

# MDrive<sup>®</sup> Hybrid

Integrated motion systems with  
Hybrid Motion Technology™



**MDrive 23 Hybrid**  
CANopen



MDrive® Hybrid CANopen  
Size: 23

### Presentation

The MDrive® Hybrid with CANopen interface is a very compact motion system that solves many servo applications with a low cost solution. The system includes a 1.8° 2-phase stepper motor integrated with a controller and high performance microstepping drive, internal encoder integral to system operation, and Hybrid Motion Technology™ (HMT). HMT combines the best of servo and stepper motor technologies, while delivering unique capabilities and enhancements over both.

IMS CANopen firmware is provided for MDrive Hybrid CANopen systems, in addition to CANopen Tester GUI software for interface with the MD-CC500-000 CANopen dongle.

MDrive Hybrid CANopen systems support CiA DS301 and DSP402 Device Profile for Drives and Motion Control.

### Application areas

The MDrive Hybrid is ideal for machine builders who want a low cost alternative to servo motors and brushed DC motors. The highly compact, integrated electronics of the MDrive Hybrid reduce the potential for problems due to electrical noise by eliminating the cable between motor and drive. This stepper-based system requires no tuning, and provides real-time closed loop control through an internal encoder.

These compact, powerful and cost effective motion control solutions deliver unsurpassed smoothness and performance that will reduce system cost, design and assembly time for a large range of motor applications — both servo and stepper.

### Features

- Highly integrated microstepping drive and high torque 1.8° 2-phase stepper motor
- HMT control for exceptional performance
- Internal encoder
- CANopen communication
- Single supply: from +12 to +60 VDC
- Cost effective
- Extremely compact
- 20 microstep resolutions up to 51,200 steps per rev including: Degrees, Metric, Arc Minutes
- Four motor stack lengths available
- Available options:
  - Long life linear actuator (1)
  - Rear control knob for manual position
  - Drive Protection Module
- Graphical user interface provided for quick and easy configuration and programming

(1) Only available with MDrive23Hybrid systems. See separate documentation.

CANopen specifications			MDrive 23	
<b>Input power</b>	Voltage	VDC	12 to 60	
	Current maximum (1)		3.5A	
<b>Thermal</b>	Operating temp non-condensing	Heat sink	-40° to +85°C	
		Motor	-40° to +100°C	
<b>Auxiliary logic input</b>	Voltage range (2)		+12 to +24 VDC	
<b>Analog input</b>	Resolution		10 bit	
	Voltage range		0 to +5 VDC, 0 to +10 VDC, 0-20 mA, 4-20 mA	
<b>General purpose I/O</b>	Number		8	
	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	
	Output sink current		Up to 600 mA	
	Protection		Over temp, short circuit, transient, over voltage, inductive clamp	
<b>Communication</b>	Type		CANopen CiA DS301 (V3.0), DSP402 (V2.0), 2.0B active	
	Baud rate		Configurable 5 KB to 1 Mb	
	ID		11 and/or 29 bit	
	Isolation		Galvanic	
	Features		Node guarding, heartbeat, SDOs, PDOs (variable mapping)	
<b>Motion</b>	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 x 10 <sup>9</sup> steps per second <sup>2</sup>	
		Resolution	90.9 steps per second <sup>2</sup>	
	<b>Software</b>	Setup parameters		Storable to nonvolatile memory
		Transmit PDOs		3 dynamically mappable
Receive PDOs			3 dynamically mappable	
Manufacturer specific objects			I/O configuration, run/hold current	
Modes of operation			Profile position, homing mode, profile velocity	
Input functions			General purpose, homing mode profiles	
Output functions			General purpose	

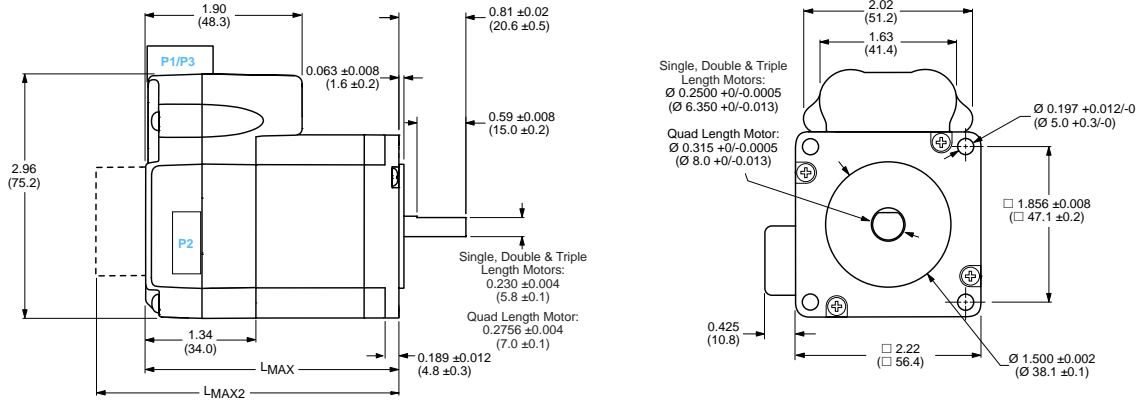
(1) Actual power supply current will depend on voltage and load.

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



See User Manual for complete details: [www.imshome.com/manuals.html](http://www.imshome.com/manuals.html)

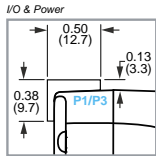
**Mechanical specifications, dimensions in inches (mm)**



Motor stack length	Lmax (1)	Lmax2 (2)
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)

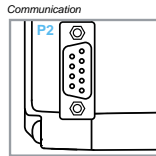
(1) Single shaft.  
(2) Control knob.

**P1/P3 connectors**



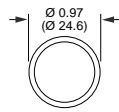
14- & 2-pin locking wire crimp connectors

**P2 connector**

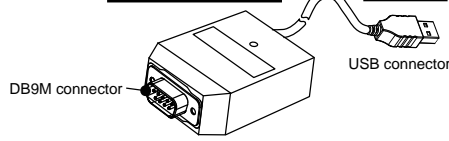
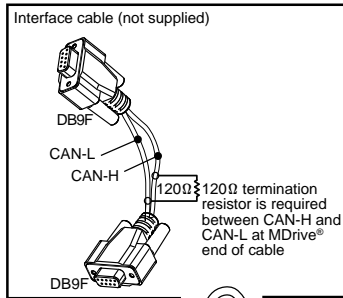


DB9 (male)

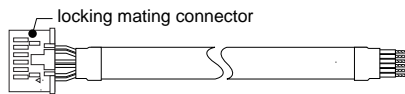
**Lmax2 option**



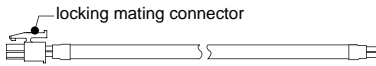
control knob



MD-CC500-000



PD14-2334-FL3



PD02-2300-FL3

### Installation accessories

Description	Length feet (m)	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 MDriveHybrid via a PC's USB port.

- Mates to DB9 connector (1) 12.0 (3.6) **MD-CC500-000**

#### 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 MDriveHybrid.

- For all MDrive23 CANopen products — **DPM75**

(1) Requires mating connector adapter, not supplied.



Connectivity details: [www.imshome.com/connect.html](http://www.imshome.com/connect.html)

MDrive® 23 Hybrid



- P1: I/O**  
C = 14-pin locking wire crimp connector
- P3: Power**  
2-pin locking wire crimp connector
- P2: Communication**  
B = CANopen with DB9 male connector

### Part numbers

Example:	M	A	I	3	C	C	B	2	3	A	6	-EJM	-N
<b>MDrive Hybrid version</b> MAI = CANopen	M	A	I	3	C	C	B	2	3	A	6	-EJM	-N
<b>Type</b> 3 = HMT	M	A	I	3	C	C	B	2	3	A	6	-EJM	-N
<b>P1 connector</b> C = wire crimp	M	A	I	3	C	C	B	2	3	A	6	-EJM	-N
<b>Communication</b> C = CANopen	M	A	I	3	C	C	B	2	3	A	6	-EJM	-N
<b>P2 connector</b> B = DB9	M	A	I	3	C	C	B	2	3	A	6	-EJM	-N
<b>Motor size</b> 23 = NEMA 23 (2.3" / 57 mm)	M	A	I	3	C	C	B	2	3	A	6	-EJM	-N
<b>Motor length</b> A = single stack B = double stack C = triple stack D = quad stack	M	A	I	3	C	C	B	2	3	A	6	-EJM	-N
<b>Drive voltage</b> 6 = +12 to +60 VDC	M	A	I	3	C	C	B	2	3	A	6	-EJM	-N
<b>Encoder, differential</b> -EJM = 1000-line internal encoder	M	A	I	3	C	C	B	2	3	A	6	-EJM	-N
<b>Option</b> Leave blank if not wanted													-N

-N = rear control knob for manual positioning



Easy MDrive part numbers via an interactive tool at:  
[www.imshome.com/MDrivePlus.html](http://www.imshome.com/MDrivePlus.html)

### Motor specifications MDrive 23 Hybrid

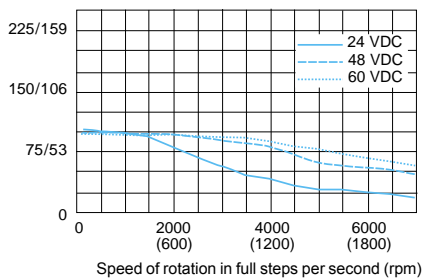
		Holding torque	Detent torque	Rotor inertia	Weight (motor + driver)
Motor stack length	Single	90.0 oz-in / 64.0 N-cm	3.9 oz-in / 2.7 N-cm	0.0025 oz-in-sec <sup>2</sup> / 0.18 kg-cm <sup>2</sup>	21.6 oz / 612.3 g
	Double	144.0 oz-in / 102.0 N-cm	5.6 oz-in / 3.92 N-cm	0.0037 oz-in-sec <sup>2</sup> / 0.26 kg-cm <sup>2</sup>	26.4 oz / 748.4 g
	Triple	239.0 oz-in / 169.0 N-cm	9.7 oz-in / 6.86 N-cm	0.0065 oz-in-sec <sup>2</sup> / 0.46 kg-cm <sup>2</sup>	39.2 oz / 1111.3 g
	Quad	283.0 oz-in / 200.0 N-cm	14.2 oz-in / 10.0 N-cm	0.0108 oz-in-sec <sup>2</sup> / 0.76 kg-cm <sup>2</sup>	61.6 oz / 1746.3 g

### Speed torque characteristics MDrive 23 Hybrid

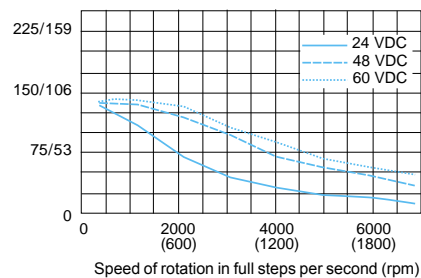
#### Single stack length

#### Double stack length

Torque in Oz-In / N-cm



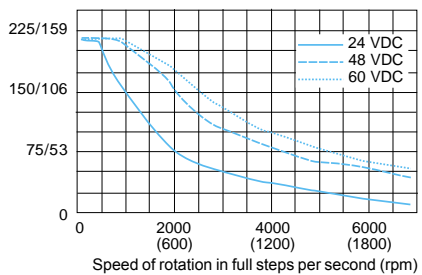
Torque in Oz-In / N-cm



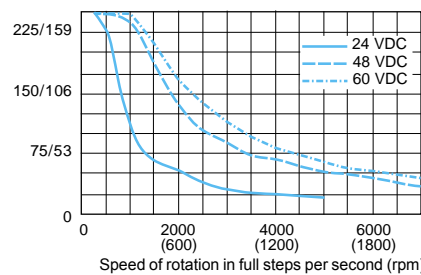
#### Triple stack length

#### Quad stack length

Torque in Oz-In / N-cm



Torque in Oz-In / N-cm



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