



MDRIVE 23TM

MOTOR+DRIVER

Plus

MICROSTEPPING

FEATURES

- Highly Integrated Microstepping Driver and NEMA 23 High Torque Brushless Motor
- *Advanced 2nd Generation Current Control for Exceptional Performance and Smoothness*
- Single Supply: *+12 to +75 VDC*
- Low Cost
- Extremely Compact
- *20* Microstep Resolutions up to 51,200 Steps Per Rev *Including: Degrees, Metric, Arc Minutes*
- Optically Isolated Logic Inputs will Accept +5 to +24 VDC Signals, Sourcing or Sinking
- Automatic Current Reduction
- Configurable:
 - Motor Run/Hold Current
 - Motor Direction vs. Direction Input
 - Microstep Resolution
 - *Clock Type: Step and Direction, Quadrature, Step Up and Step Down*
 - *Programmable Digital Filtering for Clock and Direction Inputs*
- Available Options:
 - Long Life Linear Actuators*
 - External Optical Encoder
 - Integrated Planetary Gearbox
 - Control Knob for Manual Positioning
 - *Linear Slide*
 - *IP65 Sealed Configuration with M23 Circular Connector**
- 3 Rotary Motor Lengths Available
- Setup Parameters May Be Switched On-The-Fly
- Interface Options:
 - Pluggable Locking Wire Crimp
 - Pluggable Terminal Strip
 - 12.0" (30.5cm) Flying Leads
- Graphical User Interface (GUI) for Quick and Easy Parameter Setup

DESCRIPTION

The MDrive23Plus Microstepping high torque integrated motor and driver is ideal for designers who want the simplicity of a motor with on-board electronics. The integrated electronics of the MDrive23Plus eliminate the need to run motor cabling through the machine, reducing the potential for problems due to electrical noise.

The unsurpassed smoothness and performance delivered by the MDrive23Plus Microstepping are achieved through IMS's advanced 2nd generation current control. By applying innovative techniques to control current flow through the motor, resonance is significantly dampened over the entire speed range and audible noise is reduced.

The MDrive23Plus accepts a broad input voltage range from +12 to +75 VDC, delivering enhanced performance and speed. Oversized input capacitors are used to minimize power line surges, reducing problems that can occur with long runs and multiple drive systems. An extended operating range of -40° to +85°C provides long life, trouble free service in demanding environments.

The MDrive23Plus uses a NEMA 23 frame size high torque brushless motor combined with a microstepping driver, and accepts up to *20 resolution settings* from *full* to 256 microsteps per full step, *including: degrees, metric and arc minutes*. These settings may be changed on-the-fly or downloaded and stored in nonvolatile memory with the use of a simple GUI which is provided. This eliminates the need for external switches or resistors. Parameters are changed via an SPI port.

*For use in environments where exposure to chemical, dust and liquids may occur, a sealed MDrive23Plus-65 Microstepping unit with 19-pin M23 circular connector meets IP65 specifications.**

The versatile MDrive23Plus Microstepping is available in multiple configurations to fit various system needs. Rotary motor versions come in three lengths and may include an optical encoder, control knob, planetary gearbox or *linear slide*. Long life Acme screw linear actuators* are also available. Interface connections are accomplished with either a pluggable locking wire crimp, terminal strip or 12.0" (30.5cm) flying leads, or with an *M23 circular connector for sealed -65 versions*.

The MDrive23Plus is a compact, powerful and inexpensive solution that will reduce system cost, design and assembly time for a large range of brushless motor applications.

CONFIGURING

The IMS Motor Interface software is an easy to install and use GUI for configuring the MDrive23Plus from a computer's USB port. GUI access is via the IMS SPI Motor Interface included on the CD shipped with the product, or from www.imshome.com. Optional cables are available for ease of connecting and configuring the MDrive.

The IMS SPI Motor Interface features:

- Easy installation.
- Automatic detection of MDrive version and communication configuration.
- Will not set out-of-range values.
- Tool-tips display valid range setting for each option.
- Simple screen interfaces.

*Consult Factory for Availability.

NOTE: *Contrasting text denotes new product enhancements.*

MDrive23Plus MICROSTEPPING

STANDARD SPECIFICATIONS

INPUT VOLTAGE (+V)	Range	<i>+12 to +75 VDC</i> Power supply current requirements = 2A (maximum) per MDrive23Plus. Refer to illustration. Actual power supply current will depend on voltage and load.		
	ISOLATED INPUT	Step Clock, Direction and Enable		
MOTION	Voltage Range	+5 to +24 VDC Sourcing or Sinking		
	Digital Filter Range	50 nS to 12.9 μS		
	Clock Types	Step/Direction, Quadrature, Step Up/Step Down		
	Step Frequency	2 MHz Default / 5 MHz Max		
THERMAL	Operating Temperature	Heat Sink	-40° to +85°C (non-condensing)	
		Motor	-40° to +100°C (non-condensing)	

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 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 Parameter Setup Cable is recommended with first orders.

MOTOR SPECIFICATIONS

	Holding Torque	Detent Torque	Rotor Inertia	Weight (Motor+Driver)
SINGLE LENGTH	90 oz-in / 64 N-cm	3.9 oz-in / 2.7 N-cm	0.0025 oz-in-sec ² / 0.18 kg-cm ²	21.6 oz / 612.3 g
DOUBLE LENGTH	144 oz-in / 102 N-cm	5.6 oz-in / 3.92 N-cm	0.0037 oz-in-sec ² / 0.26 kg-cm ²	26.4 oz / 748.4 g
TRIPLE LENGTH	239 oz-in / 169 N-cm	9.7 oz-in / 6.86 N-cm	0.0065 oz-in-sec ² / 0.46 kg-cm ²	39.2 oz / 1111.3 g

ENCODER SPECIFICATIONS

Pin Assignments

Encoder	DIFFERENTIAL ENCODER - LOCKING	SINGLE-END ENCODER
	Function	Function
Pin 1	No Connect	Ground
Pin 2	+5 VDC Input	Index
Pin 3	Ground	Channel A
Pin 4	No Connect	+5 VDC Input
Pin 5	Channel A -	Channel B
Pin 6	Channel A +	
Pin 7	Channel B -	
Pin 8	Channel B +	
Pin 9	Index -	
Pin 10	Index +	

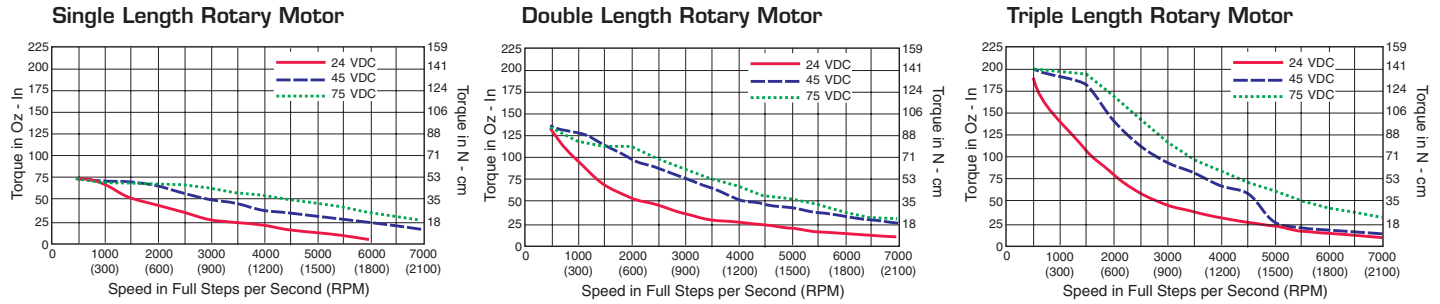
Encoder option not available on sealed -65 versions. Optional encoder cables are available.

Line Counts and Part Numbers

Line Count	DIFFERENTIAL ENCODER - LOCKING	SINGLE-END ENCODER
	Part Number	Part Number
100	EAL	E1
200	EBL	E2
250	ECL	E3
256	EWL	EP
400	EDL	E4
500	EHL	E5
512	EXL	EQ
1000	EJL	E6
1024	EYL	ER

MOTOR PERFORMANCE

Speed-Torque



WIRE/PIN ASSIGNMENTS – MDrive23Plus Microstepping

Plus

P1: I/O & POWER CONNECTOR			
Pluggable Terminal Strip	Flying Leads Wire Colors	Pluggable Locking Wire Crimp**	Function
Pin 1	White	Pin 3	Optocoupler Reference
Pin 2	—	—	No Connect
Pin 3	Orange	Pin 4	Step Clock Input
Pin 4	Blue	Pin 6	CW/CCW Direction Input
Pin 5	Brown	Pin 5	Enable Input
Pin 6	Black	Pin 1	Power Ground
Pin 7	Red	Pin 2	+V (+12 to +75 VDC)
		Pin 7	+5 VDC Output
		Pin 8	SPI Clock
		Pin 9	Communications Ground
		Pin 10	SPI Master In – Slave Out
		Pin 11	SPI Chip Select
		Pin 12	SPI Master Out – Slave In

P2: COMM CONNECTOR (SPI) **	
10-Pin IDC	Function
Pin 1	No Connect
Pin 2	No Connect
Pin 3	No Connect
Pin 4	SPI Chip Select
Pin 5	Communications Ground
Pin 6	+5 VDC Output
Pin 7	SPI Master Out – Slave In
Pin 8	SPI Clock
Pin 9	No Connect
Pin 10	SPI Master In – Slave Out

**The 12-Pin Pluggable Locking Wire Crimp connector at P1 eliminates the P2 connector.

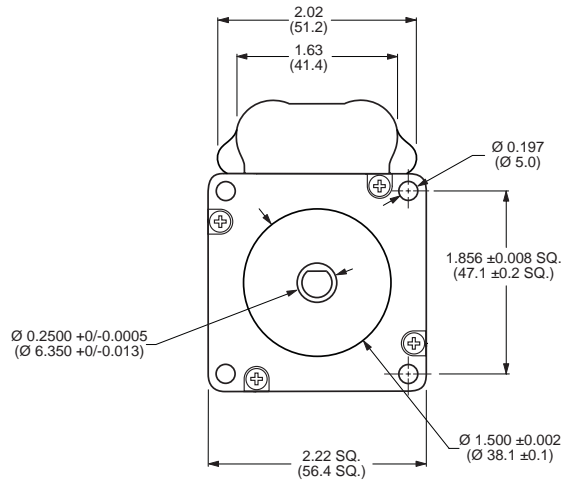
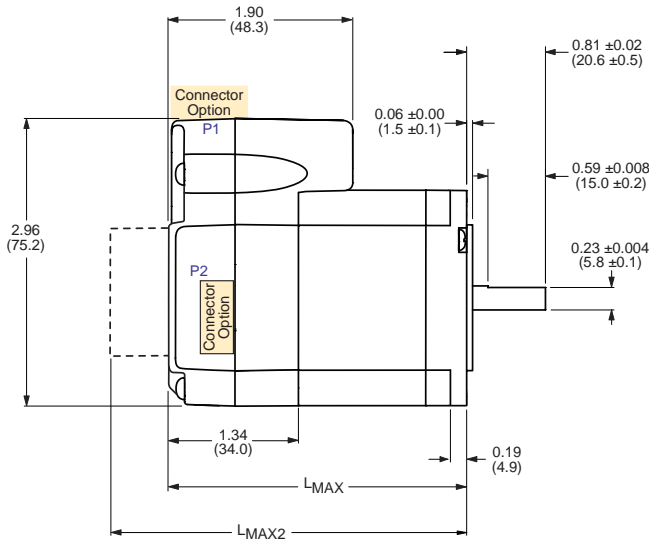
Plus-65 (sealed)

P1: I/O, POWER & COMM CONNECTOR	
M23 Circular (Male)	Function
Pin 1	Optocoupler Reference
Pin 2	Enable Input
Pin 3	No Connect
Pin 4	No Connect
Pin 5	No Connect
Pin 6	+V (+12 to +75 VDC)
Pin 7	No Connect
Pin 8	SPI Master Out – Slave In
Pin 9	SPI Chip Select
Pin 10	+5 VDC Output
Pin 11	Communications Ground
Pin 12	Shell Connect
Pin 13	CW/CCW Direction Input
Pin 14	No Connect
Pin 15	No Connect
Pin 16	SPI Clock
Pin 17	SPI Master In – Slave Out
Pin 18	Step Clock Input
Pin 19	Power Ground

MECHANICAL SPECIFICATIONS

Dimensions in Inches (mm)

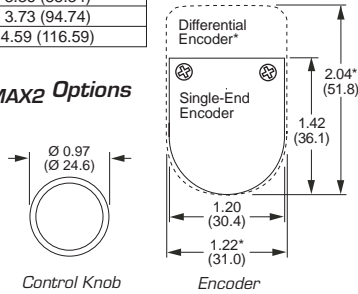
MDrive23Plus Microstepping



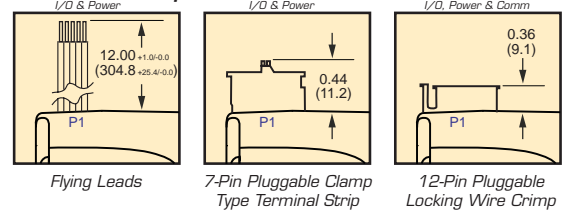
MDrive Lengths Inches (mm)

Motor Length	LMAX	LMAX2
	SINGLE SHAFT or LINEAR ACTUATOR VERSION	CONTROL KNOB or ENCODER VERSION
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)

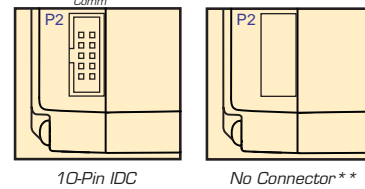
LMAX2 Options



P1 Connector Options

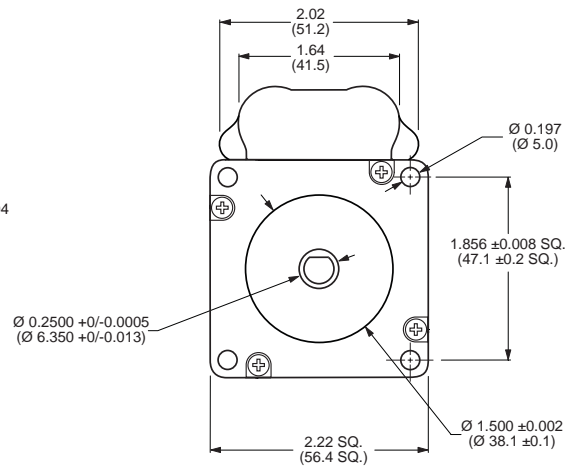
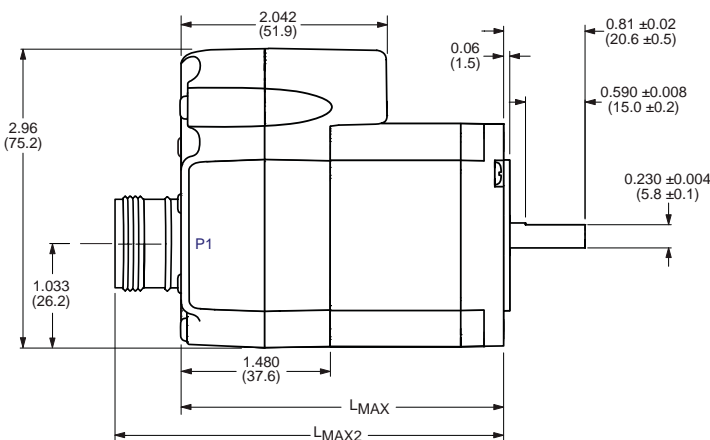


P2 Connector Options



**The 12-Pin Pluggable Locking Wire Crimp connector at P1 eliminates the P2 connector.

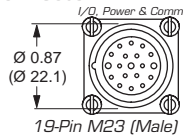
MDrive23Plus-65 Microstepping (sealed)



Sealed MDrive Lengths Inches (mm)

Motor Length	LMAX	LMAX2
	Single	2.82 (71.63)
Double	3.16 (80.26)	3.82 (97.03)
Triple	4.02 (102.11)	4.67 (118.62)

Connector



Connector mating information at: www.imshome.com/mdriveplus_connectors.html

OPTIONS

Linear Actuator

The MDrive23Plus is offered with numerous linear actuator styles and options to satisfy a broad range of linear motion applications. Contact the factory for details or see: www.imshome.com/mdriveplus_linear_actuator.html

External Encoder ‡

External optical encoders, single-end and *locking differential*, are offered factory-mounted with the MDrive23Plus. Refer to the Encoder Specifications section for available line counts. All encoders come with an index mark.

Optional encoder cables are available. Order separately.
 Single-end Cable (12.0"/30.5cm) ES-CABLE-2
Differential Locking Cable (6.0"/1.8mm) .. ED-CABLE-6

Control Knob ‡

The MDrive23Plus is available with a factory-mounted rear control knob for manual shaft positioning.

Planetary Gearbox

Efficient, low maintenance planetary gearboxes are offered assembled with the MDrive23Plus. Refer to details and part numbers on the back cover.

Linear Slide

Integrated linear slides are available factory installed for precision linear movement. Screw leads are 0.1", 0.2", 0.5" or 1.0" of travel per rev. Slides are 12.0" (30.5cm) to 36.0" (91.44cm) long. Contact factory for custom lengths. Refer to separate datasheet for complete details.

ACCESSORIES

Parameter Setup Cable and Adapters

The optional 12.0' (3.6m) parameter setup cable part number MD-CC300-000 facilitates communications wiring and is recommended with first order. It connects an MDrive to a PC's USB port. MDrives with 12-pin pluggable locking wire crimp require adapter MD-ADP-1723C. *Sealed -65 versions require a 19-pin M23 adapter MD-ADP-M23. ***

Prototype Development Cables

For testing and development of MDrives with 12-pin pluggable locking wire crimp. Flying leads connect to user interface. Plugs into MDrive or adapter MD-ADP-1723C.
 12.0" (30.5cm) ADP-3512-FL
 10.0" (3.0m) PD12-1434-FL3

Cordsets

19-pin M23 single-ended cordsets are offered to speed prototyping of the sealed MDrive23Plus-65. Measuring 13.0' (4.0m) long, they are available in either straight or right angle termination. PVC jacketed cables come with a foil shield and unconnected drain wire.
Straight Termination MD-CS100-000
Right Angle Termination MD-CS101-000

Accessories details at: www.imshome.com/cables_cordsets.html

‡ Not Available with Sealed -65 Versions.

** Requires a Single-Ended Cordset.

NOTE: Contrasting italic text denotes new product enhancements.

ORDER INFORMATION – MDrive23Plus Microstepping

Plus


MDM1 **S** **23** **7** - **OPTION**

P1: I/O & Power
 F = 12" Flying Leads
 P = Pluggable Clamp Type Terminal Strip
 C = 12-Pin Locking Wire Crimp (Includes I/O, Power & Comm)

P2: Communications
 D = SPI with 10-Pin IDC Connector
 Z = None. Used with 12-Pin Locking Wire Crimp in Position P1, which includes Communications.

Motor Lengths
 A = Single Length & Linear Actuator*
 B = Double Length
 C = Triple Length

Example #1: Part Number **MDM1PSD23A7** is an MDrive23Plus Microstepping with pluggable I/O & power interface, SPI communications with 10-pin IDC connector, and NEMA 23 single length motor.




*Plus-65**

MDM2MSZ23 **7** - **OPTION**

P1: I/O, Power & Communications
 19-Pin M23 Circular Connector

Motor Lengths
 A = Single Length
 B = Double Length
 C = Triple Length

Example #2: Part Number **MDM2MSZ23B7** is an MDrive23Plus-65 Microstepping sealed with IP65 rating, 19-pin M23 I/O, power and communications circular connector, and NEMA 23 double length motor.



*Consult Factory for Availability.

OPTIONS

Linear Actuator* -L
 For complete product specifications, see: www.imshome.com/mdriveplus_linear_actuator.html

External Encoder -E
 Refer to encoder specifications section for line counts and part numbers.
 Example: **MDM1PSD23A7-EH** adds an external 500-line count differential optical encoder with index mark to example #1.
Not available with sealed -65 versions.

Control Knob -N
 Example: **MDM1PSD23A7-N** adds a rear control knob for manual positioning to example #1. *Not available with sealed -65 versions.*

Planetary Gearbox -G -F
 Refer to gearbox page for complete table of ratios and part numbers. Optional NEMA Flange
 Example: **MDM1PSD23A7-G1A2** adds a 1-stage planetary gearbox with 5.18:1 ratio to example #1. Add -F for optional NEMA flange.

Linear Slide -R
 Screw Lead (inches/rev)
 A = 0.10" (2.54mm)
 B = 0.20" (5.08mm)
 C = 0.50" (12.7mm)
 D = 1.00" (25.4mm)
 Standard Screw Lengths
 12", 18", 24" or 36"
 For Custom Lengths, Consult Factory
 Example: **MDM1PSD23A7-RA12** adds a Linear Slide with 0.10" screw lead, 12" long to example #1.