MDrive® Plus

Stepper motors with integrated electronics

MDrive 17 Plus Speed Control
with programmable velocity control

IMS
INTELLIGENT MOTION
SYSTEMS, INC.

Schneider Electric

MDrive® Plus
Speed Control
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Presentation

The MDrive® Plus Speed Control with programmable velocity control is a 1.8° 2-phase stepper motor with on-board control electronics. The velocity control uses voltage, current, or PWM analog input signal modes.

Settings for MDrive Plus Speed Control products may be changed on-the-fly or downloaded and stored in nonvolatile memory using the IMS SPI Motor Interface software provided. This eliminates the need for external switches or resistors. Parameters are changed via an SPI port.

Application areas

The MDrive Plus Speed Control with programmable velocity control is ideal for machine builders who want an optimized motor with on-board electronics. The integrated electronics of the MDrive Plus Speed Control with programmable velocity control reduces the potential for problems due to electrical noise by eliminating the cable between motor and drive.

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

Features

- Highly integrated microstepping drive and high torque 1.8° 2-phase stepper motor
- Advanced current control for exceptional performance and smoothness
- Single supply: from +12 up to +75 VDC
- Cost effective
- Extremely compact
- 20 microstep resolutions up to 51,200 steps per rev including: Degrees, Metric, Arc Minutes
- 10-bit analog speed control inputs accept:
  - 0 to +5 VDC
  - 0 to +10 VDC
  - 4 to 20 mA
  - 0 to 20 mA
  - 15 to 25 kHz PWM
- Automatic current reduction
- Electronically configurable:
  - Motor run / hold current
  - Microstep resolution
  - Acceleration / deceleration
  - Initial and maximum velocity
  - Hold current delay time / motor settling delay time
  - Programmable filtering for the stop / start input
- Available options:
  - Encoder
  - Control knob for manual positioning
- Several motor stack lengths available
- Setup parameters may be switched on-the-fly
- Numerous connector interface choices
- Graphical user interface provided for quick and easy parameter setup

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Plus specifications

			MDrive 17	MDrive 23 *(1)*	MDrive 23 *(1)*	MDrive 34
Input power	Voltage	VDC	12 to 48	12 to 75	12 to 60	12 to 75
	Current maximum *(2)*		2A	2A	3.5A	4A
Thermal	Operating temp non-condensing	Heat sink	–40° to +85°C			–40° to +75°C
		Motor	–40° to +100°C			–40° to +90°C
Speed control	Input		0 to +5 VDC *(4)*, 0 to +10 VDC, 4 to 20 mA, 0 to 20 mA, or 15 to 25 kHz PWM			Speeds A1 and A2: 0 to +5 VDC *(4)*, 0 to +10 VDC, 4 to 20 mA, or 0 to 20 mA
	A/D resolution		10 bit			10 bit
Logic input	Low level		0 to +0.8 VDC			0 to +0.8 VDC
	High level		+2.0 to +5.0 VDC			+5.0 to +24.0 VDC
	Internal pull-up resistance		20 kΩ (to +3.3 VDC)			not applicable
	Optically isolated		no			yes
	Configurable		sinking			sourcing or sinking
Logic output	Step clock/direction	Open drain source maximum	not applicable			+100 VDC
		Open drain current continuous	not applicable			100 mA
		Output pulse width	not applicable			100 nSec to 12.8 µSec software configurable
Motion	Oscillator frequency maximum		5 MHz			
	Microstep resolution	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)			

Setup parameters *(4)*

SPI communication	Function	Range	Units	Default
A1 *(5)*	Analog input mode	0 to +5 VDC, 0 to +10 VDC, 4 to 20 mA, 0 to 20 mA, or 15 to 25 kHz PWM	—	0 to +5 VDC
ACCL	Acceleration	91 to 1.5 X 10^9	steps/sec^2	1,000,000
C *(7)*	Joystick center	1 to 1022	counts	0
CLK OUT *(6)*	Clock out	none, step/dir, quadrature, up/down	—	none
DB *(8)*	Analog deadband	0 to 255	counts	1
DECL	Deceleration	91 to 1.5 X 10^9	mSec	500
DIR	Motor direction override	Clockwise (cw)/counterclockwise (ccw)	—	cw
FAULT	Fault/checksum error	error code	—	none
FS *(8)*	Analog full scale	1 to 1023	counts	1023
HCDT	Hold current delay time	HCDT + MSDT <= 65535	milliseconds	500
IF *(8)*	Analog input filter	1 to 1000	counts	1
IMODE *(6)*	Source	A1 spd/A2 spd or PWM 15 to 25 kHz	—	A1&A2
	Analog input, A1&A2 spds	0 to +5 VDC, 0 to +10 VDC, 4 to 20 mA, 0 to 20 mA	volts or current	0 to +5 VDC
MHC	Motor hold current	0 to 100	percent	5
MRC	Motor run current	1 to 100	percent	25
MSDT	Motor settling delay time	MSDT + HCDT <= 65535	milliseconds	0
MSEL	Microstep resolution	1, 2, 4, 5, 8, 10, 16, 25, 32, 50, 64, 100, 108, 125, 127, 128, 180, 200, 250, 256	µsteps per full step	256
STEPW *(6)*	Step width	0 (square wave), 100 nSec to 12.8 µSec	nSec	550 nSec
SSD	Stop/start debounce	0 to 255	milliseconds	0
VI	Initial velocity	0 to <VM	steps/sec	1000
VM	Maximum velocity	VI to 5,000,000	steps/sec	768,000
TEMP *(6)*	Warning temperature	0 to 85°C	°C	80°C
USER ID	User ID	customizable	1-3 characters	IMS

(1) Only quad stack NEMA 23 motors have +12 to +60 VDC drives, all other NEMA 23 motors have +12 to +75 VDC drives.

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

(3) 10 kΩ potentiometer resistance.

(4) All parameters are set using the supplied IMS SPI Motor Interface GUI and may be changed on-the-fly. An optional Communication Converter is recommended with first orders.

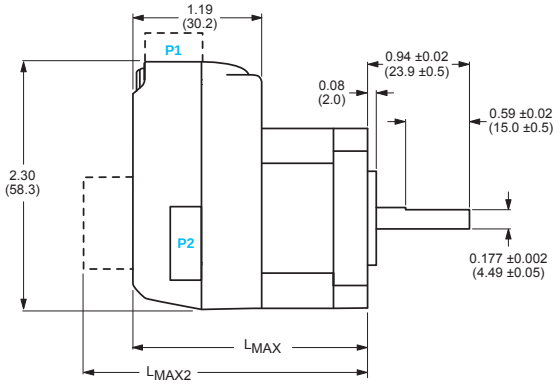
(5) Only with MDrive17 & MDrive23 products.

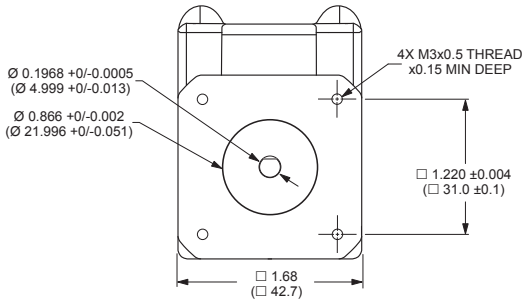
(6) Only with MDrive34 products.

(7) Separate analog inputs for A1 and A2 speeds with MDrive 34 products.

See User Manual for complete details: www.imshome.com/manuals.html

– Plus – mechanical specifications, dimensions in inches (mm)

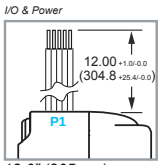




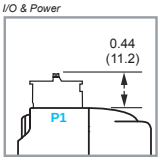
Motor stack length	Lmax *(1)*	Lmax2 *(2)*
Single	2.20 (55.9)	2.79 (70.9)
Double	2.43 (61.7)	3.02 (76.7)
Triple	2.77 (70.4)	3.37 (85.6)

(1) Single shaft.
(2) Control knob or external encoder.

P1 connector options

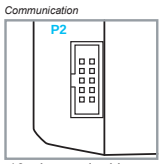


12.0" (305mm) flying leads

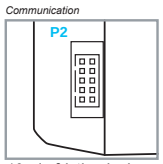


7-pin non-locking spring clamp terminal strip

P2 connector options

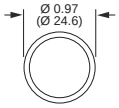


10-pin non-locking IDC connector

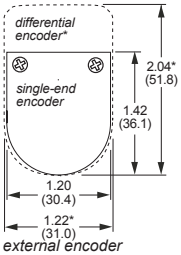


10-pin friction lock wire crimp connector

Lmax2 options



control knob



external encoder

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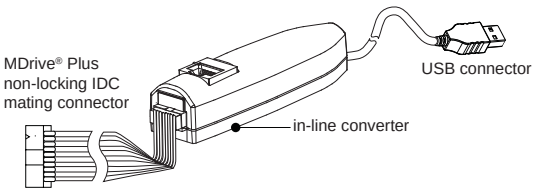
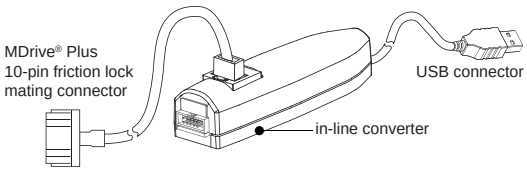


MD-CC300-001



MD-CC302-001

Installation accessories

Description	Length feet (m)	Part number
QuickStart Kit		
For rapid design verification, all-inclusive QuickStart Kits include connectivity, instructions and CD for MDrivePlus initial functional setup and system testing.		
■ For all MDrive17 Speed Control products.	—	**add "K" to part number** *(1)*
Communication converter		
Electrically isolated, in-line converter pre-wired with mating connector to conveniently set/ program communication parameters for a single MDrivePlus via a PC's USB port.		
■ Mates to 10-pin non-locking IDC connector	12.0 (3.6)	**MD-CC300-001**
■ Mates to 10-pin friction lock wire crimp connector	12.0 (3.6)	**MD-CC302-001**
Mating connector kit		
Connectors for assembly of cables, cable material not supplied. Sold in lots of 5. Manufacturer's crimp tool recommended for crimp connectors.		
■ 10-pin non-locking IDC connector for communication	—	**CK-01**
■ 10-pin friction lock wire crimp connector for communication	—	**CK-02**
Encoder cables		
Pre-wired mating connector with other cable end open.		
■ For external single-end encoder	1.0 (0.3)	**ED-CABLE-2**
■ For external differential encoder, locking cable	6.0 (1.8)	**ED-CABLE-6**
Drive protection module		
Limits surge current and voltage to a safe level when DC input power is switched on-and-off to an MDrivePlus.		
■ For all MDrive17 Speed Control products	—	**DPM75**

(1) See next page.

Connectivity details: www.imshome.com/connect.html

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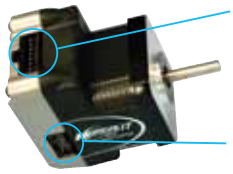

P1: I/O & Power
F = 12" flying leads
P = non-locking spring clamp terminal strip

P2: Communication
D = SPI with 10-pin IDC non-locking connector
L = SPI with 10-pin friction lock wire crimp connector

Part numbers

Example:	K	M	D	O	1	F	S	D	1	7	A	4	–E1
QuickStart Kit **K** = kit option, or leave blank if not wanted	**K**	M	D	O	1	F	S	D	1	7	A	4	–E1
MDrive Plus version **MDO** = Speed Control	K	**M**	**D**	**O**	1	F	S	D	1	7	A	4	–E1
Input **1** = Plus, standard features	K	M	D	O	**1**	F	S	D	1	7	A	4	–E1
P1 connector — I/O & power **F** = flying leads **P** = pluggable	K	M	D	O	1	**F**	S	D	1	7	A	4	–E1
Communication **S** = SPI	K	M	D	O	1	F	**S**	D	1	7	A	4	–E1
P2 connector — communication **D** = IDC **L** = wire crimp	K	M	D	O	1	F	S	**D**	1	7	A	4	–E1
Motor size **17** = NEMA 17 (1.7" / 42 mm)	K	M	D	O	1	F	S	D	**1**	**7**	A	4	–E1
Motor length **A** = single stack **B** = double stack **C** = triple stack	K	M	D	O	1	F	S	D	1	7	**A**	4	–E1
Drive voltage **4** = +12 to +48 VDC	K	M	D	O	1	F	S	D	1	7	A	**4**	–E1
Options Leave blank if not wanted Options may not be combined													**–E1**

–E___ = external optical encoder with index mark

line count	100	200	250	256	400	500	512	1000	1024
single-end part #	E1	E2	E3	EP	E4	E5	EQ	E6	ER
differential part #	EAL	EBL	ECL	EWL	EDL	EHL	EXL	EJL	EYL

–N = rear control knob for manual positioning

Easy MDrive part numbers via an interactive tool at:
www.imshome.com/MDrivePlus.html

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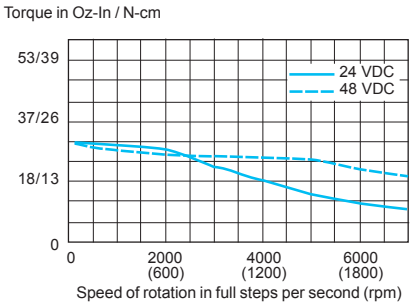
Motor specifications MDrive 17

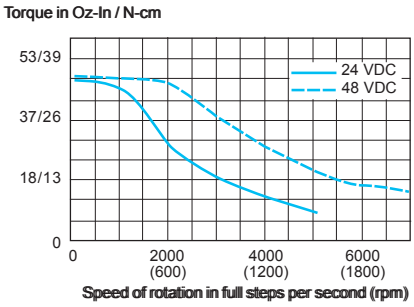
		Holding torque	Detent torque	Rotor inertia	Weight (motor + driver)
Motor stack length	Single	32.0 oz-in / 22.6 N-cm	1.66 oz-in / 1.17 N-cm	0.00053 oz-in-sec^2 / 0.038 kg-cm^2	10.4 oz / 294.8 g
	Double	60.0 oz-in / 42.4 N-cm	2.08 oz-in / 1.47 N-cm	0.00080 oz-in-sec^2 / 0.057 kg-cm^2	12.0 oz / 340.2 g
	Triple	74.9 oz-in / 52.9 N-cm	3.47 oz-in / 2.45 N-cm	0.00116 oz-in-sec^2 / 0.082 kg-cm^2	15.2 oz / 430.9 g

Speed torque characteristics MDrive 17

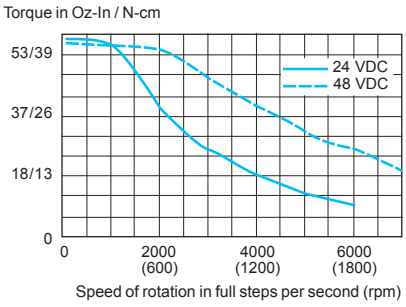
Single stack length



Double stack length



Triple stack length



USA SALES OFFICES

Eastern Region
Tel. 862 208-9742 - Fax 973 661-1275
e-mail: e.region@imshome.com

Northeast Region
Tel. 860 368-9703
e-mail: n.region@imshome.com

Central Region
Tel. 860 295-6102
e-mail: c.region@imshome.com

Western Region
Tel. 602 578-7201
e-mail: w.region@imshome.com

IMS EUROPEAN SALES MANAGEMENT

4 Quai Des Etroits
69005 Lyon, France
Tel. +33/4 7256 5113 - Fax +33/4 7838 1537
e-mail: europe.sales@imshome.com

TECHNICAL SUPPORT

Tel. +00 (1) 860 295-6102 - Fax +00 (1) 860 295-6107
e-mail: etech@imshome.com

Schneider Electric Motion USA
370 North Main Street, P.O. Box 457
Marlborough, CT 06447 - U.S.A.
Tel. +00 (1) 860 295-6102 - Fax +00 (1) 860 295-6107
e-mail: info@imshome.com
www.schneider–electric–motion.us

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INTELLIGENT MOTION SYSTEMS, INC.

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