

MDrive[®] Plus

Stepper motors with integrated electronics



MDrive 23 Plus Step/direction input



MDrive® Plus with step / direction input

Presentation

The MDrive® Plus with step / direction input is a 1.8° 2-phase stepper motor with on-board control electronics. Step / direction signals of a master controller, e.g. a motion controller, or A/B signals of an encoder are converted directly into motion.

Settings for MDrive Plus step / direction input products may be changed on-the-fly or downloaded and stored in nonvolatile memory using the IMS SPI Motor Interface software provided. This eliminates the need for external switches or resistors. Parameters are changed via an SPI port.

Application areas

The MDrive Plus with step / direction input is ideal for machine builders who want an optimized motor with on-board electronics. The integrated electronics of the MDrive Plus with step / direction input reduces the potential for problems due to electrical noise by eliminating the cable between motor and drive.

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 2-phase stepper motor applications.

Features

- Highly integrated microstepping drive and high torque 1.8° 2-phase stepper motor
- Advanced current control for exceptional performance and smoothness
- Single supply: from +12 up to +75 VDC or 120 and 240 VAC
- Cost effective
- Extremely compact
- 20 microstep resolutions up to 51,200 steps per rev including: Degrees, Metric, Arc Minutes
- Optically isolated input options:
 - Universal +5 to +24 VDC signals, sourcing or sinking
 - Differential +5 VDC signals (1)
- Automatic current reduction
- Configurable:
 - Motor run / hold current
 - Motor direction via direction input
 - Microstep resolution
 - Clock type: step and direction, quadrature, step up and step down, clockwise and counterclockwise (1)
 - Programmable digital filtering for clock and direction inputs
- Available options:
 - Long life linear actuators (2)
 - Hybrid Motion Technology™ (2)
 - Encoders
 - Control knob for manual positioning
 - Industrial connectors with IP54 rating (3)
- Several motor stack lengths available
- Setup parameters may be switched on-the-fly
- Numerous connector interface choices
- Graphical user interface provided for quick and easy parameter setup

(1) CW/CCW input unavailable for MDrive34 or MDrive34ac products.

(2) See separate documentation.

(3) Industrial connectors are unavailable for MDrive14 or MDrive34 products.

Plus specifications			MDrive 14	MDrive 17	MDrive 23 (1)	MDrive 23 (1)	MDrive 34	MDrive 34 ac		
Input power	Voltage	VDC	12 to 48	12 to 48	12 to 75	12 to 60	12 to 75	—	—	
		VAC	—	—	—	—	—	120	240	
	Current maximum (2)		1A	2A	2A	3.5A	4A	95 to 132 VAC @ 50/60 Hz	95 to 264 VAC @ 50/60 Hz	
Thermal	Operating temp non-condensing	Heat sink	-40° to +85°C				-40° to +75°C			
		Motor	-40° to +100°C				-40° to +90°C			
Temp output warning	Open-drain type		not applicable				+5 to +24 VDC, 50 mA current			
Protection	Type		not applicable				- Thermal - Over voltage/current			
Isolated input	Universal		Voltage range: +5 to +24 VDC sourcing or sinking step clock, direction and enable							
	Differential		Voltage range: +5 VDC clockwise and counterclockwise				not applicable			
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, clockwise/counterclockwise				Step/direction, quadrature, step up/step down			
	Step frequency		2 MHz default / 5 MHz maximum						2 MHz default	
	Resolution	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 (0.001 mm/µstep)							

Setup parameters (3)				
SPI communication	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, CW/CCW	—	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 MHz)
USER ID	User ID	Customizable	1–3 characters	IMS
EN ACT	Enable active	High/Low	—	High
WARN TEMP (4)	Over temperature warning	0 to 125°C	°C	80°C

(1) Only quad stack NEMA 23 motors have +12 to +60 VDC drives, all other NEMA 23 motors have +12 to +75 VDC drives.

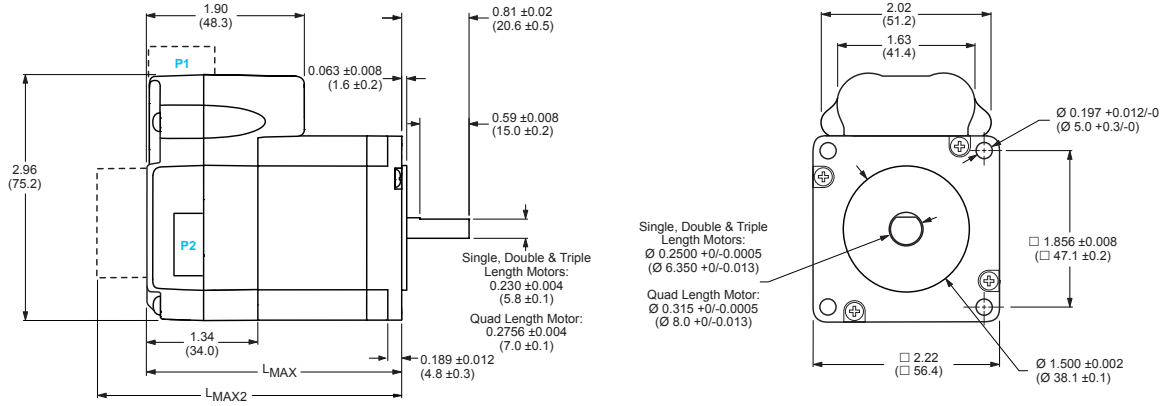
(2) Actual power supply current will depend on voltage and load.

(3) 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.

(4) Only with MDrive34 and MDrive34ac products.



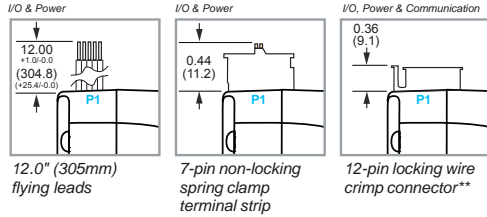
– Plus – mechanical specifications, dimensions in inches (mm)



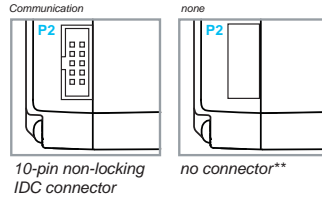
Motor stack length	Lmax (1)	Lmax2 (2)
Single	2.65 (67.31)	3.36 (85.34)
Double	3.02 (76.71)	3.73 (94.74)
Triple	3.88 (98.55)	4.59 (116.59)
Quad	5.28 (134.15)	5.99 (152.19)

(1) Single shaft.
(2) Control knob or external encoder.

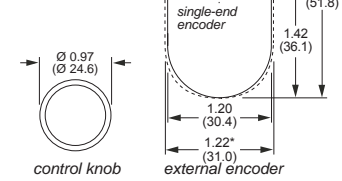
P1 connector options



P2 connector options

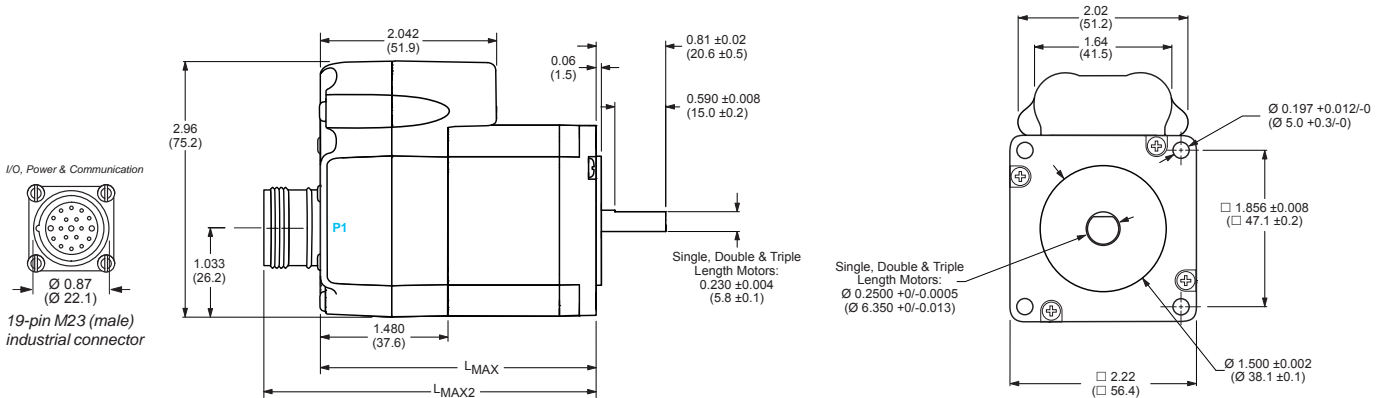


Lmax2 options

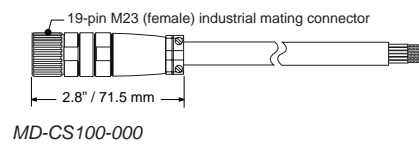
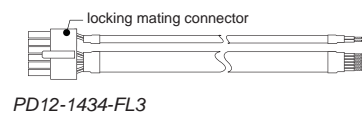
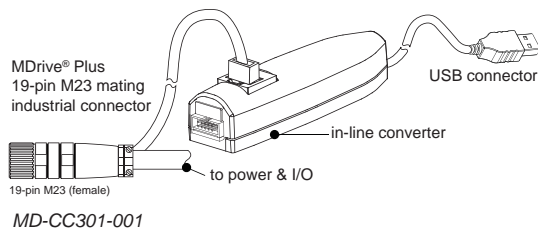
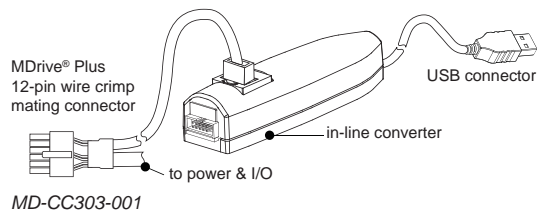
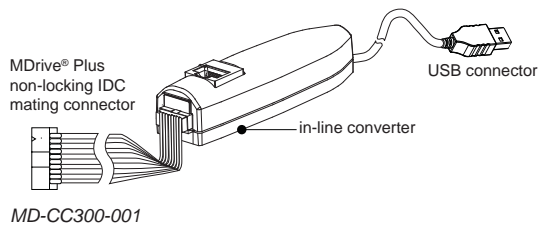


**12-pin locking wire crimp connector at P1 eliminates the P2 connector

– Plus with industrial connector – mechanical specifications, dimensions in inches (mm)



Motor stack length	Lmax	Lmax2
Single	2.82 (71.63)	3.48 (88.39)
Double	3.16 (80.26)	3.82 (97.03)
Triple	4.02 (102.11)	4.67 (118.62)



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 Plus initial functional setup and system testing.

- For all MDrive23 step / direction input products — add "K" to part number (1)

Communication converter

Electrically isolated, in-line converter pre-wired with mating connector to conveniently set/ program communication parameters for a single MDrive Plus via a PC's USB port.

- | | | |
|---|------------|--------------|
| ■ Mates to 10-pin non-locking IDC connector | 12.0 (3.6) | MD-CC300-001 |
| ■ Mates to 12-pin locking wire crimp connector | 12.0 (3.6) | MD-CC303-001 |
| ■ Mates to 19-pin male M23 industrial connector | 12.0 (3.6) | MD-CC301-001 |

Prototype development cable

Speed test/development with pre-wired mating connector with other cable end open.

- | | | |
|---|------------|---------------|
| ■ Mates to 12-pin locking wire crimp connector for I/O, communication and power | 10.0 (3.0) | PD12-1434-FL3 |
| ■ Mates to 19-pin male M23 industrial connector with straight termination for I/O, communication and power | 13.0 (4.0) | MD-CS100-000 |
| ■ Mates to 19-pin male M23 industrial connector with right angle termination for I/O, communication and power | 13.0 (4.0) | MD-CS101-000 |

Encoder cables (2)

Pre-wired mating connector with other cable end open.

- | | | |
|--|-----------|------------|
| ■ For external single-end optical encoder with non-locking connector | 1.0 (0.3) | ED-CABLE-2 |
| ■ For external differential optical encoder with locking connector | 6.0 (1.8) | ED-CABLE-6 |

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.

- | | | |
|--|---|-------|
| ■ 10-pin non-locking IDC connector for communication | — | CK-01 |
| ■ 12-pin locking wire crimp connector for I/O, communication and power | — | CK-03 |

Drive protection module

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

- | | |
|--|-------|
| ■ For all MDrive23 step / direction input products — | DPM75 |
|--|-------|

(1) See next page.



MDrive® 23 Plus

Step / direction input

MDrive® 23 Plus



P1: I/O & Power
 F = 12" flying leads
 P = non-locking spring clamp terminal strip
 C = 12-pin locking wire crimp (includes I/O, Power & Comm)

P2: Communication
 D = SPI with 10-pin IDC non-locking connector
 Z = None. Used with 12-pin locking wire crimp in position P1, which includes communication.

MDrive® 23 Plus with industrial connector



P1: I/O, Power & Communication
 19-pin M23 male industrial connector

Part numbers

Example:	K	M	D	M	1	F	S	D	2	3	A	7	-E1
QuickStart Kit K = kit option, or leave blank if not wanted	K	M	D	M	1	F	S	D	2	3	A	7	-E1
MDrive Plus version MDM = Step / direction input	K	M	D	M	1	F	S	D	2	3	A	7	-E1
Input 1 = Universal input 2 = Universal input with industrial connector, IP54-rated 5 = Differential CW/CCW input (1)	K	M	D	M	1	F	S	D	2	3	A	7	-E1
P1 connector F = flying leads P = pluggable C = wire crimp M = industrial connector (2)	K	M	D	M	1	F	S	D	2	3	A	7	-E1
Communication S = SPI	K	M	D	M	1	F	S	D	2	3	A	7	-E1
P2 connector (3) (4) D = IDC Z = none	K	M	D	M	1	F	S	D	2	3	A	7	-E1
Motor size 23 = NEMA 23 (2.3" / 57 mm)	K	M	D	M	1	F	S	D	2	3	A	7	-E1
Motor length (5) A = single stack B = double stack C = triple stack D = quad stack	K	M	D	M	1	F	S	D	2	3	A	7	-E1
Drive voltage (5) 7 = +12 to +75 VDC 6 = +12 to +60 VDC	K	M	D	M	1	F	S	D	2	3	A	7	-E1
Options Leave blank if not wanted Options may not be combined													-E1
-E _____ = external optical encoder with index mark (1)													
	line count	100	200	250	256	400	500	512	1000	1024			
	single-end part #	E1	E2	E3	EP	E4	E5	EQ	E6	ER			
	differential part #	EAL	EBL	ECL	EWL	EDL	EHL	EXL	EJL	EYL			
-N _____ = rear control knob for manual positioning (1)													

(1) Not available with industrial connector products.
 (2) Only available with industrial connector products.
 (3) Wire crimp connector at P1 includes communication, so the P2 designator is Z=none.
 (4) Industrial connector at P1 includes communication, so the P2 designator is Z=none.
 (5) Only quad stack motors have +12 to +60 VDC drives, all other motors have +12 to +75 VDC drives.

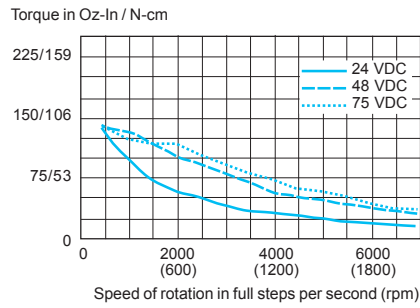
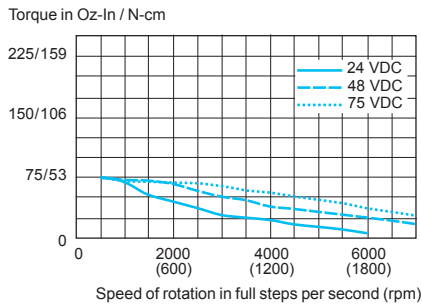
Easy MDrive part numbers via an interactive tool at: www.imshome.com/MDrivePlus.html

Motor specifications MDrive 23

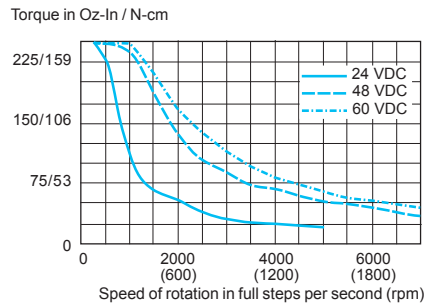
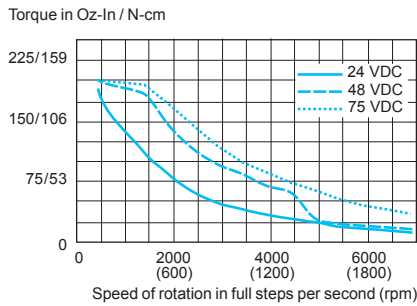
		Holding torque	Detent torque	Rotor inertia	Weight (motor + driver)
Motor stack length	Single	90.0 oz-in / 64.0 N-cm	3.9 oz-in / 2.7 N-cm	0.0025 oz-in-sec ² / 0.18 kg-cm ²	21.6 oz / 612.3 g
	Double	144.0 oz-in / 102.0 N-cm	5.6 oz-in / 3.92 N-cm	0.0037 oz-in-sec ² / 0.26 kg-cm ²	26.4 oz / 748.4 g
	Triple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

Speed torque characteristics MDrive 23

Single stack length **Double stack length**



Triple stack length **Quad stack length**



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