



**MOTION CONTROL**  
(with optional CANopen)

## STANDARD FEATURES

- Highly Integrated Microstepping Driver, Intelligent Motion Controller and NEMA 23 High Torque 1.8° Brushless Step Motor
- Advanced 2nd Generation Current Control for Exceptional Performance and Smoothness
- Single Supply: +12 up to +75 VDC\*
- Cost Effective
- Extremely Compact
- Available Options:
  - Long Life Linear Actuators\*\*
  - Internal Magnetic Encoder for Closed Loop Control
  - Integrated Planetary Gearbox
  - Control Knob for Manual Positioning
- 4 Rotary Motor Lengths Available
- Auxiliary Logic Power Supply Input
- 20 Microstep Resolutions up to 51,200 Steps Per Rev Including: Degrees, Metric, Arc Minutes
- Open or Optional Closed Loop Control
- Programmable Motor Run and Hold Currents
- Four +5 to +24 VDC I/O Lines Accept Sourcing or Sinking Outputs
- One 10 Bit Analog Input Selectable: 0 to +10 VDC, 0 to +5 VDC, 0-20 mA, 4-20 mA
- 0 to 5MHz Step Clock Rate Selectable in 0.59Hz Increments
- RS-422/485 or Optional CANopen Communications
- 62 Software Addresses for Multi-Drop Communications
- Simple 1 to 2 Character Instructions
- Interface Options:
  - Pluggable Terminal Strip
  - 12.0" (30.5cm) Flying Leads

## EXPANDED PLUS<sup>2</sup> FEATURES

- +24 VDC Tolerant I/O Lines Sourcing or Sinking, Inputs and Outputs:
  - 8 I/O Lines with Electronic Gearing (or)
  - 4 I/O Lines with External/Remote Encoder for Closed Loop Control
- High Spd Position Capture Input or Trip Output
- Pluggable Locking Wire Crimp Interface
- IP65 Sealed Configuration with M12/M23 Circular Connectors

\* 12-75 VDC single, double & triple length motors; 12-60 VDC quad length motor.

\*\* Consult Factory for Availability.

## DESCRIPTION

The **MDrive®23Plus Motion Control** offers system designers a cost effective, full featured programmable motion controller integrated with a NEMA 23 high torque 1.8° brushless step motor and a +12 up to +75 VDC\* microstepping driver.

The unsurpassed smoothness and performance delivered by the MDrive23Plus Motion Control 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 up 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 cable runs and multiple drive systems. An extended operating range of -40° to +85°C provides long life, trouble free service in demanding environments.

Standard features of all MDrive23Plus Motion Control include four +5 to +24 volt general purpose I/O lines, one 10 bit analog input, 0 to 5MHz step clock rate, 20 microstep resolutions up to 51,200 steps per revolution, and full featured easy-to-program instruction set.

Expanded features of MDrive23Plus<sup>2</sup> versions include up to eight +5 to +24 volt general purpose I/O lines and the capability of electronic gearing by following a rotary or linear axis at an electronically controlled ratio, or an output clock can be generated fixed to the internal step clock.

For use in environments where exposure to chemical, dust and liquids may occur, MDrive23Plus<sup>2</sup>-65 sealed assembly versions are designed to meet IP65 specifications.

All MDrive23Plus Motion Control are available with optional closed loop control. This increases functionality by add-

ing stall detection, position maintenance and find index mark.

The closed loop configuration is added via a 512 line (2048 edge) magnetic encoder with index mark, internal to the unit so there is no increase in length. Or, for an expanded choice of line counts and resolutions with MDrive23Plus<sup>2</sup> versions only, closed loop control is available with an interface to a remotely mounted user-supplied external encoder.

The MDrive communicates over RS-422/485 which allows for point-to-point or multiple unit configurations utilizing one communication port. Addressing and hardware support up to 62 uniquely addressed units communicating over a single line. Baud rate is selectable from 4.8 to 115.2kbps.

Optional communication protocols include CANopen. The CAN bus is 2.0B active (11 and/or 29 bit) and is capable of all standard frequencies from 10kHz to 1MHz. CANopen features include node guarding, heartbeat producer, SDOs and PDOs. Highlights include variable PDO mapping and extended node identifier.

Motor configurations include a single shaft rotary in four lengths, and linear actuators with long life Acme screw\*\*.

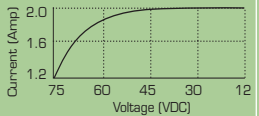
Numerous connector styles give you choices for the best fit and features. Select from 12.0" (30.5cm) flying leads, pluggable terminal strip, locking wire crimp connectors, and M12/M23 circular connectors on IP65 sealed versions.

MDrivePlus connectivity has never been easier with options ranging from **all-inclusive QuickStart Kits** to **individual interfacing cables** and **mating connector kits** to build your own cables. See pg 5.

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

# MDrive23<sup>Plus</sup> MOTION CONTROL

## STANDARD SPECIFICATIONS (Plus Versions)

INPUT VOLTAGE (+V)	Range	<b>+12 to +75 VDC</b> <i>applicable for motors:</i> - <b>Single length</b> - <b>Double length</b> - <b>Triple length</b> 		<b>+12 to +60 VDC</b> <i>applicable for motor:</i> - <b>Quad length</b> 	
		Power supply current requirements = 2A (maximum)		Power supply current requirements = 3A (maximum)	
AUX. LOGIC INPUT VOLTAGE	Range	+12 to +24 VDC Maintains power to control and feedback circuits (only) when input voltage is removed.			
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	Number/Type	4 Sinking Outputs/4 Sourcing or Sinking Inputs			
	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			
	Features	Node Guarding, Heartbeat, SDOs, PDOs (Variable Mapping)			
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)	
	Closed Loop Configuration (Optional)	Internal Encoder	Type	Internal, Magnetic	
			Steps Per Revolution	51200	
			Resolution	512 Lines / 2048 Edges Per Rev	
	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 <sup>9</sup> Steps Per Second <sup>2</sup>	
			Resolution	90.9 Steps Per Second <sup>2</sup>	
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		
	THERMAL	Operating Temperature	Heat Sink	-40° to +85°C (non-condensing)	
Motor			-40° to +100°C (non-condensing)		

## EXPANDED SPECIFICATIONS (Plus<sup>2</sup> & Plus<sup>2</sup>-65 Versions)

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 <sup>‡</sup> /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 <sup>‡</sup> (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 "Standard Specs Open Loop Steps/Rev" Above
Resolution			User-Defined Note: μstep/rev 2X the encoder count/rev minimum		

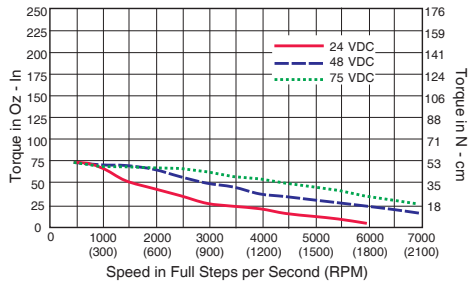
<sup>‡</sup> Adjusting the microstep resolution can increase the range.

## MOTOR SPECIFICATIONS

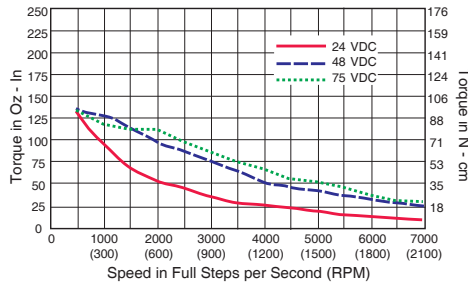
	Holding Torque	Detent Torque	Rotor Inertia	Weight (Motor+Driver)
SINGLE LENGTH	90 oz-in / 64 N-cm	3.9 oz-in / 2.7 N-cm	0.0025 oz-in-sec <sup>2</sup> / 0.18 kg-cm <sup>2</sup>	21.6 oz / 612.3 g
DOUBLE LENGTH	144 oz-in / 102 N-cm	5.6 oz-in / 3.92 N-cm	0.0037 oz-in-sec <sup>2</sup> / 0.26 kg-cm <sup>2</sup>	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 <sup>2</sup> / 0.46 kg-cm <sup>2</sup>	39.2 oz / 1111.3 g
QUAD LENGTH	283 oz-in / 200 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

## MOTOR PERFORMANCE — Speed-Torque

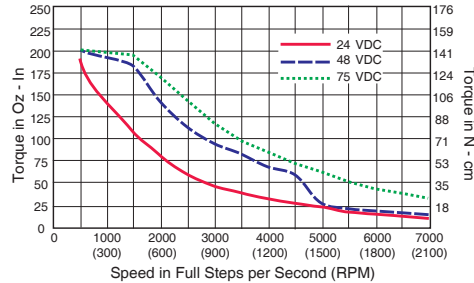
Single Length Rotary Motor



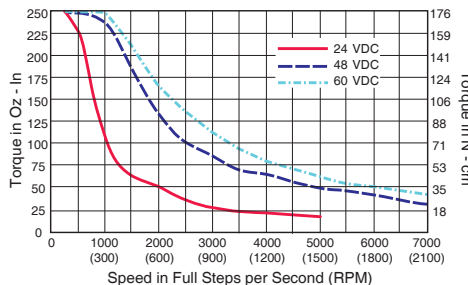
Double Length Rotary Motor



Triple Length Rotary Motor



Quad Length Rotary Motor



## WIRE/PIN ASSIGNMENTS — MDrive23Plus Motion Control

### Plus

P1: I/O & POWER CONNECTOR				
Pluggable Terminal Strip	Flying Leads Wire Colors	Function		
Pin 1	White/Yellow	I/O 1		
Pin 2	White/Orange	I/O 2		
Pin 3	White/Violet	I/O 3		
Pin 4	White/Blue	I/O 4		
Pin 5	Green	Analog Input		
Pin 6	Black	Power/Aux Ground		
Pin 7	Red	Input Voltage*		

P2: COMM CONNECTOR				
RS-422/485			CANopen	
10-Pin IDC	Wire Crimp	Function	DB9 (Male)	Function
Pin 1	Pin 9	TX +	Pin 1	No Connect
Pin 2	Pin 10	TX -	Pin 2	CAN Low
Pin 3	Pin 7	RX +	Pin 3	CAN -V
Pin 4	Pin 8	RX -	Pin 4	Aux Power
Pin 5	Pin 5	Aux-Logic (+12 to +24 VDC)	Pin 5	Shield
Pin 6	Pin 6	RX +	Pin 6	CAN -V
Pin 7	Pin 3	RX -	Pin 7	CAN High
Pin 8	Pin 4	TX -	Pin 8	No Connect
Pin 9	Pin 1	TX +	Pin 9	CAN +V
Pin 10	Pin 2	Comm Ground		

\*Input Voltage

+12 to +75 VDC – Single, Double & Triple Length Motors

+12 to +60 VDC – Quad Length Motor

### Plus2

P1: I/O CONNECTOR		
Wire Crimp	Function	
	Expanded I/O	Remote Encoder Closed Loop Control
Pin 1	I/O Power	I/O Power
Pin 2	I/O Ground	I/O Ground
Pin 3	I/O 1	I/O 1
Pin 4	I/O 2	I/O 2
Pin 5	I/O 3	I/O 3
Pin 6	I/O 4	I/O 4
Pin 7	I/O 9	Channel A +
Pin 8	I/O 10	Channel A -
Pin 9	I/O 11	Channel B +
Pin 10	I/O 12	Channel B -
Pin 11	Capture/Trip I/O	Capture/Trip I/O
Pin 12	Analog In	Analog In
Pin 13	Step/Clock I/O	Index +
Pin 14	Direction/Clock I/O	Index -

P3: POWER CONNECTOR		
Wire Crimp	Function	
	Expanded I/O	Remote Encoder Closed Loop Control
Pin 1	Input Voltage*	Input Voltage*
Pin 2	Power/Aux Ground	Power/Aux Ground

P2: COMM CONNECTOR				
RS-422/485			CANopen	
10-Pin IDC	Wire Crimp	Function	DB9 (Male)	Function
Pin 1	Pin 9	TX +	Pin 1	No Connect
Pin 2	Pin 10	TX -	Pin 2	CAN Low
Pin 3	Pin 7	RX +	Pin 3	CAN -V
Pin 4	Pin 8	RX -	Pin 4	Aux Power
Pin 5	Pin 5	Aux-Logic (+12 to +24 VDC)	Pin 5	Shield
Pin 6	Pin 6	RX +	Pin 6	CAN -V
Pin 7	Pin 3	RX -	Pin 7	CAN High
Pin 8	Pin 4	TX -	Pin 8	No Connect
Pin 9	Pin 1	TX +	Pin 9	CAN +V
Pin 10	Pin 2	Comm Ground		

### Plus2-65 (sealed)

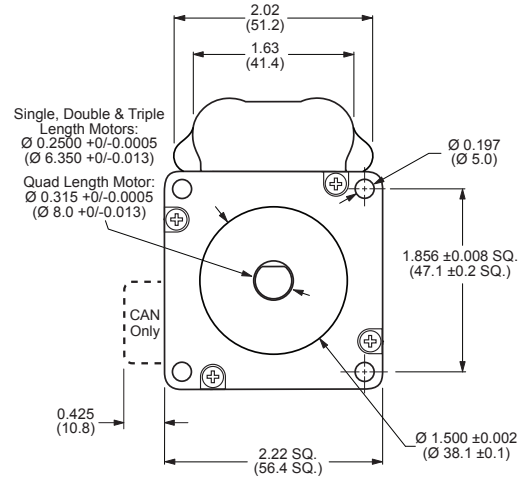
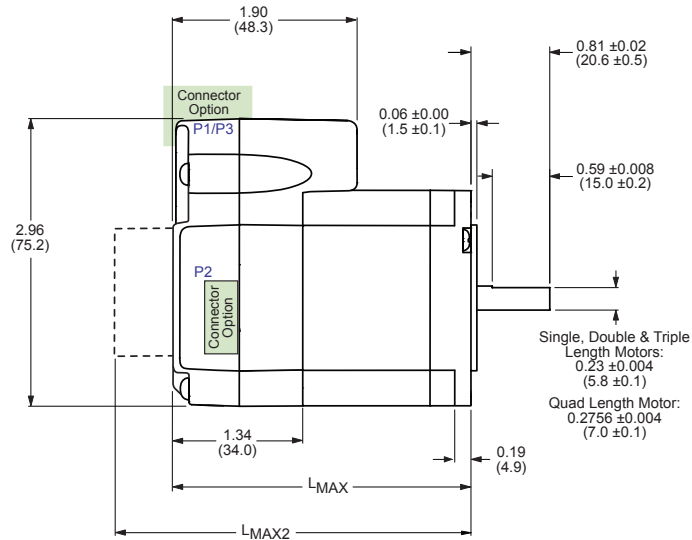
P1: I/O & POWER CONNECTOR		
M23 Circular (Male)	Function	
	Expanded I/O	Remote Encoder Closed Loop Control
Pin 1	I/O 9	Channel A +
Pin 2	I/O 11	Channel B +
Pin 3	Step/Clock I/O	Index +
Pin 4	I/O 1	I/O 1
Pin 5	Direction/Clock I/O	Index -
Pin 6	+V (+12 to +75 VDC)	+V (+12 to +75 VDC)
Pin 7	Aux-Logic (+12 to +24 VDC)	Aux-Logic (+12 to +24 VDC)
Pin 8	Comm Ground	Comm Ground
Pin 9	I/O 3	I/O 3
Pin 10	I/O Ground	I/O Ground
Pin 11	I/O Power	I/O Power
Pin 12	Shell Connect	Shell Connect
Pin 13	I/O 12	Channel B -
Pin 14	Capture/Trip I/O	Capture/Trip I/O
Pin 15	Analog In	Analog In
Pin 16	I/O 2	I/O 2
Pin 17	I/O 4	I/O 4
Pin 18	I/O 10	Channel A -
Pin 19	Power/Aux Ground	Power/Aux Ground

P2: COMM CONNECTOR				
RS-422/485			CANopen	
M12 Circular (Female)	Function	M12 Circular (Male)	Function	
Pin 1	TX -	Pin 1	Shield	
Pin 2	TX +	Pin 2	CAN +V	
Pin 3	RX +	Pin 3	CAN -V	
Pin 4	RX -	Pin 4	CAN High	
Pin 5	Comm Ground	Pin 5	CAN Low	

## MECHANICAL SPECIFICATIONS

Dimensions in Inches (mm)

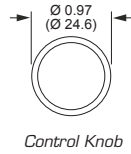
### MDrive23Plus & Plus<sup>2</sup> Motion Control



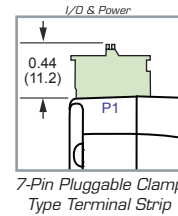
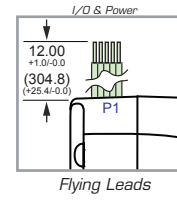
#### MDrive Lengths Inches (mm)

Motor Length	L <sub>MAX</sub> SINGLE SHAFT, INTERNAL ENCODER or LINEAR ACTUATOR VERSION	L <sub>MAX2</sub> CONTROL KNOB 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)
Quad	5.28 (134.15)	5.99 (152.19)

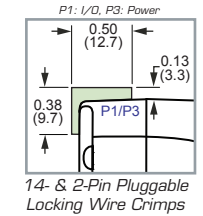
#### L<sub>MAX2</sub> Option



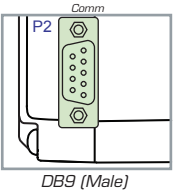
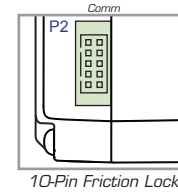
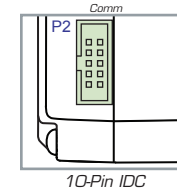
#### P1 Connector Options MDrivePlus



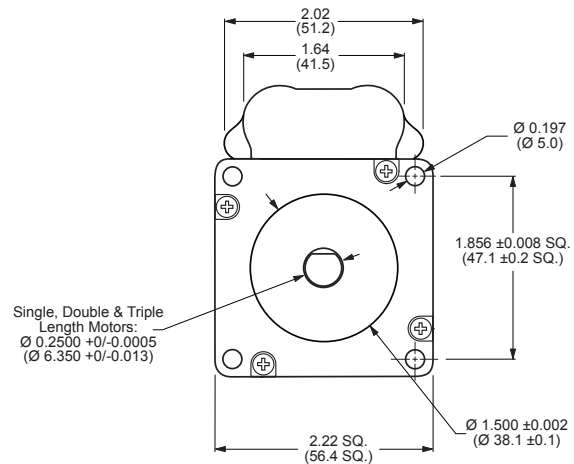
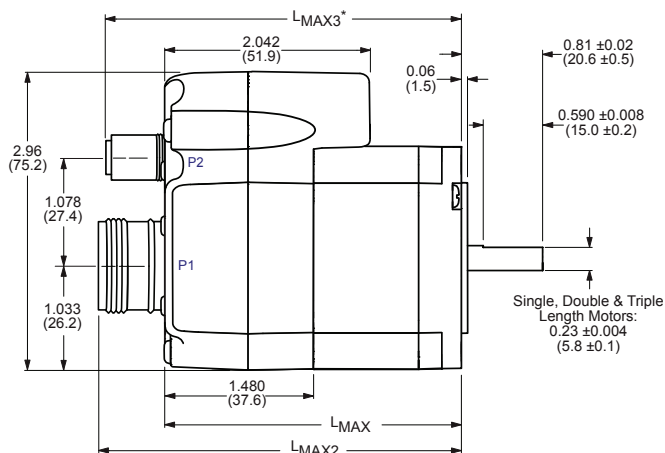
#### P1/P3 MDrivePlus<sup>2</sup>



#### P2 Connector Options MDrivePlus & Plus<sup>2</sup>



### MDrive23Plus<sup>2</sup>-65 Motion Control (sealed)

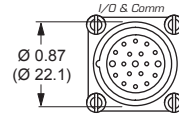


#### Sealed MDrive Lengths Inches (mm)

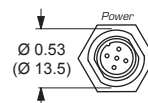
Motor Length	L <sub>MAX</sub>	L <sub>MAX2</sub>	L <sub>MAX3</sub> *
Single	2.82 (71.63)	3.48 (88.39)	3.42 (86.87)
Double	3.16 (80.26)	3.82 (97.03)	3.76 (95.5)
Triple	4.02 (102.11)	4.67 (118.62)	4.62 (117.35)

\*CANopen increases measurement by 0.09"/2.0mm

#### Connectors



P1: 19-Pin M23 (Male)



P2: 5-Pin M12 (Female)  
(or CANopen - Male)



## ORDER INFORMATION — MDrive23Plus Motion Control

### CONNECTIVITY

#### **new** QuickStart Kit

For rapid design verification, all-inclusive QuickStart Kits have communication converter, prototype development cable(s), instructions and CD for MDrivePlus initial functional setup and system testing.

#### **new** 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:

10-Pin IDC .....	MD-CC400-001
10-Pin Wire Crimp .....	MD-CC402-001
DB9 CANopen .....	MD-CC500-000*
5-Pin M12 CANopen (sealed version) .....	MD-CC500-000*
5-Pin M12 RS-422/485 (sealed version) .....	MD-CC401-001

\*Requires mating connector adapter and power supply, not supplied.

#### 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:

10-Pin Wire Crimp .....	PD10-1434-FL3
14-Pin Wire Crimp .....	PD14-2334-FL3
2-Pin Wire Crimp .....	PD02-2300-FL3

For IP65 sealed versions, single-ended cordsets are PVC jacketed with foil shield and unconnected drain wire. Length 13.0" (4.0m).

19-Pin M23

Straight Termination .....	MD-CS100-000
Right Angle Termination .....	MD-CS101-000

#### **new** 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:

10-Pin Wire Crimp .....	CK-02
14-Pin Wire Crimp .....	CK-09
2-Pin Wire Crimp .....	CK-04

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

10-Pin IDC .....	CK-01
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### 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](http://www.imshome.com/mdriveplus_linear_actuator.html)

#### Internal Encoder

All MDrive23Plus Motion Control versions are available with an optional internal 512-line (2048 count) magnetic encoder with index mark.

#### Remote Encoder (Plus<sup>2</sup> versions only)

MDrive23Plus<sup>2</sup> Motion Control versions are available with differential encoder inputs for use with a remote encoder (not supplied).

#### 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.

\*\* Consult Factory for Availability.

‡ Not Available with Sealed -65 Versions.

Connectivity details: [www.imshome.com/cables\\_cordsets.html](http://www.imshome.com/cables_cordsets.html)

### PART NUMBERING




**MDI1**       **23**       **OPTION**

**P1: I/O & Power**  
F = 12" Flying Leads  
P = Pluggable Clamp Type Terminal Strip

**P2: Communications**  
RD = RS-422/485 with 10-Pin IDC Connector  
RL = RS-422/485 with 10-Pin Friction Lock Wire Crimp  
CB = CANopen with DB9 Connector

**Motor**  
A7 = Single Length (12–75 VDC) & Linear Actuator\*\*  
B7 = Double Length (12–75 VDC)  
C7 = Triple Length (12–75 VDC)  
D6 = Quad Length (12–60 VDC)

**Example #1:** Part Number **MDI1PRD23A7** is an MDrive23Plus Motion Control with pluggable I/O & power interface, RS-422/485 communications with 10-pin IDC connector, and NEMA 23 single length motor.




**MDI3C**       **23**       **OPTION**

**P1: I/O 14-Pin Locking Wire Crimp**  
**P3: Power 2-Pin Locking Wire Crimp**

**P2: Communications**  
RD = RS-422/485 with 10-Pin IDC Connector  
RL = RS-422/485 with 10-Pin Friction Lock Wire Crimp  
CB = CANopen with DB9 Connector

**Motor**  
A7 = Single Length (12–75 VDC) & Linear Actuator\*\*  
B7 = Double Length (12–75 VDC)  
C7 = Triple Length (12–75 VDC)  
D6 = Quad Length (12–60 VDC)

**Example #2:** Part Number **MDI3CRD23C7** is an MDrive23Plus<sup>2</sup> Motion Control with 14-pin I/O interface and 2-pin power interface, RS-422/485 communications with 10-pin IDC connector, and NEMA 23 triple length motor.



**MDI4M**       **23**       **OPTION**

**P2: Communications**  
RQ = RS-422/485 with 5-Pin M12 Circular Connector  
CQ = CANopen with 5-Pin M12 Circular Connector

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

**Motor**  
A7 = Single Length (12–75 VDC)  
B7 = Double Length (12–75 VDC)  
C7 = Triple Length (12–75 VDC)

**Example #3:** Part Number **MDI4MRQ23B7** is an MDrive23Plus<sup>2</sup>-65 Motion Control sealed with IP65 rating, 19-pin M23 I/O & power interface, RS-422/485 communications with 5-pin M12 circular connector, and NEMA 23 double length motor.

\*Consult Factory for Availability.

OPTIONS	
Linear Actuator**	<b>-L</b>  For complete product specifications, see: <a href="http://www.imshome.com/mdriveplus_linear_actuator.html">www.imshome.com/mdriveplus_linear_actuator.html</a>
Internal Encoder	<b>-EQ</b>  Example: <b>MDI4MRQ23B7-EQ</b> adds a 512-line internal magnetic encoder with index mark to example #3.
Remote Encoder	<b>-EE</b>  Example: <b>MDI4MRQ23B7-EE</b> adds differential encoder inputs for use with remote encoder (not supplied). Available with Plus <sup>2</sup> versions only. May not be combined with internal encoder option.
Control Knob	<b>-N</b>  Example: <b>MDI3CRD23C7-N</b> adds a rear control knob for manual positioning to example #2. Not available with sealed -65 versions.
Planetary Gearbox	<b>-G</b> <span style="border: 1px solid black; padding: 2px;">  </span> <span style="border: 1px solid black; padding: 2px;">  </span> <span style="border: 1px solid black; padding: 2px;">  </span> <b>-F</b> <div style="display: flex; justify-content: space-between; font-size: small;"> <span>Refer to gearbox page for complete table of ratios and part numbers.</span> <span>Optional NEMA Flange</span> </div> Example: <b>MDI3CRD23C7-G1A2</b> adds a 1-stage planetary gearbox with 5.18:1 ratio to example #2. Add -F for optional NEMA flange.

## MDrive23PLUS WITH PLANETARY GEARBOX

The MDrive23Plus is available with a Planetary Gearbox option developed to increase torque at lower speeds, enable better inertia matching and produce finer positional resolutions. These efficient, low maintenance Planetary Gearbox come fully assembled with the MDrive and are offered in a large number of reduction ratios in 1-, 2- and 3-stage configurations. An optional NEMA Output Flange allows mounting the Planetary Gearbox to the load using a standard NEMA bolt circle. Planetary Gearbox may be combined with other MDrive23Plus options, however are unavailable with Linear Actuators.

### Planetary Gearbox Parameters

	Permitted Output Torque (oz-in/Nm)	Gearbox Efficiency	Maximum Backlash	Output Side with Ball Bearing			
				Maximum Load (lb-force/N)		Weight (oz/g)	
				Radial	Axial	Gearbox	with Flange
<b>1-STAGE</b>	566/4.0	0.80	0.70°	45/200	13/60	25.0/711	25.9/735
<b>2-STAGE</b>	1699/12.0	0.75	0.75°	72/320	22/100	32.2/914	33.3/945
<b>3-STAGE</b>	3540/25.0	0.70	0.80°	101/450	34/150	39.4/1117	40.7/1155

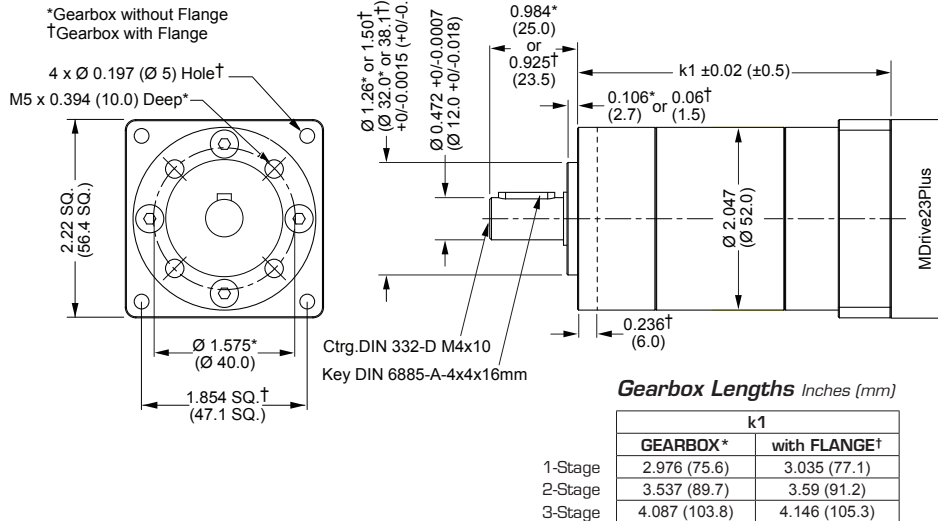
### Ratios and Part Numbers

Planetary Gearbox	Ratio (Rounded)	Part Number**
<b>1-Stage</b>	3.71:1	G1A1
<b>1-Stage</b>	5.18:1	G1A2
<b>1-Stage</b>	6.75:1	G1A3
<b>2-Stage</b>	13.73:1	G1A4
<b>2-Stage</b>	15.88:1	G1A5
<b>2-Stage</b>	18.37:1	G1A6
<b>2-Stage</b>	19.20:1	G1A7
<b>2-Stage</b>	22.21:1	G1A8
<b>2-Stage</b>	25.01:1	G1A9
<b>2-Stage</b>	26.85:1	G1B1
<b>2-Stage</b>	28.93:1	G1B2
<b>2-Stage</b>	34.98:1	G1B3
<b>2-Stage</b>	45.56:1	G1B4
<b>3-Stage</b>	50.89:1	G1B5
<b>3-Stage</b>	58.86:1	G1B6
<b>3-Stage</b>	68.07:1	G1B7
<b>3-Stage</b>	71.16:1	G1B8
<b>3-Stage</b>	78.72:1	G1B9
<b>3-Stage</b>	92.70:1	G1C1
<b>3-Stage</b>	95.18:1	G1C2
<b>3-Stage</b>	99.51:1	G1C3
<b>3-Stage</b>	107.21:1	G1C4
<b>3-Stage</b>	115.08:1	G1C5
<b>3-Stage</b>	123.98:1	G1C6
<b>3-Stage</b>	129.62:1	G1C7
<b>3-Stage</b>	139.14:1	G1C8
<b>3-Stage</b>	149.90:1	G1C9
<b>3-Stage</b>	168.85:1	G1D1
<b>3-Stage</b>	181.25:1	G1D2
<b>3-Stage</b>	195.27:1	G1D3
<b>3-Stage</b>	236.10:1	G1D4
<b>3-Stage</b>	307.55:1	G1D5

### Planetary Gearbox for MDrive23Plus

Dimensions in Inches (mm)

Dimensions in Inches (mm)



\*\*Include optional planetary gearbox by adding -G plus 3 characters to the end of an MDrive part number.

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