



MOTION CONTROL

[with optional CANopen]

STANDARD FEATURES

- Highly Integrated, High Performance Microstepping Driver and Motion Controller
- Advanced 2nd Generation Current Control for Exceptional Performance and Smoothness
- Single Supply: +12 to +48 VDC
- Low Cost
- Extremely Compact
- High Output Current up to 2 Amps RMS, 2.8 Amps Peak (Per Phase)
- 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 +10VDC, 0 to +5VDC, 0-20mA, 4-20mA
- 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
- Power and Signal Interface Options:
 - Pluggable Terminal Strip
 - 12.0" (30.5cm) Flying Leads

EXPANDED PLUS² FEATURES

- +5 to +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 Speed Position Capture Input or Trip Output
- Pluggable Locking Wire Crimp Interface

*CANopen may not support some objects.

DESCRIPTION

The ultra compact Motion Control MForce MicroDrive offers system designers a low cost, high performance microstepping driver integrated with an intelligent, programmable motion controller.

The unsurpassed smoothness and performance delivered by MForce MicroDrives 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.

Motion Control MForce MicroDrives accept a broad input voltage range from +12 to +48 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.

A high, per phase output current of up to 2 Amps RMS, 2.8 Amps Peak, allows the extremely compact MForce MicroDrive to control a broad array of motors from size 8 to size 34.

Standard features 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 in the Plus² version 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.

Motion Control MForce MicroDrive Plus² are available with optional closed loop control. This increases functionality by adding stall detection, position maintenance and find index mark. The closed loop configuration offers an expanded choice of line counts and resolutions by interfacing to a remotely mounted user-supplied external encoder.

Motion Control MForce MicroDrives communicate 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 115.2kpbs.

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.*

Power and signal interface connections are accomplished using 12.0" (30.5cm) flying leads or a 7 position terminal strip. Plus² versions come with pluggable locking wire crimp connector.

Motor phases are connected via a pluggable 4-pin locking wire crimp connector. Optional cables are available for ease of connecting and configuring the MForce MicroDrive, and are recommended with first order.

The Motion Control MForce MicroDrive is a compact, powerful and inexpensive solution that will reduce system cost, design and assembly time for a large range of applications.

MForce MicroDrive – MOTION CONTROL

STANDARD SPECIFICATIONS (Plus Versions)

INPUT VOLTAGE (+V)	Range	+12 to +48 VDC <i>Power supply current requirements = 2A (maximum) per MForce MicroDrive. Actual power supply current will depend on voltage and load.</i>		
	AUX. LOGIC INPUT VOLTAGE	Range	+12 to +24 VDC <i>Maintains power to control and feedback circuits (only) when input voltage is removed.</i>	
OUTPUT CURRENT	RMS (Max)	2 Amps		
	Peak (Per Phase)	2.8 Amps		
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.OB 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)	
	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	+, -, ×, ÷, >, <, =, <=, >=, 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, 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		
THERMAL	Heat Sink Temperature	-40° to +85°C		

EXPANDED SPECIFICATIONS (Plus² 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 [‡] /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 "Standard Specs Open Loop Steps/Rev" Above		
		Resolution	User-Defined Note: μstep/rev 2X the encoder count/rev minimum		

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

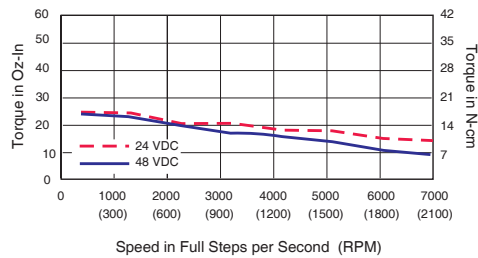
MOTOR RECOMMENDATIONS

IMS PART NUMBERS	Size 14 (0.75 Amps)	Size 17 (1.5 Amps)	Size 23 (2.4 Amps)
SINGLE LENGTH	M-1410-0.75	M-1713-1.5	M-2218-2.4
DOUBLE LENGTH	—	M-1715-1.5	M-2222-2.4
TRIPLE LENGTH	—	M-1719-1.5	M-2231-2.4

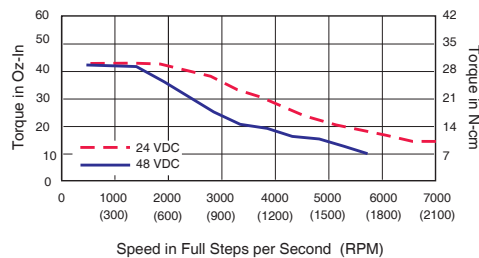
MOTOR PERFORMANCE

Speed-Torque

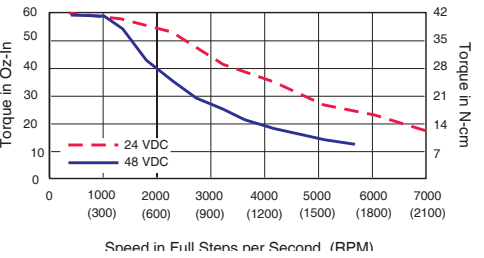
Single Length 17 Motor (IMS p/n M-1713-1.5)



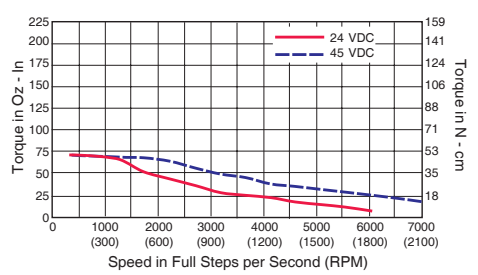
Double Length 17 Motor (IMS p/n M-1715-1.5)



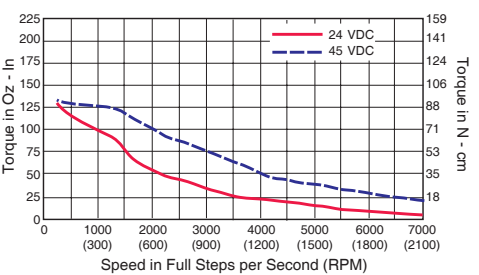
Triple Length 17 Motor (IMS p/n M-1719-1.5)



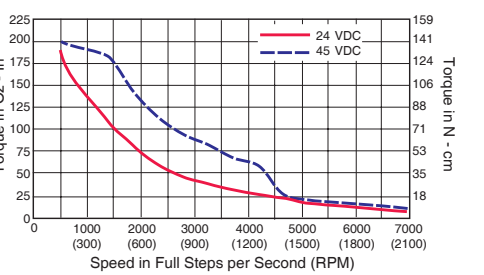
Single Length 23 Motor (IMS p/n M-2218-2.4)



Double Length 23 Motor (IMS p/n M-2222-2.4)



Triple Length 23 Motor (IMS p/n M-2231-2.4)



PIN/WIRE ASSIGNMENTS

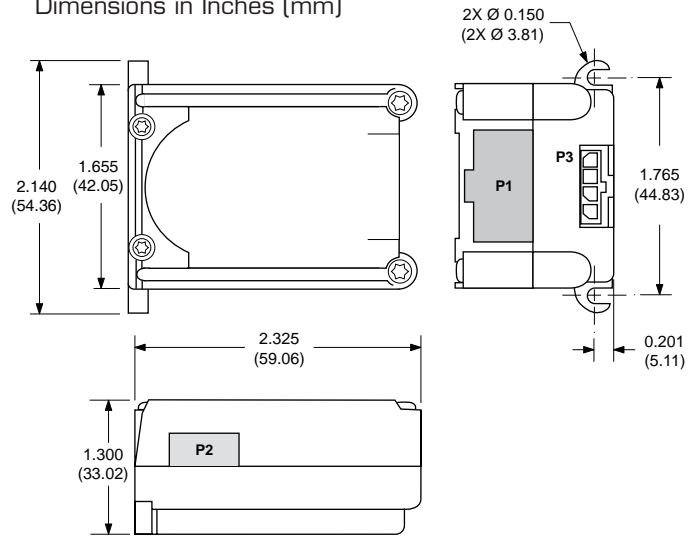
P1: I/O & POWER CONNECTOR		
PLUS – Standard Features		
Pluggable Terminal Strip	Flying Leads Wire Colors	Function
Pin 1	White/Yellow	I/O 1
Pin 2	White/Orange	I/O 2
Pin 3	White/Violet	I/O 3
Pin 4	White/Blue	I/O 4
Pin 5	Green	Analog Input
Pin 6	Black	Power/Aux Ground
Pin 7	Red	+V (+12 to +48 VDC)
PLUS ² – Expanded Features		
Wire Crimp	Function	
	Expanded I/O	Optional 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 -
Pin 15	+V (+12 to +48 VDC)	+V (+12 to +48 VDC)
Pin 16	Power/Aux Ground	Power/Aux Ground

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

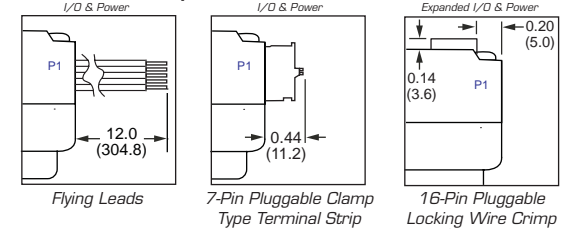
P3: MOTOR CONNECTOR	
Pluggable Locking Wire Crimp	Function
Pin 1	Phase /A
Pin 2	Phase A
Pin 3	Phase /B
Pin 4	Phase B

MECHANICAL SPECIFICATIONS

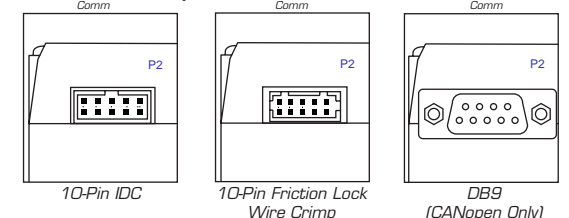
Dimensions in Inches (mm)



P1 Connector Options



P2 Connector Options



MForce MicroDrive – MOTION CONTROL

OPTIONS

Remote Encoder (Plus² versions only)

For optional closed loop control, Motion Control MForce MicroDrive Plus² versions are available with differential encoder inputs for use with a remote encoder (not supplied).

Motors and Encoders

IMS offers a wide range of motors, encoders and accessories recommended for interface with the Motion Control MForce MicroDrive. For complete specifications on these products, please visit the IMS web site at www.imshome.com.

Power Supplies

IMS recommends the following power supplies for operating the MForce MicroDrive: IP402, IP404, ISP200-4. For complete power supply specifications, visit the IMS web site at www.imshome.com.

ACCESSORIES

Communications Converter Cable and Adapter

With an in-line RS-422 converter, the optional 12.0' (3.6m) cable, and adapter required for 10-Pin Wire Crimp connector, facilitate the parameter setting of a single Motion Control MForce MicroDrive from its P2 connector to a PC's USB port with pluggable mating connectors. Recommended with first order.

- USB to 10-Pin IDC MD-CC400-000
- 10-Pin IDC to Wire Crimp Adapter MD-ADP-H


Prototype Development Cables

To speed prototyping, 10.0' (3.0m) development cables are available with pluggable wire crimp mating connectors to:

- I/O: 16-pin Connector PD16-1417-FL3
- Comm: 10-pin Connector PD10-1434-FL3
- Motor Interface: 4-pin Connector PDO4-MF17-FL3

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

ORDER INFORMATION



Plus


MF11 **17N4**

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

P3: Motor Interface
4-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

Example: Part Number **MF11PRD17N4** is a Motion Control MForce MicroDrive Plus with pluggable I/O & power interface, RS-422/485 communications with 10-pin IDC connector and 4-pin motor interface.



Plus²

MFI3C **17N4** – **OPTION EE**

P1: I/O & Power
16-Pin Locking Wire Crimp

P3: Motor Interface
4-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

Remote Encoder Interface
For Closed Loop Control (Encoder Not Supplied)

Example: Part Number **MFI3CRD17N4** is a Motion Control MForce MicroDrive Plus² with 16-pin I/O & power interface, RS-422/485 communications with 10-pin IDC connector and 4-pin motor interface.

Option: Include -EE to part number for optional interface to remote encoder (not supplied). *Plus² versions only.*



INTELLIGENT MOTION SYSTEMS, INC.

www.imshome.com

370 N. Main St., P.O. Box 457
Marlborough, CT 06447 U.S.A.
Phone: 860/295-6102
Fax: 860/295-6107
E-mail: info@imshome.com

TECHNICAL SUPPORT (U.S.A.)
Phone: 860/295-6102
Fax: 860/295-6107
E-mail: etech@imshome.com

IMS ASIA PACIFIC OFFICE
30 Raffles Pl., 23-00 Caltex House
Singapore 048622
Phone: +65/6233/6846
Fax: +65/6233/5044
E-mail: wlee@imshome.com

IMS EUROPEAN SALES MGT.
4 Quai Des Etoilts
69005 Lyon, France
Phone: +33/4 7256 5113
Fax: +33/4 7838 1537
E-mail: bmartinez@imshome.com

IMS UK Ltd.
25 Barnes Wallis Road
Segensworth East
Fareham, Hampshire PO15 5TT
Phone: +44/0 1489-889825
Fax: +44/0 1489-889857
E-mail: mcheckley@imshome.com

U.S.A. SALES OFFICES

Eastern Region
Phone: 973/661-1270
Fax: 973/661-1275
E-mail: jroake@imshome.com

Central Region
Phone: 260/402-6016
Fax: 419/858-0375
E-mail: dwaksman@imshome.com

Western Region
Phone: 602/578-7201
E-mail: dweisenberger@imshome.com

DISTRIBUTED BY:

Excellence in Motion™