

MForce stepper motor drives

for CANopen



MForce MicroDrive and PowerDrive
for CANopen

MForce stepper motor drives for CANopen



MForce PowerDrive stepper motor drive for CANopen



MForce MicroDrive stepper motor drive for CANopen

Drive system

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.

Control

The MForce Motion Control can be setup and controlled via the supplied CANopen interface. Up to eight different 24 V signals are also available. They can be used as input or output.

Power supply voltage

MForce can be operated with a voltage range of:

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

Connection technologies

The MForce has the following connections:

- Power supply
- Multifunction interface
- Communication interface
- Motor interface

Multifunction interface

The multifunction interface operates at the following signal levels:

- 5 to 24 V programmable signals, inputs or outputs, sinking or sourcing
- One analog input accepts 0 to 5 V, 0 to 10 V, 4 to 20 mA or 0 to 20 mA
- One 0 to 5 V capture input or trip output signal
- Two 0 to 5 V pulse/direction output signal

24 V I/O signals

Eight 24 V I/O signals are available via the multifunction interface, which can be commissioned 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

This 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.

5 V capture input/trip output signal

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

5 V pulse/direction signals

The pulse/direction I/O signals can be used to control a secondary device with pulse/direction inputs in an electronic gearing application. When commissioned 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).

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).

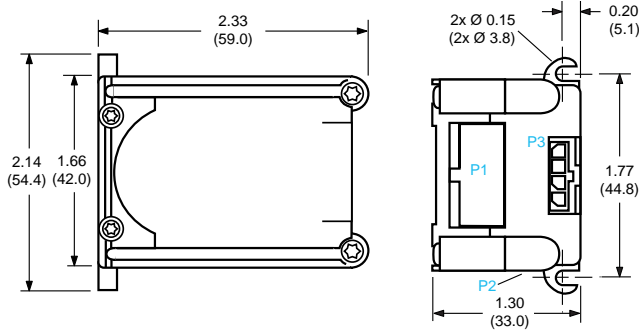
Ambient conditions	
Ambient temperature (1)	°C 0 ... 65; power reduction by 2%/°C at 50 ... 65
Transport and storage temperature	°C -25 ... +70
Installation height without power reduction	m < 1000 m above mean sea level
Relative humidity	% 15 ... 85 (not condensing)

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

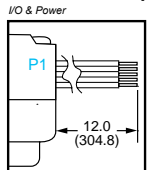
Electrical data			
Power supply connection		Not protected against reverse polarity	
		MForce MicroDrive	MForce PowerDrive
Supply voltage range (absolute limit values)	VDC	12 ... 48	12 ... 75
Nominal supply voltage	VDC	24 ... 48	24 ... 48
Ripple at nominal voltage	V _{PP}	2	2
Motor drive output current	A _{rms}	3.0	5.0
Max. current consumption	A	4.2	7.0
Inrush current		C=94 µF	C=200 µF
General purpose I/O		MForce MicroDrive	MForce PowerDrive
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)
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)	
Fieldbus interfaces			
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			
Type of stepper motor drive		MForce MicroDrive	MForce PowerDrive
Dimensions (W x H x D)	inches	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

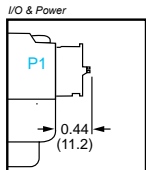
MForce MicroDrive, dimensions in inches (mm)



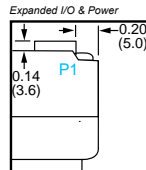
P1 connector options



12.0" (305mm) flying leads

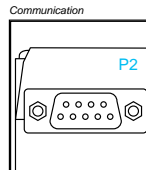


7-pin non-locking spring clamp terminal strip



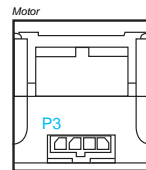
16-pin locking wire crimp connector (1)

P2 connector



DB9 connector

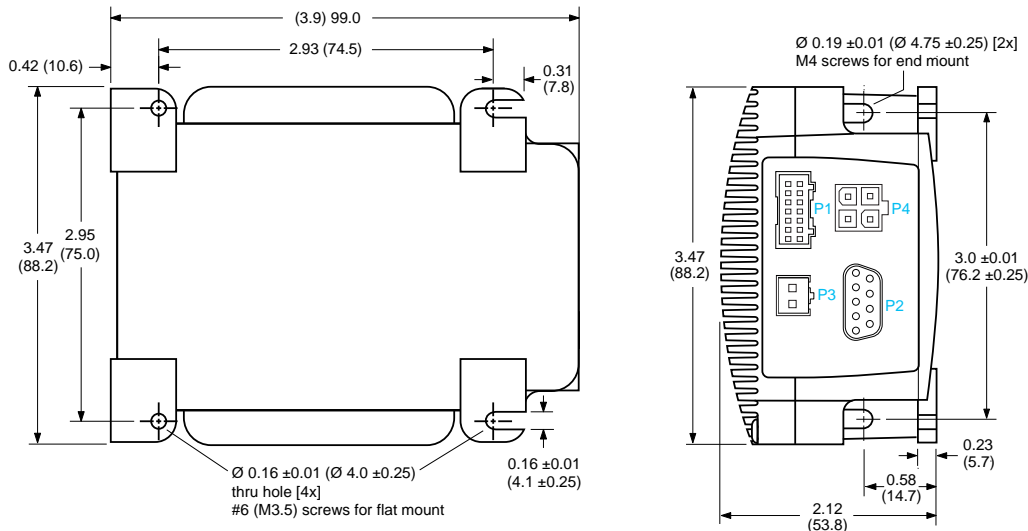
P3 connector



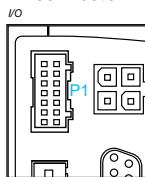
4-pin locking wire crimp connector

(1) 16-pin locking wire crimp connector at P1 only available with expanded I/O or remote encoder interface option.

MForce PowerDrive, dimensions in inches (mm)

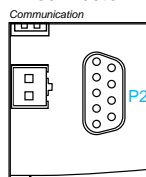


P1 connector



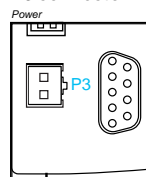
14-pin locking wire crimp connector (2)

P2 connector



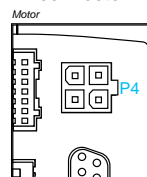
DB9 connector

P3 connector



2-pin locking wire crimp connector

P4 connector



4-pin locking wire crimp connector

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

MForce stepper motor drives for CANopen



MForce PowerDrive stepper motor drive for CANopen

PowerDrive												
Example:	M	F	I	3	C	C	B	3	4	N	7	
Product designation MFI = MForce CANopen drive	M	F	I	3	C	C	B	3	4	N	7	
3CCB = standard connector interface	M	F	I	3	C	C	B	3	4	N	7	
MForce version 34 = PowerDrive	M	F	I	3	C	C	B	3	4	N	7	
Supply voltage N7 = 75 VDC	M	F	I	3	C	C	B	3	4	N	7	
Option -EE = Interface for a remote encoder (not supplied)	M	F	I	3	C	C	B	3	4	N	7	-EE



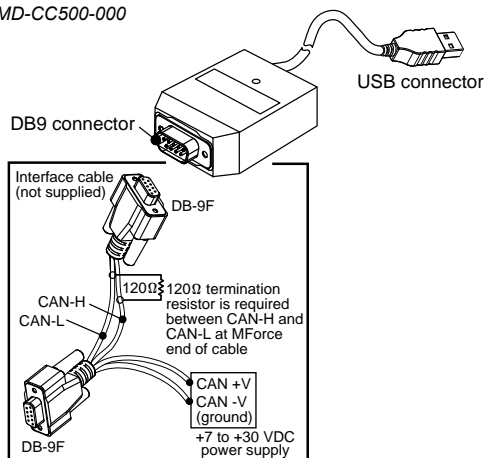
MForce MicroDrive stepper motor drive for CANopen

MicroDrive												
Example:	M	F	I	1	F	C	B	1	7	N	4	
Product designation MFI = MForce CANopen drive	M	F	I	1	F	C	B	1	7	N	4	
Input 1 = standard features 3 = expanded features (1)	M	F	I	1	F	C	B	1	7	N	4	
P1 connector style F = flying leads P = terminal strip C = wire crimp (1)	M	F	I	1	F	C	B	1	7	N	4	
P2 connector style CB = DB9	M	F	I	1	F	C	B	1	7	N	4	
MForce version 17 = MicroDrive	M	F	I	1	F	C	B	1	7	N	4	
Supply voltage N4 = 48 VDC	M	F	I	1	F	C	B	1	7	N	4	
Option (1) -EE = Interface for a remote encoder (not supplied)	M	F	I	1	F	C	B	1	7	N	4	-EE

(1) Only available on products with expanded features.

MForce stepper motor drives for CANopen

MD-CC500-000



MForce MicroDrive CANopen



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

MForce PowerDrive CANopen



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

Installation accessories

Description	Length feet (m)	Part number
Communication converter		
CANopen dongle to set/program communication parameters. Requires a mating connector adapter and power supply, not supplied.		

■ For MForce with CANopen fieldbus	12.0 (3.6)	MD-CC500-000
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Description	Length feet (m)	Part number
Cables		

Pre-wired mating connector with other cable end open.

MForce MicroDrive CANopen

■ P1	Power and multifunction interface	16-pin connector	10.0 (3.0)	PD16-1417-FL3
■ P3	Motor interface	4-pin connector	10.0 (3.0)	PD04-MF17-FL3

MForce PowerDrive CANopen

■ P1	Multifunction interface	14-pin connector	10.0 (3.0)	PD14-2334-FL3
		20-pin connector	10.0 (3.0)	PD20-3400-FL3
■ P3	Power interface	2-pin connector	10.0 (3.0)	PD02-3400-FL3
■ P4	Motor interface	4-pin connector	10.0 (3.0)	PD04-MF34-FL3

Description	Sold in lots of	Part number
Connector kits		

Connectors for assembly of cables. Cable not supplied.

MForce MicroDrive CANopen

■ P1	Power and multifunction interface	16-pin connector	5	CK-10
■ P3	Motor interface	4-pin connector	5	CK-06

MForce PowerDrive CANopen

■ P1	Multifunction interface	14-pin connector	5	CK-09
		20-pin connector	5	CK-11
■ P3	Power interface	2-pin connector	5	CK-05
■ P4	Motor interface	4-pin connector	5	CK-07

2-phase stepper motors		
Number of full steps per revolution		200
Step angle α	°	1.8
Number of leads		4
Ambient temperature	°C	-25 ... +40
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	10								
	N-cm	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	4.2								
	grams	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	32	60	75						
	N-cm	23	42	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	7.4	8.1	12.7						
	grams	210	230	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	90	144	239	90	144	239	100	150	257
	N-cm	64	102	169	64	102	169	71	106	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	16.9	21.2	35.3	16.9	21.2	35.3	16.6	24.7	35.3
	grams	480	600	1000	480	600	1000	470	700	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	408	574	1090						
	N-cm	288	405	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	60.0	84.7	141.1						
	grams	1700	2400	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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