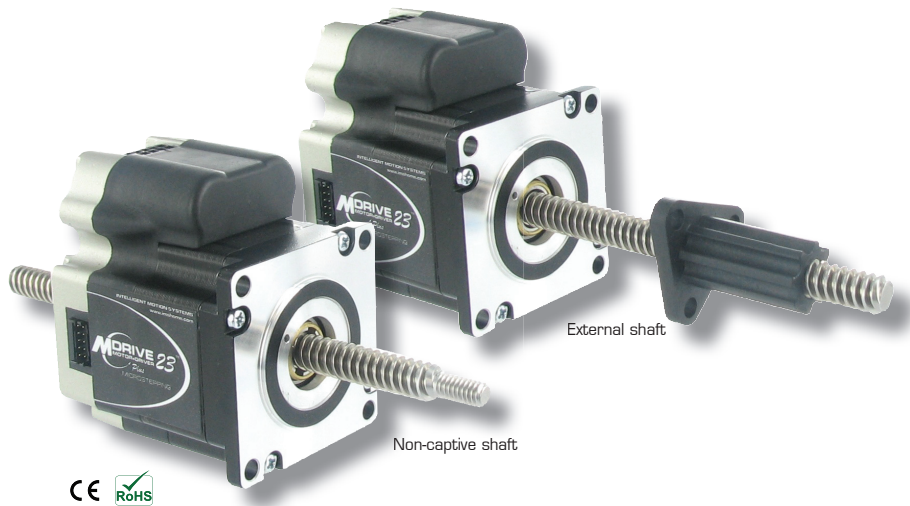


M DRIVE[®] 23 LINEAR ACTUATORS

MOTOR+DRIVER *Plus* or Hybrid

MDrive[®] Linear Actuators combine leading all-in-one integrated step motor+driver technology with linear motion to deliver long life, high accuracy and unsurpassed repeatability, all in a package that is extremely compact and affordable.



MDrive[®] 23 Linear Actuators feature high torque NEMA 23 (2.3"/57mm sq.) 1.8° linear actuator step motors integrated with electronics. A broad input voltage range from +12 up to +75 VDC and an extended operating range of -40° to +85°C provide long life, trouble free service in demanding environments.

These linear motion systems deliver high accuracy and unsurpassed repeatability with a load limit of up to 200lbs. Precision rolled lead screws are corrosion resistant stainless steel with an optional coating.

Linear actuator styles

Non-captive shaft

A threaded shaft runs through the MDrive product and moves axially as the motor rotates.

External shaft

A rotating screw, integral to the MDrive rotor, moves the nut axially along the threaded shaft.

MDrive 23 control options

MDrive Plus

There are two all-in-one linear MDrive Plus versions:

- **Microstepping, motor + driver**
for step and direction motion, SPI interface
- **Motion Control, motor + driver + controller**
fully programmable, RS-485 or CANopen interface
stand-alone solution can be used without a PLC

MDrive Hybrid

Linear products are available with Hybrid Motion Technology™ (HMT) – a revolutionary motion control technology that prevents loss of synchronization (unintentional stalling) due to transient or continued overload, extreme acceleration or deceleration, or excessive slew speed. Versions are:

- **Step • Torque • Speed, three operating modes**
all-in-one motor + driver + encoder + HMT
- **Motion Control, fully programmable**
motor + driver + controller + encoder + HMT



MDrive Plus vs. MDrive Hybrid — select the control option that is best for your linear application . . .

- What are the demands of your application?
- For a simple point-to-point move profile with steady force, MDrive Plus is likely sufficient.
- To regulate and maintain torque at a set level, MDrive Hybrid offers Torque Mode.
- MDrive Plus is a lower cost system than MDrive Hybrid.
- There is no change in the form factor between the two control options.



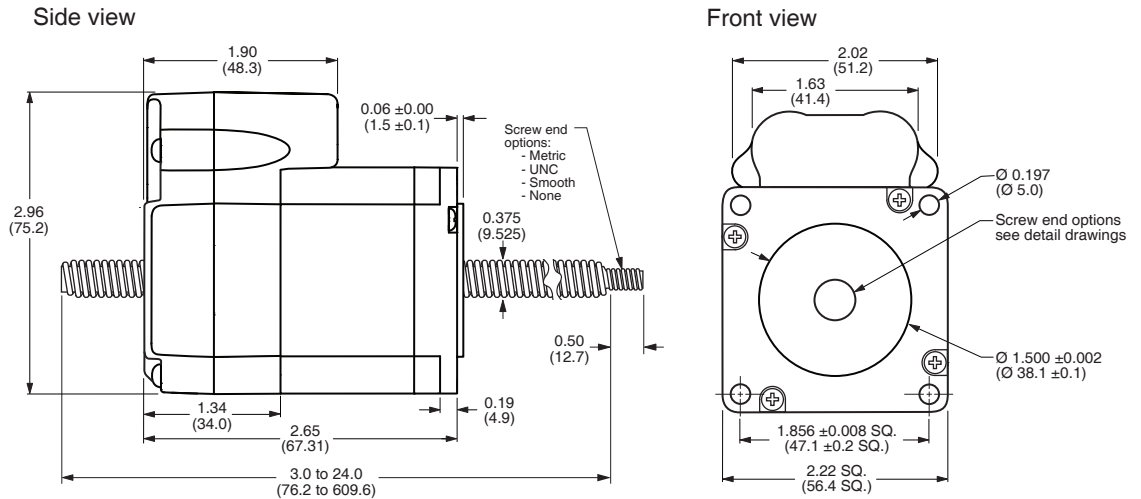
Non-captive shaft



A threaded shaft extends through the MDrive® product and moves axially as the motor rotates

Mechanical specifications

Dimensions in inches (mm)



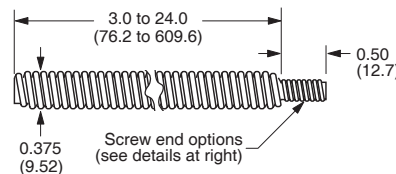
Load limit
 Nominal load limit: 200 lbs (91 kg)

Screw specifications

Screw material
 MDrive Linear Actuator precision rolled lead screws are designed specifically for motion control applications to deliver maximum life and quiet operation. Corrosion resistant and non-magnetic, screws are manufactured from premium grade stainless steel.

Screw coating
 An optional teflon screw coating is available for smooth operation and extended life.

Standard screw
 Dimensions in inches (mm)



Lead options

	inches (mm)	Travel/revolution	Travel/full step
Screw G	0.3750 (9.525)	0.001875 (0.0476)	
Screw A	0.200 (5.08)	0.001 (0.0254)	
Screw B	0.1670 (4.233)	0.000835 (0.0212)	
Screw D	0.0833 (2.116)	0.0004165 (0.0106)	

Screw end options

<p>Threaded end</p>	<p>Metric end: M6 x 1.0mm thread to within 0.03" (0.76mm) of shoulder</p> <p>UNC end: 1/4-20 UNC-2A thread to within 0.05" (1.3mm) of shoulder</p>
<p>Smooth end</p>	<p>Ø 0.2362" ± 0.001 (Ø 6mm ± 0.003)</p>
<p>None</p>	<p>—</p>

Cantilevered loads

Unsupported loads and side loading are not recommended for non-captive shaft MDrive® linear actuator products.

Calculating screw length

Screw length = [mounting surface plate thickness] + [1.8" (45.7mm)] + [desired stroke length]

External shaft



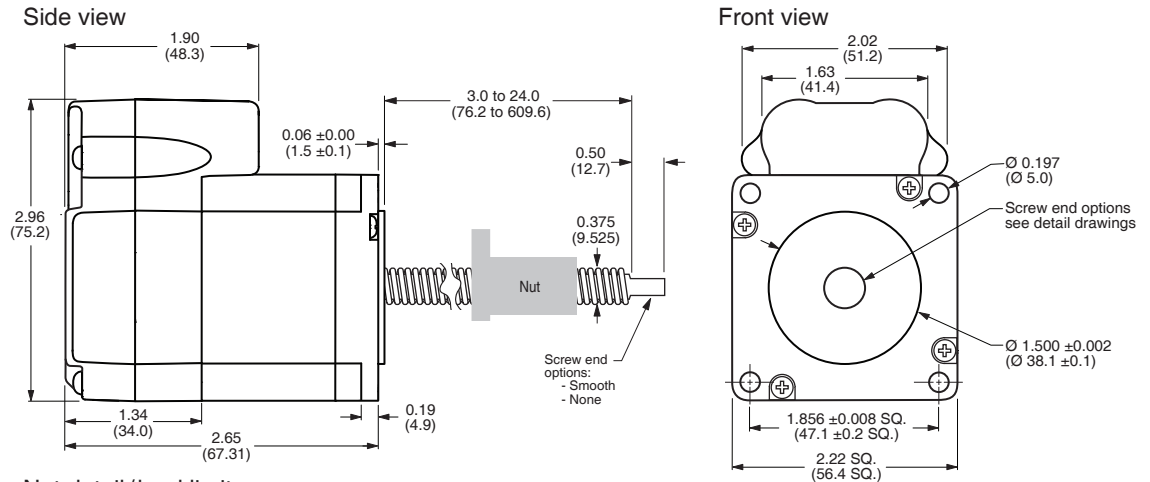
MDrive[®] 23 LINEAR ACTUATORS

MOTOR+DRIVER Plus or Hybrid

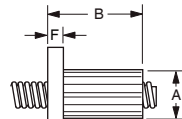
A rotating screw, integral to the MDrive[®] rotor, moves the nut axially along the threaded shaft

Mechanical specifications

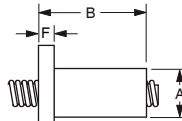
Dimensions in inches (mm)



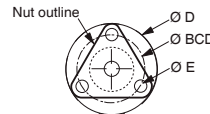
Nut detail/load limit



General purpose nut
Flange shape: round
Load limit: 60 lbs (27 kg)
Purpose: for applications not requiring anti-backlash and wear compensation.



Anti-backlash nut
Flange shape: triangle
Load limit: 25 lbs (11 kg)
Purpose: backlash free operation for high accuracy and low drag torque.



	A	B	D	E	F	BCD	load limit	drag torque
General purpose	0.71 (18.0)	1.50 (38.1)	1.5 (38.1)	0.20 (5.08)	0.20 (5.08)	1.125 (28.6)	60lbs/ 27kg	free wheeling
Anti-backlash	0.82 (20.8)	1.875 (47.63) max	1.5 (38.1)	0.20 (5.08)	0.20 (5.08)	1.125 (28.6)	25lbs/ 11kg	1-3

Screw specifications

Screw material

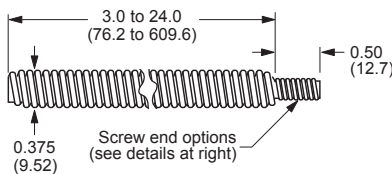
MDrive Linear Actuator precision rolled lead screws are corrosion resistant and non-magnetic, manufactured from premium grade stainless steel.

Screw coating

An optional teflon screw coating is available for smooth operation and extended life.

Standard screw

Dimensions in inches (mm)



Lead options

	inches (mm)	Travel/revolution	Travel/full step
Screw G	0.3750 (9.525)	0.001875 (0.0476)	
Screw A	0.200 (5.08)	0.001 (0.0254)	
Screw B	0.1670 (4.233)	0.000835 (0.0212)	
Screw D	0.0833 (2.116)	0.0004165 (0.0106)	

Screw end options

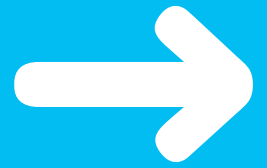
Threaded end	Metric end: M6 x 1.0mm thread to within 0.03" (0.76mm) of shoulder	UNC end: 1/4-20 UNC-2A thread to within 0.05" (1.3mm) of shoulder
Smooth end	Ø 0.2362" ±0.001 (Ø 6mm ±0.003)	
None	—	

Cantilevered loads

Loads for external shaft MDrive[®] linear actuator products MUST BE supported. Side loading is not recommended.

Calculating stroke length

Available stroke length = [screw length] – [nut length] – [mounting surface plate thickness]



MDrive[®] Plus

Leading all-in-one integrated step motor+driver technology combined with linear motion to deliver long life, high accuracy and unsurpassed repeatability all in a package that is extremely compact and affordable.

Integrated linear motion

MDrivePlus Linear Actuators are compact, powerful, easy to use and low cost, and can reduce machine cost, size and time-to-market.

Extremely compact design

Motor, mechanicals and electronics form a single, compact unit that dramatically reduces the space requirements in linear motion applications.

Great versatility

For a wide range of linear motion applications, two (2) MDrivePlus versions provide a rich choice of features at low cost. Unique to the market, a rugged internal encoder integrated with the screw is available.

Easy installation and setup

Minimized wiring and production time along with user-friendly software contribute to easy integration of MDrive products. Available QuickStart Kits provide everything needed for initial setup and testing.

Features

MDrivePlus versions

		Microstepping	Motion Control
Highly integrated microstepping driver and NEMA 23 1.8° single length brushless step linear actuator motor		√	√
Integrated fully programmable motion controller			√
Advanced 2nd generation current control for exceptional performance and smoothness		√	√
Single supply: +12 to +75 VDC		√	√
Low cost		√	√
Extremely compact		√	√
20 programmable microstep resolutions to 51,200 steps/rev including: Degrees, Metric, Arc Minutes		√	√
Premium stainless steel lead screws		√	√
Linear actuator styles	Non-captive shaft	√	√
	External shaft	√	√
Options	Internal magnetic encoder	√	√
	Anti-backlash (external linear actuators only)	√	√
	Coated screw	√	√
Interface connectors	Pluggable locking wire crimp connector	√ ⁴	√
	Pluggable terminal strip connector	√	√
	Flying leads — 12.0"/30.5cm long wires	√	√
Communications type		SPI	RS-422/485 or CANopen
Electronically configurable		√ ¹	√
Programmable motor run and hold currents		√	√
Interface software included		√	√
Parameters switchable on-the-fly		√	√
Current reduction		Automatic	Programmable
Noise reduction		Optically isolated input	Programmable filtering
Optically isolated logic input options ²		√	
Up to eight +5 to +24 VDC I/O lines ³			√
Selectable 10-bit analog input for motion/speed control			√
High speed position capture input or trip output			√ ⁴
Auxiliary logic power supply input			√
0 to 5MHz step clock rate selectable in 0.59Hz increments			√
62 software addresses for multi-drop communications			√

¹ Includes: motor direction vs. direction input; clock type - step and direction, quadrature, step up and down; programmable digital filtering for clock and direction inputs

² Select either universal +5 to +24 VDC signals (sourcing or sinking) or differential +5 VDC signals

³ MDrivePlus version offers four +5 to +24 VDC I/O line accepting sourcing or sinking outputs; MDrive-Plus² version with expanded features offer +24 VDC tolerant I/O lines sourcing or sinking, inputs & outputs with either 8 I/O lines with electronic gearing or 4 I/O lines with external/remote encoder for closed loop control

⁴ Only with MDrivePlus² expanded features



Compact intelligence



2



More success with innovative linear motion

MDrive Plus Motor specifications

	Holding torque	Rotor inertia	Maximum screw misalignment	Weight without screw
Linear actuator motor*	90 oz-in (64 N-cm)	0.0025 oz-in-sec ² (0.18 kg-cm ²)	± 1°	22.0 oz (625.0 g)
	Maximum thrust		Maximum repeatability	
	general purpose	with anti-backlash nut	general purpose	with anti-backlash nut
Non-captive shaft*	200 lbs (91 kg)	—	0.005" (0.127mm)	—
External shaft*	60 lbs (27 kg)	25 lbs (11 kg)	0.005" (0.127mm)	0.0005" (0.0127mm)

Performance data for maximum force/load is based on a *static* load and will vary with a *dynamic* load.
* All specifications above are applicable for MDrive Plus and MDrive AccuStep products.

Input voltage (+V)	Range	+12 to +75 VDC	Power supply current requirements = 2A (max) per MDrive23Plus Actual power supply current will depend on voltage and load.	
			Number of settings	
Motion	Microstep resolution	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)	
		Operating temperature	Heat sink	-40° to +85°C (non-condensing)
	Motor		-40° to +100°C (non-condensing)	

MDrive Plus Microstepping version with step and direction input

Standard specifications

Isolated input	Universal	Voltage range: +5 to +24 VDC sourcing or sinking — Step Clock, Direction and Enable
	Differential	Voltage range: +5 VDC — Step Clock and Direction
Motion	Digital filter range	50 nS to 12.9 μS (10 MHz to 38.8 kHz)
	Clock types	Step/Direction, Quadrature, Step Up/Step Down
	Step frequency	2 MHz default / 5 MHz maximum

Setup parameters

	Function	Range	Units	Default
MHC	Motor hold current	0 to 100	percent	5
MRC	Motor run current	1 to 100	percent	25
MSEL	Microstep resolution	1, 2, 4, 5, 8, 10, 16, 25, 32, 50, 64, 100, 108, 125, 127, 128, 180, 200, 250, 256	μsteps per full step	256
DIR	Motor direction override	0/1	—	CW
HCDT	Hold current delay time	0 or 2-65535	mSec	500
CLK TYPE	Clock type	Step/Dir, Quadrature, Up/Down	—	Step/Dir
CLK IOF	Clock and direction filter	50 nS to 12.9 μS (10 MHz to 38.8 kHz)	nS (MHz)	200 nS (2.5 MHz)
USER ID	User ID	Customizable	1-3 characters	IMS
EN ACT	Enable active	High/Low	—	High

All parameters are set using the supplied IMS SPI Motor Interface GUI and may be changed on-the-fly.
An optional Communication Converter is recommended with first orders.

Interface wire/pin assignments

P1 I/O and power connector					P2 Communication connector** (SPI)		P4 Internal encoder option	
Pluggable terminal strip	Flying leads wire colors	12-pin locking wire crimp**	Function		10-pin IDC	Function	10-pin locking wire crimp	Function
			Universal input	Differential input <i>Clockwise/Counterclockwise</i>				
Pin 1	White	Pin 3	Optocoupler reference	CW +	Pin 1	No connect	Pin 1	Ground
Pin 2	—	—	No connect	No connect	Pin 2	No connect	Pin 2	Channel A +
Pin 3	Orange	Pin 4	Step clock input	CW -	Pin 3	No connect	Pin 3	Channel A -
Pin 4	Blue	Pin 6	CW/CCW direction input	CCW -	Pin 4	SPI chip select	Pin 4	Channel B +
Pin 5	Brown	Pin 5	Enable input	CCW +	Pin 5	Communications ground	Pin 5	Channel B -
Pin 6	Black	Pin 1	Power ground	Power ground	Pin 6	+5 VDC output	Pin 6	Index +
Pin 7	Red	Pin 2	+V (+12 to +75 VDC)	+V (+12 to +75 VDC)	Pin 7	SPI master out - slave in	Pin 7	Index -
		Pin 7	+5 VDC output	+5 VDC output	Pin 8	SPI clock	Pin 8	No connect
		Pin 8	SPI clock	SPI clock	Pin 9	No connect	Pin 9	No connect
		Pin 9	Communications ground	Communications ground	Pin 10	SPI master in - slave out	Pin 10	No connect
		Pin 10	SPI master out - slave in	SPI master out - slave in				
		Pin 11	SPI chip select	SPI chip select				
		Pin 12	SPI master in - slave out	SPI master in - slave out				

**The 12-pin pluggable locking wire crimp connector at P1 eliminates the P2 connector.

MDrive Plus Motion Control version with programmable controller or CANopen

Standard (Plus) specifications

Auxiliary logic input voltage	Range	+12 to +24 VDC Maintains power to control and feedback circuits (only) when input voltage is removed.		
	Resolution	10 Bit		
Analog input	Voltage range	0 to +5 VDC, 0 to +10 VDC, 0-20 mA, 4-20 mA		
	Number/type	4 sinking outputs/4 sourcing or sinking inputs		
General purpose I/O	Logic range	Inputs and outputs tolerant to +24VDC, inputs TTL level compatible		
	Output sink current	Up to 600 mA per channel		
	Protection	Over temp, short circuit, transient over voltage, over voltage, inductive clamp		
Communication	Type (standard)	RS-422/485		
	Baud rate	4.8 to 115.2kbps		
	Type (optional)	CANopen DSP-402 (V2.0), DS-301 (V3.0), 2.0B active		
	ID	11 and/or 29 bit		
	Isolation	Galvanic		
Motion	Features	Node guarding, heartbeat, SDOs, PDOs (variable mapping)		
	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)	
	Closed loop configuration (optional)	Internal encoder	Type	Internal, magnetic
			Steps per revolution	51200
	Counters	Type	Position, encoder/32 bit	
		Edge rate (max)	5 MHz	
	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		
Software	Program storage	Type/size	Flash/6384 bytes	
	User registers	(4) 32 Bit		
	User program labels and 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, analog in, general purpose	
		Outputs	Moving, fault, stall, velocity change, general purpose	
	Trip functions	Trip on input, trip on position, trip on time, trip capture		
	Party mode addresses	62		
	Encoder functions	Stall detection, position maintenance, find index		

Expanded (Plus²) specifications

General purpose I/O	Number/type	8 sourcing or sinking outputs/inputs (or 4 when remote encoder option is selected)			
	Logic range	Sourcing outputs +12 to +24 VDC, inputs and sinking outputs tolerant to +24 VDC, inputs TTL level compatible			
	Output sink/source current	Up to 600 mA per channel			
Motion	Electronic gearing	Range [‡] /resolution/threshold (external clock in)	0.001 to 2.000/32 bit/TTL		
		Input filter range	50 nS to 12.9 μS (10 MHz to 38.8 kHz)		
		Range [‡] (secondary clock out)	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/resolution/threshold	150 nS/32 bit/TTL		
	Closed loop configuration (optional)	Remote encoder	Type	User-supplied differential encoder	
Steps per revolution, see above: "Standard specs open loop steps/rev"					
		Resolution	User-defined Note: μstep/rev 2X the encoder count/rev minimum		

[‡] Adjusting the microstep resolution can increase the range.

Interface wire/pin assignments

Plus P1 I/O and power connector			Plus ² P1/P3 I/O connector / Power connector			Plus & Plus ² P2 Communication connector				
Pluggable terminal strip	Flying leads wire colors	Function	Wire crimp 14-pin	I/O connector function		RS-422/485		CANopen		
				Expanded I/O	Remote encoder closed loop control	10-pin IDC	Wire crimp	Function	DB9	Function
Pin 1	White/yellow	I/O 1	Pin 1	I/O power	I/O power	Pin 1	Pin 9	TX +	Pin 1	No connect
Pin 2	White/orange	I/O 2	Pin 2	I/O ground	I/O ground	Pin 2	Pin 10	TX -	Pin 2	CAN low
Pin 3	White/violet	I/O 3	Pin 3	I/O 1	I/O 1	Pin 3	Pin 7	RX +	Pin 3	CAN -V
Pin 4	White/blue	I/O 4	Pin 4	I/O 2	I/O 2	Pin 4	Pin 8	RX -	Pin 4	No connect
Pin 5	Green	Analog input	Pin 5	I/O 3	I/O 3	Pin 5	Pin 5	Aux-logic (+12 to +24 VDC)	Pin 5	Shield
Pin 6	Black	Power/aux ground	Pin 6	I/O 4	I/O 4					
Pin 7	Red	+V (+12 to +48 VDC)	Pin 7	I/O 9	Channel A +	Pin 6	Pin 6	RX +	Pin 6	CAN -V
			Pin 8	I/O 10	Channel A -	Pin 7	Pin 3	RX -	Pin 7	CAN high
			Pin 9	I/O 11	Channel B +	Pin 8	Pin 4	TX -	Pin 8	No connect
			Pin 10	I/O 12	Channel B -	Pin 9	Pin 1	TX +	Pin 9	CAN +V
			Pin 11	Capture/trip I/O	Capture/trip I/O	Pin 10	Pin 2	Comm ground		
			Pin 12	Analog in	Analog in					
			Pin 13	Step/clock I/O	Index +					
			Pin 14	Direction/clock I/O	Index -					
			2-pin Power connector function							
			Pin 1	+V (+12 to +75 VDC)	+V (+12 to +75 VDC)					
			Pin 2	Power/aux ground	Power/aux ground					



MDrive Hybrid

All-in-one step motor systems integrated with revolutionary new motion control technology that prevents loss of synchronization (unintentional stalling) due to transient or continued overload, extreme acceleration or deceleration, or excessive slew speed.

Game-changing technology

Hybrid Motion Technology™ not only bridges the gap between servo and step motor technologies, it also delivers unique capabilities and enhancements over both.

Hybrid Motion Technology™ is a revolutionary, low cost control technology that, when applied to step motors, prevents the loss of synchronization (unintentional stalling) due to transient or continued overload, extreme acceleration or deceleration, or excessive slew speed.

Hybrid Motion Technology system benefits

- Reacts quickly to large changes in loads without loss of synchronization;
- No tuning required;
- Higher inertia mismatch allowed;
- High starting torque;
- Smooth motion, even at extremely slow speeds;
- Minimizes impact of system resonance.

Enhanced motor performance

- Uses cost effective step motor;
- Eliminates loss of synchronization;
- Allows full use of motor's torque;
- Maintains constant motor torque with *torque mode*;
- Reduces motor heating with *variable current control*.

Hybrid Motion Technology is hardware based for real-time response. It continually monitors the relationship between the rotor and stator at sub-microsecond intervals, and will not allow that relationship to exceed the point where synchronization is lost. Delivering smooth movement while eliminating unintentional stalling, Hybrid Motion Technology will never lose functional control of the motor.

Hybrid Motion Technology offers numerous unique capabilities such as torque mode for regulating and maintaining torque at a set level. While torque mode enhances the many benefits of step motors, which include smooth movement, high starting torque and low speed stability, it also puts their performance on par with small to mid-size servo motors up to 2500 rpm — all at a lower cost and without requiring tuning.

Hybrid Motion Technology also offers a variable current setting. This feature can be enabled to allow only the required current necessary to perform a task. This efficient, energy-saving setting further enhances system performance by reducing motor heat which can be significant with traditional step motor technology.

50%

Speed-torque performance
Hybrid Motion Technology allows full use of a step motor's maximum torque rating, eliminating derating of up to 50% as a buffer against stalling of standard step motor systems.

Applications



Printing, paper,
packaging



Handling,
labeling



Electronics
manufacture



Medical
technology



Laboratory
equipment

MDrive Hybrid Motor specifications

Input voltage (+V)	Range	+12 to +60 VDC	Power supply current requirements = 3.5A (max) per MDrive23 Hybrid Actual power supply current will depend on voltage and load.	
Communication	Type	RS-422/485		
	Baud rate	4.8 to 115.2kbps		
Thermal	Operating temperature	Heat sink	-40° to +85°C (non-condensing)	
		Motor	-40° to +100°C (non-condensing)	
Linear actuator motor	See page 6 for: holding torque, rotor inertia, screw misalignment, weight, thrust and repeatability specs			

MDrive Hybrid Step•Torque•Speed version

Standard specifications

Isolated input	Voltage range	+5 to +24 VDC sourcing or sinking		
Motion	Digital filter range	50 nS to 12.9 μS (10 MHz to 38.8 kHz)		
	Clock types (Step mode)	Step/Direction, Quadrature, Step Up/Step Down		
	Step frequency	5 MHz maximum 100 ns minimum pulse width		
	Closed loop configuration	Internal magnetic encoder	Resolutions 100, 200, 250, 256, 400, 500, 512, 1000	
	Microstep resolution	Number of settings		20
Steps per revolution		Binary	200, 400, 800, 1600, 3200, 6400, 12800, 25600, 51200, 36000 (0.01 deg/μstep), 21600 (1 arc minute/μstep), 25400 (0.001mm/μstep)	
		Decimal	1000, 2000, 5000, 10000, 20000, 25000, 40000, 50000	

Step•Torque•Speed versions integrate Hybrid Motion Technology with step motor, microstepping driver, velocity generator and encoder. Three different operating modes are available:

- > **Step Mode**
operates in typical step and direction input mode for point-to-point positioning.
- > **Torque Mode**
operates in relation to an analog input for positioning to torque setting.
- > **Velocity Mode**
operates as an independent velocity control device, no external controller required.

Setup parameters

An MDrive Hybrid configuration GUI is provided for ease of setup and configuring your device. Shown below is an overview of all settings with general descriptions. Note: available settings vary with each of the three operating modes. *Reference the product manual for details.*

Operating Mode (Select Application)	Select: Step & Direction (ASM), Torque Control (AST) or Speed Control (ASO)		
MDrive Hybrid Settings	Setup/Configuration	Turn AccuStep off or on in fixed or variable mode; set and confirm encoder line count	
	Operation	Set control bounds for motor torque and speed, lead, lag, and make-up of lost steps	
	HMT Status	Display status alerts of 8 pre-programmed fields, read-only	
	Calibration	To maintain synchronization, select options for motor's rotor-to-stator physical position	
Analog Settings	Set analog ranges, select input mode: 0-5V, 0-10V, -10 to +10V (not applicable for Step mode)		
Communication Settings	Set baud rate; enable/disable parity mode and features; Check Sum integrity quality assurance		
I/O Settings	Clock and filter settings; Attention Output with 11 pre-programmed fields to select among		
Motion Settings	All operating modes	Set various motion settings, which vary with the operating mode selected ex. Current, MSEL	
	Speed control mode	Additional settings: for setting acceleration, deceleration, velocity and flags	
Defaults	Restore system defaults or previously stored settings; view current communication settings		

Interface pin assignments

P1 I/O and power connector		P2 Communication connector		P4 Internal encoder	
12-pin locking wire crimp	Function	10-pin friction lock wire crimp	Function	10-pin locking wire crimp	Function
Pin 1	Power ground	Pin 1	TX +	Pin 1	Ground
Pin 2	+V (+12 to +60 VDC)	Pin 2	Communication ground	Pin 2	Channel A +
Pin 3	Optocoupler reference	Pin 3	RX -	Pin 3	Channel A -
Pin 4	Motion	Pin 4	TX -	Pin 4	Channel B +
Pin 5	Enable input	Pin 5	Communication ground	Pin 5	Channel B -
Pin 6	CW/CCW direction input	Pin 6	RX +	Pin 6	Index +
Pin 7	Aux-Power	Pin 7	RX +	Pin 7	Index -
Pin 8	Attention output emitter	Pin 8	RX -	Pin 8	No connect
Pin 9	Attention output collector	Pin 9	TX +	Pin 9	No connect
Pin 10	Analog	Pin 10	TX -	Pin 10	No connect
Pin 11	Ground				
Pin 12	+5 VDC output				

MDrive Hybrid Motion Control version

Standard specifications

Aux. logic input voltage	Range	+12 to +24 VDC <i>Maintains power to control and feedback circuits (only) when input voltage is removed.</i>		
	Resolution	10 Bit		
Analog input	Range	0 to +5 VDC, 0 to +10 VDC, 0-20 mA, 4-20 mA		
	Number/type	8 sourcing or sinking outputs/inputs		
General purpose I/O	Logic range	Sourcing outputs +12 to +24VDC, inputs and sinking outputs tolerant to +24VDC, inputs TTL level compatible		
	Output sink/source current	Up to 600 mA per channel		
	Protection	Over Temp, Short Circuit, Transient Over Voltage, Over Voltage, Inductive Clamp		
Motion	Closed loop configuration with encoder	Encoder type	Internal, magnetic	
		Steps per revolution	51200	
		Resolution	1000 lines / 4000 edges per rev	
	Counters	Type	Position, encoder	
		Resolution	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 ⁹ steps per second ²	
		Resolution	90.9 steps per second ²	
	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 / resolution / threshold		150 nS / 32 bit / TTL		
Software	Program storage	Type / size	Flash / 6384 bytes	
	User registers	(4) 32 bit		
	User program labels and variables	192		
	Math functions	+, -, x, ÷, >, <, =, <=, >=, AND, OR, XOR, NOT		
	Branch functions	Branch & 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			

Motion Control versions integrate Hybrid Motion Technology™ with step motor, microstepping driver, fully programmable motion controller and encoder. Point-to-point positioning, torque mode and velocity control are all user programmed with the feature rich MCode software and easy-to-use terminal emulator programs provided.

Interface pin assignments

P1 I/O connector	
14-pin locking wire crimp	Function
Pin 1	I/O power
Pin 2	I/O ground
Pin 3	I/O 1
Pin 4	I/O 2
Pin 5	I/O 3
Pin 6	I/O 4
Pin 7	I/O 9
Pin 8	I/O 10
Pin 9	I/O 11
Pin 10	I/O 12
Pin 11	Capture/trip I/O
Pin 12	Analog in
Pin 13	Aux power
Pin 14	Aux ground

P2 Communication connector	
10-pin friction lock wire crimp	Function
Pin 1	TX +
Pin 2	Communication ground
Pin 3	RX –
Pin 4	TX –
Pin 5	Communication ground
Pin 6	RX +
Pin 7	RX +
Pin 8	RX –
Pin 9	TX +
Pin 10	TX –

P3 Power connector	
2-pin locking wire crimp	Function
Pin 1	+V (+12 to +60 VDC)
Pin 2	Power ground

Hybrid Motion Technology™ control

Combines the benefits of servo and step motor technologies . . .

- plus:*
- no unintentional stalling or loss of synchronization
 - variable current / torque
 - real time control
 - optimum torque at all speeds

servo motors

- peak torque
- real time control
- torque mode

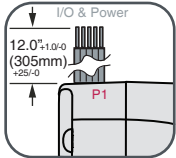
step motors

- smooth motion
- stiffness at standstill
- cost effective
- no tuning

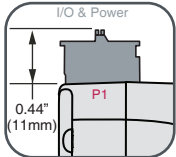
Connectivity

Interfacing options

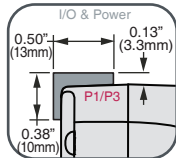
P1 / P3 Connectors



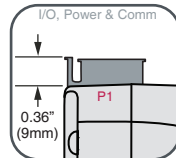
F = flying leads



P = pluggable terminal
7-pin strip

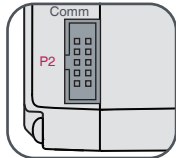


C = locking wire crimp
14-pin & 2-pin (Motion Control)

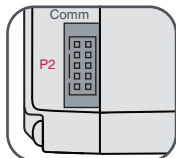


C = locking wire crimp
12-pin (Microstepping)

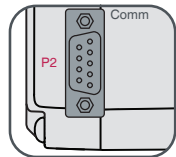
P2 Connector



D = 10-pin IDC

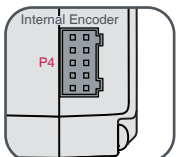


L = 10-pin friction lock
wire crimp



B = DB9 (CANopen)

P4 Connector



10-pin locking wire crimp for:
• MDrive Hybrid
• Step•Torque•Speed

Microstepping version

Communication Converters

Electrically isolated, in-line converters pre-wired with mating connectors to conveniently set/program communication parameters for a single MDrivePlus via a PC's USB port. Length 12.0' (3.6m).

Mates to connector:

P1 12-pin wire crimp.....	MD-CC303-001
P2 10-pin IDC.....	MD-CC300-001

Prototype Development Cables

Speed test/development with pre-wired mating connectors that have flying leads other end.

Mates to wire crimp connector:

P1 12-pin (length: 10.0'/3.0m)	PD12-1434-FL3
--------------------------------------	---------------

Mating Connector Kits

Use to build your own cables. Kit contains 5 mating shells with pins. Cable not supplied. Manufacturer's crimp tool recommended.

Mates to connector:

P1 12-pin wire crimp.....	CK-03
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Kit contains 5 mating connectors that press fit onto ribbon cable. Cable not supplied.

P2 10-pin IDC.....	CK-01
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Motion Control version

Communication Converters

Electrically isolated, in-line converters pre-wired with mating connectors to conveniently set/program communication parameters for a single MDrive product via a PC's USB port. Length 12.0' (3.6m).

Mates to connector:

P2 10-pin IDC.....	MD-CC400-001
P2 10-pin wire crimp.....	MD-CC402-001
P2 DB9 (dongle requires adapter & power supply) ..	MD-CC500-000

Prototype Development Cables

Speed test/development with pre-wired mating connectors that have flying leads other end. Length 10.0' (3.0m).

Mates to connector:

P1 14-pin wire crimp.....	PD14-2334-FL3
P2 10-pin wire crimp.....	PD10-1434-FL3
P3 2-pin wire crimp.....	PD02-2300-FL3

Mating Connector Kits

Use to build your own cables. Kit contains 5 mating shells with pins. Cable not supplied. Manufacturer's crimp tool recommended.

Mates to connector:

P1 14-pin wire crimp.....	CK-09
P2 10-pin wire crimp.....	CK-02
P3 2-pin wire crimp.....	CK-04

Kit contains 5 mating connectors that press fit onto ribbon cable. Cable not supplied.

P2 10-pin IDC.....	CK-01
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MDrive Hybrid

Step•Torque•Speed version

Communication Converter

Electrically isolated, in-line converters pre-wired with mating connectors to conveniently set/program communication parameters for single MDriveHybrid via PC's USB port. Length 12.0' (3.6m).

Mates to connector:

P2 10-pin wire crimp.....	MD-CC402-001
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Prototype Development Cables

Speed test/development with pre-wired mating connectors that have flying leads other end.

Mates to wire crimp connector:

P1 12-pin (length: 10.0'/3.0m)	PD12-1434-FL3
P2 10-pin wire crimp.....	PD10-1434-FL3
P4 10-pin internal encoder (length: 6.0'/1.8m) ..	ED-CABLE-JST10

Mating Connector Kits

Use to build your own cables. Kit contains 5 mating shells with pins. Cable not supplied. Manufacturer's crimp tool recommended.

Mates to connector:

P1 12-pin wire crimp.....	CK-03
P2 10-pin wire crimp.....	CK-02
P4 10-pin wire crimp.....	CK-13

Motion Control version

Communication Converter

Electrically isolated, in-line converter pre-wired with mating connector to conveniently set/program communication parameters for single MDriveHybrid via PC's USB port. Length 12.0' (3.6m).

Mates to connector:

P2 10-pin wire crimp.....	MD-CC402-001
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Prototype Development Cables

Speed test/development with pre-wired mating connectors that have flying leads other end. Length 10.0' (3.0m).

Mates to connector:

P1 14-pin wire crimp.....	PD14-2334-FL3
P2 10-pin wire crimp.....	PD10-1434-FL3
P3 2-pin wire crimp.....	PD02-2300-FL3

Mating Connector Kits

Use to build your own cables. Kit contains 5 mating shells with pins. Cable not supplied. Manufacturer's crimp tool recommended.

Mates to connector:

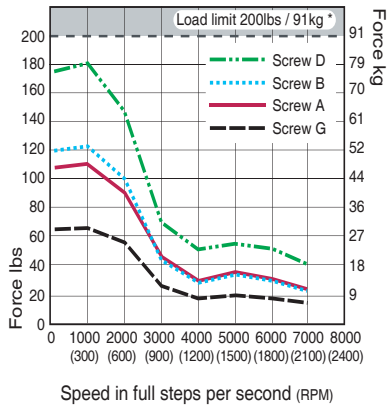
P1 14-pin wire crimp.....	CK-09
P2 10-pin wire crimp.....	CK-02
P3 2-pin wire crimp.....	CK-04

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

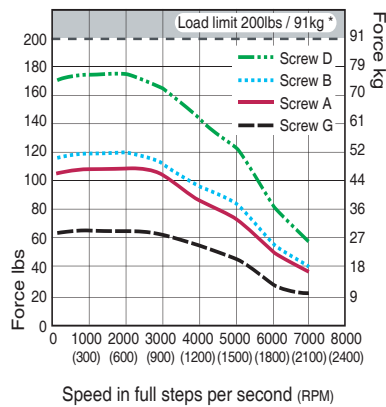
Speed-force performance curves

MDrive Plus

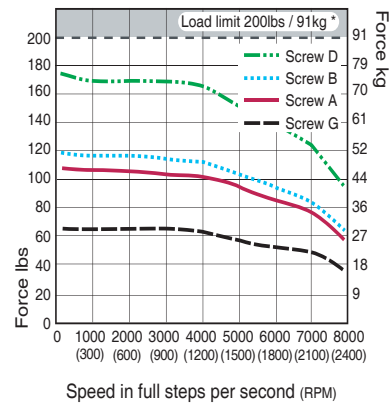
24 VDC



48 VDC



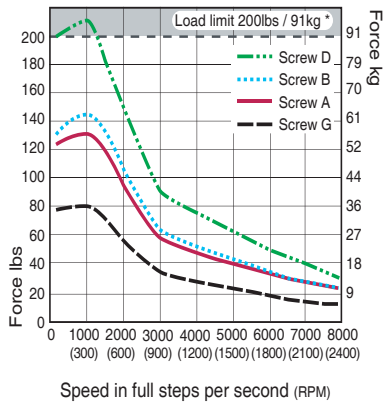
75 VDC



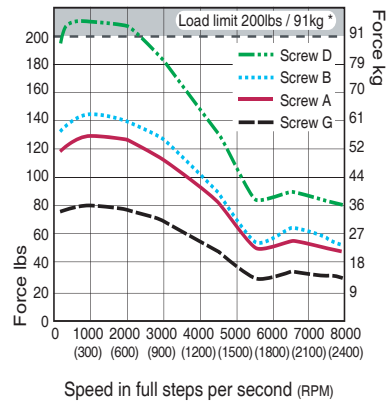
NOTE: Performance data for maximum force/load is based on a *static* load and will vary with a *dynamic* load.
 *For non-captive shaft linear actuators. Load limit for external shaft linear actuators is determined by selected nut.

MDrive Hybrid

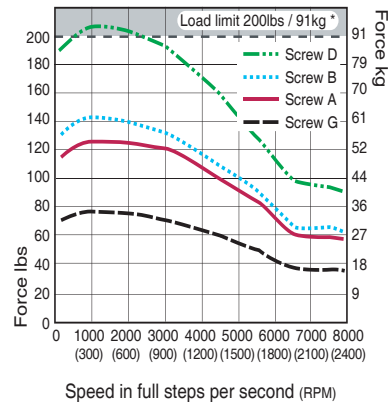
24 VDC



48 VDC



60 VDC



NOTE: Performance data for maximum force/load is based on a *static* load and will vary with a *dynamic* load.
 *For non-captive shaft linear actuators. Load limit for external shaft linear actuators is determined by selected nut.

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