

MDrive® Plus

MDI•23 programmable Motion Control

Product overview

MDrive® Plus Motion Control products integrate 1.8° 2-phase stepper motor, fully programmable motion controller, drive electronics and optional encoder. Products with encoders include stall detection, position maintenance, and find index mark.

Programming for these stand-alone motion control solutions is via RS-422/485 interface with MCode software using simple 1 to 2 character instructions.

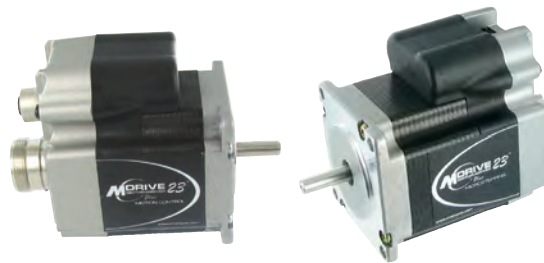
Application areas

MDrive Plus products deliver reliable performance for new and existing motion control applications. Satisfying the requirements for a wide range of machine builders.

Simplify your machine design and reduce cabinet size by replacing multiple components with a single compact integrated motor. Fewer individual

system components eliminates multiple potential failure points, and lowers risk of electrical noise by eliminating cabling between motor and drive.

These compact, powerful and cost effective motion control solutions deliver exceptional smoothness and performance that can reduce system cost, design and assembly time for a large range of 2-phase stepper motor applications.



MDI•23 MDrive Plus programmable Motion Control products: integrated NEMA23 motor and controls, IP65 & IP20-rated

General features

Compact integrated microstepping drive, programmable motion controller and NEMA23 1.8° 2-phase stepper motor	
Advanced current control for exceptional performance and smoothness	
+12 to +75 VDC single supply	
20 microstep resolutions up to 51,200 steps per rev including: Degrees, Metric, Arc Minutes	
Auxiliary logic power supply input	
0 to 5 MHz step clock rate selectable in 0.59 Hz increments	
Up to 8 I/O lines	
One 10 bit selectable analog input	
Communication	RS-422/485
Protection	IP20, IP65 ratings
Programmable	Motor run/hold current
Available options	Motor stack lengths
	Long life linear actuators (1)
	Connector options
	Encoders
	Rear control knob for manual positioning
Graphical user interface provided for quick and easy parameter setup	

(1) Refer to MDrive Linear Actuator documentation.

MDrive Plus

MDI•23 programmable Motion Control

Specifications

Communication	Protocol type	RS-422/485	4.8 to 115.2 kbps baud rate	
Input power	Voltage	VDC	+12...+75 for motor stack lengths: single, double, triple +12...+60 for motor stack length: quad	
	Current maximum (1)	Amp	2.0 for motor stack lengths: single, double, triple 3.5 for motor stack length: quad	
Motor	Frame size	NEMA	23	
		inches	2.3	
		mm	57	
	Holding torque	oz-in	90...283	
		N-cm	64 ... 200	
	Length	stack sizes	1, 2, 3 & 4	
Thermal	Operating temp non-condensing	Heat sink maximum	85°C	
		Motor maximum	100°C	
Protection	Type	IP rating	IP20, IP65	
		I/O warnings	Over temp, short circuit, transient, over voltage, inductive clamp	
Auxiliary logic input	Voltage range		+12 to +24 VDC When input voltage is removed, maintains power only to control and feedback circuits.	
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	Output sinking current		Up to 600 mA	
	Plus products	Number	4	
		Type		Sourcing or sinking inputs, or sinking outputs
		Logic range		Inputs and outputs tolerant to +24 VDC, inputs TTL level compatible
	Plus ² products	Number		8 or 4 (2)
		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	
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
	Velocity	Range		+/- 5,000,000 steps per second
		Resolution		0.5961 steps per second
	Accel/Decel	Range		1.5 to 10 ⁹ steps per second ²
		Resolution		90.9 steps per second ²
		Position feedback	Optional	Encoder required
	Expanded motion Plus ² products only	Electronic gearing external clock in (3)	Range	0.001 to 2.000
Resolution			32 bit	
Threshold			TTL	
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
		Position feedback	Optional	Remote encoder interface required
Software		Program storage	Type/size	Flash/6384 bytes
		User registers		Four 32 bit
	User program labels & 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, 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 (2)	
	Encoder functions		Stall detection, position maintenance, find index	

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

(2) I/O is reduced from 8 to 4 for products with remote encoder option.

(3) Adjusting the microstep resolution can increase the range.

See User Manual for complete details: <https://novantaims.com/downloads/product-literature/manuals-3/>

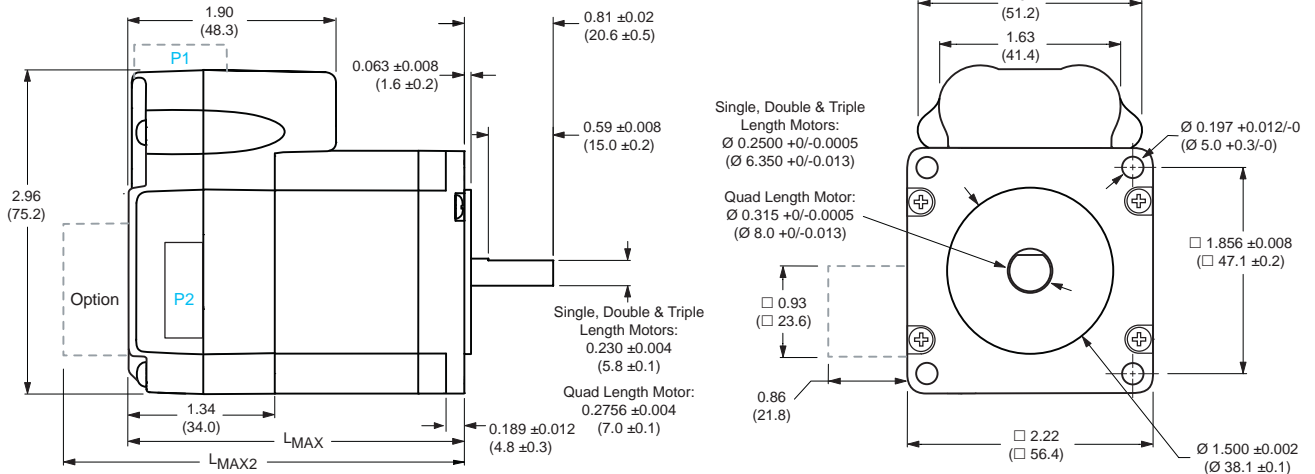
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Dimensions

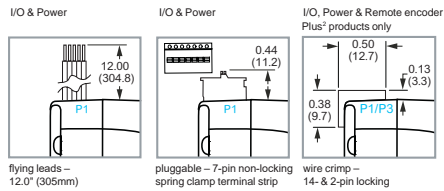
MDI•23 NEMA23 motor, IP20-rated

inches (mm)

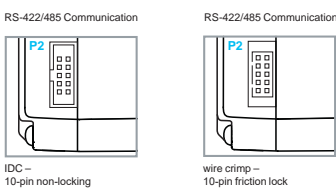


Motor stack length	Lmax	Lmax2
Single	2.65 (67.31)	3.36 (85.34)
Double	3.02 (76.71)	3.73 (94.74)
Triple	3.88 (98.55)	4.59 (116.59)
Quad	5.28 (134.15)	5.99 (152.19)

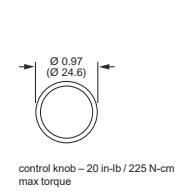
P1/P3 connector options



P2 connector options

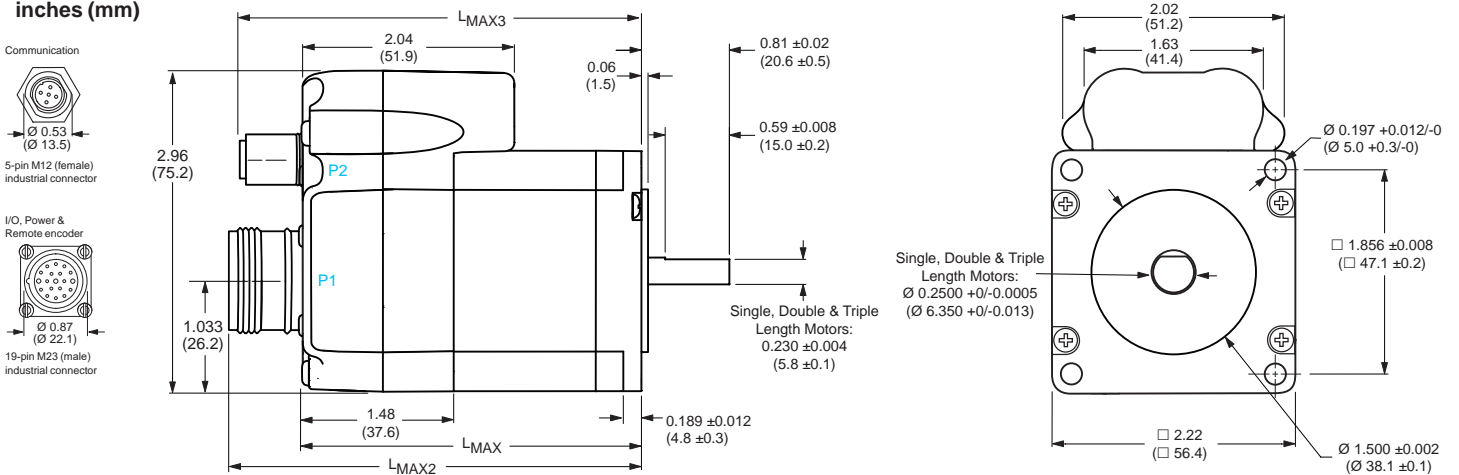


Lmax2 option



MDI•23 NEMA23 motor, IP65-rated

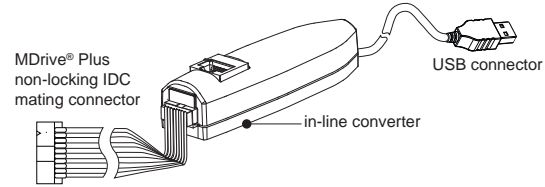
inches (mm)



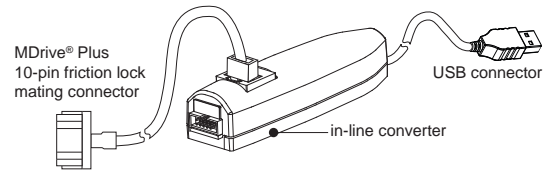
Motor stack length	Lmax	Lmax2	Lmax3
Single	2.82 (71.63)	3.48 (88.39)	3.42 (86.87)
Double	3.16 (80.26)	3.82 (97.03)	3.76 (95.5)
Triple	4.02 (102.11)	4.67 (118.62)	4.62 (117.35)

MDrive Plus

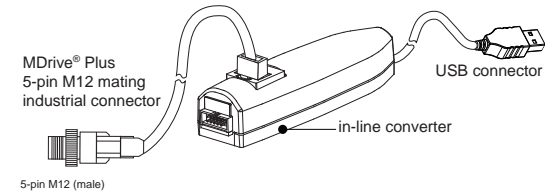
MDI•23 programmable Motion Control



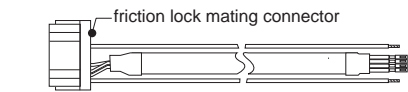
MD-CC400-001



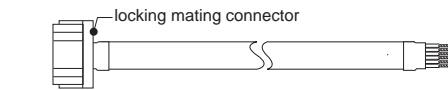
MD-CC402-001



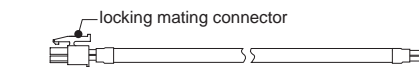
MD-CC401-001



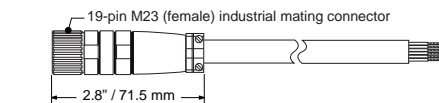
PD10-1434-FL3



PD14-2334-FL3



PD02-2300-FL3



MD-CS100-000

Accessories

description	length feet (m)	part number
QuickStart Kit For rapid design verification, all-inclusive QuickStart Kits includes prototype development cables and a communication converter for MDrive Plus initial functional setup and system testing.		
For all MDrive23 programmable Motion Control products	—	add "K" to part number

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-CC400-001
Mates to 10-pin friction lock wire crimp connector	12.0 (3.6)	MD-CC402-001
Mates to 5-pin female M12 industrial connector	12.0 (3.6)	MD-CC401-001

Prototype development cable

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

Mates to 10-pin locking wire crimp connector for I/O and remote encoder option	10.0 (3.0)	PD10-1434-FL3
Mates to 14-pin locking wire crimp connector for I/O and remote encoder option	10.0 (3.0)	PD14-2334-FL3
Mates to 2-pin locking wire crimp connector for power	10.0 (3.0)	PD02-2300-FL3
Mates to 19-pin male M23 industrial connector with straight termination for I/O, power and remote encoder option	13.0 (4.0)	MD-CS100-000
Mates to 19-pin male M23 industrial connector with right angle termination for I/O, power and remote encoder option	13.0 (4.0)	MD-CS101-000

Mating connector kits

Connectors for assembly of cables, cable material not supplied. Sold in lots of 5. Manufacturer's crimp tool recommended for crimp connectors.

10-pin friction lock wire crimp connector for communication	—	CK-02
10-pin non-locking IDC connector for communication	—	CK-01
14-pin locking wire crimp connector for I/O and remote encoder option	—	CK-09
2-pin locking wire crimp connector for power	—	CK-04

Drive protection module

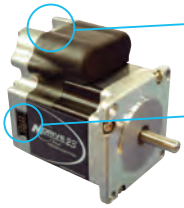
Limits surge current and voltage to a safe level when DC input power is switched on-and-off to an MDrive Plus.

For all MDrive23 programmable Motion Control products	—	DPM75
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MDrive Plus

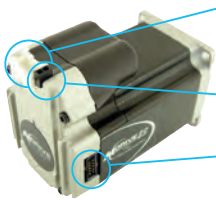
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MDrive® 23 Plus IP20



- P1: I/O & Power**
F = 12" flying leads
P = non-locking spring clamp terminal strip
- P2: Communication**
D = RS-422/485 with 10-pin IDC non-locking connector
L = RS-422/485 with 10-pin friction lock wire crimp connector

MDrive® 23 Plus² IP20



- P1: I/O, and optional remote encoder**
C = 14-pin locking wire crimp connector
- P3: Power**
2-pin locking wire crimp connector
- P2: Communication**
D = RS-422/485 with 10-pin IDC non-locking connector
L = RS-422/485 with 10-pin friction lock wire crimp connector

MDrive® 23 Plus² IP65 with industrial connectors



- P2: Communication**
Q = RS-422/485 with 5-pin M12 female industrial connector
- P1: I/O & Power, and optional remote encoder**
M = 19-pin M23 male industrial connector

Part numbers

IP20-rated products

example part number	K	M	D	I	1	F	R	D	2	3	A	7	-N
QuickStart Kit K = kit option, omit from part number if unwanted	K	M	D	I	1	F	R	D	2	3	A	7	-N
MDrivePlus version MDI = Intelligent — programmable Motion Control	K	M	D	I	1	F	R	D	2	3	A	7	-N
Input 1 = Plus version with standard features 3 = Plus ² version with expanded features	K	M	D	I	1	F	R	D	2	3	A	7	-N
P1 connector F = flying leads P = pluggable C = wire crimp (1)	K	M	D	I	1	F	R	D	2	3	A	7	-N
Communication type R = RS-422/485	K	M	D	I	1	F	R	D	2	3	A	7	-N
P2 connector D = IDC L = wire crimp	K	M	D	I	1	F	R	D	2	3	A	7	-N
Motor size 23 = NEMA 23 2.3" / 57mm	K	M	D	I	1	F	R	D	2	3	A	7	-N
Motor length A = single stack B = double stack C = triple stack D = quad stack	K	M	D	I	1	F	R	D	2	3	A	7	-N
Drive voltage (2) 7 = +12 to +75 VDC 6 = +12 to +60 VDC	K	M	D	I	1	F	R	D	2	3	A	7	-N
Options — omit from part number if unwanted -N = rear control knob for manual positioning -EQ = internal 512-line magnetic encoder w/ index mark -EE (1) = remote differential encoder interface; encoder not supplied	K	M	D	I	1	F	R	D	2	3	A	7	-N

(1) Only available with Plus² products.

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

IP65-rated products

example part number	K	M	D	I	4	M	R	Q	2	3	A	7	-EQ
QuickStart Kit K = kit option, omit from part number if unwanted	K	M	D	I	4 <td>M</td> <td>R</td> <td>Q</td> <td>2</td> <td>3</td> <td>A</td> <td>7</td> <td>-EQ</td>	M	R	Q	2	3	A	7	-EQ
MDrivePlus version MDI = Intelligent — programmable Motion Control	K	M	D	I	4 <td>M</td> <td>R</td> <td>Q</td> <td>2</td> <td>3</td> <td>A</td> <td>7</td> <td>-EQ</td>	M	R	Q	2	3	A	7	-EQ
Input 4 = Plus ² version with expanded features	K	M	D	I	4 <td>M</td> <td>R</td> <td>Q</td> <td>2</td> <td>3</td> <td>A</td> <td>7</td> <td>-EQ</td>	M	R	Q	2	3	A	7	-EQ
P1 connector M = M23 industrial connectors	K	M	D	I	4 <td>M</td> <td>R</td> <td>Q</td> <td>2</td> <td>3</td> <td>A</td> <td>7</td> <td>-EQ</td>	M	R	Q	2	3	A	7	-EQ
Communication type R = RS-422/485	K	M	D	I	4 <td>M</td> <td>R</td> <td>Q</td> <td>2</td> <td>3</td> <td>A</td> <td>7</td> <td>-EQ</td>	M	R	Q	2	3	A	7	-EQ
P2 connector Q = M12 industrial connector	K	M	D	I	4 <td>M</td> <td>R</td> <td>Q</td> <td>2</td> <td>3</td> <td>A</td> <td>7</td> <td>-EQ</td>	M	R	Q	2	3	A	7	-EQ
Motor size 23 = NEMA 23 2.3" / 57mm	K	M	D	I	4 <td>M</td> <td>R</td> <td>Q</td> <td>2</td> <td>3</td> <td>A</td> <td>7</td> <td>-EQ</td>	M	R	Q	2	3	A	7	-EQ
Motor length A = single stack B = double stack C = triple stack	K	M	D	I	4 <td>M</td> <td>R</td> <td>Q</td> <td>2</td> <td>3</td> <td>A</td> <td>7</td> <td>-EQ</td>	M	R	Q	2	3	A	7	-EQ
Drive voltage 7 = +12 to +75 VDC	K	M	D	I	4 <td>M</td> <td>R</td> <td>Q</td> <td>2</td> <td>3</td> <td>A</td> <td>7</td> <td>-EQ</td>	M	R	Q	2	3	A	7	-EQ
Options — omit from part number if unwanted -EQ = internal 512-line magnetic encoder w/ index mark -EE = remote differential encoder interface; encoder not supplied	K	M	D	I	4 <td>M</td> <td>R</td> <td>Q</td> <td>2</td> <td>3</td> <td>A</td> <td>7</td> <td>-EQ</td>	M	R	Q	2	3	A	7	-EQ

MDrive Plus

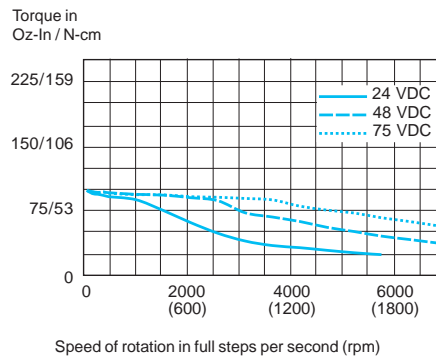
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Motor performance

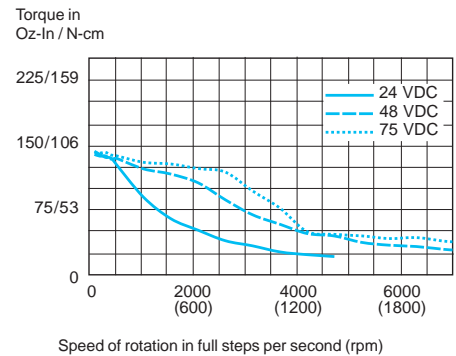
MD•23 NEMA 23 motor specifications	Motor	Stack length	Single	Double	Triple	Quad
			Holding torque	oz-in	90	144
		N-cm	64	102	169	200
Detent torque	oz-in		3.9	5.6	9.7	14.2
	N-cm		2.7	3.9	6.9	10.0
Rotor inertia	oz-in-sec ²		0.0025	0.0037	0.0065	0.0108
	kg-cm ²		0.18	0.26	0.46	0.76
Weight (motor+driver)	oz		21.6	26.4	39.2	62
	g		612	748	1111	1746

MD•23 NEMA 23 speed torque (1)

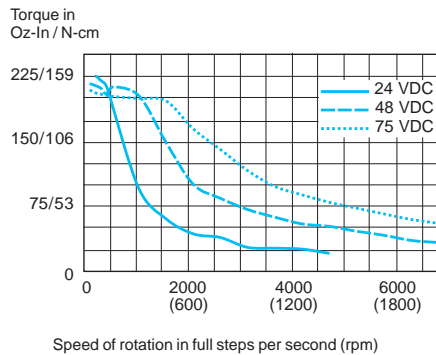
Single stack length



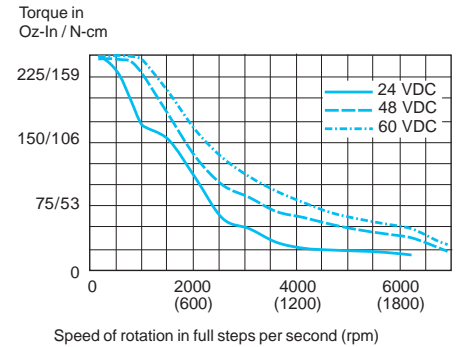
Double stack length



Triple stack length



Quad stack length



(1) Test conditions: 100% current with damper simulating load.

Novanta IMS

370 North Main Street
 Marlborough, CT 06447
 Phone: (860) 295-6102
 Fax: (860) 295-6107
www.novantaims.com

