
Analog input	Resolution			10 bit	
	Voltage 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	
	Protection			Over temp, short circuit, transient, over voltage, inductive clamp	
Communication	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	unavailable
			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)	
			Resolution	32 bit	
		Trip output	Speed	150 nS	
			Resolution	32 bit	
			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.

See User Manual for complete details: www.imshome.com/manuals.html

Mechanical specifications, dimensions in inches (mm)

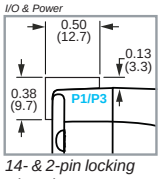




Motor stack length	Lmax	Lmax2 *(1)*
Single	2.65 (67.31)	3.36 (85.34)
Double	3.02 (76.71)	3.73 (94.74)
Triple	3.88 (98.55)	4.59 (116.59)
Quad	5.28 (134.15)	5.99 (152.19)

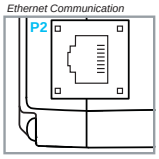
(1) Control knob option only available with MDrive Hybrid products.

P1/P3 connectors



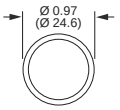
14- & 2-pin locking wire crimp connectors

P2 connector



RJ45 connector

Lmax2 option

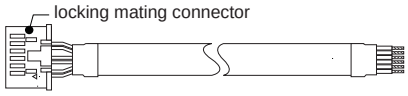


control knob (1)

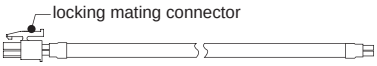
See User Manual for complete details: www.imshome.com/manuals.html

MDrive® EtherNet/IP™

MDrive 23 Plus / MDrive 23 Hybrid



PD14-2334-FL3



PD02-2300-FL3

Installation accessories

Description	Length feet (m)	Part number
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**

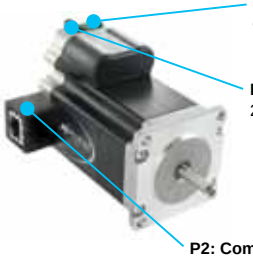
(1) See next page.

Connectivity details: www.imshome.com/connect.html

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** = rear control knob for manual positioning *(4)*														**–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.

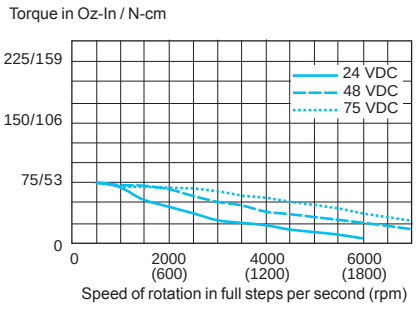
Easy MDrive part numbers via an interactive tool at:
www.imshome.com/MDrivePlus.html

Motor specifications MDrive 23

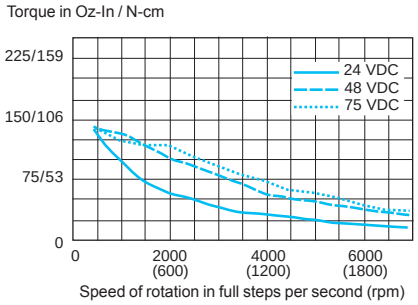
		Holding torque	Detent torque	Rotor inertia	Weight (motor + driver)
Motor stack length	Single	90.0 oz-in / 64.0 N-cm	3.9 oz-in / 2.7 N-cm	0.0025 oz-in-sec^2 / 0.18 kg-cm^2	24 oz / 680 g
	Double	144.0 oz-in / 102.0 N-cm	5.6 oz-in / 3.92 N-cm	0.0037 oz-in-sec^2 / 0.26 kg-cm^2	28 oz / 794 g
	Triple	239.0 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

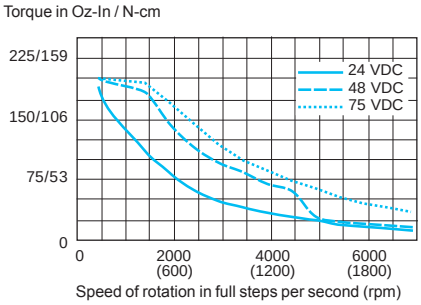
Single stack length



Double stack length

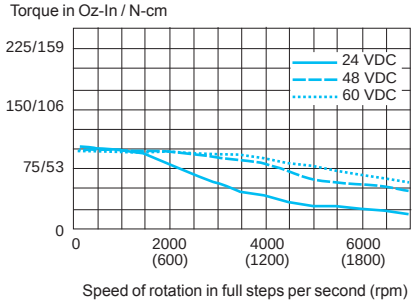


Triple stack length

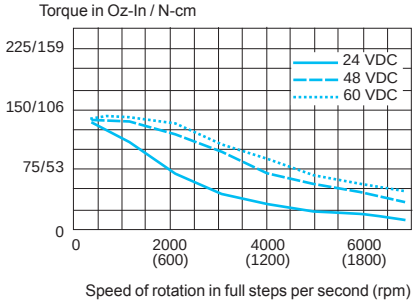


Speed torque characteristics MDrive 23 Hybrid

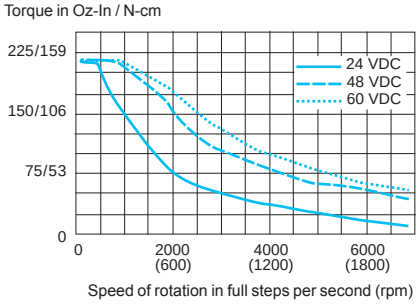
Single stack length



Double stack length

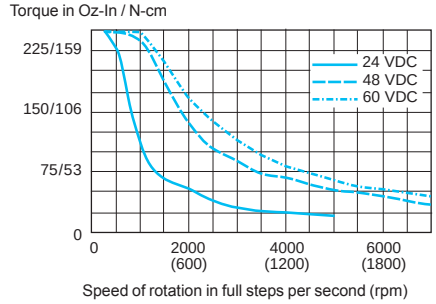


Triple stack length



Speed torque characteristics MDrive23 Plus & Hybrid

Quad stack length



USA SALES OFFICES

Eastern Region
Tel. 862-208-9742 – Fax 973-661-1275
e-mail: e.region@imshome.com

Northeast Region
Tel. 860-368-9703
e-mail: n.region@imshome.com

Central Region
Tel. 860-295-6102
e-mail: c.region@imshome.com

Western Region
Tel. 602-578-7201
e-mail: w.region@imshome.com

EUROPEAN SALES MANAGEMENT
Tel. +33/4 7256 5113 – Fax +33/4 7838 1537
e-mail: europe.sales@imshome.com

TECHNICAL SUPPORT
Tel. +00 (1) 860-295-6102 – Fax +00 (1) 860-295-6107
e-mail: etech@imshome.com

Schneider Electric Motion USA
370 North Main Street
Marlborough, CT 06447 – U.S.A.
Tel. +00 (1) 860-295-6102 – Fax +00 (1) 860-295-6107
e-mail: info@imshome.com
www.imshome.com

Schneider Electric