REACH

MForce

Motion Control stepper motor drive, CANopen interface

Product overview

MForce products are universally applicable stepper motor drives with on-board motion controller for CANopen (DS402) interface. Together with selected Schneider Electric Motion USA stepper motors, MForce is a very compact, high performance drive system that can used on a CANopen network. MForce operating voltage ranges are:

- 12 to 48 VDC — MForce MicroDrive
- 12 to 75 VDC — MForce PowerDrive

Connection technologies

CANopen MForce connections include:

- Power input
- Communication interface
- Motor interface
- Mulitfunction interface

The multifunction interface operates at the following signal levels:

- 5 - 24 V programmable signals, inputs or outputs, sinking or sourcing

  Up to eight 24 V I/O signals are available via the multifunction interface, which can be configured as sinking or sourcing inputs or outputs. They can be used for the following predefined functions:

  Input functions: home, limit +, limit -, go, stop, pause, jog +, jog -, general purpose.

  Output functions: moving, error, stall, velocity changing, general purpose.

- Analog input signal

  The one input signal accepts interface to a range of input types in voltage or current mode. In voltage mode it will accept input from 0 to 5 V or 0 to 10 V devices. In current mode it will accept input from 4 to 20 mA or 0 to 20 mA devices.

MForce MicroDrive (above left) and PowerDrive (above right) motion control via CANopen interface

- 0 - 5 V capture input or trip output signal

  The one capture/trip I/O high speed signal can be used to capture the axis position when active, or to control an external event when configured as a trip output.

- 0 - 5 V pulse/direction output signals

  Two pulse/direction I/O signals can be used to control a secondary device with pulse/direction inputs in an electronic gearing application. When configured as inputs they can be used to receive pulse/direction signals from a master controller.

Communication interface

The communication interface is used to connect CANopen for commissioning and programming purposes. A PC can be connected to the communication interface via a USB to CANopen converter. The provided software can be used for commissioning functionality, creating programs and programming the MForce drives (see accessories section).

MOTION CONTROL PRODUCTS
Official UK & Ireland Distributor

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Electrical data

Power supply connection (1)

		MForce MicroDrive	MForce PowerDrive
Supply voltage range (absolute limit values)	VDC	12 ... 48	12 ... 75
Nominal supply voltage	VDC	24 ... 48	24 ... 48
Ripple at nominal voltage	V_{PP}	2	2
Motor drive output current	A rms	3.0	5.0
Max. current consumption	A	4.2	7.0
Inrush current		C=94 µF	C=200 µF

(1) Not protected against reverse polarity

General purpose I/O

Number/Type			Standard features: 4 sinking outputs / 4 sourcing or sinking inputs	Expanded features: 8 sourcing or sinking outputs/ inputs (or 4 with remote encoder interface option)	8 sourcing or sinking outputs/inputs (or 4 with remote encoder interface option)
When defined as inputs		VDC	0 to +24		
	Input current (typical at +24VDC)	mA	1.75 maximum		
When defined as outputs		VDC	Up to +24		
	Sourcing/sinking output current	mA	600 (single channel, duty cycle = 0.80)		

Communication interface

CANopen	Signal inputs/outputs		According to ISO 11898 standard, galvanic isolation, externally powered
	Transmission rate	kBaud	10 / 20 / 50 / 100 / 125 / 250 / 800 / 1000
	Transmission protocol		CANopen as per DS301; IEC61800-7-201 (CiA 402)

Mechanical data

		MForce MicroDrive	MForce PowerDrive
Dimensions (W x H x D)	inch	1.8 x 1.3 x 2.3	3.0 x 2.1 x 3.9
	mm	45 x 33 x 59	76 x 54 x 99
Mass	oz	3	12
	kg	0.08	0.34
Type of cooling		Convection and conduction	Convection

Ambient conditions

Ambient temperature (2)	°C	0 ... 65; power reduction by 2%/°C at 50 ... 65
Transport and storage temperature	°C	-25 ... +70
Installation height without power reduction	m	< 1000 m above mean sea level
Relative humidity	%	15 ... 85 (not condensing)

(2) Limit values with flanged motor mounted on a steel plate 300 x 300 x 10 mm

Certifications

Conformity to standards		MForce drives have been developed to conform to the requirements of EN 55011:2007, A2:2007 for Group 1, Class A, conducted and radiated emissions EN 61000-3-2:2006 harmonic current emissions EN 61000-3-3:1995, A1:2001, A2:2005 voltage fluctuation emissions. (Proper use of power supply/mains filters and shielding on power and interface cables is necessary to meet these requirements.)
	EMC immunity	IEC 61000-4-2, electrostatic discharge immunity IEC 61000-4-3, radiated electromagnetic field immunity IEC 61000-4-4, electrical fast transient / burst immunity IEC 61000-4-5, surge immunity IEC 61000-4-6, immunity to conducted disturbances induced by RF fields IEC 61000-4-11, immunity to voltage dips and interruptions
	Conducted and radiated EMC emissions	EN 55011:2007, A2:2007 for Group 1, Class A
CE marking		The MForce drives are CE marked in accordance with the European EMC Directive (2004/108/EEC).

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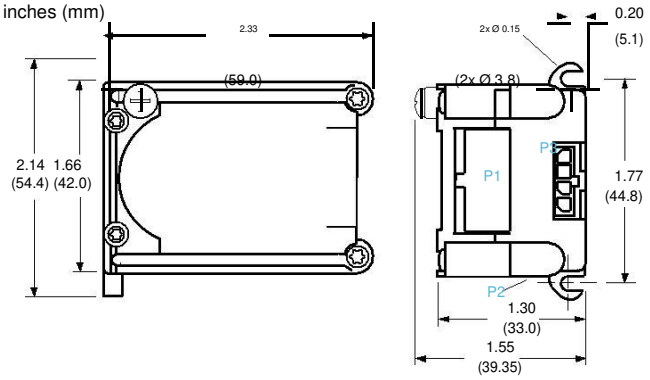
Dimensions

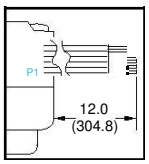
MForce MicroDrive

inches (mm)



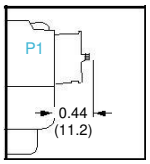
P1 connector options

I/O & Power



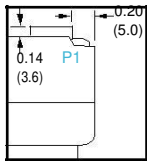
flying leads – 12.0" (305mm)

I/O & Power



pluggable non-locking clamp terminal strip – 7-pin spring

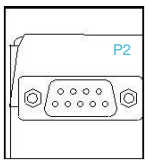
Expanded I/O & Power



wire crimp – 16-pin locking (1)

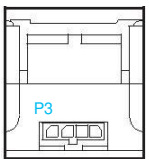
P2 connector

Communication



IDB9 connector

P3 connector

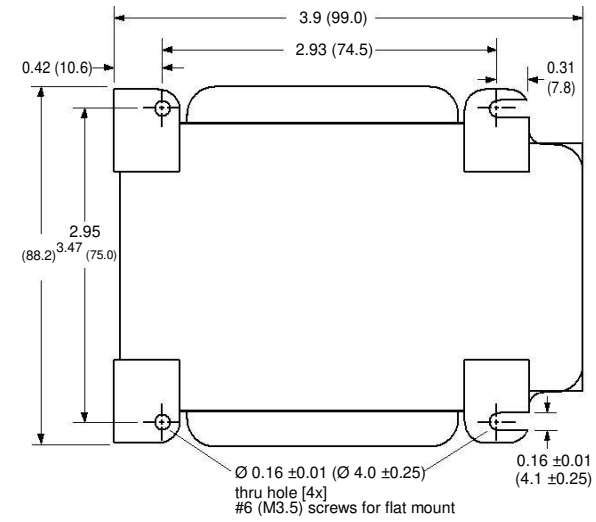


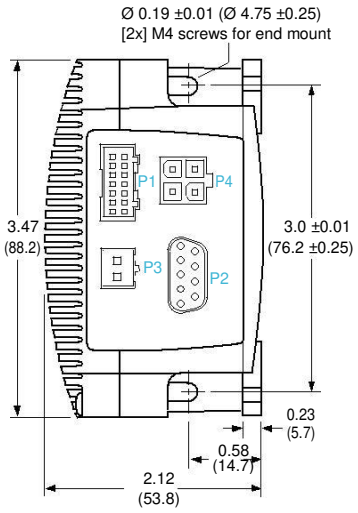
wire crimp – 4-pin locking

(1) 16-pin locking wire crimp connector at P1 only on products with expanded features or remote encoder interface option.

MForce PowerDrive

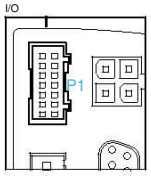
inches (mm)





P1 connector

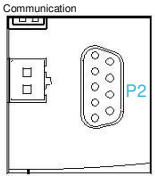
I/O



wire crimp – 14-pin locking (2)

P2 connector

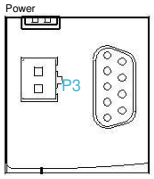
Communication



DB9 connector

P3 connector

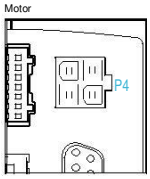
Power



wire crimp – 2-pin locking

P4 connector

Motor



wire crimp – 4-pin locking

(2) Products with optional remote encoder interface have a 20-pin connector at P1.

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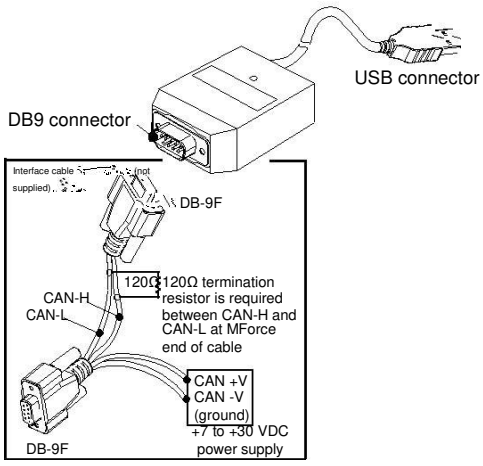

MD-CC500-000

MicroDrive

Connector	Style	Assignment
P1	7-pin terminal strip, 12" flying leads or 16-pin wire crimp	Power and multifunction
P2	DB9	Communication
P3	4-pin wire crimp	Motor

PowerDrive

Connector	Style	Assignment
P1	14- or 20-pin wire crimp	Multifunction
P2	DB9	Communication
P3	2-pin wire crimp	Power
P4	4-pin wire crimp	Motor

Connectivity

Communication converter

CANopen dongle to set/program communication parameters. Requires a mating connector adapter and power supply, not supplied.

	length feet (m)	part number
Mates to DB9 connector	12.0 (3.6)	MD-CC500-000

Cables

To speed your test/development, these cables are pre-wired with mating connectors.

			length feet (m)	part number
MicroDrive				
P1 mate	Power and multifunction interface		10.0 (3.0)	PD16-1417-FL3
P3 mate	Motor interface		10.0 (3.0)	PD04-MF17-FL3
PowerDrive				
P1 mate	Multifunction interface	14-pin wire crimp	10.0 (3.0)	PD14-2334-FL3
		20-pin wire crimp	10.0 (3.0)	PD20-3400-FL3
P3 mate	Power interface		10.0 (3.0)	PD02-3400-FL3
P4 mate	Motor interface		10.0 (3.0)	PD04-MF34-FL3

Connector kits

Connectors for assembly of cables. Cable not supplied.

			Sold in lots of	part number
MicroDrive				
P1 mate	Power and multifunction interface		5	CK-10
P3 mate	Motor interface		5	CK-06
PowerDrive				
P1 mate	Multifunction interface	14-pin	5	CK-09
		20-pin	5	CK-11
P3 mate	Power interface		5	CK-05
P4 mate	Motor interface		5	CK-07

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Motion Control stepper motor drive, CANopen interface

MForce MicroDrive stepper motor drive for CANopen

Part numbers

MicroDrive

example part number	MF I 1FCB17N4
Product designation MFI = Motion Control for CANopen	MF I 1 F CB 1 7N4
Input 1 = standard features 3 = expanded features (1)	MF I 1 F CB 1 7N4
P1 connector style F = flying leads P = terminal strip C = wire crimp (1)	MF I 1 F C B 1 7N4
P2 connector style CB = DB9	MF I 1 F CB 1 7N4
MForce version 17 = MicroDrive	MF I 1 F CB 1 7N4
Supply voltage N4 = 48 VDC	MF I 1 F C B 1 7N4
Option (1) -EE = Interface for a remote encoder (not supplied)	MF I 1 F C B 1 7N4–EE

(1) Only available on products with expanded features.

MForce PowerDrive stepper motor drive for CANopen

PowerDrive

example part number	MF I 3CCB34N7
Product designation MFI = Motion Control for CANopen	MF 1 3 CCB3 4 N7
Interface 3CCB = standard connector interface	MF 1 3 CCB 3 4N7
MForce version 34 = PowerDrive	MF 1 3 CC B3 4N7
Supply voltage N7 = 75 VDC	MF 1 3 CCB3 4N7
Option -EE = Interface for a remote encoder (not supplied)	MF 1 3 CCB3 4N7–EE

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Optional motors

2-phase stepper motors

Full steps per revolution	200
Step angle a	1.8 °
Number of leads	4
Ambient temperature	-25 ... +40 °C
Thermal class	130 (B)

Electrical and mechanical data

NEMA14		M-1410-0.75• (1)								
Stack length		single								
Phase current	amps	0.75								
Holding torque	oz-in / N-cm	10 / 7								
Rotor inertia	oz-in-sec^2	0.00017								
	kg-cm^2	0.012								
Phase inductance	mH	4.0								
Phase resistance	Ω	4.3								
Weight	oz / grams	4.2 / 120								
NEMA17		M-1713-1.5• (1)	M-1715-1.5• (1)	M-1719-1.5• (1)						
Stack length		single	double	triple						
Phase current	amps	1.5	1.5	1.5						
Holding torque	oz-in / N-cm	32 / 23	60 / 42	75 / 53						
Rotor inertia	oz-in-sec^2	0.000538	0.0008037	0.0011562						
	kg-cm^2	0.038	0.057	0.082						
Phase inductance	mH	2.1	5.0	3.85						
Phase resistance	Ω	1.3	2.1	2.0						
Weight	oz / grams	7.4 / 210	8.1 / 230	12.7 / 360						
NEMA23		M-2218-2.4S (2)	M-2222-2.4S (2)	M-2231-2.4S (2)	M-2218-3.0• (2)	M-2222-3.0• (2)	M-2231-3.0• (2)	M-2218-6.0• (3)	M-2222-6.0• (3)	M-2231-6.0• (3)
Stack length		single	double	triple	single	double	triple	single	double	triple
Phase current	amps	2.4	2.4	2.4	3.0	3.0	3.0	6.0	6.0	6.0
Holding torque	oz-in / N-cm	90 / 64	144 / 102	239 / 169	90 / 64	144 / 102	239 / 169	100 / 71	150 / 106	257 / 181
Rotor inertia	oz-in-sec^2	0.00255	0.00368	0.0065	0.00255	0.00368	0.0065	0.0017	0.00397	0.0068
	kg-cm^2	0.18	0.26	0.46	0.18	0.26	0.46	0.12	0.28	0.48
Phase inductance	mH	2.4	4.0	5.4	1.5	2.6	3.36	0.47	0.73	1.04
Phase resistance	Ω	0.95	1.2	1.5	0.65	0.85	0.95	0.16	0.19	0.23
Weight	oz / grams	16.9 / 480	21.2 / 600	35.3 / 1000	16.9 / 480	21.2 / 600	35.3 / 1000	16.6 / 470	24.7 / 700	35.3 / 1000
NEMA34		M-3424-6.3• (3)	M-3431-6.3• (3)	M-3447-6.3• (3)						
Stack length		single	double	triple						
Phase current	amps	6.3	6.3	6.3						
Holding torque	oz-in / N-cm	408 / 288	574 / 405	1090 / 770						
Rotor inertia	oz-in-sec^2	0.01275	0.01924	0.03849						
	kg-cm^2	0.90	1.35	2.70						
Phase inductance	mH	1.9	3.3	6.2						
Phase resistance	Ω	0.30	0.32	0.56						
Weight	oz / grams	60.0 / 1700	84.7 / 2400	141.1 / 4000						

(1) Recommended for use with MForce MicroDrives.
(2) Recommended for use with MForce MicroDrives and PowerDrives.
(3) Recommended for use with MForce PowerDrives.

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